

Sensors



Vision



Wireless



Lighting & Indicators



Machine Safety





*From simple to advanced,
Banner solves more applications in your plant!*



Sensors

- Presence
- Absence
- Inspection
- Gating
- Counting
- Measurement
- Position

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Vision

- Pattern Recognition
- Complex Part Inspection
- Multi-Component Gauging
- Part ID/Orientation
- Assembly Verification
- Print Verification
- Traceability (Bar Code and Text)

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Wireless

- Process Control & Monitoring
- Factory Automation
- Agriculture & Water Management
- Traffic Monitoring & Control
- Commercial & Consumer Monitoring

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Lighting & Actuators

- Bin & Part Picking
- Error Proofing
- Pick-to-Light & Call for Parts
- Visual & Audible Indication
- Operator Guidance
- Visual Management
- Andon Indication
- Pilot & Stack Light Replacement

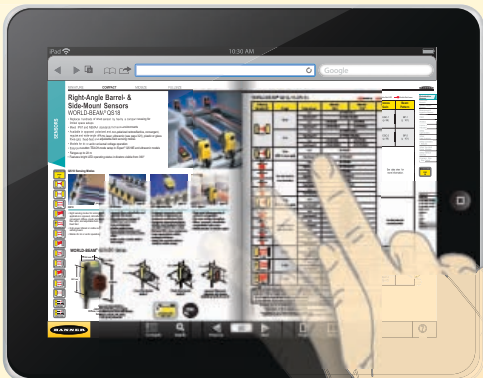
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Machine Safety

- Safety Light Screens
- Fiber Optic Safety Systems
- Safety Modules & Controllers
- Emergency Stop Devices
- Safety Interlocks
- Ergonomic Two-Hand Control & Run Bars

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2012 Catalog is also available electronically.



catalog.bannerengineering.com

Who we are

If you've done business with Banner, you know that we're a strong friendly team of professionals totally committed to making your job easier.

If you're new to Banner, we invite you to experience our extraordinary products, customized solutions and outstanding service. We're a global leader in industrial and process automation with an extensive product line of award-winning photo eyes and sensors, wireless sensors, vision sensors and vision lighting, machine safety and indicator lights.

Whether you're in the field or on the factory floor, you'll find us to be fast, flexible problem solvers, eager to address your process and factory automation challenges.

This "customers first" philosophy permeates everything we do. And it's responsible for the success of our global, continually growing firm.

Strong past, bright future

It's been over 40 years since Bob Fayfield founded Banner, a small electronics engineering firm focused on personal service and smart, customized solutions.

Today, Banner is a global leader in photo eyes, sensors, wireless sensors, vision sensors and vision lighting, machine safety, and indicator lights. With worldwide distributors and thousands of products, Banner still maintains a steadfast focus on attentive service and rapid customization.

Every year Banner releases hundreds of new products for industrial and process automation. Banner's products help customers increase efficiency, reduce costs, ensure quality, monitor and control processes, and safeguard employees. And the firm continues to attract the industry's top talent: inventive product designers, highly skilled application engineers, talented business managers, and strong channel partners.

Banner values

- Customers First
- Integrity Always
- Quality in Everything
- New Solutions — Every Day



Banner Engineering is a global company providing industrial automation and process automation solutions around the world. Banner distributors can help you select the right solution for your application.



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Photoelectric Sensors page 52

Miniature page 61

Miniature photoelectric sensors are tiny and slim, for mounting in confined spaces. Opposed-mode sensing distance is up to 15 m. Dimensions, in millimeters, range from 12x16x15 to 26x9x16.

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Compact page 89

Compact photoelectric sensors are about the size of a thumb and are either rectangular or barrel shaped. Opposed-mode sensing distance is up to 30 m and operate with ac, dc or ac/dc universal voltage. Dimensions, in millimeters, range from 35x31x15 to 81x30.7x12.2.

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Midsize page 153

Midsize photoelectric sensors are rectangular or barrel shaped. Opposed-mode sensing distance is up to 60 m and operate with ac, dc or ac/dc universal voltage. Dimensions, in millimeters, range from 42x42x12.7 to 102x30.7x12.2 for rectangles and 102x30 for barrels.

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Fullsize page 193

Fullsize photoelectric sensors can sense distances up to 200 m, operate with ac, dc, or ac/dc universal voltage and offer E/M relay outputs. Dimensions, in mm, range from 67x52x25 to 98.6x54.6x44.5.

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| OMNI-BEAM | 211 | | |

Fiber Optic Sensors page 226

Fiber Sensors page 226

Fiber optic sensors are ideal for harsh conditions: high vibration, extreme heat, and wet, explosive or corrosive environments. In confined areas, the flexible fibers can be positioned precisely.

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Plastic Fibers page 252

Plastic fibers are for general purpose use. They tolerate severe flexing, can be cut to length during installation.

Glass Fibers page 269

Glass fibers are the best fiber choice for challenging environments such as high temperatures, corrosive materials and moisture.

Special-Purpose Sensors page 276

Part-Sensing page 277

Part-sensing sensors detect objects that pass through an area defined by an array of sensing beams.

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Slot & Label page 279

Slot sensors, sometimes called optical fork sensors because of their "forked" shape, detect objects that pass between the two arms—one with the emitter, the other with the receiver. The fixed slot width provides reliable opposed-mode sensing of objects as small as 0.30 mm.

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Registration Mark & Color page 286

Registration mark sensors detect subtle color contrasts to inspect registration marks, using one, two or three color LEDs. True color sensors accurately analyze and compare color to color or varying intensities of one color.

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Luminescence page 293

Luminescence sensors detect luminescence that is inherent in a material or luminophores that have been added to a material to make it luminescent.

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Optical Touch Buttons page 299

Ergonomic optical switches require no physical pressure to operate, eliminating the hand stress that can lead to repetitive-motion injuries.

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Measurement & Inspection Sensors page 300

Light Gauging page 303

Light gauging sensors use lasers to deliver precise, long-distance sensing at the speed of light.

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Ultrasonic page 316

Because ultrasonic sensors use sound waves rather than light, they are ideal for sensing uneven surfaces, liquids, clear objects and objects in dirty environments.

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Measuring Arrays page 348

Using an array of closely spaced light beams, measuring light screens are designed for profiling, inspections and process monitoring.

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| EZ-ARRAY..... | 349 | MINI-ARRAY..... | 356 |
| High-Resolution MINI-ARRAY..... | 352 | | |

Radar page 362

Radar sensors use Frequency Modulated Continuous Wave (FMCW) radar to reliably detect moving or stationary targets, including cars, trains, trucks and cargo in extreme weather conditions.

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Vision page 367

iVu Image Sensors page 372

Touch screen image sensors delivers superior inspection performance faster and easier; no PC or external controller required.

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| iVu..... | 372 | iVu Plus..... | 373 |
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PresencePlus® Vision Sensors page 378

Full-featured vision sensors with a complete suite of location, inspection, analysis and geometric tools; all can be used simultaneously for inspecting multiple features and solving complex applications.

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Standard, high-performance or megapixel C-mount and Microvideo lenses provide enhanced sensor performance.

Lighting page 390

Specialized lighting creates all-important contrast between the feature of interest and its background.

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Wireless page 391

The Banner SureCross Wireless System is an industrial wireless I/O network that can operate in extreme environments while eliminating the need for costly wiring runs.

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Lighting & Indicators page 415

Task Lights page 416

Task Lights provide a variety of sizes of bright and even illumination for enclosures, area lighting, machine lighting and control panels.

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Vision Lights page 427

Banner offers a wide selection of high-intensity LED lights with built-in current and strobe control. A variety of specialty lights are available, including fluorescent lights. A complete selection of polarizing filter kits, colored filters and lighting diffusers are offered to improve lighting quality.

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Tower Lights page 442

Displays up to five lights in a single tower, multiple lights can be on simultaneously, includes models with audible alert and intensity adjustable.

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| Tower Lights..... | 442 |
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Small Indicators page 451

EZ-LIGHT indicators provide real-time operational indication for workers and supervisors. Two housing choices of right-angle or barrel are available for small spaces.

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Medium Indicators page 454

EZ-LIGHT indicators provide real-time operational indication for works and supervisors. Medium indicators are available in T-style or dome housings and are generally used in panel mounting applications.

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EZ-LIGHT indicators provide real-time operational indication for works and supervisors. Large indicators are available in flat profile or dome housings and have audible, segmented and daylight visible options.

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Actuators page 464

Actuators help manufacturers reduce the risk of error in the assembly process, boosting product quality and reducing cost.

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| Fiber Optic Safety Systems |
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| Safety Two-Hand Control Modules |
| Safety Interlock Switches |
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Machine Safety page 483

Light Screens page 489

Safety light screens protect personnel from injury and machines from damage by guarding points of operation, access, areas and perimeters.

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| 14 or 30 mm.....493 | 30 mm511 |
| EZ-SCREEN Type 4 Low Profile | EZ-SCREEN |
| 14 or 25 mm.....501 | Grids & Points.....516 |

Laser Scanner page 525

Safety laser scanners are used to protect personnel, as well as stationary and mobile systems, within a user-designated, two-dimensional area.

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| AG4525 |
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Controllers & Modules page 529

Safety modules and controllers provide an interface between safety devices and the machines and processes those devices monitor.

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| SC22-3/-3E533 | Muting550 |
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Two-Hand Control Modules page 560

Module monitors the output of each mechanical switch button and de-energizes when the machine operator removes one or both hands from the buttons.

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| DUO-TOUCH SG | DUO-TOUCH SG |
| Two-Hand Control Modules562 | Run Bars570 |
| STB Buttons567 | |

Interlock Switches page 572

Safety interlock switches respond when a mechanical guard opens. They feature "positive opening" contacts for high reliability and coded actuators to discourage tampering or defeat.

| | |
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| Magnet Style575 | Compact Metal590 |
| Hinge Style578 | Locking Style593 |
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Emergency Stop & Stop Control page 607

Emergency stop devices provide workers a means of stopping a device during an emergency by pushing a button or pulling a rope.

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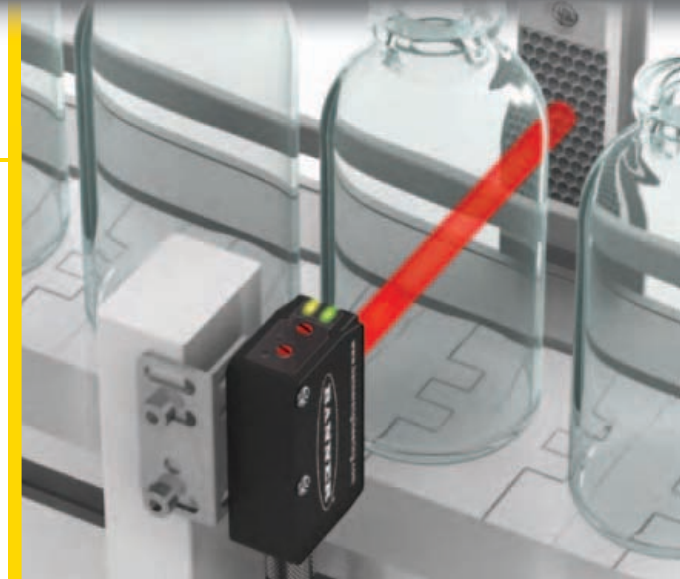
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| International Reps | page 848 |
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Q26 Clear Object Sensors

- Reliable detection of clear, translucent or opaque objects including mirror like surfaces
- Coaxial optics enable reliable detection of targets to the face of the sensor
- Simple setup with an easy-to-use single turn sensitivity adjustment potentiometer
- Light Operate and Dark Operate selection by rotary switch
- Compact design ideal for tight spaces

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DF-G1 Dual Fiber Amplifier

- Easy to read dual digital displays show both signal level and threshold simultaneously
- Lever action fiber clamp provides stable, reliable, and trouble free fiber clamping
- Expert TEACH and SET methods ensure optimal gain and threshold for all applications, especially low contrast applications
- ECO display mode reduces amplifier power consumption by 25%
- Cross talk avoidance algorithm allows two sensors to operate in close proximity for many applications
- Visible red LED sensing beam for easy alignment to the target

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R58B Color Sensors

- Sensor automatically selects red, green or blue LED to maximize contrast
- Excellent color contrast sensitivity; can sense 16 levels of gray
- Simple TEACH mode function with push button or remote input
- Smart gain control algorithm to boost performance in low-contrast, high-gloss situations

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What's New!



DX80 Performance Series

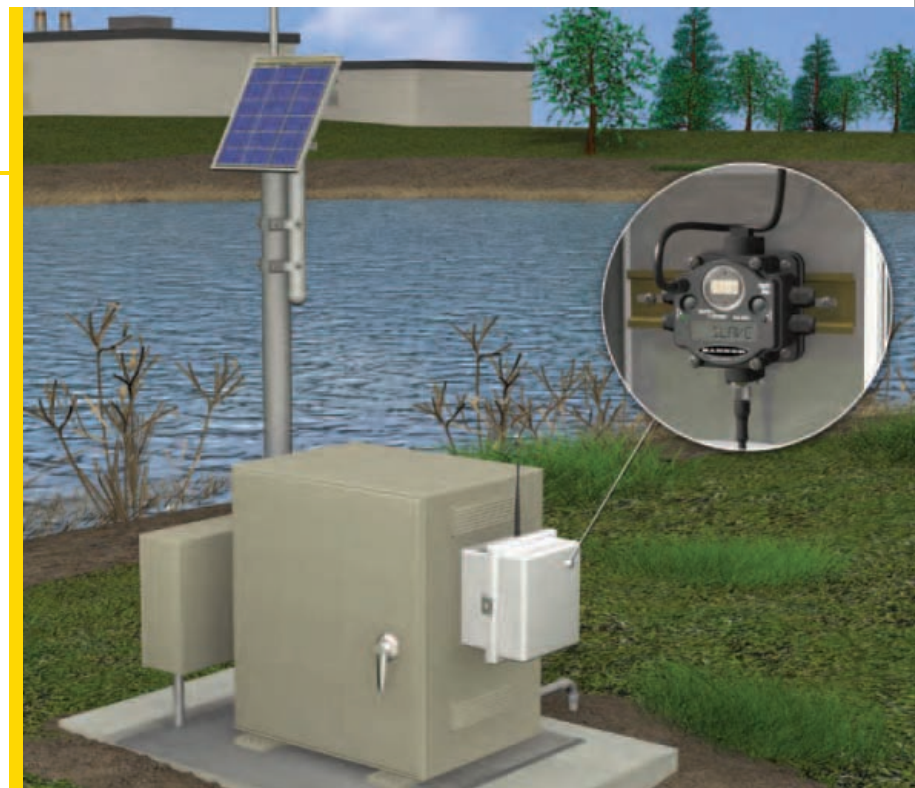
- Networks are formed using a Gateway and one or more Nodes operating in the same frequency band
- Selectable transmit power levels up to 1 Watt to extend the network's range
- Optional "E" housing model includes a battery integrated into the housing
- Universal analog inputs allow the customer to select between mA or V dc

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DX80 MultiHop with I/O

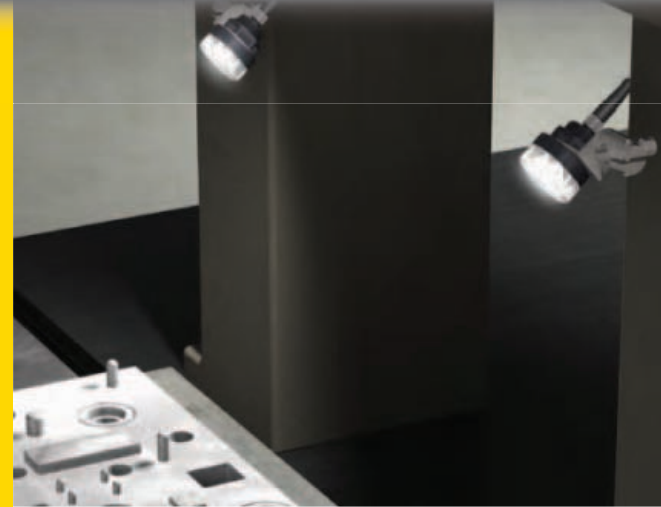
- Networks are automatically formed using one master radio and up to 50 repeater or slave radios operating in the same frequency band
- Selectable transmit power levels up to 1 Watt; license-free operation up to 4 Watt EIRP, with a high-gain antenna, in the U.S. and Canada for 900 MHz
- FlexPower power input options allow for 10 to 30V dc, solar, or battery power sources
- Optional "E" housing model includes a battery integrated into the housing
- Optional "C" housing is Class I, Division 2 certified when installed in an approved enclosure

See page 408



WL50S Spot Work Light

- Highly concentrated, focused light available in three colors
 - Three high-intensity LED lights create impeccable illumination
 - Lenses come in three sizes to cover area of concentration
 - Rugged sealed housing rated to IP69K
 - Cabled and quick-disconnect models available
 - 50 mm diameter with threaded profile and 30 mm mounting base
- See page 424



WLS28 Push-Button and Sealed Work Light Strip

- New models are available in waterproof housing rated IEC IP68
 - ON/OFF switch and non-switch models available
 - LED lights available in six colors ranging from 145 to 1130 mm lighted lengths
 - Low power consumption less than 9 watts per foot
 - Cabled or quick-disconnect models for installation flexibility and convenient cascading of lights
 - Swivel mounting brackets included
- See page 417

WLA Work Light Area with Lenses

- High-power, solid-state LED array with cool white, warm white, red, green, blue or yellow light
 - Available in four sizes
 - Illuminates a large area with an even pattern of light and no shadows
 - Extremely long-lasting LED technology for greater than 50,000 hours of continuous working life
 - Rugged thermoplastic housing rated to IP69K
 - Lensed models provide a concentrated, more intense beam pattern
- See page 420



What's New!

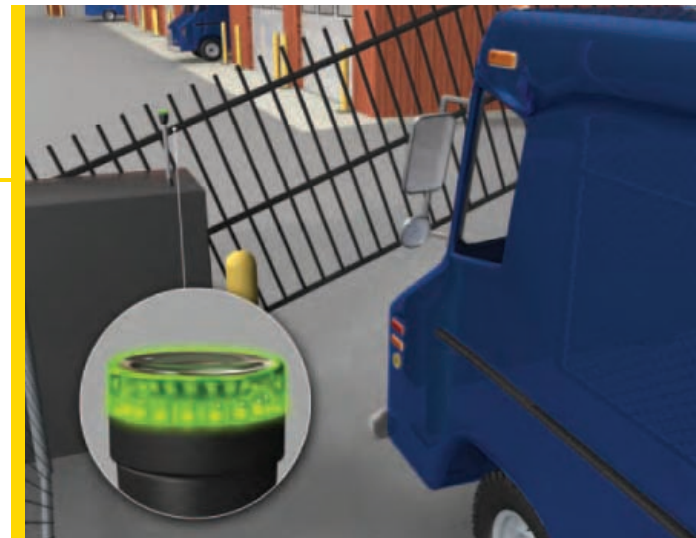


TL50BL Beacon Tower Light

- Rugged, cost-effective and easy-to-install multi-segment indicators
 - Displays up to four colors plus audible
 - Illuminated segments provide easy-to-see operator guidance and indication of equipment status
 - Immune to EMI/RFI interference
 - Easily adjustable for variable sound intensity
- See page 447

K50BL Beacon Light

- Intense levels of light output for areas with high ambient light — even outdoors
 - Viewable around entire perimeter; some models also emit light from top
 - 1- or 2-color models available
 - Rugged, sealed thermoplastic housing rated for IP67 and IP69K
 - Cabled and quick-disconnect models available
 - 12 to 30V dc or 85 to 130V ac (75 to 120V dc) operation, depending on model
 - 12V dc operation useful for applications on mobile vehicles
 - Consult factory for models with strobing capability
- See page 454



K30 Push Button

- Rugged, cost-effective and easy-to-install solutions for error-proofing and parts-verification applications
 - Illuminated dome provides an easy-to-see green job light; some models also light red for alternate operation
 - Waterproof IP65 construction for washdown environments
 - Compact devices are self-contained — no controller needed
 - Immune to EMI and RFI interference
 - 12 to 30V dc operation
 - Cabled and Quick Disconnect models available
- See page 464



EZ-mount E-Stops Flush Mount E-Stop Buttons

- Push-to-stop, twist-to-release operation per IEC 60947-5-5
 - Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
 - "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
 - Rugged design; easy installation with no assembly or individual wiring required
 - Models available with lockable emergency stop push buttons
 - Models designed to interface with Safety BUS nodes/gateways
- See page 608

EZ-mount E-Stops 30 mm Mount E-Stop Buttons

- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
 - "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
 - Rugged design; easy installation with no assembly or individual wiring required
 - Models designed to interface with Safety BUS nodes/gateways
 - Models with YELLOW and RED indication of actuation (armed or depressed/latched button) and machine status (optional)
 - Model with RED LED indication of actuation (depressed/latched button)
- See page 610



Selection Guide

Miniature

| Series | WORLD-BEAM® Q12 | M12 | T8 | S12/SB12T |
|------------------------|--|---|---|--|
| Catalog Page | 62 | 66 | 70 | 73 |
| Description | Miniature side-mount sensors | 12 mm threaded barrel-mount sensor with visible red sensing beam | Right-angle barrel-mount sensor for small areas | Opposed-mode barrel-mount sensors |
| Maximum Sensing Range | Opposed: 2 m Retro Non-Polar: 1.5 m Retro Polarized: 1 m Fixed-Field: 50 mm | Opposed: 5 m Retro Non-Polar: 2.5 m Retro Polarized: 1.5 m Diffuse: 400 mm Fixed-field: 75 mm | Opposed: 2 m Diffuse: 100 mm | Opposed: 15 m |
| Dimensions (h x w x d) | 23 x 8 x 12 mm | ø 12 x 67.5 mm | 19 x 16 x 16 mm | SB12: ø 16 x 31 mm S12: ø 12 x 64 mm |
| Housing Material | Thermoplastic elastomer | Nickel-plated brass | ABS | ABS |
| Protection Rating | IP67 | IP67; NEMA 6P, IP68 | IP67; NEMA 6 | SB12: IP65 SB12T: IP67 S12: IP67; NEMA 6P |
| Operating Temperature | -20° to +55° C | -20° to +60° C | -20° to +55° C | SB12: -20° to +50° C S12: -40° to +70° C |
| Power Supply | 10 to 30V dc | 10 to 30V dc | 10 to 30V dc | 10 to 30V dc |
| Outputs | Bipolar NPN/PNP, PNP, NPN | Solid-state | Solid-state | Solid-state |
| Output Response Time | Opposed: 1.3 ms ON/900 µs OFF All others: 700 µs ON/OFF | Opposed: 625 µs ON/375 µs OFF All others: 500 µs ON/OFF | 1 ms ON/0.5 ms OFF | SB12: 2.5 ms ON; 1.75 ms OFF S12: 3.0 ms ON; 1.5 ms OFF |
| Adjustments | — | — | — | — |

Miniature

| |  |  |  |  |
|--|---|---|---|---|
| | VSM | VS1 | VS2 | VS3 |
| | 76 | 80 | 83 | 86 |
| | Tiny, heavy-duty metal sensors | Miniature, convergent-mode sensor | Ultra-thin miniature sensor for confined flush-mounting | Miniature sensor with advanced optics and coaxial retroreflective models |
| | Opposed: 250 mm Convergent: 90 mm | Convergent: 15 mm focus | Opposed: 3 m Convergent: 30 mm | 250 mm |
| | VSM4: \varnothing 4 x 36.8 mm VSM5: \varnothing 5 x 36.8 mm VSMQ: 40 x 5 mm | 26 x 8 x 12 mm | 25 x 12 x 4 mm | 26 x 9 x 16 mm |
| | Stainless steel | ABS | ABS | ABS |
| | IP67 | IP54; NEMA 3 | IP67; NEMA 6 | IP67; NEMA 6 |
| | 0° to +55° C | -20° to +55° C | -20° to +55° C | -20° to +55° C |
| | 10 to 30V dc | 10 to 30V dc | 10 to 30V dc | 10 to 30V dc |
| | Solid-state | Solid-state | Solid-state | Solid-state |
| | 2.5 ms | 1 ms ON/OFF | Opposed: 1 ms ON/0.5 ms OFF Convergent: 1 ms ON/OFF | 1 ms ON/OFF |
| | — | — | — | — |





Selection Guide

Compact



| Series | WORLD-BEAM® QS18 | WORLD-BEAM® Q20 | Q26 | MINI-BEAM® |
|------------------------|--|--|--|---|
| Catalog Page | 90 | 105 | 110 | 112 |
| Description | Right-angle barrel- and side-mount sensors | Side-mount rectangular sensors | Side-mount rectangular sensors | Comprehensive family of Photoelectric sensors |
| Maximum Sensing Range | Opposed: 20 m Laser Emitter: 15 m Retro Non-Polarized: 6.5 m Retro Polarized: 3.5 m Laser Retro Polarized: 10 m Diffuse: 1 m Laser Diffuse: 300 mm Convergent: 43 mm Adjustable-Field: 300 mm Laser Adjustable-Field: 250 mm Fixed-Field: 100 mm Ultrasonic: 500 mm Glass &Plastic: depends on fiber used | Opposed: 20 m Retro Polarized: 4 m Retro Non-Polar: 6 m Diffuse: 1500 mm Fixed-Field: 100 mm | Retro Polarized: 800 mm | Opposed: 30 m Retro Non-Polarized: 5 m Retro Polarized: 3 m Diffuse: 380 mm Divergent: 130 mm Convergent: 49 mm Glass & Plastic: depends on fiber used |
| Dimensions (h x w x d) | 35 x 15 x 31 mm | 32 x 12 x 20 mm | 52 x 14 x 25 mm | Depends on model (see page 112) |
| Housing Material | ABS | ABS | ABS | PBT polyester |
| Protection Rating | IP67; NEMA 6 | IP67; NEMA 6 | IP67; NEMA 6 | IP67; NEMA 4X |
| Operating Temperature | -20° to +70° C (most models) | -20° to +60° C | -10° to +55° C | NAMUR: -40° to +70° C All others: -20° to +70° C |
| Power Supply | 10 to 30V dc, 20 to 140V ac/dc, or 20 to 270V ac/dc | 10 to 30V dc | 12 to 30V dc | 10 to 30V dc, 24 to 240V ac or 5 to 15V dc (NAMUR) |
| Outputs | Solid-state, P-MOSFET, N-MOSFET | Solid-state | Solid-state | DC & Expert: Bipolar NPN/PNP AC: SPST SCR solid-state NAMUR: Constant current |
| Output Response Time | Depends on model | Opposed: 1 ms ON/600 µs OFF All others: 800 µs ON/OFF | 250 µs ON/OFF | Depends on model |
| Adjustments | Depends on sensing mode | Depends on sensing mode | LO/DO selection 270° sensitivity adjustment | Depends on model |

Compact

| | | | |
|--|---|---|---|
|  |  |  |  |
| S18 & M18 | T18 | TM18 | Q25 |
| 131 | 138 | 144 | 148 |
| EZ-BEAM®-style 18 mm barrel-mount sensor in thermoplastic or stainless steel | EZ-BEAM®-style right-angle barrel-mount sensor | Heavy-duty, right-angle barrel-mount sensor | EZ-BEAM®-style right-angle base-mount sensor |
| <p>Opposed: 20 m Retro Polarized: 2 m Retro Non-Polar: 2 m Diffuse: 300 mm Fixed-Field: 100 mm</p> | <p>Opposed: 20 m Retro Polarized: 2 m Retro Non-Polar: 2 m Diffuse DC: 500 mm Diffuse AC: 300 mm Fixed-Field: 100 mm</p> | <p>Opposed: 20 m Retro Polarized: 5.5 m Fixed-Field: 100 mm</p> | <p>Opposed: 20 m Retro Polarized: 2 m Fixed-Field: 100 mm</p> |
| DC: ø 18 x 59 mm AC: ø 18 x 85 mm | DC: 42 x 30 x 30 mm AC: 52 x 30 x 30 mm | 41 x 30 x 30 mm | 50 x 25 x 30 mm |
| S18: PBT polyester M18: Stainless steel | PBT polyester | Zinc die-cast | PBT polyester |
| IP67; NEMA 6P QD models: IP69K per DIN 40050-9 | IP67; NEMA 6P QD models: IP69K per DIN 40050-9 | IP67 or IP69K | IP67; NEMA 6P QD models: IP69K per DIN 40050-9 |
| -40° to +70° C | -40° to +70° C | -40° to +70° C | -40° to +70° C |
| 10 to 30V dc or 20 to 250V ac | 10 to 30V dc or 20 to 250V ac | 10 to 30V dc | 10 to 30V dc or 20 to 250V ac |
| Solid-state | Solid-state | Solid-state | Solid-state |
| Depends on model | Depends on model | Depends on model | Depends on model |
| — | Depends on sensing mode | — | — |

Selection Guide

Midsize



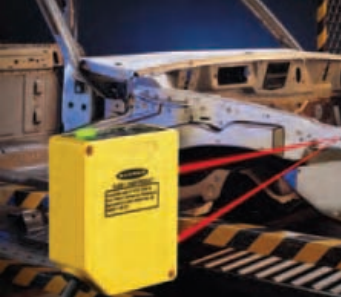


| Series | WORLD-BEAM® QS30 | S30 | SM30/SMI30 |
|------------------------|---|--|---|
| Catalog Page | 154 | 165 | 170 |
| Description | Midsize right-angle barrel- and side-mount sensors | EZ-BEAM®-style 30 mm barrel-mount sensors | Harsh-duty or intrinsically safe opposed-mode sensor with 30 mm threaded barrel |
| Maximum Sensing Range | Opposed: 60 m Opposed High Power: 213 m Opposed Water: 8 m Retro Polarized: 8 m Retro Non-Polarized: 12 m Laser Retro Polar: 18 m Clear Object: 2 m Diffuse: 1 m Laser Diffuse: 800 mm Adjustable-Field: 600 mm Fixed-Field: 600 mm | Opposed: 60 m Retro Polarized: 6 m Fixed-Field: 600 mm | SM30: 200 m SMI30: 140 m |
| Dimensions (h x w x d) | 44 x 22 x 35 mm or 44 x 22 x 52 mm | DC: ø 30 x 69 mm AC: ø 30 x 81 mm | ø 30 x 102 mm |
| Housing Material | PC/ABS (most models) | PBT polyester | PBT polyester or stainless steel |
| Protection Rating | IP67; NEMA 6 (most models) | NEMA 6P; IP67 QD models: IP69K per DIN 40050-9 | IP67; NEMA 6P |
| Operating Temperature | -20° to +70° C (most models) | -40° to +70° C | -40° to +70° C |
| Power Supply | 10 to 30V dc, 12 to 250V dc or 24 to 250V ac | 10 to 30V dc or 20 to 250V ac | 10 to 30V dc or 24 to 240V ac |
| Outputs | DC: Bipolar NPN/PNP AC/DC: SPDT e/m relay | Solid-state | DC: Bi-Modal™ (NPN or PNP) AC: SPST solid-state SMI: NPN |
| Output Response Time | Depends on model | Depends on model | 10 ms ON/OFF |
| Adjustments | Depends on model | — | — |

Midsize

| | | | |
|---|---|---|---|
|  |  |  |  |
| T30 | Q40 | PicoDot® | QM42 & QMT42 |
| 174 | 179 | 183 | 187 |
| EZ-BEAM®-style right-angle barrel-mount sensors | EZ-BEAM®-style right-angle base-mount sensors | Compact laser for precise position detection, inspection and counting | Rugged sensors in die-cast housing with a range of sensing modes |
| Opposed: 60 m Retro Polarized: 6 m Fixed-Field: 600 mm | Opposed: 60 m Retro Polarized: 6 m Fixed-Field: 600 mm | Laser Convergent: 305 mm Laser Retro Polarized: 10.6 m | Opposed: 10 m Retro Polarized: 3 m Diffuse (LR): 6 m Diffuse (SR): 400 mm Adjustable-Field: 400 mm Fixed-Field: 2 m Plastic fiber optics: depends on fiber used |
| 52 x 40 x 45 mm | 70 x 40 x 46 mm | PD45: 41 x 13 x 46 mm PD49: 43 x 15 x 49 mm | QM42: 42 x 13 x 42 mm QMT42: 58 x 18 x 42 mm |
| PBT polyester | PBT polyester | ABS/polycarbonate | Zinc alloy |
| NEMA 6P; IP67 QD models: IP69K per DIN 40050-9 | NEMA 6P; IP67 QD models: IP69K per DIN 40050-9 | PD45: IP54; NEMA 3 PD49: IP67; NEMA 6 | IP67; NEMA 6 |
| -40° to +70° C | -40° to +70° C | -10° to +45° C | LR models: -20° to +55° C SR models: -20° to +70° C |
| 10 to 30V dc or 20 to 250V ac | 10 to 30V dc or 20 to 250V ac | 10 to 30V dc | 10 to 30V dc |
| Solid-state | Solid-state | Solid-state | Solid-state |
| Depends on model | Depends on model | 200 µs ON/OFF | Depends on model |
| — | — | 12-turn Sensitivity (Gain) adjustment | Depends on model |

Selection Guide

Fullsize

| | | | |
|---|--|---|---|
|  |  |  |  |
| Series | Q45 | OMNI-BEAM™ | Q60 |
| Catalog Page | 194 | 211 | 221 |
| Description | Advanced one-piece, rugged sensor with outstanding optical performance | Modular, limit-switch style, field-programmable sensor | Laser or LED sensor for low reflectivity targets, regardless of background |
| Maximum Sensing Range | Opposed: 60 m Retro Laser: 70 m Retro Non-Polar: 9 m Retro Polarized: 6 m Diffuse: 3 m Convergent: 100 mm Glass & Plastic fiber optic: depends on fiber used | Opposed: 45 m Retro Non-Polar: 9 m Retro Polarized: 4.5 m Retro Clear Object: 4 m Diffuse: 2 m Convergent: 38 mm Glass & Plastic fiber optic: depends on fiber used | Adjustable-Field: 2 m |
| Dimensions (h x w x d) | 88 x 45 x 55 mm | DC: 76 x 45 x 55 mm AC: 99 x 45 x 55 mm | 75 x 25 x 60 mm |
| Housing Material | PBT polyester | PBT polyester | ABS/Polycarbonate |
| Protection Rating | IP67; NEMA 6P | IP66; NEMA 4 | IP67; NEMA 6 |
| Operating Temperature | DC: -40° to +70° C AC: -40° to +70° C AC/DC: -25° to +55° C | -40° to +70° C | -20° to +55° C (most models) |
| Power Supply | 10 to 30V dc, 90 to 250V ac, 24 to 250V ac, 12 to 250V dc or 5 to 15V dc (NAMUR) | 10 to 30V dc, 105 to 130V ac or 210 to 250V ac | 10 to 30V dc, 12 to 250V dc or 24 to 250V ac |
| Outputs | DC: Bipolar NPN/PNP AC: SPST or SPDT Relay NAMUR: Constant current | DC: Bi-Modal™ AC: SPST relay | DC: Bipolar NPN/PNP AC/DC: SPST or SPDT Relay |
| Output Response Time | Depends on model | Depends on model | Depends on model |
| Adjustments | LO/DO switch, sensitivity adjustment control | Field-programmable for 4 operating parameters | 2 momentary push buttons/ remote program wire |

Fiber Optic Sensors

| Series | DF-G1 | D10 | D12 | R55F |
|------------------------|--|---|---|---|
| Catalog Page | 229 | 234 | 243 | 248 |
| Description | High-performance, low-contrast sensor with dual displays | High-performance, low-contrast sensor with numeric or bargraph display | Versatile, high-power sensor with bargraph display | Fiber optic sensor for outstanding color contrast sensitivity |
| Maximum Sensing Range | Range varies with response speed selection and with fiber optics used | Range varies with power level/speed selection and with fiber optics used | Range varies depending on sensing mode and fiber optics used | Range varies depending on sensing mode and fiber optics used |
| Dimensions (h x w x d) | 33 x 10 x 72 mm | 36 x 10 x 68 mm | Plastic Fibers: 30 x 12 x 64 mm Glass Fibers: 30 x 12 x 70 mm | 25 x 30 x 85 mm |
| Housing Material | ABS/Polycarbonate | ABS/Polycarbonate | ABS | ABS/Polycarbonate |
| Protection Rating | IP50; NEMA 1 | IP50; NEMA 1 | IP11; NEMA 2 | IP67; NEMA 6 |
| Operating Temperature | -10° to +55° C, depending on model | -20° to +55° C, depending on model | -40° to +70° C or -20° to +70° C, depending on model | -10° to +55° C |
| Power Supply | 10 to 30V dc | 10 to 30V dc, 12 to 30V dc, 12 to 24V dc or 15 to 24V dc | 10 to 30V dc | 10 to 30V dc |
| Outputs | Solid-state | <i>Expert</i> Numeric Discrete: Two solid-state <i>Expert</i> Numeric Analog/Discrete: 0 to 10V or 4 to 20 mA and Solid-state <i>Expert</i> Bargraph Discrete: Bipolar NPN/PNP Discrete: Bipolar NPN/PNP <i>Expert</i> Small Object Counter: NPN or PNP | <i>Expert</i> : Solid-state Standard: Solid-state AC Coupled: Bipolar NPN/PNP | Bipolar NPN/PNP |
| Output Response Time | High Speed: 200 μ s Standard: 500 μ s Long Range: 2 ms Extra Long Range: 5 ms | Depends on model | <i>Expert</i> : 200 μ s ON/OFF Standard: 50 or 500 μ s ON/OFF AC Coupled: 50 μ s ON/OFF | 50 μ s |

* Operating temperature range for plastic fiber optic assemblies is typically -30° to +70° C and -140° to +250° C for metal-sheathed glass fiber optic assemblies. See the Fiber Sensor section (beginning on page 243) for specific fiber optic temperature information.

Selection Guide

Special Purpose

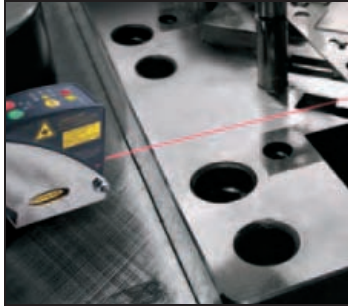
| Series | LX | SLM | SL Series | R58 |
|------------------------|---|--|--|--|
| Catalog Page | 277 | 280 | 283 | 287 |
| Description | High-speed light screens to detect tiny objects | Fixed opposed-mode metal slot sensor for easy installation, in eight slot widths | Opposed-mode slot sensor with multiple setup options, in two slot widths | High-performance color registration sensor with 3 light colors |
| Maximum Sensing Range | Standard Normal: 300 to 2 m Reduced: 150 to 600 mm Short-range Normal: 100 to 200 mm Reduced: 75 to 150 mm | 10, 20, 30, 50, 80, 120, 180 or 220 mm | 10 or 30 mm | Focus: 10 mm |
| Dimensions (h x w x d) | 25 x 32 mm x height Array heights: 113 mm 190 mm 266 mm 342 mm 418 mm 494 mm 571 mm 647 mm | Max size: 12 x 252 x 140 mm | 72 x 52 x 19 mm | 62 x 30 x 83 mm |
| Housing Material | Aluminum | Zinc and ABS | ABS | Zinc alloy |
| Protection Rating | IP65 | IP67; NEMA 6 | IP67; NEMA 6 | IP67 |
| Operating Temperature | -20° to +70° C | -20° to +60° C | SL30, SL10 & SLO: -40° to 70° C SLE30 & SLE10: -20° to 70° C | R58E: -10° to +50° C R58A: -10° to +50° C |
| Power Supply | 10 to 30V dc | 10 to 30V dc | 10 to 30V dc | 10 to 30V dc |
| Outputs | Bipolar NPN/PNP | Bipolar NPN/PNP, PNP or NPN | Bipolar NPN/PNP | Bipolar NPN/PNP |
| Output Response Time | 0.8 to 6.4 ms (ON-time) 6 to 11.5 ms (OFF-time) | 500 µs | 150, 300 or 500 µs or 1 ms, depending on model | 50 µs |
| Adjustments | — | One-turn sensitivity potentiometer | Depends on model | R58E: Push button and remote TEACH R58A: Potentiometer |

Special Purpose

| | | | |
|---|---|--|---|
|  |  |  |  |
| QC50 & QCX50 | QL50 | QL56 | Optical Buttons |
| 291 | 294 | 296 | 299 |
| True color sensor for detecting color and intensity | Compact luminescence sensor with an ultraviolet LED | Compact luminescence sensor with an ultraviolet LED | Ergonomic touch buttons to prevent repetitive motion stress |
| 20 mm (typical) | 40 mm | 50 mm | — |
| 50 x 25 x 50 mm | 66 x 15 x 50 mm | 97 x 66 x 32 mm | 57 x 60 x 43 mm |
| ABS | ABS | Aluminum | Black polysulfone or red polycarbonate with polyester or polycarbonate base |
| IP62 | IP62 | IP67 | IP66; NEMA 4X |
| -10° to +55° C | -25° to +55° C | -10° to +55° C | OTB/LTB/VTB: -20° to +50° C STB: 0° to +50° C |
| 10 to 30V dc | 10 to 30V dc | 15 to 30V dc | 10 to 30V dc, 20 to 30V ac/dc, 120V ac, 220/240V ac or 12 to 30V dc |
| NPN or PNP, 3 channel | Discrete PNP or NPN | Bipolar PNP/NPN & analog | Depends on model |
| QC50: 335 μ s QCX50: Selectable 5 ms or 1 ms | 250 μ s | 250 μ s | OTB/LTB/VTB: 100 ms STB: 20 ms |
| 2 push buttons program teach, delay and tolerance level | 1 push button and remote program wire | 2 push buttons | — |

Selection Guide

Light Gauging



| Series | LT3 | LT7 | |
|---|--|--|--|
| Catalog Page | 304 | 308 | |
| Description | Advanced laser distance-gauging sensor for precise inspections | Self-contained long-range laser sensor for accurate distance sensing | |
| Technology | Time-of-Flight Laser | Time-of-Flight Laser | |
| Maximum Sensing Range | Retro: 50 m Diffuse: 5 m | Retro: 250 m Diffuse: 10 m | |
| Dimensions (h x w x d) | 69 x 35 x 87 mm | 93 x 42 x 95 mm | |
| Light Source | Class 1 and 2 laser | Class 1 | |
| Housing Material | ABS/polycarbonate | ABS | |
| Protection Rating | IP67; NEMA 6 | IP67 | |
| Operating Temperature | 0° to +50° C | -10° to +50° C | |
| Power Supply | 12 to 24V dc | 18 to 30V dc | |
| Outputs | Analog and discrete, or dual discrete | Analog and discrete, or dual discrete | |
| Discrete Outputs | One NPN or PNP, or Dual NPN or PNP, depending on model | 2 PNP | |
| Analog Outputs | 0 to 10V dc or 4 to 20 mA | 4 to 20 mA | |
| Analog Resolution or Discrete Repeatability | Retro: 5 or 10 mm Diffuse: 1 or 3.2 mm | Retro: ±2 mm Diffuse: ±4 mm | |
| Response Speed | 1 to 192 ms, depending on model and setting | 12 ms | |
| Adjustments | Window limits, response speed | See Specifications | |

Light Gauging



| LH | LG |
|---|--|
| 311 | 313 |
| High-precision laser sensor for displacement and thickness measurements | Economical short-range laser sensor with analog and discrete outputs |
| Laser /CMOS imager triangulation | Laser/PSD triangulation |
| LH30: 35 mm LH80: 100 mm LH150: 200 mm | LG5: 60 mm LG10: 125 mm |
| 80 x 33 x 65 mm | 55 x 20 x 82 mm |
| Class 2 laser | Class 2 laser |
| Aluminum | Zinc alloy die-cast; black painted finish |
| IP67 | IP67; NEMA 6 |
| -10° to +45° C | -10° to +50° C |
| 18 to 30V dc | 12 to 30V dc |
| Analog and Serial | Analog and discrete |
| — | One NPN or PNP |
| 4-20 mA | 0 to 10V dc or 4 to 20 mA |
| LH30: 1 μm LH80: 4 μm LH150: 10 μm | LG5: 3 μm @ 50 mm LG10: 10 μm @ 100 mm |
| 250 μs typical | 2, 10 or 100 ms, depending on setting |
| Advanced configuration software | Window limits, response speed |





Selection Guide

Ultrasonic

| Series | QT50U | S18U | QS18U | T30UX/T30U |
|--|--|---|---|--|
| Catalog Page | 317 | 322 | 325 | 328 |
| Description | Long-range programmable, precision ultrasonic sensor | Compact barrel-mount ultrasonic sensor in straight or right-angle housing | Low-cost right-angle, barrel- and side-mount ultrasonic sensor in a compact universal housing | Compact right-angle barrel-mount ultrasonic sensors in long- and short-range |
| Outputs | Analog, dual discrete or e/m relay | Analog or discrete | Discrete | Analog and discrete, dual discrete or analog |
| Maximum Sensing Range | Proximity mode 200 mm to 8 m | Proximity mode 30 to 300 mm | Proximity mode 50 to 500 mm | Proximity mode 0.15 to 1.0 m, 0.3 to 2.0 m, 0.1 to 1 m, 0.2 to 2.0 m or 0.3 to 3.0 m |
| Dimensions (h x w x d) | DC & AC/DC: 84 x 74 x 67 mm Teflon® Protected: 85 x 74 x 73 mm | Straight: ø 18 x 81 mm Right-angle: ø 18 x 85 mm | 41 x 15 x 33 mm | Short- & Long-Range: 52 x 40 x 45 mm Teflon® Protected: 64 x 40 x 48 mm |
| Housing Material | ABS/polycarbonate | PBT polyester, ABS/ polycarbonate | ABS | PBT polyester |
| Protection Rating | IP67; NEMA 6P | IP67; NEMA 6P | Push button: IP67; NEMA 6P Remote TEACH: IP68, NEMA 6P | T30UX: IP67; NEMA 6 T30U: IP67, NEMA 6P |
| Operating Temperature | -20° to +70° C | -20° to +60° C | -20° to +60° C | T30UX: -40° to +70° C T30U: -20° to +70° C |
| Power Supply | 10 to 30V dc or 85 to 264V ac / 24 to 250V dc | 10 to 30V dc | 12 to 30V dc | 10 to 30V dc, 12 to 24V dc or 15 to 24V dc, depending on model |
| Discrete Outputs (when available) | DC: Selectable dual NPN or PNP AC/DC: SPDT e/m relay | Bipolar NPN/PNP | NPN or PNP | NPN or PNP, or NPN/PNP selectable, depending on model |
| Analog Resolution or Discrete repeatability | 1.0 mm | 0.5 mm | 0.7 mm | T30UX: 0.1% of distance T30U: 0.25% of sensing distance |
| Analog Output (when available) | 0 to 10V dc or 4 to 20 mA, Selectable | 0 to 10V dc or 4 to 20 mA, depending on model | — | 0 to 10V dc or 4 to 20 mA, depending on model |
| High/low Limit Control (pump control) | Yes | — | — | Yes |
| Adjustments | Window limits, DIP switch functions | Near & far window limits | Near & far window limits | Window limits, output selection, analog output slope, temperature compensation and response speed |

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Ultrasonic

| |  |  |  |  |
|--|---|---|---|---|
| | M25U | T18U | Q45U | Q45UR |
| | 336 | 338 | 340 | 344 |
| | Stainless steel opposed-mode ultrasonic sensors | Right-angle, barrel-mount opposed-mode ultrasonic sensors | Programmable ultrasonic sensor with temperature compensation | High-precision ultrasonic sensor with remote sensing transducer |
| | Discrete | Discrete | Analog or discrete | Analog or discrete |
| | Normal Speed: 500 mm High Speed: 250 mm | Opposed mode 0.6 m | Proximity mode 0.1 to 1.4 m or 0.25 to 3.0 m | Proximity mode 50 to 250 mm |
| | ø 25 x 103 mm | 52 x 40 x 30 mm | Short range: 88 x 45 x 61 mm Long range: 88 x 45 x 79 mm | Controller: 88 x 45 x 6 mm Remote transducers: 28 x 28 x 12 mm flat or ø18 x 45 mm barrel |
| | 316 stainless steel | PBT polyester | PBT polyester | PBT polyester or stainless steel |
| | IP67; NEMA 6, IP69K | IP67; NEMA 6P | IP67; NEMA 6P | Sensor: IP65; NEMA 4 Controller: IP67; NEMA 6P |
| | -20° to +70° C | -40° to +70° C | -25° to +70° C | -25° to +70° C |
| | 10 to 30V dc | 12 to 30V dc | 12 to 24V dc or 15 to 24V dc, depending on model | 12 to 24V dc or 15 to 24V dc, depending on model |
| | Bipolar NPN/PNP | Complementary NPN or PNP, depending on model | Bipolar NPN/PNP | Bipolar NPN/PNP |
| | Normal Speed: 4.0 ms High Speed: 3.0 ms | 1 or 2 mm, depending on resolution | 0.1% of sensing distance (0.25 or 0.5 mm min.) | 0.2% of sensing distance |
| | — | — | Selectable 0 to 10V dc or 4 to 20 mA | Selectable 0 to 10V dc or 4 to 20 mA |
| | — | — | Yes | — |
| | — | — | Near & far window limits; DIP Switch functions | Near & far window limits; DIP Switch functions |

Selection Guide

Measuring Arrays

| Series | | EZ-ARRAY™ | High-Resolution MINI-ARRAY® | MINI-ARRAY® |
|-------------------------------|------------------------|--|---|--|
| Catalog Page | | 349 | 352 | 356 |
| Description | | Cost-effective light curtains for quick installation and tough sensing application | High-speed, high-resolution scanning | Compact long-range array with flexible output configurations |
| Minimum Object Detection Size | | 5 mm | 2.5 mm | 19 mm for arrays/ 9.5 mm beam spacing 38 mm for arrays/ 19 mm beam spacing |
| Maximum Sensing Range | | 4 m | 0.4 mm to 1.8 m | 0.6 to 17 m, depending on model |
| Emitters and Receivers | Dimensions (h x w x d) | 36.0 x 45.2 x height Array heights: 227 mm 828 mm 1578 mm 379 mm 978 mm 1878 mm 529 mm 1128 mm 2178 mm 678 mm 1278 mm 2478 mm | 38.1 x 38.1 x height Array heights: 236 mm 887 mm 1540 mm 399 mm 1049 mm 1703 mm 559 mm 1215 mm 1865 mm 724 mm 1377 mm 2028 mm | 38.1 x 38.1 x height Approximate array heights: 201 mm 810 mm 1572 mm 356 mm 963 mm 1877 mm 505 mm 1115 mm 659 mm 1267 mm |
| | Power Supply | 12 to 30V dc | Supplied by controller | Supplied by controller |
| | Construction | Anodized aluminum | Black anodized aluminum | Black anodized aluminum |
| | Protection Rating | IP65 | IP65; NEMA 4, 13 | IP65; NEMA 4, 13 |
| | Operating Temperature | -40° to +70° C | 0° to +50° C | -20° to +70° C |
| | Power Supply | — | 16 to 30V dc | 16 to 30V dc |
| Controllers | Output Configuration | — | MAHCV-1: Two analog 0 to 10V sourcing + two PNP MAHCVN-1: Two analog 0 to 10V sourcing + two NPN MAHCIP-1: Two analog 4 to 20 mA sinking + two PNP MAHCIN-1: Two analog 4 to 20 mA sinking + two NPN All models: Serial RS-232 & RS-485 | MAC-1: One reed relay & one NPN MACN-1: Two NPN MAC16N-1: 16 NPN MACP-1: Two PNP MAC16P-1: 16 PNP MACV-1: Two 0-10V dc sourcing analog + one NPN MACI-1: Two 4-20 mA sinking analog + one NPN Serial RS-232 and/or RS-485, depending on model MACNXDN-1: 2 NPN (DeviceNet) MACPXDN-1: 2 PNP (DeviceNet) |
| | Protection Rating | — | IP20; NEMA 1 | IP20; NEMA 1 |
| | Operating Temperature | — | 0° to +50° C | -20° to +70° C |

Radar



| Series | R-GAGE™ |
|-----------------------|--|
| Catalog Page | 362 |
| Description | Radar-based sensor for a wide variety of outdoor or challenging applications |
| Operating Principle | Frequency Modulated Continuous Wave (FMCW) radar |
| Detectable Objects | Objects containing metal or similar high-dielectric materials |
| Radio Frequency | 24 GHz, ISM Band |
| Range | up to 15 m |
| Dimensions | 100 x 74 x 46 mm |
| Power supply | 12 to 30V dc |
| Housing Material | ABS/polycarbonate |
| Protection Rating | IP67 |
| Operating Temperature | -40° to +65° C |
| Output Configuration | Bipolar NPN/PNP |
| Adjustments | DIP-switch functions |

Selection Guide





Vision



| Series | | iVu TG | iVu Plus TG | iVu BCR | iVu Plus BCR |
|-----------------------|------------------------|--|---------------------------------------|--|---------------------------------------|
| Catalog Page | | 372 | 372 | 373 | 373 |
| Description | | One-piece image sensor with integrated touch screen or two-piece image sensor with remote touch screen | | One-piece image sensor with integrated touch screen or two-piece image sensor with remote touch screen | |
| Hardware | Integrated I/O | 5 | 6 | 5 | 6 |
| | Interchangeable Lenses | Microvideo | Microvideo | Microvideo | Microvideo |
| | Imager | CMOS 752 x 480 | CMOS 752 x 480 | CMOS 752 x 480 | CMOS 752 x 480 |
| | Effective Resolution | 320 x 240 | 320 x 240 | 752 x 480 | 752 x 480 |
| | Imager Speed | 100 frames per second | 100 frames per second | 50 frames per second | 50 frames per second |
| | Construction | Black Valox™ housing, acrylic window | Black Valox™ housing*, acrylic window | Black Valox™ housing, acrylic window | Black Valox™ housing*, acrylic window |
| | Environmental Rating | IP67 | IP67 | IP67 | IP67 |
| Communications | Serial | — | RS-232 | RS-232 | RS-232 |
| | Ethernet Connection | — | — | — | — |
| | Programmable Outputs | 2 | 3 | 2 | 3 |
| Programming/Interface | Runs without a PC | | | | |
| | Strobe OUT | | | | |
| | Remote TEACH | | | | |
| | Demo Mode | | | | |
| Inspection | Tools | Area, Blemish and Match | Area, Blemish, Match and Sort | Bar Code | Bar Code |
| | Multiple Inspections | — | | — | |






* Die cast Zinc on Plus Integrated LCD models

Vision






| Series | | Pro | P4 OMNI | P4 Dedicated Function | | | | | | | |
|--|--|---|--|--|--|--|--|--|-------------|--|--|
|  | |  |  |  | | | | | | | |
| Catalog Page | | 378 | 378 | 385 | | | | | | | |
| Description | | Two-piece, all-purpose vision sensor with a full range of inspection tools | One-piece, all-purpose vision sensor with a full range of inspection tools | AREA: Inspects sizes, shapes and intensity EDGE: Counts and measures multiple edges and objects GEO: Pattern recognition, regardless of orientation BCR: Reads and grades 2D and 1D bar codes | | | | | | | |
| Hardware | Integrated I/O | 14 | 7 | 7 | | | | | | | |
| | Interchangeable Lenses | C-Mount | C-Mount | C-Mount | | | | | | | |
| | Imager | PROII: CCD & CMOS PROII 1.3: CMOS PROII COLOR: CMOS | OMNI: CCD OMNI 1.3: CMOS OMNI COLOR: CMOS | AREA & AREA 1.3: CMOS BCR: CCD, BCR 1.3: CMOS EDGE & EDGE 1.3: CMOS GEO & GEO 1.3: CMOS | | | | | | | |
| | Resolution | PROII: 640 x 480 PROII 1.3: 1280 x 1024 PROII COLOR: 752 x 480 | OMNI: 640 x 480 OMNI 1.3: 1280 x 1024 OMNI COLOR: 752 x 480 | AREA, EDGE & GEO: 128 x 100 BCR: 640 x 480 AREA1.3, EDGE 1.3, GEO 1.3 & BCR 1.3: 1280 x 1024 | | | | | | | |
| | Imager Speed (frames per second) | PROII: 48 fps PROII 1.3: 18 fps PROII COLOR: 17 fps | OMNI: 48 fps OMNI 1.3: 27 fps OMNI COLOR: 17 fps | AREA, EDGE & GEO: 500 fps BCR: 48 fps AREA1.3, EDGE 1.3, GEO 1.3 & BCR 1.3: 27 fps | | | | | | | |
| | Live Video Output | | | | | | | | | | |
| | Memory | 64 MB | 32 MB | AREA, EDGE, GEO & BCR: 8 MB AREA1.3, EDGE 1.3, GEO 1.3 & BCR 1.3: 32 MB | | | | | | | |
| | Construction/ Environmental Rating | <table border="1"> <tr> <td>Camera:</td> <td>Black anodized aluminum/ IP20; NEMA 1</td> </tr> <tr> <td></td> <td>Nickel-plated aluminum/ IP68, NEMA 6P</td> </tr> <tr> <td></td> <td>316 stainless steel/ IP68; NEMA 6P & 4X</td> </tr> <tr> <td>Controller:</td> <td>Steel with zinc plating/ IP20; NEMA 1</td> </tr> </table> | Camera: | Black anodized aluminum/ IP20; NEMA 1 | | Nickel-plated aluminum/ IP68, NEMA 6P | | 316 stainless steel/ IP68; NEMA 6P & 4X | Controller: | Steel with zinc plating/ IP20; NEMA 1 | Black anodized aluminum/IP20; NEMA 1 or Nickel-plated aluminum/ IP68 |
| Camera: | Black anodized aluminum/ IP20; NEMA 1 | | | | | | | | | | |
| | Nickel-plated aluminum/ IP68, NEMA 6P | | | | | | | | | | |
| | 316 stainless steel/ IP68; NEMA 6P & 4X | | | | | | | | | | |
| Controller: | Steel with zinc plating/ IP20; NEMA 1 | | | | | | | | | | |
| Communications & Programming/Interface | Ethernet | 10/100 | | | | | | | | | |
| | Serial | RS-232 | | | | | | | | | |
| | Programmable Discrete I/O | 6 | 4 | 4 | | | | | | | |
| | Industrial Ethernet Protocols | EtherNet/IP & Modbus TCP/IP | EtherNet/IP & Modbus TCP/IP | EtherNet/IP & Modbus TCP/IP | | | | | | | |
| | Software Premium Tools | Bar Code Reader (BCR), OCR/OCV and Bead | | | | | | | | | |
| | Runs without a PC | Yes | | | | | | | | | |
| | ActiveX interface | | | | | | | | | | |
| | Quick & Remote TEACH | | | | | | | | | | |

Selection Guide


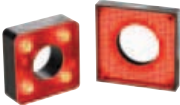


SureCross Wireless



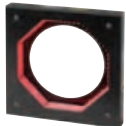
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|---|--|--|---|--|
| Series | Performance | DX80 | DX99 | MultiHop |
| Catalog Page | 393 | 396 | 404 | 406 |
| Description | Point-to-Multipoint Wireless Network Up to 1 Watt | Point-to-Multipoint Wireless Network | Point-to-Multipoint for Hazardous Areas | MultiHop Wireless Network Up to 1 Watt |
| Radio Frequency and Range | 900 MHz: up to 9.6 km 2.4 GHz: up to 3.2 km | 900 MHz: up to 4.8 km 2.4 GHz: up to 3.2 km | 900 MHz: up to 4.8 km 2.4 GHz: up to 3.2 km | 900 MHz: up to 9.6 km 2.4 GHz: up to 3.2 km |
| Power Supply | 10 to 30V dc, Solar, DX81 or DX81P6 | 10 to 30V dc, Solar, DX81 or DX81P6 | Integrated battery | 10 to 30V dc, Solar or DX81P6 |
| Inputs/Outputs | Discrete: PNP/NPN/NMOS, Dry Contact, Counter Analog: 0–20 mA, 0–10V dc, PT100 RTD, Thermocouple | Discrete: PNP/NPN/NMOS, Dry Contact, Counter Analog: 0–20 mA, 0–10V dc, PT100 RTD, Thermocouple | Discrete: PNP/NPN/NMOS, Dry Contact Analog: 0–20 mA, 0–10V dc, PT100 RTD, Thermocouple, Bridge | Discrete: PNP/NPN/NMOS, Dry Contact, Counter Analog: 0–20 mA, 0–10V dc, PT100 RTD, Thermocouple, Bridge, SDI-12 |
| Dimensions and Housing Material | Polycarbonate: 127 × 81 × 60 mm | Polycarbonate: 127 × 81 × 60 mm | Metal: 127 × 110 mm | Polycarbonate: 127 × 81 × 60 mm |
| Protection Rating | DX80: IP67; NEMA 6 DX80...C: IP20; NEMA 1 | DX80: IP67; NEMA 6 DX80...C: IP20; NEMA 1 | IP68; NEMA 4X | IP67; NEMA 6 |
| Certified Area | — | DX80...C: CI D2, Zone 2 | CI D1, Zone 0 and 20 | CI D2, Zone 2 |
| Operating Temperature | –40° to +85° C | –40° to +85° C | –40° to +70° C | –40° to +85° C |
| Communication | Gateway: Modbus RTU Master and Slave, Modbus TCP/IP and EtherNet/IP | Gateway: Modbus RTU Master and Slave, Modbus TCP/IP and EtherNet/IP | See DX80 Gateway | Modbus: RS-232 and RS-485 or EtherNet/IP |

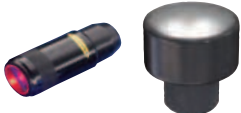


Task Lights

|  |  |  |  |  |
|--|---|---|---|---|
| Series | WLS28 | WLA | WL50/WL50F | WL50S |
| Catalog Page | 417 | 420 | 422 | 424 |
| Description | 28 mm wide industrial strip lighting for enclosure and area lighting | Rugged, sealed light for area and machine lighting | 50 mm light for enclosure and area lighting | Intense, sealed spot light for area and machine lighting |
| Color | Cool White, Warm White, Red, Green, Blue, Yellow | Cool White, Warm White, Red, Green, Blue, Yellow | White | White, Red, Green, Blue |
| Dimensions | 28 x 21 x (H) mm (H): 183.5 to 1181 mm (depending on position and light length) | 105 x 180 mm 190 x 180 mm 275 x 180 mm 360 x 180 mm | WL50: 47.5 x 50 mm WL50F: 76 x 23 x ø 50 mm | 66 x 50 mm |
| Power Supply | 12 to 30V dc | 12 to 30V dc | 10 to 30V dc | 12 to 30V dc |
| Construction | Clear anodized aluminum | Valox™ | Polycarbonate | Black anodized aluminum |
| Mounting | End mounting | Flat mount | WL50: 30 mm threaded base mount WL50F: Flat mount | 30 mm threaded base mount |
| Environmental Rating | IP50 | IP69K | Standard models: IP69K per DIN 40050 Push-button models: IEC IP67 | IP69K |

Selection Guide

| Vision Lights | | | |
|---|---|--|--|
|  |  |  |  |
| Series | Ring Lights | Area Lights | Backlights |
| Catalog Page | 430 | 432 | 434 |
| Description | Mounts directly to the sensor for easy setup and illuminates any object directly in front of the sensor | Provides even illumination in a concentrated area | Installs behind the target, directly facing the sensor; has a highly diffused surface and uniform brightness |

| | | |
|--|--|--|
|  |  |  |
| Linear Array Lights | On-Axis Lights | Low-Angle Ring Lights |
| 435 | 436 | 436 |
| Provides high-intensity illumination of large areas, at long distances | Provides collimated illumination along the same optical path as camera | Illuminates nearly perpendicular to the direction of an inspection |

| | | |
|---|---|---|
|  |  |  |
| Spot Lights | Tubular Fluorescent Lights | Structured Lights |
| 437 | 438 | 438 |
| Provides even illumination in a small concentrated spot | Features flicker-free high-intensity illumination of large areas | Uses Class 2 laser line for 3-dimensional sensing |

For additional Vision Lighting selection information, see page 415.

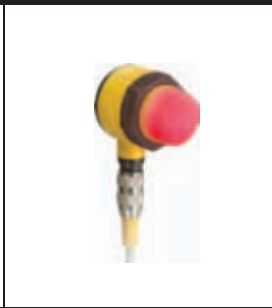
Indicators



| Series | TL50 Tower Lights | TL30F Tower Lights | CL50 Column Lights | TL50BL Beacon Lights |
|--------------------------------|---|--|---|--|
| Catalog Page | 442 | 442 | 445 | 447 |
| Description | Preassembled and preconfigured multi-segment indicators with up to five colors in a single tower | Preassembled and preconfigured multi-segment indicators with three or five colors in one tower | Large single illuminated segment with 30 mm base | Preassembled, highly visible, multi-segmented indicators with up to 4 colors in a single tower. |
| Maximum Colors in One Housing* | General-Purpose: 5 Audible: 4 | 5 | 3 & Audible Alert | General-Purpose: 5 Audible: 4 |
| Indication | General-Purpose: Green, Yellow, Red, Blue, White Audible: Green, Yellow, Red, Blue, White, Audible Alert | General-Purpose: Green, Yellow, Red, Blue, White | General-Purpose: Green, Red, Yellow Audible: Green, Red, Yellow and Audible Alert | General-Purpose: Green, Red, Yellow, Blue Audible: Green, Red, Yellow, Blue and Audible Alert |
| Typical Audible | IP50: 92 dB @ 1 m IP67: 94 dB @ 1 m | — | IP50: 92 dB @ 1 m IP67: 94 dB @ 1 m | IP50: 92 dB @ 1 m IP67: 94 dB @ 1 m |
| Dimensions | ø 50 mm x (H) Tower Height (H) General Purpose: 61.2 to 224.0 mm Audible (IP50): 92.0 to 214.1 mm Audible (IP67): 74.4 to 237.2 mm | 30 x 19.1 mm x height Tower Height 3 Color: 128.1 mm 5 Color: 204.3 mm | General Purpose: ø 50 x 114.2 mm Audible (IP50): ø 50 x 145.3 mm Audible (IP67): ø 50 x 168.2 mm | ø 50 mm x (H) Tower Height (H) General Purpose: 46.2 to 123.6 mm Audible (IP50): 77.1 to 154.5 mm Audible (IP67): 100.2 to 177.6 mm |
| Mounting | 30 mm threaded base mount | Flat mount | 30 mm threaded base mount | 30 mm threaded base mount |
| Construction | ABS/Polycarbonate (black or gray housings) | Black Painted Aluminum | ABS/Polycarbonate (black or gray housings) | ABS/Polycarbonate (black or gray housings) |
| Environmental Rating | General-Purpose: IP67 Audible: IP50 or IP67, depending on model | IP65 | General-Purpose: IP67 Audible: IP50 or IP67, depending on model | General-Purpose: IP67 Audible: IP50 or IP67, depending on model |
| Operating Temperature | General-Purpose: -40° to +50° C Audible: -20° to +50° C | -40° to +50° C | General-Purpose: -40° to +50° C Audible: -20° to +50° C | General-Purpose: -40° to +50° C Audible: -20° to +50° C |
| Power Supply | 18 to 30V dc or 24V ac | 18 to 30V dc or 24V ac | 18 to 30V dc | 12 to 30V dc or 24V ac |






* Contact factory for other colors and color combinations.

Selection Guide



| Housing | K80L | K50L & K50FL | T30 | K30L | |
|-------------------------------|---|--|--|--|--|
| Catalog Page | 444 | 444 | 432 | 432 | |
| Description | 50 mm dome or flat profile | 50 mm dome or flat profile | 30 mm T-style | 30 mm dome | |
| Maximum Colors in One Housing | 5 | 5 | 3 | 3 | |
| Indication* | <p>General-Purpose: Green, Red, Yellow</p> <p>Multi-Function: Green, Red, Yellow, Blue, White ON, flashing or alternating</p> <p>Sensor Emulator: Green, Yellow</p> <p>Audible: Green, Red, Yellow, Steady or Pulsed Tone</p> <p>Segmented: Green, Red, Yellow, Blue, White</p> | <p>General-Purpose: Green, Red, Yellow</p> <p>Multi-Function: Green, Red, Yellow, Blue, White ON, flashing or alternating</p> <p>Sensor Emulator: Green, Yellow</p> <p>Audible: Green, Red, Yellow, Steady or Pulsed Tone</p> <p>Daylight Visible: Green, Red, Yellow, Blue, White</p> | <p>General-Purpose: Green, Red, Yellow</p> <p>Multi-Function: Green, Red, Yellow ON, flashing or alternating</p> <p>Sensor Emulator: Green, Yellow</p> | <p>General-Purpose: Green, Red, Yellow</p> <p>Sensor Emulator: Green, Yellow</p> | |
| Audible | <p>Steady or Pulsed: Typical—75 dB @ 1 m Min—66 dB @ 1 m</p> <p>Loud Steady: Typical—92 dB @ 1 m Min—84 dB @ 1 m</p> | <p>Steady or Pulsed: Typical—75 dB @ 1 m Min—66 dB @ 1 m</p> <p>Loud Steady: Typical—92 dB @ 1 m Min—84 dB @ 1 m</p> | — | — | |
| Dimensions | Segmented: 110 x 81 x 41mm All others: 110 x 81 x 66 mm | K50L: 57 x ø 50 mm K50FL: 60 x ø 50 mm Daylight visible: 50 x ø 50 mm | 64 x 40 x 45 mm | 42 x ø 30 mm | |
| Mounting | Flat or DIN-rail mount | 30 mm threaded base or flat mount | 30 mm threaded mount | 22 mm threaded base mount | |
| Construction | Polycarbonate | K50L: Polycarbonate K50FL: ABS/polycarbonate Daylight Visible: Polycarbonate | Thermoplastic polyester | Polycarbonate | |
| Protection Rating | Audible: IP50 All others: IP67 | Audible: IP50 All others: IP67 | IP67 | IP67 | |
| Operating Temperature | Audible: -20° to +50° C All others: -40° to +50° C | Audible: -20° to +50° C All others: -40° to +50° C | -40° to +50° C | -40° to +50° C | |
| Power Supply | 18 to 30V dc, 24V dc or 85 to 130V ac | 15 to 30V dc, 24V dc, 18 to 30V dc or 85 to 130V ac depending on model | 10 to 30V dc | 10 to 30V dc | |

* Contact factory for other colors and color combinations.

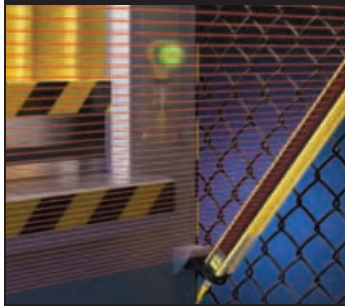
| | | | | |
|---|---|---|---|--|
|  |  |  |  |  |
| T18 | M18 | T8L | K80CLR Call Light | Traffic Lights |
| 432 | 432 | 432 | 439 | 440 |
| 18 mm T-style | 18 mm barrel | 8 mm T-style | Battery-powered 50 mm dome | Preassembled indicators for signaling and traffic control |
| 3 | 3 | 2 | 1 | 1 Light: 3 2 Light: 1 (each light) 3 Light: 1 (each light) |
| General-Purpose: Green, Red, Yellow Sensor Emulator: Green, Yellow | General-Purpose: Green, Red, Yellow Multi-Function: Green, Red, Yellow ON, flashing or alternating Sensor Emulator: Green, Yellow | General-Purpose: Green, Red, Yellow Sensor Emulator: Green, Yellow | Red | 1 Light: Green, Red, Yellow 2 Light: Top—Red Bottom—Green 3 Light: Top—Red Middle—Yellow Bottom—Green |
| — | — | — | — | — |
| 40 x 33 x ø 16 mm | 51 x ø 18 mm | 19 x 16 x ø 16 mm | 80 x 81 x 41 mm | 1 Light: 110 x 81 x 92 mm 2 Light: 190 x 88 x 110 mm 3 Light: 210 x 80 105 mm |
| 18 mm threaded mount | 18 mm threaded barrel mount | 8 mm threaded nose mount | Flat or DIN-mount | Flat or DIN-mount polycarbonate |
| Thermoplastic polyester | Nickel-plated brass | Polycarbonate/ABS blend | Polycarbonate | Polycarbonate |
| IP67 | IP67 | IP67 | IP50 | 1 Light: IP67 2 & 3 Light: IP65 |
| -40° to +50° C | -40° to +50° C | -40° to +50° C | -20° to +50° C | -40° to +50° C |
| 10 to 30V dc | 10 to 30V dc | 10 to 30V dc | 18V (two 9V batteries) | 15 to 30V dc or 85-130V ac, depending on model |

Selection Guide

Actuators

| Series | K50 & K80 | PVD | PVA | VTB |
|-------------------------------|---|---|--|---|
| Catalog Page | 465 | 470 | 472 | 475 |
| Description | 50 mm dome light with sensor in two housing styles | One-component light sensor for part assembly and error-proofing | Two-component light screen for part-pick verification | Ultra-bright optical touch buttons for indicating bin-picking sequences |
| Job Light Color | Green, Red, Yellow | Green, Red | Green | Green, Red, Blue |
| Maximum Sensing Range | Retroreflective: 2 m Fixed-Field: 100 mm Push button: — | Retroreflective: 2 m Diffuse: 400 mm | Opposed: 2 m | — |
| Minimum Object Detection Size | — | Retroreflective: 51 to 100 mm Diffuse: 55 mm | Opposed: 35 mm | — |
| Dimensions (h x w x d) | K50: ø 50 x 57 mm K80: 110 x 81 x 73 mm | PVD100: 138 x 30 x 16 mm PVD225: 266 x 30 x 16 mm | 30 x 15 mm x height Array heights: 138 mm 341 mm 266 mm 417 mm | 57 x 60 x 43 mm |
| Construction | Polycarbonate & Thermoplastic | Black painted aluminum | Black anodized aluminum | Black polysulfone or red polycarbonate with white polycarbonate base |
| Protection Rating | IP69K (depending on installation) | IP62; NEMA 2 | IP62; NEMA 2 | IP66; NEMA 4X |
| Operating Temperature | -40° to +50° C | 0° to +50° C | 0° to +50° C | -20° to +50° C |
| Power Supply | 12 to 30V dc | 12 to 30V dc | 12 to 30V dc | 12 to 30V dc |
| Output configuration | One NPN or PNP & NO or NC, depending on model | One user-selectable PNP or NPN | One NPN or PNP, depending on model; programmable for Light or Dark Operate | One NPN or PNP, depending on model |

Safety Light Screens



| Series | EZ-SCREEN® Type 4 | EZ-SCREEN® Type 2 | EZ-SCREEN™ TYPE 4 Grids & Points |
|----------------------------------|--|--|--|
| Catalog Page | 493 | 511 | 516 |
| Description | 2-piece system • 14 or 30 mm resolution light screen • 14 or 25 mm resolution LP light screen • 2-, 3- or 4- Beam Grids • Single-beam Points | 2-piece, 30 mm resolution light screen system for lower risk applications | Suited to a variety of access and long-range perimeter guarding applications |
| Safety Rating (Depends on model) | Type 4 /Category 4/PLe | Type 2 /Category 2 | Type 4 /Category 4/PLe |
| System Components | Emitter, receiver and one cordset for each. Optional interfacing components available. | Emitter, receiver and one cordset for each. Optional interfacing components available. | Emitter, receiver and one cordset for each. Optional interfacing components available. |
| Range | 14 or 30 mm: up to 18 m 14 or 25 mm: up to 7 m Grids & Points: up to 70 m | up to 15 m | up to 70 m |
| Supply Voltage | 24V dc | 24V dc | 24V dc |
| Safety Output | 2 PNP OSSD | 2 PNP OSSD | 2 PNP OSSD |
| Aux. Output | Yes | — | — |
| Response Time | 8 to 56 ms, depending on model | 11 to 25 ms | 24 ms or less |
| Defined Area (Protected Height) | 14 mm resolution: 150 to 1800 mm 30 mm resolution: 150 to 2400 mm 14 or 25 mm resolution: 270 to 1810 mm Grids: 500 to 1066 mm Points: 25 mm beam diameter | 150 to 1500 mm | 500 to 1066 mm |
| Cascading | Allow up to 4 emitter/receiver pairs (14, 25 or 30 mm systems) to be wired together to form a single safety device. Only matched pairs must be the same length and resolution. | — | — |

Selection Guide

Safety Laser Scanner



| Series | AG4 |
|----------------------------------|--|
| Catalog Page | 525 |
| Description | Two-dimensional, programmable area scanner |
| Safety Rating (Depends on model) | Type 3/Category 3 |
| System Components | Laser scanner, configuration cordset and communication cordset |
| Protective Field | up to 6 m |
| Warning Field | up to 15 m |
| Scanning Angle | 190° |
| Supply Voltage | 24V dc |
| Safety Output | 2 PNP OSSD |
| Aux. Output | 2 PNP |
| Response Time | 80 ms (adjustable to 640 ms) |

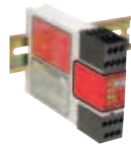
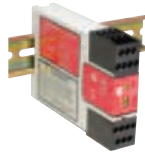
Safety Controllers



| Series | SC22-3/-3E |
|-----------------------------------|--|
| Catalog Page | 533 |
| Description | Four standard models and four models for direct connectivity to EtherNet/IP and Modbus TCP industrial networks |
| Safety Rating (Depends on models) | Category 2, 3 or 4 |
| Functional Stop Category | 0 & 1 |
| Voltage | 24V dc |
| Inputs | 22 input terminals monitor safety and non-safety devices. |
| Safety Output | 6 PNP (3 pair) |
| Aux. Output | 10 discrete status outputs, EtherNet/IP & Modbus TCP |
| Output Response Time | 10 ms |

* USSI = Universal Safety Stop Interface

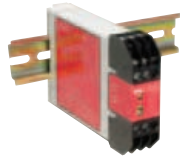
Safety Modules



| Series | E-Stop & Interlocked Guard | Universal Input | Safety Mat | Muting | Safe Speed |
|----------------------------------|---|---|--|--|---|
| Catalog Page | 537 | 545 | 547 | 550 | 554 |
| Description | Modules monitor contacts of E-stop switches, guard interlock switches or the outputs of other safety modules. | Modules monitor one or two solid-state PNP or relay contact outputs from safety or non-safety devices, such as sensors or safety light screens. | Modules monitor one 4-wire safety mat (or multiple connected in series). | Modules suspend safeguarding during non-hazards time in the machine's cycle. | Modules monitor two sensors with PNP outputs for rotation and linear movements. |
| Safety Rating (Depends on model) | Category 2 or 4, depending on model | Category 2, 3 or 4 | Category 3 (with mat) | Category 2, 3 or 4 | Category 3 |
| Functional Stop Category | 0 & 1 | 0 | 0 | 0 | 0 |
| Supply Voltage | 24V ac/dc, 115V ac & 12-24V dc, 230V ac & 12-24V dc or 24V dc | 24V ac/dc | 115V ac & 12-24V dc or 230V ac & 12-24V dc | 24V dc | 24V ad/dc |
| Safety Outputs | 2 NO, 3 NO, 4 NO, 2 NO & 2 NO w/delay or 4 NO & 4 NO w/delay | 3 NO or 2 NO | 4 NO | 2 PNP OSSD or 2 NO | 2 NO |
| Aux. Outputs | 1 NC, 1 NC & 2 PNP, or 1 NC (immediate) & 1 NC (delayed) | 1 NC | 1 NC & 2 PNP | 1 PNP or 1 NC | 1 NC |
| Output Response Time | 25, 35 or 50 ms | 25 ms | 50 ms | 10 or 20 ms | 700 or 350 ms |

Selection Guide

Safety Modules



| Series | Extension Relay | Interface Relay |
|----------------------------------|---|---|
| Catalog Page | 556 | 558 |
| Description | Single or dual (depending on model) input channels accept the outputs of a primary safety device. Modules provide additional safety outputs for a primary safety device. Typically interfaced with safety modules with relay outputs. | One dual input accepts the single or dual safety output of a primary safety device. Typically interfaced with devices solid-state OSSD outputs. Module increases switching current capacity (up to 6 amps) for the output of a primary safety device. |
| Safety Rating (Depends on model) | Category 2, 3 or 4 (Depends on hookup) | Category 2, 3 or 4 (Depends on hookup) |
| Functional Stop Category | 0 or 1 | 0 |
| Supply Voltage | 24V dc or 24V ac/dc, depending on model | 24V dc |
| Safety Outputs | 4 NO or 4 NO (w/delay) | 3 NO or 2 NO |
| Aux. Outputs | — | 1 NC, depending on model |
| Output Response Time | 20, 30 or 35 ms, depending on model | 20 ms |

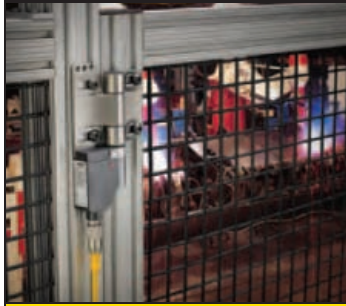
Two-Hand Control



| Series | DUO-TOUCH® SG THC Modules | DUO-TOUCH® SG Run Bars |
|-----------------------|--|---|
| Catalog Page | 562 | 570 |
| Description | Two-Hand Control Modules; STB compatible | Two-hand control Run Bar with pre-mounted STB buttons |
| Inputs | Two STB Self-Checking Touch Buttons or Form C Mechanical Button | Requires IIC Two-Hand Control logic device for safe guarding applications |
| Safety Rating | Category 4 (module); Type IIC | Dependent on controller/module |
| Modules | Five models with different supply voltage, outputs and control functions (example, muting) | Five models with different supply voltage, outputs and control functions (purchased separately) |
| Supply Voltage | 24V ac/dc, 115V ac/24V dc or 230V ac/24V dc, depending on model | 10 to 30V dc |
| Safety Outputs | 2 NO or 4 NO | — |
| Aux. Outputs/Function | AT-FM-10K: none All others: 1 NPN, 1 PNP & 1 NC | Models with or without E-Stop buttons |
| STB Touch Buttons | Six models with varying supply voltage, output type, cable and housing material Kits with modules and STB buttons available | 2 x STBVP6 |

Selection Guide

Safety Interlock Switches



| Series | Magnet | Hinge | Compact Plastic & Metal | Locking |
|-------------------|-------------|--|--|---|
| Catalog Page | 575 | 578 | 584 & 590 | 593 |
| Type | Magnetic | Electromechanical Non-Locking | Electromechanical Non-Locking | Electromechanical Locking |
| Package Style | 2-piece | 1-piece | 2-piece | 2-piece |
| Housing Material | Plastic | Plastic or metal | Plastic or metal | Plastic or metal |
| Actuator Contacts | 1 NO & 1 NC | 2 NC & 1 NO, SPDT (Form C), 1 NC & 1 NO, or 2 NC | 2 NC & 1 NO, 1 NC & 1 NO, 2 NC, 1 NC, or 1 NO & 1 NC | 1 NC & 1 NO, 2 NC, 2 NC & 1 NO, or 3 NC |
| Solenoid Contacts | — | — | — | 1 NC & 1 NO, or 1 NC |


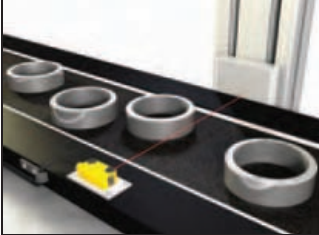

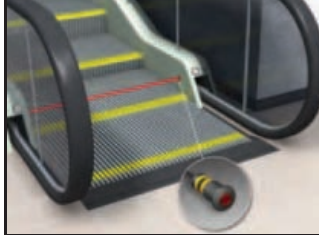

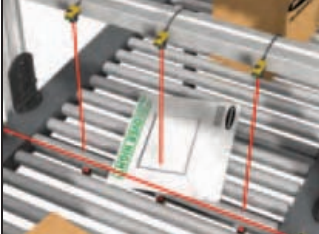


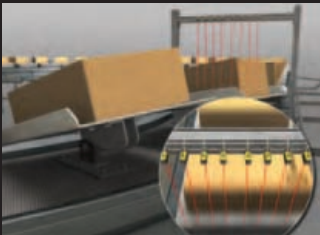




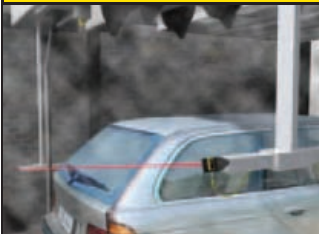


Emergency Stop & Stop Control Devices



| Series | Mechanical E-Stop Buttons | Rope Pull Switches | Enabling Devices |
|------------------|-----------------------------------|--|--|
| Catalog Page | 608 | 617 | 627 |
| Description | Mechanical E-Stop Push Buttons | E-Stop and Stop Control Rope Pulls | Stop Control Enabling Devices |
| Housing Material | Plastic or metal | Plastic or metal | Plastic |
| Contacts | 2 NC, 1 NC & 1 NO, or 2 NC & 1 NO | Safety Contacts: 2 NC or 4 NC Aux. Contacts: 2 NO or 1 NO | 2 NC & 1 NO Aux. or 2 NC & 1 NO Aux. & 1 NO momentary push button, or 2 NC & 2 NO momentary push button |

Applications

Sensor Applications

| | | | |
|---|--|--|--|
| Low-Profile Object Detection  <p>ONLINE LOOK FOR MORE INFO page 62</p> <p>Product: To detect the presence of integrated circuit chips in a confined space.</p> | Reflective Object Counting  <p>ONLINE LOOK FOR MORE INFO page 62</p> <p>Product: To reliably count metal rings passing on a conveyor.</p> | Part Presence  <p>ONLINE LOOK FOR MORE INFO page 62</p> <p>Product: To verify the presence of colored caps on bottles of children's medicine.</p> | People Detection  <p>ONLINE LOOK FOR MORE INFO page 73</p> <p>Product: To detect people as they enter/exit an escalator.</p> |
| Precise Counting  <p>ONLINE LOOK FOR MORE INFO page 90</p> <p>Product: To count the narrow barrels of syringes.</p> | Sorting  <p>ONLINE LOOK FOR MORE INFO page 90</p> <p>Product: To sort letters from packages, based on height.</p> | Liquid Leak Detection  <p>ONLINE LOOK FOR MORE INFO page 90</p> <p>Product: To detect a hazardous fluid leaking from pipes inside a valve box.</p> | Reflective Package Detection  <p>ONLINE LOOK FOR MORE INFO page 90</p> <p>Product: To detect the presence of product wrapped in reflective Mylar on a conveyor belt.</p> |
| Tilt Tray Inspection  <p>ONLINE LOOK FOR MORE INFO page 105</p> <p>Product: To detect items in a tray for sorting.</p> | Outsert Detection  <p>ONLINE LOOK FOR MORE INFO page 105</p> <p>Product: To ensure that a coupon is present before applying it to a bottle cap.</p> | Thread Hole Inspection  <p>ONLINE LOOK FOR MORE INFO page 154</p> <p>Product: To verify, from a distance, that threads have been cut into holes in a manifold.</p> | Feeder Bowl Level Monitoring  <p>ONLINE LOOK FOR MORE INFO page 154</p> <p>Product: To monitor supply level of caps as they move out of the feeder bowl.</p> |
| Lumber Inspection  <p>ONLINE LOOK FOR MORE INFO page 154</p> <p>Product: To check lumber for warping.</p> | Vehicle Detection  <p>ONLINE LOOK FOR MORE INFO page 154</p> <p>Product: To verify that a vehicle is in position in a car wash.</p> | Liquid Detection  <p>ONLINE LOOK FOR MORE INFO page 154</p> <p>Product: To detect water or liquid containing water, regardless of bottle color.</p> | Clear Bottle Counting  <p>ONLINE LOOK FOR MORE INFO page 154</p> <p>Product: To reliably count clear bottles moving on a high-speed conveyor line.</p> |

Sensor Applications

Long-Distance Feature Detection



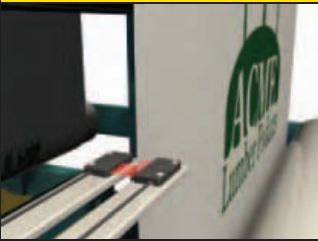
ONLINE
LOOK FOR MORE INFO
Product:
To detect a small flange from a long distance.
page 221

Product Flow Control



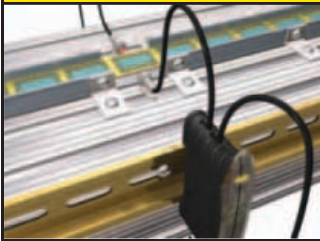
ONLINE
LOOK FOR MORE INFO
Product:
To signal the machine control when cans are absent, using a time delay to filter out gaps between the cans.
page 221

Edge Guiding



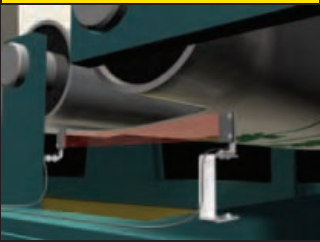
ONLINE
LOOK FOR MORE INFO
Product:
To keep a roll of plastic in the correct position by monitoring the edge.
page 234

Lead Frame Presence Detection



ONLINE
LOOK FOR MORE INFO
Product:
To detect the presence of an IC lead frame.
page 234

Loop Tension Monitoring



ONLINE
LOOK FOR MORE INFO
Product:
To control the speed of a web using a loop control system.
page 234

Wafer Mapping



ONLINE
LOOK FOR MORE INFO
Product:
To map the presence of wafers in a cassette.
page 234

Poly Bag Seal Detection



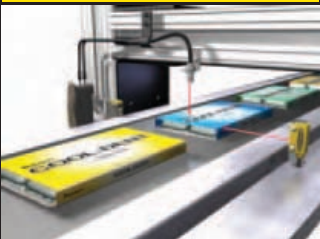
ONLINE
LOOK FOR MORE INFO
Product:
To locate the perforations between bags on a web.
page 234

Thread Break Detection



ONLINE
LOOK FOR MORE INFO
Product:
To detect broken threads on a loom.
page 234

Color Sorting



ONLINE
LOOK FOR MORE INFO
Product:
To sort gum packets by label color.
page 234

Pill Counting



ONLINE
LOOK FOR MORE INFO
Product:
To quickly and accurately count small pills, tablets and gelatin tablets to ensure correct fill level.
page 234

Part Detection Error-Proofing



ONLINE
LOOK FOR MORE INFO
Product:
To check that certain steps have been performed before the assembly process can continue.
page 234

Equipment Inspection



ONLINE
LOOK FOR MORE INFO
Product:
To check whether the weld tips of an automotive welder are within specifications.
page 248

Small Part Detection



ONLINE
LOOK FOR MORE INFO
Product:
To detect extremely small parts as they fall through a web of sensing beams.
page 277

Small Object Detection



ONLINE
LOOK FOR MORE INFO
Product:
To accurately detect flat objects passing on a conveyor.
page 277

Splice Detection



ONLINE
LOOK FOR MORE INFO
Product:
To identify splices on a roll of paper.
page 287

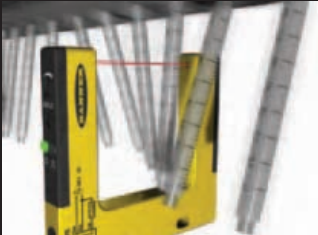
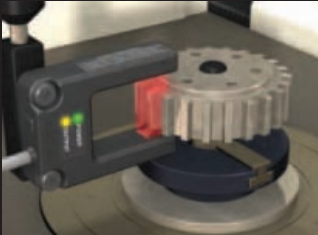





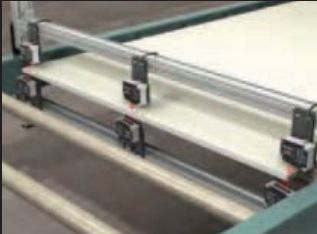





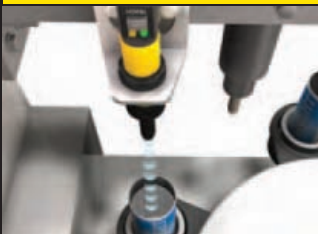


Registration Mark Detection



ONLINE
LOOK FOR MORE INFO
Product:
To detect registration marks on labels as they pass at high speeds.
page 287

Applications

Sensor Applications

| | | | |
|---|--|---|---|
| <h3>Counting</h3>  <p>ONLINE LOOK FOR MORE INFO page 280</p> <p>Product: To count syringe barrels in an assembly line.</p> | <h3>Gear Tooth Sensing</h3>  <p>ONLINE LOOK FOR MORE INFO page 283</p> <p>Product: To sense the teeth of a timing gear to produce pulses used in automated production machinery.</p> | <h3>Tamper Evident Seal Detection</h3>  <p>ONLINE LOOK FOR MORE INFO page 294</p> <p>Product: To detect the presence of a tamper evident seal on a bottle.</p> | <h3>Range of Motion</h3>  <p>ONLINE LOOK FOR MORE INFO page 304</p> <p>Product: To accurately measure the range of motion of an auto seat back.</p> |
| <h3>Dry Fill Level</h3>  <p>ONLINE LOOK FOR MORE INFO page 304</p> <p>Product: To accurately determine the level of dry bulk material in a bin hopper, despite the material's uneven surface.</p> | <h3>Extremely Long-Range Sensing</h3>  <p>ONLINE LOOK FOR MORE INFO page 308</p> <p>Product: To instantly measure the location of an automated storage and retrieval shuttle, to track its position.</p> | <h3>Long-Range Sensing</h3>  <p>ONLINE LOOK FOR MORE INFO page 308</p> <p>Product: To detect the presence and position of a car seat on an automotive assembly line.</p> | <h3>Thickness Measurement</h3>  <p>ONLINE LOOK FOR MORE INFO page 313</p> <p>Product: To measure thickness of drywall at the points across the width of a sheet.</p> |
| <h3>Wood Profiling</h3>  <p>ONLINE LOOK FOR MORE INFO page 311</p> <p>Product: To accurately profile wooden moldings, regardless of color.</p> | <h3>Liquid Level Monitoring</h3>  <p>ONLINE LOOK FOR MORE INFO page 317</p> <p>Product: To monitor the level of liquid in a tank by sending a continuous signal that represents the current depth.</p> | <h3>Roll Size</h3>  <p>ONLINE LOOK FOR MORE INFO page 317</p> <p>Product: To monitor the decreasing size of a roll of material, so it can be replaced when empty.</p> | <h3>Pallet Load</h3>  <p>ONLINE LOOK FOR MORE INFO page 317</p> <p>Product: To detect that a pallet with packages stacked at different heights is loaded and ready for wrapping.</p> |
| <h3>Loop Control</h3>  <p>ONLINE LOOK FOR MORE INFO page 322</p> <p>Product: To control the amount of play in a loop of clear plastic within a set range.</p> | <h3>Liquid Level Detection</h3>  <p>ONLINE LOOK FOR MORE INFO page 322</p> <p>Product: To accurately determine the level of liquid in a narrow tube.</p> | <h3>Bottle Counting</h3>  <p>ONLINE LOOK FOR MORE INFO page 325</p> <p>Product: To count tinted glass bottles on a conveyor in a soft drink bottling operation.</p> | <h3>Liquid Level Detection</h3>  <p>ONLINE LOOK FOR MORE INFO page 325</p> <p>Product: To monitor the level of soap in a reservoir in a car wash.</p> |

Sensor Applications

Loop Control of Clear Plastic



ONLINE
LOOK FOR MORE INFO
Product:
To control the speed of a web by reliably detecting the clear plastic film.
page 328

Moonroof Detection



ONLINE
LOOK FOR MORE INFO
Product:
To reliably detect the presence of clear glass to ensure that the moonroof has been installed.
page 328

Pharmaceutical Bottle Detection



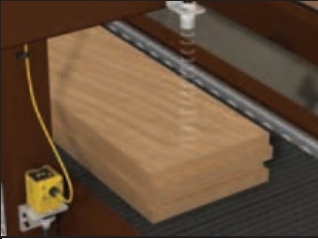
ONLINE
LOOK FOR MORE INFO
Product:
To reliably detect clear bottles in an aseptic environment.
page 336

Inverted Object Detection



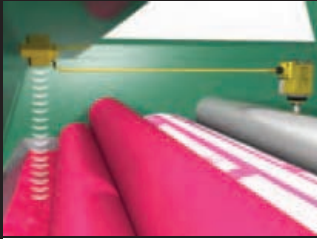
ONLINE
LOOK FOR MORE INFO
Product:
To detect a product that has flipped over by measuring small differences in height.
page 340

Height Measurement



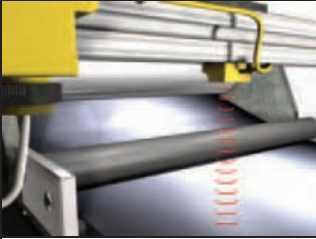
ONLINE
LOOK FOR MORE INFO
Product:
To verify that a stack of boards has the correct number.
page 344

Ink Level



ONLINE
LOOK FOR MORE INFO
Product:
To monitor the ink level in a printer tray.
page 344

Web Thickness



ONLINE
LOOK FOR MORE INFO
Product:
To measure the thickness of webbing.
page 344

Empty Rack Verification



ONLINE
LOOK FOR MORE INFO
Product:
To verify that all glass hard disks are removed from the holding rack after the disks are rinsed.
page 338

Carton Sizing



ONLINE
LOOK FOR MORE INFO
Product:
To measure height, length and width of cartons for storage or palletizing
page 349

Plastic Bottle Detection



ONLINE
LOOK FOR MORE INFO
Product:
To ensure that clear bottles are properly placed on a conveyor.
page 349

Carpet Web Detection



ONLINE
LOOK FOR MORE INFO
Product:
To determine the location of two edge transitions on carpet web: air to selvage and selvage to tufting.
page 349

Vehicle Separation



ONLINE
LOOK FOR MORE INFO
Product:
To detect vehicle separation in an Automated Vehicle Classification (AVC) system.
page 356

Edge Monitoring



ONLINE
LOOK FOR MORE INFO
Product:
To track the edge of a web as it rolls, to make sure it stays aligned.
page 356

Train and Tram Detection



ONLINE
LOOK FOR MORE INFO
Product:
To detect and locate a train or tram in a tunnel.
page 362

Cargo Positioning



ONLINE
LOOK FOR MORE INFO
Product:
To detect and position cargo on a truck bed.
page 362

Automobile Detection in Drive-Through



ONLINE
LOOK FOR MORE INFO
Product:
To detect the presence of large moving or stationary objects, regardless of shape or color.
page 362

Applications

Vision Applications

Label Alignment Inspection



ONLINE
LOOK FOR MORE INFO
Product:
To verify that each bottle has a label applied and that each label is applied straight.
page 372

Date/Lot Code Inspection



ONLINE
LOOK FOR MORE INFO
Product:
To verify each package has a date/lot code printed on it.
page 372

Punch Hole Inspection



ONLINE
LOOK FOR MORE INFO
Product:
To verify that the expected number of holes exist on a small metal part.
page 372

Vial Stopper Inspection



ONLINE
LOOK FOR MORE INFO
Product:
To ensure that a stopper is properly inserted as each vial leaves the filling station.
page 372

Part Flaw Detection



ONLINE
LOOK FOR MORE INFO
Product:
To detect bent or missing connectors, and make sure electronic components are correctly oriented.
page 372

Intelligent Mail Bar Code (IMB) Reading



ONLINE
LOOK FOR MORE INFO
Product:
To sort mail by reading the information encoded in the bar code.
page 372

Lot Code Inspection



ONLINE
LOOK FOR MORE INFO
Product:
To verify that a readable lot code is present on the chip.
page 372

Pharmaceutical Insert Verification



ONLINE
LOOK FOR MORE INFO
Product:
To read pharma code on insert to verify it is the correct insert for the product.
page 372

Vial Fill Level and Cap Seal Inspection



ONLINE
LOOK FOR MORE INFO
Product:
To rapidly verify that vials are filled to the correct level and that the vial caps are correctly aligned.
page 378

Stamped Metal Pin Inspection



ONLINE
LOOK FOR MORE INFO
Product:
To check for correct count, straightness and pitch of connector pins on a stamped metal subassembly.
page 378

Color Inspection and Verification



ONLINE
LOOK FOR MORE INFO
Product:
To inspect pour spouts for correct insertion and color.
page 378

Capping and Fill Inspection



ONLINE
LOOK FOR MORE INFO
Product:
To make sure bottles are filled and capped property.
page 378

Verification of Two Bar Codes on a Part



ONLINE
LOOK FOR MORE INFO
Product:
To read and verify 1D and 2D bar codes on a part.
page 378

Product ID and Lot Control



ONLINE
LOOK FOR MORE INFO
Product:
To track a batch of a pharmaceutical product.
page 378

Label Inspection in a Wet Environment









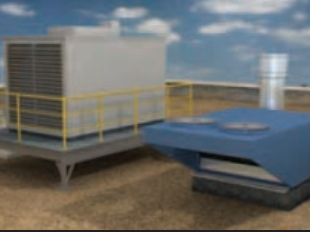









ONLINE
LOOK FOR MORE INFO
Product:
To confirm that each bottle in a wet environment has a label in the correct position.
page 378

2D Stamped Bar Code Verification



ONLINE
LOOK FOR MORE INFO
Product:
To detect and verify a dot-peened bar code on a metal part.
page 378

Wireless Applications


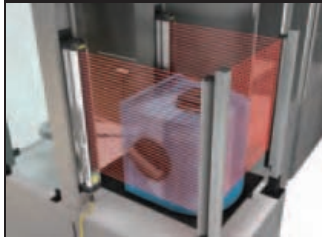
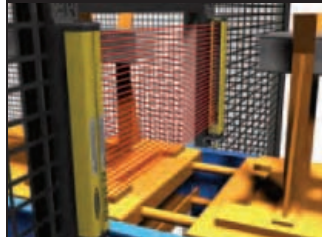

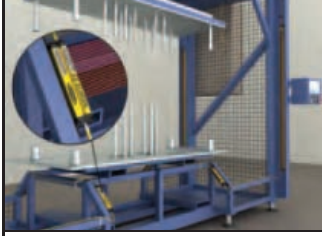


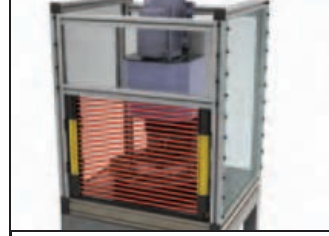

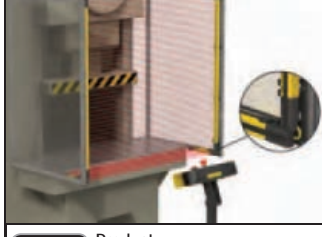
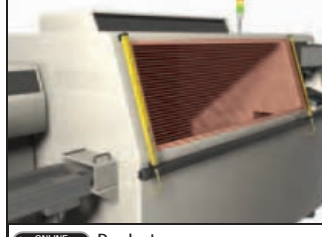





| | | | |
|---|---|--|---|
| <p>Remote HVAC Controls</p>  <p>ONLINE LOOK FOR MORE INFO page 393</p> <p>Product: To monitor production line monitors machine status a Node is installed at each location.</p> | <p>Warehouse Door</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To control the routing of an Automated Guided Vehicle (AGV) through a facility a FlexNode is positioned at each door.</p> | <p>Report Activated Emergency Shower Location</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To alert management when and where an emergency shower has been activated.</p> | <p>Rotary Bottle Filler Monitoring</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To monitor fill level, temperature and pressure to determine when to activate the inflow into the tank.</p> |
| <p>Gated Community Entry</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To open/close gates by detecting presence/absence of vehicles using a wireless M-GAGE Node.</p> | <p>Call for Parts (Flooring Monitoring)</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To allow operators to call forklift drivers to deliver additional parts or remove completed assemblies.</p> | <p>Energy Management</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To control and optimize energy consumption by turning on and off industrial fans and air movers.</p> | <p>Pick-to-Light</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To deploy a wireless pick-to-light system using a FlexNode equipped with low-power EZ-LIGHT models.</p> |
| <p>Tank Level Management</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To monitor tank levels, pressure or flow rates with a FlexPower Node and external sensor.</p> | <p>Process Tank Level Monitoring</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To maintain optimal fill level with a FlexPower Node and power-optimized ultrasonic sensor.</p> | <p>Valve Temperature Monitoring in a Steam Power Plant</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To monitor the valve temperature to identify possible energy losses and schedule repairs.</p> | <p>Failing Conduit Replacement</p>  <p>ONLINE LOOK FOR MORE INFO page 409</p> <p>Product: To replace failing wired systems with a Node and Gateway pair.</p> |
| <p>Robotics Retrofit</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To eliminate the need for slip rings using a FlexNode to capture data onboard a moving robot.</p> | <p>Temp and Humidity Control</p>  <p>ONLINE LOOK FOR MORE INFO page 396</p> <p>Product: To monitor and maintain important environmental conditions.</p> | <p>Retention Pond Monitoring</p>  <p>ONLINE LOOK FOR MORE INFO page 406</p> <p>Product: To remotely monitor retention ponds and eliminate manual collection measurements.</p> | <p>Center Pivot Irrigation</p>  <p>ONLINE LOOK FOR MORE INFO page 406</p> <p>Product: To monitor every motor along the center pivot arm and ensure all sections are rotating properly.</p> |

Applications

Indicator & Actuator Applications





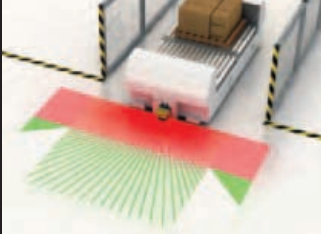
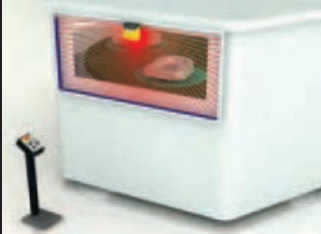







| | | | |
|--|---|---|---|
| <p>Machine Status Indication</p>  <p>ONLINE LOOK FOR MORE INFO page 442</p> <p>Product: To clearly indicate where in the process the machine is, and when the machine needs attention.</p> | <p>Pump Panel Status Indication</p>  <p>ONLINE LOOK FOR MORE INFO page 442</p> <p>Product: To use multiple lights and audible alert to communicate pump status, even from a distance.</p> | <p>Checkout Lane Status Indication</p>  <p>ONLINE LOOK FOR MORE INFO page 441</p> <p>Product: To identify which grocery store lanes are open, which are closed and which are about to close.</p> | <p>Conveyor Jam detection</p>  <p>ONLINE LOOK FOR MORE INFO page 454</p> <p>Product: To use an indicator light and audible alert to signal a conveyor jam.</p> |
| <p>Part Loaded Indicator</p>  <p>ONLINE LOOK FOR MORE INFO page 441</p> <p>Product: To signal to an operator that a part is placed correctly, without leaving the station.</p> | <p>Process Inspection Indicator</p>  <p>ONLINE LOOK FOR MORE INFO page 441</p> <p>Product: To allow an inspector to monitor the pass/fail reading of several sensors at the same time.</p> | <p>Remote Level Indication</p>  <p>ONLINE LOOK FOR MORE INFO page 441</p> <p>Product: To alert the operator that a sensor has detected that the content level is running low.</p> | <p>Traffic Control</p>  <p>ONLINE LOOK FOR MORE INFO page 459</p> <p>Product: To indicate the status of a loading dock.</p> |
| <p>Call for Parts</p>  <p>ONLINE LOOK FOR MORE INFO page 459</p> <p>Product: To alert personal to refill bins before parts are depleted.</p> | <p>Incorrect Pick Signal</p>  <p>ONLINE LOOK FOR MORE INFO page 465</p> <p>Product: To indicate whether the operator is picking from the correct bin or wrong bin.</p> | <p>Wide Bin Confirmation</p>  <p>ONLINE LOOK FOR MORE INFO page 465</p> <p>Product: To provide compact part-pick confirmation for a shelf with a wide opening.</p> | <p>Call for Service</p>  <p>ONLINE LOOK FOR MORE INFO page 465</p> <p>Product: To signal and indicate that service is required using a hanging indicator and push button.</p> |
| <p>Enclosure Lighting</p>  <p>ONLINE LOOK FOR MORE INFO page 422</p> <p>Product: To provide bright, even illumination where space is limited.</p> | <p>Order Fulfillment</p>  <p>ONLINE LOOK FOR MORE INFO page 470</p> <p>Product: To guide a packer to the next item in an order and to confirm the pick.</p> | <p>Long Bin Pick-to-Light</p>  <p>ONLINE LOOK FOR MORE INFO page 472</p> <p>Product: To provide pick-to-light sensing for bins that extend beyond the rack.</p> | <p>Part Pick Verification</p>  <p>ONLINE LOOK FOR MORE INFO page 475</p> <p>Product: To indicate which part to pick for an assembly and to verify the pick is done.</p> |

Machine Safety Applications

| | | | |
|--|---|--|---|
| <p>Personnel Protection with Fixed Blanking</p>  <p>ONLINE LOOK FOR MORE INFO page 489</p> <p>Product: To protect hands and fingers from the hazardous parts of a carton erector.</p> | <p>Guarding in ESD-Sensitive Environment</p>  <p>ONLINE LOOK FOR MORE INFO page 489</p> <p>Product: To guard a wafer cell in an environment sensitive to electrostatic discharge.</p> | <p>Safe Material Access</p>  <p>ONLINE LOOK FOR MORE INFO page 489</p> <p>Product: To prevent injury while allowing materials into a process.</p> | <p>Perimeter Guarding</p>  <p>ONLINE LOOK FOR MORE INFO page 489</p> <p>Product: To combine a light screen and mirrors to guard access to a work cell.</p> |
| <p>Vertical and Horizontal Guarding</p>  <p>ONLINE LOOK FOR MORE INFO page 489</p> <p>Product: Guarding of two sides of machine because of separate operator load and unload stations.</p> | <p>Weld Cell Protection</p>  <p>ONLINE LOOK FOR MORE INFO page 489</p> <p>Product: To protect operators in semi-automated operations involving the manual feeding and/or removal of parts.</p> | <p>L-Configured Guarding</p>  <p>ONLINE LOOK FOR MORE INFO page 489</p> <p>Product: To link multiple light screens to safeguard a robotic cell.</p> | <p>Small Machine Guarding</p>  <p>ONLINE LOOK FOR MORE INFO page 501</p> <p>Product: To provide low-profile, point-of-operation guarding for small machinery.</p> |
| <p>U-Configured Guarding</p>  <p>ONLINE LOOK FOR MORE INFO page 501</p> <p>Product: To guard multiple sides of a machine without overlapping light curtains.</p> | <p>L-Configured Guarding without Overlapping</p>  <p>ONLINE LOOK FOR MORE INFO page 501</p> <p>Product: To provide continual sensing with no gaps.</p> | <p>Lower-Risk Machine Guarding</p>  <p>ONLINE LOOK FOR MORE INFO page 511</p> <p>Product: To provide guarding for a lower-risk application.</p> | <p>Lower-Risk Machine Guarding</p>  <p>ONLINE LOOK FOR MORE INFO page 511</p> <p>Product: To protect personnel from a machine that can cause slight injuries.</p> |
| <p>Perimeter Guarding</p>  <p>ONLINE LOOK FOR MORE INFO page 516</p> <p>Product: To shut off the hazardous motion of a tube bender when someone enters the cell.</p> | <p>Single-Point Access Guarding</p>  <p>ONLINE LOOK FOR MORE INFO page 516</p> <p>Product: To prevent personnel from accessing a hazardous area.</p> | <p>Entry/Exit Guarding with Muting</p>  <p>ONLINE LOOK FOR MORE INFO page 525</p> <p>Product: To prevent personnel from accessing a hazardous area.</p> | <p>Explosive Environment Point-of-Operation Guarding</p>  <p>ONLINE LOOK FOR MORE INFO page 516</p> <p>Product: To protect hands from a hazard while allowing material to pass through, by spacing individual Points as needed.</p> |

Applications

Machine Safety Applications

| | | | |
|--|--|--|--|
| <p>Moving Door Monitoring</p>  <p>ONLINE LOOK FOR MORE INFO Product: To prevent passengers from being struck by closing doors. page 516</p> | <p>Explosive Environment Guarding with Muting</p>  <p>ONLINE LOOK FOR MORE INFO Product: To provide entry/exit guarding and muting, using Points in an explosive environment. page 516</p> | <p>Monitoring Access to an Assembly Line</p>  <p>ONLINE LOOK FOR MORE INFO Product: To detect the presence/absence of objects or personnel as vehicles move along an assembly line. page 525</p> | <p>Collision Avoidance</p>  <p>ONLINE LOOK FOR MORE INFO Product: To provide collision avoidance for automated guided vehicle (AGV). page 525</p> |
| <p>Two-Zone Monitoring</p>  <p>ONLINE LOOK FOR MORE INFO Product: To detect the approach of personnel to each of two operator work stations of a robotic cell. page 525</p> | <p>AGV Turn Clearance</p>  <p>ONLINE LOOK FOR MORE INFO Product: To detect the presence of personnel or objects in the path of the automated guided vehicle (AGV). page 525</p> | <p>Point-of-Operation Guarding</p>  <p>ONLINE LOOK FOR MORE INFO Product: To detect a hand, arm or entire body using reference container monitoring. page 525</p> | <p>Whole Body Detection</p>  <p>ONLINE LOOK FOR MORE INFO Product: To safeguard a pallet load/unload station using two scanners with field pair switch over. page 525</p> |
| <p>Monitoring of Multiple Safety Devices</p>  <p>ONLINE LOOK FOR MORE INFO Product: To provide monitoring of safety light grids, interlock switches, E-Stop button and a run bar with one safety controller. page 533</p> | <p>Monitoring of Multiple Safety Devices</p>  <p>ONLINE LOOK FOR MORE INFO Product: To monitor a safety light screen, self-checking touch buttons and an E-Stop button with one safety controller. page 533</p> | <p>Emergency Stop Monitoring</p>  <p>ONLINE LOOK FOR MORE INFO Product: To stop a machine's operation in an emergency, using a module with three output switching channels. page 537</p> | <p>Emergency Stop Monitoring</p>  <p>ONLINE LOOK FOR MORE INFO Product: To stop a machine's operation in an emergency, using a module with four output switching channels. page 537</p> |
| <p>Gate Monitoring</p>  <p>ONLINE LOOK FOR MORE INFO Product: To monitor a door-guarding switch, whether the switch is mechanical or magnetic. page 529</p> | <p>Mat Monitoring</p>  <p>ONLINE LOOK FOR MORE INFO Product: To monitor a safety mat that provides area guarding by responding to pressure. page 547</p> | <p>Safe Material Access</p>  <p>ONLINE LOOK FOR MORE INFO Product: To prevent injury while allowing material into a process. page 529</p> | <p>Two-Hand Control Monitoring</p>  <p>ONLINE LOOK FOR MORE INFO Product: To monitor any actuation device pair, using a module with two redundant output contacts. page 560</p> |

Machine Safety Applications

| | | | |
|--|---|---|--|
| <h3>Two-Hand Control Monitoring</h3>  <p>ONLINE LOOK FOR MORE INFO page 560</p> <p>Product: To monitor any actuation device pair, using a module with four redundant output contacts.</p> | <h3>Two-Hand Control Monitoring with Muting</h3>  <p>ONLINE LOOK FOR MORE INFO page 560</p> <p>Product: To use a two-hand control to start a cycle and mute during the cycle's safe portion.</p> | <h3>Swinging Gate Monitoring</h3>  <p>ONLINE LOOK FOR MORE INFO page 578</p> <p>Product: To safeguard a hazard with a guard, gate or door that is mounted on a hinge.</p> | <h3>Gate Monitoring</h3>  <p>ONLINE LOOK FOR MORE INFO page 578</p> <p>Product: To prevent trapping or crushing by protecting an interlocked breakaway guard with an integral hinge.</p> |
| <h3>Switch Door Locking</h3>  <p>ONLINE LOOK FOR MORE INFO page 593</p> <p>Product: To lock out an area until a machine's hazardous motion stops.</p> | <h3>Sliding Door Monitoring</h3>  <p>ONLINE LOOK FOR MORE INFO page 593</p> <p>Product: To instantly stop a hazardous machine when sliding door is opened.</p> | <h3>Emergency Stopping</h3>  <p>ONLINE LOOK FOR MORE INFO page 610</p> <p>Product: To instantly stop the hazardous motion of a conveyor from multiple points, using a heavy-duty switch.</p> | <h3>Emergency Stopping</h3>  <p>ONLINE LOOK FOR MORE INFO page 617</p> <p>Product: To instantly stop the hazardous motion of a conveyor from multiple points, using a center-mounted switch.</p> |
| <h3>Emergency Stopping</h3>  <p>ONLINE LOOK FOR MORE INFO page 617</p> <p>Product: To instantly stop the hazardous motion of a conveyor from multiple points, using an end-mounted switch.</p> | <h3>Emergency Stopping</h3>  <p>ONLINE LOOK FOR MORE INFO page 617</p> <p>Product: To instantly stop the hazardous motion of a machine from a safe distance.</p> | <h3>Emergency Stopping</h3>  <p>ONLINE LOOK FOR MORE INFO page 606</p> <p>Product: To instantly stop the hazardous motion of a machine from a safe distance.</p> | |



Photoelectric

Page 60

- Miniature 61
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- Midsize 153
- Fullsize 193



Fiber Optic Sensors

Page 226

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- Glass Fibers 269



Special Purpose

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Measurement & Inspection

Page 300

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- Measuring Array 348
- Radar 362

Basics of Photoelectric Sensing

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

How a sensor pair works

A photoelectric sensor is an optical control used in a variety of automated processes. It works by detecting a visible or invisible beam of light, and responding to a change in the received light intensity.

Effective beam: "Working" part of a photoelectric beam.

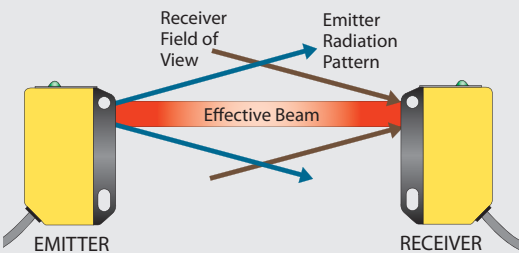
Radiation pattern: Total area of sensing energy emission.

Field of view: Area of response.

Components of a Sensor

Emitter contains the light source, usually an LED, and an oscillator which modulates the LED at a high rate of speed. The emitter sends a modulated light beam to the receiver.

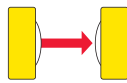
Receiver decodes the light beam and switches an output device that interfaces with the load.



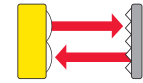
Sensing Modes

One way to tell sensors apart is by their **sensing mode**, the method in which a sensor sends and receives light. Photoelectric sensors are divided into three basic sensing modes: opposed, retroreflective and proximity. (more on page 54)

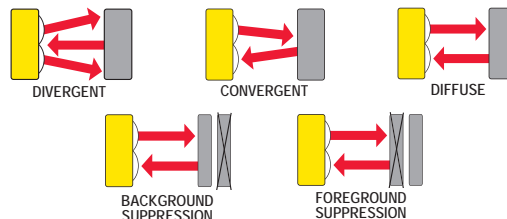
Opposed mode: The sensor's emitter and receiver are housed in two separate units. The emitter is placed opposite the receiver. An object is detected when it breaks the effective beam.



Retroreflective mode: The sensor contains both the emitter and receiver elements. The effective beam is established between the emitter, the retroreflector and the receiver. As with an opposed-mode sensor, an object is sensed when it interrupts or breaks the effective beam.



Proximity mode: These sensors contain both emitter and receiver elements. A proximity-mode sensor detects an object when emitted light is reflected off the object, back to the sensor.



Types of Sensors

1. Self-contained sensors: One-piece photoelectric sensors that contain both the optics and the electronics. These sensors perform their own modulation, demodulation, amplification and output switching.



2. Remote systems: Sensing systems in which the amplification and the optical sensing are divided. The opto-elements contain only the optical components, allowing the sensing heads to be extremely small. The amplifier module contains the power input, amplification and output switching. This allows the sensitive electronics to be located away from the sensing event.



3. Fiber optic systems: Sensing systems in which fiber optic cables are used with either remote or self-contained sensors. Fiber optic devices have no electrical circuitry and no moving parts, and can be used to safely pipe light into and out of hostile environments.



Range

The range is the specified operating distance of a sensor or sensing system.

- **Opposed mode:** The distance from the emitter to the receiver.
- **Retroreflective mode:** The distance from the sensor to the retroreflector.
- **Proximity mode:** The distance from the sensor to the object being sensed.

Contrast

Contrast is the ratio of the amount of light falling on a receiver in the "light" state, compared to the "dark" state. Increasing contrast in any sensing situation will increase the reliability of the sensing system. (more on page 57)

| |
|--------|
| GOOD |
| BETTER |
| BEST |

Excess Gain

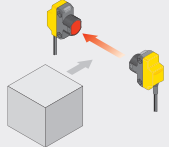
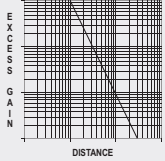
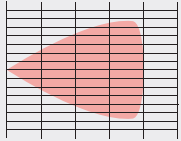
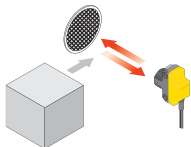
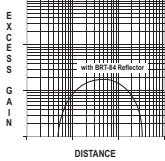
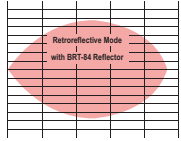
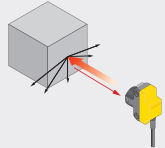
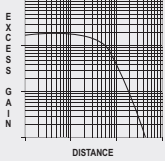
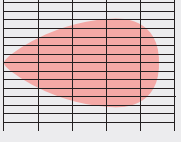
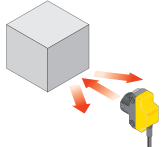
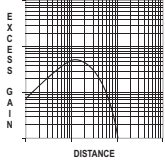
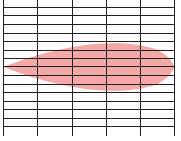
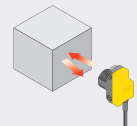
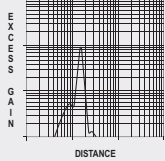
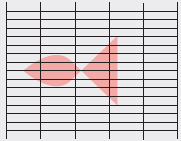
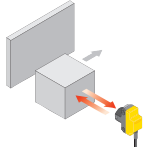
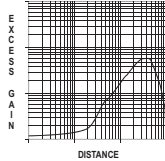

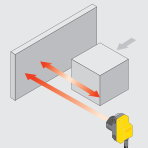
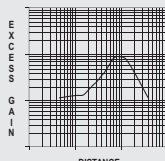

Excess gain is a measurement of the amount of light falling on a receiver, over and above the amount of light required to operate the sensor. (more on page 55)

Beam Pattern

A beam pattern is plotted on a 2-dimensional graph to illustrate how the sensor responds to its emitter or sensing target. Use the beam pattern to estimate placement of the sensing system with respect to adjacent objects. (more on page 56)

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE

Learning about sensing modes

| Mode | Features | Excess Gain | Beam Pattern |
|--|---|---|---|
| <p>OPPOSED</p>  | <ul style="list-style-type: none"> • Most reliable mode for opaque targets • High excess gain results in long sensing range • Good performance in contaminated environments • High tolerance to misalignment |  |  |
| <p>RETROREFLECTIVE</p>  | <ul style="list-style-type: none"> • Convenient when space is limited • High excess gain results in long sensing range |  |  |
| <p>DIFFUSE</p>  | <ul style="list-style-type: none"> • Convenient when space is limited • Used in applications requiring reflectivity monitoring |  |  |
| <p>DIVERGENT</p>  | <ul style="list-style-type: none"> • Convenient when space is limited • Good performance in detecting clear materials at close range • Used in applications requiring reflectivity monitoring • Reliable in detection of shiny or vibrating surfaces |  |  |
| <p>CONVERGENT</p>  | <ul style="list-style-type: none"> • Used for accurate positioning • Excellent in small color mark or small object detection applications • Used for accurate counting of radiused objects • High excess gain allows detection of objects having low reflectivity |  |  |
| <p>BACKGROUND SUPPRESSION</p>  | <ul style="list-style-type: none"> • Definite range limit used to ignore backgrounds • High excess gain allows detection of objects having low reflectivity • Good at detecting targets of varying reflectivity |  |  |
| <p>FOREGROUND SUPPRESSION</p>  | <ul style="list-style-type: none"> • Definite range limit used to sense backgrounds • Reliable detection when the color or shape of the objects vary • Detect objects that return no light to sensor |  |  |

What is Excess Gain?

Measuring Excess Gain

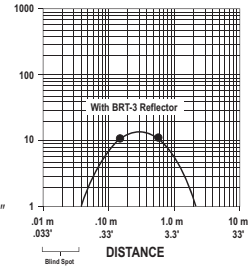
Excess gain is a measurement of the sensing light energy over and above the minimum amount required to operate the sensor's amplifier. This extra sensing energy is used to overcome signal attenuation caused by contaminants in the sensing environment.

Choose a sensor that will give you the optimal excess gain for your application. In most sensing situations, high excess gain relates directly to sensing reliability.

$$\text{Excess Gain} = \frac{\text{Light energy falling on receiver element}}{\text{Sensor's amplifier threshold}}$$

Excess Gain Curve

An excess gain curve is plotted on an X/Y axis. It shows the excess gain available for a particular sensor or sensing system as a function of distance. Excess gain curves are plotted for conditions of perfectly clean air and maximum receiver gain.



Threshold: The level of sensing energy required to cause the sensor's output to switch "ON" or "OFF." Excess gain of one (1x) is the measured voltage at the amplifier threshold level. Excess gain charts are useful when comparing sensors for an application, as direct measurement of amplifier voltage is often impractical.

Reading an Excess Gain Curve

| | | | |
|------------------------------------|--|--|--|
| <p>OPPOSED MODE</p> | <p>The excess gain of an opposed-mode sensor pair is directly related to sensing distance. If the sensing distance is doubled, the excess gain is reduced by a factor of one-fourth, so the curve is always a straight line, when plotted on a log-log scale.</p> | | <p>Reading an Opposed Mode Curve If an environment is moderately dirty (with 10x minimum excess gain required), sensors can be mounted up to approximately 1.2 meters apart.</p> |
| <p>RETROREFLECTIVE MODE</p> | <p>The shape of a retroreflective excess gain curve is significantly influenced by the size of the retroreflector. The larger the retroreflector, the larger the shape and size of the curve.</p> | | <p>Reading a Retro Mode Curve If an environment is moderately dirty (with 10x minimum excess gain required), a BRT-3 retroreflector can be mounted 0.15 to 0.5 meters away from the sensor for reliable sensing.</p> |
| <p>PROXIMITY MODE</p> | <p>Excess gain for proximity-mode sensors is usually lower than that of other photoelectric sensing modes, because proximity modes depend on light reflected off the surface of a target. The curves are plotted using a Kodak 90% reflectance white test card as the reference material. Other materials are ranked compared to the test card in the table below.</p> | | <p>Reading a Proximity Mode Curve Use the online Relative Reflectivity Chart to estimate the excess gain required. Multiply the excess gain required to sense the material by the excess gain level required for the environment.</p> |

Excess Gain Guidelines

Excess gain of one (1x) describes the measured sensing energy at the amplifier threshold level. These guidelines show how much excess gain is required to overcome environmental conditions.

| EG | General Conditions |
|------|---|
| 1.5x | Clean air: No dirt buildup on lenses or reflectors. |
| 5x | Slightly dirty: Slight buildup of dust, dirt, oil, moisture, etc. on lenses or reflectors. Lenses are cleaned on a regular schedule. |
| 10x | Moderately dirty: Obvious contamination of lenses or reflectors (but not obscured). Lenses cleaned occasionally or when necessary. |
| 50x | Very dirty: Heavy contamination of lenses. Heavy fog, mist, dust, smoke, or oil film. Minimal cleaning of lenses. |

Relative Reflectivity

When using a proximity sensor, refer to the Relative Reflectivity chart to determine how reflectivity of different target surfaces will affect the excess gain requirements. Here are some sample targets.

| Material | General Reflectivity | Minimum Excess Gain Required |
|------------------------------|----------------------|------------------------------|
| Stainless steel, microfinish | 400% | 0.2 |
| Natural aluminum, unfinished | 140% | 0.6 |
| Kraft paper, cardboard | 70% | 1.3 |
| Clear plastic bottle | 40% | 2.3 |
| Tissue paper (1 ply) | 35% | 2.6 |
| Rough wood pallet (clean) | 20% | 4.5 |

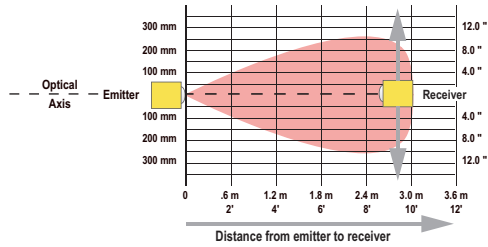
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE

How to read a beam pattern

Measuring a beam pattern

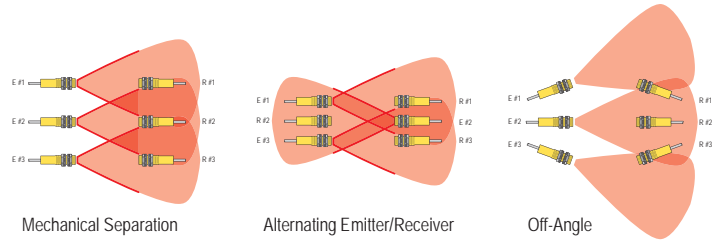
A beam pattern is plotted on a 2-dimensional graph to illustrate how the photoelectric receiver is designed to respond to its emitter. Maximum light energy occurs along the sensor's optical axis. The light energy decreases towards the beam pattern boundaries. The horizontal axis usually shows the range of the sensor.



Beam Pattern (Opposed Mode shown)

Uses for Beam Patterns

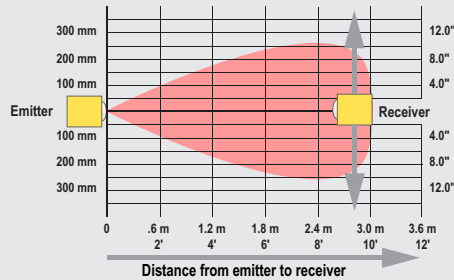
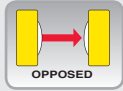
- Predict general radiation pattern given a specific target.
- Predict how multiple sensors can be mounted on a line without generating crosstalk.
- Provide accurate depiction of a light pattern a few feet from the sensor.



Using Beam Patterns to Avoid Optical Crosstalk

Reading a Beam Pattern

OPPOSED MODE

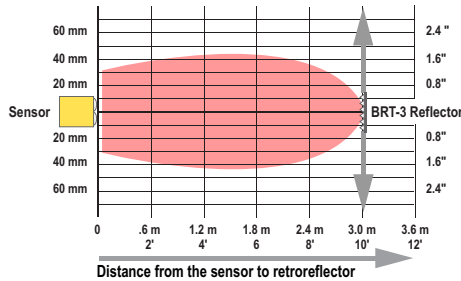
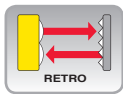


Uses: To predict how closely adjacent, parallel opposed-mode sensor pairs can be placed to each other without generating optical crosstalk.

Horizontal: Scale shows separation distance between the emitter and receiver.

Vertical: The balloon-shaped plot defines the boundary of the receiver's response to the emitter. The receiver response is measured on either side of the optical axis.

RETROREFLECTIVE MODE



Uses: To show the area within which the sensor will respond to the retroreflector. The size of the beam pattern is proportional to the size and the reflective efficiency of the retroreflector.

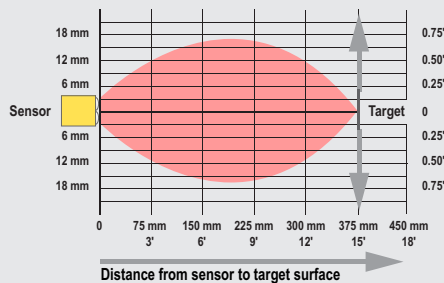
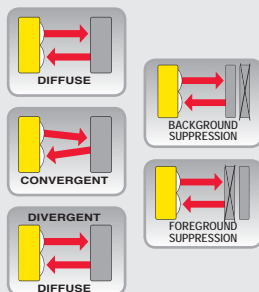
Horizontal: The scale shows the related distance between the retroreflective sensor and the retroreflector.

Vertical: The scale depicts the farthest distance on either side of the sensor's optical axis where a retroreflector can establish a beam with the sensor.

Blind Spot: If a beam pattern shows an area of no response at close range, it is indicating that the sensor has a "blind spot" area, where a retroreflector should not be located.

Retroreflective beam patterns are plotted using a model BRT-3 (75 mm) retroreflector (except where otherwise specified).

PROXIMITY MODE



Uses: To show the boundary within which the edge of a light-colored diffuse surface will be detected as it moves past the sensor. The sensor's optical axis is represented as "0" on the vertical scale.

Horizontal: The scale shows the distance from the sensor to the target's surface.

Vertical: The scale shows the width of the sensor response measured on either side of the optical axis.

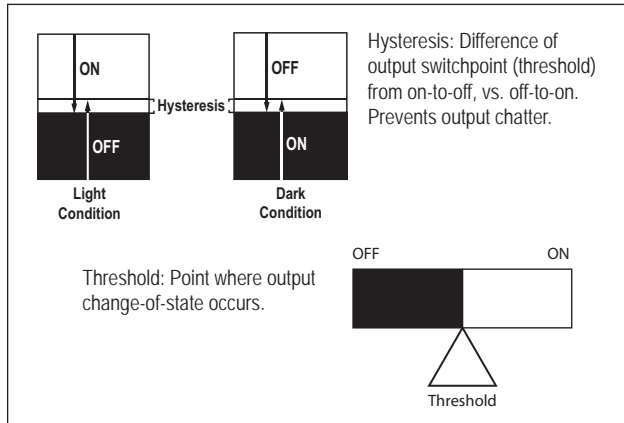
Proximity-mode beam patterns are plotted using an 8 x 10 90% reflective white Kodak test card.

Learning about contrast

Measuring contrast

Contrast is also referred to as the light-to-dark ratio. While most sensors do not allow direct measurement of light signals, contrast can be estimated. The higher the contrast ratio, the better and more accurately your sensor will detect its target.

$$\text{Contrast} = \frac{\text{Received light in the light condition}}{\text{Received light in the dark condition}}$$

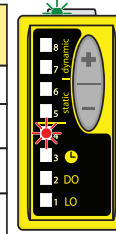


Contrast Guidelines

Follow these contrast guidelines to improve sensing reliability:

1. Choose a sensor or lensing option that will optimize contrast in any photoelectric sensing situation.
2. Adjust alignment and gain for maximum contrast during sensor installation.
3. If light and dark conditions are separated by 1/3 or more of the adjustment range of a sensor's sensitivity potentiometer, contrast is sufficient. Most Banner sensors intended for low-contrast applications are microprocessor-driven and will provide feedback of relative contrast.

| Bargraph LED Number | Relative Contrast/ Recommendation |
|---------------------|---|
| 6 to 8 | Excellent: Very stable operation |
| 4 to 5 | Good: Minor sensing variables will not affect sensing reliability. |
| 2 to 3 | Low: Minor sensing variables will affect sensing reliability. |
| 1 | Marginal: Consider an alternate sensing scheme. |



Bargraph sensors offer relative feedback in low-contrast applications.

- Photoelectrics Sensors
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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE

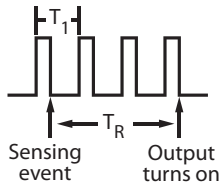
Adjusting Sensitivity

Field-adjust the sensitivity of a sensor in order to maximize the contrast in an application.

| Technique | Process | Concept |
|---|--|--|
| Potentiometer Adjustment Manually adjust sensitivity with the potentiometer. | <ol style="list-style-type: none"> 1. Adjust potentiometer to minimum. 2. Present the light and dark sensing conditions individually, turning the potentiometer slowly clockwise, until the alignment indicator just comes on. Note the settings. 3. Adjust the potentiometer to approximately midway between the two settings. | Operating sensitivity setting (midway between light and dark thresholds) |
| SET Mode Adjustment Sensor's microprocessor automates sensitivity adjustment. | Present the dark sensing condition, and press the SET button. The sensor automatically sets the operating sensitivity below the switchpoint threshold for the dark condition. | Operating sensitivity setting (automatically set by sensor) |
| TEACH Mode Adjustment Sensor's microprocessor optimizes sensitivity adjustment between two user-set reference points. | <ol style="list-style-type: none"> 1. Present the light sensing condition, and single-click the TEACH button. 2. Present the dark sensing condition, and (again) single-click the TEACH button. 3. The sensor automatically sets the operating sensitivity. | Operating sensitivity setting (automatically set by sensor) |

What is response time?

Response time is the maximum time required for the sensor to respond to a change in the input signal. It is the time from when the sensor sees its target to when it gives an output signal to the load. Response time is the time between the leading (or trailing) edge of the sensing event and the output's change of state.



T1 = Time of one light pulse
TR = Response time

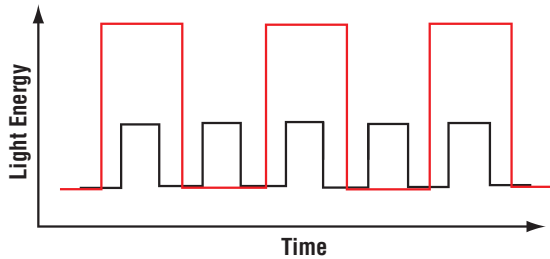
The response time of sensors with discrete output depends largely on the sensor's output switching device. In general, sensors with solid-state outputs provide faster switching.

Response time can help determine how long a fast-moving object must stay in the sensor's field-of-view in order to be detected. It is especially important when your application requires detection of:

- High-speed events
- Small objects moving at high speeds
- Narrow gaps between objects
- Brief intervals between sensing events

Response time vs. sensing range

The speed of response of a modulated photoelectric sensor is limited by its frequency of modulation. There is a direct trade-off between sensor response time and sensing range (excess gain). High-speed sensors are modulated faster, thus yielding shorter range. If an LED is pulsed less often, it can be pulsed with a higher current, thereby producing more light energy.



Fast Response Yields Lower Excess Gain

Repeatability

The repeatability specification is used in applications where customers need to know the precise position of a moving part.

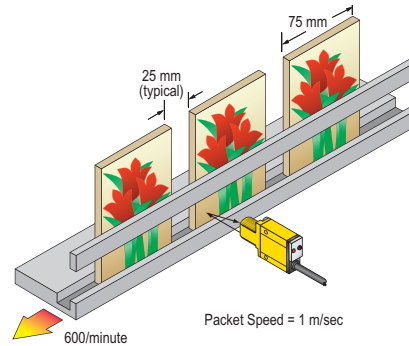
The sensor's output is allowed to switch only after a few modulated light pulses are counted. The response time before a modulated sensor turns on is equal to the time required for the sensor to count that number of pulses, and the sensor output changes state as soon as the sensor counts enough light pulses of the correct frequency.

Since the sensing event can occur at any time during a modulation cycle, the actual time between the sensing event and the sensor's output change can vary by up to one modulation cycle. This variation is the sensor's repeatability.

Calculating Response Time

You can determine a sensor's required response time when you know the size, speed and spacing of the objects to be detected.

$$\text{Response Time} = \frac{\text{Object width (or gap between objects)}}{\text{Object velocity}}$$



Calculate Response Time for Seed Packets with a Convergent Sensor

Application Example

To calculate the required sensor response time, the production line speed is first converted to the speed of, in this case, a seed packet.

When calculating the speed of the seed packet, take into account the space between the packets.

1. Determine how many packets are being processed per second:
600 packets/minute = 10 packets per second
2. Determine the distance of linear travel: 75 mm (packet width) + 25 mm (space between packets) = 100 mm
3. Calculate speed of packet = 100 mm/packet x 10 packets/sec

$$\text{Packet Speed} = 1 \text{ m/sec}$$

Knowing the speed of the object (1 m/sec), it is possible to calculate the time during which the sensor "sees" a packet of seeds.

Light condition: Sensing condition characterized by higher level of received sensing energy.

$$\frac{\text{Object width (75 mm)}}{\text{Object velocity (1 m/sec)}} = .075 \text{ sec}$$

$$\text{Time of each packet passing the sensor} = 75 \text{ ms}$$

Dark condition: Sensing condition characterized by lower level of light energy (or none).

$$\frac{\text{Space width (25 mm)}}{\text{Object velocity (1 m/sec)}} = .025 \text{ sec}$$

$$\text{Time of each space passing the sensor} = 25 \text{ ms}$$

In this application, the time between the packets is much less than the time during which the sensor "sees" a packet. As a result, the dark (or "OFF") time between packets is the more important consideration.

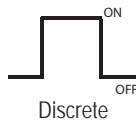
Learning about outputs

The output circuit is the section of the sensor that interfaces to the external load. Output also refers to the useful energy delivered by the sensor.

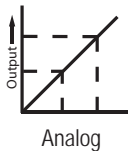
Knowing the voltage and current requirements of the load is crucial to selecting the best sensor. Sensors with analog outputs always interface to circuits or devices which operate at low levels of dc voltage and current. Sensors with discrete outputs interface to either ac or dc loads.

Discrete/Analog Output

The output of a sensor is either discrete or analog. A discrete, or switched, output has only two states: "ON" and "OFF." ON and OFF commonly refer to the status of the load that the sensor output is controlling.



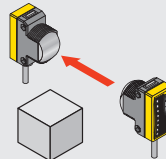
An analog sensor is one that varies over a range of voltage (or current) and is proportional to some sensing parameter. Analog sensors provide a metered or gradual response.



Light Operate/Dark Operate

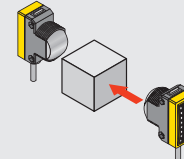
The sensor should be active when the application requires it. With discrete photoelectric sensors, the input and the output are characterized by one of two sensing terms: Light Operate and Dark Operate.

Light Operate



The sensor "sees" light.

Dark Operate



The sensor "sees" dark.

Light Operate (LO):

A condition where a photoelectric sensor output energizes its load when the sensor "sees" a sufficient amount of its own modulated light.

Dark Operate (DO):

The complement of LO, where the sensor output energizes its load when it no longer "sees" the modulated light.

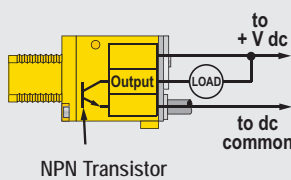
Contact Configuration Types

Solid-State Relays

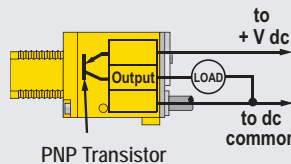
Switching is accomplished by elements such as a transistor or SCR, without moving parts, heated filament or vacuum gaps.

Complementary outputs: The dual-output configuration of a sensing device, where one output is Normally Open and the other is Normally Closed. In this case, both outputs have the same switchpoint, but only one output conducts at a time.

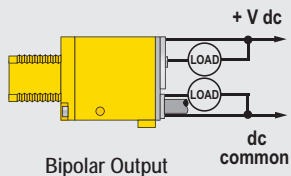
NPN output (sinking): Output switch configured with its collector open and its emitter connected to ground (dc common). The load is connected between the output (collector) and the positive of the dc supply.



PNP output (sourcing): Output switch configured with its collector open and its emitter connected to the positive of the sensor supply voltage. The load is connected between the output (collector) and ground (dc common).

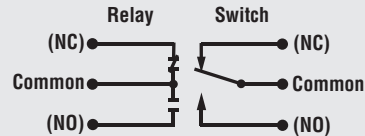


Bipolar outputs: The dual-output configuration of a dc sensing device, where one output switch is a sinking device (NPN) and the other output switch is a sourcing device (PNP). Both outputs have the same switchpoint.



E/M Relays

Used when a sensor provides direct control of a load that draws more current than can be handled by a solid-state relay. Double-throw contacts are used in interfaces that require complementary switching. E/M relays are useful when a string of sensor outputs are wired together in series for AND logic. Some E/M relay configurations include SPST, SPDT, DPST and DPDT.



Normally Open (NO): Designation for contacts of a switch or relay that are not connected when at rest. When activated, the contacts close (become connected).

Normally Closed (NC): Designation for contacts of a switch or relay that are connected when at rest. When activated, the contacts open (separate).

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- FULLSIZE

Miniature page 61

- WORLD-BEAM Q12
- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3



Compact page 89

- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25



Midsize page 153

- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42



Fullsize page 193

- Q45
- OMNI-BEAM
- Q60



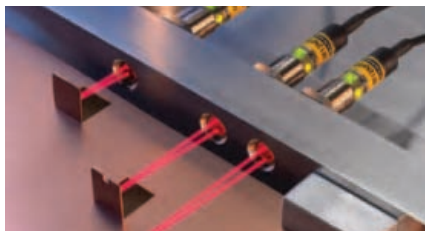
MINIATURE SENSORS

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WORLD-BEAM® Q12 page 62

- Universal housing for consistent mounting regardless of sensing mode
- Fits in extremely confined areas
- Opposed, retroreflective and fixed-field modes
- Overmolded design for enhanced durability and shielding
- Models with PFA jacket for wet or corrosive environments



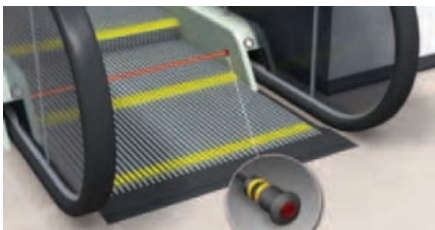
M12 page 66

- 12 mm threaded metal barrel
- Ideal replacement for range limited proximity sensors
- Opposed, retroreflective, diffuse and fixed-field modes
- Excellent background suppression for fixed-field models



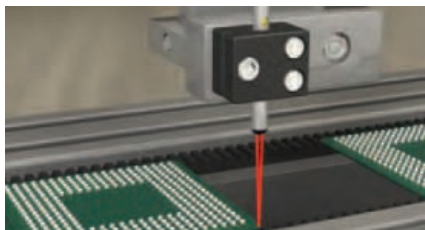
T8 page 70

- 8 mm thread ultra-miniature sensor
- Convenient T-shaped package
- 50 or 100 mm diffuse range
- Powerful 2 m opposed range



S12/SB12 page 73

- 12 mm plastic barrel
- Thread- or snap-barrel housing
- 1.5 or 15 m opposed-mode sensing range
- Can be easily embedded in machinery



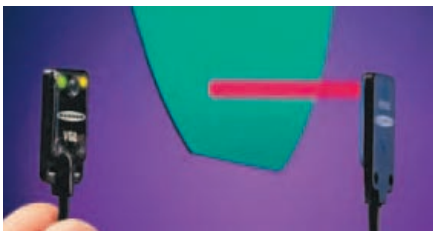
VSM page 76

- Tough stainless steel housing with sapphire lens in convergent and opposed sensing modes
- Sensor with housings as small as 4 mm diameter
- Well focused beam to allow recessing into fixtures



VS1 page 80

- Available with 10 or 15 mm focal length
- Available in Dark- or Light-Operate models
- Provides high-quality, low-cost replacement for competitive miniature sensors



VS2 page 83

- Ultra-thin opposed and convergent modes
- Flat front mounting
- Range up to 3 m



VS3 page 86

- Advanced coaxial lens design
- Range up to 250 mm
- Accurate detection of shiny objects
- Sensing up to the face of the sensor

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE

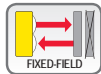
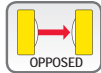
Side-Mount Sensors

WORLD-BEAM® Q12

- Features a housing as small as 22 x 8 x 12 mm for powerful sensing performance in extremely confined areas
- Rated IP67 for use in a wide range of locations and applications
- Mounts directly on or inside manufacturing equipment using robust metal-lined mounting holes
- Provides excellent crosstalk avoidance circuitry for multi-sensor applications
- Uses unique overmolded design for enhanced durability and shielding
- Provides bright, visible red (640 nm) sensing beam for simple alignment
- Features models with liquid-tight PFA jackets for use in wet and corrosive environments



ACCESSORIES
page 64



Q12 Sensing Modes



page 63

Q12 Opposed

- 2 m range
- 1.3 millisecond response time
- Embeddable in confined spaces



page 63

Q12 Retroreflective

- Range up to 1.5 m
- 700 microsecond response time
- Ideal for difficult to access areas and detection of shiny objects (polarized retroreflective models)



page 63

Q12 Fixed-Field

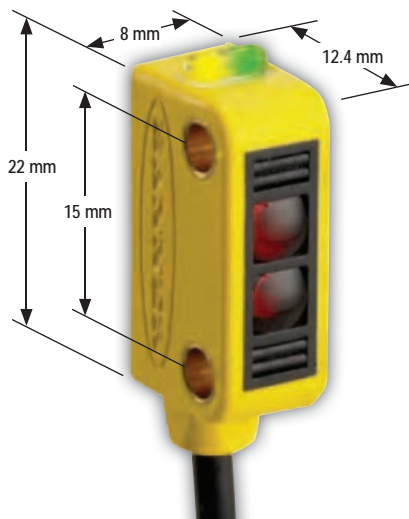
- Range of 15, 30 or 50 mm, depending on model
- Excellent background cutoff
- Small sensitivity to target color



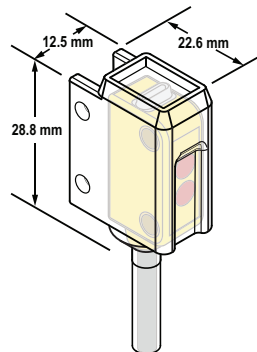
page 63

Q12 PFA-Jacketed

- Liquid tight to withstand wet and corrosive environments
- Chemical resistant for use in cleaning, printing, etching and other chemical processes
- Opposed and fixed-field models



Opposed, Retroreflective and Fixed-field Models
Suffix E, R, LV and FF



Chemical-resistant Models
Suffix CR



WORLD-BEAM® Q12, 10-30V dc

→ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output | Models LO | Models DO | Excess Gain | Beam Pattern |
|--------------------|--------------|-----------------------|-----------------|------------------|---------------|------------------|-----------------|
| <p>OPPOSED</p> | 2 m | 2 m | - | Q126E Emitter† | | EGC-1 (p. 64) | BP-1 (p. 65) |
| | | 4-Pin Pico Pigtail QD | - | Q126EQ Emitter† | | | |
| | | 3-Pin Pico Pigtail QD | - | Q126EQ3 Emitter† | | | |
| | | 2 m | Bipolar NPN/PNP | Q12AB6R† | Q12RB6R† | | |
| | | 4-Pin Pico Pigtail QD | Bipolar NPN/PNP | Q12AB6RQ† | Q12RB6RQ† | | |
| | | 3-Pin Pico Pigtail QD | PNP | Q12AP6RQ3† | Q12RP6RQ3† | | |
| <p>RETRO</p> | 1.5 m†† | 2 m | Bipolar NPN/PNP | Q12AB6LV | Q12RB6LV | EGC-2 (p. 64) | BP-2 (p. 65) |
| | | 4-Pin Pico Pigtail QD | Bipolar NPN/PNP | Q12AB6LVQ | Q12RB6LVQ | | |
| | | 3-Pin Pico Pigtail QD | PNP | Q12AP6LVQ3 | Q12RP6LVQ3 | | |
| | | 3-Pin Pico Pigtail QD | NPN | Q12AN6LVQ3 | Q12RN6LVQ3 | | |
| <p>POLAR RETRO</p> | 1 m†† | 2 m | Bipolar NPN/PNP | Q12AB6LP | Q12RB6LP | EGC-3 (p. 64) | BP-3 (p. 65) |
| | | 4-Pin Pico Pigtail QD | Bipolar NPN/PNP | Q12AB6LPQ | Q12RB6LPQ | | |
| | | 3-Pin Pico Pigtail QD | PNP | Q12AP6LPQ3 | Q12RP6LPQ3 | | |
| | | 3-Pin Pico Pigtail QD | NPN | Q12AN6LPQ3 | Q12RN6LPQ3 | | |
| <p>FIXED-FIELD</p> | 15 mm Cutoff | 2 m | Bipolar NPN/PNP | Q12AB6FF15† | Q12RB6FF15† | EGC-4 (p. 65) | — |
| | | 4-Pin Pico Pigtail QD | Bipolar NPN/PNP | Q12AB6FF15Q† | Q12RB6FF15Q† | | |
| | | 3-Pin Pico Pigtail QD | PNP | Q12AP6FF15Q3† | Q12RP6FF15Q3† | | |
| | | 3-Pin Pico Pigtail QD | NPN | Q12AN6FF15Q3† | Q12RN6FF15Q3† | | |
| | 30 mm Cutoff | 2 m | Bipolar NPN/PNP | Q12AB6FF30† | Q12RB6FF30† | EGC-5 (p. 65) | — |
| | | 4-Pin Pico Pigtail QD | Bipolar NPN/PNP | Q12AB6FF30Q† | Q12RB6FF30Q† | | |
| | | 3-Pin Pico Pigtail QD | PNP | Q12AP6FF30Q3† | Q12RP6FF30Q3† | | |
| | | 3-Pin Pico Pigtail QD | NPN | Q12AN6FF30Q3† | Q12RN6FF30Q3† | | |
| | 50 mm Cutoff | 2 m | Bipolar NPN/PNP | Q12AB6FF50† | Q12RB6FF50† | EGC-6 (p. 65) | — |
| | | 4-Pin Pico Pigtail QD | Bipolar NPN/PNP | Q12AB6FF50Q† | Q12RB6FF50Q† | | |
| | | 3-Pin Pico Pigtail QD | PNP | Q12AP6FF50Q3† | Q12RP6FF50Q3† | | |
| | | 3-Pin Pico Pigtail QD | NPN | Q12AN6FF50Q3† | Q12RN6FF50Q3† | | |

Photoelectrics Sensors

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MINIATURE

- WORLD-BEAM Q12
- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3

COMPACT

- MIDSIZE
- FULLSIZE

Connection options:

Bipolar Models Only:
 For 9 m cable, add suffix W/30 to the 2 m model number (example, Q12AB W/30).
 QD models: A model with a QD requires a mating cordset (see page 64).
 • For 4-pin 150 mm Euro-style QD, add suffix Q5 (example, Q126EQ5).

† For sensors with a PFA chemical-resistant jacket (opposed and fixed-field), add suffix CR to the 2 m model number (example, Q12AB6R15CR).
 †† Retroreflective range is specified using a BRT-60X40C retroreflector.
 Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.
 PFA chemical-resistant models provide a range of 1.5 m in opposed mode and 12, 28 or 48 mm in fixed-field mode, depending on model.

WORLD-BEAM® Q12 Specifications

| | |
|-----------------------------|--|
| Sensing Beam | 640 nm visible red |
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) @ 20 mA max. current |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Bipolar: 1 NPN (current sinking) and 1 PNP (current sourcing); Light Operate (LO) or Dark Operate (DO), depending on model Single-output: 1 NPN or 1 PNP; light operate (LO) or dark operate (DO), depending on model |
| Output Rating | 50 mA total across both outputs with overload and short circuit protection OFF-state leakage current: NPN: 200 A PNP: 10 A ON-state saturation voltage: NPN: 1.25V @ 50 mA PNP: 1.45V @ 50 mA |
| Output Protection Circuitry | Protected against false pulse on power-up; short-circuit protected. |
| Output Response Time | Opposed: 1.3 milliseconds ON; 900 microseconds OFF All others: 700 microseconds ON/OFF |

More on next page

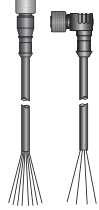
WORLD-BEAM® Q12 Specifications (cont'd)

| | | |
|----------------------|--|--|
| Delay at Power-up | 120 milliseconds; outputs do not conduct during this time. | |
| Repeatability | 175 microseconds | |
| Switching Frequency | Opposed models: 385 Hz | All other models: 715 Hz |
| Indicators | 2 LED indicators (Emitters-Green only): Green—power ON Yellow—light sensed | |
| Construction | Polarized Retroreflective: Thermoplastic elastomer housing with glass lens Standard: Thermoplastic elastomer housing with polycarbonate lens Chemical-resistant: Housing encased in PFA jacket; cable encased in 3/16" O.D. PFA tubing. | |
| Environmental Rating | Standard: IEC IP67 Chemical-resistant: IEC IP67 (NEMA 6) and PW12 1200 psi washdown per NEMA ICS 5, Annex F-2002 | |
| Connections | Bipolar: 2 m or 9 m attached PVC cable, or 150 mm pigtail with 4-pin Pico-style (Q) or 4-pin Euro-style (Q5) quick-disconnect fitting. QD cordsets are ordered separately. See pages 62. Single output: 150 mm pigtail with 3-pin Pico-style (Q3) quick-disconnect fitting. QD cordsets are ordered separately. See page 64. Chemical-resistant: 2 m attached cable encased in 3/16" O.D. PFA tubing | |
| Operating Conditions | Temperature: -20° to +55° C Storage temperature: -30° to +75° C Relative humidity: 95% max. @ 50° C (non-condensing) | |
| Certifications | | |
| Hookup Diagrams | Emitters: DC02 (p. 758) | Bipolar: DC04 (p. 758) Single output: DC01 (p. 758) |

Cordsets

Euro QD
See page 696

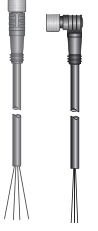
| Length | Threaded 4-Pin | |
|--------|----------------|-------------|
| | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |



Additional cordset information available. See page 693.



Pico QD
See page 693

| Length | Threaded 4-Pin | | Threaded 3-Pin | |
|--------|----------------|-------------|----------------|-------------|
| | Straight | Right-Angle | Straight | Right-Angle |
| 2.00 m | PKG4M-2 | PKW4M-2 | PKG3M-2 | PKW3M-2 |
| 5.00 m | PKG4M-5 | PKW4M-5 | PKG3M-5 | PKW3M-5 |
| 7.00 m | - | - | PKG3M-7 | - |
| 9.00 m | PKG4M-9 | PKW4M-9 | PKG3M-9 | PKW3M-9 |
| 10.0 m | - | - | PKG3M-10 | - |



Brackets

WORLD-BEAM® Q12

| | |
|--|--|
|  pg. 681 SMBQ12A |  pg. 681 SMBQ12T |
|--|--|

Additional bracket information available. See page 632.

REFLECTORS



PAGE 724

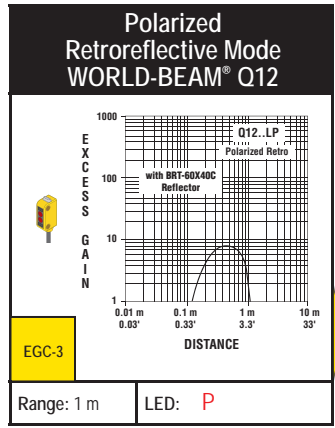
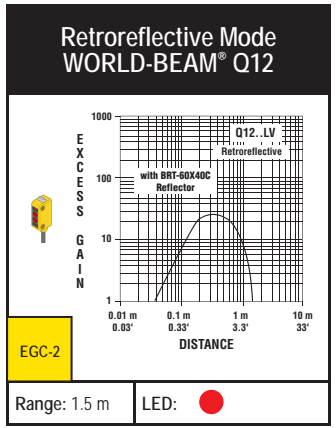
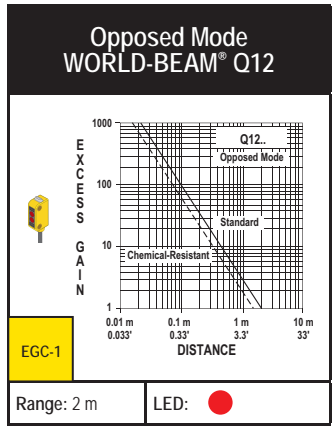
APERTURES



PAGE 750

Excess Gain Curves

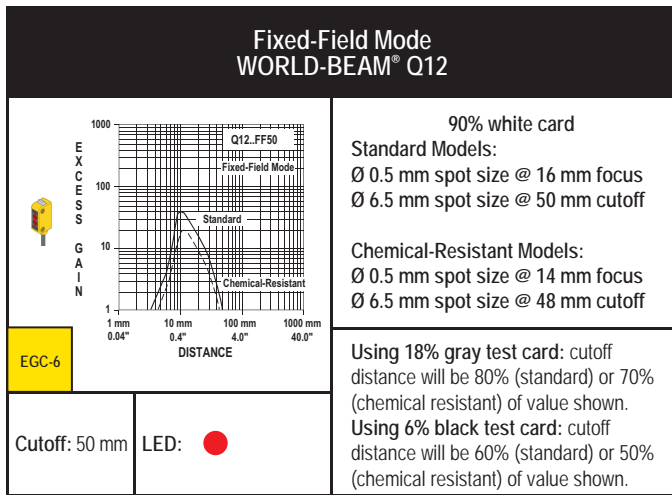
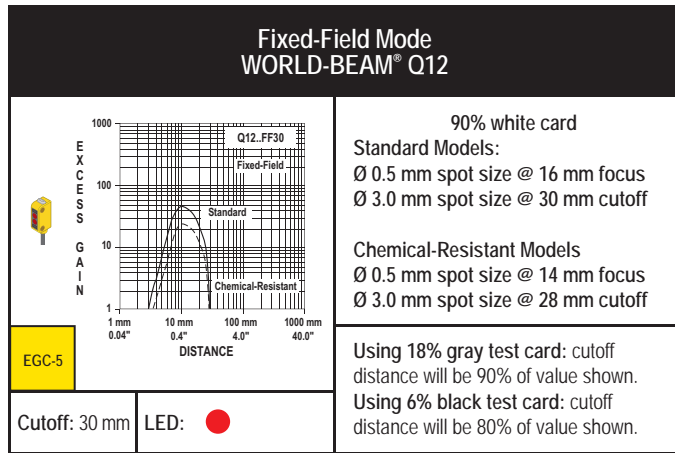
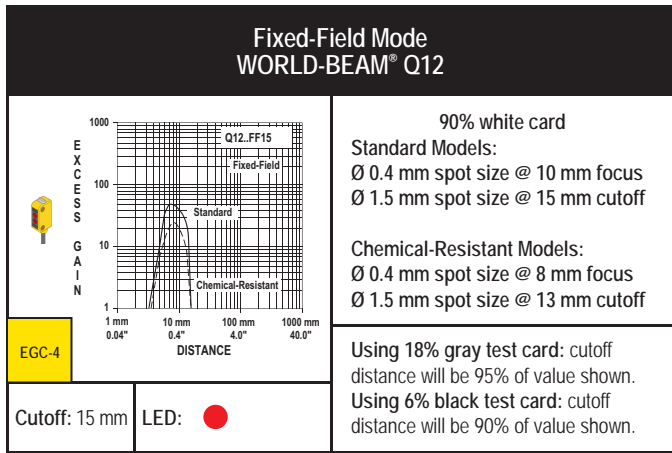
● = Visible Red LED P = Visible Red LED Polarized



More on next page

Excess Gain Curves (Performance based on 90% reflectance white test card)

● = Visible Red LED

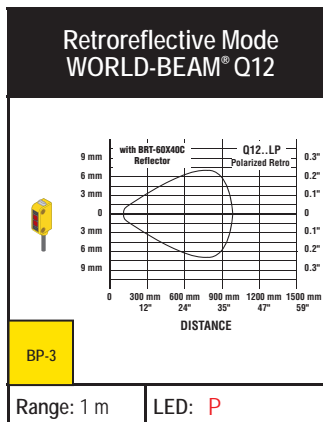
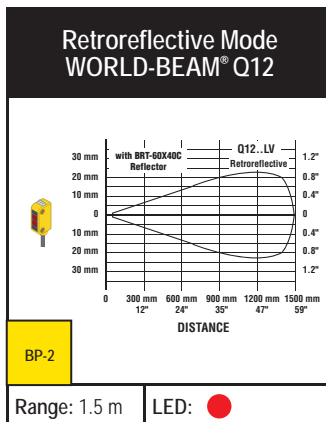
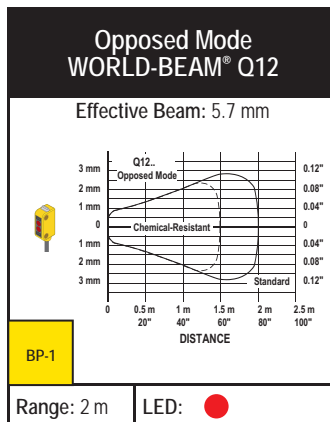


- Photoelectronics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- WORLD-BEAM Q12
- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE

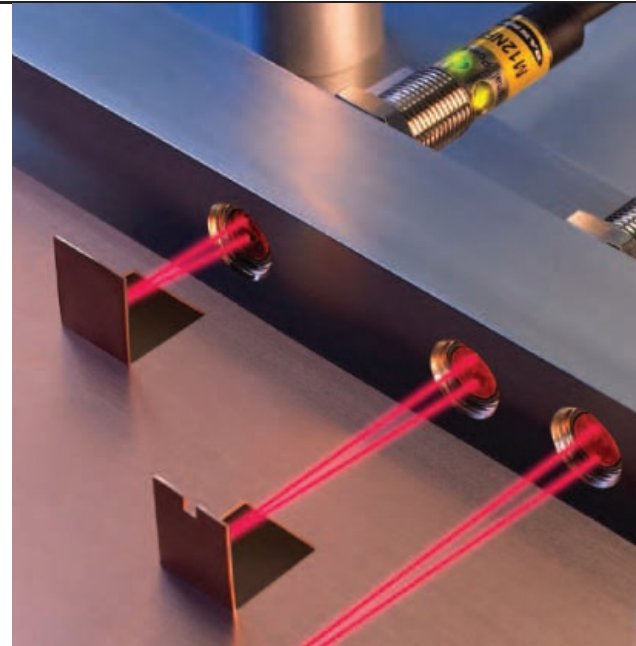
Beam Patterns

● = Visible Red LED P = Visible Red LED Polarized



Barrel-Mount Sensors M12

- Features compact 12 mm threaded metal barrel
- Available in opposed, polarized and non-polarized retroreflective, diffuse and fixed-field modes
- Provides excellent crosstalk avoidance circuitry for diffuse, retroreflective and fixed-field models
- Provides single-turn sensitivity adjustment on opposed, retroreflective and diffuse models
- Features fixed-field models with excellent background suppression and recessed mounting
- Visible red sensing beam for easy alignment
- Fully encapsulated electronics—rated IP67



Opposed, Retroreflective
Diffuse and Fixed-field Models
Suffix E, R, LP, LV, D and FF

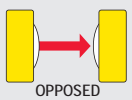
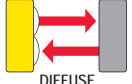




ACCESSORIES
page
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M12, 10-30V dc

→ Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|--|--------------------|---------------|----------------|------------|------------------|-----------------|
|  OPPOSED | 5 m | 2 m | M12E Emitter | | EGC-1 (p. 68) | BP-1 (p. 69) |
| | | 4-Pin Euro QD | M12EQ8 Emitter | | | |
| | | 2 m | M12NR | M12PR | | |
| | | 4-Pin Euro QD | M12NRQ8 | M12PRQ8 | | |
|  DIFFUSE | 400 mm | 2 m | M12ND | M12PD | EGC-4 (p. 68) | BP-4 (p. 69) |
| | | 4-Pin Euro QD | M12NDQ8 | M12PDQ8 | | |
|  RETRO | 2.5 m [†] | 2 m | M12NLV | M12PLV | EGC-2 (p. 68) | BP-2 (p. 69) |
| | | 4-Pin Euro QD | M12NLVQ8 | M12PLVQ8 | | |
|  POLAR RETRO | 1.5 m [†] | 2 m | M12NLP | M12PLP | EGC-3 (p. 68) | BP-3 (p. 69) |
| | | 4-Pin Euro QD | M12NLPQ8 | M12PLPQ8 | | |

More on next page

Connection options: A model with a QD requires a mating cordset (see page 68).

For 9 m cable, add suffix W/30 to the 2 m model number (example, M12PD W/30).
QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, M12PDQ5).

[†] Retroreflective range is specified using a BRT-84 retroreflector.
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

M12, 10-30V dc (cont'd)

→ Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|------------------|--------------|---------------|------------|------------|------------------|--------------|
| | 25 mm Cutoff | 2 m | M12NFF25 | M12PFF25 | EGC-5 (p. 68) | - |
| | | 4-Pin Euro QD | M12NFF25Q8 | M12PFF25Q8 | | |
| | 50 mm Cutoff | 2 m | M12NFF50 | M12PFF50 | EGC-6 (p. 68) | - |
| | | 4-Pin Euro QD | M12NFF50Q8 | M12PFF50Q8 | | |
| | 75 mm Cutoff | 2 m | M12NFF75 | M12PFF75 | EGC-7 (p. 68) | - |
| | | 4-Pin Euro QD | M12NFF75Q8 | M12PFF75Q8 | | |

Connection options: A model with a QD requires a mating cordset (see page 68).

For 9 m cable, add suffix W/30 to the 2 m model number (example, M12PD W/30).
 QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, M12PDQ5).

- Photoelectronics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 68

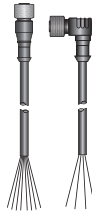
M12 Specifications

| | |
|-----------------------------|---|
| Sensing Beam | Fixed-field: 680 nm visible red All others: 660 nm visible red |
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) @ 20 mA max current (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Complementary (1 normally open and 1 normally closed) solid-state, NPN or PNP, depending on model |
| Output Ratings | 100 mA total across both outputs with overload and short circuit protection OFF-state leakage current: NPN: less than 200 A @ 30V dc (see Application Note 1) PNP: less than 10 A @ 30V dc ON-state saturation voltage: NPN: less than 1.6V @ 100 mA PNP: less than 3.0V @ 100 mA |
| Output Protection Circuitry | Protected against false pulse on power-up, short-circuit protected |
| Output Response Time | Opposed: 625 microsecond ON/375 microseconds OFF All others: 500 microseconds ON/OFF |
| Delay at Power-up | 100 milliseconds; outputs do not conduct during this time. |
| Repeatability | Opposed: 85 microseconds All others: 95 microseconds |
| Indicators | 2 LED indicators: Green—power ON Yellow—light sensed |
| Adjustments | Fixed-field: none All others: single-turn Gain (sensitivity) potentiometer |
| Construction | Housing: Nickel-plated brass Lenses: PMMA Cable endcap and Gain potentiometer adjuster: PBT |
| Environmental Rating | IEC IP67; NEMA 6, IEC IP68 and 1200 PSI washdown, NEMA 1CS 5 Annex F-2002 |
| Connections | 2 m or 9 m 4-wire PVC-jacketed cable, 4-pin integral Euro-style QD (Q8), or 150 mm pigtail with 4-pin Euro-style quick-disconnect fitting (Q5), depending on model. QD cordsets ordered separately. See page 68. |
| Operating Conditions | Operating temperature: -20° to +60° C Relative humidity: 90% max @ +50° C |
| Application Notes | NPN off-state leakage current is < 200 µA for load resistances > 3 k or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current |
| Certifications | |
| Hookup Diagrams | Emitters: DC02 (p. 758) All others: DC03 (p. 758) |

- MINIATURE
- WORLD-BEAM Q12
- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE

Cordsets

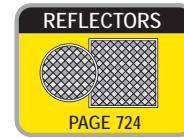
| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |



Additional cordset information available. See page 693.

Brackets

| M12 |
|---|
|  |
| pg. 683 |
| SMBQS12PD |



Additional bracket information available. See page 632.

Excess Gain Curves

(Diffuse and Fixed-field mode performance based on 90% reflectance white test card)

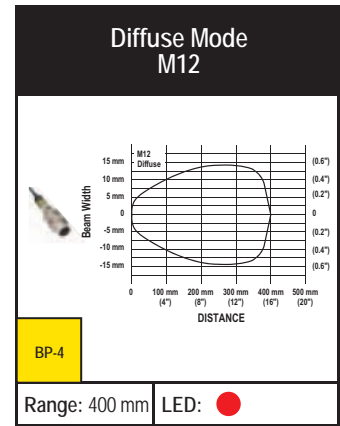
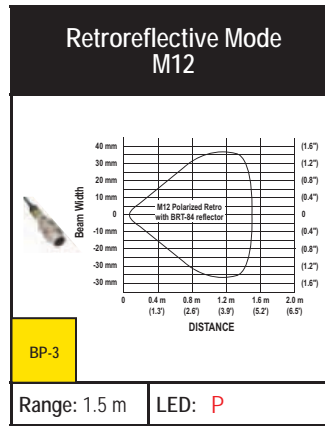
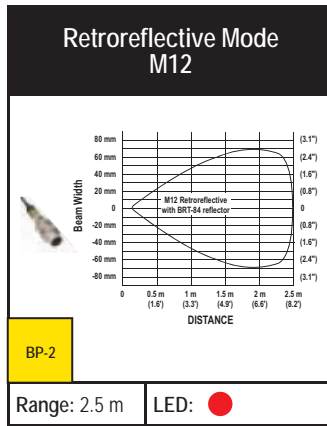
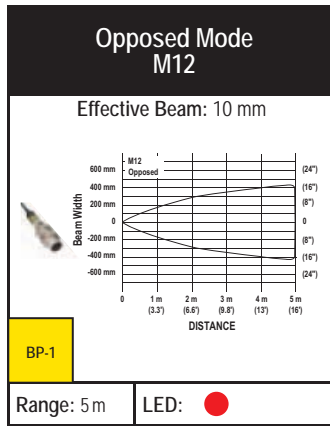
● = Visible Red LED P = Visible Red LED Polarized

| | | | |
|---|--|--|---|
| <p>Opposed Mode M12</p> <p>Range: 5 m LED: ●</p> | <p>Retroreflective Mode M12</p> <p>Range: 2.5 m LED: ●</p> | <p>Polarized Retroreflective Mode M12</p> <p>Range: 1.5 m LED: P</p> | <p>Diffuse Mode M12</p> <p>Range: 400 mm LED: ●</p> |
| <p>Fixed-Field Mode M12</p> <p>Cutoff: 25 mm LED: ●</p> <p>90% white test card: Ø 2 mm spot size @ 25 mm focus Ø 2 mm spot size @ 25 mm cutoff</p> <p>Using 18% gray test card: cutoff distance will be 96% of value shown. Using 6% black test card: cutoff distance will be 94% of value shown.</p> | <p>Fixed-Field Mode M12</p> <p>Cutoff: 50 mm LED: ●</p> <p>90% white test card: Ø 2 mm spot size @ 25 mm focus Ø 7 mm spot size @ 50 mm cutoff</p> <p>Using 18% gray test card: cutoff distance will be 90% of value shown. Using 6% black test card: cutoff distance will be 85% of value shown.</p> | | |
| <p>Fixed-Field Mode M12</p> <p>Cutoff: 75 mm LED: ●</p> <p>90% white test card: Ø 2 mm spot size @ 25 mm focus Ø 13 mm spot size @ 75 mm cutoff</p> <p>Using 18% gray test card: cutoff distance will be 80% of value shown. Using 6% black test card: cutoff distance will be 70% of value shown.</p> | | | |

Beam Patterns

(Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED P = Visible Red LED Polarized



- Photoelectrics Sensors
- Fiber Optic Sensors
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- Wireless
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- Safety Light Screens
- Safety Laser Scanners
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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

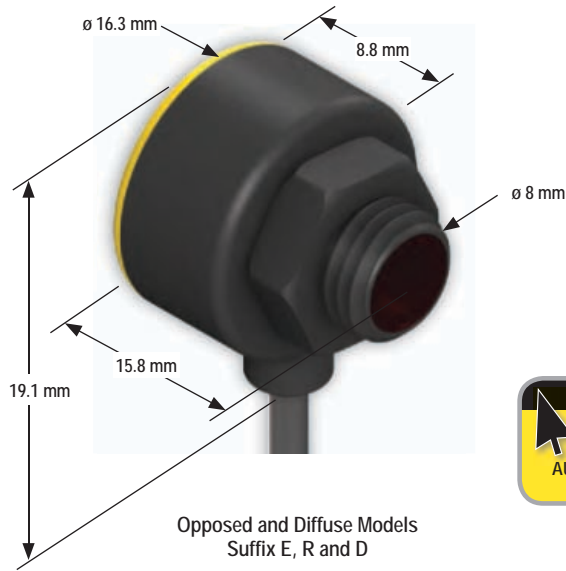
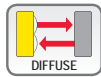
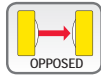
- MINIATURE
- WORLD-BEAM Q12
- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE

Right-Angle Barrel-Mount Sensors T8

- Features EZ-BEAM® technology, with specially designed optics and electronics for reliable sensing without adjustments
- Ideal for presence sensing in small areas previously accessible only to remote sensors and fiber optic cable
- Offers visible sensing beam for easy alignment
- Can replace range-limited 8 mm inductive proximity sensors
- Available in dark- or light-operate models
- Offered in opposed mode with 2 m range or diffuse mode with 50 and 100 mm ranges



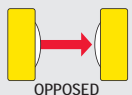
ACCESSORIES
page
72



ONLINE
AUTOCAD, STEP,
IGES & PDF

T8, 10-30V dc

→ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|--|-------|-----------------------|-------------|----------------|------------|---------------|--------------|
|  OPPOSED | 2 m | 2 m | — | T86EV Emitter | | EGC-1 (p. 72) | BP-1 (p. 72) |
| | | 3-Pin Pico Pigtail QD | | T86EVQ Emitter | | | |
| | | 2 m | LO | T8AN6R | T8AP6R | | |
| | | 3-Pin Pico Pigtail QD | | T8AN6RQ | T8AP6RQ | | |
| | | 2 m | DO | T8RN6R | T8RP6R | | |
| | | 3-Pin Pico Pigtail QD | | T8RN6RQ | T8RP6RQ | | |

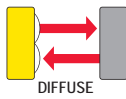
More on next page

Connection options: A model with a QD requires a mating cordset (see page 72).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T8AN6D50 W/30).

T8, 10-30V dc (cont'd)

➔ Visible Red LED


| Sensing Mode/LED | Range | Connection | Output Type | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|---|--------|-----------------------|-------------|------------|------------|------------------|-----------------|
|  DIFFUSE | 50 mm | 2 m | LO | T8AN6D50 | T8AP6D50 | EGC-2 (p. 72) | BP-2 (p. 72) |
| | | 3-Pin Pico Pigtail QD | | T8AN6D50Q | T8AP6D50Q | | |
| | | 2 m | DO | T8RN6D50 | T8RP6D50 | | |
| | | 3-Pin Pico Pigtail QD | | T8RN6D50Q | T8RP6D50Q | | |
| | 100 mm | 2 m | LO | T8AN6D100 | T8AP6D100 | EGC-3 (p. 72) | BP-3 (p. 72) |
| | | 3-Pin Pico Pigtail QD | | T8AN6D100Q | T8AP6D100Q | | |
| | | 2 m | DO | T8RN6D100 | T8RP6D100 | | |
| | | 3-Pin Pico Pigtail QD | | T8RN6D100Q | T8RP6D100Q | | |

➔ Connection options: A model with a QD requires a mating cordset (see page 72).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T8AN6D50 W/30).

- Photoelectrics Sensors
- Fiber Optic Sensors
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- Safety Laser Scanners
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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
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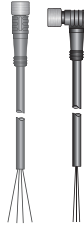
| T8 Specifications | |
|--------------------------------|--|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at less than 25 mA (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model. Light Operate (LO) or Dark Operate (DO), depending on model. |
| Output Rating | 50 mA max. OFF-state leakage current: less than 1 A at 24V dc ON-state saturation voltage: less than 0.25V at 10 mA dc; less than 0.5V at 50 mA dc |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point 100 mA |
| Output Response Time | 1 millisecond ON; 0.5 milliseconds OFF |
| Delay at Power-up | Maximum 100 milliseconds (150 milliseconds for Diffuse); output does not conduct during this time. |
| Repeatability | Opposed: 100 microseconds Diffuse: 160 microseconds |
| Indicators | Opposed: Receiver has Green and Red LED Emitter has one Green LED Green: power ON Red: light sensed Diffuse: Red: light is sensed |
| Construction | Reinforced polycarbonate/ABS alloy housing, acrylic window with 8 mm ABS nut |
| Environmental Rating | IEC IP67; NEMA 6 |
| Connections | 2 m or 9 m attached cable, or 150 mm pigtail with 3-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 72. |
| Operating Conditions | Temperature: -20° to +55° C Relative humidity: 80% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | Vibration: All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F Method 201A; 10 to 60 Hz, 0.5 mm peak to peak Shock: All models meet IEC 60068-2-27, IEC 60947-5-2; 30g peak acceleration, 11 millisecond pulse duration, half-sine wave pulse shape |
| Certifications |  |
| Hookup Diagrams | Emitters: DC02 (p. 758) All others: DC01 (p. 758) |

- MINIATURE
- WORLD-BEAM Q12
- M12
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- VS2
- VS3
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- FULLSIZE


Cordsets

| Pico QD | | |
|----------------|----------|-------------|
| See page 693 | | |
| Threaded 3-Pin | | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG3M-2 | PKW3M-2 |
| 5.00 m | PKG3M-5 | — |
| 7.00 m | PKG3M-7 | — |
| 9.00 m | PKG3M-9 | PKW3M-9 |
| 10.0 m | PKG3M-10 | — |

Additional cordset information available. See page 693.



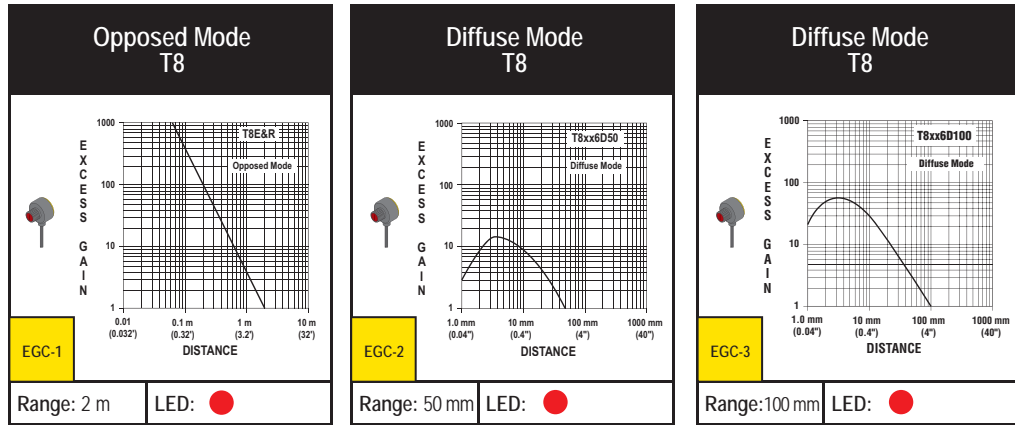
Brackets

| T8 |
|---|
|  |
| pg. 659 |
| SMB8MM |

Additional bracket information available. See page 632.

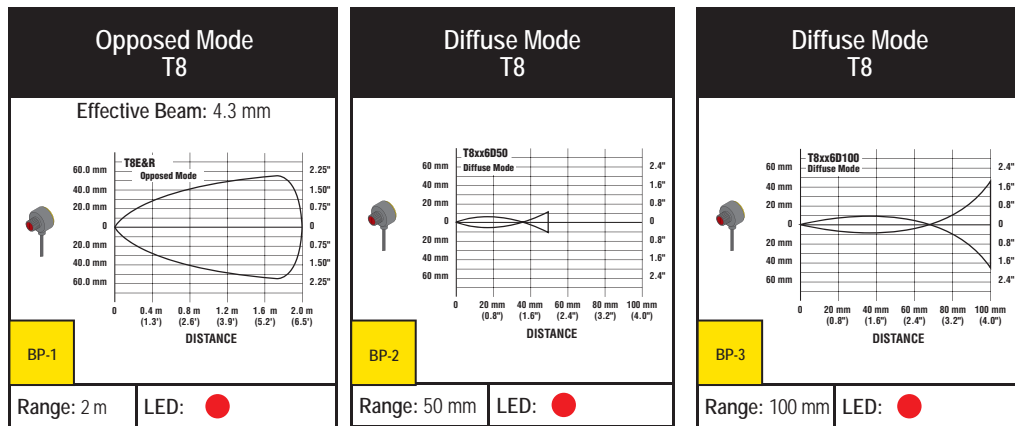
Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

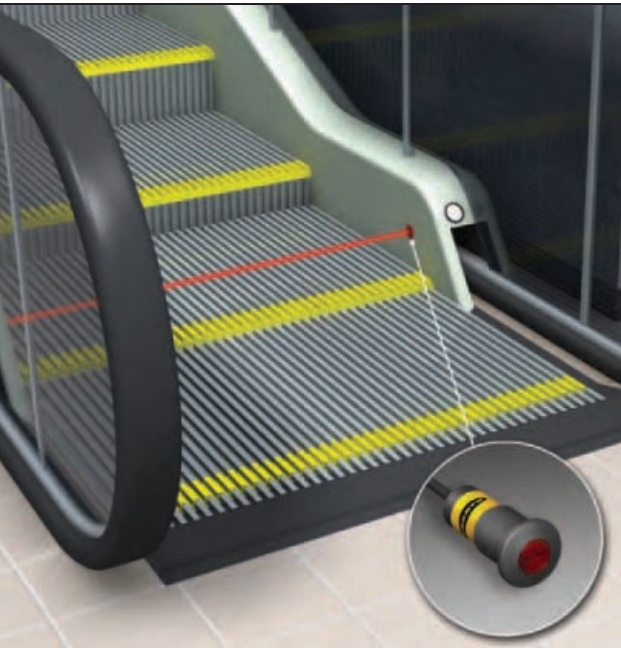
● = Visible Red LED



Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

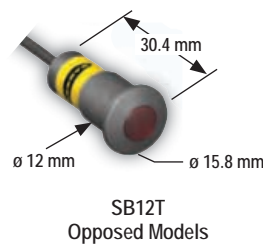
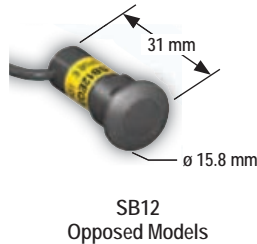
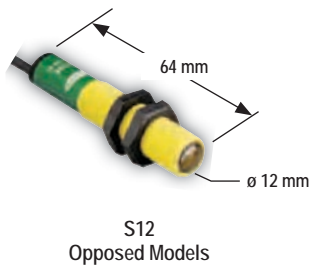
● = Visible Red LED





S12 & SB12 Opposed-Mode Barrel-Mount Sensors

- S12 threaded housing rated for IP67 for heavy-duty industrial sensing and reliable detection up to 15 m
- Economical SB12/SB12T sensors for personal detection applications in escalators, turnstiles and ticket booths
 - SB12 snap-barrel housing for applications where mounting holes are precisely located and formed, and sensor can be hidden behind a protective window
 - SB12T threaded housing for robust mounting in applications with vibration, rough handling or vandalism
 - Narrow beams for reliable operation of multiple sensors in close proximity and reliable short-range detection up to 1.5 m



- Photoelectrics Sensors
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- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE

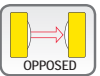
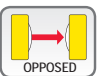
S12, 10-30V dc

→ Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|------------------|-------|------------|---------------|------------|---------------|--------------|
| OPPOSED | 15 m | 2 m | S126E Emitter | | EGC-1 (p. 75) | BP-1 (p. 75) |
| | | | S12SN6R | S12SP6R | | |

Connection options: A model with a QD requires a mating cordset (see page 75).

QD models: For a 4-pin 150 mm Pico-style pigtail QD, add suffix QP (example, S12SN6RQP).



SB12, 10-30V dc

⇒ Infrared Red LED

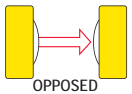
| Sensing Mode/LED | Range | Connection | Output | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|------------------|-------|------------|--------|----------------|------------|-------------|--------------|
| OPPOSED | 1.5 m | 2 m | – | SB12E1 Emitter | | – | BP-2 (p. 75) |
| | | | LO | SB12ANR | SB12APR | | |
| | | | DO | SB12RNR | SB12RPR | | |

Connection options: A model with a QD requires a mating cordset (see page 75).

QD models: For a 3-pin 150 mm Pico-style pigtail QD, add suffix Q3 (example, SB12E1Q3).

SB12T, 10-30V dc


 Infrared Red LED

| Sensing Mode/LED | Range | Connection | Output | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|--|-------|------------|--------|-----------------|------------|-------------|-----------------|
|  OPPOSED | 1.5 m | 2 m | – | SB12TE1 Emitter | | – | BP-2 (p. 75) |
| | | | LO | SB12TANR | SB12TAPR | | |
| | | | DO | SB12TRNR | SB12TRPR | | |

Connection options: A model with a QD requires a mating cordset (see page 75).

QD models: For a 3-pin 150 mm Pico-style pigtail QD, add suffix Q3 (example, SB12TE1Q3).


S12/SB12 Specifications

| | |
|--------------------------------|--|
| Supply Voltage and Current | S12: 10 to 30V dc (10% max. ripple); 25 mA (emitters) or 20 mA (receivers) exclusive of load SB12/SB12T: 10 to 30V dc; less than 15 mA max exclusive of load |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | SB12/SB12T: One solid state output, NPN (sinking) or PNP (sourcing), depending on model S12: Complementary solid-state dc switch; choose NPN (current sinking) or PNP (current sourcing) models Light Operate: N.O. output conducts when the sensor sees the emitter's modulated light Dark Operate: N.C. output conducts when the sensor sees dark; The N.C. (normally closed) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply |
| Output Ratings | S12: 100 mA maximum (each) in standard hookup; when wired for alarm output, the total load may not exceed 100 mA OFF-state leakage current: less than 1 μ A @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5V @ 150 mA SB12/SB12T: 100 mA OFF-state leakage current: < 10 μ A ON-state saturation voltage: < 0.2V @ 10 mA; < 0.6V @ 100 mA |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs |
| Output Response Time | S12: 3 milliseconds ON, 1.5 milliseconds OFF SB12/SB12T: 2.5 milliseconds ON, 1.75 milliseconds OFF |
| Delay at Power-up | S12: 100 millisecond; outputs are non-conducting during this time. SB12/SB12T: Less than 1 second |
| Repeatability | S12: 375 microseconds SB12/SB12T: 350 microseconds |
| Switching Frequency | SB12/SB12T: 235 Hz |
| Indicators | Green LED (emitter and receiver): power ON Amber LED (receiver only): light sensed |
| Construction | S12: Housings are reinforced thermoplastic polyester; lenses are Lexan®; Polyurethane end cap SB12/SB12T: Housing: ABS Lens: Polycarbonate; epoxy encapsulant Cable: PVC-jacketed |
| Environmental Rating | S12: Leakproof design rated NEMA 6P (IEC IP67) SB12: IP65 SB12T: IP67 |
| Connections | S12: 2 m or 9 m cable, or a 150 mm pigtail with 4-pin Pico-style QD SB12/SB12T: 2 m cable or 150 mm pigtail with 3-pin Pico-style QD QD cordset ordered separately. See page 75. |
| Operating Conditions | S12: Temperature: -40° to +70° C Maximum relative humidity: 90% at 50° C (non-condensing) SB12/SB12T: Temperature: -20° to +50° C |
| Vibration and Mechanical Shock | S12: Meets Mil. Std. 202F requirements. Method 201A (Vibration: frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation). |
| Certifications |  |
| Hookup Diagrams | Emitters: DC02 (p. 758) S12 Receivers NPN: DC05 (p. 759) S12 Receivers PNP: DC06 (p. 759) SB12/SB12T Receivers: DC01 (p. 758) |


Lexan® is a registered trademark of General Electric Co.

Cordsets

| Pico QD | | |
|----------------|----------|-------------|
| See page 693 | | |
| Threaded 3-Pin | | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG3M-2 | PKW3M-2 |
| 5.00 m | PKG3M-5 | PKW3M-5 |
| 7.00 m | PKG3M-7 | — |
| 9.00 m | PKG3M-9 | PKW3M-9 |
| 10.0 m | PKG3M-10 | — |




| Pico QD | | |
|---------------|----------|-------------|
| See page 695 | | |
| Snap-on 4-Pin | | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG4-2 | PKW4Z-2 |



Additional cordset information available. See page 693.

Brackets

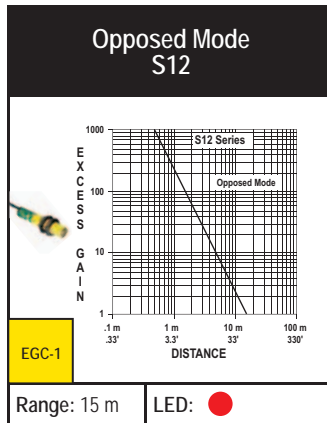
| S12 |
|---|
|  |
| pg. 649 |
| SMB12MM |

Additional bracket information available. See page 632.

- Photoelectronics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Excess Gain Curves

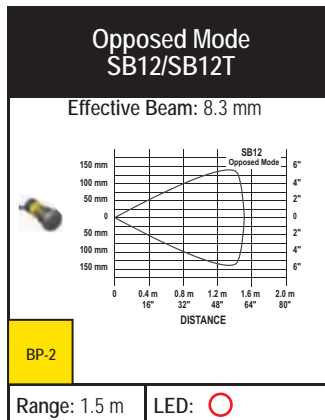
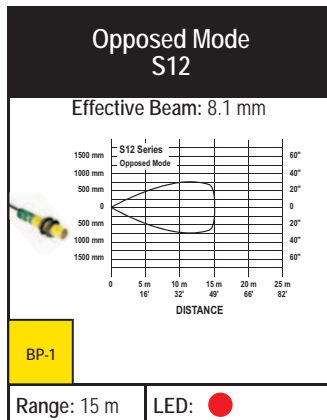
● = Visible Red LED



- MINIATURE
- WORLD-BEAM Q12
- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE

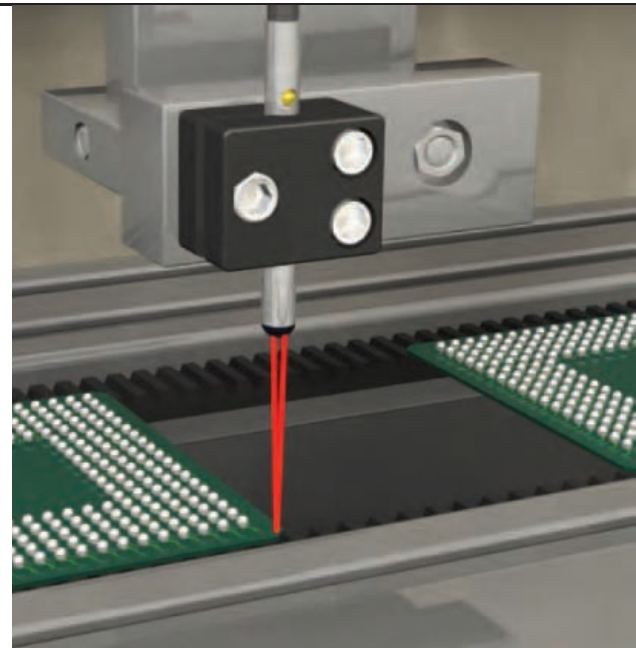
Beam Patterns

● = Visible Red LED ○ = Infrared LED

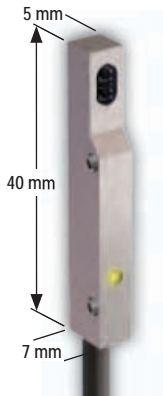
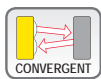
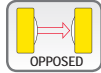


Heavy-Duty Metal Sensors VSM

- 300 series stainless steel body with sapphire lens withstands a wide variety of chemicals and cutting fluids
- Models available about the size of a single optical fiber assembly
- Economical, self-contained sensors are available in convergent or opposed sensing modes; no separate amplifier required
- Advanced convergent optical design provides high performance with repeatable sensing
- A narrow well focused beam allows the entire sensor to be recessed into fixtures
- Smooth, stainless steel barrel is perfect for hygienic applications that require routine cleaning
- A choice of housing styles are available



ACCESSORIES
page
77



VSMQ
Convergent Models



VSM4
Opposed and
Convergent Models



VSM5
Opposed and
Convergent Models



VSM, 10-30V dc

➔ Infrared LED

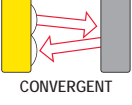
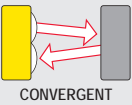
| Sensing Mode/LED | Housing Style | Range | Connection | Output Type | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|------------------|----------------------|--------|---------------|-------------|------------------|---------------|---------------|--------------|
| OPPOSED | 4 mm Smooth Barrel | 250 mm | 2 m | — | VSM46E Emitter | | EGC-1 (p. 78) | BP-1 (p. 79) |
| | | | 3-Pin Pico QD | | VSM46EQ7 Emitter | | | |
| | | | 2 m | DO | VSM4RN6R | VSM4RP6R | | |
| | | | 3-Pin Pico QD | | VSM4RN6RQ7 | VSM4RP6RQ7 | | |
| OPPOSED | 5 mm Threaded Barrel | 250 mm | 2 m | — | VSM56E Emitter | | EGC-1 (p. 78) | BP-1 (p. 79) |
| | | | 3-Pin Pico QD | | VSM56EQ7 Emitter | | | |
| | | | 2 m | DO | VSM5RN6R | VSM5RP6R | | |
| | | | 3-Pin Pico QD | | VSM5RN6RQ7 | VSM5RP6RQ7 | | |
| CONVERGENT | 4 mm Smooth Barrel | 10 mm | 2 m | LO | VSM4AN6CV10 | VSM4AP6CV10 | EGC-2 (p. 78) | BP-2 (p. 79) |
| | | | 3-Pin Pico QD | | VSM4AN6CV10Q7 | VSM4AP6CV10Q7 | | |
| | | 20 mm | 2 m | | VSM4AN6CV20 | VSM4AP6CV20 | EGC-3 (p. 78) | BP-3 (p. 79) |
| | | | 3-Pin Pico QD | | VSM4AN6CV20Q7 | VSM4AP6CV20Q7 | | |
| | | 50 mm | 2 m | | VSM4AN6CV50 | VSM4AP6CV50 | EGC-4 (p. 78) | BP-4 (p. 79) |
| | | | 3-Pin Pico QD | | VSM4AN6CV50Q7 | VSM4AP6CV50Q7 | | |

➔ Connection options: A model with a QD requires a mating cordset (see page 77).

➔ More on next page



VSM, 10-30V dc (cont'd)

 Infrared LED

| Sensing Mode/LED | Housing Style | Range | Connection | Output Type | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|--|------------------------|-------|---------------|-------------|---------------|---------------|---------------|--------------|
|  CONVERGENT | 5 mm Threaded Barrel | 10 mm | 2 m | LO | VSM5AN6CV10 | VSM5AP6CV10 | EGC-2 (p. 78) | BP-2 (p. 79) |
| | | | 3-Pin Pico QD | | VSM5AN6CV10Q7 | VSM5AP6CV10Q7 | | |
| | | 20 mm | 2 m | | VSM5AN6CV20 | VSM5AP6CV20 | EGC-3 (p. 78) | BP-3 (p. 79) |
| | | | 3-Pin Pico QD | | VSM5AN6CV20Q7 | VSM5AP6CV20Q7 | | |
| | | 50 mm | 2 m | | VSM5AN6CV50 | VSM5AP6CV50 | EGC-4 (p. 78) | BP-4 (p. 79) |
| | | | 3-Pin Pico QD | | VSM5AN6CV50Q7 | VSM5AP6CV50Q7 | | |
|  CONVERGENT | Flat-Pack, Side-Looker | 20 mm | 2 m | LO | VSMQAN6CV20 | VSMQAP6CV20 | EGC-5 (p. 78) | BP-5 (p. 79) |
| | | 50 mm | | | VSMQAN6CV50 | VSMQAP6CV50 | EGC-6 (p. 78) | BP-6 (p. 79) |
| | | 90 mm | | | VSMQAN6CV90 | VSMQAP6CV90 | EGC-7 (p. 78) | BP-7 (p. 79) |

 Connection options: A model with a QD requires a mating cordset (see page 77).

VSM Specifications

| | |
|-----------------------------|--|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Single-output: 1 NPN or 1 PNP, Light Operate (LO) or Dark Operate (DO), depending on model |
| Output Rating | 100 mA max. OFF-state leakage current: less than 1 A ON-state saturation voltage: less than 2V @ 100 mA |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point 100 mA |
| Response Time | 2.5 milliseconds |
| Delay at Power-up | 20 milliseconds |
| Repeatability | 1 millisecond |
| Indicators | Yellow LED: light sensed |
| Construction | 300 series stainless steel with sapphire lens and PVC cable |
| Environmental Rating | IP67 |
| Connections | 2 m PVC-jacketed cable or 3-pin Pico-style integral QD (Q7), depending on model. QD cordsets ordered separately. See page 77. |
| Operating Conditions | Operating temperature: 0° to +55° C |
| Hookup Diagram | Emitters: DC02 (p. 758) Receivers: DC01 (p. 758) |
| Certification |   LISTED (pending) |

- Photoelectronics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


ACCESSORIES
page 77

- MINIATURE
- WORLD-BEAM Q12
- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE

Cordsets


| Pico QD | | |
|----------------|----------|-------------|
| See page 693 | | |
| Threaded 3-Pin | | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG3M-2 | PKW3M-2 |
| 5.00 m | PKG3M-5 | PKW3M-5 |
| 9.00 m | PKG3M-9 | PKW3M-9 |



 Additional cordset information available. See page 693.

Brackets

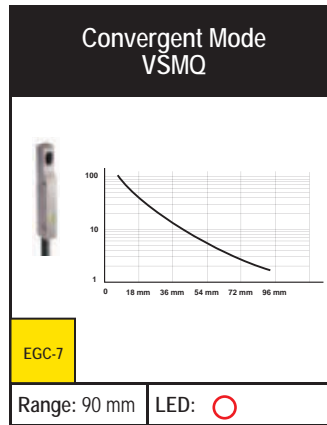
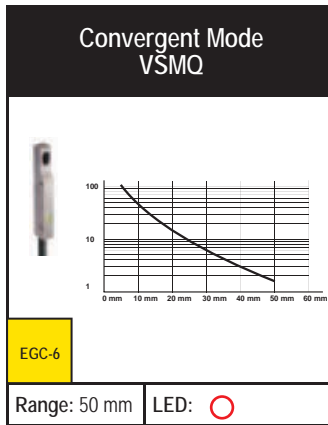
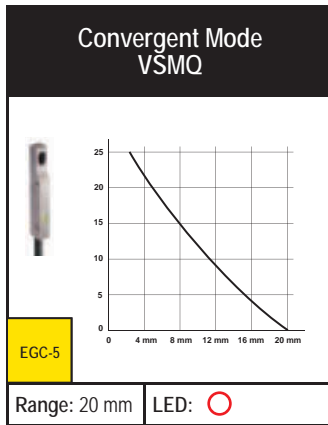
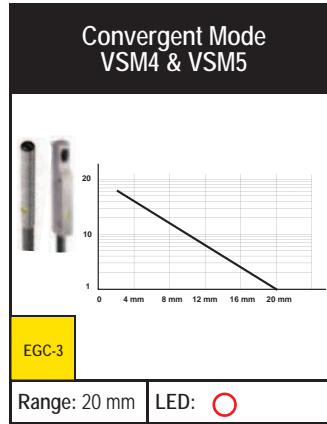
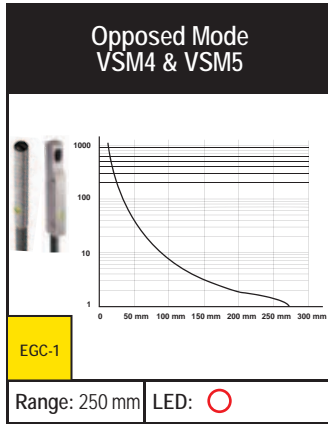
| VSM |
|---|
|  pg. 689 SMBVSM4 |

 Additional bracket information available. See page 632.

Excess Gain Curves

(Convergent performance based on 90% reflectance white test card)

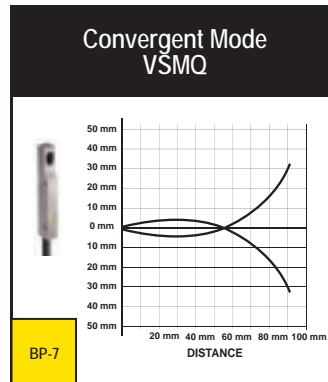
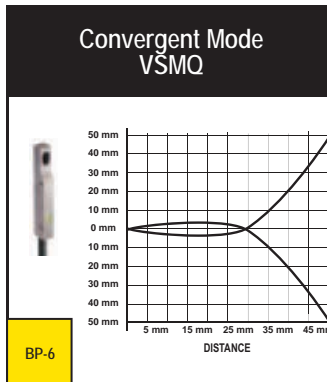
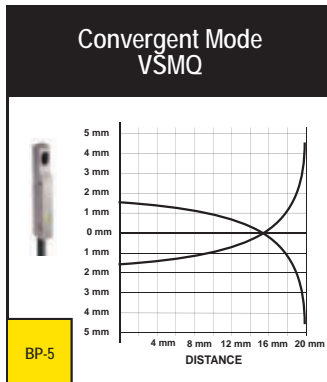
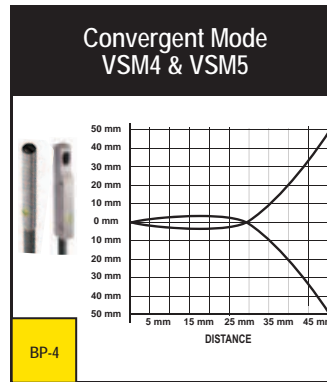
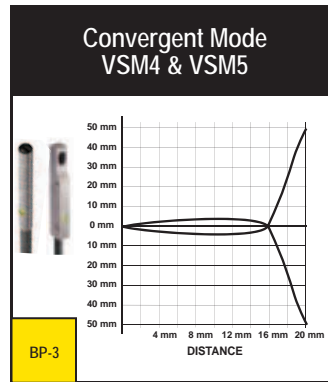
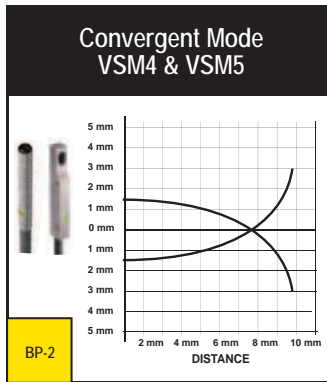
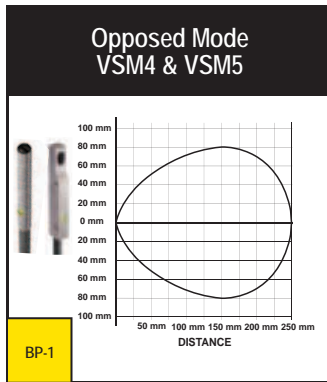
○ = Infrared LED



Beam Patterns

(Convergent performance based on 90% reflectance white test card)

○ = Infrared LED



- Photoelectronics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

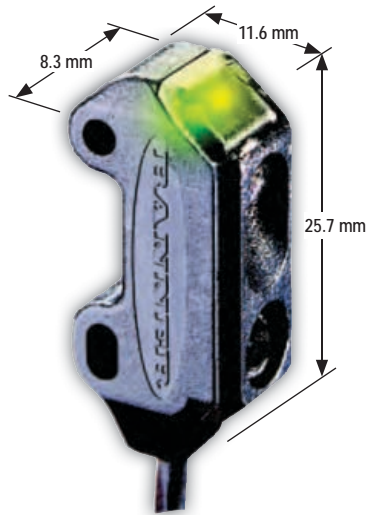
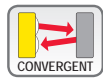
- MINIATURE
- WORLD-BEAM Q12
- M12
- T8
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE

Small Convergent-Mode Sensors VS1

- Specially designed optics and electronics for reliable sensing without adjustments
- Provides high-quality, low-cost replacement for competitive miniature sensors
- Available with 10 or 15 mm focal length
- Available in Dark or Light Operate models
- Available with integral cable or 150 mm pigtail quick-disconnect



ACCESSORIES
page
82



ONLINE
AUTOCAD, STEP,
IGES & PDF

VS1, 10-30V dc

→ Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|-------------------|-------------|-----------------------|-------------|-------------|-------------|------------------|-----------------|
| <p>CONVERGENT</p> | 10 mm focus | 2 m | LO | VS1AN5CV10 | VS1AP5CV10 | EGC-1 (p. 82) | BP-1 (p. 82) |
| | | 3-Pin Pico Pigtail QD | | VS1AN5CV10Q | VS1AP5CV10Q | | |
| | | 2 m | DO | VS1RN5CV10 | VS1RP5CV10 | | |
| | | 3-Pin Pico Pigtail QD | | VS1RN5CV10Q | VS1RP5CV10Q | | |
| | 15 mm focus | 2 m | LO | VS1AN5CV20 | VS1AP5CV20 | EGC-2 (p. 82) | BP-2 (p. 82) |
| | | 3-Pin Pico Pigtail QD | | VS1AN5CV20Q | VS1AP5CV20Q | | |
| | | 2 m | DO | VS1RN5CV20 | VS1RP5CV20 | | |
| | | 3-Pin Pico Pigtail QD | | VS1RN5CV20Q | VS1RP5CV20Q | | |

Connection options: A model with a QD requires a mating cordset (see page 82).

For 9 m cable, add suffix W/30 to the 2 m model number (example, VS1AN5CV10 W/30).

More on next page

VS1, 10-30V dc (cont'd)

Infrared LED

| Sensing Mode/LED | Range | Connection | Output Type | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|------------------|-------------|-----------------------|-------------|------------|------------|------------------|-----------------|
| CONVERGENT | 10 mm focus | 2 m | LO | VS1AN5C10 | VS1AP5C10 | EGC-3 (p. 82) | BP-3 (p. 82) |
| | | 3-Pin Pico Pigtail QD | | VS1AN5C10Q | VS1AP5C10Q | | |
| | | 2 m | DO | VS1RN5C10 | VS1RP5C10 | | |
| | | 3-Pin Pico Pigtail QD | | VS1RN5C10Q | VS1RP5C10Q | | |
| | 15 mm focus | 2 m | LO | VS1AN5C20 | VS1AP5C20 | EGC-4 (p. 82) | BP-4 (p. 82) |
| | | 3-Pin Pico Pigtail QD | | VS1AN5C20Q | VS1AP5C20Q | | |
| | | 2 m | DO | VS1RN5C20 | VS1RP5C20 | | |
| | | 3-Pin Pico Pigtail QD | | VS1RN5C20Q | VS1RP5C20Q | | |

Connection options: A model with a QD requires a mating cordset (see page 693).

For 9 m cable, add suffix W/30 to the 2 m model number (example, VS1AN5CV10 W/30).


- Photoelectronics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


| VS1 Specifications | |
|-----------------------------|--|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at less than 25 mA (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model Light Operate (LO) or Dark Operate (DO) models |
| Output Rating | 50 mA max. OFF-state leakage current: less than 1 A at 24V dc ON-state saturation voltage: less than 0.25V at 10 mA dc; less than 0.5V at 50 mA dc |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point 100 mA |
| Output Response Time | 1 millisecond ON/OFF |
| Repeatability | 250 microseconds |
| Indicators | Two LEDs: Green: power ON Yellow: light sensed |
| Construction | Black ABS/polycarbonate housing with clear acrylic lens |
| Environmental Rating | IP54; NEMA 3 |
| Connections | 2 m or 9 m attached cable, or 150 mm pigtail with 3-pin Pico-style quick-disconnect fitting. QD cables are ordered separately. See page 80. |
| Operating Conditions | Temperature: -20° to +55° C Relative humidity: 80% at 50° C (non-condensing) |
| Application Notes | M2 stainless steel mounting hardware is included. Optional mounting brackets are available. See page 632. |
| Certifications | |
| Hookup Diagrams | DC01 (p. 758) |

- MINIATURE
- WORLD-BEAM Q12
- T8
- M12
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE





Cordsets


| Pico QD | | |
|----------------|----------|-------------|
| See page 693 | | |
| Threaded 3-Pin | | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG3M-2 | PKW3M-2 |
| 5.00 m | PKG3M-5 | PKW3M-5 |
| 7.00 m | PKG3M-7 | — |
| 9.00 m | PKG3M-9 | PKW3M-9 |
| 10.0 m | PKG3M-10 | — |




Additional cordset information available. See page 693.

Brackets

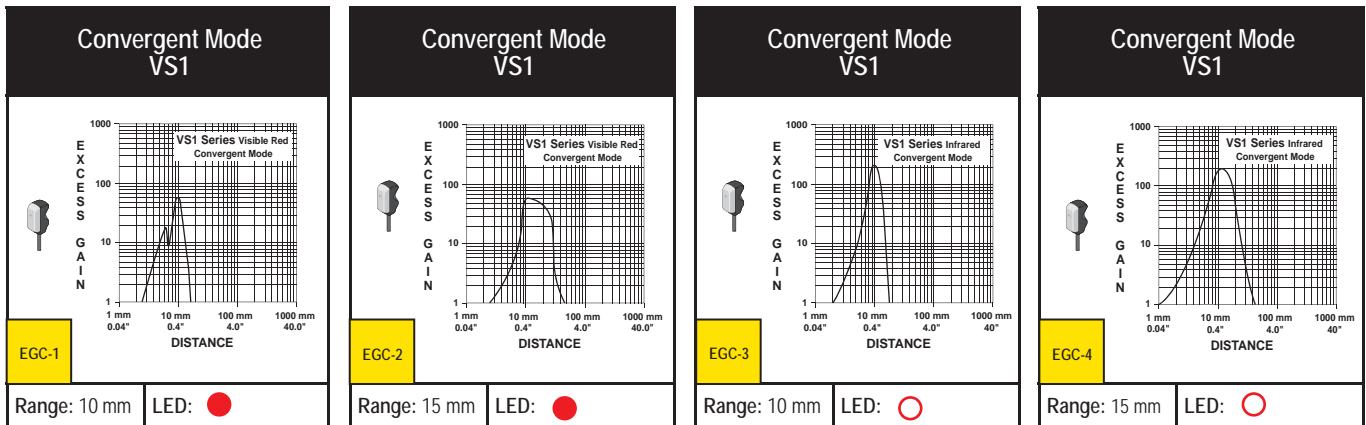
| VS1 | | | |
|---|---|--|---|
|  |  |  |  |
| pg. 688 | pg. 688 | pg. 688 | pg. 688 |
| SMBVS1T | SMBVS1TC | SMBVS1S | SMBVS1SC |


Additional bracket information available. See page 632.

Excess Gain Curves

(Convergent performance based on 90% reflectance white test card)

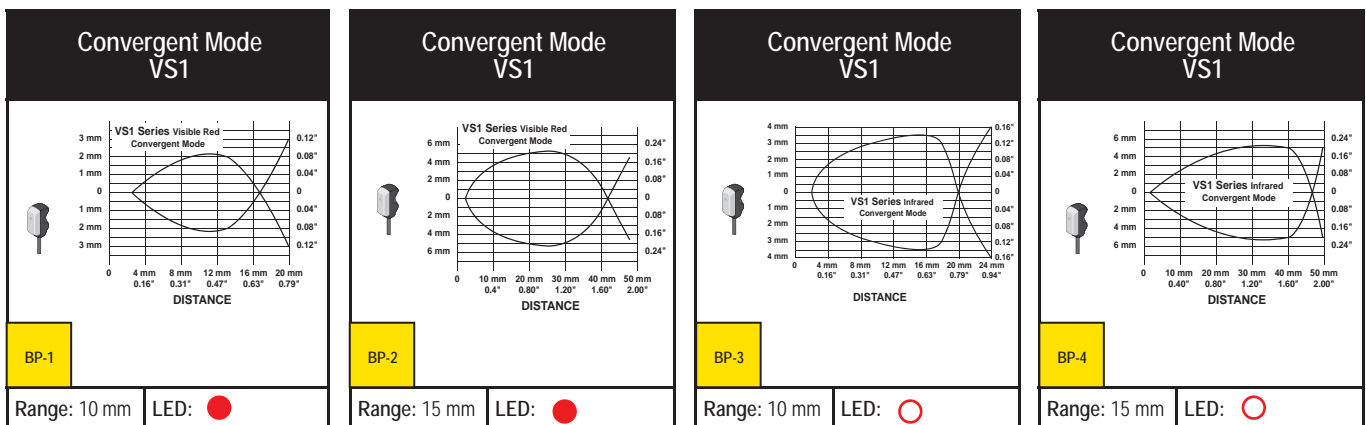
● = Visible Red LED ○ = Infrared LED

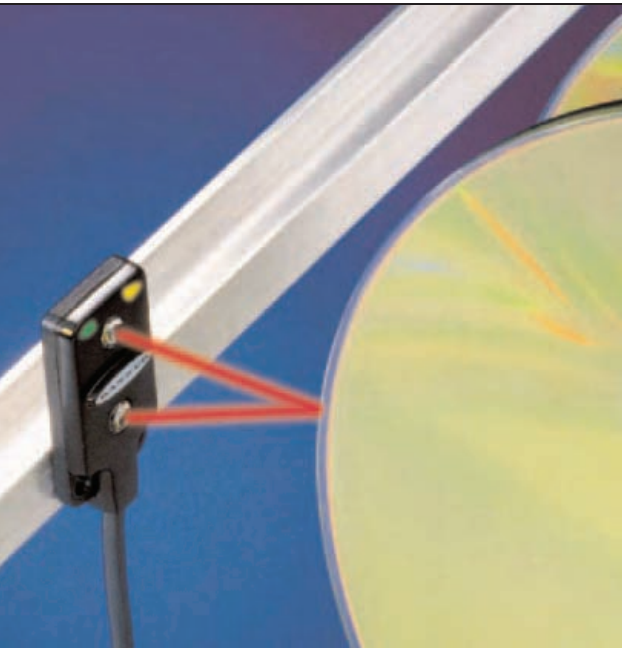


Beam Patterns

(Convergent performance based on 90% reflectance white test card)

● = Visible Red LED ○ = Infrared LED





Ultra-Thin Miniature Sensors VS2

- Specially designed optics and electronics for reliable sensing without adjustments
- Ideal as a low-cost, high-quality miniaturized solution for confined areas
- Available in opposed and convergent modes
- Available in Dark or Light Operate models
- Offers flat front mounting or optional bracket

Photoelectrics Sensors

- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 85



Opposed Models
Suffix E and R

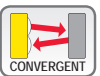
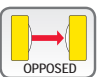


Convergent Models
Suffix C



MINIATURE

- WORLD-BEAM Q12
- T8
- M12
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE



VS2, 10-30V dc

→ Visible Red LED ⇨ Infrared LED

| Sensing Mode/LED | Range | Connection | Output Type | Models [†] NPN | Models [†] PNP | Excess Gain | Beam Pattern |
|-----------------------|----------------------------------|-----------------------|-------------|----------------------------|----------------------------|---------------|--------------|
| OPPOSED | Optimum up to 600 mm, 1.2 m max. | 2 m | — | VS25EV Emitter | | EGC-1 (p. 85) | BP-1 (p. 85) |
| | | 3-Pin Pico Pigtail QD | | VS25EVQ Emitter | | | |
| | | 2 m | LO | VS2AN5R | VS2AP5R | | |
| | | 3-Pin Pico Pigtail QD | | VS2AN5RQ | VS2AP5RQ | | |
| 2 m | DO | VS2RN5R | VS2RP5R | | | | |
| 3-Pin Pico Pigtail QD | | VS2RN5RQ | VS2RP5RQ | | | | |
| OPPOSED | 3.0 m | 2 m | — | VS25E Emitter | | EGC-2 (p. 85) | BP-2 (p. 85) |
| | | 3-Pin Pico Pigtail QD | | VS25EQ Emitter | | | |
| | | 2 m | LO | VS2AN5R | VS2AP5R | | |
| | | 3-Pin Pico Pigtail QD | | VS2AN5RQ | VS2AP5RQ | | |
| 2 m | DO | VS2RN5R | VS2RP5R | | | | |
| 3-Pin Pico Pigtail QD | | VS2RN5RQ | VS2RP5RQ | | | | |

More on next page

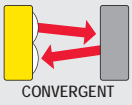
Connection options: A model with a QD requires a mating cordset (see page 85).

For 9 m cable, add suffix W/30 to the 2 m model number (example, VS2RP5R W/30).

† Opposed-mode models also sold as pairs. Contact factory for more information 1-888-373-6767.

VS2, 10-30V dc (cont'd)

 Visible Red LED


| Sensing Mode/LED | Range | Connection | Output Type | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|---|-----------------|-----------------------|-------------|-------------|-------------|------------------|-----------------|
|  CONVERGENT | 15 mm ±5 mm | 2 m | LO | VS2AN5CV15 | VS2AP5CV15 | EGC-3 (p. 85) | BP-3 (p. 85) |
| | | 3-Pin Pico Pigtail QD | | VS2AN5CV15Q | VS2AP5CV15Q | | |
| | | 2 m | DO | VS2RN5CV15 | VS2RP5CV15 | | |
| | | 3-Pin Pico Pigtail QD | | VS2RN5CV15Q | VS2RP5CV15Q | | |
| | 30 mm ±10 mm | 2 m | LO | VS2AN5CV30 | VS2AP5CV30 | EGC-4 (p. 85) | BP-4 (p. 85) |
| | | 3-Pin Pico Pigtail QD | | VS2AN5CV30Q | VS2AP5CV30Q | | |
| | | 2 m | DO | VS2RN5CV30 | VS2RP5CV30 | | |
| | | 3-Pin Pico Pigtail QD | | VS2RN5CV30Q | VS2RP5CV30Q | | |

 Connection options: A model with a QD requires a mating cordset (see page 85).

For 9 m cable, add suffix W/30 to the 2 m model number (example, VS2RP5R W/30).


 ACCESSORIES
page
83

VS2 Specifications

| | |
|--------------------------------|---|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) Emitter: 25 mA (visible red); 30 mA (infrared) Convergent: at less than 25 mA (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model Light Operate (LO) or Dark Operate (DO), depending on model |
| Output Rating | 50 mA max. OFF-state leakage current: less than 1 A at 24V dc ON-state saturation voltage: less than 0.25V at 10 mA dc; less than 0.5V at 50 mA dc |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point 100 mA |
| Output Response Time | Opposed: 1 millisecond ON; 0.5 millisecond OFF Convergent: 1 millisecond ON; OFF |
| Delay at Power-up | Maximum 100 millisecond (opposed) and 150 millisecond (convergent); output does not conduct during this time. |
| Repeatability | Opposed: 100 microseconds Convergent: 160 microseconds |
| Indicators | Two LEDs: Green: power ON Yellow: light sensed |
| Construction | Opposed: Black ABS housing with clear MABS lens Convergent: Black ABS housing with acrylic lens |
| Environmental Rating | IEC IP67; NEMA 6 |
| Connections | 2 m or 9 m attached cable or 150 mm pigtail with 3-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 85. |
| Operating Conditions | Temperature: -20° to +55° C Relative humidity: 80% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | Vibration: All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F Method 201A; 10 to 60 Hz, 0.5 mm peak to peak Shock: All models meet IEC 60068-2-27, IEC 60947-5-2; 30g peak acceleration, 11 millisecond pulse duration, half-sine wave pulse shape |
| Application Notes | M2 stainless steel mounting hardware is included. Optional mounting brackets are available. See page 85. |
| Certifications |  |
| Hookup Diagrams | Emitters: DC02 (p. 758) All others: DC01 (p. 758) |


Cordsets

| Pico QD | | |
|----------------|----------|-------------|
| See page 693 | | |
| Threaded 3-Pin | | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG3M-2 | PKW3M-2 |
| 5.00 m | PKG3M-5 | PKW3M-5 |
| 7.00 m | PKG3M-7 | — |
| 9.00 m | PKG3M-9 | PKW3M-9 |
| 10.0 m | PKG3M-10 | — |



Additional cordset information available. See page 693.

Brackets

| VS2 |
|---|
|  |
| pg. 689 |
| SMBVS2RA |

Additional bracket information available. See page 632.

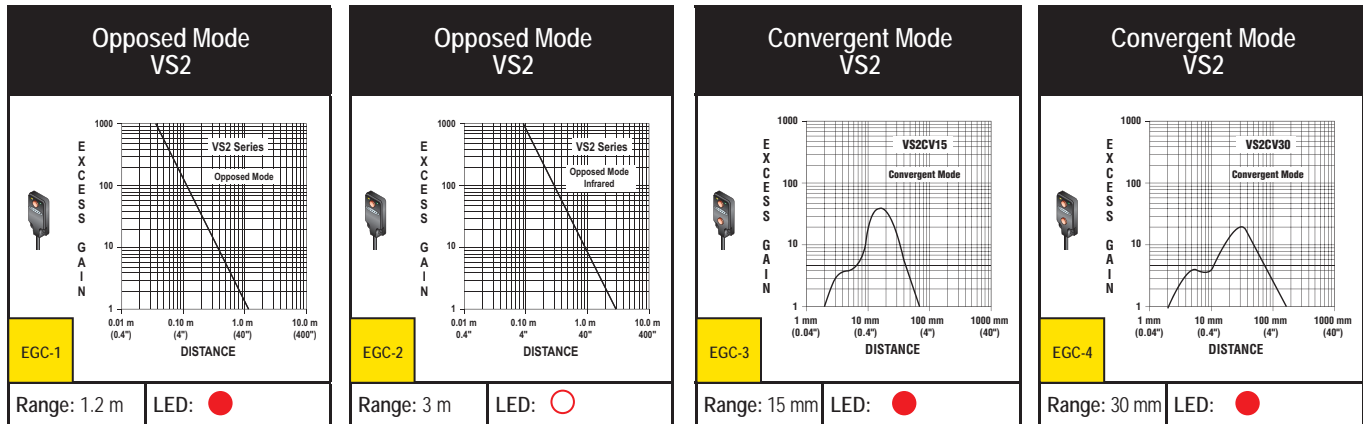


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Excess Gain Curves

(Convergent mode performance based on 90% reflectance white test card)

● = Visible Red LED ○ = Infrared LED

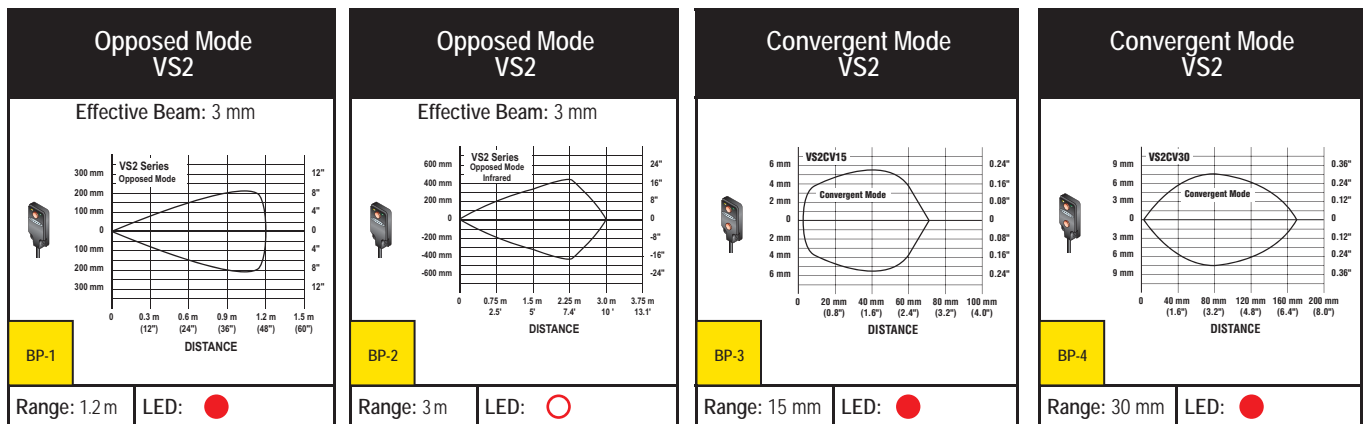


- MINIATURE
- WORLD-BEAM Q12
- T8
- M12
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE

Beam Patterns

(Convergent mode performance based on 90% reflectance white test card)

● = Visible Red LED ○ = Infrared LED

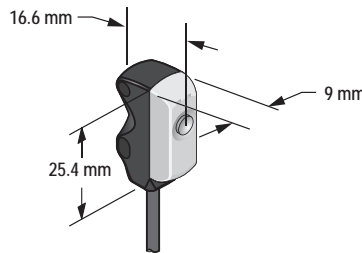


Sensors with Advanced Optics VS3

- Specially designed optics and electronics for reliable sensing without adjustments
- Offers extremely compact self-contained miniature design
- Uses coaxial optics to eliminate blind areas at close range
- Accurately detects shiny objects
- Features visible sensing beam for easy alignment
- Available in Dark or Light Operate models



Non-Polarized Retroreflective Models
Suffix LV

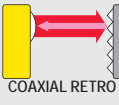



Polarized Retroreflective Models
Suffix LP



VS3, 10-30V dc

→ Visible Red LED

| Sensing Mode/LED | Range† | Connection | Output Type | Models [†] NPN | Models [†] PNP | Excess Gain | Beam Pattern |
|--|--------|---------------|-------------|----------------------------|----------------------------|------------------|-----------------|
|  COAXIAL RETRO | 250 mm | 2 m | LO | VS3AN5XLV | VS3AP5XLV | EGC-1 (p. 88) | BP-1 (p. 88) |
| | | 3-Pin Pico QD | | VS3AN5XLVQ | VS3AP5XLVQ | | |
| | | 2 m | DO | VS3RN5XLV | VS3RP5XLV | | |
| | | 3-Pin Pico QD | | VS3RN5XLVQ | VS3RP5XLVQ | | |
|  COAXIAL POLAR RETRO | 250 mm | 2 m | LO | VS3AN5XLP | VS3AP5XLP | EGC-2 (p. 88) | BP-2 (p. 88) |
| | | 3-Pin Pico QD | | VS3AN5XLPQ | VS3AP5XLPQ | | |
| | | 2 m | DO | VS3RN5XLP | VS3RP5XLP | | |
| | | 3-Pin Pico QD | | VS3RN5XLPQ | VS3RP5XLPQ | | |

Connection options: A model with a QD requires a mating cordset (see page 87).

For 9 m cable, add suffix W/30 to the 2 m model number (example, VS3AN5XLV W/30).

† Retroreflective range is specified using one model BRT-32X20AM retroreflector. Actual sensing range may differ, depending on efficiency and reflective area of the retroreflector in use. See accessories for more information.

| VS3 Specifications | |
|--------------------------------|---|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at less than 25 mA (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state switch NPN (current sinking) or PNP (current sourcing), depending on model Light Operate (LO) or Dark Operate (DO), depending on model |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs. Overload trip point 100 mA |
| Output Rating | 50 mA max. OFF-state leakage current: less than 1 A at 24V dc ON-state saturation voltage: less than 0.25V at 10 mA dc; less than 0.5V at 50 mA dc |
| Output Response Time | 1 millisecond ON/OFF |
| Delay at Power-up | 150 millisecond; output does not conduct during this time. |
| Repeatability | 160 microseconds |
| Indicators | Two LEDs: Green: power ON Yellow: light sensed |
| Construction | Non-polarized Retroreflective: Black ABS housing with acrylic lens Polarized Retroreflective: Black ABS housing with glass lens and acrylic cover |
| Environmental Rating | IEC IP67; NEMA 6 |
| Connections | 2 m or 9 m attached cable, or 3-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 85. |
| Operating Conditions | Temperature: -20° to +55° C Relative humidity: 80% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | Vibration: All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F Method 201A; 10 to 60 Hz, 0.5 mm peak to peak Shock: All models meet IEC 60068-2-27, IEC 60947-5-2; 30g peak acceleration, 11 millisecond pulse duration, half-sine wave pulse shape |
| Application Notes | M3 stainless steel mounting hardware is included. Optional mounting brackets are available. See page 87. |
| Certifications | |
| Hookup Diagrams | Emitters: DC02 (p. 758) All others: DC01 (p. 758) |

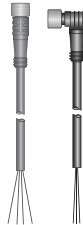
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- WORLD-BEAM Q12
- T8
- M12
- S12/SB12
- VSM
- VS1
- VS2
- VS3
- COMPACT
- MIDSIZE
- FULLSIZE

Cordsets

| Pico QD | | |
|----------------|----------|-------------|
| See page 693 | | |
| Threaded 3-Pin | | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG3M-2 | PKW3M-2 |
| 5.00 m | PKG3M-5 | PKW3M-5 |
| 7.00 m | PKG3M-7 | — |
| 9.00 m | PKG3M-9 | PKW3M-9 |
| 10.0 m | PKG3M-10 | — |

Additional cordset information available.
See page 693.



Brackets

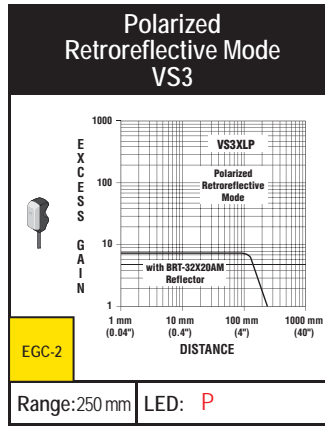
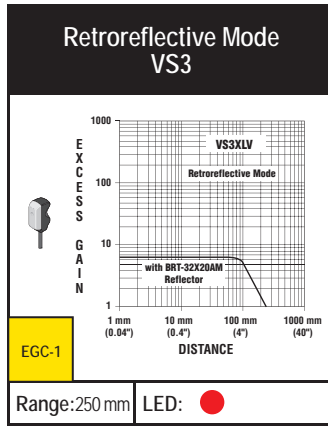
| VS3 | |
|------------------------|------------------------|
| pg. 689 SMBVS3S | pg. 689 SMBVS3T |

Additional bracket information available.
See page 632.



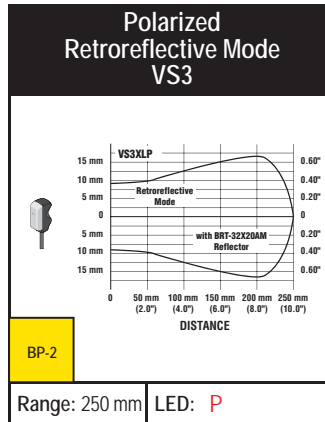
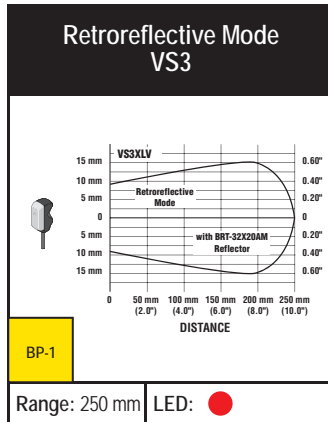
Excess Gain Curves

● = Visible Red LED P = Visible Red LED Polarized



Beam Patterns

● = Visible Red LED P = Visible Red LED Polarized



COMPACT SENSORS

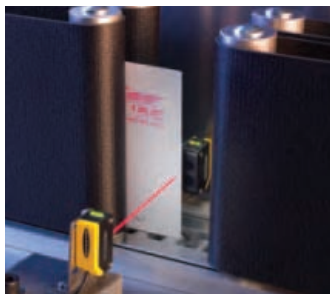


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



WORLD-BEAM® QS18 page 90

- Universal photoelectric family with 18 mm threaded lens or side mounts
- Ideal replacement for hundreds of other sensor styles
- All sensing modes available, including laser, fiber optic and ultrasonic
- *Expert™* push-button teach models available
- Models for ac or dc power



WORLD-BEAM® Q20 page 105

- Powerful sensing in a small package
- Rugged overmolded design for enhanced durability
- Ranges up to 20 m
- Four sensing modes
- Universal threaded inserts with 25.4 mm hole spacing



WORLD-BEAM® Q26 page 110

- Reliable detection of clear, translucent or opaque objects including mirror like surfaces
- Coaxial optics enable reliable detection of targets to the face of the sensor
- Simple setup with a single turn sensitivity adjustment potentiometer



MINI-BEAM® page 112

- Extensive family in all sensing modes and ranges up to 30 m
- *Expert™* push-button teach models available
- Models available for challenging applications including clear plastic detection and NAMUR outputs
- World's most popular photoelectric

- MINIATURE
- COMPACT**
- MIDSIZE
- FULLSIZE



S18 page 131

- Completely epoxy-encapsulated 18 mm threaded plastic barrels
- Specialized laser diode emitter models
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments
- Models for ac or dc power



M18 page 131

- Rugged 18 mm stainless steel threaded barrels
- Opposed, polarized and non-polarized retroreflective, diffuse and fixed-field modes
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments



T18 page 138

- Completely epoxy-encapsulated right-angle, T-shaped package
- Specialized fixed-field and polarized retroreflective models
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments
- Models for ac or dc power



TM18 page 144

- Rugged, metal right-angle, T-shaped package
- Opposed, polarized retroreflective, diffuse and fixed-field models
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments



Q25 page 148

- Compact, rectangular 25 mm right-angle housing with 18 mm threaded mounting base
- Completely epoxy-encapsulated
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments
- Models for ac or dc power

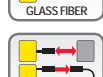
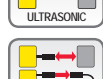
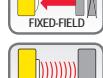
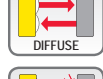
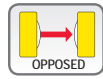
Right-Angle Barrel- & Side-Mount Sensors

WORLD-BEAM® QS18

- Replaces hundreds of other sensors by having a compact housing for limited space setups
- Meets IP67 and NEMA 6 standards for harsh environments
- Available in opposed, polarized and non-polarized retroreflective, convergent, regular and wide-angle diffuse, laser, ultrasonic (see page 321), plastic or glass fiber optic, fixed-field and adjustable-field sensing modes
- Models for dc or ac/dc universal voltage operation
- Easy push-button TEACH-mode setup in *Expert™* QS18E and ultrasonic models
- Ranges up to 20 m
- Features bright LED operating status indicators visible from 360°



ACCESSORIES
page 98



QS18 Sensing Modes



page 91

QS18

- Eight sensing modes for solving most applications: opposed, retroreflective, convergent, diffuse, plastic and glass fiber optic, and adjustable field and fixed field
- High-power infrared or visible red sensing beam
- Models for dc or ac/dc operation



page 91

QS18 Laser

- Opposed, diffuse, retroreflective and adjustable-field models
- High-performance sensing with visible Class 1 and 2 lasers
- Long sensing ranges
- Ideal for confined areas
- Narrow effective beam for small object detection and precise position control
- Emitter models available with five beam shapes



page 92

QS18 Adjustable-Field

- Background suppression models for detection of objects when the background condition is not fixed
- Foreground suppression models for detection when background is fixed and object varies in color or shape
- Visible red LED or laser sensing beam
- Long-range models for reliable sensing up to 300 mm
- Models with crosstalk avoidance circuitry for reliable sensing

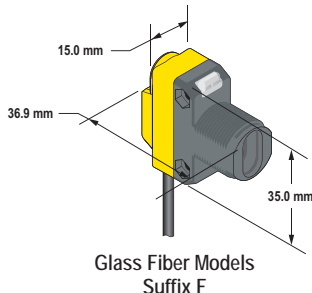


page 95

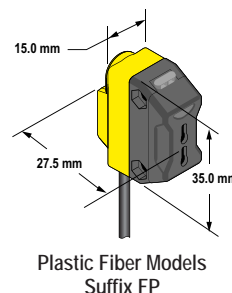
QS18 Expert™

- Single push-button programming of advanced sensing options
- Five sensor configuration options
- Diffuse, convergent, retroreflective and plastic fiber optic modes
- Reliable detection of reflective objects

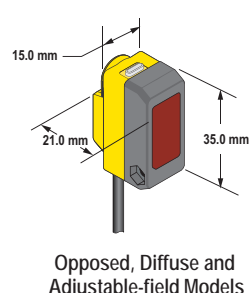
WORLD-BEAM® QS18 DC Series



Glass Fiber Models
Suffix F



Plastic Fiber Models
Suffix FP



Opposed, Diffuse and
Adjustable-field Models
Suffix EB, RB, DB, W and AF

Opposed, Retroreflective,
Laser Retroreflective, Convergent,
Diffuse, Laser Diffuse and Fixed-field Models
Suffix E, R, LV, LP, LLP, CV15,
CV45, D, LD, LE and FF



WORLD-BEAM® QS18, 10-30V dc

→ Infrared LED → Visible Red LED → Visible Red Laser

| Sensing Mode/LED | Range | Connection | Models* NPN | Models* PNP | Excess Gain | Beam Pattern |
|----------------------------------|--------------------------------------|---------------|-------------------|--------------|--------------------------------------|------------------|
| <p>OPPOSED</p> | 20 m | 2 m | QS186E Emitter | | EGC-1 (p. 99) | BP-1 (p. 101) |
| | | 4-pin Euro QD | QS186EQ8 Emitter | | | |
| | | 2 m | QS18VN6R | QS18VP6R | | |
| | | 4-pin Euro QD | QS18VN6RQ8 | QS18VP6RQ8 | | |
| | 3 m | 2 m | QS186EB Emitter | | EGC-2 (p. 99) | BP-2 (p. 101) |
| | | 4-pin Euro QD | QS186EBQ8 Emitter | | | |
| 2 m | | QS18VN6RB | QS18VP6RB | | | |
| 4-pin Euro QD | | QS18VN6RBQ8 | QS18VP6RBQ8 | | | |
| <p>Class 1 LASER EMITTER</p> | 15 m (4500 X excess gain) | 2 m | QS186LE** | | See data sheet for more information. | |
| | | 4-pin Euro QD | QS186LEQ8** | | | |
| <p>Class 1 LASER SPOT</p> | See data sheet for more information. | 2 m | QS186LE10 | | | |
| | | 4-pin Euro QD | QS186LE10Q8 | | | |
| | | 2 m | QS186LE11 | | | |
| | | 4-pin Euro QD | QS186LE11Q8 | | | |
| <p>Class 1 LASER SPOT</p> | See data sheet for more information. | 2 m | QS186LE12 | | | |
| | | 4-pin Euro QD | QS186LE12Q8 | | | |
| <p>Class 1 LASER SPOT</p> | See data sheet for more information. | 2 m | QS186LE14 | | | |
| | | 4-pin Euro QD | QS186LE14Q8 | | | |
| <p>Class 2 LASER EMITTER</p> | 15 m (7000 X excess gain) | 2 m | QS186LE2** | | See data sheet for more information. | |
| | | 4-pin Euro QD | QS186LE2Q8** | | | |
| <p>Class 2 LASER SPOT</p> | See data sheet for more information. | 2 m | QS186LE210 | | | |
| | | 4-pin Euro QD | QS186LE210Q8 | | | |
| | | 2 m | QS186LE211 | | | |
| | | 4-pin Euro QD | QS186LE211Q8 | | | |
| <p>Class 2 LASER SPOT</p> | See data sheet for more information. | 2 m | QS186LE212 | | | |
| | | 4-pin Euro QD | QS186LE212Q8 | | | |
| <p>Class 2 LASER SPOT</p> | See data sheet for more information. | 2 m | QS186LE214 | | | |
| | | 4-pin Euro QD | QS186LE214Q8 | | | |
| <p>RETRO</p> | 6.5 m [†] | 2 m | QS18VN6LV | QS18VP6LV | EGC-3 (p. 99) | BP-3 (p. 101) |
| | | 4-pin Euro QD | QS18VN6LVQ8 | QS18VP6LVQ8 | | |
| <p>POLAR RETRO</p> | 3.5 m [†] | 2 m | QS18VN6LP | QS18VP6LP | EGC-4 (p. 99) | BP-4 (p. 101) |
| | | 4-pin Euro QD | QS18VN6LPQ8 | QS18VP6LPQ8 | | |
| <p>Class 1 LASER POLAR RETRO</p> | 0.1-10 m ^{††} | 2 m | QS18VN6LLP | QS18VP6LLP | EGC-5 (p. 99) | — |
| | | 4-pin Euro QD | QS18VN6LLPQ8 | QS18VP6LLPQ8 | | |

Photoelectrics Sensors

- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 98

MINIATURE COMPACT

- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

More on next page

Connection options: A model with a QD requires a mating cordset (see page 98).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18VN6LV W/30).

QD models (except Laser Emitters): A model with a QD requires a mating cable (see page 98).

- For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18VN6LVQ8).
- For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18VN6LVQ5).
- For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18VN6LVQ7).
- For 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, QS18VN6LVQ).

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

† Retroreflective range is specified using one model BRT-84 retroreflector.

†† Retroreflective range is specified using one model BRT-51X518M or BRT-TVHG-2X2 retroreflector.

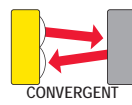
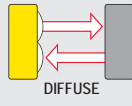
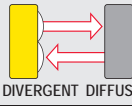

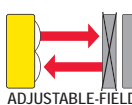
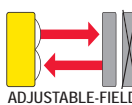
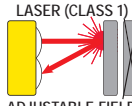
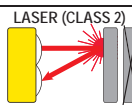
* Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.

** Specified with QS18 threaded lens receiver. Not recommended for dusty or dirty environments; the scattered light would greatly reduce excess gain.

WORLD-BEAM® QS18, 10-30V dc (cont'd)

→ Infrared LED → Visible Red LED → Visible Red Laser

ACCESSORIES
page 98

| Sensing Mode/LED | Range | Connection | Models* NPN | Models* PNP | Excess Gain | Beam Pattern |
|---|---|---|---------------------------------|-----------------|--|--|
|  CONVERGENT | 16 mm | 2 m | QS18VN6CV15 | QS18VP6CV15 | EGC-17 (p. 100) | BP-16 (p. 102) |
| | | 4-pin Euro QD | QS18VN6CV15Q8 | QS18VP6CV15Q8 | | |
| | 43 mm | 2 m | QS18VN6CV45 | QS18VP6CV45 | EGC-18 (p. 100) | BP-17 (p. 102) |
| | | 4-pin Euro QD | QS18VN6CV45Q8 | QS18VP6CV45Q8 | | |
|  DIFFUSE | 450 mm | 2 m | QS18VN6D | QS18VP6D | EGC-7 (p. 99) | BP-6 (p. 101) |
| | | 4-pin Euro QD | QS18VN6DQ8 | QS18VP6DQ8 | | |
| | | 2 m | QS18VN6DB | QS18VP6DB | EGC-8 (p. 99) | BP-7 (p. 101) |
| | | 4-pin Euro QD | QS18VN6DBQ8 | QS18VP6DBQ8 | | |
|  DIVERGENT DIFFUSE | 100 mm | 2 m | QS18VN6W | QS18VP6W | EGC-9 (p. 99) | BP-8 (p. 101) |
| | | 4-pin Euro QD | QS18VN6WQ8 | QS18VP6WQ8 | | |
|  CLASS 1 DIFFUSE LASER | 300 mm | 2 m | QS18VN6LD | QS18VP6LD | EGC-10 (p. 99) | BP-9 (p. 102) |
| | | 4-pin Euro QD | QS18VN6LDQ8 | QS18VP6LDQ8 | | |
|  ADJUSTABLE-FIELD FOREGROUND | Adjustable between 30-200 mm | 2 m | QS18VN6AFF200 | QS18VP6AFF200 | EGC-24 (p. 100) Min Separation Distance MSD-2 (p. 101) | — |
| | | | QS18AB6AFF200 (Bipolar NPN/PNP) | | | |
| | | | 4-pin Euro Pigtail QD | QS18VN6AFF200Q5 | | |
| | Adjustable between 15-40 mm | 2 m | QS18VN6AFF40 | QS18VP6AFF40 | EGC-22 (p. 98) Min Separation Distance MSD-4 (p. 103) | — |
| | | | QS18AB6AFF40 (Bipolar NPN/PNP) | | | |
| | | | 4-pin Euro Pigtail QD | QS18VN6AFF40Q5 | | |
|  ADJUSTABLE-FIELD BACKGROUND SUPPRESSION | Adjustable between 30-300 mm | 2 m | QS18VN6AF300 | QS18VP6AF300 | EGC-23 (p. 100) Min Separation Distance MSD-1 (p. 103) | — |
| | | | QS18AB6AF300 (Bipolar NPN/PNP) | | | |
| | | | 4-pin Euro Pigtail QD | QS18VN6AF300Q5 | | |
| | Adjustable between 15-40 mm | 2 m | QS18VN6AF40 | QS18VP6AF40 | EGC-21 (p. 100) Min Separation Distance MSD-3 (p. 103) | — |
| | | | QS18AB6AF40 (Bipolar NPN/PNP) | | | |
| | | | 4-pin Euro Pigtail QD | QS18VN6AF40Q5 | | |
| | 1 mm to cutoff point (adjustable between 20-100 mm) | 2 m | QS18VN6AF100 | QS18VP6AF100 | EGC-25 (p. 100) Cutoff Point Deviation Curve CPDC-1 (p. 104) | — |
| | | | 4-pin Euro Pigtail QD | QS18VN6AF100Q5 | | |
| |  LASER (CLASS 1) ADJUSTABLE-FIELD BACKGROUND SUPPRESSION | 1 mm to cutoff point (adjustable between 30-150 mm) | 2 m | QS18VN6LAF | QS18VP6LAF | EGC-26 (p. 100) Cutoff Point Deviation Curve CPDC-2 (p. 104) |
| 4-pin Euro Pigtail QD | | | QS18VN6LAFQ5 | QS18VP6LAFQ5 | | |
|  LASER (CLASS 2) ADJUSTABLE-FIELD BACKGROUND SUPPRESSION | 20 mm to cutoff point (adjustable between 50-250 mm) | 2 m | QS18VN6LAF250 | QS18VP6LAF250 | EGC-27 (p. 100) Cutoff Point Deviation Curve CPDC-3 (p. 104) | — |
| | | 4-pin Euro Pigtail QD | QS18VN6LAF250Q5 | QS18VP6LAF250Q5 | | |

More on next page

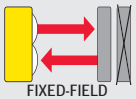
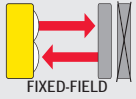
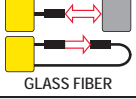
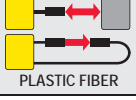
Connection options: A model with a QD requires a mating cordset (see page 98).

- For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18VN6D W/30).
- QD models (except Adjustable-Field):
 - For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18VN6LVQ8).
 - For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18VN6LVQ7).
 - For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18VN6LVQ5).
 - For 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, QS18VN6LVQ).
- QD models (Adjustable-Field only):
 - For 4-pin 150 mm Pico-style QD, add suffix Q (example, QS18VP6AF100Q).
 - For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18VP6AF100Q5).

* Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.

WORLD-BEAM® QS18, 10-30V dc (cont'd)

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Models* NPN | Models* PNP | Excess Gain | Beam Pattern |
|---|--|---------------|----------------|----------------|--------------------------------|---------------------------|
|  FIXED-FIELD | 0-50 mm Cutoff | 2 m | QS18VN6FF50 | QS18VP6FF50 | EGC-28 (p. 100) | — |
| | | 4-pin Euro QD | QS18VN6FF50Q8 | QS18VP6FF50Q8 | | |
|  FIXED-FIELD | 0-100 mm Cutoff | 2 m | QS18VN6FF100 | QS18VP6FF100 | EGC-29 (p. 100) | — |
| | | 4-pin Euro QD | QS18VN6FF100Q8 | QS18VP6FF100Q8 | | |
|  GLASS FIBER | Range varies by sensing mode and fiber optics used | 2 m | QS18VN6F | QS18VP6F | EGC-30 & EGC-31 (p. 100) | BP-20 & BP-21 (p. 102) |
| | | 4-pin Euro QD | QS18VN6FQ8 | QS18VP6FQ8 | | |
|  PLASTIC FIBER | Range varies by sensing mode and fiber optics used | 2 m | QS18VN6FP | QS18VP6FP | EGC-32 & EGC-33 (p. 100) | BP-22 & BP-23 (p. 102) |
| | | 4-pin Euro QD | QS18VN6FPQ8 | QS18VP6FPQ8 | | |

Connection options: A model with a QD requires a mating cordset (see page 98).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18VN6LV W/30).
 QD models:
 • For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18VN6LVQ8). • For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18VN6LVQ5).
 • For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18VN6LVQ7). • For 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, QS18VN6LVQ).

* Contact factory at 1-888-373-6767 for Bipolar NPN/PNP output model options.

Photoelectronics Sensors

Fiber Optic Sensors

Special Purpose Sensors

Measurement & Inspection Sensors

Vision

Wireless

Lighting & Indicators

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
page 98

WORLD-BEAM® QS18 DC Specifications

| | |
|--|---|
| Supply Voltage and Current | Retroreflective, Diffuse and Adjustable-field Laser: 10 to 30V dc (10% max. ripple) at less than 15 mA, exclusive of load Laser Emitters: 10 to 30V dc (10% max. ripple) at less than 35 mA Adjustable-field (40, 200 & 300 mm): 10 to 30V dc (10% max. ripple) at less than 27 mA All others: 10 to 30V dc (10% max. ripple) at less than 25 mA, exclusive of load |
| Laser Characteristics (Laser models only) | Wavelength: Class 1: 650 nm visible red Class 2: Adjustable-field—658 nm visible red Laser Emitter—650 nm visible red |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Laser Control (Emitters only) | Apply 0V dc to white wire to enable beam Apply +10 to 30V dc to white wire to inhibit beam Enable Time: Class 1—240 ms Class 2—8 ms Disable time: Class 1—100 ms Class 2—1 ms |
| Output Configuration* | Solid-state complementary; NPN (current sinking), PNP (current sourcing), or bipolar (both sinking and sourcing depending on model) Rating: 100 mA max. each output at 25° C OFF-state leakage current: Adjustable-field LED (40, 200 & 300 mm), Retroreflective, Diffuse and Adjustable-field Laser: NPN: less than 200 µA @ 30V dc (see Application Note 1) PNP: less than 10 µA @ 30V dc Fixed-field: less than 200 µA @ 30V dc All others: less than 50 µA @ 30V dc ON-state saturation voltage: Adjustable-field LED (40, 200 & 300 mm), Retroreflective, Diffuse and Adjustable-field Laser: NPN: less than 1.6V @ 100 mA PNP: less than 3.0V @ 100 mA All others: less than 1V @ 10 mA; less than 1.5V @ 100 mA Protected against false pulse on power-up and continuous overload or short circuit of outputs |
| Output Response Time* | Opposed: 750 microseconds ON; 375 microseconds OFF Retroreflective Laser, Diffuse Laser and Adjustable-field (100, 150 & 250 mm): 700 microseconds ON/OFF Adjustable-field:(40, 200 & 300 mm): 2.5 milliseconds ON/OFF Fixed-field: 850 microseconds ON/OFF All others: 600 microseconds ON/OFF |
| Delay at Power-up | Laser Emitters: Class 1—250 milliseconds Class 2—10 milliseconds Adjustable-field LED (40, 200 & 300 mm), Retroreflective, Diffuse and Adjustable-field Laser: 200 milliseconds; outputs do not conduct during this time. All others: 100 milliseconds; outputs do not conduct during this time. |

* Does not apply to laser emitter models.

More on next page

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

WORLD-BEAM Q26

MINI-BEAM

S18/M18

T18


TM18

Q25

MIDSIZE

FULLSIZE

WORLD-BEAM® QS18 DC Specifications (cont'd)

| | |
|--|--|
| Repeatability* | Opposed: 100 microseconds Retroreflective Laser, Diffuse Laser and Adjustable-field Laser: 130 microseconds Adjustable-field LED (100 mm): 175 microseconds Adjustable-field LED (40, 200 & 300 mm): 250 microseconds Fixed-field: 160 microseconds All others: 150 microseconds |
| Sensing Hysteresis* | Retroreflective Laser: 12% of range typical Diffuse Laser: 15% of range typical Adjustable-field (100 mm): 0.5% of range typical at 20 mm cutoff, 1% of range typical at 50 mm cutoff, 3% of range typical at 100 mm cutoff Adjustable-field Laser (Class 1): 1% range typical at 30 mm cutoff, 2% range typical at 75 mm cutoff, 5% range typical at 150 mm cutoff Adjustable-field Laser (Class 2): 1% range typical at 50 mm cutoff, 2% range typical at 150 mm cutoff, 5% range typical at 250 mm cutoff |
| Adjustments* | Retroreflective, Retroreflective Laser, Convergent, Diffuse, Diffuse Laser and Glass & Plastic Fiber Optic: Single-turn sensitivity (Gain) adjustment potentiometer Adjustable-field: Five-turn adjustment screw sets cutoff distance between min. and max. position |
| Indicators | Laser Emitters: Green LED: Power applied All others, 2 LED indicators: Green: Power ON Yellow: Light sensed See data sheet for detailed information |
| Construction | ABS housing; acrylic lens cover (Laser Emitter models have PMMA window) 2.5 mm (adjustable-field only) and 3 mm mounting hardware included |
| Environmental Rating | Rated IEC IP67; NEMA 6; UL Type 1 |
| Connections | 2 m or 9 m 4-wire PVC cable, or 4-pin 150 mm pigtail Pico-style QD (Q), or 4-pin 150 mm pigtail Euro-style QD (Q5), or 4-pin Integral Pico-style QD (Q7), or 4-pin Integral Euro-style QD (Q8), depending on model. QD cordsets are ordered separately. See page 98. |
| Operating Conditions | Lasers Adjustable-field LED (100 mm) Adjustable-field LED (40, 200 & 300 mm) All others Temperature: -10° to +50° C 0° to +55° C -20° to +55° C -20° to +70° C Relative humidity: 95% @ 50° C (non-condensing) |
| Laser Classification (Laser models only) | Class 1 and Class 2 laser product; complies with IEC 60825-1: 2001 and 21 CFR 1040.10, except deviations pursuant to Laser Notice 50, dated 7-26-01. |
| Certifications |  |
| Application Notes | NPN off-state leakage current is < 200 µA for load resistances > 3 kΩ or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current |
| Hookup Diagrams | LED Emitters: DC02 (p. 758) Single output: DC03 (p. 758) Bipolar: DC04 (p. 758) Laser Emitters: DC22 (p. 762) |

* Does not apply to laser emitter models.

Class 1 Laser Sensors

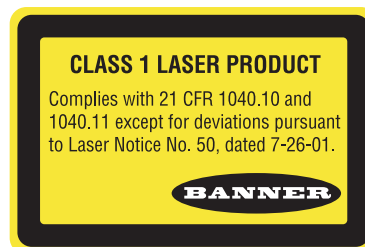
Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1: 2001, section 8.2.

Class 2 Lasers

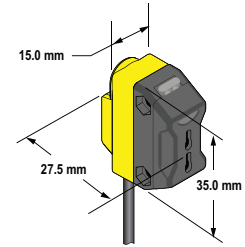
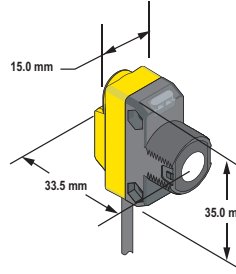
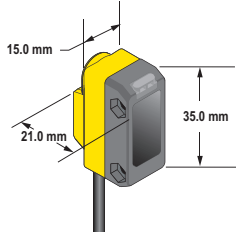
Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm, where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference IEC 60825-1:2001, section 8.2.

For safe laser use (Class 1 or Class 2):

- Do not permit a person to stare at the laser from within the beam.
- Do not point the laser at a person's eye at close range.
- Terminate the beam emitted by a Class 2 laser product at the end of its useful path.
- Locate open laser beam paths either above or below eye level, where practical.



WORLD-BEAM® QS18 Expert™ and Ultrasonic Sensors



Retroreflective, Convergent and Diffuse Models
Suffix LP, CV15, CV45, D and DV

Diffuse Models
Suffix DB and W

Ultrasonic Models
Suffix NA and PA

Plastic Fiber Models
Suffix FP



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



WORLD-BEAM® QS18, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|-----------------------|--|---------------|---------------|---------------|-----------------------------|---------------------------|
| POLAR RETRO | 3.5 m [†] | 2 m | QS18EN6LP | QS18EP6LP | EGC-6 (p. 99) | BP-5 (p. 101) |
| | | 4-pin Euro QD | QS18EN6LPQ8 | QS18EP6LPQ8 | | |
| CONVERGENT | 16 mm | 2 m | QS18EN6CV15 | QS18EP6CV15 | EGC-19 (p. 100) | BP-18 (p. 102) |
| | | 4-pin Euro QD | QS18EN6CV15Q8 | QS18EP6CV15Q8 | | |
| | 43 mm | 2 m | QS18EN6CV45 | QS18EP6CV45 | EGC-20 (p. 100) | BP-19 (p. 102) |
| | | 4-pin Euro QD | QS18EN6CV45Q8 | QS18EP6CV45Q8 | | |
| DIFFUSE | 800 mm | 2 m | QS18EN6D | QS18EP6D | EGC-13 (p. 99) | BP-12 (p. 102) |
| | | 4-pin Euro QD | QS18EN6DQ8 | QS18EP6DQ8 | | |
| | 500 mm | 2 m | QS18EN6DB | QS18EP6DB | EGC-14 (p. 99) | BP-13 (p. 102) |
| | | 4-pin Euro QD | QS18EN6DBQ8 | QS18EP6DBQ8 | | |
| DIVERGENT DIFFUSE | 300 mm | 2 m | QS18EN6W | QS18EP6W | EGC-15 (p. 99) | BP-14 (p. 102) |
| | | 4-pin Euro QD | QS18EN6WQ8 | QS18EP6WQ8 | | |
| DIFFUSE | 600 mm | 2 m | QS18EN6DV | QS18EP6DV | EGC-16 (p. 99) | BP-15 (p. 102) |
| | | 4-pin Euro QD | QS18EN6DVQ8 | QS18EP6DVQ8 | | |
| PLASTIC FIBER | Range varies by sensing mode and fiber optics used | 2 m | QS18EN6FP | QS18EP6FP | EGC-34 & EGC-35 (p. 101) | BP-24 & BP-25 (p. 102) |
| | | 4-pin Euro QD | QS18EN6FPQ8 | QS18EP6FPQ8 | | |

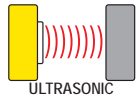
- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Connection options: A model with a QD requires a mating cordset (see page 98).

- For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18EN6LP W/30).
- QD models
 - For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18EN6LPQ8).
 - For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18EN6LPQ7).
 - For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18EN6LPQ5).
 - For 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, QS18EN6LPQ).

[†] Retroreflective range is specified using one model BRT-84 retroreflector.
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

WORLD-BEAM® QS18 Ultrasonic, 12-30V dc

| Sensing Mode/LED | Range | Connection | Models [†] NPN | Models [†] PNP | Excess Gain | Beam Pattern |
|---|-------------|---------------|----------------------------|----------------------------|-------------|--------------|
|  ULTRASONIC | 50 - 500 mm | 2 m | QS18UNA | QS18UPA | — | — |
| | | 4-pin Euro QD | QS18UNAQ8 | QS18UPAQ8 | | |
| | | 2 m | QS18UNAE ^{††} | QS18UPAE ^{††} | | |
| | | 4-pin Euro QD | QS18UNAEQ8 ^{††} | QS18UPAEQ8 ^{††} | | |

Connection options: A model with a QD requires a mating cordset (see page 98).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18UNA W/30).

QD models:

• For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18UNAQ8).

• For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18UNAQ7).


• For 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, QS18UNAQ5).

• For 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, QS18UNAQ).

[†] For complete information see QS18U Ultrasonic Sensors on page 325.

^{††} Models are epoxy-encapsulated, IP68; NEMA 6P with remote TEACH programming.

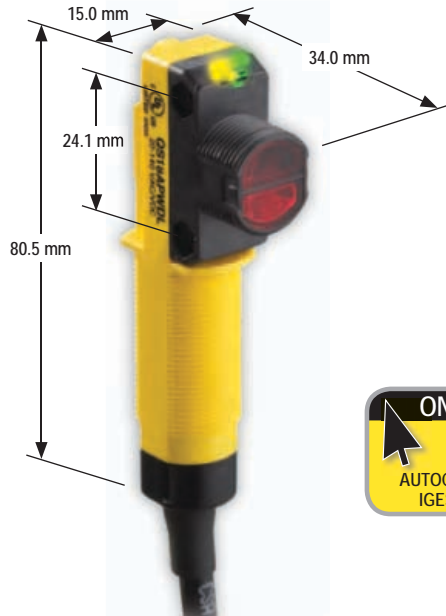
WORLD-BEAM® QS18 Expert™ Specifications

| | |
|-----------------------------|--|
| Supply Voltage | 10 to 30V dc (10% max. ripple) at less than 35 mA, exclusive of load; 10 to 24V dc @ greater than 55° C |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state NPN (current sinking) or PNP (current sourcing), depending on model Light (LO) or Dark Operate (DO) selectable Selectable 30 millisecond output OFF-delay Rating: 100 mA max. OFF-state leakage current: less than 50 µA @ 30V dc ON-state saturation voltage: less than 1.5V (2 m cable); 1.7V (9 m cable) Protected against false pulse on power-up and continuous overload or short circuit of output |
| Output Response Time | 600 microseconds ON/OFF |
| Delay at Power-up | Momentary delay on power-up; outputs do not conduct during this time |
| Repeatability | 75 microseconds |
| Adjustments | <ul style="list-style-type: none"> • Thresholds: Push-button/remote-wire configurable • Five Expert™-style TEACH and SET options Light/Dark Operate: selectable by programming order (load output follows the first taught target condition) • Push-button enable/disable: (remote wire only) See data sheet for detailed information |
| Indicators | 2 LED indicators: Green: RUN mode, output short-circuit Yellow: Output ON/marginal, TEACH mode |
| Construction | ABS housing, PMMA lens rated IEC IP67; NEMA 6 3 mm mounting hardware included |
| Environmental Rating | Meets NEMA 6; IEC IP67; UL Type 1 |
| Connections | 2 m or 9 m 4-wire PVC cable, or 4-pin 150 mm pigtail Pico-style QD (Q), or 4-pin 150 mm pigtail Euro-style QD (Q5), or 4-pin Integral Pico-style QD (Q7), or 4-pin Integral Euro-style QD (Q8). QD cordsets are ordered separately. See page 98. |
| Operating Conditions | Temperature: -20° to +70° C Relative humidity: 95% @ 50° C (non-condensing) |
| Certifications |  |
| Hookup Diagrams | DC07 (p. 759) |

WORLD-BEAM® QS18 Ultrasonic Specifications

See page 326

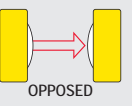

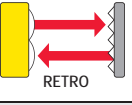
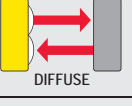
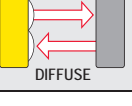
WORLD-BEAM® QS18 Universal Voltage Sensors



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 98

WORLD-BEAM® QS18 Universal Voltage, 20-140V ac/dc or 20-270V ac/dc ⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Output†† | Models LO | Models DO | Excess Gain | Beam Pattern |
|--|--------|---------------------|----------------|------------|-------------------|-------------------|
|  OPPOSED | 20 m | — | QS18WE Emitter | | EGC-1 (p. 99) | BP-1 (p. 101) |
| | | N-MOSFET (Sinking) | QS18ANWR | QS18RNWR | | |
| | | P-MOSFET (Sourcing) | QS18APWR | QS18RPWR | | |
|  POLAR RETRO | 3.5 m† | N-MOSFET (Sinking) | QS18ANWLP | QS18RNWLP | EGC-4 (p. 99) | BP-4 (p. 101) |
| | | P-MOSFET (Sourcing) | QS18APWLP | QS18RPWLP | | |
|  RETRO | 6.5 m† | N-MOSFET (Sinking) | QS18ANWLV | QS18RNWLV | EGC-3 (p. 99) | BP-3 (p. 101) |
| | | P-MOSFET (Sourcing) | QS18APWLV | QS18RPWLV | | |
|  DIFFUSE | 450 mm | N-MOSFET (Sinking) | QS18ANWDL | QS18RNWDL | EGC-11 (p. 99) | BP-10 (p. 102) |
| | | P-MOSFET (Sourcing) | QS18APWDL | QS18RPWDL | | |
|  DIFFUSE | 1 m | N-MOSFET (Sinking) | QS18ANWDXL | QS18RNWDXL | EGC-12 (p. 99) | BP-11 (p. 102) |
| | | P-MOSFET (Sourcing) | QS18APWDXL | QS18RPWDXL | | |

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Connection options: A model with a QD requires a mating cordset (see page 98).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18WE W/30).
 QD models
 • For 4-pin 150 mm Micro-style pigtail QD, add suffix Q2 to the model number (example, QS18WEQ2).
 600V cable models: Standard models are supplied with 300V cable. For a 600V cable, add suffix C1 to the 2 m model number (example, QS18WEC1).


† Retroreflective range is specified using one model BRT-84 retroreflector.
 Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.
 †† MOSFET: Metal oxide semiconductor field-effect transistor.

| WORLD-BEAM® QS18 Universal Voltage Specifications | |
|---|--|
| Supply Voltage | P-MOSFET Models: 20 to 140V ac/dc @ < 10 mA, exclusive of load N-MOSFET Models: 20 to 270V ac/dc @ < 10 mA, exclusive of load |
| Supply Protection Circuitry | Protected against reverse polarity and transient over-voltages |

➔

More on next page


WORLD-BEAM® QS18 Universal Voltage Specifications (cont'd)

| | | |
|-----------------------------|---|---|
| Output Configuration | Single Discrete Output, 100 mA load rating N-MOSFET or P-MOSFET, depending on model number Light Operate or Dark Operate, depending on model number | |
| Output Rating | P-MOSFET models 100 mA with short circuit protection OFF-state leakage current: < 400 µA ON-state saturation voltage: 2.75V | N-MOSFET models 100 mA with short circuit protection OFF-state leakage current: < 400 µA ON-state saturation voltage: 2.5V |
| Output Protection Circuitry | Protected against output short-circuit and false pulse on power up Latching short-circuit protection; reset by cycling power | |
| Delay at Power-up | 100 milliseconds max. dc, 300 milliseconds max. ac; outputs do not conduct during this time | |
| Repeatability | 1.5 milliseconds | |
| Output Response Time | Opposed mode: 16.6 milliseconds (1 cycle at 60 Hz) All other modes: 8.3 milliseconds (½ cycle at 60 Hz) | |
| Adjustments | Diffuse, Retroreflective and Polarized Retroreflective models only: 1-turn potentiometer Sensitivity (Gain) adjustment | |
| Indicators | Green: Power ON Yellow: Light Sensed | |
| Construction | Housing: ABS Lenses: PMMA Gain Adjuster: acetal | |
| Environmental Rating | IEC IP67 (NEMA 6); 1200 PSI washdown NEMA ICS5, Annex F-2002 (PW12); UL Type 1 | |
| Connections | 2 m 3-conductor, 22 AWG PVC cable (300V ac), or 150 mm pigtail PVC cable with 4-pin threaded Micro-style connector; C1 suffix models: 2 m 3-conductor, 22 AWG PVC cable (600V ac) | |
| Operating Conditions | Temperature: Less than 140V ac/dc: -25° to +70° C (N-MOSFET and P-MOSFET models) 140V ac/dc or greater: -25° to +55° C (N-MOSFET models only) Max. Relative Humidity: 95% @ 55° C (non-condensing) | |
| Certifications |  | |
| Hookup Diagrams | Cabled Emitters: UN03 (p. 767) QD Emitters: UN04 (p. 767) | Other cable models: UN05 (p. 768) Other QD models: UN06 (p. 768) |






Cordsets




| Euro QD | | | Euro QD (with Shield) | | | Pico QD | | | Pico QD (with Shield) | | | Micro QD | |
|----------------|----------|-------------|-----------------------|------------|--------------|---------------|----------|-------------|-----------------------|----------|-------------|----------------|----------|
| See page 696 | | | See page 697 | | | See page 694 | | | See page 695 | | | See page 712 | |
| Threaded 4-Pin | | | Threaded 4-Pin | | | Snap-on 4-Pin | | | Snap-on 4-Pin | | | Threaded 4-Pin | |
| Length | Straight | Right-Angle | Length | Straight | Right-Angle | Length | Straight | Right-Angle | Length | Straight | Right-Angle | Length | Straight |
| 1.83 m | MQDC-406 | MQDC-406RA | 1.83 m | MQDEC2-406 | MQDEC2-406RA | 2.00 m | PKG4-2 | PKW4Z-2 | 2.00 m | PKG4S-2 | PKW4ZS-2 | 1.83 m | MQAC-406 |
| 4.57 m | MQDC-415 | MQDC-415RA | 4.57 m | MQDEC2-415 | MQDEC2-415RA | | | | | | | 4.57 m | MQAC-415 |
| 9.14 m | MQDC-430 | MQDC-430RA | 9.14 m | MQDEC2-430 | MQDEC2-430RA | | | | | | | 9.14 m | MQAC-430 |

 Additional cordset information available. See page 693.

Brackets

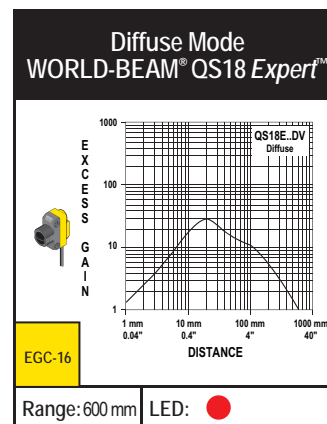
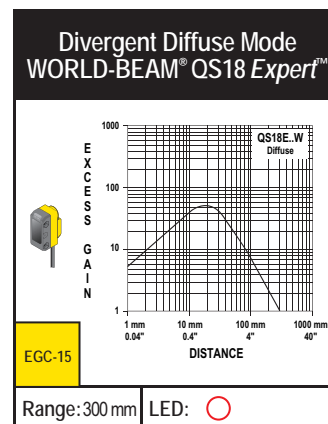
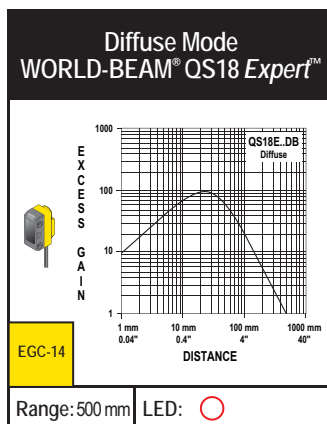
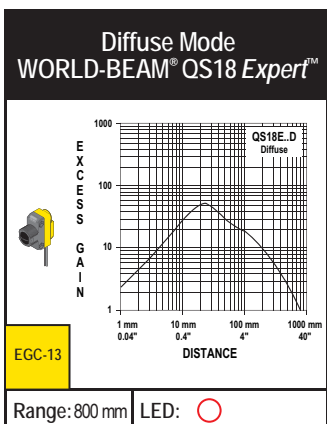
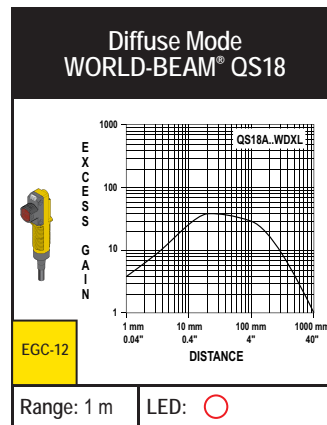
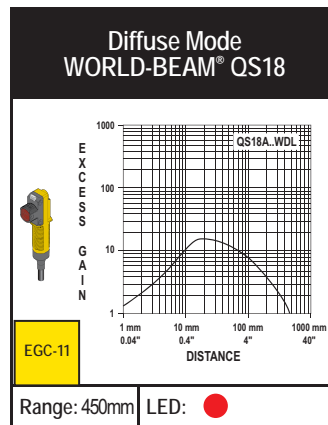
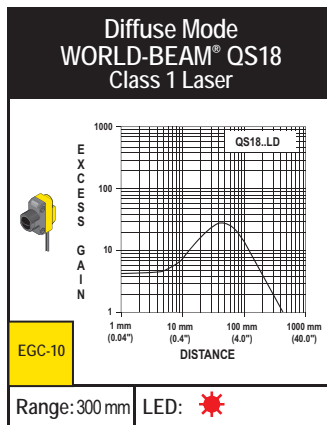
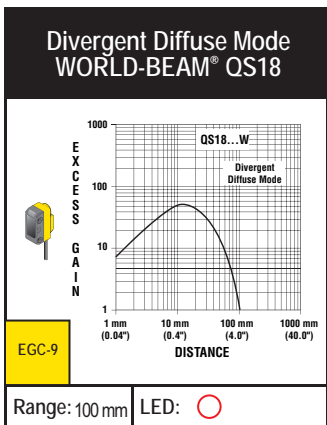
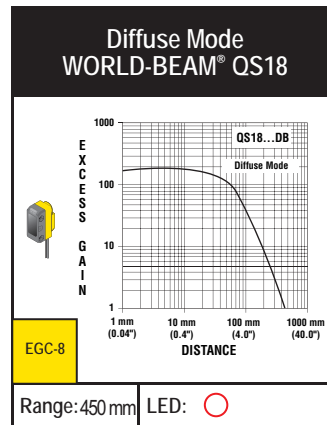
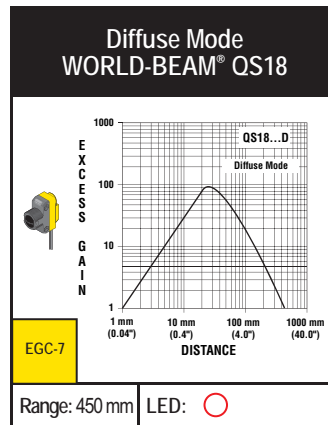
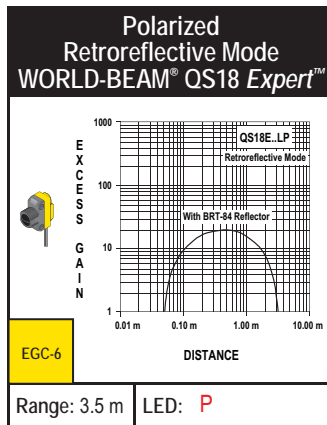
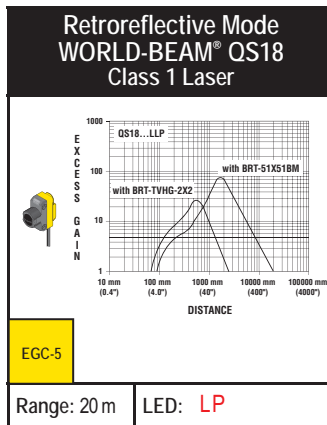
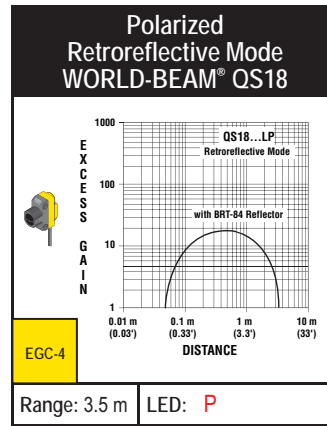
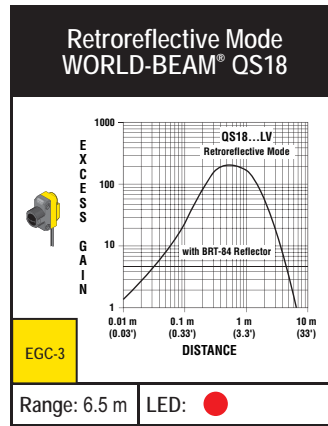
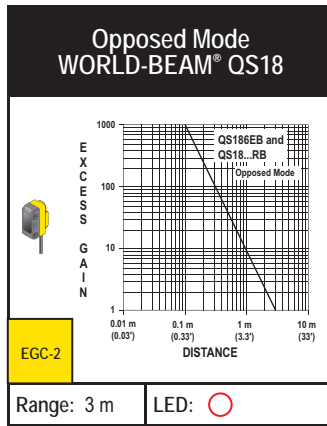
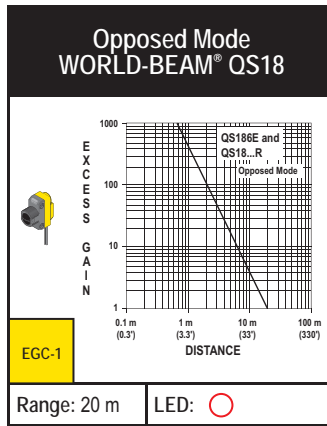
| QS18 | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
| pg. 650 | pg. 651 | pg. 683 | pg. 684 | pg. 652 |
| SMB18A | SMB18FA.. | SMBQS18A | SMBQS18AF | SMB18SF |

 Additional brackets and information available. See page 632.



Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized LP = Visible Red Laser Polarized ✶ = Visible Red Laser



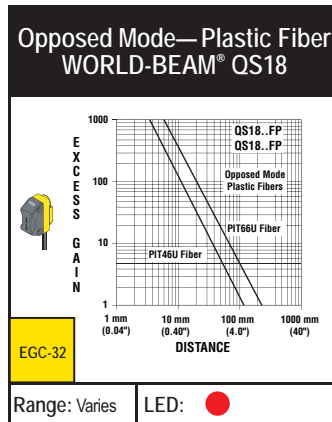
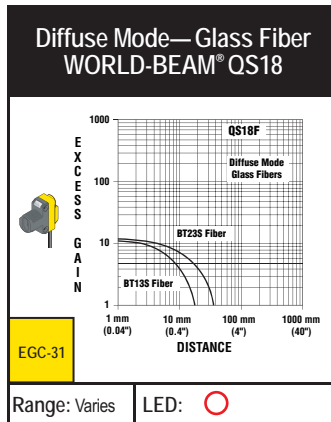
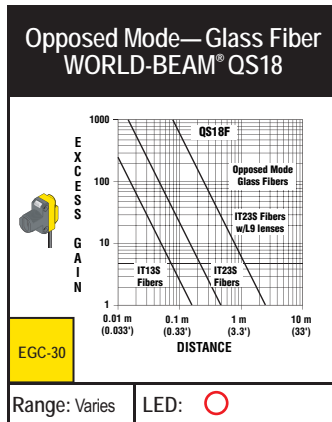
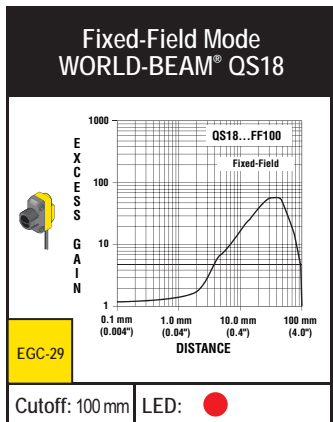
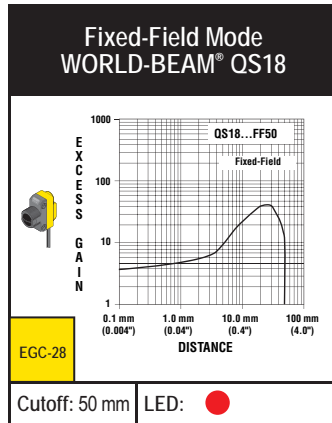
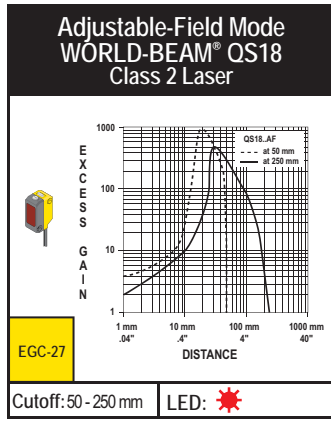
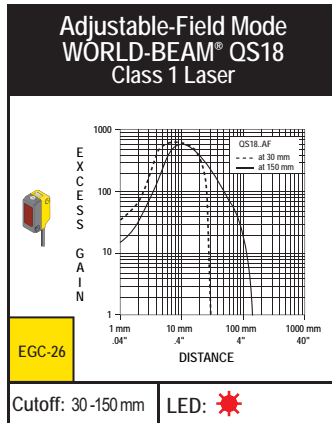
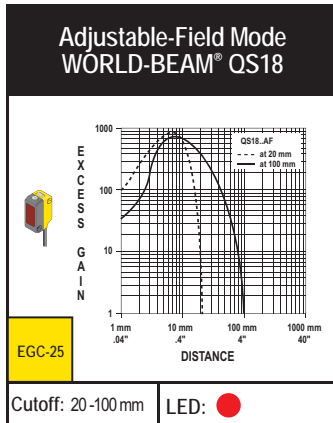
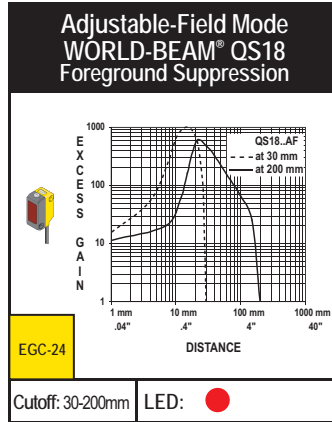
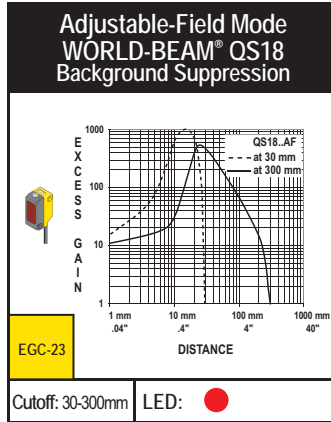
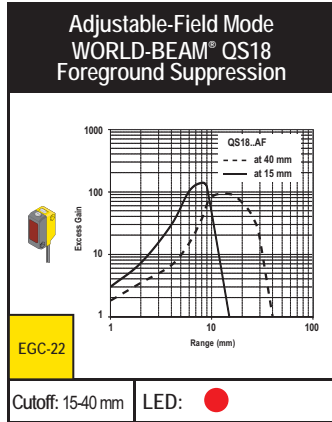
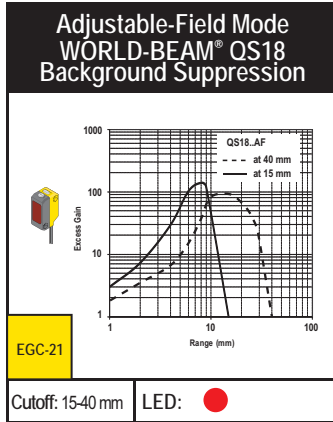
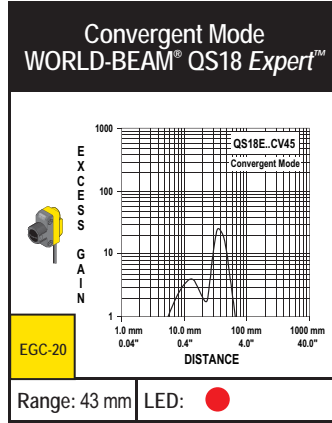
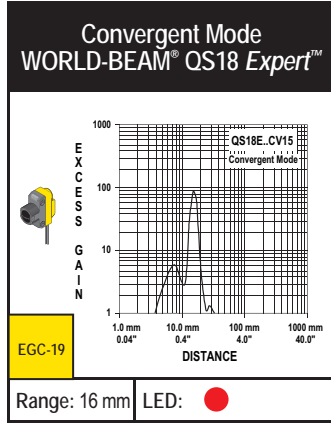
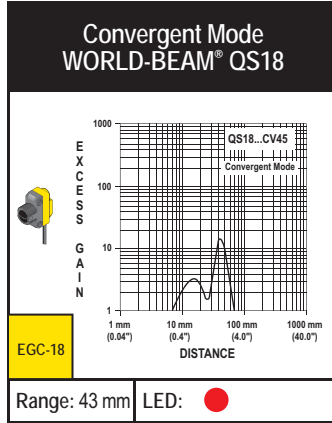
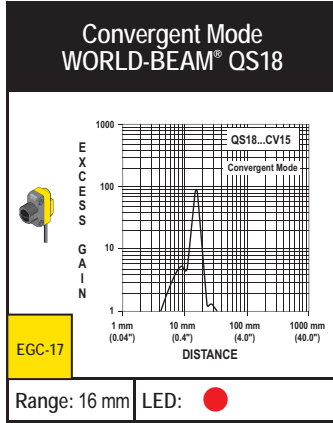
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Excess Gain Curves (Convergent, Diffuse, Adjustable-Field and Fixed-Field mode performance based on 90% reflectance white test card)

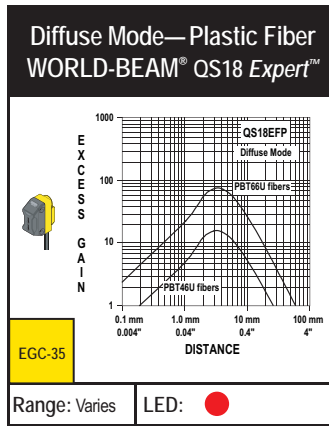
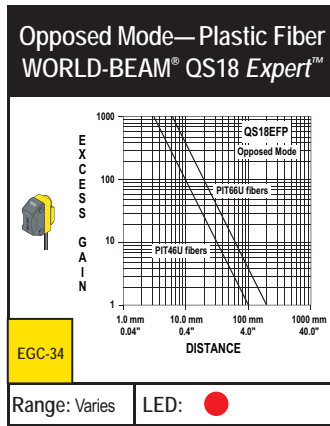
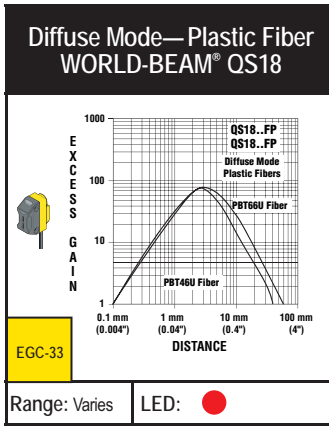
○ = Infrared LED ● = Visible Red LED ✨ = Visible Red Laser

SENSORS



Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

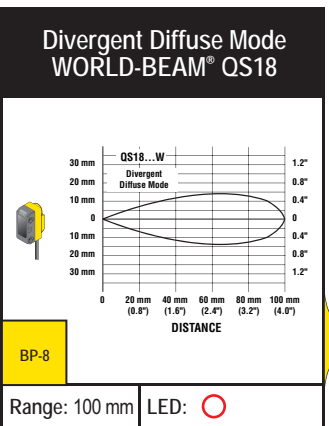
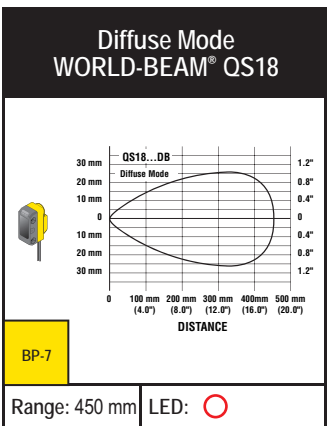
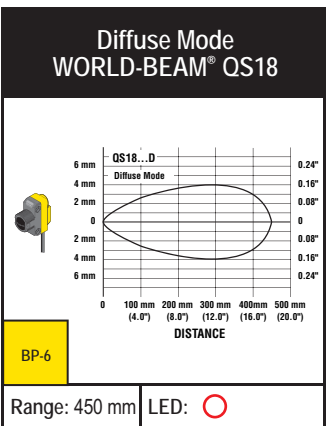
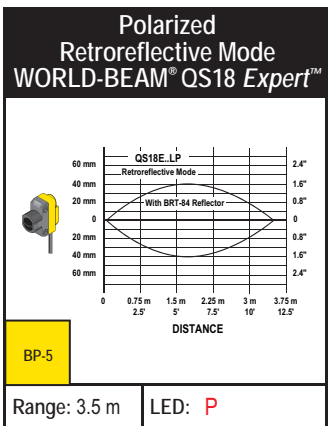
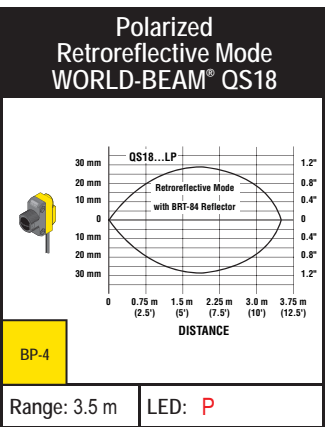
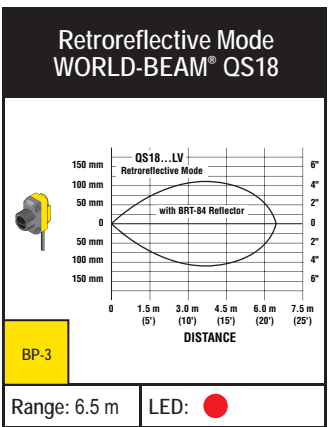
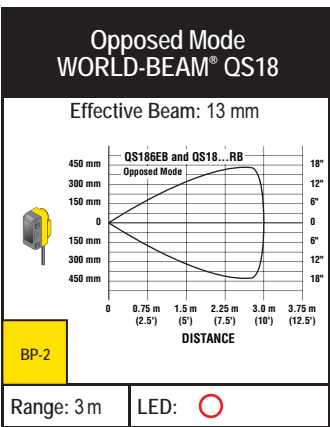
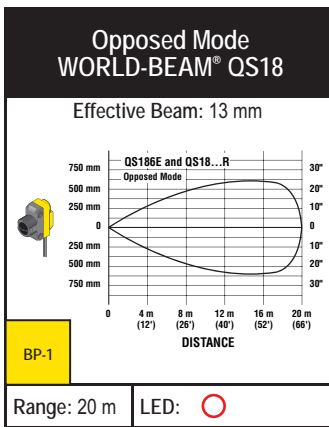
● = Visible Red LED



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized



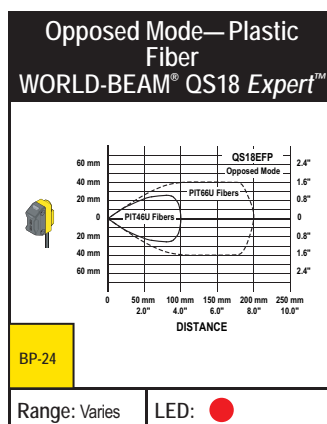
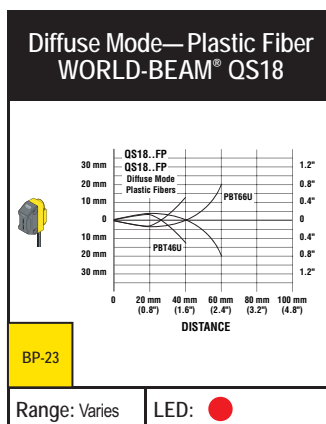
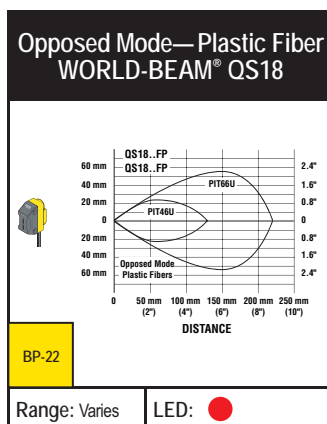
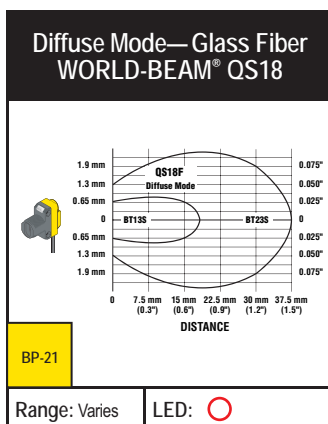
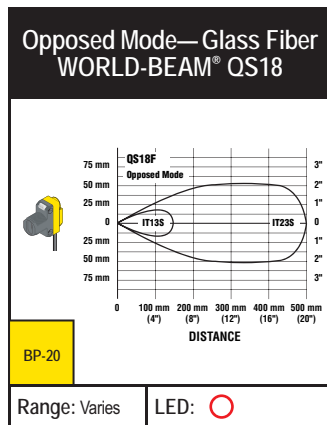
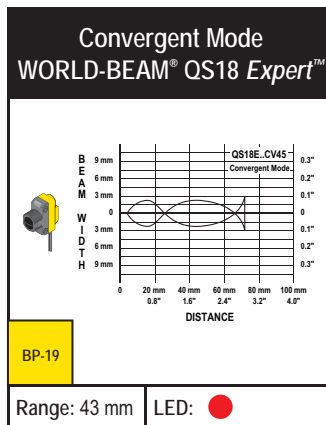
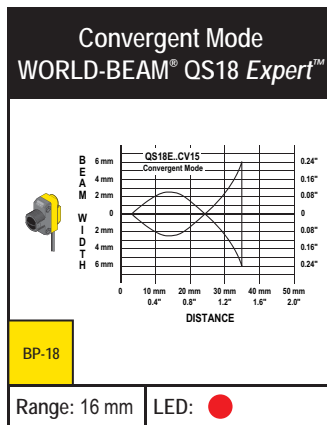
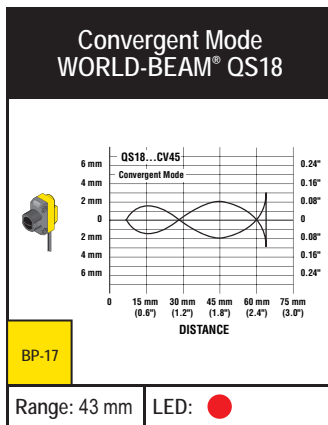
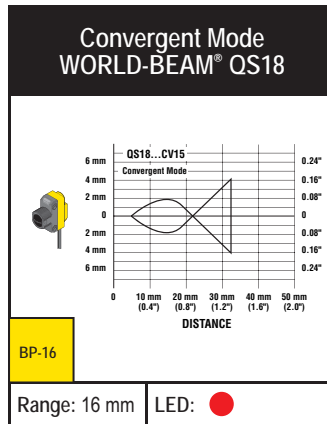
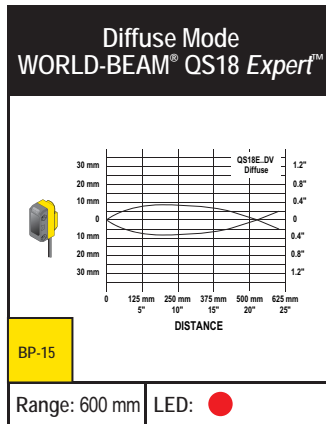
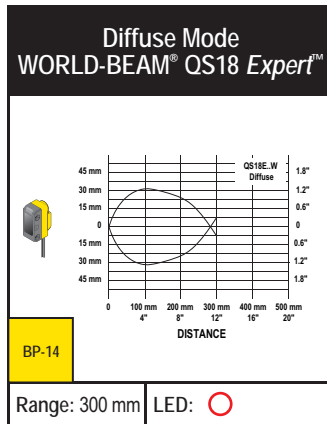
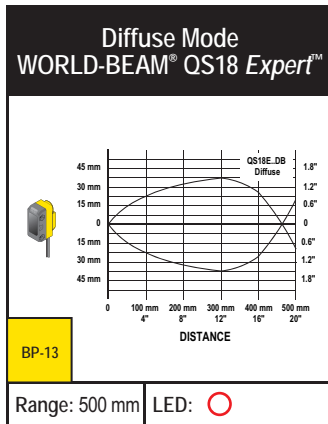
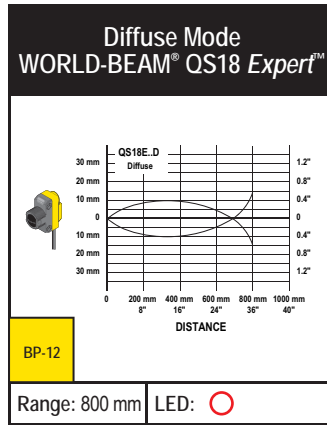
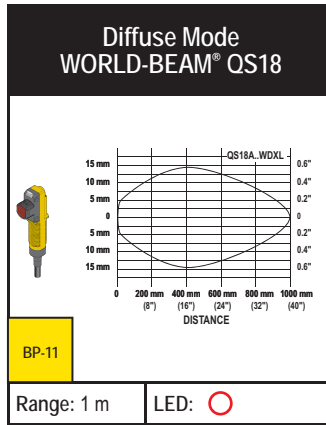
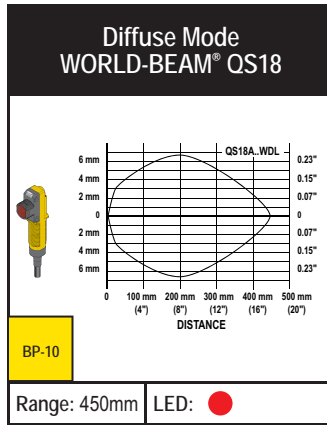
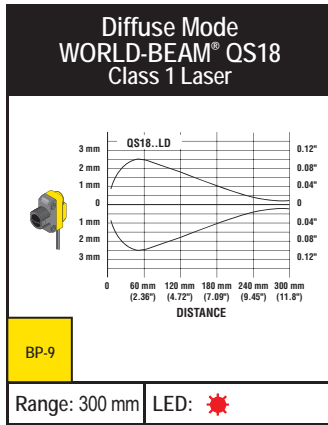
- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE



Beam Patterns

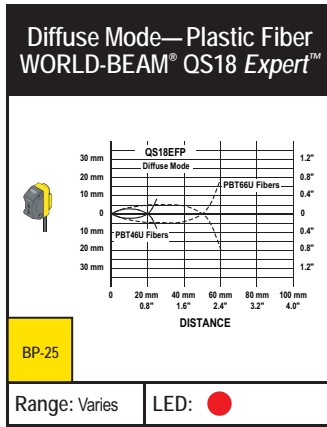
(Diffuse and Convergent mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED ✶ = Visible Red Laser



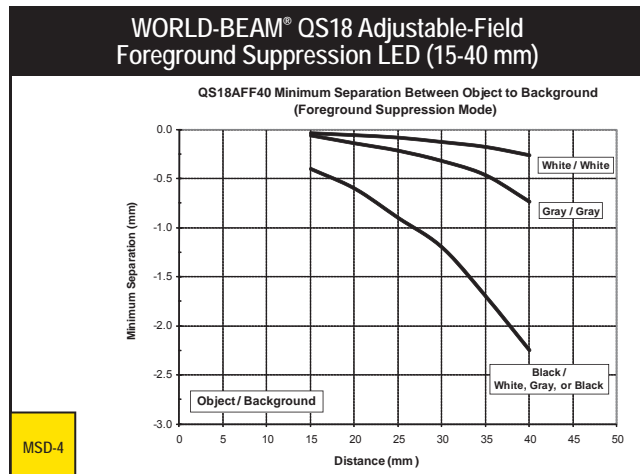
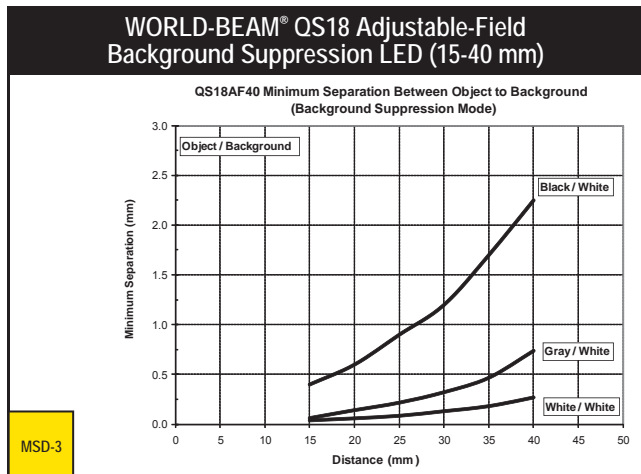
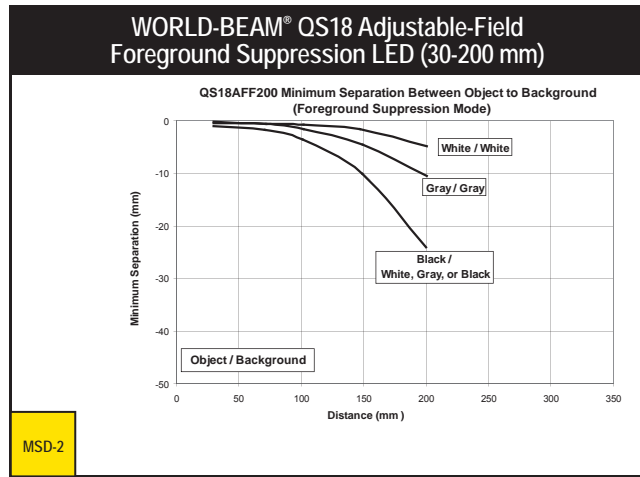
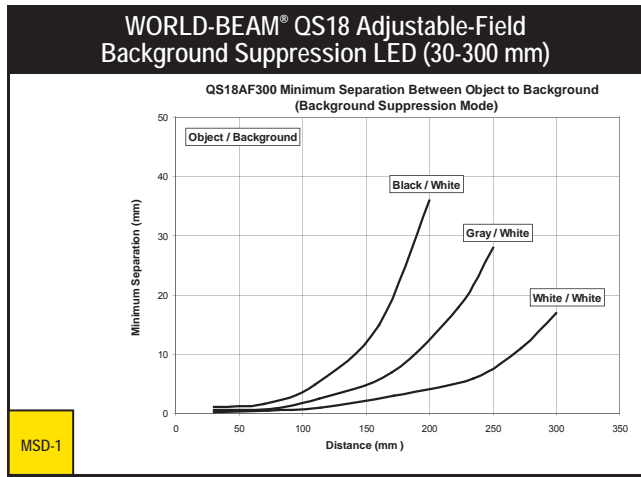
Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED



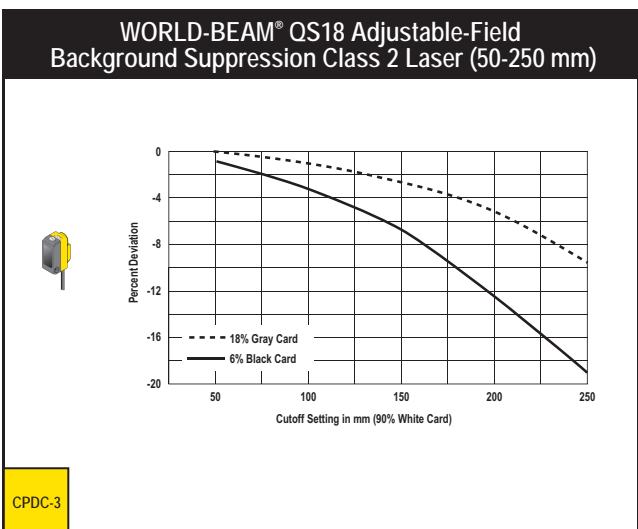
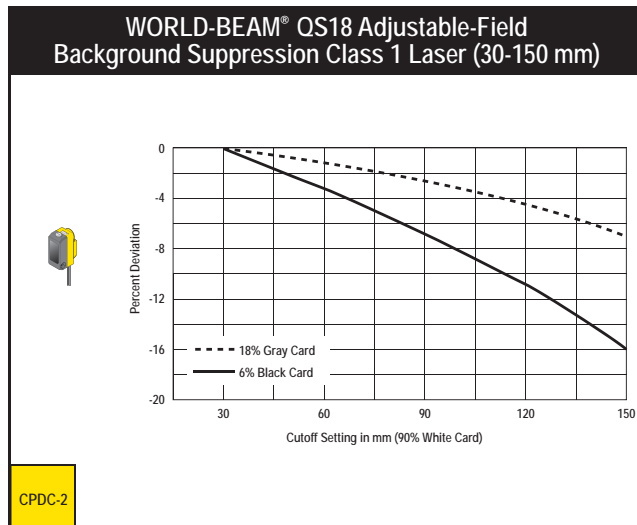
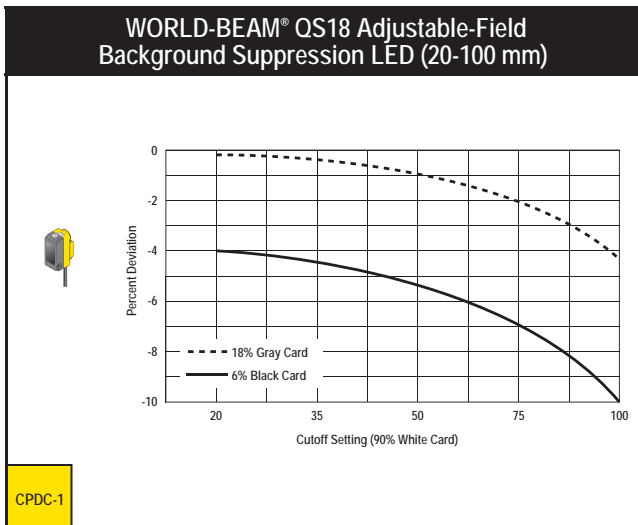
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

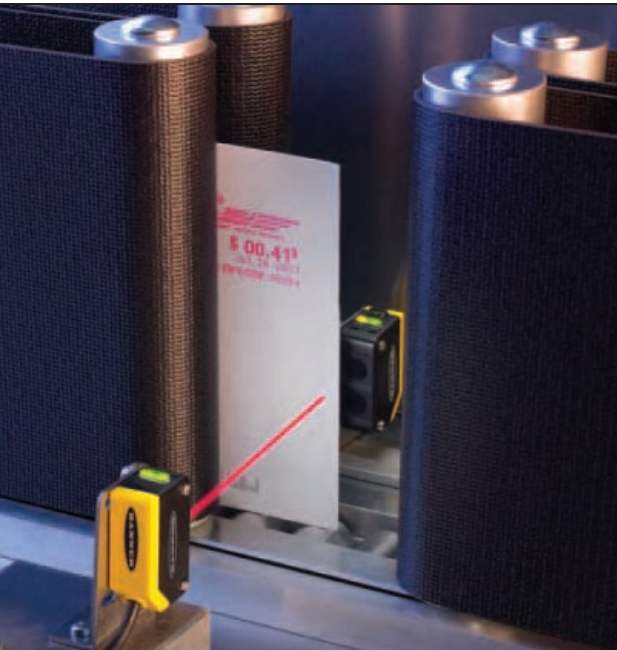
Minimum Separation Distance



- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Cutoff Point Deviation





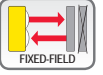
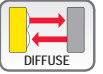
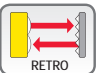
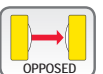
Side-Mount Rectangular Sensor WORLD-BEAM® Q20

- Features compact, rectangular housing with industry-standard mounting configuration
- Available in opposed, polarized and non-polarized retroreflective, diffuse and fixed-field models
- Offers visible red beam for easy alignment on most models
- Features bright LED status indicators visible from 360°
- Provides water-tight, IP67 and NEMA 6 rated enclosure for rugged, reliable sensing
- Rated to 1200 psi for washdown environments
- Features an advanced electronic design for excellent noise immunity and crosstalk avoidance
- Provides versatile mounting options, including M3 (3 mm) inserts and 25.4 mm hole spacing
- Includes single-turn gain potentiometer for easy configuration, depending on model
- Background suppression models provide reliable detection up to 150 mm while ignoring objects in the background

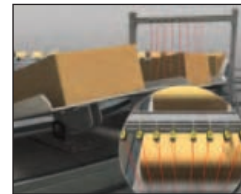
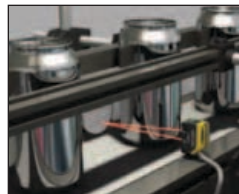
- Photoelectronics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 107

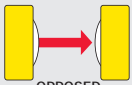
- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE



Opposed, Retroreflective, Fixed-field and Diffuse Models
Suffix E, EL, R, RL, LP, LV, D, DL, DXL and FF



WORLD-BEAM® Q20, 10-30V dc

| Sensing Mode/LED | Range | Connection | Models* NPN | Models* PNP | Excess Gain | Beam Pattern |
|---|-------|-----------------------|----------------|-------------|----------------|---------------|
|  <p>OPPOSED</p> | 12 m | 2 m | Q20E Emitter | | EGC-1 (p. 108) | BP-1 (p. 109) |
| | | 4-pin Euro Pigtail QD | Q20EQ5 Emitter | | | |
| | | 2 m | Q20NR | Q20PR | | |
| | | 4-pin Euro Pigtail QD | Q20NRQ5 | Q20PRO5 | | |

More on next page

Connection options: A model with a QD requires a mating cordset (see page 107).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q20ND W/30).
 QD models:

- For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, Q20NDQ5).
- For a 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, Q20NDQ).
- For a 4-pin integral Pico-style QD, add suffix Q7 (example, Q20NDQ7).

* Available with health or alarm mode output; contact factory at 1-888-373-6767 for details.

WORLD-BEAM® Q20, 10-30V dc

 Infrared LED  Visible Red LED

| Sensing Mode/LED | Range | Connection | Models* NPN | Models* PNP | Excess Gain | Beam Pattern |
|---|-----------------|-----------------------|-----------------|----------------|-------------------|------------------|
|  OPPOSED | 20 m | 2 m | Q20EL Emitter | | EGC-1 (p. 108) | BP-1 (p. 109) |
| | | 4-pin Euro Pigtail QD | Q20ELO5 Emitter | | | |
| | | 2 m | Q20NRL | Q20PRL | | |
| | | 4-pin Euro Pigtail QD | Q20NRLQ5 | Q20PRLQ5 | | |
|  RETRO | 6 m† | 2 m | Q20NLV | Q20PLV | EGC-2 (p. 108) | BP-2 (p. 109) |
| | | 4-pin Euro Pigtail QD | Q20NLVQ5 | Q20PLVQ5 | | |
|  POLAR RETRO | 4 m† | 2 m | Q20NLP | Q20PLP | EGC-3 (p. 108) | BP-3 (p. 109) |
| | | 4-pin Euro Pigtail QD | Q20NLPQ5 | Q20PLPQ5 | | |
|  DIFFUSE | 250 mm | 2 m | Q20ND | Q20PD | EGC-4 (p. 108) | BP-4 (p. 109) |
| | | 4-pin Euro Pigtail QD | Q20NDQ5 | Q20PDQ5 | | |
| | 800 mm | 2 m | Q20NDL | Q20PDL | EGC-5 (p. 108) | BP-5 (p. 109) |
| | | 4-pin Euro Pigtail QD | Q20NDLQ5 | Q20PDLQ5 | | |
|  DIFFUSE | 1500 mm | 2 m | Q20NDXL | Q20PDXL | EGC-6 (p. 108) | BP-6 (p. 109) |
| | | 4-pin Euro Pigtail QD | Q20NDXLQ5 | Q20PDXLQ5 | | |
|  FIXED-FIELD | 0-50 mm Cutoff | 2 m | Q20NFF50 | Q20PFF50 | EGC-7 (p. 108) | — |
| | | 4-pin Euro Pigtail QD | Q20NFF50Q5 | Q20PFF50Q5 | | |
| | 0-100 mm Cutoff | 2 m | Q20NFF100 | Q20PFF100 | EGC-8 (p. 108) | — |
| | | 4-pin Euro Pigtail QD | Q20NFF100Q5 | Q20PFF100Q5 | | |
| | 0-150 mm Cutoff | 2 m | Q20NFF150 | Q20PFF150 | EGC-9 (p. 108) | — |
| | | 4-pin Euro Pigtail QD | Q20NFF150Q5 | Q20PFF150Q5 | | |

Connection options: A model with a QD requires a mating cordset (see page 107).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q20ND W/30).

QD models:

- For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 (example, Q20NDQ5).
- For a 4-pin 150 mm Pico-style pigtail QD, add suffix Q (example, Q20NDQ).
- For a 4-pin integral Pico-style QD, add suffix Q7 (example, Q20NDQ7).

† Retroreflective range is specified using one model BRT-84 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

* Available with health or alarm mode output; contact factory at 1-888-373-6767 for details.

WORLD-BEAM® Q20 Specifications

| | |
|-----------------------------|--|
| Supply Voltage and Current | 10 to 30V dc (10% maximum ripple) at less than 18 mA, exclusive of load |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state complementary; PNP (sourcing) or NPN (sinking), depending on model |
| Output Rating | 100 mA with short circuit protection OFF-state leakage current: NPN: less than 200 µA sinking PNP: less than 10 µA sourcing ON-state saturation voltage: NPN: less than 1.6V @ 100 mA PNP: less than 3.0V @ 100 mA |
| Output Response Time | Opposed: 1 millisecond/600 microseconds OFF All others: 800 microseconds ON/OFF |
| Delay a Power-up | 100 milliseconds; outputs do not conduct during this time |
| Repeatability | Opposed: 140 microseconds All others: 155 microseconds |
| Adjustments | Diffuse, Retroreflective and Polarized Retroreflective: single-turn sensitivity (Gain) adjustment potentiometer |
| Indicators | Emitters: Green power ON only All others: Two LED Indicators: Green: Power ON Yellow: Black (LO) wire conducting |

More on next page

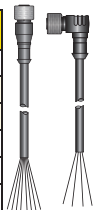
WORLD-BEAM® Q20 Specifications (cont'd)

| | |
|--------------------------------|--|
| Construction | Housing: ABS Lenses: PPMA Gain Adjuster: PBT |
| Connections | 2 m or 9 m 4-wire PVC cable, 4-pin 150 mm pigtail Pico-style QD (Q), or 4-pin 150 mm pigtail Euro-style QD (Q5), or 4-pin integral Pico-style QD (Q7), depending on model. QD cordsets are ordered separately. See pages 107. |
| Operating Conditions | Temperature: -20° to +60° C Relative humidity: 95% @ 50° C (non-condensing) |
| Environmental Rating | IEC IP67; NEMA 6 and 1200 psi washdown NEMA ICS 5, Annex F-2002 |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2: 30G 11 ms duration, half sine wave |
| Application Note | 1. Opposed mode sensor spacing can be reduced by alternating emitters and receivers or by applying crosstalk filters (visible red models only). 2. NPN OFF-state leakage current is < 200 µA for load resistances > 3 kΩ or optically isolated loads. For load currents of 100 mA, leakage is < 1% of load current. |
| Certification | CE |
| Hookup Diagram | Emitters: DC02 (p. 758) All others: DC03 (p. 758) |

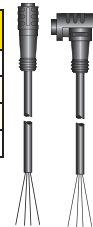
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Cordsets

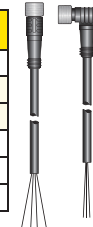
| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |



| Pico QD | | |
|---------------|----------|-------------|
| See page 694 | | |
| Snap-on 4-Pin | | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG4-2 | PKW4Z-2 |



| Pico QD | | |
|----------------|----------|-------------|
| See page 695 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG4M-2 | PKW4M-2 |
| 5.00 m | PKG4M-5 | PKW4M-5 |
| 9.00 m | PKG4M-9 | PKW4M-9 |



Additional cordset information available. See page 693.

Brackets

| Q20 | | | |
|---------|---------|----------|---------|
| | | | |
| pg. 682 | pg. 682 | pg. 682 | pg. 682 |
| SMBQ20H | SMBQ20L | SMBQ20LV | SMBQ20U |

Additional bracket information available. See page 632.

REFLECTORS

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APERTURES

PAGE 750

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Excess Gain Curves (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card)

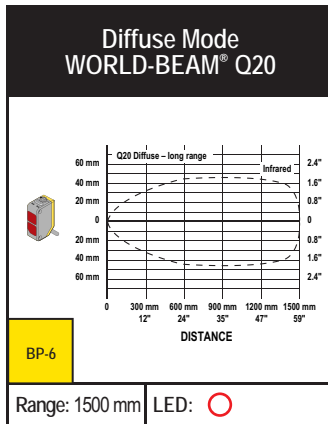
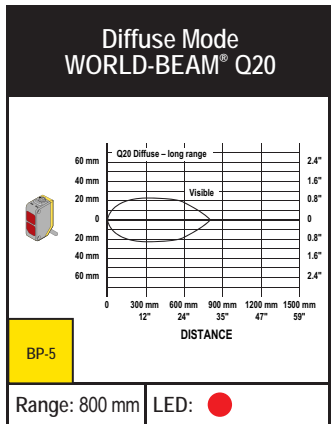
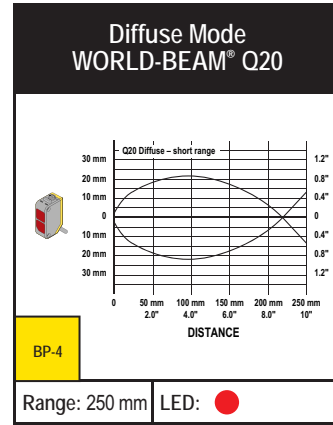
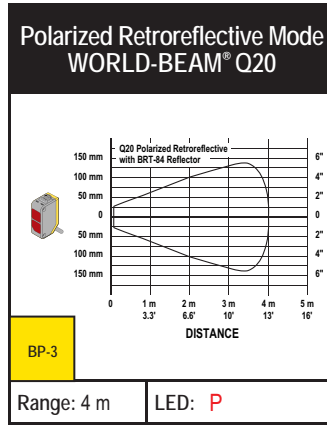
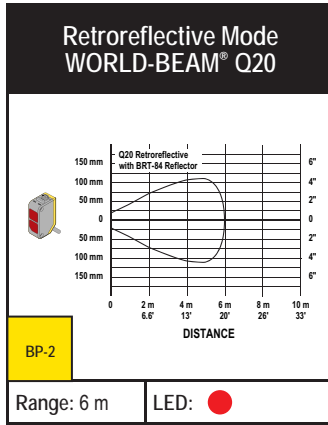
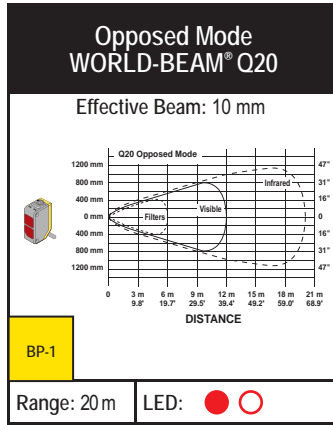
○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized

| | | | |
|---|---|--|---|
| <p>Opposed Mode WORLD-BEAM® Q20</p> <p>EGC-1</p> <p>Range: 20 m LED: ● ○</p> | <p>Retroreflective Mode WORLD-BEAM® Q20</p> <p>EGC-2</p> <p>Range: 6 m LED: ●</p> | <p>Polarized Retroreflective Mode WORLD-BEAM® Q20</p> <p>EGC-3</p> <p>Range: 4 m LED: P</p> | <p>Diffuse Mode WORLD-BEAM® Q20</p> <p>EGC-4</p> <p>Range: 250 mm LED: ●</p> |
| <p>Diffuse Mode WORLD-BEAM® Q20</p> <p>EGC-5</p> <p>Range: 800 mm LED: ●</p> | <p>Diffuse Mode WORLD-BEAM® Q20</p> <p>EGC-6</p> <p>Range: 1500 mm LED: ○</p> | <p>Fixed-Field Mode Q20</p> <p>EGC-7</p> <p>Cutoff: 50 mm LED: ●</p> | <p>Ø 6 mm spot size @ 25 mm focus Ø 6 mm spot size @ 50 mm cutoff</p> <p>† Using 18% gray test card: Cutoff distance will be 95% of value shown. † Using 6% black test card: Cutoff distance will be 90% of value shown.</p> |
| <p>Fixed-Field Mode Q20</p> <p>EGC-8</p> <p>Cutoff: 100 mm LED: ●</p> | <p>Ø 6 mm spot size @ 50 mm focus Ø 6 mm spot size @ 100 mm cutoff</p> <p>† Using 18% gray test card: Cutoff distance will be 90% of value shown. † Using 6% black test card: Cutoff distance will be 85% of value shown.</p> | <p>Fixed-Field Mode Q20</p> <p>EGC-9</p> <p>Cutoff: 150 mm LED: ●</p> | <p>Ø 6 mm spot size @ 75 mm focus Ø 9 mm spot size @ 150 mm cutoff</p> <p>† Using 18% gray test card: Cutoff distance will be 80% of value shown. † Using 6% black test card: Cutoff distance will be 70% of value shown.</p> |



Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized

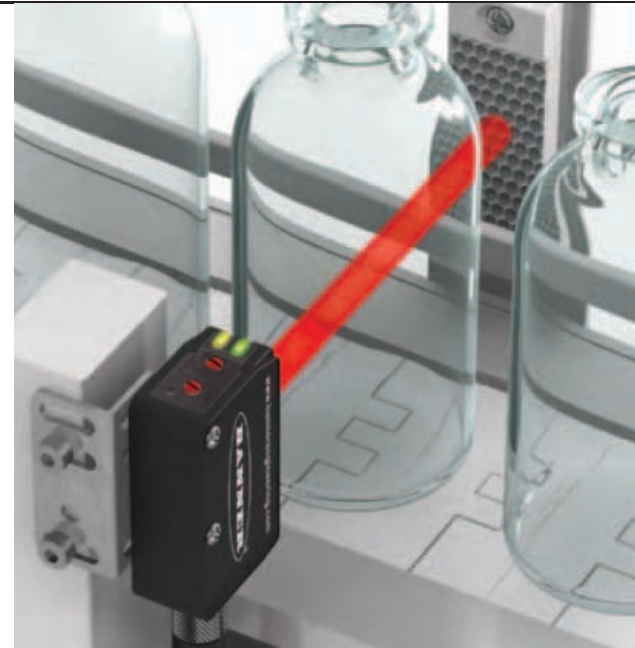


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
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- Safety Light Screens
- Safety Laser Scanners
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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

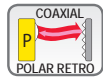
- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Clear Object Sensor Q26


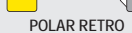
- Reliable detection of clear, translucent or opaque objects including mirror like surfaces
- Coaxial optics enable reliable detection of targets to the face of the sensor
- Simple setup with a single turn sensitivity adjustment potentiometer
- Light Operate and Dark Operate selection by rotary switch
- Compact design ideal for when space is limited



ACCESSORIES
page
111



Q26, 12-30V dc

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Beam Pattern |
|--|---|-----------------------|------------|------------|------------------|
|  COAXIAL  POLAR RETRO | 5-800 mm sensor to reflector distance with no detection | 4-pin Pico QD | Q26NXLPO7 | Q26PXLPO7 | BP-1 (p. 111) |
| | | 4-pin Euro Pigtail QD | Q26NXLPO5 | Q26PXLPO5 | |

Connection options: A model with a QD requires a mating cordset (see page 111).

For a 9 m cable, add suffix W/30 to the 2 m model number (example, Q26NXLPO7 W/30)

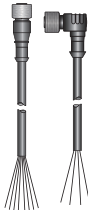
Q26 Specifications

| | |
|-----------------------------|---|
| Supply Voltage and Current | 12 to 30V dc (10% maximum ripple within specified limits); supply current (exclusive of load current): 15mA |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Primary output (pin 2) NPN or PNP (current sinking or sourcing), depending on model; second output (pin 4) is a Health mode output. |
| Output Rating | 100 mA max OFF-state leakage current: less than 1 microamp @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA dc; less than 1.5V @ 150 mA dc |
| Output Protection Circuitry | Protected against false power-up and continuous overload or short circuit of outputs |
| Output Response Time | 250 μS ON and OFF |
| Repeatability | 50 microseconds |
| Indicators | Green steady: Power ON Yellow steady: Output conducting |
| Construction | ABS plastic housing; glass window |
| Operating Conditions | Temperature: -10° to +55° C Relative Humidity: 90% at 50°; non-condensing |
| Environmental Rating | Leakproof design rated IP67 |
| Connection | 4-pin Threaded/Snap M8/Pico-Style QD connector or 4-pin 150 mm (6") Euro-style pigtail QD with PVC cable jacket depending on model. QD cordsets are ordered separately. See page 111. |
| Vibration and Shock | EN60068-2-6 and EN60068-2-27 |
| Certifications | |
| Hookup Diagrams | DC23 (p. 763) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Cordsets

| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |



| Pico QD | | |
|----------------|----------|-------------|
| See page 695 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG4M-2 | PKW4M-2 |
| 5.00 m | PKG4M-5 | PKW4M-5 |
| 9.00 m | PKG4M-9 | PKW4M-9 |



Additional cordset information available. See page 693.

Brackets

| Q26 | |
|-------------|-----------|
| | |
| pg. 670 | pg. 671 |
| SMBLSTDLQ26 | SMBLSTQ26 |

Additional bracket information available. See page 632.

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

APERTURES

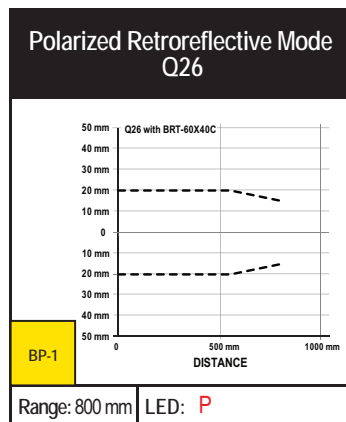
PAGE 750

REFLECTORS

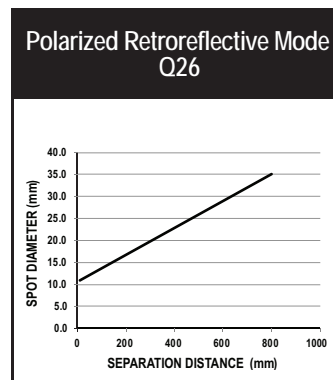
PAGE 724

Beam Patterns

P = Visible Red LED Polarized



Spot Diameter



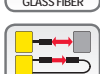
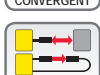
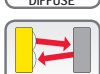
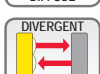
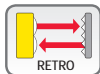
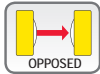
Comprehensive Family of Photoelectric Sensors

MINI-BEAM®

- Compact, high-performance sensors feature 18 mm threaded lens or side mount
- Available models include opposed, opposed clear plastic detection, diffuse and divergent diffuse, polarized and non-polarized retroreflective, convergent, glass and plastic fiber optic
- Models are available for ac or dc operation
- Convergent and fiber optic models offer infrared or visible red, blue, white, or green LED light source; select a color based on the application
- SME312 *Expert*™ models offer easy, push-button TEACH-mode setup
- MIAD9 series NAMUR models are for hazardous environments with approved switching amplifiers having intrinsically safe input circuits
- MINI-BEAM models detect clear plastic; MINI-BEAM *Expert*™ models detect clear objects



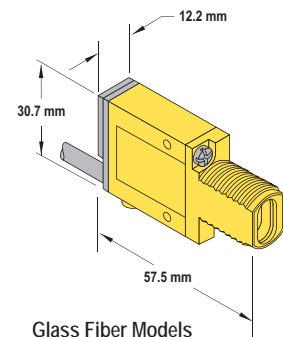
ACCESSORIES
page 122



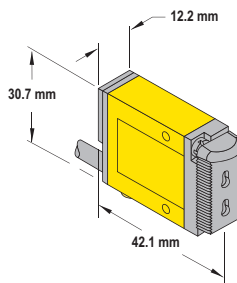
MINI-BEAM® DC Sensors



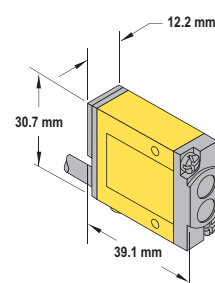
Opposed, Retroreflective, Diffuse and Convergent Models
Suffix E, R, EPD, RPD, D, LV, LP, C, C2, CV,
CV2, CVB, CV2B, CVG and CV2G



Glass Fiber Models
Suffix F, FV, FVG and FVB



Plastic Fiber Models
Suffix FP, FPG and FPB



Diffuse Models
Suffix DBZ and W

| | |
|------------------------|----------|
| DC Models | page 112 |
| AC Models | 115 |
| <i>Expert</i> ™ Models | 118 |
| NAMUR Models | 121 |



MINI-BEAM®, 10-30V dc

Infrared LED
 Visible Red LED
 Visible Green LED
 Visible Blue LED

| Sensing Mode/LED | Range | Connection | Output | Models | Excess Gain | Beam Pattern | |
|-------------------------------|-------------------|---------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| OPPOSED | 3 m | 2 m | Bipolar NPN/PNP | SM31E Emitter | EGC-1 (p. 123) | BP-1 (p. 127) | |
| | | 4-Pin Euro QD | | SM31EQD Emitter | | | |
| | | 2 m | | SM31R | | | |
| | 30 m | 2 m | | SM31RQD | EGC-2 (p. 123) | BP-2 (p. 127) | |
| | | 4-Pin Euro QD | | SM31EL Emitter | | | |
| | | 2 m | | SM31ELQD Emitter | | | |
| CLEAR PLASTIC OPPOSED | 0.3 m | 2 m | | SM31RL | See Note Below*** | See Note Below*** | |
| | | 4-Pin Euro QD | | SM31RLQD | | | |
| | | 2 m | | SM31EPD Emitter | | | |
| | | 4-Pin Euro QD | | SM31EPDQD Emitter | | | |
| RETRO | 5 m† | 2 m | | Bipolar NPN/PNP | SM312LV | EGC-4 (p. 123) | BP-4 (p. 127) |
| | | 4-Pin Euro QD | | | SM312LVQD | | |
| POLAR RETRO | 50 mm - 2 m† | 2 m | SM312LVAG | | EGC-5 (p. 123) | BP-5 (p. 127) | |
| | | 4-Pin Euro QD | SM312LVAGQD | | | | |
| EXTENDED RANGE POLAR RETRO | 10 mm - 3 m† | 2 m | SM312LP | | EGC-6 (p. 123) | BP-6 (p. 127) | |
| | | 4-Pin Euro QD | SM312LPQD | | | | |
| DIFFUSE | 380 mm | 2 m | Bipolar NPN/PNP | | SM312D | EGC-12 (p. 123) | BP-12 (p. 127) |
| | 300 mm | 4-Pin Euro QD | | | SM312DQD | | |
| | | 2 m | | | SM312DBZ | | |
| 130 mm | 4-Pin Euro QD | SM312DBZQD | | | | | |
| | DIVERGENT DIFFUSE | 16 mm | | | 2 m | SM312W | EGC-14 (p. 123) |
| 4-Pin Euro QD | | | | | SM312WQD | | |
| CONVERGENT | 43 mm | 2 m | | Bipolar NPN/PNP | SM312C | EGC-20 (p. 124) | BP-20 (p. 128) |
| | | 4-Pin Euro QD | | | SM312CQD | | |
| CONVERGENT | 16 mm | 2 m | | | SM312C2 | EGC-21 (p. 124) | BP-21 (p. 128) |
| | | 4-Pin Euro QD | | | SM312C2QD | | |
| CONVERGENT | 43 mm | 2 m | | | SM312CV | EGC-22 (p. 124) | BP-22 (p. 128) |
| | | 4-Pin Euro QD | | | SM312CVQD | | |
| CONVERGENT | 49 mm | 2 m | SM312CV2 | | EGC-23 (p. 124) | BP-23 (p. 128) | |
| | | 4-Pin Euro QD | SM312CV2QD | | | | |
| CONVERGENT | 16 mm | 2 m | SM312CVG | | EGC-24 (p. 124) | BP-24 (p. 128) | |
| | | 4-Pin Euro QD | SM312CVGQD | | | | |
| CONVERGENT | 49 mm | 2 m | SM312CV2G | | EGC-25 (p. 124) | BP-25 (p. 128) | |
| | | 4-Pin Euro QD | SM312CV2GQD | | | | |
| CONVERGENT | 16 mm | 2 m | SM312CVB | EGC-26 (p. 124) | BP-26 (p. 128) | | |
| | | 4-Pin Euro QD | SM312CVBQD | | | | |
| CONVERGENT | 49 mm | 2 m | SM312CV2B | EGC-27 (p. 124) | BP-27 (p. 128) | | |
| | | 4-Pin Euro QD | SM312CV2BQD | | | | |

Photoelectronics Sensors

- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 122

MINIATURE COMPACT

- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

More on next page

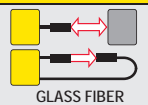
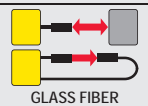
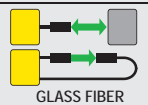
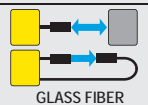
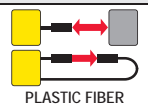
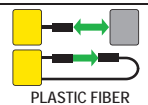
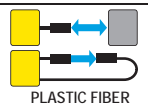
Connection options: A model with a QD requires a mating cordset (see page 122).


For 9 m cable, add suffix W/30 to the 2 m model number (example, SM312D W/30).

*** Actual range depends on light transmission through the plastic being sensed. Some clear plastic materials may not be detected. When in doubt, ask your Banner representative to evaluate material samples.
 † Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

MINI-BEAM®, 10-30V dc (cont'd)




 Infrared LED
  Visible Red LED
  Visible Green LED
  Visible Blue LED

| Sensing Mode/LED | Range | Connection | Output | Models | Excess Gain | Beam Pattern | |
|--|--|---------------|-----------------|-----------------|--------------------------|--------------------------|------------------------|
|  GLASS FIBER | Range varies by sensing mode and fiber optics used | 2 m | Bipolar NPN/PNP | SM312F | EGC-35 & EGC-36 (p. 125) | BP-35 & BP-36 (p. 129) | |
| | | 4-Pin Euro QD | | SM312FQD | | | |
|  GLASS FIBER | | 2 m | | SM312FV | EGC-37 & EGC-38 (p. 125) | BP-37 & BP-38 (p. 129) | |
| | | 4-Pin Euro QD | | SM312FVQD | | | |
|  GLASS FIBER | | 2 m | | SM312FVG | EGC-39 (p. 125) | BP-39 (p. 129) | |
| | | 4-Pin Euro QD | | SM312FVGQD | | | |
|  GLASS FIBER | | 2 m | | SM312FVB | EGC-40 (p. 125) | BP-40 (p. 129) | |
| | | 4-Pin Euro QD | | SM312FVBQD | | | |
|  PLASTIC FIBER | | 2 m | | Bipolar NPN/PNP | SM312FP | EGC-50 & EGC-51 (p. 126) | BP-50 & BP-51 (p. 130) |
| | | 4-Pin Euro QD | | | SM312FPQD | | |
|  PLASTIC FIBER | 2 m | SM312FPG | EGC-52 (p. 126) | | BP-52 (p. 130) | | |
| | 4-Pin Euro QD | SM312FPGQD | | | | | |
|  PLASTIC FIBER | 2 m | SM312FPB | EGC-53 (p. 126) | | BP-53 (p. 130) | | |
| | 4-Pin Euro QD | SM312FPBQD | | | | | |

 Connection options: A model with a QD requires a mating cordset (see page 122).

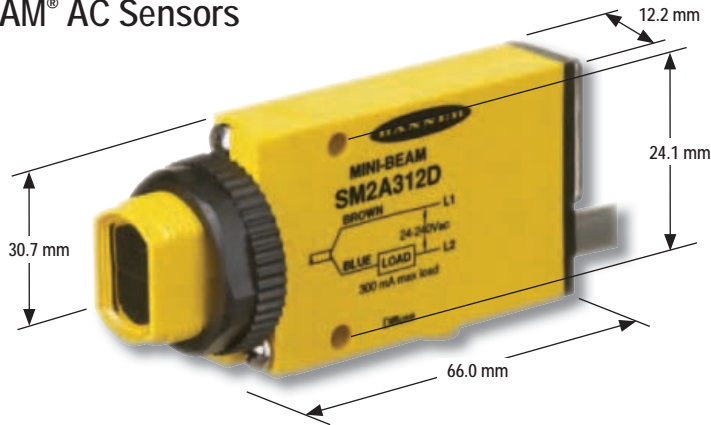
For 9 m cable, add suffix W/30 to the 2 m model number (example, SM312F W/30).

MINI-BEAM® DC Specifications

| | | |
|-----------------------------|---|---|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at less than 25 mA (exclusive of load) | |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages | |
| Output Configuration | Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor; Light Operate (LO) or Dark Operate (DO) selectable. | |
| Output Rating | 150 mA max. each output at 25° C, derated to 100 mA at 70° C (derate ≈ 1 mA per ° C) OFF-state leakage current: less than 1 µA Output saturation voltage (PNP output): less than 1 V @ 10 mA; less than 2 V @ 150 mA Output saturation voltage (NPN output): less than 200 mV @ 10mA; less than 1 V @ 150 mA | |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short-circuit of outputs | |
| Output Response Time | Sensors will respond to either a "light" or a "dark" signal of 1 millisecond or longer duration, 500 Hz max. 0.3 millisecond response modification is available. See note below†. | |
| Delay at Power-up | 100 millisecond; outputs do not conduct during this time. | |
| Repeatability | Opposed: 0.14 milliseconds | Non-Polarized and Polarized Retroreflective, Diffuse, Convergent, and Glass and Plastic Fiber Optic: 0.3 milliseconds. Response time and repeatability specifications are independent of signal strength. |
| Adjustments | Light or Dark Operate select switch and 15-turn GAIN (sensitivity) adjustment potentiometer | |
| Indicators | Alignment Indicating Device system (AID) lights a rear-panel mounted red LED indicator whenever the sensor sees a "light" condition, with a superimposed pulse rate proportional to the light signal strength (the stronger the signal, the faster the pulse rate) | |
| Construction | Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses, and stainless steel screws | |
| Environmental Rating | Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12, and 13; IEC IP67 | |
| Connections | PVC-jacketed 4-conductor 2 m or 9 m cables, or 4-pin Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 122. | |
| Operating Conditions | Temperature: -20° to +70° C | Relative humidity: 90% at 50° C (non-condensing) |
| Certifications |    | |
| Hookup Diagrams | Emitters: DC02 (p. 758) | Other Models: DC04 (p. 758) |

† NOTE: DC MINI-BEAMS may be ordered with 0.3 millisecond ON/OFF response by adding suffix MHS to the model number (example, SM312LVMHS). This modification reduces sensing range (and excess gain).

MINI-BEAM® AC Sensors



Opposed, Retroreflective, Diffuse and Convergent Models
Suffix E, R, EPD, RPD, D, LV, LP, C and CV



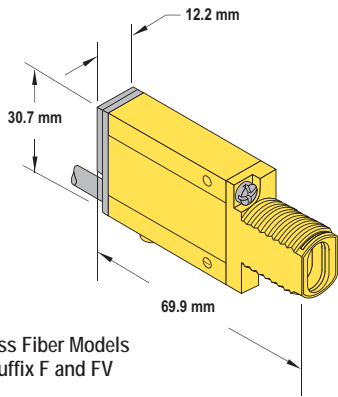
Photoelectronics Sensors

- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

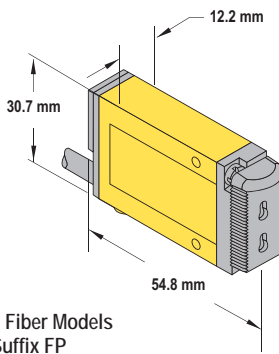


MINIATURE COMPACT

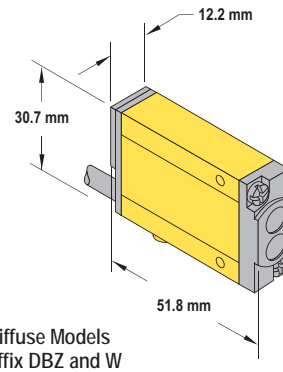
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE



Glass Fiber Models
Suffix F and FV



Plastic Fiber Models
Suffix FP



Diffuse Models
Suffix DBZ and W

MINI-BEAM®, 24-240V ac

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output | Models | Excess Gain | Beam Pattern |
|----------------------------------|-------|----------------|----------------------------|-------------------|-------------------|------------------|
| <p>OPPOSED</p> | 3 m | 2 m | SPST Solid-State 2-Wire | SMA31E Emitter | EGC-1 (p. 123) | BP-1 (p. 127) |
| | | 3-Pin Micro QD | | SMA31EQD Emitter | | |
| | | 2 m | | SM2A31R | | |
| | | 3-Pin Micro QD | | SM2A31RQD | | |
| | 30 m | 2 m | | SMA31EL Emitter | EGC-2 (p. 123) | BP-2 (p. 127) |
| | | 3-Pin Micro QD | | SMA31ELQD Emitter | | |
| | | 2 m | | SM2A31RL | | |
| | | 3-Pin Micro QD | | SM2A31RLQD | | |
| <p>CLEAR PLASTIC OPPOSED</p> | 0.3 m | 2 m | SMA31EPD Emitter | See Note Below*** | See Note Below*** | |
| | | 3-Pin Micro QD | SMA31EPQD Emitter | | | |
| | | 2 m | SM2A31RPD | | | |
| | | 3-Pin Micro QD | SM2A31RPDQD | | | |

More on next page

Connection options: A model with a QD requires a mating cordset (see page 122).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SM2A312D W/30).

*** Actual range depends on light transmission through the plastic being sensed. Some clear plastic materials may not be detected. When in doubt, ask your Banner representative to evaluate material samples.

MINI-BEAM®, 24-240V ac (cont'd)

⇨ Infrared LED ⇨ Visible Red LED ⇨ Visible Green LED

| Sensing Mode/LED | Range | Connection | Output | Models | Excess Gain | Beam Pattern |
|----------------------------|--|----------------|----------------------------|-----------------------------|-----------------------------|---------------------------|
| DIFFUSE | 380 mm | 2 m | SPST Solid-State 2-Wire | SM2A312D | EGC-12 (p. 123) | BP-12 (p. 127) |
| | | 3-Pin Micro QD | | SM2A312DQD | | |
| DIFFUSE | 300 mm | 2 m | | SM2A312DBZ | EGC-13 (p. 123) | BP-13 (p. 127) |
| | | 3-Pin Micro QD | | SM2A312DBZQD | | |
| DIVERGENT DIFFUSE | 130 mm | 2 m | | SM2A312W | EGC-14 (p. 123) | BP-14 (p. 127) |
| | | 3-Pin Micro QD | | SM2A312WQD | | |
| RETRO | 5 m [†] | 2 m | | SM2A312LV | EGC-4 (p. 123) | BP-4 (p. 127) |
| | | 3-Pin Micro QD | | SM2A312LVQD | | |
| POLAR RETRO | 50 mm - 2 m [†] | 2 m | | SM2A312LVAG | EGC-5 (p. 123) | BP-5 (p. 127) |
| | | 3-Pin Micro QD | | SM2A312LVAGQD | | |
| EXTENDED RANGE POLAR RETRO | 10 mm - 3 m [†] | 2 m | | SM2A312LP | EGC-6 (p. 123) | BP-6 (p. 127) |
| | | 3-Pin Micro QD | | SM2A312LPQD | | |
| CONVERGENT | 16 mm | 2 m | SM2A312C | EGC-20 (p. 124) | BP-20 (p. 128) | |
| | | 3-Pin Micro QD | SM2A312CQD | | | |
| CONVERGENT | 43 mm | 2 m | SM2A312C2 | EGC-21 (p. 124) | BP-21 (p. 128) | |
| | | 3-Pin Micro QD | SM2A312C2QD | | | |
| CONVERGENT | 16 mm | 2 m | SM2A312CV | EGC-22 (p. 124) | BP-22 (p. 128) | |
| | | 3-Pin Micro QD | SM2A312CVQD | | | |
| CONVERGENT | 43 mm | 2 m | SM2A312CV2 | EGC-23 (p. 124) | BP-23 (p. 128) | |
| | | 3-Pin Micro QD | SM2A312CV2QD | | | |
| CONVERGENT | 16 mm | 2 m | SM2A312CVG | EGC-24 (p. 124) | BP-24 (p. 128) | |
| | | 3-Pin Micro QD | SM2A312CVGQD | | | |
| GLASS FIBER | Range varies by sensing mode and fiber optics used | 2 m | SPST Solid-State 2-Wire | SM2A312F | EGC-35 & EGC-36 (p. 125) | BP-35 & BP-36 (p. 129) |
| | | 3-Pin Micro QD | | SM2A312FQD | | |
| GLASS FIBER | | 2 m | | SM2A312FV | EGC-37 & EGC-38 (p. 125) | BP-37 & BP-38 (p. 129) |
| | | 3-Pin Micro QD | | SM2A312FVQD | | |
| PLASTIC FIBER | Range varies by sensing mode and fiber optics used | 2 m | SM2A312FP | EGC-50 & EGC-51 (p. 126) | BP-50 & BP-51 (p. 130) | |
| | | 3-Pin Micro QD | SM2A312FPQD | | | |

Connection options: A model with a QD requires a mating cordset (see page 122).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SM2A312LP W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

MINI-BEAM® AC Specifications

| | | |
|-----------------------------|---|--|
| Supply Voltage and Current | 24 to 240V ac (50/60 Hz), 250V ac max | |
| Supply Protection Circuitry | Protected against transient voltages | |
| Output Configuration | SPST SCR solid-state relay (light/dark operate selectable); 2-wire hookup | |
| Output Rating | Min. load current 5 mA max. steady-state load capability 300 mA to 50° C ambient 100 mA to 70° C ambient Inrush capability: 3 amps for 1 second (non repetitive); 10 amps for 1 cycle (non repetitive) OFF-state leakage current: less than 1.7 mA rms ON-state voltage drop: ≤ 5 volts at 300 mA load, ≤ 10 volts at 15 mA load | |
| Output Protection Circuitry | Protected against false pulse on power-up | |
| Output Response Time | Opposed: 2 milliseconds ON and 1 millisecond OFF Non-Polarized and Polarized Retroreflective, Convergent and Plastic Fiber Optic: 4 milliseconds ON and OFF Diffuse and Glass Fiber Optic: 8 milliseconds ON and OFF OFF response time specification does not include load response of up to ½ ac cycle (8.3 milliseconds) Response time specification of load should be considered when important | |
| Delay at Power-up | 300 milliseconds | |
| Repeatability | Opposed: 0.3 milliseconds Non-Polarized and Polarized Retroreflective, Convergent and Plastic Fiber Optic: 1.3 milliseconds Diffuse and Glass Fiber Optics: 2.6 milliseconds Response time and repeatability specifications are independent of signal strength | |
| Adjustments | Light or Dark Operate select switch and 15-turn slotted GAIN (sensitivity) adjustment potentiometer | |
| Indicators | Red indicator LED on rear of sensor is "ON" when the load is energized | |
| Construction | Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses, and stainless steel screws | |
| Environmental Rating | Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12, and 13; IEC IP67 | |
| Connections | PVC-jacketed 2-conductor 2 m or 9 m cables, or 3-pin Micro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 122. | |
| Operating Conditions | Temperature: -20° to +70° C | Relative humidity: 90% at 50° C (non-condensing) |
| Application Notes | <ol style="list-style-type: none"> Overload conditions can destroy ac MINI-BEAM sensors. Directly wiring sensor without load series across hot and neutral will damage sensor (except emitter models). Low voltage use requires careful analysis of the load to determine if the leakage current or on-state voltage of the sensor will interfere with proper operation of the load. The false-pulse protection feature may cause momentary drop-out of the load when the sensor is wired in series or parallel with mechanical switch contacts. | |
| Certifications | | |
| Hookup Diagrams | Cabled Emitters: AC03 (p. 764) QD Emitters: AC04 (p. 764) | All Other Cables Models: AC01 (p. 764) All Other Cabled Models: AC02 (p. 764) |

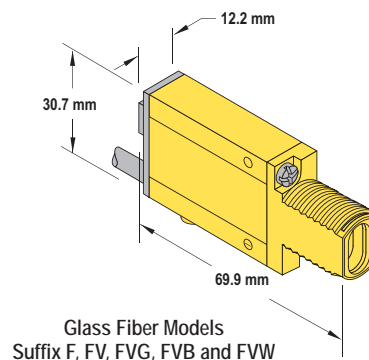
- Photoelectrics Sensors
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- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

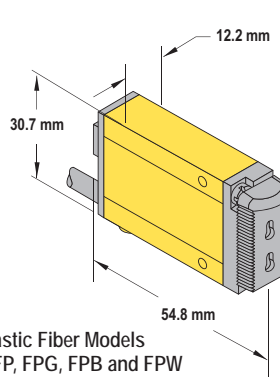
MINI-BEAM® Expert™ Sensors



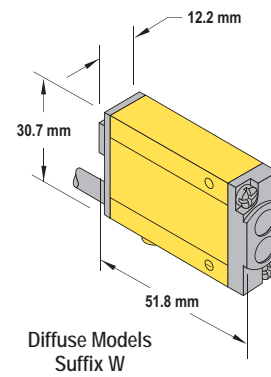
Retroreflective, Diffuse and Convergent Models
Suffix LV, LP, D, DV, CV, CV2, CVG, CVB and CVW



Glass Fiber Models
Suffix F, FV, FVG, FVB and FW



Plastic Fiber Models
Suffix FP, FPG, FPB and FPW



Diffuse Models
Suffix W

ACCESSORIES
page
122



MINI-BEAM® Expert, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output | Models | Excess Gain | Beam Pattern |
|-----------------------|--------------------------|---------------|-----------------|--------------|--------------------|-------------------|
| RETRO | 5 m [†] | 2 m | Bipolar NPN/PNP | SME312LV | EGC-7 (p. 123) | BP-7 (p. 127) |
| | | 5-Pin Euro QD | | SME312LVQD | | |
| POLAR RETRO | 10 mm - 3 m [†] | 2 m | | SME312LP | EGC-8 (p. 123) | BP-8 (p. 127) |
| | | 5-Pin Euro QD | | SME312LPQD | | |
| CLEAR OBJECT | 1 m | 2 m | | SME312LPC* | EGC-9 (p. 123) | BP-9 (p. 127) |
| | | 5-Pin Euro QD | | SME312LPCQD* | | |
| DIFFUSE | 380 mm | 2 m | | SME312D | EGC-15 (p. 123) | BP-15 (p. 127) |
| | | 5-Pin Euro QD | | SME312DQD | | |
| DIFFUSE | 1100 mm | 2 m | | SME312DV | EGC-17 (p. 124) | BP-17 (p. 128) |
| | | 5-Pin Euro QD | | SME312DVQD | | |
| DIVERGENT DIFFUSE | 130 mm | 2 m | | SME312W | EGC-16 (p. 123) | BP-16 (p. 127) |
| | | 5-Pin Euro QD | | SME312WQD | | |

Connection options: A model with a QD requires a mating cordset (see page 122).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SME312D W/30).

- * NOTE: For clear object detection, sensing range varies, according to the efficiency and reflective area of the retroreflector(s) used. For these low-contrast applications, the model BRT-2X2 reflector is recommended and is included with each SME312LPC(QD) sensor.
 - For applications with high vibration, the model BRT-51X51BM, with its micro-prism geometry, is recommended.
 - For long-range applications, the BRT-77X77C reflector provides a range up to 2 m.
 - SME312LPC(QD) are for use with corner cube type reflectors only; reflective tape is not recommended. See page 724 for more information.

- † NOTE: Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

More on next page

MINI-BEAM® Expert, 10-30V dc (cont'd)



| Sensing Mode/LED | Range | Connection | Output | Models | Excess Gain | Beam Pattern |
|-------------------|--|--|-----------------|--------------------|--------------------------------|------------------------------|
| CONVERGENT | 16 mm | 2 m | Bipolar NPN/PNP | SME312CV | EGC-28 (p. 124) | BP-28 (p. 128) |
| | | 5-Pin Euro QD | | SME312CVQD | | |
| | 43 mm | 2 m | | SME312CV2 | EGC-29 (p. 124) | BP-29 (p. 128) |
| | | 5-Pin Euro QD | | SME312CV2QD | | |
| CONVERGENT | 16 mm | 2 m | | SME312CVG | EGC-30 (p. 128) | BP-30 (p. 128) |
| | | 5-Pin Euro QD | | SME312CVGQD | | |
| CONVERGENT | 16 mm | 2 m | | SME312CVB | EGC-31 (p. 124) | BP-31 (p. 128) |
| | | 5-Pin Euro QD | | SME312CVBQD | | |
| CONVERGENT | 16 mm | 2 m | | SME312CVW | EGC-32 (p. 124) | BP-32 (p. 128) |
| | | 5-Pin Euro QD | | SME312CVWQD | | |
| GLASS FIBER | Range varies by sensing mode and fiber optics used | 2 m | | SME312F | EGC-41 & EGC-42 (p. 125) | BP-41 & BP-42 (p. 129) |
| | | 5-Pin Euro QD | | SME312FQD | | |
| GLASS FIBER | | 2 m | | SME312FV | EGC-43 & EGC-44 (p. 125) | BP-43 & BP-44 (p. 129) |
| | | 5-Pin Euro QD | | SME312FVQD | | |
| GLASS FIBER | | 2 m | | SME312FVG | EGC-45 (p. 125) | BP-45 (p. 129) |
| | | 5-Pin Euro QD | | SME312FVGQD | | |
| GLASS FIBER | | 2 m | SME312FVB | EGC-46 (p. 125) | BP-46 (p. 129) | |
| | | 5-Pin Euro QD | SME312FVBQD | | | |
| GLASS FIBER | | 2 m | SME312FVW | EGC-47 (p. 125) | BP-47 (p. 129) | |
| | | 5-Pin Euro QD | SME312FVWQD | | | |
| PLASTIC FIBER | | Range varies by sensing mode and fiber optics used | 2 m | SME312FP | EGC-54 & EGC-55 (p. 126) | BP-54 & BP-55 (p. 130) |
| | | | 5-Pin Euro QD | SME312FPQD | | |
| PLASTIC FIBER | | | 2 m | SME312FPG | EGC-56 (p. 126) | BP-56 (p. 130) |
| | | | 5-Pin Euro QD | SME312FPGQD | | |
| PLASTIC FIBER | | | 2 m | SME312FPB | EGC-57 (p. 126) | BP-57 (p. 130) |
| | | | 5-Pin Euro QD | SME312FPBQD | | |
| PLASTIC FIBER | 2 m | | SME312FPW | EGC-58 (p. 126) | BP-58 (p. 130) | |
| | 5-Pin Euro QD | | SME312FPWQD | | | |

Connection options: A model with a QD requires a mating cordset (see page 122).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SME312CV W/30).

Photoelectronics Sensors


- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 122

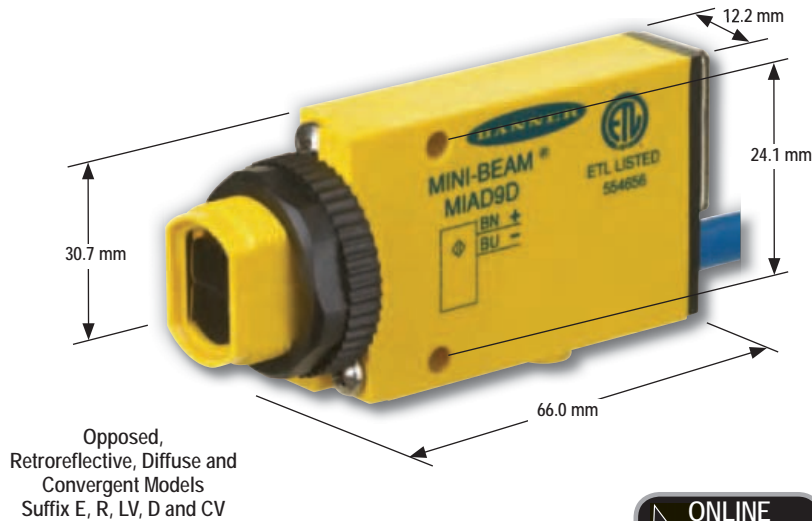
MINIATURE COMPACT

- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

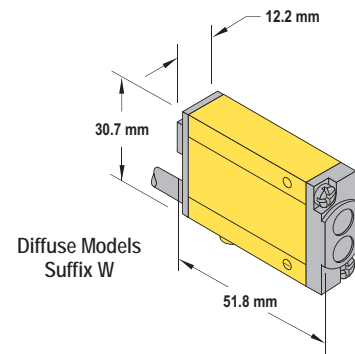
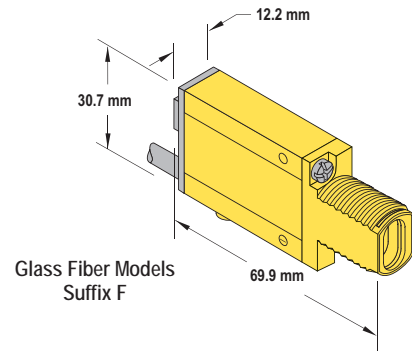
MINI-BEAM® Expert™ Specifications

| | |
|------------------------------------|---|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at less than 45 mA, exclusive of load |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor Configuration in TEACH sequence for Light Operate (LO) or Dark Operate (DO) |
| Output Rating | 150 mA max. each output at 25° C, derated to 100 mA at 70° C (derate ≈ 1 mA per ° C) OFF-state leakage current: less than 5 µA @ 30V dc Output saturation voltage (PNP output): less than 1 V at 10 mA and less than 2 V at 150 mA Output saturation voltage (NPN output): less than 200 mV at 10 mA and less than 1 V at 150 mA |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short-circuit of outputs |
| Output Response Time | Sensors will respond to either a "light" or a "dark" signal of 500 microseconds or longer duration, 1 kHz max. |
| Delay at Power-up | 1 second; outputs do not conduct during this time |
| Repeatability | 100 microseconds (all models) |
| Adjustments | Push-button TEACH mode sensitivity setting; remote TEACH mode input is provided (gray wire) |
| Indicators | Two LEDs: Yellow and Bicolor Green/Red Green: power ON Red: OFF when no signal is received. Yellow (TEACH Mode): ON to indicate sensor is ready to learn output ON condition OFF to indicate sensor is ready to learn output OFF condition Yellow (RUN Mode): ON when outputs are conducting See data sheet for more detailed information. |
| Construction | Reinforced thermoplastic polyester housing, totally encapsulated, o-ring seal, acrylic lenses, and stainless steel screws |
| Environmental Rating | Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12, and 13; IEC IP67 |
| Connections | PVC-jacketed 5-conductor 2 m or 9 m unterminated cable, or 5-pin Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 118. |
| Operating Conditions | Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Application Notes | The first condition presented during TEACH mode becomes the output ON condition |
| Certifications |  |
| Hookup Diagrams | DC08 (p. 759) |

MINI-BEAM® NAMUR Sensors



Opposed, Retroreflective, Diffuse and Convergent Models
Suffix E, R, LV, D and CV



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



MINI-BEAM® NAMUR Sensors, 5-15V dc

→ Infrared LED → Visible Red LED






| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern | | |
|-----------------------|--|---------------|--|-----------------------------|---------------------------|-------------------|--------------------|-------------------|
| OPPOSED | 6 m | 2 m | Constant Current: ≤1.2 mA dark ≥2.1 mA light | MI9E Emitter | EGC-3 (p. 123) | BP-3 (p. 127) | | |
| | | 4-Pin Euro QD | | MI9EQ Emitter | | | | |
| RETRO | 5 m [†] | 2 m | | MIAD9R | | | EGC-10 (p. 123) | BP-10 (p. 127) |
| | | 4-Pin Euro QD | | MIAD9LV | | | | |
| POLAR RETRO | 50 mm - 2 m [†] | 2 m | | MIAD9LVAG | EGC-11 (p. 123) | BP-11 (p. 127) | | |
| | | 4-Pin Euro QD | | MIAD9LVAGQ | | | | |
| DIFFUSE | 380 mm | 2 m | | MIAD9D | EGC-18 (p. 124) | BP-18 (p. 128) | | |
| | | 4-Pin Euro QD | | MIAD9DQ | | | | |
| DIVERGENT DIFFUSE | 75 mm | 2 m | | MIAD9W | EGC-19 (p. 124) | BP-19 (p. 128) | | |
| | | 4-Pin Euro QD | | MIAD9WQ | | | | |
| CONVERGENT | 16 mm | 2 m | | MIAD9CV | EGC-33 (p. 125) | BP-33 (p. 129) | | |
| | 43 mm | 2 m | | MIAD9CVQ | | | | |
| GLASS FIBER | Range varies by sensing mode and fiber optics used | 2 m | | MIAD9V | EGC-34 (p. 125) | BP-34 (p. 129) | | |
| | | 4-Pin Euro QD | | MIAD9CV2Q | | | | |
| GLASS FIBER | Range varies by sensing mode and fiber optics used | 2 m | MIAD9F | EGC-48 & EGC-49 (p. 125) | BP-48 & BP-49 (p. 129) | | | |
| | | 4-Pin Euro QD | MIAD9FQ | | | | | |

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Connection options: A model with a QD requires a mating cordset (see page 122).

For 9 m cable, add suffix W/30 to the 2 m model number (example, MIAD9LV W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

| MINI-BEAM® NAMUR Specifications | |
|---------------------------------|---|
| Supply Voltage | 5 to 15V dc (provided by the amplifier to which the sensor is connected) |
| Output | Constant current output: ≤ 1.2 mA in the "dark" condition and ≥ 2.1 mA in the "light" condition |
| Output Response Time | Opposed receiver: 2 milliseconds ON/400 microseconds OFF All others: 5 milliseconds ON/OFF (does not include amplifier response) |
| Adjustments | GAIN (sensitivity) adjustment potentiometer |
| Indicators | Red LED Alignment Indicator Device (AID) located on rear panel lights when the sensor sees a "light" condition; pulse rate is proportional to signal strength (the stronger the signal, the faster the pulse rate). |
| Construction | Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses, and stainless steel screws |
| Environmental Rating | Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12 and 13; IEC IP67 |
| Connections | PVC-jacketed 2-conductor 2 m or 9 m cables, or special 4-pin Euro-style quick-disconnect (QD) fitting are available; QD cordsets are ordered separately. See page 122. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Design Standards | MIAD9 Series sensors comply with the following standards: DIN 19 234, EN 50 014 Part 1. 1977, EN50 020 Part 7. 1977, Factory Mutual #3610 and 3611, CSA 22.2 #157-92 and 22.2 #213-M1987 |
| Certifications |      |
| Hookup Diagrams | SP01 (p. 770) |






| APPROVALS | | | |
|--------------------|--|--------------------|--|
| CSA: #LR 41887 | Intrinsically Safe, with Entity for Class I, Groups A-D Class I, Div. 2, Groups A-D | FM: #J.I. 5Y3A4.AX | Intrinsically Safe, with Entity for Class I, II, III, Div. 1, Groups A-G Class I, II, III, Div. 2, Groups A-D and G |
| KEMA: #03ATEX1441X | II IG EEx ia IIC T6 | ETL: #553868 | |

Cordsets

| Euro QD | | | | | Micro | | | NAMUR Euro QD | | |
|--------------|----------------|-------------|----------------|-------------|--------------|----------------|-------------|---------------|----------------|-------------|
| See page 696 | | | | | See page 712 | | | See page 697 | | |
| | Threaded 4-Pin | | Threaded 5-Pin | | | Threaded 3-Pin | | | Threaded 4-Pin | |
| Length | Straight | Right-Angle | Straight | Right-Angle | Length | Straight | Right-Angle | Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA | MQDC1-506 | MQDC1-506RA | 1.83 m | MQDC-306 | MQDC-306RA | 1.83 m | MQD9-406 | MQD9-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA | MQDC1-515 | MQDC1-515RA | 4.57 m | MQDC-315 | MQDC-315RA | 4.57 m | MQD9-415 | MQD9-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA | MQDC1-530 | MQDC1-530RA | 9.14 m | MQDC-330 | MQDC-330RA | | | |

Additional cordset information available. See page 693.

Brackets

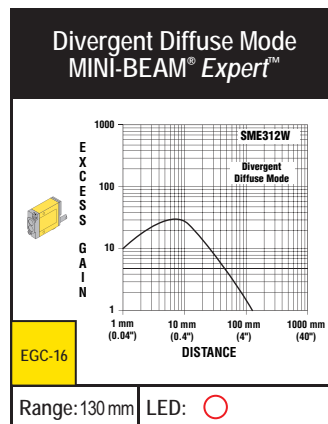
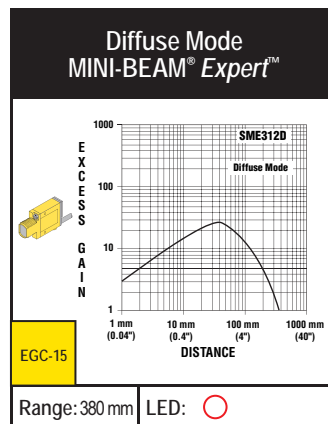
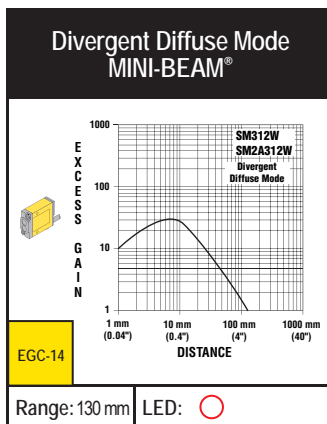
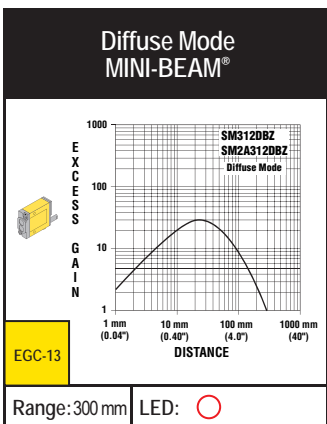
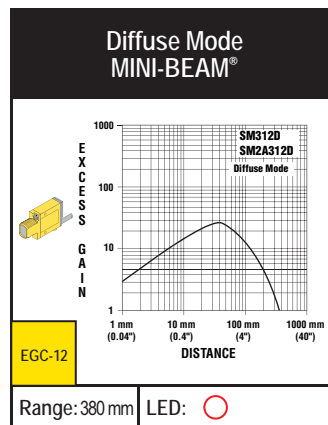
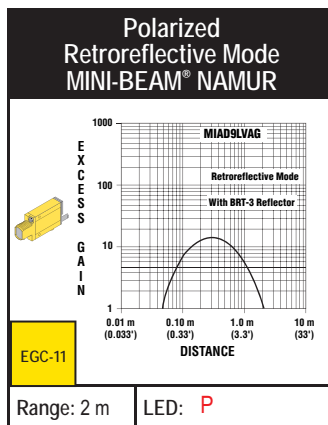
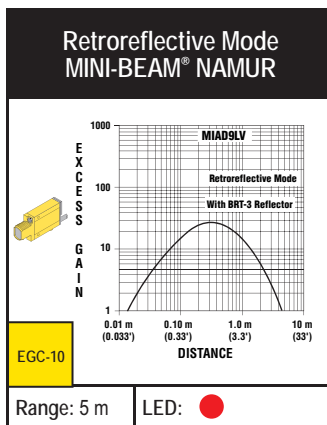
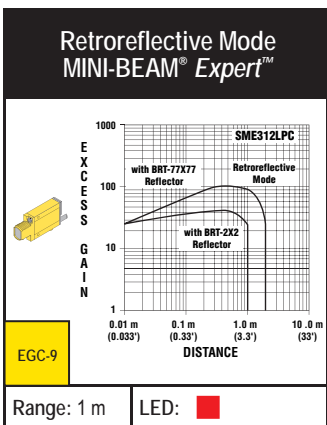
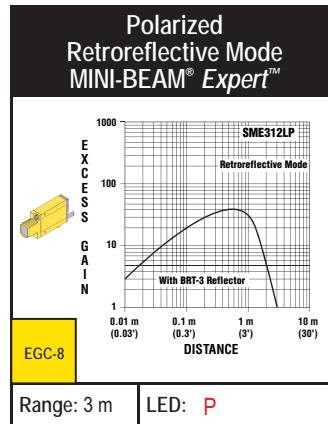
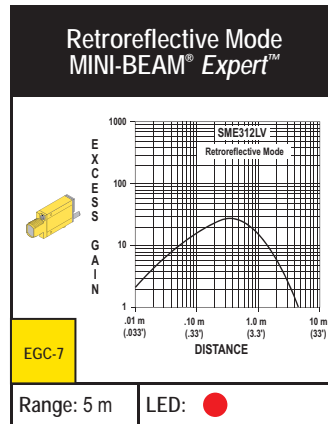
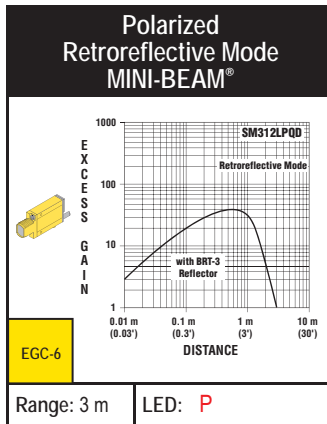
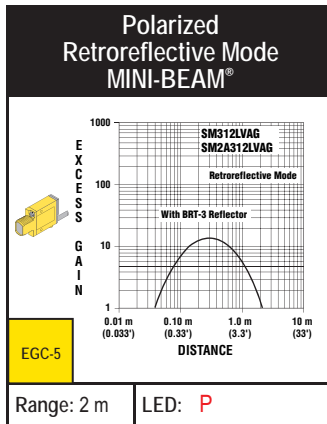
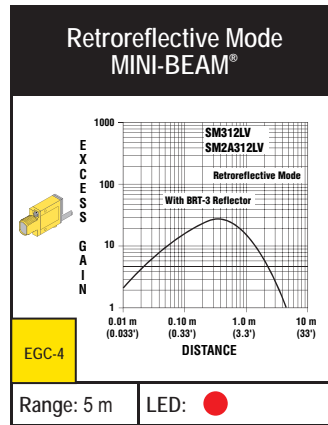
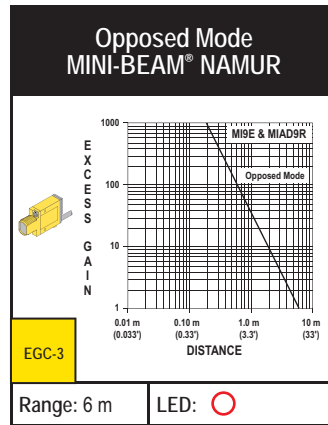
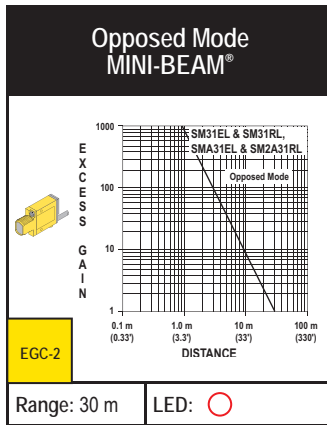
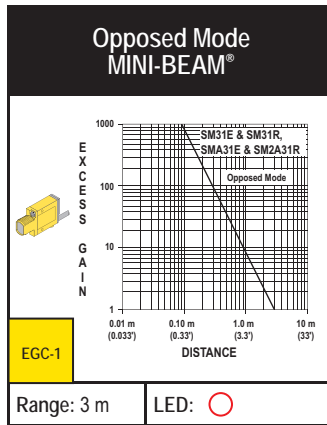
| MINI-BEAM | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
| pg. 650 | pg. 651 | pg. 652 | pg. 655 | pg. 652 |
| SMB18A | SMB18FA.. | SMB18SF | SMB312B | SMB3018SC |

Additional brackets and information available. See page 632.



Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ■ = Visible Red Clear Object Detection Polarized



- Photoelectronics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

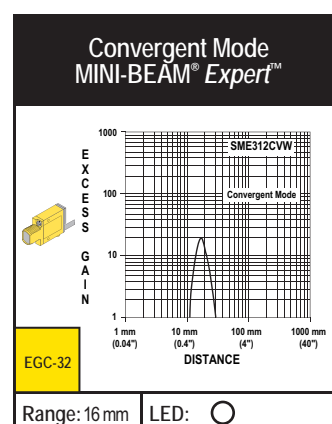
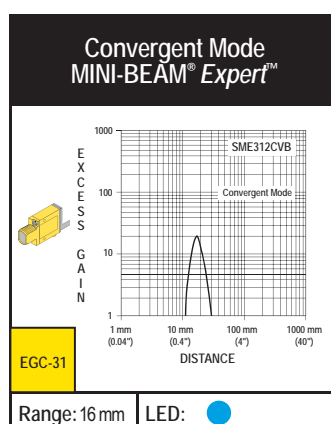
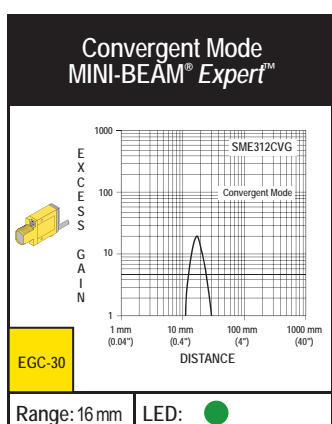
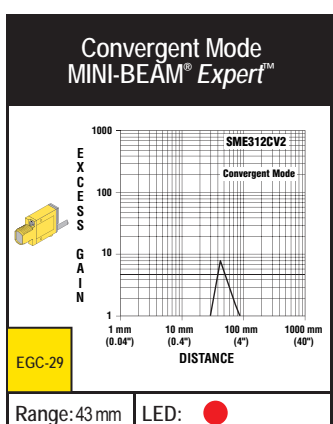
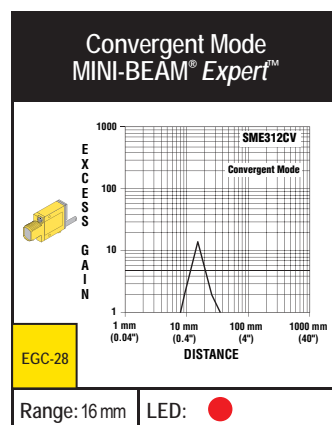
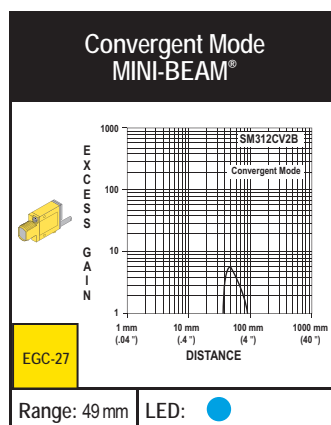
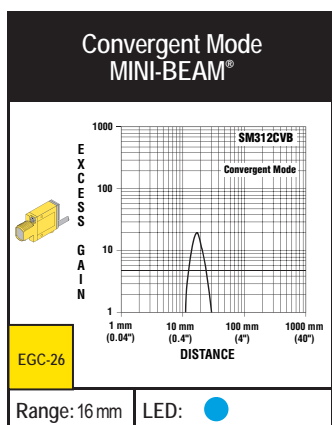
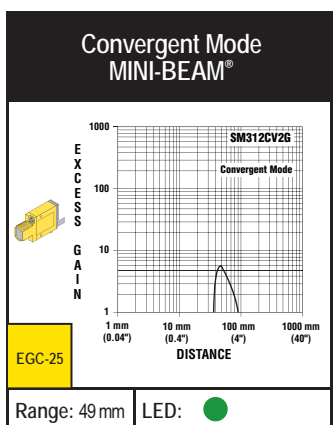
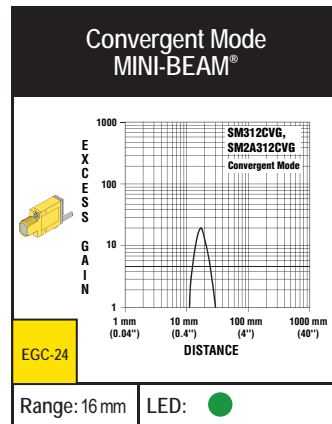
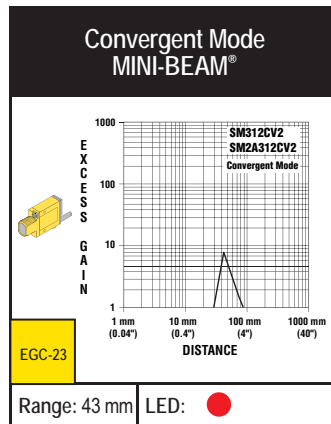
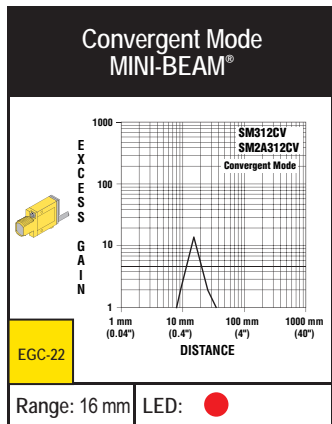
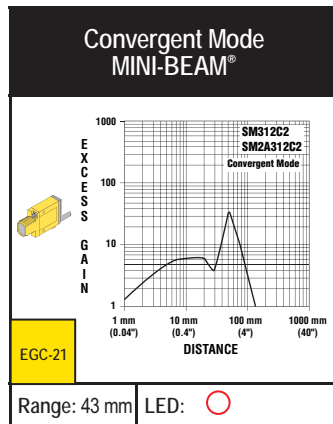
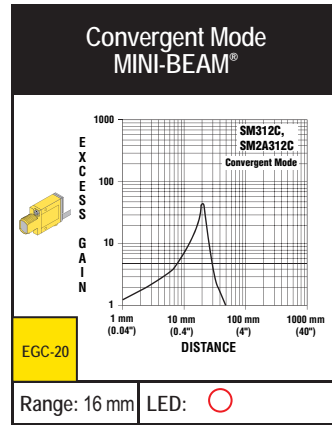
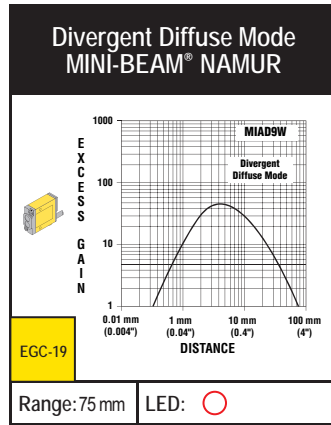
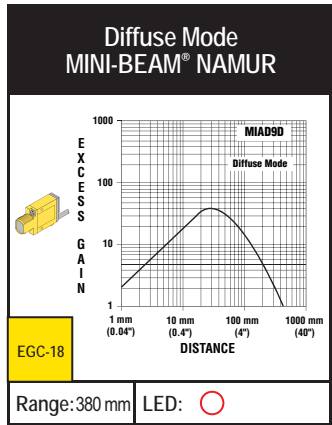
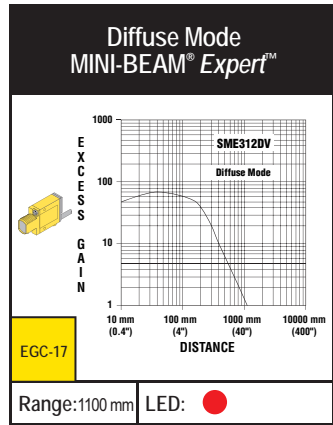
- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE



Excess Gain Curves (Diffuse and Convergent mode performance based on 90% reflectance white test card)

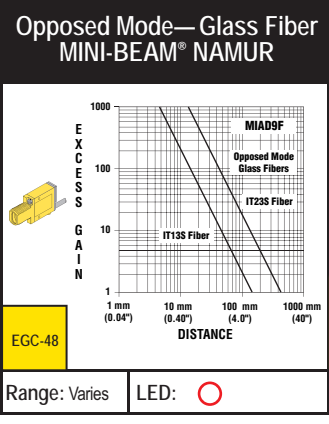
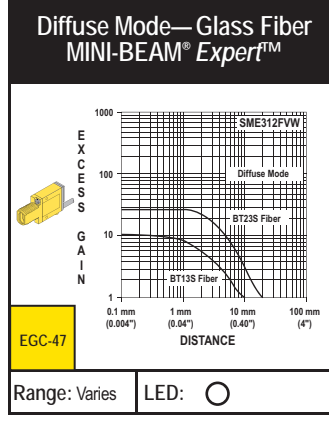
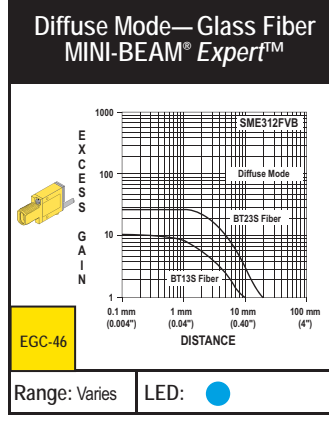
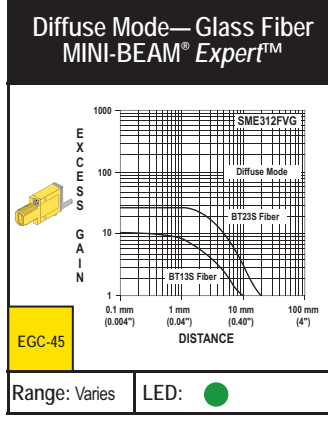
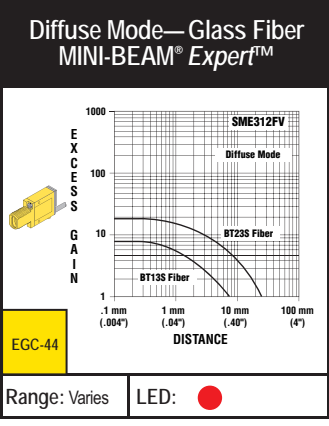
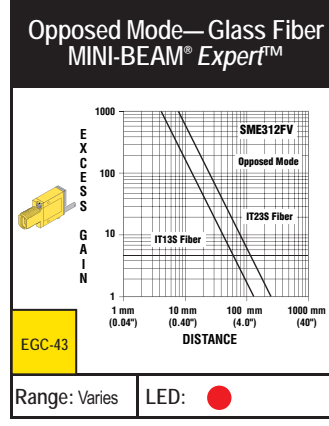
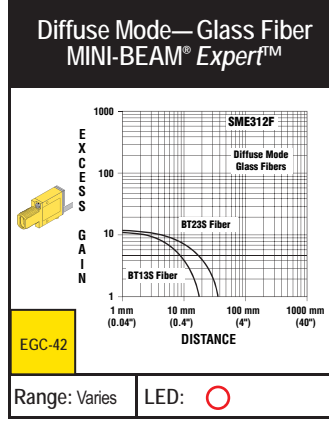
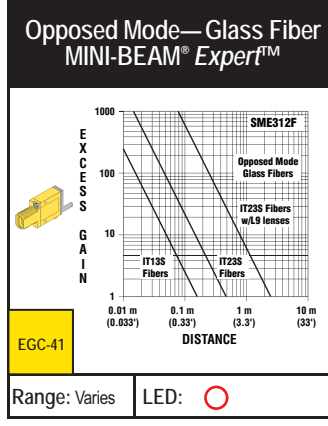
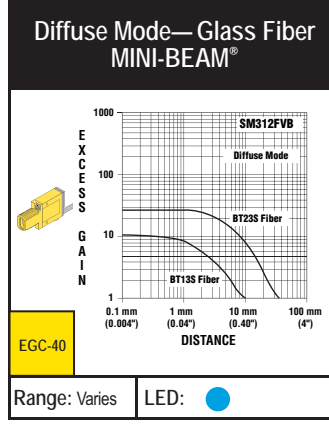
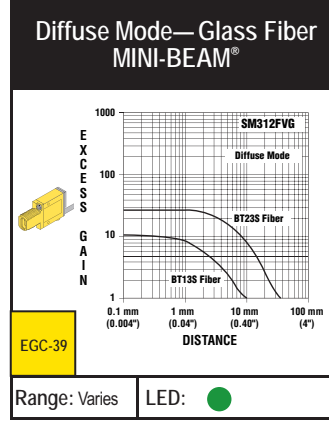
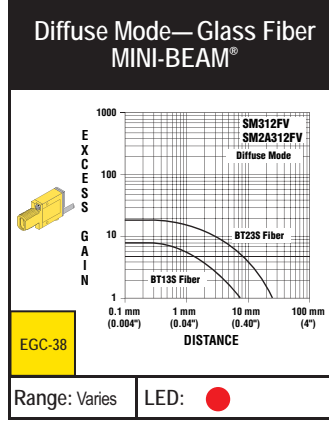
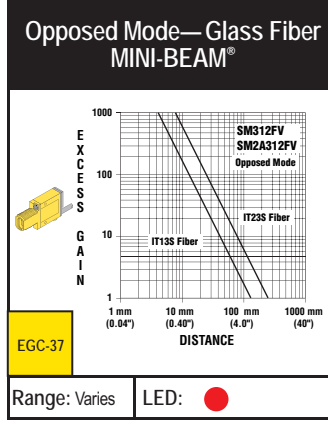
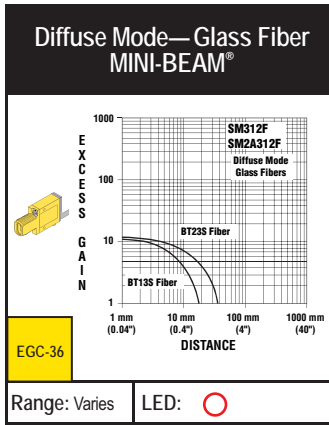
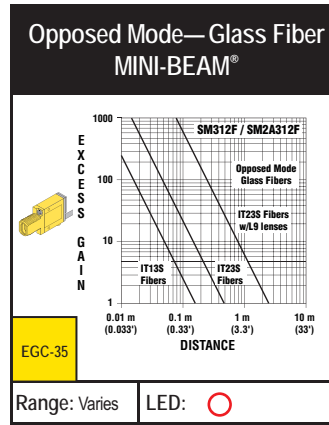
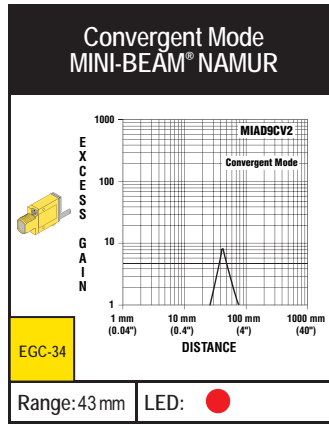
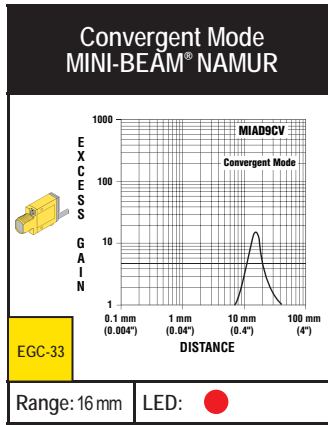
○ = Infrared LED ● = Visible Red LED ● = Visible Green LED ● = Visible Blue LED ○ = Visible White LED

SENSORS



Excess Gain Curves (Convergent and Diffuse mode performance based on 90% reflectance white test card)

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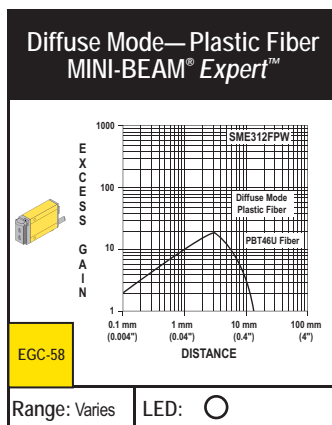
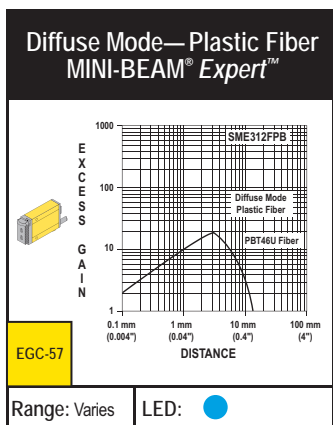
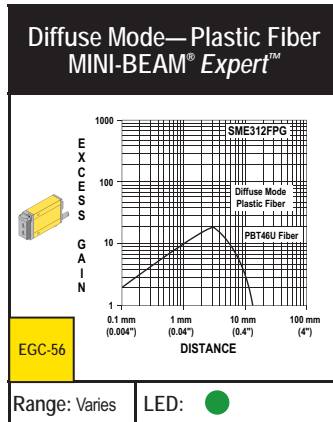
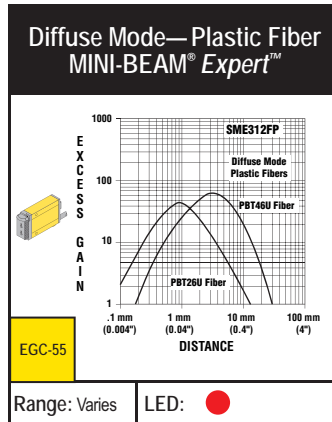
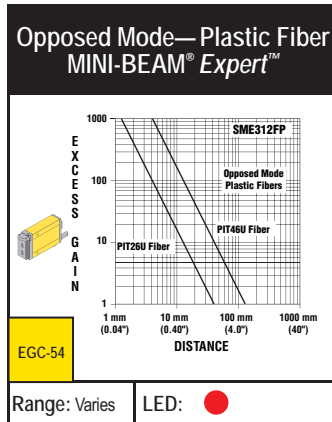
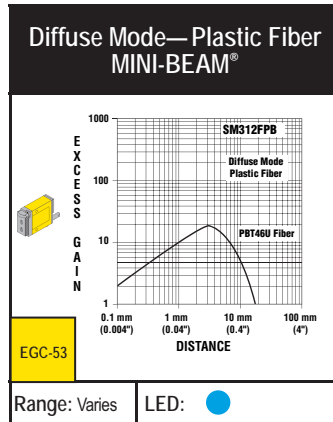
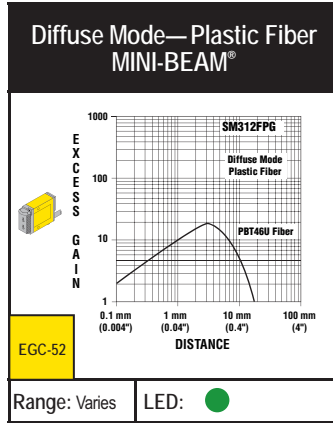
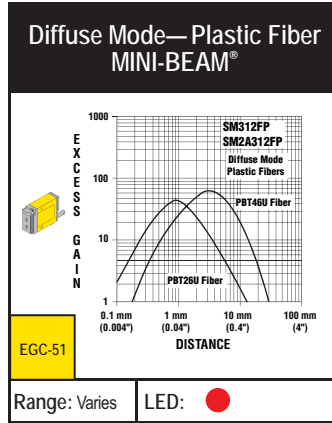
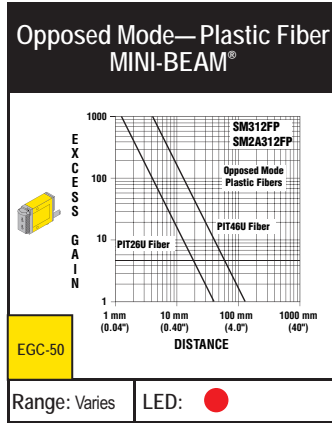
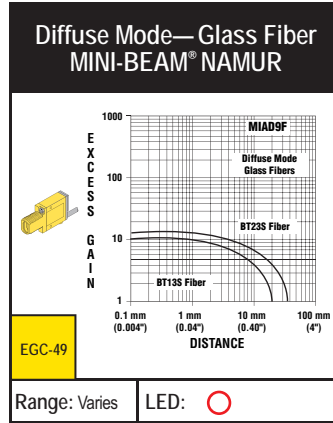
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- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
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- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

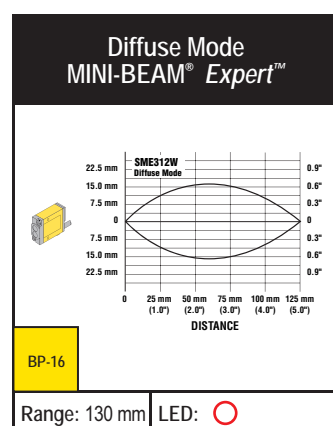
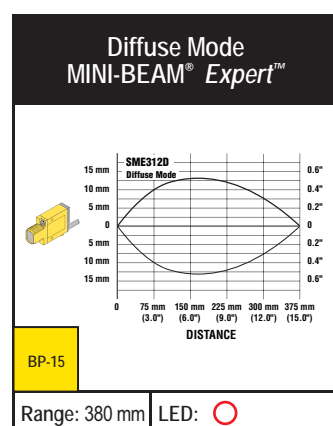
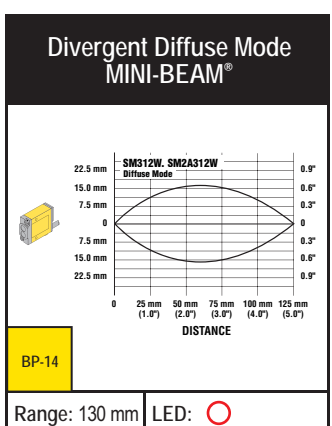
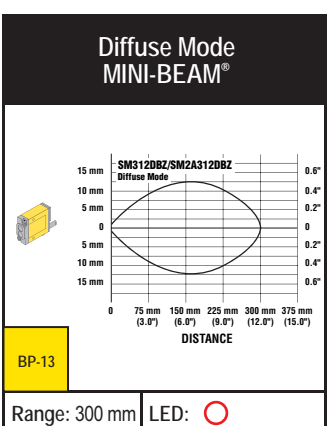
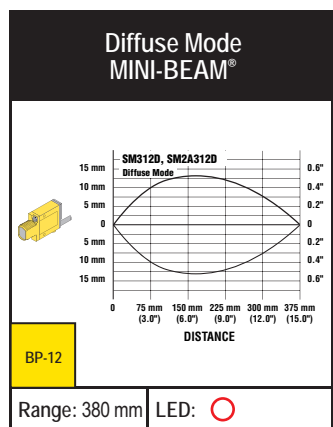
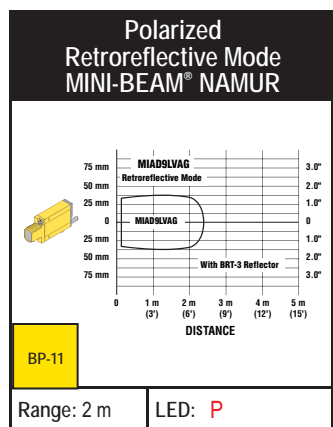
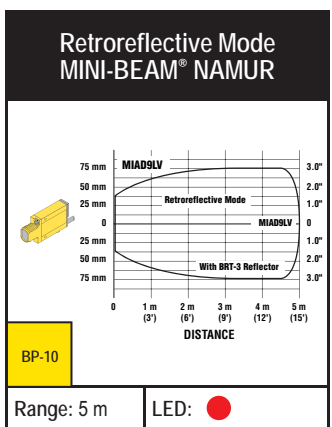
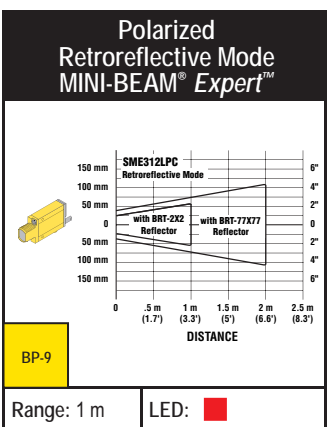
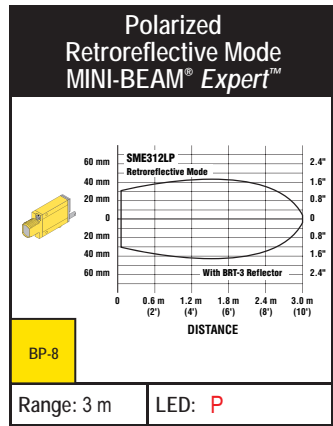
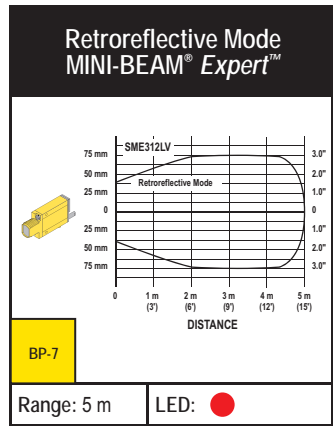
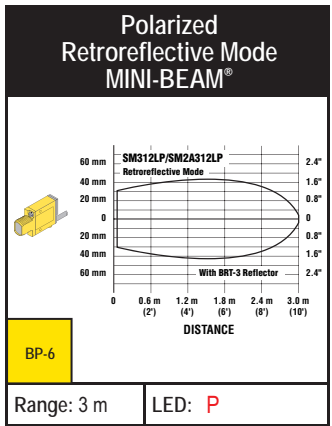
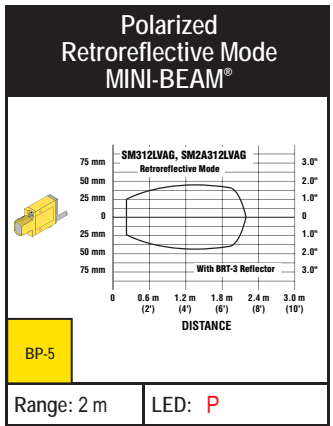
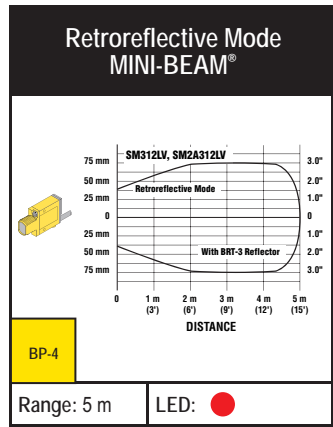
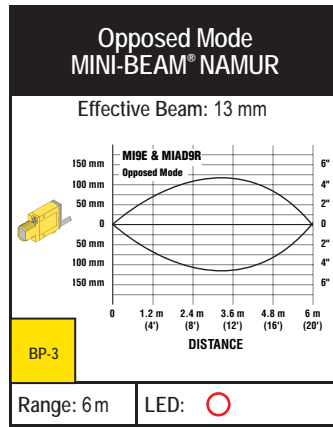
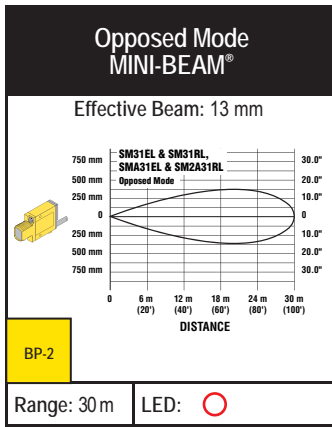
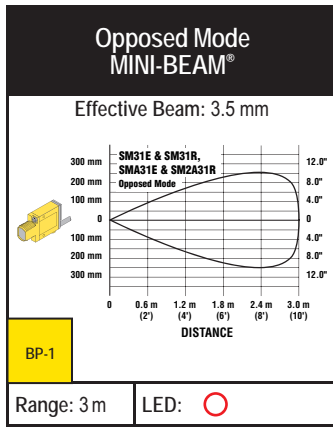
Excess Gain Curves (Diffuse mode performance based on 90% reflectance white test card)

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Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ■ = Visible Red Clear Object Detection Polarized



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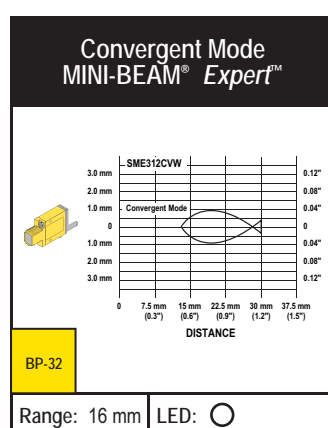
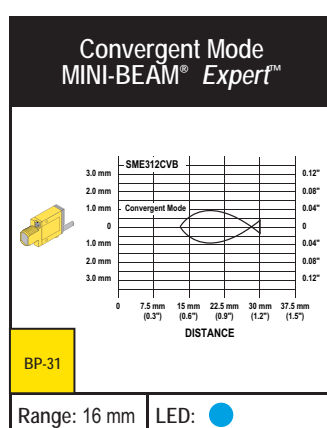
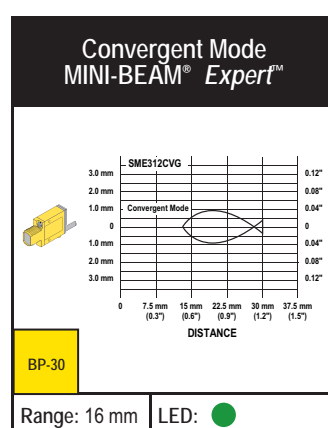
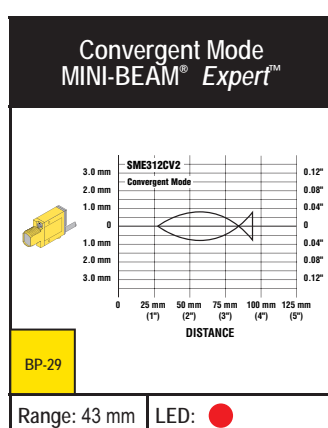
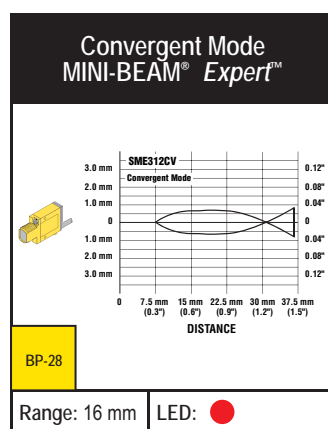
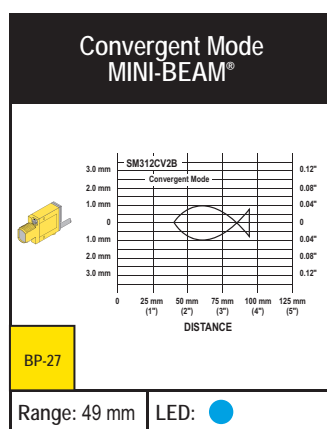
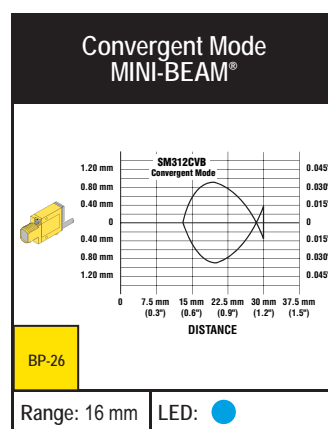
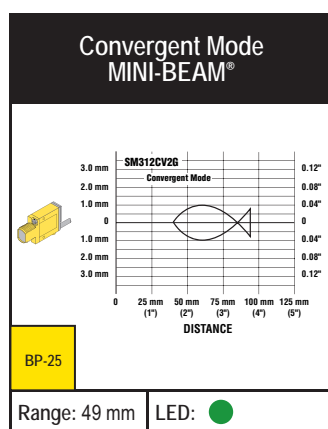
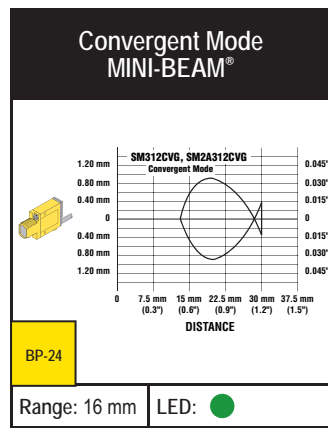
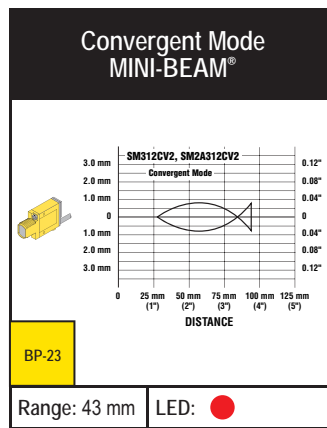
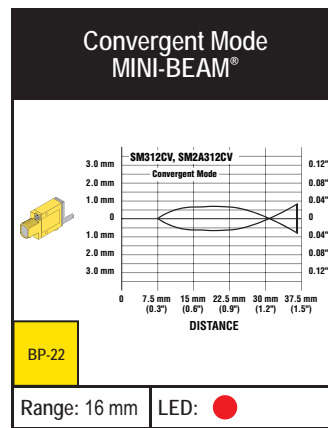
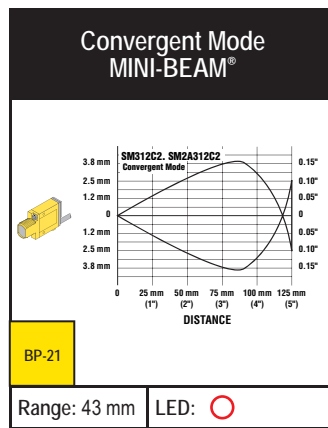
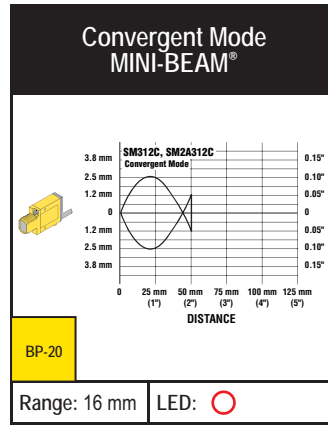
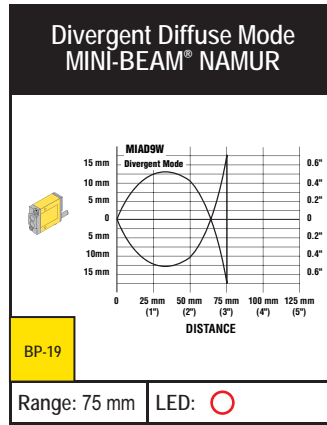
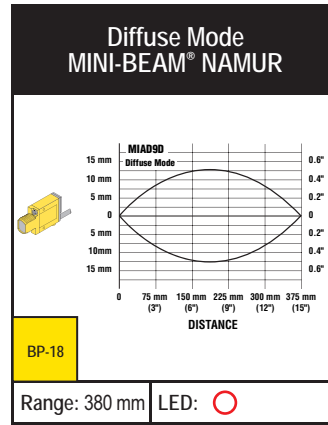
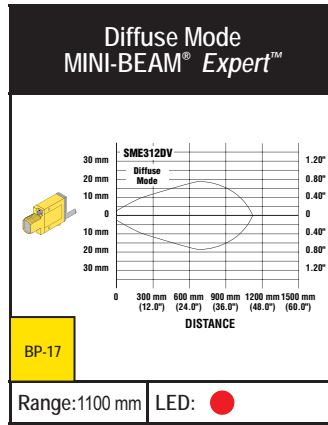
- MINIATURE
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Beam Patterns (Convergent and Diffuse mode performance based on 90% reflectance white test card)

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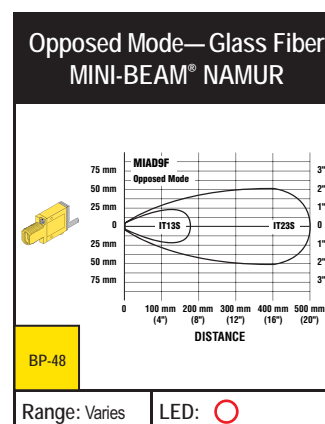
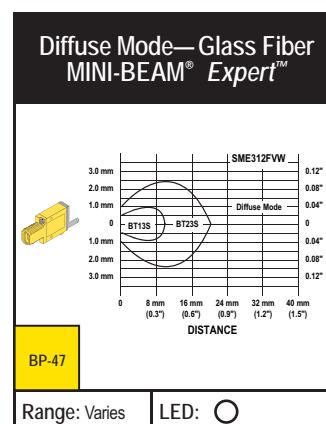
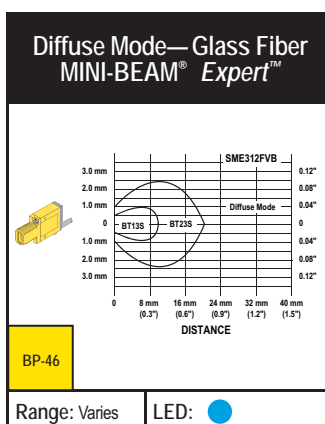
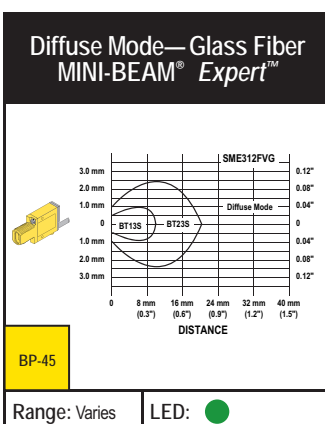
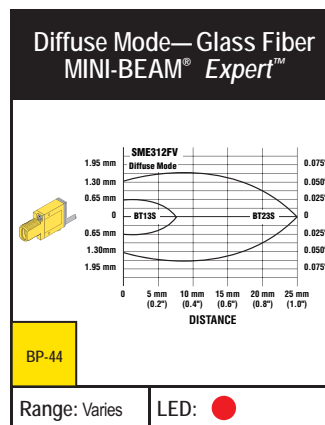
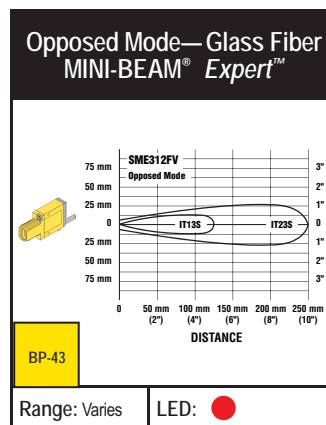
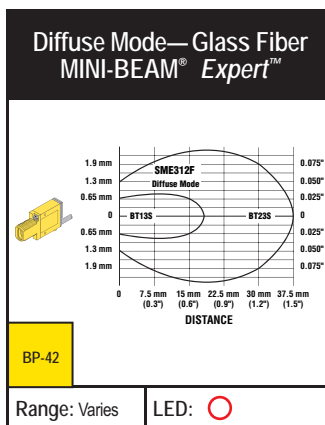
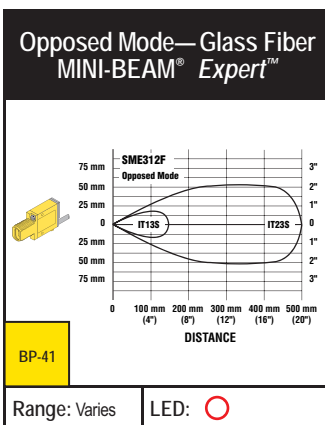
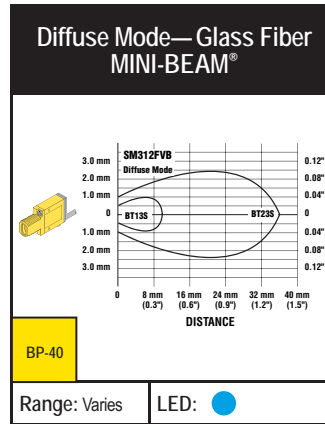
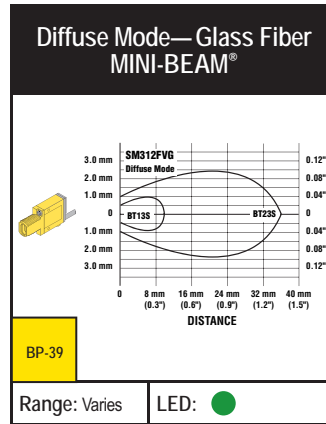
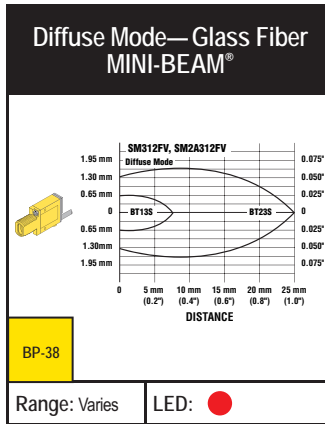
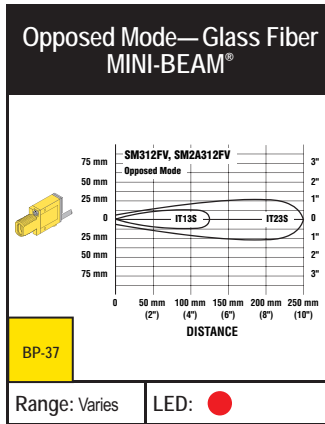
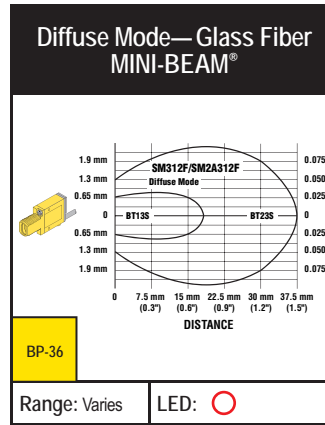
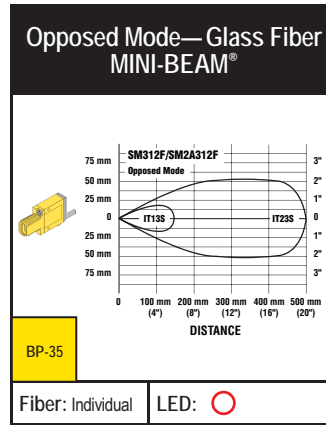
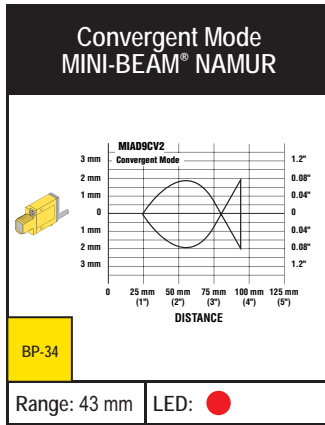
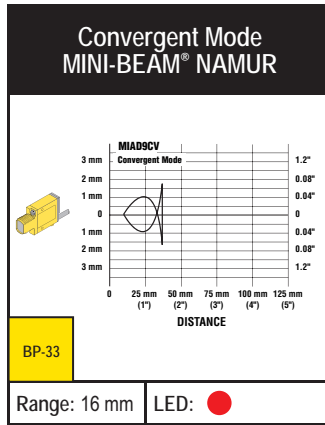
SENSORS



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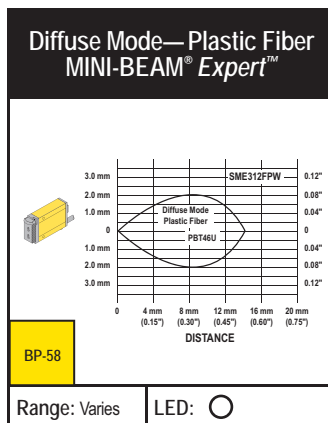
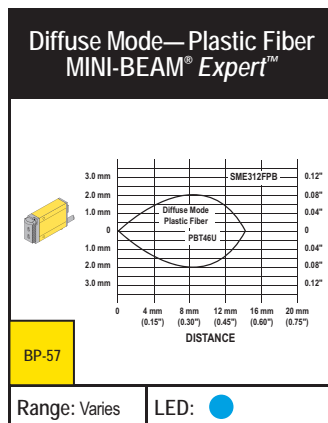
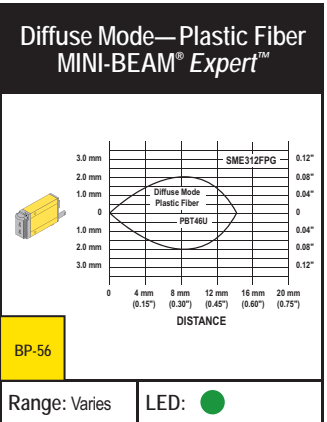
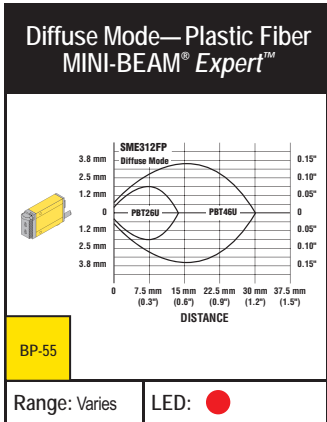
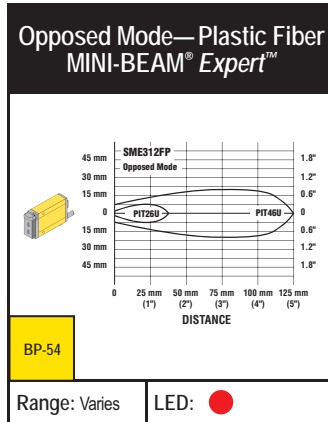
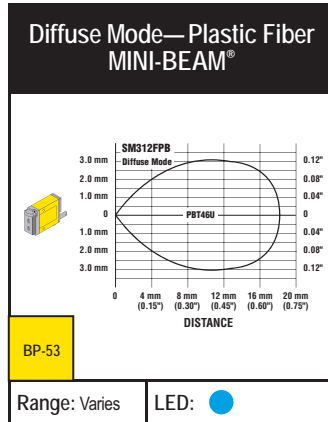
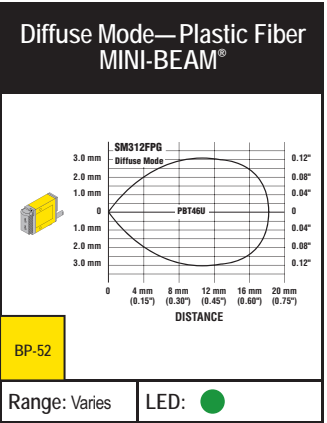
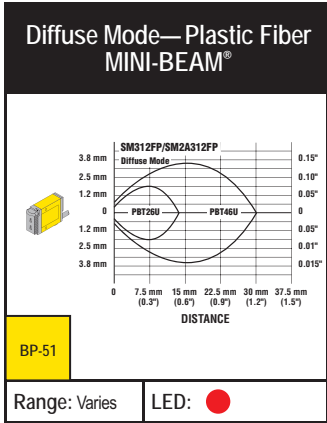
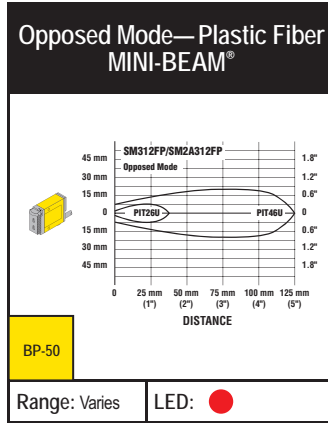
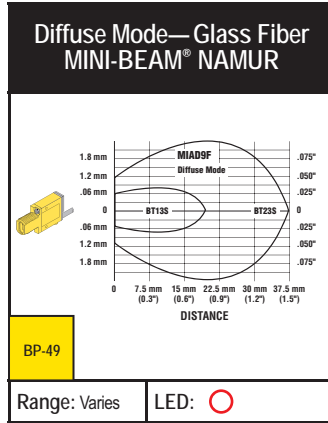
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Barrel-Mount Sensors S18 and M18

- Specially designed optics and electronics for reliable sensing without adjustments
- Plastic threaded barrel (S18) or stainless steel threaded barrel sensor (M18) available
- Completely epoxy-encapsulated to provide superior durability, even in harsh sensing environments
- Uses innovative dual-indicator system to reduce complexity of monitoring sensor performance
- Models available for ac or dc power
- Meets rigorous IP69K standards for use in washdown applications
- Includes advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)

Photoelectrics Sensors

Fiber Optic Sensors

Special Purpose Sensors

Measurement & Inspection Sensors

Vision

Wireless

Lighting & Indicators

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

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M18 DC Models 132

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page 135

S18 and M18 DC Sensors



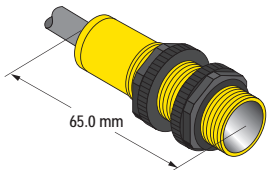
S18 Opposed, Non-polarized Retroreflective and Diffuse Models
Suffix E, R, L and D



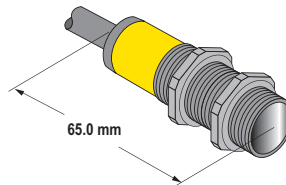
M18 Opposed, Non-polarized Retroreflective and Diffuse Models
Suffix E, R, L, D and DL

ONLINE

AUTOCAD, STEP, IGES & PDF



S18 Polarized Retroreflective and Fixed-field Models
Suffix LP and FF



M18 Polarized Retroreflective and Fixed-field Models
Suffix LP and FF

MINIATURE

COMPACT

WORLD-BEAM QS18

WORLD-BEAM Q20

WORLD-BEAM Q26

MINI-BEAM

S18/M18

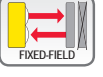
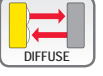
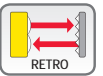
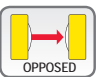
T18

TM18

Q25

MIDSIZE

FULLSIZE



S18, 10-30V dc

⇒ Infrared LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|------------------|-------|---------------|----------------|------------|----------------|---------------|
| <p>OPPOSED</p> | 20 m | 2 m | S186E Emitter | | EGC-1 (p. 136) | BP-1 (p. 137) |
| | | 4-pin Euro QD | S186EQ Emitter | | | |
| | | 2 m | S18SN6R | S18SP6R | | |
| | | 4-pin Euro QD | S18SN6RQ | S18SP6RQ | | |

More on next page

Connection options: A model with a QD requires a mating cordset (see pages 135).

For 9 m cable, add suffix W/30 to the 2 m model number (example, S18SP6R W/30).

S18, 10-30V dc (cont'd)

Infrared LED Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|------------------|-------------------|---------------|--------------|--------------|-------------------|------------------|
| RETRO | 2 m [†] | 2 m | S18SN6L | S18SP6L | EGC-2 (p. 136) | BP-2 (p. 137) |
| | | 4-pin Euro QD | S18SN6LQ | S18SP6LQ | | |
| POLAR RETRO | 2 m [†] | 2 m | S18SN6LP | S18SP6LP | EGC-3 (p. 136) | BP-3 (p. 137) |
| | | 4-pin Euro QD | S18SN6LPQ | S18SP6LPQ | | |
| FIXED-FIELD | 0 - 25 mm Cutoff | 2 m | S18SN6FF25 | S18SP6FF25 | EGC-6 (p. 136) | — |
| | | 4-pin Euro QD | S18SN6FF25Q | S18SP6FF25Q | | |
| | 0 - 50 mm Cutoff | 2 m | S18SN6FF50 | S18SP6FF50 | EGC-7 (p. 136) | — |
| | | 4-pin Euro QD | S18SN6FF50Q | S18SP6FF50Q | | |
| | 0 - 100 mm Cutoff | 2 m | S18SN6FF100 | S18SP6FF100 | EGC-8 (p. 136) | — |
| | | 4-pin Euro QD | S18SN6FF100Q | S18SP6FF100Q | | |
| DIFFUSE | 100 mm | 2 m | S18SN6D | S18SP6D | EGC-4 (p. 136) | BP-4 (p. 137) |
| | | 4-pin Euro QD | S18SN6DQ | S18SP6DQ | | |
| | 300 mm | 2 m | S18SN6DL | S18SP6DL | EGC-5 (p. 136) | BP-5 (p. 137) |
| | | 4-pin Euro QD | S18SN6DLQ | S18SP6DLQ | | |

Connection options: A model with a QD requires a mating cordset (see page 135).

For 9 m cable, add suffix W/30 to the 2 m model number (example, S18SP6D W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

M18, 10-30V dc

Infrared LED Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|------------------|-------------------|---------------|----------------|--------------|-------------------|------------------|
| OPPOSED | 20 m | 2 m | M186E Emitter | | EGC-1 (p. 136) | BP-1 (p. 137) |
| | | 4-pin Euro QD | M186EQ Emitter | | | |
| | | 2 m | M18SN6R | M18SP6R | | |
| | | 4-pin Euro QD | M18SN6RQ | M18SP6RQ | | |
| RETRO | 2 m [†] | 2 m | M18SN6L | M18SP6L | EGC-2 (p. 136) | BP-2 (p. 137) |
| | | 4-pin Euro QD | M18SN6LQ | M18SP6LQ | | |
| POLAR RETRO | 2 m [†] | 2 m | M18SN6LP | M18SP6LP | EGC-3 (p. 136) | BP-3 (p. 137) |
| | | 4-pin Euro QD | M18SN6LPQ | M18SP6LPQ | | |
| FIXED-FIELD | 0 - 25 mm Cutoff | 2 m | M18SN6FF25 | M18SP6FF25 | EGC-6 (p. 136) | — |
| | | 4-pin Euro QD | M18SN6FF25Q | M18SP6FF25Q | | |
| | 0 - 50 mm Cutoff | 2 m | M18SN6FF50 | M18SP6FF50 | EGC-7 (p. 136) | — |
| | | 4-pin Euro QD | M18SN6FF50Q | M18SP6FF50Q | | |
| | 0 - 100 mm Cutoff | 2 m | M18SN6FF100 | M18SP6FF100 | EGC-8 (p. 136) | — |
| | | 4-pin Euro QD | M18SN6FF100Q | M18SP6FF100Q | | |
| DIFFUSE | 100 mm | 2 m | M18SN6D | M18SP6D | EGC-4 (p. 136) | BP-4 (p. 137) |
| | | 4-pin Euro QD | M18SN6DQ | M18SP6DQ | | |
| | 300 mm | 2 m | M18SN6DL | M18SP6DL | EGC-5 (p. 136) | BP-5 (p. 137) |
| | | 4-pin Euro QD | M18SN6DLQ | M18SP6DLQ | | |

Connection options: A model with a QD requires a mating cordset (see page 135).

For 9 m cable, add suffix W/30 to the 2 m model number (example, M18SP6D W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

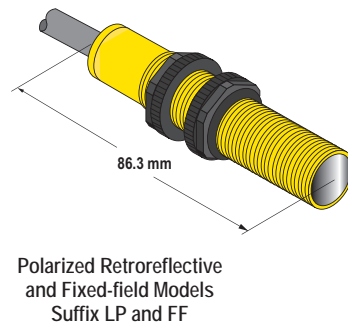
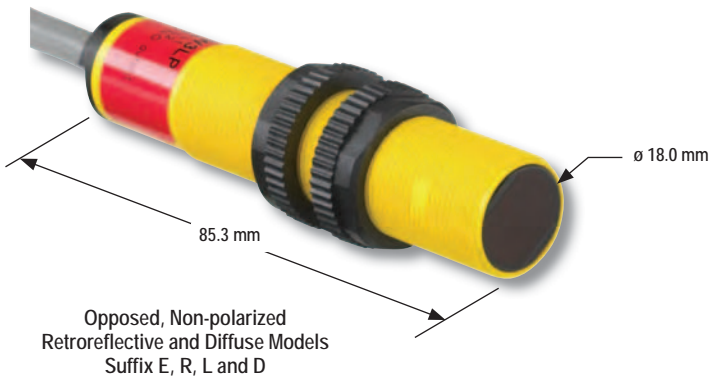
S18 and M18 DC Specifications

| | |
|--------------------------------|--|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple); Supply current (exclusive of load current): Opposed Emitters: 25 mA Polarized Retroreflective: 30 mA Fixed-field: 35 mA Opposed Receivers: 20 mA Non-polarized Retroreflective: 25 mA Diffuse: 25 mA |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state complementary dc switch; NPN (current sinking) or PNP (current sourcing), depending on model The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply |
| Output Rating | 150 mA max. (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA OFF-state leakage current: less than 1 μ A at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 150 mA dc |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs |
| Output Response Time | Opposed: 3 milliseconds ON, 1.5 milliseconds OFF Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 3 milliseconds ON/OFF |
| Delay at Power-up | 100 milliseconds; outputs are non-conducting during this time |
| Repeatability | Opposed: 375 microseconds Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 750 microseconds. Repeatability and response are independent of signal strength. |
| Indicators | Two LEDs: Green: Power is ON Yellow: Light Operate (LO) output is energized |
| Construction | M18 models: stainless steel housing S18 models: thermoplastic polyester housing Lenses are polycarbonate or acrylic; S18 and M18 models come with two jam nuts |
| Environmental Rating | Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9. |
| Connections | 2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 135. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation) |
| Certifications | S18 and M18 models: S18 models: |
| Hookup Diagrams | Emitters: DC02 (p. 758) NPN Models: DC05 (p. 759) PNP Models: DC06 (p. 759) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- WORLD-BEAM Q518
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

S18 AC Sensors



S18, 20-250V ac

⇨ Infrared LED

➔ Visible Red LED

ACCESSORIES
page 135

| Sensing Mode/LED | Range | Connection | Models LO | Models DO | Excess Gain | Beam Pattern |
|------------------|-------------------|----------------|-----------------|---------------|-------------------|------------------|
| OPPOSED | 20 m | 2 m | S183E Emitter | | EGC-1 (p. 136) | BP-1 (p. 137) |
| | | 4-pin Micro QD | S183EQ1 Emitter | | | |
| | | 2 m | S18AW3R | S18RW3R | | |
| | | 4-pin Micro QD | S18AW3RQ1 | S18RW3RQ1 | | |
| RETRO | 2 m† | 2 m | S18AW3L | S18RW3L | EGC-2 (p. 136) | BP-2 (p. 137) |
| | | 4-pin Micro QD | S18AW3LQ1 | S18RW3LQ1 | | |
| POLAR RETRO | 2 m† | 2 m | S18AW3LP | S18RW3LP | EGC-3 (p. 136) | BP-3 (p.137) |
| | | 4-pin Micro QD | S18AW3LPQ1 | S18RW3LPQ1 | | |
| FIXED-FIELD | 0 - 25 mm Cutoff | 2 m | S18AW3FF25 | S18RW3FF25 | EGC-6 (p. 136) | — |
| | | 4-pin Micro QD | S18AW3FF25Q1 | S18RW3FF25Q1 | | |
| | 0 - 50 mm Cutoff | 2 m | S18AW3FF50 | S18RW3FF50 | EGC-7 (p. 136) | — |
| | | 4-pin Micro QD | S18AW3FF50Q1 | S18RW3FF50Q1 | | |
| | 0 - 100 mm Cutoff | 2 m | S18AW3FF100 | S18RW3FF100 | EGC-8 (p. 136) | — |
| | | 4-pin Micro QD | S18AW3FF100Q1 | S18RW3FF100Q1 | | |
| DIFFUSE | 100 mm | 2 m | S18AW3D | S18RW3D | EGC-4 (p. 136) | BP-4 (p. 137) |
| | | 4-pin Micro QD | S18AW3DQ1 | S18RW3DQ1 | | |
| | 300 mm | 2 m | S18AW3DL | S18RW3DL | EGC-5 (p. 136) | BP-5 (p. 137) |
| | | 4-pin Micro QD | S18AW3DLQ1 | S18RW3DLQ1 | | |

Connection options: A model with a QD requires a mating cordset (see page 135).

For 9 m cable, add suffix W/30 to the 2 m model number (example, S18AW3D W/30).

† Retroreflective range is specified using one model BRT-3 retroreflector, unless otherwise noted.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

| S18 AC Specifications | |
|-----------------------------|--|
| Supply Voltage and Current | 20 to 250V ac (50/60 Hz). Average current: 20 mA. Peak current: 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac |
| Supply Protection Circuitry | Protected against transient voltages |
| Output Configuration | Solid-state ac switch; three-wire hookup; Light Operate (LO) or Dark Operate (DO), depending on model Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark |
| Output Rating | 300 mA max. (continuous) Fixed-field: derate 5 mA/° C above +50° C Inrush capability: 1 amp for 20 milliseconds, non-repetitive OFF-state leakage current: less than 100 µA ON-state voltage drop: 3V at 300 mA ac; 2V at 15 mA ac |

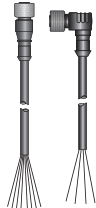


| S18 AC Specifications (cont'd) | |
|--------------------------------|--|
| Output Protection Circuitry | Protected against false pulse on power-up |
| Output Response Time | Opposed: 16 milliseconds ON, 8 milliseconds OFF Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 16 milliseconds ON/OFF |
| Delay at Power-up | 100 milliseconds |
| Repeatability | Opposed: 2 milliseconds Polarized Retroreflective, Non-polarized Retroreflective, Fixed-field and Diffuse: 4 milliseconds Repeatability and response are independent of signal strength. |
| Indicators | Two LEDs: Green: Power ON Yellow: Light sensed |
| Construction | Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; two jam nuts included. |
| Environmental Rating | Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9. |
| Connections | 2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 135. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation) |
| Certifications | |
| Hookup Diagrams | Cabled Emitters: AC03 (p. 764) Other Cabled Models: AC05 (p. 765) QD Emitters: AC07 (p. 765) Other QD Models: AC06 (p. 765) |

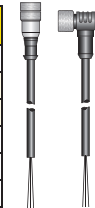
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Cordsets

| Euro QD | | |
|--------------|----------------|-------------|
| See page 696 | | |
| | Threaded 4-Pin | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |



| Micro QD | | |
|--------------|----------------|-------------|
| See page 712 | | |
| | Threaded 4-Pin | |
| Length | Straight | Right-Angle |
| 1.83 m | MQAC-406 | MQAC-406RA |
| 4.57 m | MQAC-415 | MQAC-415RA |
| 9.14 m | MQAC-430 | MQAC-430RA |



Additional cordset information available. See page 693.

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Brackets

| M18 & S18 | | | |
|-----------|---------|-----------|-----------|
| | | | |
| pg. 651 | pg. 650 | pg. 652 | pg. 660 |
| SMB18FA.. | SMB18A | SMB3018SC | SMBAMS18P |

Additional brackets and information available. See page 632.

REFLECTORS

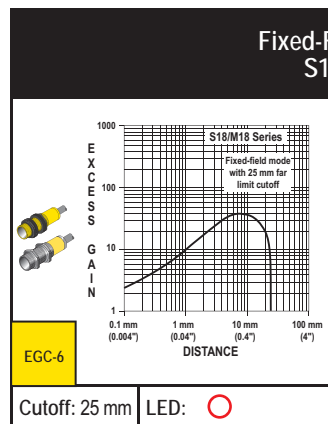
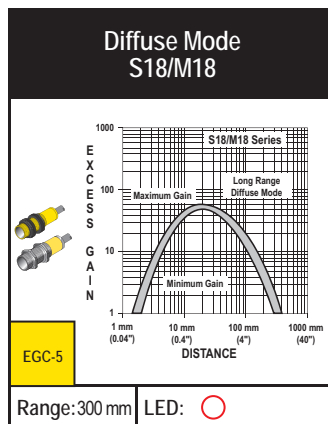
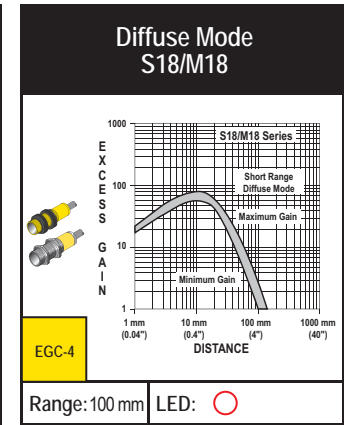
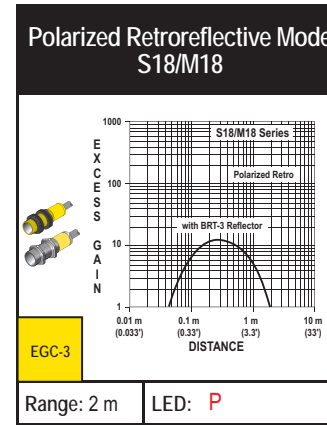
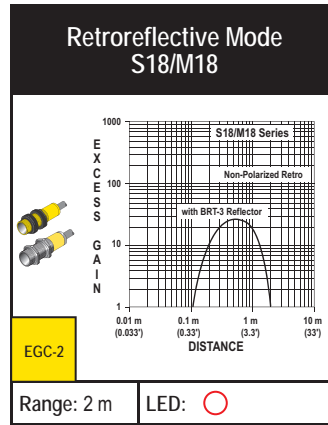
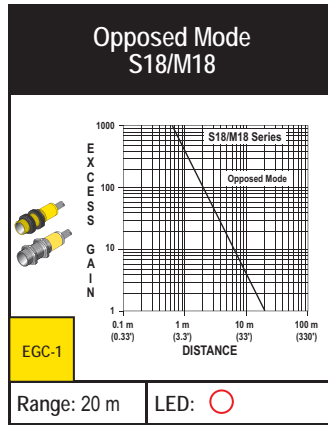
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APERTURES

PAGE 750

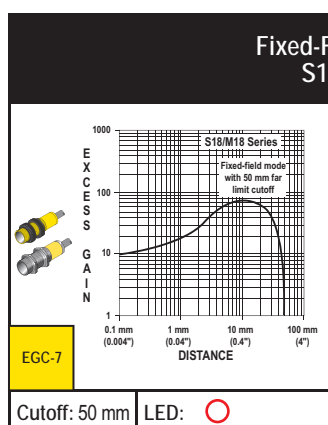
Excess Gain Curves (Diffuse and Fixed-Field mode performance based on 90% reflectance white test card[†])

○ = Infrared LED P = Visible Red LED Polarized



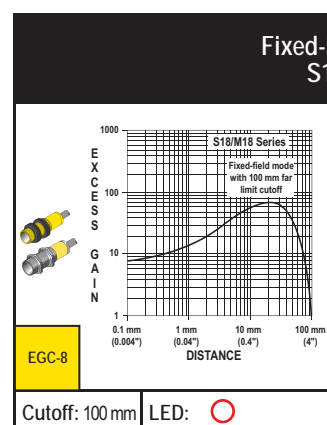
Ø 10 mm spot size @ 8 mm focus
 Ø 10 mm spot size @ 25 mm cutoff

† Using 18% gray test card: Cutoff distance will be 95% of value shown.
 † Using 6% black test card: Cutoff distance will be 90% of value shown.



Ø 10 mm spot size @ 10 mm focus
 Ø 10 mm spot size @ 50 mm cutoff

† Using 18% gray test card: Cutoff distance will be 90% of value shown.
 † Using 6% black test card: Cutoff distance will be 85% of value shown.

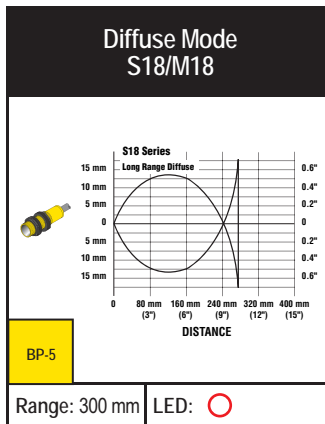
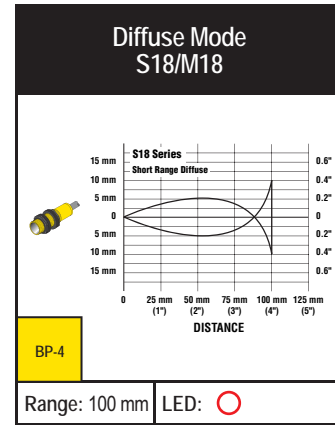
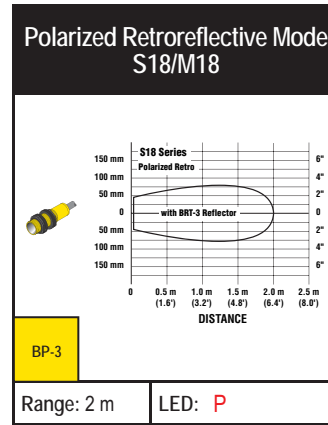
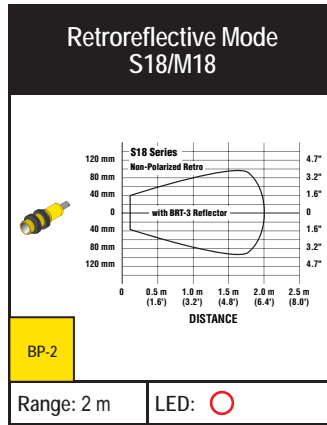
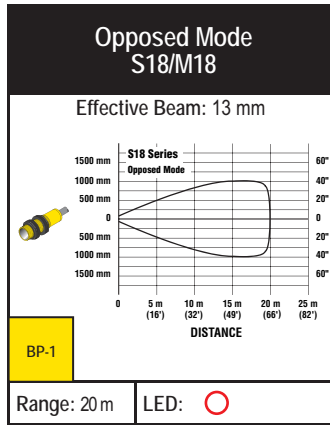


Ø 10 mm spot size @ 20 mm focus
 Ø 10 mm spot size @ 100 mm cutoff

† Using 18% gray test card: Cutoff distance will be 85% of value shown.
 † Using 6% black test card: Cutoff distance will be 75% of value shown.

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED P = Visible Red LED Polarized



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

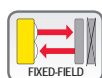
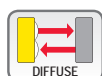
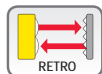
- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Right-Angle Barrel-Mount Sensors T18

- Specially designed optics and electronics for reliable sensing without adjustments on most models
- T-style plastic housing with 18 mm threaded lens mount
- Available in opposed, retroreflective, diffuse and fixed-field modes
- Completely epoxy-encapsulated to provide superior durability, even in harsh sensing environments
- Uses innovative dual-indicator system to take the guesswork out of monitoring sensor performance
- Models available for ac or dc power
- Includes advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)



ACCESSORIES
page 142



T18 DC Sensors



DC Sensors (all models)

T18 DC Models [page 134](#)

T18 AC Models [136](#)



T18, 10-30V dc

Infrared LED Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|------------------|------------------|---------------|----------------|------------|-------------------|------------------|
| OPPOSED | 20 m | 2 m | T186E Emitter | | EGC-1 (p. 142) | BP-1 (p. 143) |
| | | 4-pin Euro QD | T186EQ Emitter | | | |
| | | 2 m | T18SN6R | T18SP6R | | |
| | | 4-pin Euro QD | T18SN6RQ | T18SP6RQ | | |
| RETRO | 2 m [†] | 2 m | T18SN6L | T18SP6L | EGC-2 (p. 142) | BP-2 (p. 143) |
| | | 4-pin Euro QD | T18SN6LQ | T18SP6LQ | | |
| POLAR RETRO | 2 m [†] | 2 m | T18SN6LP | T18SP6LP | EGC-3 (p. 142) | BP-3 (p. 143) |
| | | 4-pin Euro QD | T18SN6LPQ | T18SP6LPQ | | |

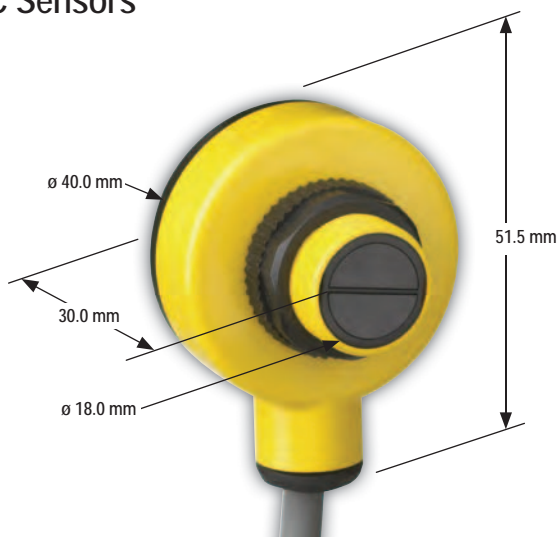
More on next page

Connection options: A model with a QD requires a mating cordset (see page 142).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T18SN6L W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

T18 AC Sensors



AC Sensors (all models)



ACCESSORIES
page
142

T18, 20-250V ac

⇨ Infrared LED → Visible Red LED

| Sensing Mode/LED | Range | Connection | Models LO | Models DO | Excess Gain | Beam Pattern |
|--------------------------|-------------------|----------------|-----------------|---------------|-------------------|------------------|
| <p>OPPOSED</p> | 20 m | 2 m | T183E Emitter | | EGC-1 (p. 142) | BP-1 (p. 143) |
| | | 4-pin Micro QD | T183EQ1 Emitter | | | |
| | | 2 m | T18AW3R | T18RW3R | | |
| | | 4-pin Micro QD | T18AW3RQ1 | T18RW3RQ1 | | |
| <p>RETRO</p> | 2 m [†] | 2 m | T18AW3L | T18RW3L | EGC-2 (p. 142) | BP-2 (p. 143) |
| | | 4-pin Micro QD | T18AW3LQ1 | T18RW3LQ1 | | |
| <p>P POLAR RETRO</p> | 2 m [†] | 2 m | T18AW3LP | T18RW3LP | EGC-3 (p. 142) | BP-3 (p. 143) |
| | | 4-pin Micro QD | T18AW3LPQ1 | T18RW3LPQ1 | | |
| <p>DIFFUSE</p> | 300 mm | 2 m | T18AW3D | T18RW3D | EGC-5 (p. 142) | BP-5 (p. 143) |
| | | 4-pin Micro QD | T18AW3DQ1 | T18RW3DQ1 | | |
| <p>FIXED-FIELD</p> | 0 - 25 mm Cutoff | 2 m | T18AW3FF25 | T18RW3FF25 | EGC-6 (p. 142) | — |
| | | 4-pin Micro QD | T18AW3FF25Q1 | T18RW3FF25Q1 | | |
| | 0 - 50 mm Cutoff | 2 m | T18AW3FF50 | T18RW3FF50 | EGC-7 (p. 143) | — |
| | | 4-pin Micro QD | T18AW3FF50Q1 | T18RW3FF50Q1 | | |
| | 0 - 100 mm Cutoff | 2 m | T18AW3FF100 | T18RW3FF100 | EGC-8 (p. 143) | — |
| | | 4-pin Micro QD | T18AW3FF100Q1 | T18RW3FF100Q1 | | |

Connection options: A model with a QD requires a mating cordset (see page 142).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T18AW3FF25 W/30).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.





Cordsets

| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MOQC-406 | MOQC-406RA |
| 4.57 m | MOQC-415 | MOQC-415RA |
| 9.14 m | MOQC-430 | MOQC-430RA |

Additional cordset information available. See page 693.

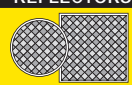
| Micro QD | | |
|----------------|----------|-------------|
| See page 712 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MOAC-406 | MOAC-406RA |
| 4.57 m | MOAC-415 | MOAC-415RA |
| 9.14 m | MOAC-430 | MOAC-430RA |

Brackets

| T18 | | | |
|---|---|---|---|
|  |  |  |  |
| pg. 650 | pg. 650 | pg. 651 | pg. 660 |
| SMB1815SF | SMB18A | SMB18FM | SMBAMS18P |

Additional brackets and information available. See page 632.

REFLECTORS



PAGE 724

APERTURES

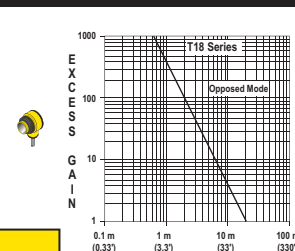
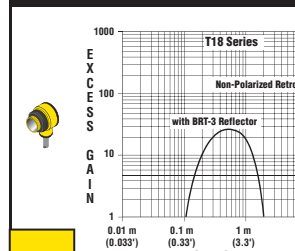
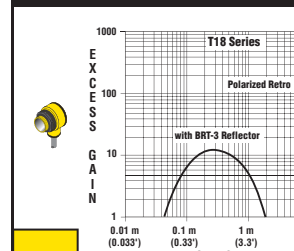
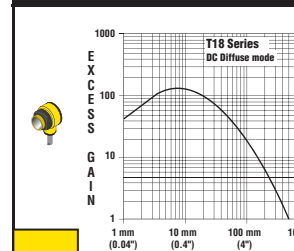
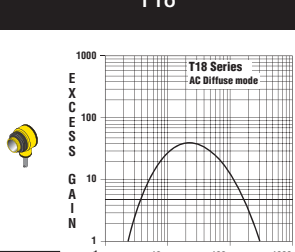
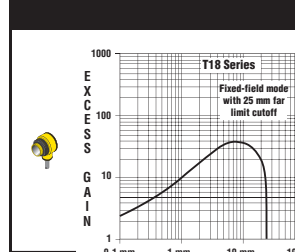


PAGE 750

Excess Gain Curves

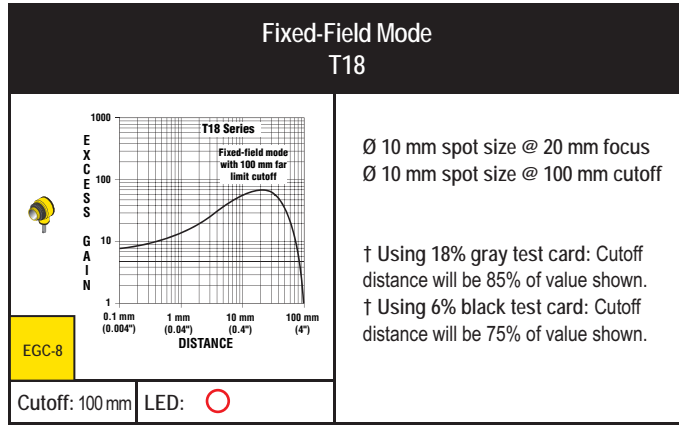
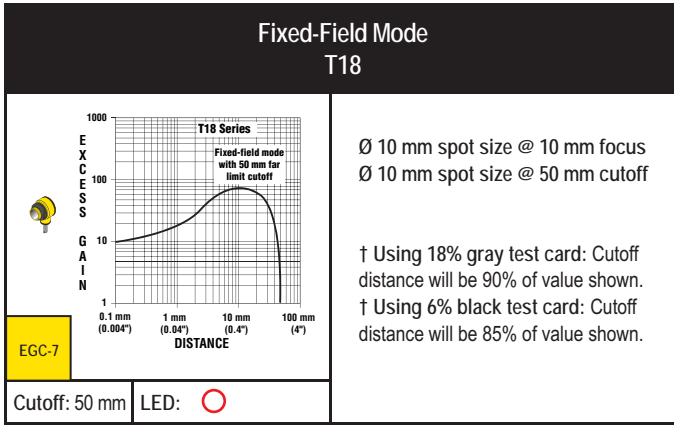
(Diffuse and Fixed-field mode performance based on 90% reflectance white test card†)

○ = Infrared LED P = Visible Red LED Polarized

| | | | |
|--|---|--|--|
| <p>Opposed Mode T18</p>  <p>EGC-1</p> <p>Range: 20 m LED: ○</p> | <p>Retroreflective Mode T18</p>  <p>EGC-2</p> <p>Range: 2 m LED: ○</p> | <p>Polarized Retroreflective Mode T18</p>  <p>EGC-3</p> <p>Range: 2 m LED: P</p> | <p>Diffuse Mode T18</p>  <p>EGC-4</p> <p>Range: 500 mm LED: ○</p> |
| <p>Diffuse Mode T18</p>  <p>EGC-5</p> <p>Range: 300 mm LED: ○</p> | <p>Fixed-Field Mode T18</p>  <p>EGC-6</p> <p>Cutoff: 25 mm LED: ○</p> | <p>Ø 10 mm spot size @ 8 mm focus Ø 10 mm spot size @ 25 mm cutoff</p> <p>† Using 18% gray test card: Cutoff distance will be 95% of value shown. † Using 6% black test card: Cutoff distance will be 90% of value shown.</p> <p>More on next page</p> | |

Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card¹)

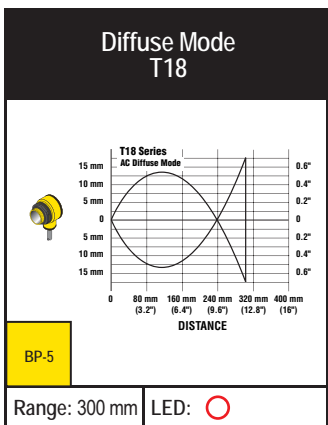
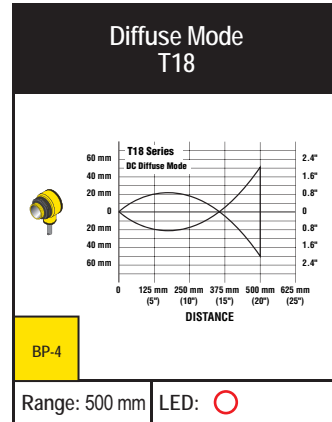
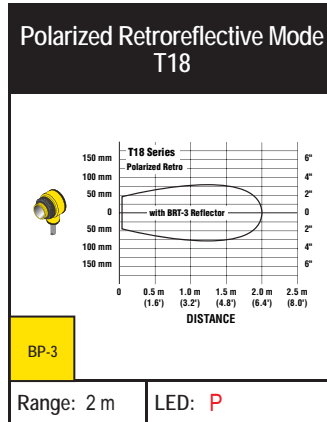
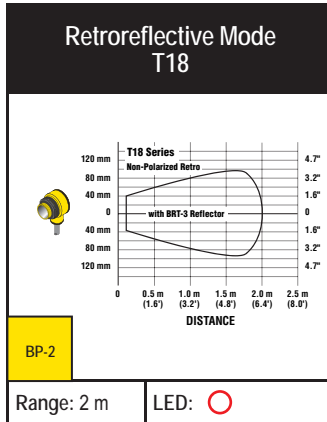
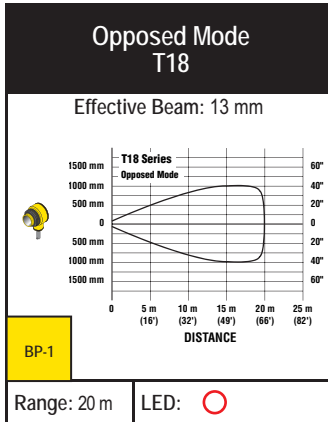
○ = Infrared LED



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Interlocks & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED P = Visible Red LED Polarized



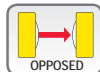
- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Heavy-Duty Right-Angle Barrel-Mount Sensors TM18

- Heavy-duty, die-cast metal housing with integral metal QD prevents sensor damage during machine assembly, transport, maintenance and operation
- Robust, all-metal, one-piece design easily fits in tight places for added sensor protection
- Specially designed optics and electronics provides reliable sensing without adjustments
- All models have an extremely bright LED red sensing beam for easy sensor alignment
- Completely epoxy-encapsulated electronics deliver superior durability, especially in harsh sensing environments
- Sensors models with a QD are rated IP69K for resistance to intermittent high-pressure washdown
- Fixed-field models have enhanced immunity to fluorescent lights
- Crosstalk avoidance, on polarized and fixed-field models, allows two sensors to be used in close proximity
- Uses innovative dual-indicator system to reduce complexity of monitoring sensor performance

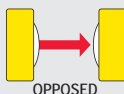


ACCESSORIES
page 146



TM18, 10-30V dc

→ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|--|------------|---------------|-------------|------------------|------------|-------------------|------------------|
|  OPPOSED | 20 m | 2 m | — | TM186E Emitter | | EGC-1 (p. 146) | BP-1 (p. 147) |
| | | 4-pin Euro QD | | TM186EQ8 Emitter | | | |
| | | 2 m | LO | TM18AN6R | TM18AP6R | | |
| | | 4-pin Euro QD | | TM18AN6RQ8 | TM18AP6RQ8 | | |
| | | 2 m | DO | TM18RN6R | TM18RP6R | | |
| | | 4-pin Euro QD | | TM18RN6RQ8 | TM18RP6RQ8 | | |
| | | 2 m | LO/DO | TM18VN6R | TM18VP6R | | |
| 4-pin Euro QD | TM18VN6RQ8 | TM18VP6RQ8 | | | | | |


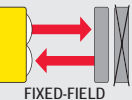
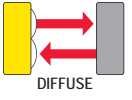


Connection options: A model with a QD requires a mating cordset (see page 146).

For 9 m cable, add suffix W/30 to the 2 m model number (example, TM186E W/30).
QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 to the 2 m model number (example, TM186EQ5).

TM18, 10-30V dc (cont'd)

➔ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|---|--------------------|---------------|-------------|----------------|----------------|-------------------|------------------|
|  POLAR RETRO | 5.5 m [†] | 2 m | LO | TM18AN6LP | TM18AP6LP | EGC-2 (p. 146) | BP-2 (p. 147) |
| | | 4-pin Euro QD | | TM18AN6LPQ8 | TM18AP6LPQ8 | | |
| | | 2 m | DO | TM18RN6LP | TM18RP6LP | | |
| | | 4-pin Euro QD | | TM18RN6LPQ8 | TM18RP6LPQ8 | | |
| | | 2 m | LO/DO | TM18VN6LP | TM18VP6LP | | |
| 4-pin Euro QD | TM18VN6LPQ8 | TM18VP6LPQ8 | | | | | |
|  FIXED-FIELD | 25 mm | 2 m | LO | TM18AN6FF25 | TM18AP6FF25 | EGC-4 (p. 147) | — |
| | | 4-pin Euro QD | | TM18AN6FF25Q8 | TM18AP6FF25Q8 | | |
| | | 2 m | LO/DO | TM18VN6FF25 | TM18VP6FF25 | | |
| | | 4-pin Euro QD | | TM18VN6FF25Q8 | TM18VP6FF25Q8 | | |
| | 50 mm | 2 m | LO | TM18AN6FF50 | TM18AP6FF50 | EGC-5 (p. 147) | — |
| | | 4-pin Euro QD | | TM18AN6FF50Q8 | TM18AP6FF50Q8 | | |
| | | 2 m | LO/DO | TM18VN6FF50 | TM18VP6FF50 | | |
| | | 4-pin Euro QD | | TM18VN6FF50Q8 | TM18VP6FF50Q8 | | |
| | 100 mm | 2 m | LO | TM18AN6FF100 | TM18AP6FF100 | EGC-6 (p. 147) | — |
| | | 4-pin Euro QD | | TM18AN6FF100Q8 | TM18AP6FF100Q8 | | |
| | | 2 m | LO/DO | TM18VN6FF100 | TM18VP6FF100 | | |
| | | 4-pin Euro QD | | TM18VN6FF100Q8 | TM18VP6FF100Q8 | | |
|  DIFFUSE | 500 mm | 2 m | LO | TM18AN6DV | TM18AP6DV | EGC-3 (p. 146) | BP-3 (p. 147) |
| | | 4-pin Euro QD | | TM18AN6DVQ8 | TM18AP6DVQ8 | | |
| | | 2 m | DO | TM18RN6DV | TM18RP6DV | | |
| | | 4-pin Euro QD | | TM18RN6DVQ8 | TM18RP6DVQ8 | | |
| | | 2 m | LO/DO | TM18VN6DV | TM18VP6DV | | |
| | | 4-pin Euro QD | | TM18VN6DVQ8 | TM18VP6DVQ8 | | |

Photoelectronics Sensors

- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 146

MINIATURE COMPACT

- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18**
- Q25
- MIDSIZE
- FULLSIZE



➔ Connection options: A model with a QD requires a mating cordset (see page 146).

For 9 m cable, add suffix W/30 to the 2 m model number (example, TM186E W/30).
 QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix Q5 to the 2 m model number (example, TM186EQ5).

† Retroreflective range is specified using one model BRT-84 retroreflector.
 Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

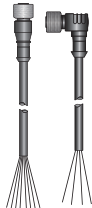
| TM18 Specifications | |
|-----------------------------|---|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple within specified limits); supply current (exclusive of load current): Opposed Emitters: 25 mA Opposed Receivers: 20 mA Polarized Retroreflector: 20 mA Diffuse and Fixed Field: 35 mA |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state dc switch; NPN (current sinking) or PNP (current sourcing), depending on model Light Operate: Output conducts when sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor does not see its own (or the emitter's) modulated light |
| Output Rating | 150 mA max. each output at 25° C, derated to 100mA at 70° C (derate about 1mA per °C) OFF-state leakage current: less than 1 mA @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA dc; less than 1.5V @ 150 mA dc |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs |
| Output Response Time | Opposed: 1.5 milliseconds ON, 0.75 milliseconds OFF Polarized Retroreflective: 3 milliseconds ON/OFF Diffuse and Fixed-Field: 3 milliseconds ON, 1.5 milliseconds OFF |
| Delay at Power-up | 100 milliseconds Outputs do not conduct during this time. |
| Repeatability | Opposed: 190 microseconds Polarized Retroreflective: 585 microseconds Diffuse and Fixed-Field: 185 microseconds |



| TM18 Specifications (cont'd) | |
|--------------------------------|---|
| Adjustments | Diffuse models only: single turn rear panel sensitivity control |
| Indicators | Two LEDs: Green: Power ON Yellow: Output energized |
| Construction | Housing: Zinc die-cast with nickel plating Lens: PC or PMMA Black Cover: PBT polyester housing; polycarbonate (opposed mode) or acrylic lens |
| Environmental Rating | Leakproof design rated NEMA 6; IP67, IP69K QD models and cable models when PVC jacket is protected |
| Connections | 2 m or 9 m attached cable, or 4-pin Euro-style integral or pigtail QD, depending on model. QD cordsets are ordered separately. See page 146. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% @ 50° C |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06" acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation) |
| Certifications |   |
| Hookup Diagrams | Emitters: DC02 (p. 758) NPN Models: DC01 (p. 758) PNP Models: DC01 (p. 758) All Others: DC03 (p. 758) |




Cordsets

| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.86 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |



Additional cordset information available. See page 693.

Brackets

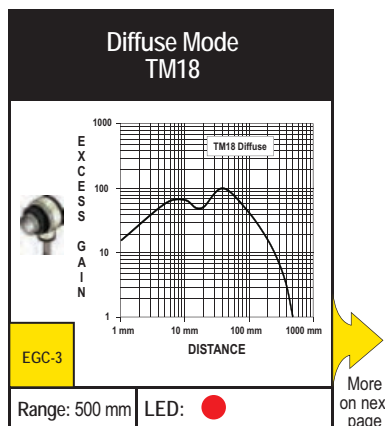
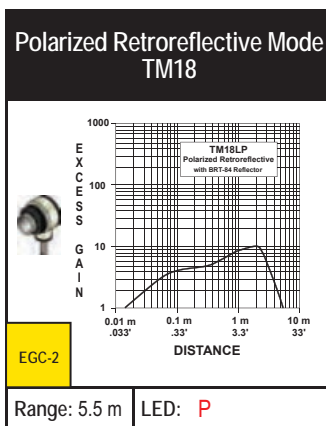
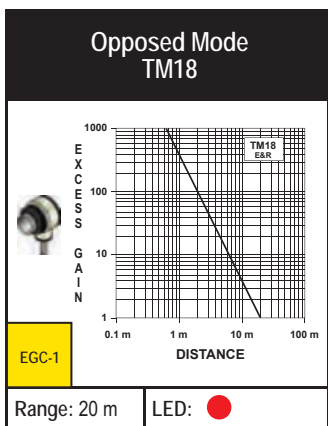
| TM18 | | |
|---|---|--|
|  |  |  |
| pg. 687 | pg. 650 | pg. 660 |
| SMBT18Y | SMB18A | SMBAMS18P |

Additional brackets and information available. See page 632.



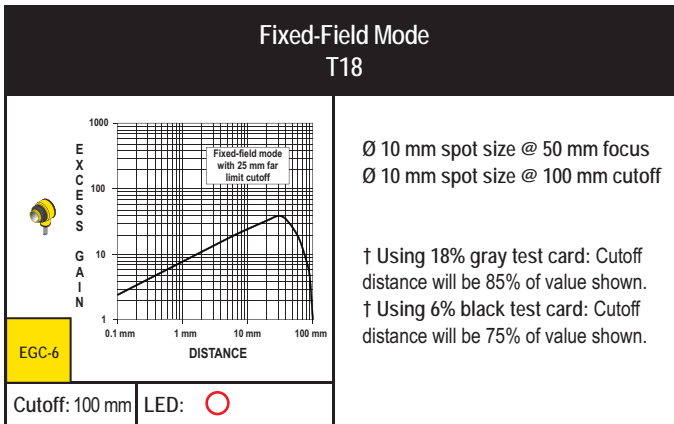
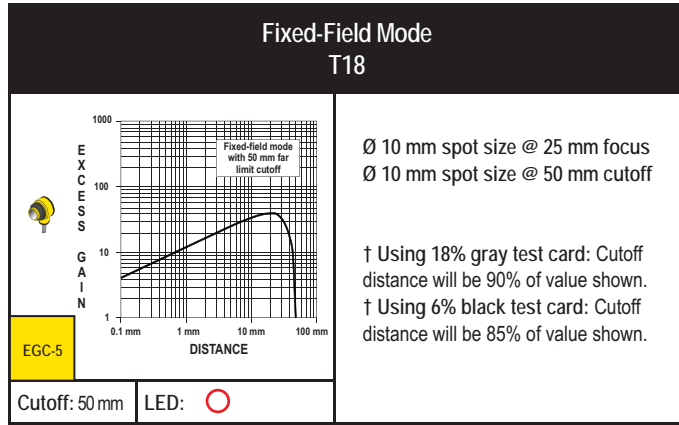
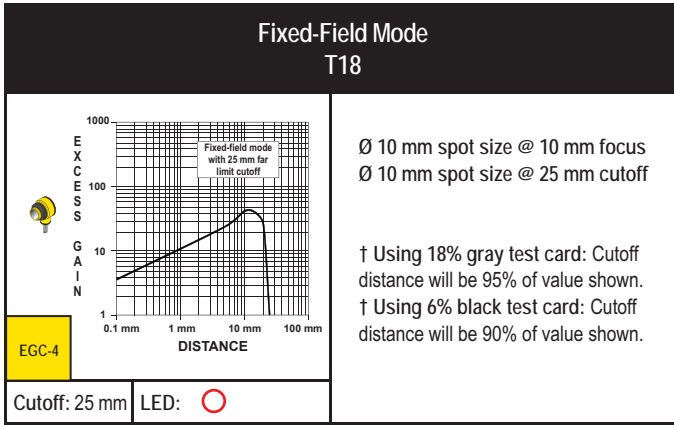
Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card¹)

● = Visible Red LED P = Visible Red LED Polarized



Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card¹)

○ = Infrared LED

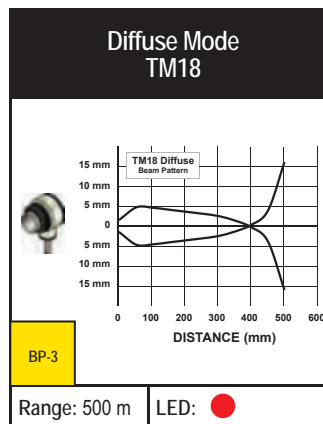
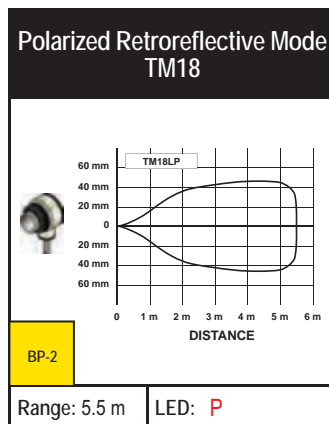
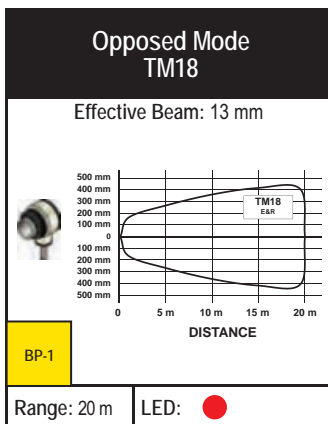


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
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- Lighting & Indicators
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- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Beam Patterns

● = Visible Red LED P = Visible Red LED Polarized

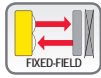
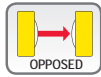


Right-Angle Base-Mount Rectangular Sensors Q25

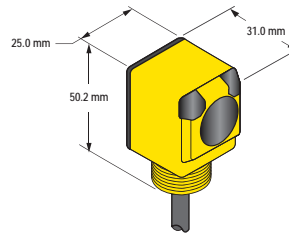
- Specially designed optics and electronics for reliable sensing without adjustments
- Available in opposed, retroreflective or fixed-field modes in rectangular 25 mm plastic housing with 18 mm threaded mounting base
- Completely epoxy-encapsulated for superior durability, even in harsh sensing environments
- Uses an innovative dual-indicator system to reduce complexity of monitoring sensor performance
- Models available for ac or dc power
- Includes advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)



ACCESSORIES
page 151



Opposed and Retroreflective Models
Suffix E, R and LP

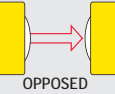


Fixed-field Models
Suffix FF



Q25, 10-30V dc

⇒ Infrared LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|--|-------|---------------|----------------|------------|-------------------|------------------|
|  OPPOSED | 20 m | 2 m | Q256E Emitter | | EGC-1 (p. 152) | BP-1 (p. 152) |
| | | 4-pin Euro QD | Q256EQ Emitter | | | |
| | | 2 m | Q25SN6R | Q25SP6R | | |
| | | 4-pin Euro QD | Q25SN6RQ | Q25SP6RQ | | |


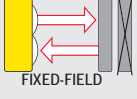
More on next page

Connection options: A model with a QD requires a mating cordset (see page 151).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q25SN6R W/30).

Q25, 10-30V dc (cont'd)

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|--|----------------------|---------------|--------------|--------------|-------------------|------------------|
|  POLAR RETRO | 2 m [†] | 2 m | Q25SN6LP | Q25SP6LP | EGC-2 (p. 152) | BP-2 (p. 152) |
| | | 4-pin Euro QD | Q25SN6LPQ | Q25SP6LPQ | | |
|  FIXED-FIELD | 0 - 25 mm Cutoff | 2 m | Q25SN6FF25 | Q25SP6FF25 | EGC-3 (p. 152) | — |
| | | 4-pin Euro QD | Q25SN6FF25Q | Q25SP6FF25Q | | |
| | 0 - 50 mm Cutoff | 2 m | Q25SN6FF50 | Q25SP6FF50 | EGC-4 (p. 152) | — |
| | | 4-pin Euro QD | Q25SN6FF50Q | Q25SP6FF50Q | | |
| | 0 - 100 mm Cutoff | 2 m | Q25SN6FF100 | Q25SP6FF100 | EGC-5 (p. 152) | — |
| | | 4-pin Euro QD | Q25SN6FF100Q | Q25SP6FF100Q | | |

Connection options: A model with a QD requires a mating cordset (see page 151).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q25SN6LP W/30).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

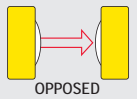

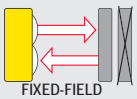
Photoelectrics Sensors

- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 151

Q25, 20-250V ac

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Models LO | Models DO | Excess Gain | Beam Pattern |
|--|----------------------|----------------|-----------------|---------------|-------------------|------------------|
|  OPPOSED | 20 m | 2 m | Q253E Emitter | | EGC-1 (p. 152) | BP-1 (p. 152) |
| | | 4-pin Micro QD | Q253EQ1 Emitter | | | |
| | | 2 m | Q25AW3R | Q25RW3R | | |
| | | 4-pin Micro QD | Q25AW3RQ1 | Q25RW3RQ1 | | |
|  POLAR RETRO | 2 m [†] | 2 m | Q25AW3LP | Q25RW3LP | EGC-2 (p. 152) | BP-2 (p. 152) |
| | | 4-pin Micro QD | Q25AW3LPQ1 | Q25RW3LPQ1 | | |
|  FIXED-FIELD | 0 - 25 mm Cutoff | 2 m | Q25AW3FF25 | Q25RW3FF25 | EGC-3 (p. 152) | — |
| | | 4-pin Micro QD | Q25AW3FF25Q1 | Q25RW3FF25Q1 | | |
| | 0 - 50 mm Cutoff | 2 m | Q25AW3FF50 | Q25RW3FF50 | EGC-4 (p. 152) | — |
| | | 4-pin Micro QD | Q25AW3FF50Q1 | Q25RW3FF50Q1 | | |
| | 0 - 100 mm Cutoff | 2 m | Q25AW3FF100 | Q25RW3FF100 | EGC-5 (p. 152) | — |
| | | 4-pin Micro QD | Q25AW3FF100Q1 | Q25RW3FF100Q1 | | |

Connection options: A model with a QD requires a mating cordset (see page 151).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q25AW3LP W/30).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories section for more information.

MINIATURE


COMPACT

- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

Q25 DC Specifications


| | |
|-----------------------------|--|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple); Supply current (exclusive of load current): Opposed Emitters: 25 mA Opposed Receivers: 20 mA Polarized Retroreflective: 30 mA Fixed-field: 35 mA |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state complementary dc switch; NPN (current sinking) or PNP (current sourcing), depending on model The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply |

More on next page

| Q25 DC Specifications (cont'd) | |
|--------------------------------|---|
| Output Rating | 150 mA max. (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA OFF-state leakage current: less than 1 µA at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 150 mA dc |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs |
| Output Response Time | Opposed: 3 milliseconds ON, 1.5 milliseconds OFF Polarized Retroreflective and Fixed-field: 3 milliseconds ON/OFF |
| Delay at Power-up | 100 milliseconds; outputs do not conduct during this time |
| Repeatability | Opposed: 375 microseconds Polarized Retroreflective and Fixed-field: 750 microseconds Repeatability and response are independent of signal strength |
| Indicators | Two LEDs: Green: Power ON Yellow: Light Operate (LO) output energized |
| Construction | Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included. |
| Environmental Rating | Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9. |
| Connections | 2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 151. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation) |
| Certifications |  |
| Hookup Diagrams | Emitters: DC02 (p. 758) NPN Models: DC05 (p. 759) PNP Models: DC06 (p. 759) |

| Q25 AC Specifications | |
|-----------------------------|---|
| Supply Voltage and Current | 20 to 250V ac (50/60 Hz) Average current: 20 mA Peak current: 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac |
| Supply Protection Circuitry | Protected against transient voltages |
| Output Configuration | Solid-state ac switch; three-wire hookup; Choose Light Operate (LO) or Dark Operate (DO), depending on model Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark |
| Output Rating | 300 mA max. (continuous) Fixed-field: derate 5 mA/° C above +50° C Inrush capability: 1 amp for 20 milliseconds, non-repetitive OFF-state leakage current: less than 100 mA ON-state voltage drop: 3V at 300 mA ac; 2V at 15 mA ac |
| Output Protection Circuitry | Protected against false pulse on power-up |
| Output Response Time | Opposed: 16 milliseconds ON, 8 milliseconds OFF Polarized Retroreflective and Fixed-field: 16 milliseconds ON/OFF |
| Delay at Power-up | 100 milliseconds |
| Repeatability | Opposed: 2 milliseconds; Polarized Retroreflective and Fixed-field: 4 milliseconds Repeatability and response are independent of signal strength. |
| Indicators | Two LEDs: Green and Yellow Green: Power ON Yellow: Light sensed |
| Construction | Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included. |
| Environmental Rating | Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9. |
| Connections | 2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 152. |

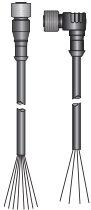


| Q25 AC Specifications (cont'd) | |
|--------------------------------|--|
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation) |
| Certifications |  |
| Hookup Diagrams | Cabled Emitters: AC03 (p. 764) Other Cabled Models: AC05 (p. 765) QD Emitters: AC07 (p. 765) Other QD Models: AC06 (p. 765) |


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


Cordsets

| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |







| Micro QD | | |
|----------------|----------|-------------|
| See page 712 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQAC-406 | MQAC-406RA |
| 4.57 m | MQAC-415 | MQAC-415RA |
| 9.14 m | MQAC-430 | MQAC-430RA |



 Additional cordset information available. See page 693.

Brackets

| Q25 | | |
|--|---|---|
|  |  |  |
| pg. 650 | pg. 651 | pg. 652 |
| SMB18A | SMB18FA.. | SMB18SF |

 Additional brackets and information available. See page 632.

REFLECTORS

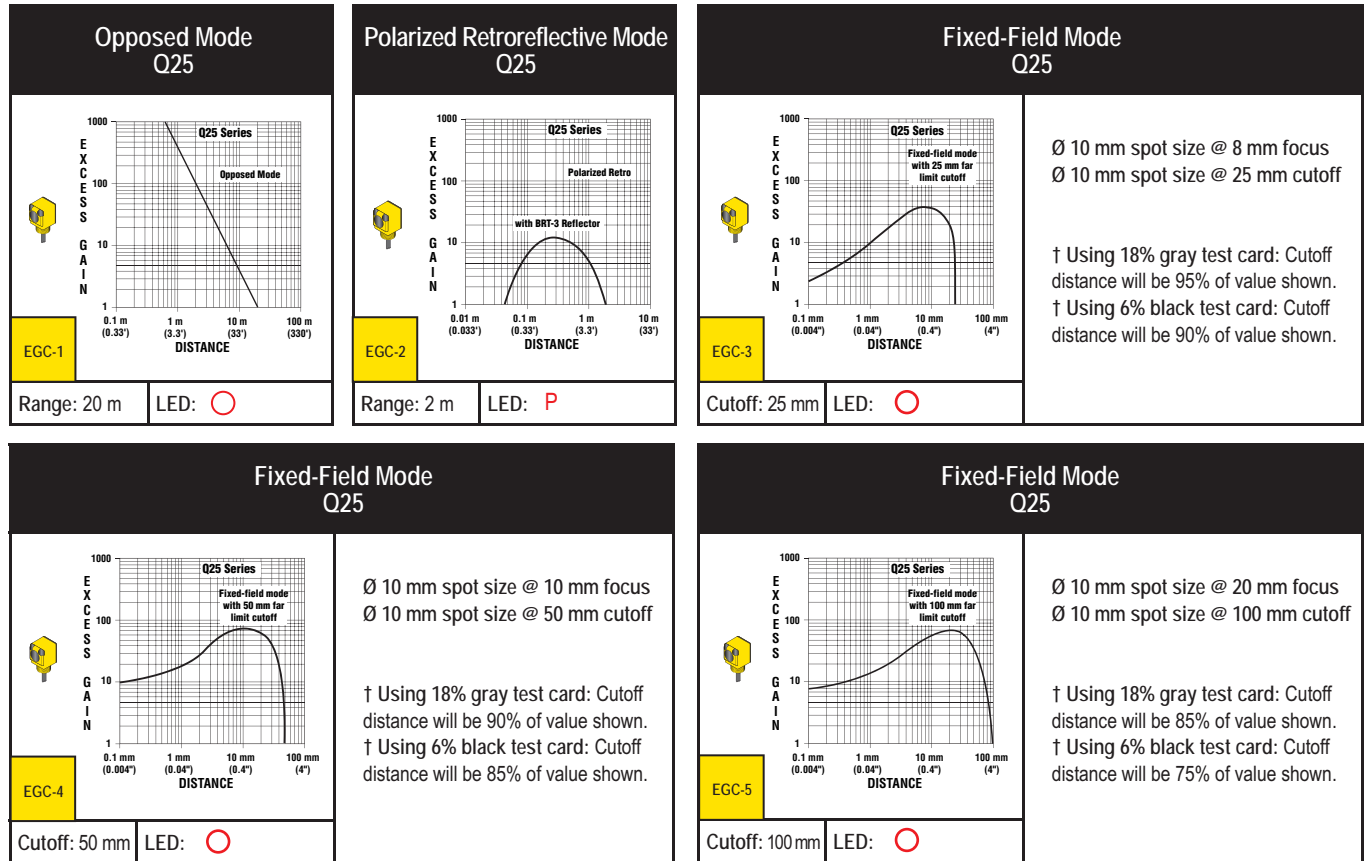


PAGE 724

- MINIATURE
- COMPACT
- WORLD-BEAM QS18
- WORLD-BEAM Q20
- WORLD-BEAM Q26
- MINI-BEAM
- S18/M18
- T18
- TM18
- Q25
- MIDSIZE
- FULLSIZE

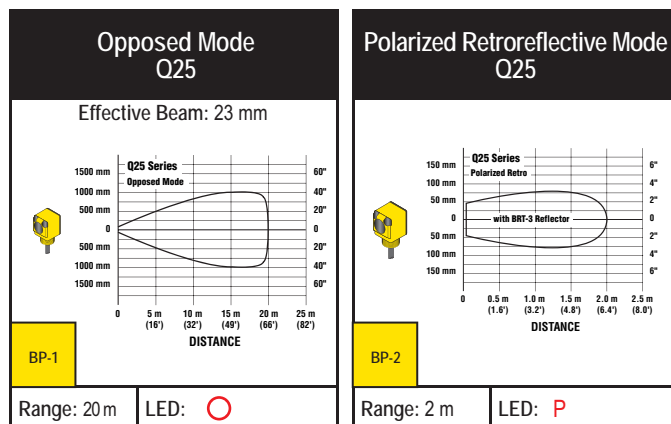
Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card[†])

○ = Infrared LED P = Visible Red LED Polarized



Beam Patterns

○ = Infrared LED P = Visible Red LED Polarized



MIDSIZE SENSORS

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



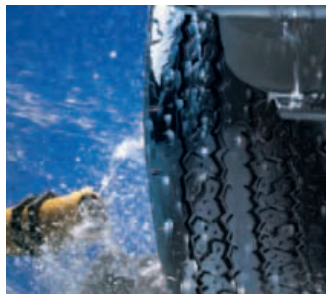
WORLD-BEAM® QS30 page 158

- Universal housing with 30 mm threaded lens or side mount
- High-power opposed sensing available with certain models
- Popular dc or ac/dc universal power supply options
- *Expert™* models with push-button TEACH-mode setup
- Models to detect water, or liquids that contain water
- New models for reliable clear object detection



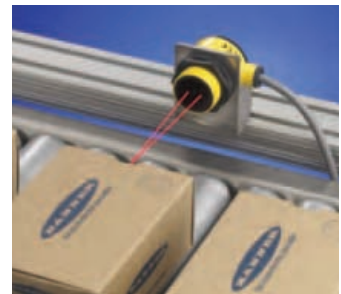
S30 page 165

- EZ-BEAM® technology for reliable sensing without adjustments
- 30 mm plastic threaded barrel sensor in opposed, retroreflective and fixed-field modes
- Completely epoxy encapsulated
- Models available for ac or dc power



SM30/SMI30 page 170

- Economical, easy-to-use opposed-mode barrel sensors
- Models certified as intrinsically safe for use in hazardous atmospheres
- Quad-ring sealed lens to eliminate capillary leakage
- Very high excess gain with a 200 m sensing range



T30 page 174

- Right-angle T-style housing with 30 mm threaded lens
- Completely epoxy encapsulated
- Models available for ac or dc power and bus network compatible connection
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments



Q40 page 179

- Rectangular 40 mm plastic housing with 30 mm threaded mounting base in opposed, retroreflective and fixed-field modes
- Models available for ac or dc power
- Completely epoxy encapsulated
- Specially designed EZ-BEAM® style optics and electronics for reliable sensing without adjustments



PicoDot® Lasers page 183

- Convergent and retroreflective mode laser sensors for accurate position detection, inspection or counting
- Convergent models with precise 0.25 mm focus point beam width and background suppression
- Retroreflective models for sensing small objects at close range or larger objects up to 10.6 m



QM42/QMT42 page 187

- Rugged low-cost dc sensor in die-cast housing
- Outstanding immunity to noise
- Opposed, retroreflective, diffuse, fixed-field, adjustable-field and plastic fiber models

- MINIATURE
- COMPACT
- MIDSIZE**
- FULLSIZE

Right-Angle Barrel- & Side-Mount WORLD-BEAM® QS30

- Innovative housing design with 30 mm threaded lens or side mount suits almost any mounting requirement
- Available in opposed, high-power opposed, polarized and non-polarized retroreflective, diffuse, laser, and fixed-field and adjustable-field sensing modes
- High-power sensing with ranges up to 213 m
- Class 1 visible laser in diffuse and retroreflective models and Class 2 in diffuse models for small object detection and precise position control
- Specialized models for reliable detection of water or liquids containing water, as well as clear object detection
- Easy push-button *Expert™* configuration in laser, clear object detection and visible red diffuse models
- Models available with dc supply or ac/dc supply voltage
- Light or Dark Operate selectable or configurable, depending on model
- IP67 or IP69K environmental rating, depending on model



ACCESSORIES
page 159



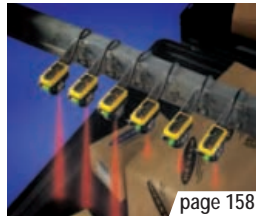
QS30 Sensing Modes



page 155

QS30

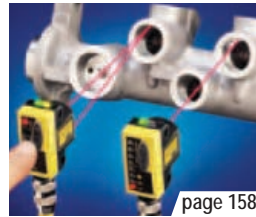
- Available in opposed, polarized and non-polarized retroreflective, and diffuse sensing modes
- Precise background and foreground suppression models
- Ranges up to 213 m
- High-power opposed and water detecting models
- Large bright output state indicator



page 158

QS30 Expert™

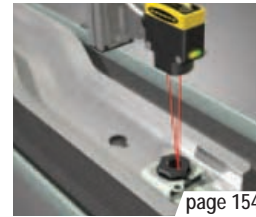
- Visible red LED or laser for easy alignment
- Models for reliable clear object detection
- Push-button configuration
- 8-segment LED bargraph for easy setup



page 158

QS30 Lasers

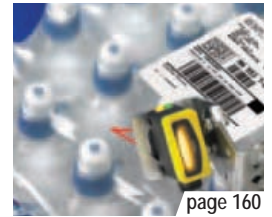
- High-performance sensing with visible Class 1 and Class 2 lasers
- Available in diffuse or retroreflective sensing modes
- Visible beam for easy alignment and long-range sensing
- Convenient push-button TEACH or SET programming
- 8-segment LED bargraph for easy setup



page 154

QS30 Adjustable-Field

- Background suppression models for detection of objects when background condition is not fixed
- Foreground suppression models for detection when background is fixed and object varies in color or shape
- Fluorescent light and crosstalk immunity for reliable sensing
- Long range for reliable sensing up to 600 mm
- Accurate and reliable even with low-reflectivity targets



page 160

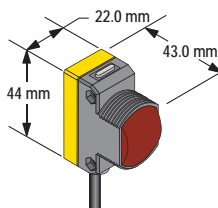
QS30 Universal Voltage

- Universal voltage for use anywhere regardless of supply voltage
- Available in opposed, retroreflective and fixed-field sensing modes
- Operation from 12 to 250V dc or 24 to 250V ac
- Convenient SPDT electromechanical relay to switch up to 5 A

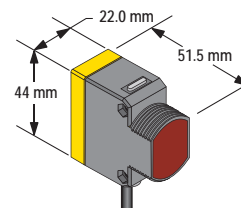
WORLD-BEAM® QS30 DC Sensors



Opposed, Retroreflective, Diffuse and Fixed-field Models
Suffix E, R, LP, LV, D, AF and FF



Opposed High-Power Models
Suffix EX and RX

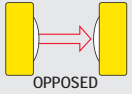
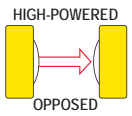
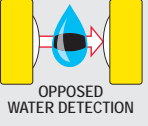
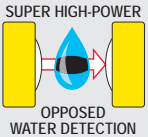
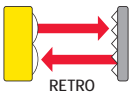

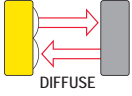


Opposed Water Detector and Adjustable-field Models
Suffix H2O and AFF



WORLD-BEAM® QS30, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Model | Excess Gain | Beam Pattern | |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-------------------|
|  <p>OPPOSED</p> | 60 m | 2 m | Bipolar NPN/PNP | QS30E Emitter | EGC-1 (p. 162) | BP-1 (p. 163) | |
| | | 5-pin Euro QD | | QS30EQ Emitter | | | |
| | | 2 m | | QS30R | | | |
| | | 5-pin Euro QD | | QS30RQ | | | |
|  <p>HIGH-POWERED OPPOSED</p> | 213 m | 2 m | Bipolar NPN/PNP LO | QS30EX Emitter | EGC-2 (p. 162) | BP-2 (p. 163) | |
| | | 5-pin Euro QD | | QS30EXQ Emitter | | | |
| | | 2 m | Bipolar NPN/PNP DO | QS30ARX | | | |
| | | 5-pin Euro QD | | QS30ARXQ | | | |
| | | 2 m | Bipolar NPN/PNP DO | QS30RRX | | | |
| | | 5-pin Euro QD | | QS30RRXQ | | | |
|  <p>OPPOSED WATER DETECTION</p> | 4 m ^{††} | 2 m | Bipolar NPN/PNP LO | QS30EXH2O Emitter* | EGC-3 (p. 162) | BP-3 (p. 163) | |
| | | 5-pin Euro Pigtail QD | | QS30EXH2OQ5 Emitter* | | | |
| | | 2 m | | Bipolar NPN/PNP DO | | | QS30ARXH2O |
| | | 5-pin Euro Pigtail QD | | | | | QS30ARXH2OQ5 |
| | | 2 m | | Bipolar NPN/PNP DO | | | QS30RRXH2O |
| | 5-pin Euro Pigtail QD | QS30RRXH2OQ5 | | | | | |
| | 2 m ^{††} | 2 m | Bipolar NPN/PNP LO | QS30ARH2O | | | |
| | | 5-pin Euro Pigtail QD | | QS30ARH2OQ5 | | | |
| | | 2 m | | Bipolar NPN/PNP DO | | | QS30RRH2O |
| | | 5-pin Euro Pigtail QD | | | | | QS30RRH2OQ5 |
|  <p>SUPER HIGH-POWER OPPOSED WATER DETECTION</p> | | 8 m ^{††} | | 2 m | Bipolar NPN/PNP LO | QS30EXSH2O Emitter* | EGC-3 (p. 162) |
| | 5-pin Euro Pigtail QD | | QS30EXSH2OQ5 Emitter* | | | | |
| | 2 m | | Bipolar NPN/PNP DO | QS30ARXSH2O | | | |
| | 5-pin Euro Pigtail QD | | | QS30ARXSH2OQ5 | | | |
| | 2 m | | Bipolar NPN/PNP DO | QS30RRXSH2O | | | |
| | 5-pin Euro Pigtail QD | | | QS30RRXSH2OQ5 | | | |
|  <p>RETRO</p> | 12 m [†] | 2 m | Bipolar NPN/PNP | QS30LV | EGC-4 (p. 162) | BP-4 (p. 163) | |
| | | 5-pin Euro QD | | QS30LVQ | | | |
|  <p>POLAR RETRO</p> | 8 m [†] | 2 m | Bipolar NPN/PNP | QS30LP | EGC-5 (p. 162) | BP-5 (p. 163) | |
| | | 5-pin Euro QD | | QS30LPQ | | | |
|  <p>DIFFUSE</p> | 1 m | 2 m | Bipolar NPN/PNP | QS30D | EGC-8 (p. 162) | BP-6 (p. 163) | |
| | | 5-pin Euro QD | | QS30DQ | | | |

Photoelectrics Sensors

Fiber Optic Sensors

Special Purpose Sensors

Measurement & Inspection Sensors

Vision

Wireless

Lighting & Indicators

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
page 159

MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

Q40

PicoDot

QM42/QMT42

FULLSIZE

More on next page

Connection options: A model with a QD requires a mating cordset (see page 159).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS30D W/30).

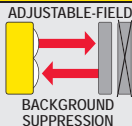
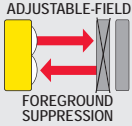
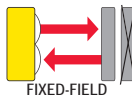
* Standard emitters will only work with standard receivers. Super High-Power emitters will only work with Super High-Power receivers.

† Retroreflective range is specified using one model BRT-84 retroreflector.

†† Sensors can be used at ranges greater than listed for applications that require less excess gain. Please consult the factory for assistance on your long-range applications. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

WORLD-BEAM® QS30, 10-30V dc (cont'd)

➔ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Model | Excess Gain | Beam Pattern |
|---|------------------------------|---------------|-----------------|-------------|---|--------------|
|  ADJUSTABLE-FIELD BACKGROUND SUPPRESSION | Adjustable between 50-600 mm | 2 m | Bipolar NPN/PNP | QS30AF600 | EGC-13 (p. 163) Min separation distance MSD-1 (p. 164) | — |
| | | 5-pin Euro QD | | QS30AF600Q | | — |
|  ADJUSTABLE-FIELD FOREGROUND SUPPRESSION | Adjustable between 50-400 mm | 2 m | Bipolar NPN/PNP | QS30AFF400 | EGC-12 (p. 163) Min separation distance MSD-2 (p. 164) | — |
| | | 5-pin Euro QD | | QS30AFF400Q | | — |
|  FIXED-FIELD | 200 mm Cutoff | 2 m | Bipolar NPN/PNP | QS30FF200 | EGC-14 (p. 163) | — |
| | | 5-pin Euro QD | | QS30FF200Q | | — |
| | 400 mm Cutoff | 2 m | | QS30FF400 | EGC-15 (p. 163) | — |
| | | 5-pin Euro QD | | QS30FF400Q | | — |
| | 600 mm Cutoff | 2 m | | QS30FF600 | EGC-16 (p. 163) | — |
| | | 5-pin Euro QD | | QS30FF600Q | | — |

ACCESSORIES
page 159

➔ Connection options: A model with a QD requires a mating cordset (see page 159).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS30FF200 W/30).

WORLD-BEAM® QS30 DC Specifications

| | |
|-----------------------------|--|
| Supply Voltage | Emitters (High-Powered): 10 to 30V dc (10% max. ripple) at less than 70 mA Receivers (High-Powered): 10 to 30V dc (10% max. ripple) at less than 22 mA Emitters (Water): 10 to 30V dc (10% max. ripple) at less than 80 mA Receivers (Water): 10 to 30V dc (10% max. ripple) at less than 65 mA (exclusive of load) Adjustable-field: 10 to 30V dc (10% max. ripple); current consumption: less than 80 mA at 10V dc, less than 40 mA at 30V dc All others: 10 to 30V dc (10% max. ripple) at 40 mA, (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Delay at Power-Up | Adjustable-field: 200 milliseconds; outputs do not conduct during this time All others: 100 milliseconds; outputs do not conduct during this time (except Opposed High-Powered and Water) |
| Output Configuration | Bipolar: One PNP (current sourcing) and one NPN (current sinking); Light Operate (LO) or Dark Operate (DO) selectable or configurable (depending on model) |
| Output Rating | Opposed (High-Power): 100 mA max. load OFF-state leakage current: less than 200 µA ON-state saturation voltage: less than 1.5V at 100 mA; less than 900 mV at 10 mA Opposed (Water): 100 mA max. load at 25° C OFF-state leakage current: less than 10 µA ON-state saturation voltage: NPN: less than 200 mV at 10 mA; less than 1V at 100 mA PNP: less than 1.2V at 10 mA; less than 2.5V at 100 mA Adjustable-field: 100 mA total output current (derate 1 mA per °C above 30°C) Off-state leakage current: less than 5 µA @ 30V dc ON-state saturation voltage: NPN: less than 1.5V @ 100 mA PNP: less than 2.0V @ 100 mA All others: 100 mA max. each output at 25° C OFF-state leakage current: NPN: less than 200 µA @ 30V dc PNP: less than 10 µA ON-state saturation voltage: NPN: less than 1.6V @ 100 mA PNP: less than 2.0V @ 100 mA |
| Output Protection | Protected against false pulse on power-up and continuous overload or short circuit of outputs |
| Output Response Time | Opposed: 5 milliseconds ON/OFF Opposed (High-Power): 30 milliseconds ON/OFF Opposed (Water): 10 x excess gain or more– Standard: 1 millisecond ON/OFF Super High-Power: 10 milliseconds ON/OFF 2x to 10x excess gain– Standard: 3 milliseconds ON/OFF Super High-Power: 30 milliseconds ON/OFF Adjustable-field: 5 milliseconds ON/OFF All others: 2 milliseconds ON/OFF |



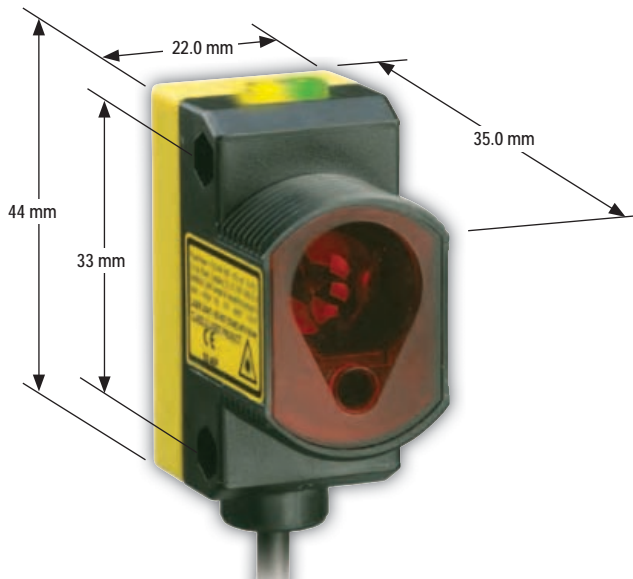
WORLD-BEAM® QS30 DC Specifications (cont'd)

| | |
|--------------------------------|--|
| Repeatability | <p>Opposed: not applicable Opposed (High-Power): 5 milliseconds Opposed (Water): 10 x excess gain or more– Standard: 500 microseconds 2x to 10x excess gain– Standard: 2.5 milliseconds Adjustable-field: 750 microseconds All others: 500 microseconds</p> <p style="text-align: right;">Super High-Power: 5 milliseconds Super High-Power: 25 milliseconds</p> |
| Adjustments | <p>Opposed (High-Power and Water): Light Operate/Dark Operate–dependent on model selected Frequency via gray wire: A: Gray (+) B: Gray (-) Emitter only: LED inhibit, via white wire White (-) turns emitter LED OFF (to allow verification of sensor operation)</p> <p>Opposed, Retroreflective, and Polarized Retroreflective: Selectable Light/Dark Operate is achieved via the gray wire Light Operate - Low (0 to 3V)* Dark Operate - High (open or 5 to 30V)*</p> <p>Diffuse and Fixed-field: Selectable Light/Dark Operate is achieved via the gray wire Light Operate - High (open or 5 to 30V)* Dark Operate - Low (0 to 3V)*</p> <p>Diffuse, Retroreflective, and Polarized Retroreflective (only): Single-turn sensitivity (Gain) adjustment potentiometer</p> <p>Adjustable-field: Four-turn adjustment screw sets cutoff distance between min and max. positions, clutched at both ends of travel LO/DO adjustment</p> <p>* Input impedance 10 kΩ See data sheets for more detailed information</p> |
| Indicators | <p>Opposed (High-Power): 4-LED Signal Strength light bar Green LED: Power ON Frequency indicator: (A or B) Receiver only: Yellow LED: Output conducting</p> <p>All others (except emitters): Large, oval LED indicator on sensor back Yellow: Output conducting Small indicator on back (adjustable-field only) Blue/Red: End of travel (EOT) LED 2 indicators on top Green: Power ON Yellow: Light sensed</p> |
| Construction | ABS plastic housing; acrylic lens cover |
| Environmental Rating | Opposed (High-Power): Cabled: IP67; NEMA 6P QD: IP69K per DIN 40050-9 Opposed (Water): IEC IP67 (NEMA 6); PW12 1200 PSI washdown per NEMA PW12 Adjustable-field: IEC IP67; NEMA 6 All others: IP67; NEMA 6 |
| Connections | 5-conductor 2 m or 9 m PVC cable, or 5-pin 150 mm pigtail or integral Euro-style quick-disconnect fitting, depending on model. QD cordsets are ordered separately. See page 157. |
| Operating Conditions | Opposed (Water), Opposed (High-Power) and Adjustable-field: -20° to +60° C Relative humidity: 95% (non-condensing) All others: -20° to +70° C Relative humidity: 95% (non-condensing) |
| Vibration and Mechanical Shock | All models (except Opposed High-Power) meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max. double amplitude 0.06", max. acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave. |
| Certifications | Adjustable-field: (pending) All others: |
| Hookup Diagrams | High-Powered and Water models: Emitters: DC10 (p. 760) Receivers: DC11 (p. 760) All other models: Emitters: DC02 (p. 758) Bipolar NPN/PNP: DC08 (p. 759) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

WORLD-BEAM® QS30 Expert™ Sensors



Laser Retroreflective, LED Diffuse, Laser Diffuse and LED Retroreflective Models
Suffix LLP, LLPC, LVC, EDV, LD and LDL

ACCESSORIES
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159

WORLD-BEAM® QS30 Expert™, 10-30V dc


➔ Visible Red LED ✶ Visible Red Laser

| Sensing Mode/LED | Laser Class | Range | Connection | Model Bipolar NPN/PNP | Excess Gain | Beam Pattern |
|---------------------------|---------------|--|---------------|-----------------------|------------------------|---------------|
| <p>LASER POLAR RETRO</p> | Class 1 | 0.2-18 m [†] | 2 m | QS30LLP | EGC-6 & EGC-7 (p. 162) | — |
| | | | 5-pin Euro QD | QS30LLPQ | | |
| | | | 2 m | QS30LLPC | | |
| | | | 5-pin Euro QD | QS30LLPCQ | | |
| <p>CLEAR OBJECT RETRO</p> | — | 100 mm to 2 m ^{††} | 2 m | QS30ELVC | — | — |
| | | | 5-pin Euro QD | QS30ELVCQ | | |
| <p>DIFFUSE</p> | — | High-Speed: 1100 mm Normal: 1400 mm | 2 m | QS30EDV | EGC-11 (p. 163) | BP-9 (p. 163) |
| | | | 5-pin Euro QD | QS30EDVQ | | |
| <p>DIFFUSE LASER</p> | Class 1 | 400 mm | 2 m | QS30LD | EGC-9 (p. 163) | BP-7 (p. 163) |
| | Class 2 | 800 mm | 5-pin Euro QD | QS30LDQ | | |
| | | | 2 m | QS30LDL | EGC-10 (p. 163) | BP-8 (p. 163) |
| | 5-pin Euro QD | QS30LDLQ | | | | |

➔ Connection options: A model with a QD requires a mating cordset (see page 159).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS30LLP W/30).

† Retroreflective range is specified using one model BRT-36X40BM retroreflector. BRT-TVHG-2X2 and BRT-36X40BM are included.
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.
†† BRT-2X2LVC and BRT40X19A retroreflectors are included with sensor.

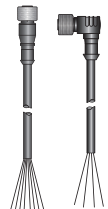
| WORLD-BEAM® QS30 Expert™ Specifications | |
|---|---|
| Supply Voltage and Current | Diffuse LED and Retroreflective LED: 10 to 30V dc (10% max. ripple) at less than 25 mA, exclusive of load Diffuse Laser and Retroreflective Laser: 10 to 30V dc (10% max. ripple @ 10% duty cycle) @ 35 mA max current, exclusive of load |
| Sensing Beam | LED models: 660 nm visible Red Laser models: Class 1: 650 nm visible Red Class 2: 658 nm visible Red |
| Beam size at Aperture | Diffuse Laser: Approx. 2 mm Retroreflective Laser: Approx. 3 mm |
| Supply Protection Circuitry | Protected against reverse polarity; over voltage and transient voltages |
| Output Configuration | Bipolar: One NPN (current sinking) and one PNP (current sourcing); Light Operate (LO) or Dark Operate (DO) configurable |
| Output Rating | Retroreflective LED (see Application Note 1) and Diffuse LED: 150 mA max. load (derate ~ 1 mA/° C above 25° C) OFF-state leakage current: less than 50 µA @ 30V dc ON-state saturation voltage: NPN: less than 200 mV @ 10 mA; less than 1V @ 150 mA PNP: less than 1.25V @ 10 mA; less than 2V @ 150 mA Diffuse Laser and Retroreflective Laser: 150 mA max. load OFF-state leakage current: less than 10 µA at 30V dc ON-state saturation voltage: NPN: less than 1.0V @ 150 mA load PNP: less than 2.0V @ 150 mA load |
| Output Protection Circuitry | Protected against output short-circuit, continuous overload, transient over-voltages and false pulse on power-up |
| Output Response Time | Diffuse LED: High-speed mode: 300 microseconds Normal mode: 1.8 milliseconds Diffuse Laser, Retroreflective Laser and Retroreflective LED: 500 microseconds |
| Delay at Power-up | Diffuse LED and Retroreflective LED: 250 milliseconds; outputs do not conduct during this time Diffuse Laser and Retroreflective Laser: 1 second max.; outputs do not conduct during this time |
| Repeatability | Diffuse LED: High-speed mode: 100 microseconds Normal mode: 150 microseconds Retroreflective LED: 150 microseconds Diffuse Laser and Retroreflective Laser: 70 microseconds |
| Adjustments | 2 push buttons and remote wire for TEACH programming and configuration See data sheet for detailed information |
| Indicators | 2 LEDs: Green: Power ON Yellow: Output conducting See data sheets for more detailed information |
| Construction | PC/ABS housing with acrylic lens cover |
| Environmental Rating | Retroreflective LED: IEC IP67 (NEMA 6); PW12 1200 PSI washdown All others: IP67; NEMA 6 |
| Connections | 5-conductor 2 m or 9 m attached PVC cable, or 5-pin Euro-style quick-disconnect fitting. QD cordset are ordered separately. See page 159. |
| Operating Conditions | Diffuse LED and Retroreflective LED: Temperature: -10° to +55° C Relative humidity: 95% @ 55° C (non-condensing) Diffuse Laser and Retroreflective Laser: Temperature: -10° to +50° C Relative humidity: 95% @ 50° C (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz max., double amplitude 0.06-inch acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half-sine wave. |
| Application Note | If supply voltage is > 24V dc, derate maximum output current 1 mA/°C above 25°C |
| Certification |  |
| Hookup Diagrams | DC08: (p. 759) |


- Photoelectrics Sensors
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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE





Cordsets


| Euro QD | | |
|----------------|-----------|-------------|
| See page 699 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC1-506 | MQDC1-506RA |
| 4.57 m | MQDC1-515 | MQDC1-515RA |
| 9.14 m | MQDC1-530 | MQDC1-530RA |



 Additional cordset information available. See page 693.

Brackets

| QS30 | | | |
|---|---|---|---|
|  |  |  |  |
| pg. 653 | pg. 685 | pg. 686 | pg. 685 |
| SMB30A | SMBQS30L | SMBQS30YL | SMBQS30Y |

 Additional brackets and more information available. See page 632.

REFLECTORS

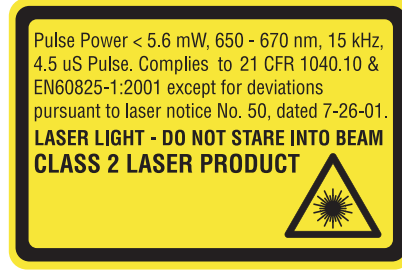
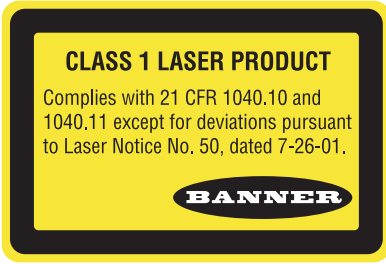


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APERTURES



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Class 1 Lasers

Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

For safe laser use:

- Do not permit a person to stare at the laser from within the beam.
- Do not point the laser at a person's eye at close range.
- Locate open laser beam paths either above or below eye level, where practical.

Class 2 Lasers

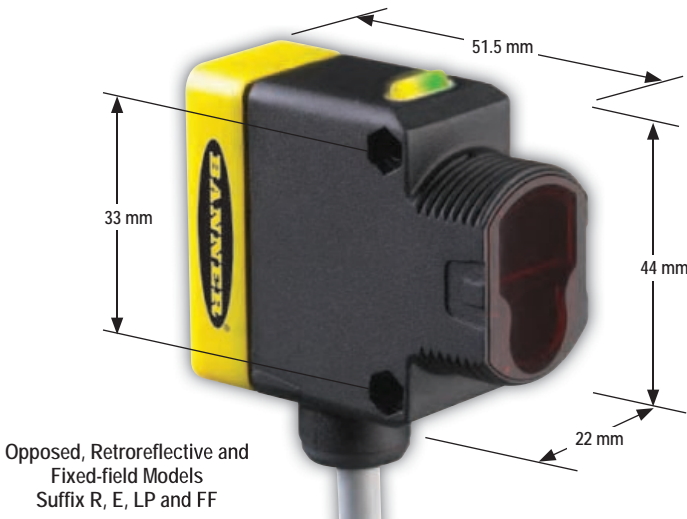
Lasers that emit visible radiation in the wavelength range from 400 to 700 nm where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

For safe laser use:

- Do not permit a person to stare at the laser from within the beam.
- Do not point the laser at a person's eye at close range.
- Locate open laser beam paths either above or below eye level, where practical.

ACCESSORIES
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WORLD-BEAM® QS30 Universal Voltage Sensors



WORLD-BEAM® QS30 Universal Voltage, 12-250V dc or 24-250V ac

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Model | Excess Gain | Beam Pattern |
|------------------|------------------|------------|----------------|----------------|----------------|---------------|
| OPPOSED | 60 m | 2 m | — | QS303E Emitter | EGC-1 (p. 162) | BP-1 (p. 163) |
| | | 2 m | SPDT e/m Relay | QS30VR3R | | |
| POLAR RETRO | 8 m [†] | 2 m | SPDT e/m Relay | QS30VR3LP | EGC-5 (p. 162) | BP-5 (p. 163) |

Connection options:

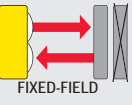
For 9 m cable, add suffix W/30 to the 2 m model number (example, QS303E W/30).
OD models: Available with modified specification, contact factory at 1-888-373-6767.

[†] Retroreflective range is specified using one model BRT-84 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

More on next page

WORLD-BEAM® QS30 Universal Voltage, 12-250V dc or 24-250V ac (cont'd)



→ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Model | Excess Gain | Beam Pattern |
|---|---------------|------------|----------------|--------------|-----------------|--------------|
|  FIXED-FIELD | 200 mm Cutoff | 2 m | SPDT e/m Relay | QS30VR3FF200 | EGC-14 (p. 163) | — |
| | 400 mm Cutoff | 2 m | | QS30VR3FF400 | EGC-15 (p. 163) | — |
| | 600 mm Cutoff | 2 m | | QS30VR3FF600 | EGC-16 (p. 163) | — |

Connection options:
 For 9 m cable, add suffix W/30 to the 2 m model number (example, QS303E W/30).
 QD models: Available with modified specification, contact factory at 1-888-373-6767.



- Photoelectrics Sensors
- Fiber Optic Sensors
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- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

WORLD-BEAM® QS30 Universal Voltage Specifications

| | | |
|-----------------------------|--|---|
| Supply Voltage | 24 to 250V ac, 50/60 Hz or 12 to 250V dc (1.0 watt max.) | |
| Supply Protection Circuitry | Protected against transient voltages | |
| Output Configuration | SPDT (Single-Pole Double-Throw) electromechanical relay output (all models except emitters) | |
| Output Rating | Max. Switching Power (resistive load): 150 W, 1250 VA Max. Switching Voltage (resistive load): 250V ac; 125V dc Max. Switching Current (resistive load): 5 A @ 250V ac; 5 A @ 30V dc derated to 200 mA @ 125V dc Min. Voltage and Current: 5V dc, 10 mA Mechanical life of relay: 50 million operations Electrical life of relay at full resistive load: 100,000 operations | |
| Output Response | 15 milliseconds ON/OFF | |
| Delay at Power-Up | 100 millisecond delay; output does not conduct during this time. | |
| Indicators | 2 LED indicators on sensor top: Green: Power ON Yellow: Light sensed Large, oval LED indicator on sensor back (except emitters): Yellow: Output conducting See data sheet for detailed information | |
| Construction | ABS housing; Acrylic lens cover | |
| Environmental Rating | IEC IP67; NEMA 6 | |
| Connections | 2 m or 9 m 5-wire PVC cable | |
| Operating Conditions | Temperature: -20° to +70° C | Relative humidity: 95% @ 50° C (non-condensing) |
| Certifications |   | |
| Hookup Diagrams | Emitters: UN02 (p. 753) | All other models: UN01 (p. 753) |

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

Brackets

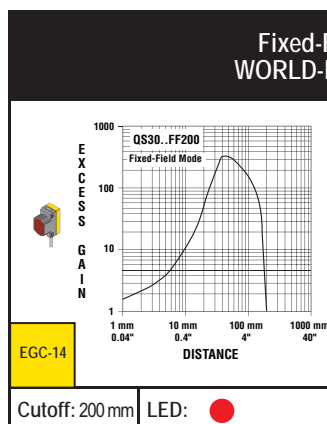
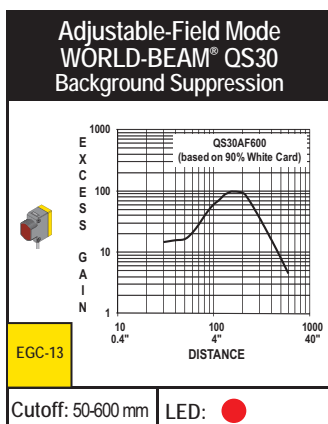
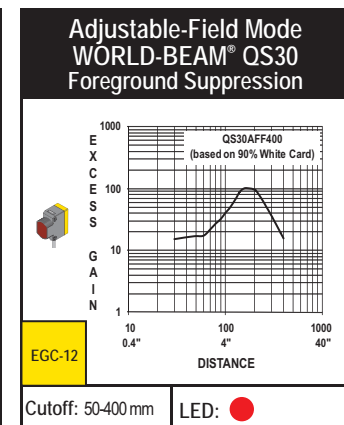
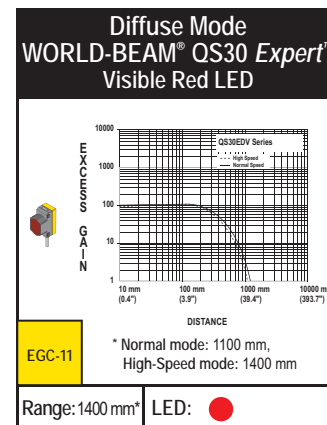
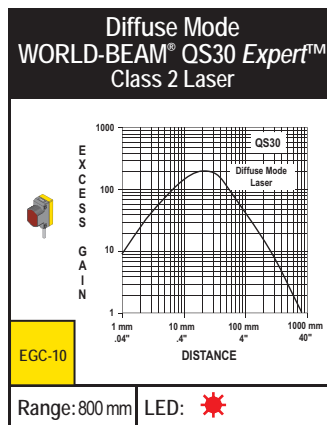
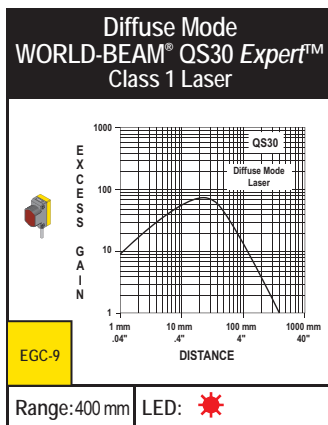
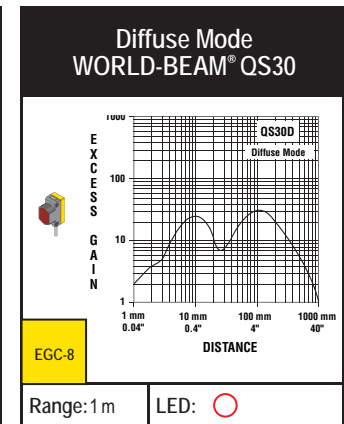
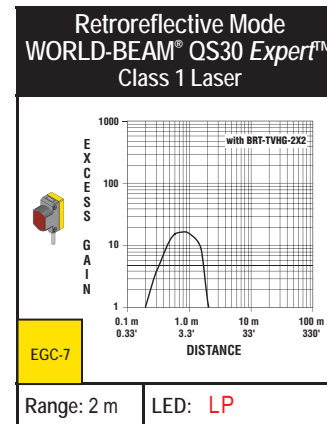
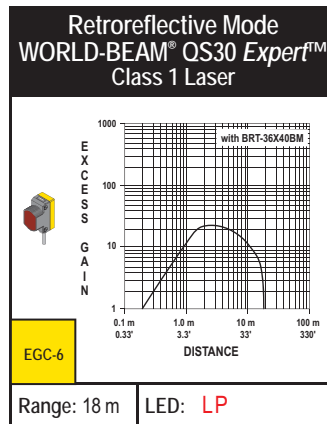
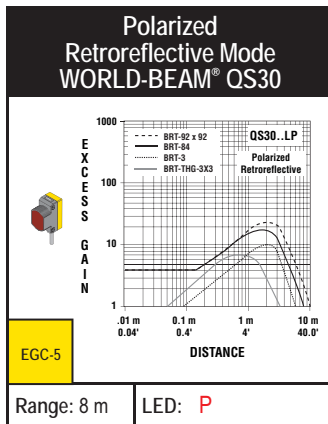
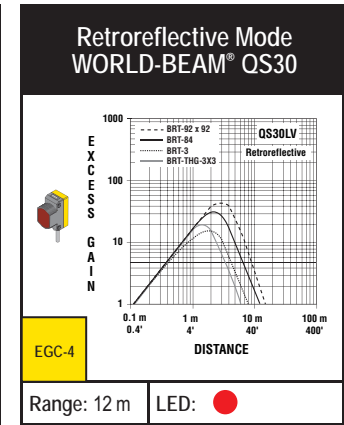
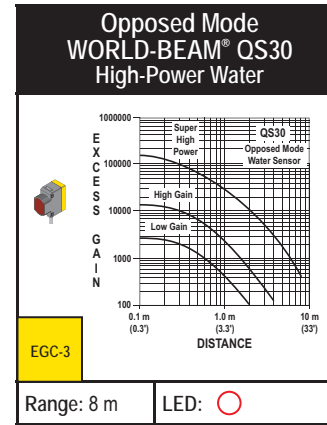
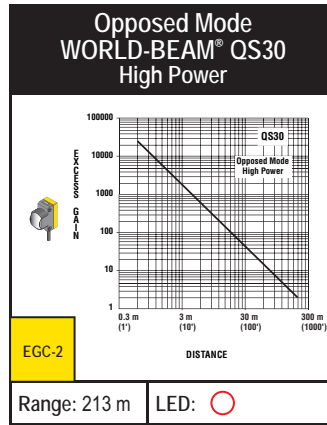
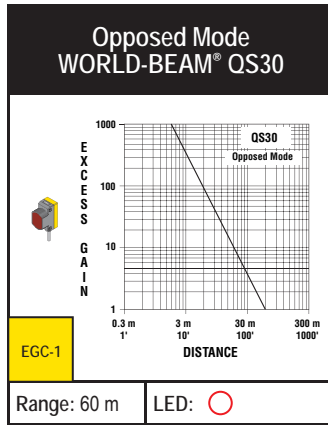
| QS30 | |
|---|---|
|  pg. 653 SMB30A |  pg. 685 SMBQ30L |

Additional brackets and more information available. See page 632.



Excess Gain Curves (Diffuse, Adjustable-Field and Fixed-field mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized LP = Visible Red Laser Polarized ★ = Visible Red Laser



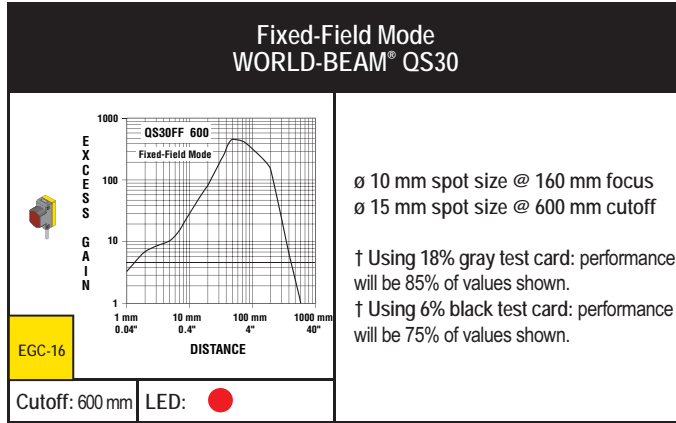
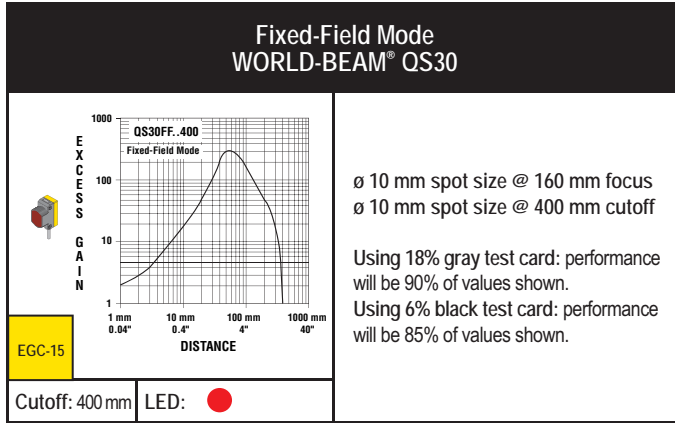
ø 10 mm spot size @ 160 mm focus
ø 7 mm spot size @ 200 mm cutoff

Using 18% gray test card: performance will be 95% of values shown.
Using 6% black test card: performance will be 90% of values shown.

More on next page

Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card)

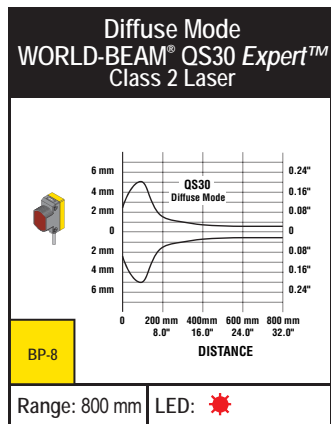
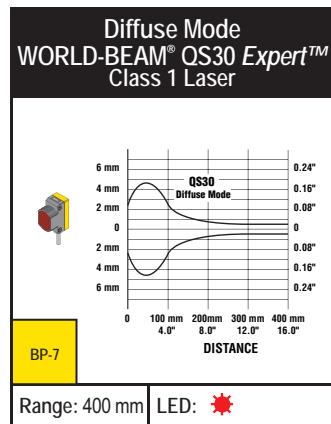
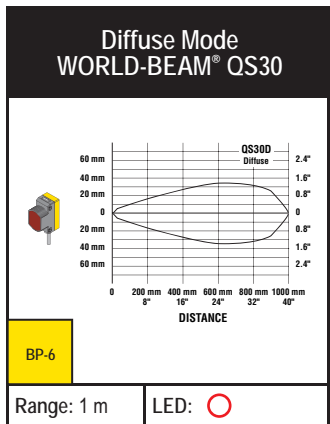
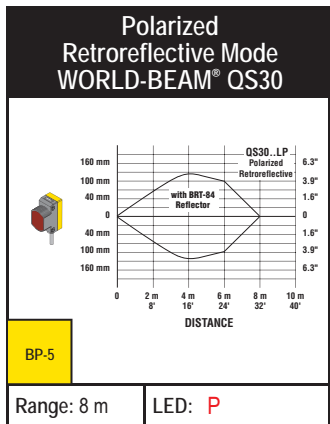
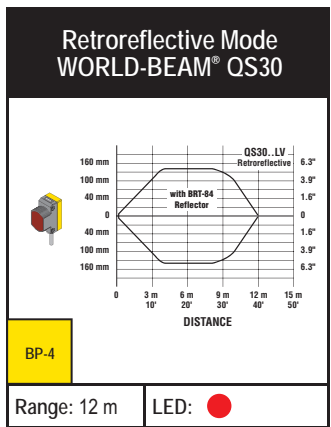
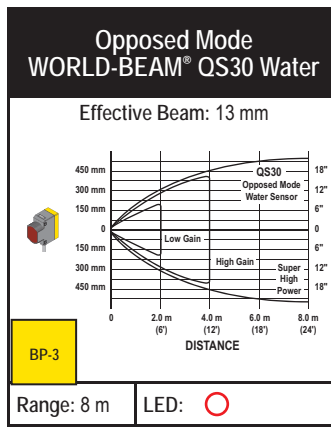
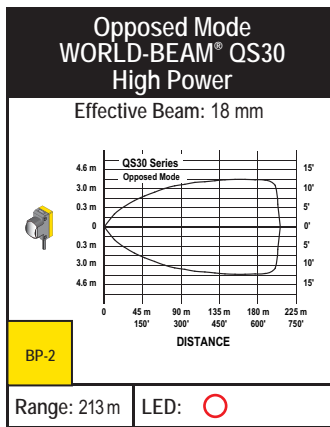
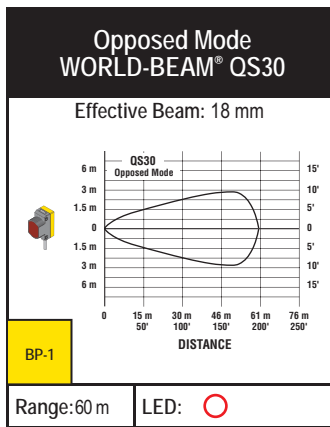
● = Visible Red LED



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- Safety Laser Scanners
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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ✨ = Visible Red Laser

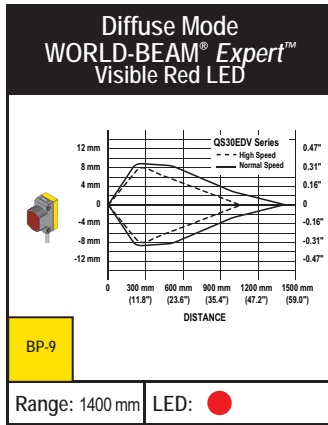


- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

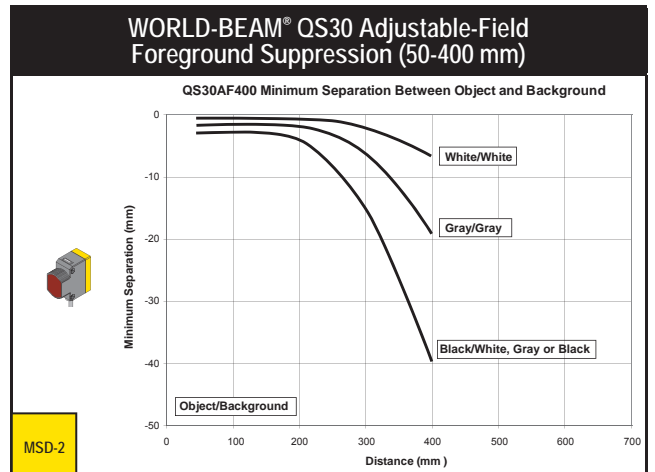
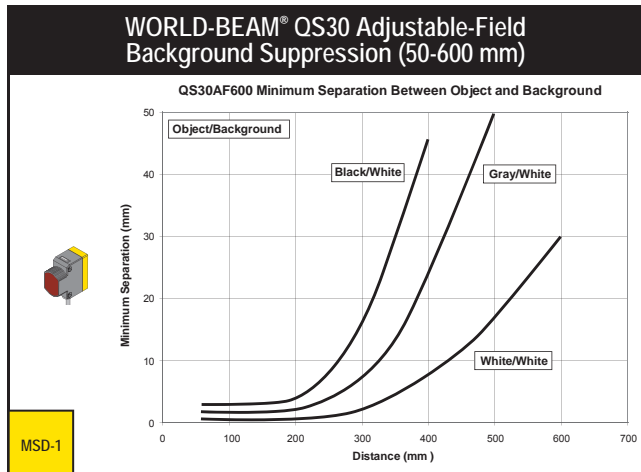
More on next page

Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

● = Visible Red LED



Minimum Separation Distance





Barrel-Mount Sensors S30

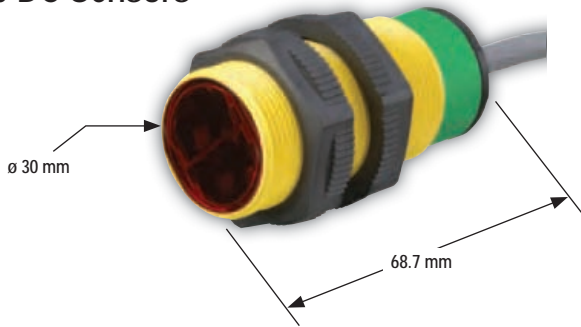
- Specially designed optics and electronics for reliable sensing without adjustments
- Completely epoxy-encapsulated to provide superior durability, even in harsh environments
- Uses innovative dual-indicator system to reduce the complexity of monitoring sensor performance
- Available in 30 mm plastic threaded barrel sensor in opposed, retroreflective and fixed-field modes
- Models available for ac or dc power
- Includes advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)

DC Models [page 165](#)
 AC Models [167](#)

- Photoelectronics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
[page 168](#)

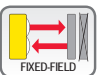
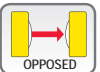
S30 DC Sensors



Opposed, Polarized Retroreflective and Fixed-field Models
 Suffix E, R, LP and FF

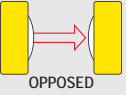



- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/ QMT42
- FULLSIZE



S30, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|---|------------------|---------------|----------------|------------|-------------------|------------------|
|  OPPOSED | 60 m | 2 m | S306E Emitter | | EGC-1 (p. 169) | BP-1 (p. 169) |
| | | 4-Pin Euro QD | S306EQ Emitter | | | |
| | | 2 m | S30SN6R | S30SP6R | | |
| | | 4-Pin Euro QD | S30SN6RQ | S30SP6RQ | | |
|  POLAR RETRO | 6 m [†] | 2 m | S30SN6LP | S30SP6LP | EGC-2 (p. 169) | BP-2 (p. 169) |
| | | 4-Pin Euro QD | S30SN6LPQ | S30SP6LPQ | | |



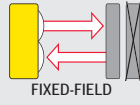
Connection options: A model with a QD requires a mating cordset (see page 168).


For 9 m cable, add suffix W/30 to the 2 m model number (example, S30SP6LP W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector.
 Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

S30, 10-30V dc (cont'd)




 Infrared LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|--|-------------------|---------------|--------------|--------------|-------------------|--------------|
|  FIXED-FIELD | 0 - 200 mm Cutoff | 2 m | S30SN6FF200 | S30SP6FF200 | EGC-3 (p. 165) | — |
| | | 4-Pin Euro QD | S30SN6FF200Q | S30SP6FF200Q | | |
| | 0 - 400 mm Cutoff | 2 m | S30SN6FF400 | S30SP6FF400 | EGC-4 (p. 165) | — |
| | | 4-Pin Euro QD | S30SN6FF400Q | S30SP6FF400Q | | |
| | 0 - 600 mm Cutoff | 2 m | S30SN6FF600 | S30SP6FF600 | EGC-5 (p. 165) | — |
| | | 4-Pin Euro QD | S30SN6FF600Q | S30SP6FF600Q | | |

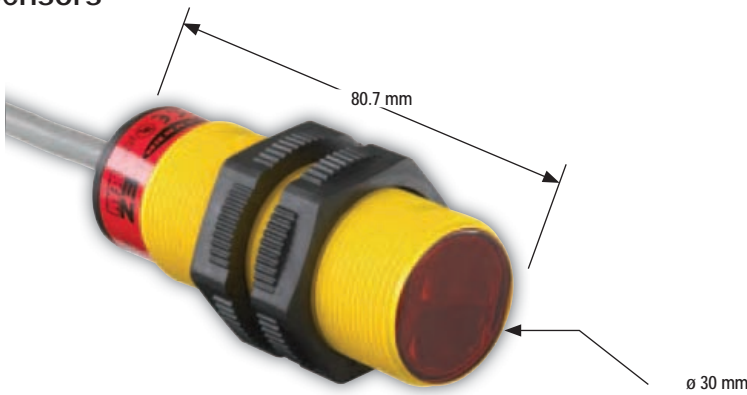
 Connection options: A model with a QD requires a mating cordset (see page 164).

For 9 m cable, add suffix W/30 to the 2 m model number (example, S30SP6FF W/30).

S30 DC Specifications

| | |
|--------------------------------|---|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple); Supply current (exclusive of load current): Opposed Emitters: 25 mA Opposed Receivers: 20 mA Polarized Retroreflective: 30 mA Fixed-field: 35 mA |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply. |
| Output Rating | 150 mA max. (each) in standard hookup; When wired for alarm output, the total load may not exceed 150 mA OFF-state leakage current: less than 1 μ A at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 150 mA dc |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs |
| Output Response Time | Opposed: 3 milliseconds ON; 1.5 milliseconds OFF Polarized Retroreflective and Fixed-field: 3 milliseconds ON/OFF |
| Delay at Power-up | 100 milliseconds; outputs are non-conducting during this time |
| Repeatability | Opposed: 375 microseconds Polarized Retroreflective and Fixed-field: 750 microseconds Repeatability and response are independent of signal strength |
| Indicators | Two LEDs: Green: Power ON Yellow: Light Operate (LO) energized See data sheet for detailed information |
| Construction | Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; two jam nuts included. |
| Environmental Rating | Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9. |
| Connections | 2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 168. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation) |
| Certifications |    |
| Hookup Diagrams | Emitters: DC02 (p. 758) NPN Models: DC05 (p. 759) PNP Models: DC06 (p. 759) |

S30 AC Sensors



Opposed, Polarized Retroreflective and Fixed-field Models
Suffix E, R, LP and FF

Photoelectrics Sensors

- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

S30, 20-250V ac

⇒ Infrared LED → Visible Red LED

| Sensing Mode/LED | Range | Connection | Models LO | Models DO | Excess Gain | Beam Pattern |
|--------------------|-------------------|----------------|-----------------|---------------|-------------------|------------------|
| <p>OPPOSED</p> | 60 m | 2 m | S303E Emitter | | EGC-1 (p. 169) | BP-1 (p. 165) |
| | | 4-Pin Micro QD | S303EQ1 Emitter | | | |
| | | 2 m | S30AW3R | S30RW3R | | |
| | | 4-Pin Micro QD | S30AW3RQ1 | S30RW3RQ1 | | |
| <p>POLAR RETRO</p> | 6 m [†] | 2 m | S30AW3LP | S30RW3LP | EGC-2 (p. 169) | BP-2 (p. 165) |
| | | 4-Pin Micro QD | S30AW3LPQ1 | S30RW3LPQ1 | | |
| <p>FIXED-FIELD</p> | 0 - 200 mm Cutoff | 2 m | S30AW3FF200 | S30RW3FF200 | EGC-3 (p. 169) | — |
| | | 4-Pin Micro QD | S30AW3FF200Q1 | S30RW3FF200Q1 | | |
| | 0 - 400 mm Cutoff | 2 m | S30AW3FF400 | S30RW3FF400 | EGC-4 (p. 169) | — |
| | | 4-Pin Micro QD | S30AW3FF400Q1 | S30RW3FF400Q1 | | |
| | 0 - 600 mm Cutoff | 2 m | S30AW3FF600 | S30RW3FF600 | EGC-5 (p. 169) | — |
| | | 4-Pin Micro QD | S30AW3FF600Q1 | S30RW3FF600Q1 | | |



MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

C40

PicoDot

QM42/QMT42

FULLSIZE

Connection options: A model with a QD requires a mating cordset (see page 168).


For 9 m cable, add suffix W/30 to the 2 m model number (example, S30AW3FF200 W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector.
Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

| S30 AC Specifications | |
|-----------------------------|---|
| Supply Voltage and Current | 20 to 250V ac (50/60 Hz). Average current: 20 mA Peak current: 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac |
| Supply Protection Circuitry | Protected against transient voltages |
| Output Configuration | Solid-state ac switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models; Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark |
| Output Rating | 300 mA max. (continuous) Fixed-field: derate 5 mA/° C above +50° C Inrush capability: 1 amp for 20 milliseconds, non-repetitive OFF-state leakage current: less than 100 µA ON-state voltage drop: 3V at 300 mA ac; 2V at 15 mA ac |

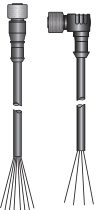



S30 AC Specifications (cont'd)

| | | | |
|--------------------------------|--|--|--|
| Output Protection Circuitry | Protected against false pulse on power-up | | |
| Output Response Time | Opposed: 16 milliseconds ON; 8 milliseconds OFF Polarized Retroreflective and Fixed-field: 16 milliseconds ON/OFF | | |
| Delay at Power-up | 100 milliseconds | | |
| Repeatability | Opposed: 2 milliseconds Polarized Retroreflective and Fixed-field: 4 milliseconds Repeatability and response are independent of signal strength | | |
| Indicators | Two LEDs: Green: Power ON Yellow: Light sensed See data sheet for detailed information | | |
| Construction | Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; two jam nuts included | | |
| Environmental Rating | Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9 | | |
| Connections | 2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting QD cordsets are ordered separately. See page 168. | | |
| Operating Conditions | Temperature: -40° to +70° C | | Relative humidity: 90% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation) | | |
| Certifications |  | | |
| Hookup Diagrams | Cabled Emitters: AC03 (p. 764) QD Emitters: AC07 (p. 765) | | Cabled Models: AC05 (p. 765) QD Models: AC06 (p. 765) |



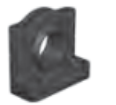

Cordsets

| Euro QD | | | Micro QD | | |
|--------------|----------|-------------|----------------|----------|-------------|
| See page 696 | | | See page 712 | | |
| 4-Pin | | | Threaded 4-Pin | | |
| Length | Straight | Right-Angle | Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA | 1.83 m | MQAC-406 | MQAC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA | 4.57 m | MQAC-415 | MQAC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA | 9.14 m | MQAC-430 | MQAC-430RA |

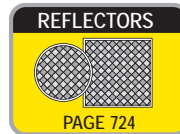



Additional cordset information available.
See page 693.

Brackets

| S30 | | | |
|--|---|---|---|
|  pg. 653 SMB30A |  pg. 653 SMB30FA.. |  pg. 654 SMB30SC |  pg. 661 SMBAMS30P |

Additional brackets and information available.
See page 632.



Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card)

○ = Infrared LED P = Visible Red LED Polarized

| | | |
|---|---|---|
| <p>Opposed Mode S30</p> <p>EGC-1</p> <p>Range: 60 m LED: ○</p> | <p>Polarized Retroreflective Mode S30</p> <p>EGC-2</p> <p>Range: 6 m LED: P</p> | <p>Fixed-Field Mode S30</p> <p>EGC-3</p> <p>Cutoff: 200 mm LED: ○</p> <p>Ø 16 mm spot size @ 35 mm focus Ø 20 mm spot size @ 200 mm cutoff</p> <p>Using 18% gray test card: Cutoff distance will be 95% of value shown. Using 6% black test card: Cutoff distance will be 90% of value shown.</p> |
| <p>Fixed-Field Mode S30</p> <p>EGC-4</p> <p>Cutoff: 400 mm LED: ○</p> <p>Ø 17 mm spot size @ 35 mm focus Ø 25 mm spot size @ 400 mm cutoff</p> <p>Using 18% gray test card: Cutoff distance will be 90% of value shown. Using 6% black test card: Cutoff distance will be 85% of value shown.</p> | | <p>Fixed-Field Mode S30</p> <p>EGC-5</p> <p>Cutoff: 600 mm LED: ○</p> <p>Ø 17 mm spot size @ 35 mm focus Ø 30 mm spot size @ 600 mm cutoff</p> <p>Using 18% gray test card: Cutoff distance will be 85% of value shown. Using 6% black test card: Cutoff distance will be 75% of value shown.</p> |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

Beam Patterns

○ = Infrared LED P = Visible Red LED Polarized

| | |
|--|--|
| <p>Opposed Mode S30</p> <p>Effective Beam: 23 mm</p> <p>BP-1</p> <p>Range: 60 m LED: ○</p> | <p>Polarized Retroreflective Mode S30</p> <p>BP-2</p> <p>Range: 6 m LED: P</p> |
|--|--|

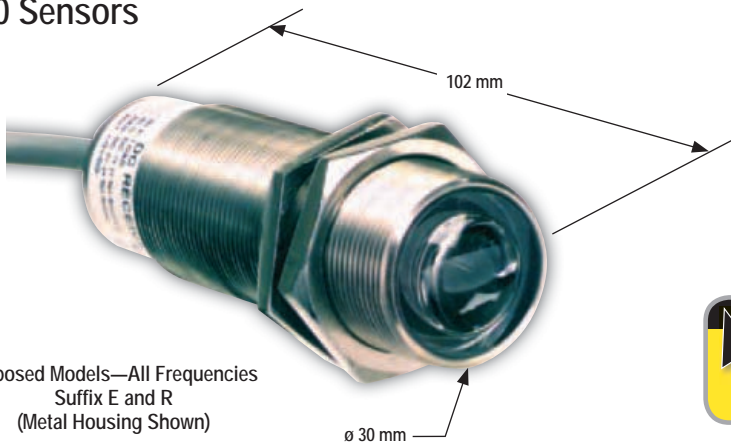
High-Power, Opposed-Mode Barrel Sensors

SM30 and SMI30

- Features reliable sensing without the need for adjustments
- Operates in opposed mode with very high excess gain
- Models available for either ac or dc operation (standard SM30 Series)
- Certified as intrinsically safe for use in hazardous atmospheres (SMI30 Series)
- Uses positive sealing to eliminate even capillary leakage, has a quad-ring-sealed lens
- Exceeds IEC IP67 (NEMA 6P) ratings; ideal in equipment washdown environments



SM30 Sensors



Opposed Models—All Frequencies
Suffix E and R
(Metal Housing Shown)

ACCESSORIES
page 173



| | |
|--------------------------|----------|
| SM30 | page 170 |
| SMI30 Intrinsically Safe | 172 |



SM30 Emitters, 10-30V dc or 12-240V ac, Frequency A[†]

⇒ Infrared LED

| Sensing Mode/LED | Housing | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern |
|------------------|-----------------|-------|---------------|-------------|------------|-------------------|------------------|
| OPPOSED | Plastic | 150 m | 2 m | N/A | SMA30PEL | EGC-1 (p. 173) | BP-1 (p. 173) |
| | | | 3-Pin Mini QD | | SMA30PELQD | | |
| | Stainless Steel | | 2 m | | SMA30SEL | | |
| | | | 3-Pin Mini QD | | SMA30SELQD | | |

SM30 Receivers, 10-30V dc Frequency A[†]

⇒ Infrared LED

| Sensing Mode/LED | Housing | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern |
|------------------|-----------------|-------|---------------|-------------------------|-----------|-------------------|------------------|
| OPPOSED | Plastic | 150 m | 2 m | Bi-Modal™ NPN or PNP | SM30PRL | EGC-1 (p. 173) | BP-1 (p. 173) |
| | | | 4-Pin Mini QD | | SM30PRLQD | | |
| | Stainless Steel | | 2 m | | SM30SRL | | |
| | | | 4-Pin Mini QD | | SM30SRLQD | | |

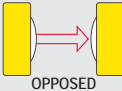
Connection options: A model with a QD requires a mating cordset (see page 173).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SM30PR W/30).

[†] Modulation frequency "A" is standard; frequencies "B" and "C" are also available to minimize optical crosstalk potential between adjacent pairs and are specified by adding "B" or "C" at the end of the standard model number (example, SM30PRLB or SM30PRLC).

SM30 Receivers, 24-240V ac, Frequency A†

➔ Infrared LED

| Sensing Mode/LED | Housing | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern | |
|--|-----------------|-------|---------------|---------------|-------------|-------------------|------------------|---------------|
|  | Plastic | 150 m | 2 m | LO | SM2A30PRL | EGC-1 (p. 173) | BP-1 (p. 173) | |
| | | | 3-Pin Mini QD | | SM2A30PRLQD | | | |
| | Stainless Steel | | 2 m | | SM2A30SRL | | | |
| | | | 3-Pin Mini QD | | SM2A30SRLQD | | | |
| | Plastic | | 3-Pin Mini QD | 2 m | DO | | | SM2A30PRLNC |
| | | | | 3-Pin Mini QD | | | | SM2A30PRLNCQD |
| | Stainless Steel | | 2 m | SM2A30SRLNC | | | | |
| | | | 3-Pin Mini QD | SM2A30SRLNCQD | | | | |

Connection options: A model with a QD requires a mating cordset (see page 173).


For 9 m cable, add suffix W30 to the 2 m model number (example, SM2A30PRL W30).

† Modulation frequency "A" is standard; frequencies "B" and "C" are also available to minimize optical crosstalk potential between adjacent pairs and are specified by adding "B" or "C" at the end of the standard model number (example, SM30PRLB or SM30PRLC).

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 173

SM30 Specifications

| | |
|-----------------------------|---|
| Supply Voltage and Current | Emitters: 12 to 240V ac (50/60 Hz) or 10 to 30V dc (10% max. ripple) at 20 mA DC Receivers: 10 to 30V dc (10% max. ripple) at 10 mA max, exclusive of load AC Receivers: 24 to 240V ac (50/60 Hz) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | DC Receivers: Bi-Modal™ output (PNP sourcing or NPN sinking). Selection of sourcing or sinking configuration depends upon receiver's power supply hookup polarity. Once wired, the unit performs as a solid-state switch. AC Receivers: Solid-state switch offer Light Operate (LO) or Dark Operate (DO) by model |
| Output Rating | DC Receivers: 250 mA continuous Output saturation voltage: (PNP & NPN configuration) less than 1 volt at 10 mA; less than 2 volts at 250 mA OFF-state leakage current: less than 10 μA AC Receivers: Max. steady-state load capability is 500 mA Inrush capability: 10 amps for 1 second (non-repeating) OFF-state leakage: current less than 1.7 mA rms ON-state voltage drop: less than 3.5 volts rms across a 500 mA load; less than 5 volts rms across a 15 mA load |
| Output Protection Circuitry | Outputs of dc receivers are short circuit protected |
| Output Response Time | 10 milliseconds ON/OFF |
| Repeatability | "A" frequency units: 1 millisecond "B" frequency units: 1.5 milliseconds "C" frequency units: 2.3 milliseconds |
| Indicators | Internal Red LED, visible through the lens or from side of the sensor. Emitters: Red "Power ON" indicator LED DC Receivers: Lights whenever receiver sees its modulated light source AC Receivers: Lights whenever receiver's output is conducting |
| Construction | Fully epoxy-encapsulated tubular threaded housing, positive sealed at both ends, quad-ring sealed acrylic lens. Plastic models: 30 mm diameter thermoplastic polyester housing and jam nuts Stainless Steel models: 30 mm diameter 303 stainless steel housing and jam nuts |
| Environmental Rating | Exceeds NEMA 6P; IEC IP67 standards |
| Connections | PVC-jacketed 2 m or 9 m cables or Mini-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 173. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Certifications |  |
| Hookup Diagrams | Cabled Emitters: UN10 (p. 769) AC Cabled Receivers: AC10 (p. 766) DC Receivers: DC20 & DC21 (pp. 762 & 788) QD Emitters: AC04 (p. 764) AC QD Receivers: AC11 (p. 766) |

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

Intrinsically Safe DC Sensors SMI30

- Extremely rugged and powerful opposed-mode intrinsically safe barrel sensors are designed for the most demanding hazardous area sensing applications
- Sensor is certified as intrinsically safe for use in all hazardous atmospheres as defined by Article 500 of the National Electrical Code, when used with approved "positive input" intrinsic safety barriers
- Sensor is certified by Factory Mutual and CSA as non-incendive devices when used in Division 2 locations (except Groups E and F) without intrinsic safety barriers
- Use each sensor pair with model CI3RC2 current trip point amplifier and dual-channel intrinsic safety barrier for a complete intrinsically safe sensing system (components available as a kit)



ACCESSORIES
page
173

SMI30, 10-30V dc, Frequency A[†]

⇨ Infrared LED

| Sensing Mode/LED | Range | Connection | Output Type | Response Time | Models | Excess Gain | Beam Pattern |
|------------------|-------|---------------|-------------|---------------|-------------|--|------------------|
| | 105 m | 3-Pin Mini QD | — | 10 ms | SMI306EQ | Frequency: A: EGC-2 B: EGC-3 C: EGC-4 (p. 173) | BP-2 (p. 173) |
| | | | NPN/LO | | SMI30AN6RQ | | |
| | | | NPN/DO | | SMI30RN6RQ | | |
| | 45 m | | — | 1 ms | SMI306EYQ | | BP-3 (p. 173) |
| | | | NPN/LO | | SMI30AN6RYQ | | |
| | | | NPN/DO | | SMI30RN6RYQ | | |

Connection options: A model with a QD requires a special Mini-style mating cordset (see page 173).

[†] Modulation frequency "A" is standard; frequencies "B" and "C" are also available to minimize optical crosstalk potential between adjacent pairs and are specified by adding "B" or "C" at the end of the standard model number (example, SMI306EBQ or SMI306ECQ).





Intrinsic Safety Kits for Use with SMI30 Intrinsically Safe Sensors

| Model | Description |
|---------|---|
| CI2BK-1 | Includes a CI3RC2 current amplifier, one RS-11 socket, one DIN-rail mount and one single-channel intrinsically safe barrier |
| CI2BK-2 | Includes a CI3RC2 current amplifier, one RS-11 socket, one DIN-rail mount and one dual-channel intrinsically safe barrier |
| CI3RC2 | Current trip point amplifier |
| CIB-1 | Single channel intrinsic safety barrier |
| CI2B-1 | Dual channel intrinsic safety barrier |

SMI30 Specifications

| | |
|-----------------------------|--|
| Supply Voltage and Current | Emitters: 10 to 30V dc at 25 mA Receivers: 10 to 30V dc at 15 mA max. Division 1 use, with barriers, requires minimum system supply voltage of 10V. |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Receivers: Current sinking NPN open-collector transistor |
| Output Rating | Three-wire hookup sinks 15 mA max. continuous, 10 to 30V dc. Two-wire hookup sinks ≤10 mA |
| Output Protection Circuitry | Outputs are short circuit protected |
| Output Response Time | 10 milliseconds or 1 millisecond ON/OFF, depending on models; independent of signal strength |
| Repeatability | "A" frequency units: 10 millisecond receiver is 1 milliseconds and 1 millisecond receiver is 360 microseconds "B" frequency units: 1.6 milliseconds "C" frequency units: 10 millisecond receiver is 2.3 milliseconds and 1 millisecond receiver is 210 microseconds Repeatability is independent of signal strength |

More on next page

| SMI30 Specifications (cont'd) | |
|-------------------------------|--|
| Indicators | Internal Red LED lights whenever the receiver sees the emitter's modulated light source. Emitters have Red "power on" indicator LED. All indicators are visible through the lens or from side of the sensor. |
| Construction | 30 mm diameter tubular threaded thermoplastic polyester housing, fully epoxy-encapsulated, positive sealing at both ends, quad-ring sealed acrylic lens. Two thermoplastic polyester jam nuts provided. |
| Environmental Rating | IP67; NEMA 6P |
| Connections | 3-wire Mini-style quick-disconnect (QD) fitting. Use cordset models SMICC-3xx (p. 173). Cable electric properties: 40 pf/ft; 20 μH/ft. Order cable separately from sensor. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Certifications |   Exia NRTL/C  KEMA  FM APPROVED |
| Hookup Diagrams | See data sheet for detailed Hookup Diagrams. |


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Cordsets





| Mini QD | | | |
|--------------|-------------------|-----------|----------|
| See page 714 | | | |
| | 3-Pin | 3-Pin* | 4-Pin |
| Length | Threaded Straight | | |
| 1.83 m | SM30CC-306 | SMICC-306 | MBCC-406 |
| 3.66 m | SM30CC-312 | SMICC-312 | MBCC-412 |
| 9.14 m | - | SMICC-330 | MBCC-430 |




* Required for Intrinsically safe

 Additional cordset information available. See page 693.

Brackets

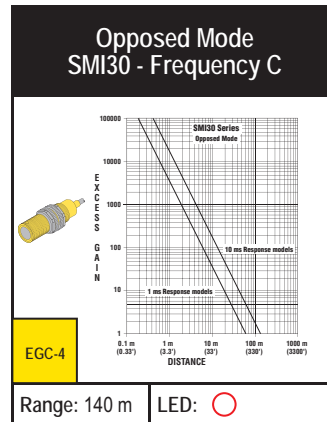
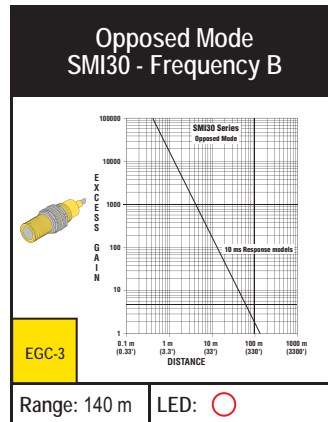
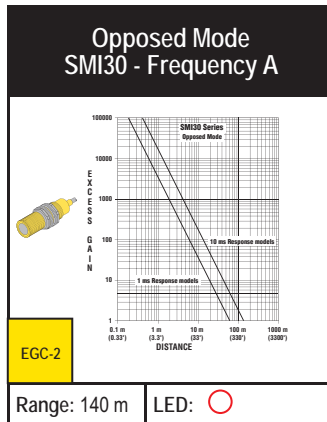
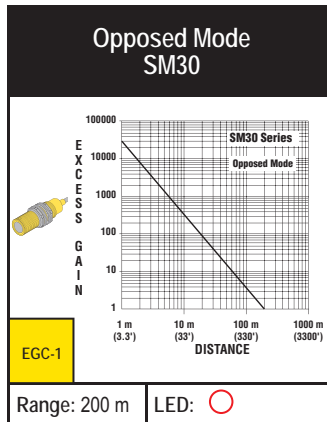
| SM30 & SMI30 | | | |
|---|---|---|---|
|  |  |  |  |
| pg. 653 | pg. 653 | pg. 654 | pg. 661 |
| SMB30A | SMB30FA.. | SMB30SC | SMBAMS30P |



 Additional brackets and information available. See page 632.

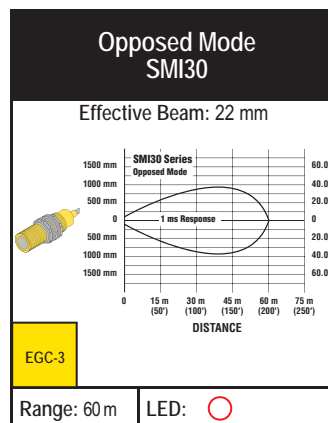
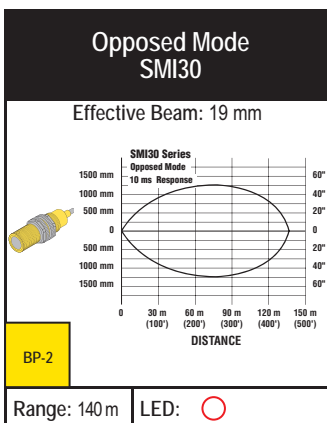
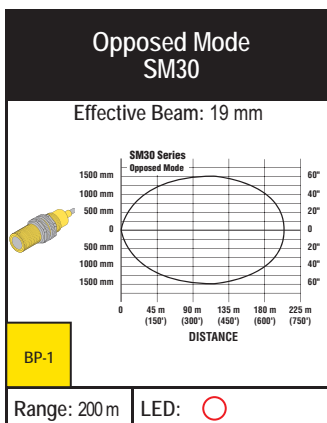
Excess Gain Curves

○ = Infrared LED



Beam Patterns

○ = Infrared LED



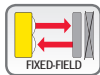
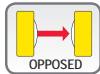
- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

Right-Angle Barrel-Mount Sensors T30

- Specially designed optics and electronics for reliable sensing without adjustments
- Completely epoxy-encapsulated to provide superior durability, even in harsh sensing environments
- Uses an innovative dual-indicator system to reduce complexity of monitoring sensor performance
- Includes advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)
- Features T-style plastic housing with 30 mm threaded lens in opposed, retroreflective and fixed-field modes
- Models available for ac or dc power



ACCESSORIES
page 177



T30, 10-30V dc

Infrared LED Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|------------------|------------------|---------------|----------------|------------|----------------|---------------|
| OPPOSED | 60 m | 2 m | T306E Emitter | | EGC-1 (p. 178) | BP-1 (p. 178) |
| | | 4-Pin Euro QD | T306EQ Emitter | | | |
| | | 2 m | T30SN6R | T30SP6R | | |
| | | 4-Pin Euro QD | T30SN6RQ | T30SP6RQ | | |
| POLAR RETRO | 6 m [†] | 2 m | T30SN6LP | T30SP6LP | EGC-2 (p. 178) | BP-2 (p. 178) |
| | | 4-Pin Euro QD | T30SN6LPQ | T30SP6LPQ | | |

More on next page

Connection options: A model with a QD requires a mating cordset (see page 177).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T30SN6LP W/30).

[†] Retroreflective range is specified using a BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

T30, 10-30V dc (cont'd)

→ Infrared LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|------------------|-------------------|---------------|--------------|--------------|----------------|--------------|
| FIXED-FIELD | 0 - 200 mm Cutoff | 2 m | T30SN6FF200 | T30SP6FF200 | EGC-3 (p. 178) | — |
| | | 4-Pin Euro QD | T30SN6FF200Q | T30SP6FF200Q | | |
| | 0 - 400 mm Cutoff | 2 m | T30SN6FF400 | T30SP6FF400 | EGC-4 (p. 178) | — |
| | | 4-Pin Euro QD | T30SN6FF400Q | T30SP6FF400Q | | |
| | 0 - 600 mm Cutoff | 2 m | T30SN6FF600 | T30SP6FF600 | EGC-5 (p. 178) | — |
| | | 4-Pin Euro QD | T30SN6FF600Q | T30SP6FF600Q | | |

T30, 20-250V ac

→ Infrared LED → Visible Red LED

| Sensing Mode/LED | Range | Connection | Models LO | Models DO | Excess Gain | Beam Pattern |
|------------------|-------------------|----------------|-----------------|---------------|----------------|---------------|
| OPPOSED | 60 m | 2 m | T303E Emitter | | EGC-1 (p. 178) | BP-1 (p. 178) |
| | | 4-Pin Micro QD | T303EQ1 Emitter | | | |
| | | 2 m | T30AW3R | T30RW3R | | |
| | | 4-Pin Micro QD | T30AW3RQ1 | T30RW3RQ1 | | |
| POLAR RETRO | 6 m [†] | 2 m | T30AW3LP | T30RW3LP | EGC-2 (p. 178) | BP-2 (p. 178) |
| | | 4-Pin Micro QD | T30AW3LPQ1 | T30RW3LPQ1 | | |
| FIXED-FIELD | 0 - 200 mm Cutoff | 2 m | T30AW3FF200 | T30RW3FF200 | EGC-3 (p. 178) | — |
| | | 4-Pin Micro QD | T30AW3FF200Q1 | T30RW3FF200Q1 | | |
| | 0 - 400 mm Cutoff | 2 m | T30AW3FF400 | T30RW3FF400 | EGC-4 (p. 178) | — |
| | | 4-Pin Micro QD | T30AW3FF400Q1 | T30RW3FF400Q1 | | |
| | 0 - 600 mm Cutoff | 2 m | T30AW3FF600 | T30RW3FF600 | EGC-5 (p. 178) | — |
| | | 4-Pin Micro QD | T30AW3FF600Q1 | T30RW3FF600Q1 | | |

Connection options: A model with a QD requires a mating cordset (see page 177).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T30AW3FF200 W/30).

[†] Retroreflective range is specified using a BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Photoelectronics Sensors

- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 177

MINIATURE

COMPACT


MIDSIZE

- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30**
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

T30 DC Specifications


| | |
|-----------------------------|--|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple); Supply current (exclusive of load current): Opposed Emitters: 25 mA Opposed Receivers: 20 mA Polarized Retroreflective: 30 mA Fixed-field: 35 mA |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state dc switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark |
| Output Rating | 150 mA max. (each) in standard hookup; When wired for alarm output, the total load may not exceed 150 mA OFF-state leakage current: less than 1 µA at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 150 mA dc |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs |

More on next page

| T30 DC Specifications (cont'd) | |
|--------------------------------|---|
| Output Response Time | Opposed: 3 milliseconds ON; 1.5 milliseconds OFF Polarized Retroreflective and Fixed-field: 3 milliseconds ON/OFF |
| Delay at Power-up | 100 milliseconds; outputs are non-conducting during this time |
| Repeatability | Opposed: 375 microseconds Polarized Retroreflective and Fixed-field 750 microseconds Repeatability and response are independent of signal strength. |
| Indicators | Two LEDs: Green: Power ON Yellow: Light operate (LO) output energized |
| Construction | Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included. |
| Environmental Rating | Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9. |
| Connections | 2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 177. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation) |
| Certifications |  |
| Hookup Diagrams | Emitters: DC02 (p. 758) NPN Models: DC05 (p. 759) PNP Models: DC06 (p. 759) |

| T30 AC Specifications | |
|-----------------------------|--|
| Supply Voltage and Current | 20 to 250V ac (50/60 Hz). Average current: 20 mA Peak current: 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac |
| Supply Protection Circuitry | Protected against transient voltages |
| Output Configuration | Solid-state ac switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark |
| Output Rating | 300 mA max. (continuous) Fixed-field: derate 5 mA/° C above +50° C Inrush capability: 1 amp for 20 milliseconds, non-repetitive OFF-state leakage current: less than 100 µA ON-state voltage drop: 3V at 300 mA ac; 2V at 15 mA ac |
| Output Protection Circuitry | Protected against false pulse on power-up |
| Output Response Time | Opposed: 16 milliseconds ON; 8 milliseconds OFF Polarized Retroreflective and Fixed-field: 16 milliseconds ON/OFF |
| Delay at Power-up | 100 milliseconds |
| Repeatability | Opposed: 2 milliseconds Polarized Retroreflective and Fixed-field: 4 milliseconds Repeatability and response are independent of signal strength |
| Indicators | Two LEDs: Green: Power ON Yellow: Light sensed |
| Construction | Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included. |
| Environmental Rating | Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9. |
| Connections | 2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 177. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |

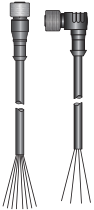



| T30 AC Specifications (cont'd) | |
|--------------------------------|--|
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation) |
| Certifications |  |
| Hookup Diagrams | Cabled Emitters: AC03 (p. 764) Cabled Models: AC05 (p. 765) QD Emitters: AC07 (p. 765) QD Models: AC06 (p. 765) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

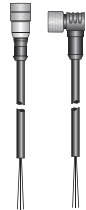
Cordsets

| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |







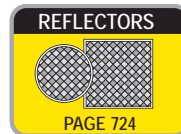
 Additional cordset information available. See page 693.


| Micro QD | | |
|----------------|----------|-------------|
| See page 712 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQAC-406 | MQAC-406RA |
| 4.57 m | MQAC-415 | MQAC-415RA |
| 9.14 m | MQAC-430 | MQAC-430RA |



Brackets

| T30 | | | |
|--|---|---|---|
|  |  |  |  |
| pg. 650 | pg. 653 | pg. 653 | pg. 661 |
| SMB1815SF | SMB30A | SMB30FA.. | SMBAMS30P |



 Additional brackets and information available. See page 632.

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card)

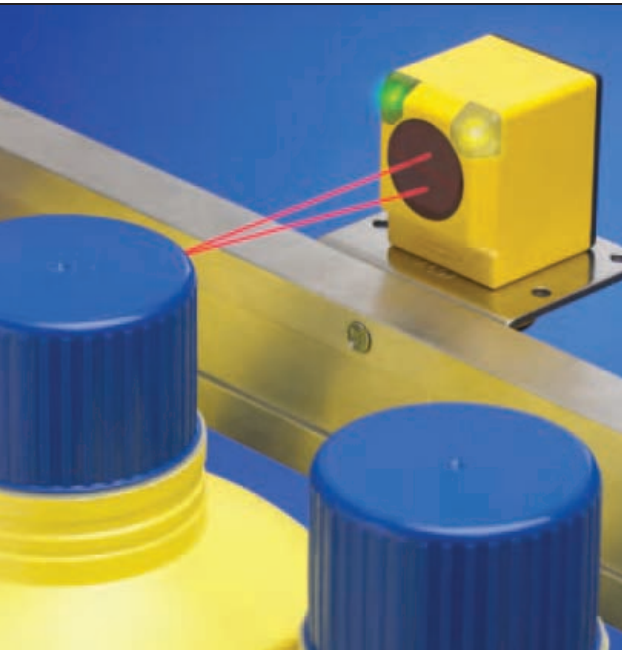
○ = Infrared LED P = Visible Red LED Polarized

| | | | |
|--|---|--|---|
| <p>Opposed Mode T30</p> <p>EGC-1</p> <p>Range: 60 m LED: ○</p> | <p>Polarized Retroreflective Mode T30</p> <p>EGC-2</p> <p>Range: 6 m LED: P</p> | <p>Fixed-Field Mode T30</p> <p>EGC-3</p> <p>Cutoff: 200 mm LED: ○</p> | <p>Ø 16 mm spot size @ 35 mm focus Ø 20 mm spot size @ 200 mm cutoff</p> <p>Using 18% gray test card: cutoff distance will be 95% of value shown. Using 6% black test card: cutoff distance will be 90% of value shown.</p> |
| <p>Fixed-Field Mode T30</p> <p>EGC-4</p> <p>Cutoff: 400 mm LED: ○</p> | <p>Ø 17 mm spot size @ 35 mm focus Ø 25 mm spot size @ 400 mm cutoff</p> <p>Using 18% gray test card: cutoff distance will be 90% of value shown. Using 6% black test card: cutoff distance will be 85% of value shown.</p> | <p>Fixed-Field Mode T30</p> <p>EGC-5</p> <p>Cutoff: 600 mm LED: ○</p> | <p>Ø 17 mm spot size @ 35 mm focus Ø 30 mm spot size @ 600 mm cutoff</p> <p>Using 18% gray test card: cutoff distance will be 85% of value shown. Using 6% black test card: cutoff distance will be 75% of value shown.</p> |

Beam Patterns

○ = Infrared LED P = Visible Red LED Polarized

| | |
|---|---|
| <p>Opposed Mode T30</p> <p>Effective Beam: 23 mm</p> <p>BP-1</p> <p>Range: 60 m LED: ○</p> | <p>Polarized Retroreflective Mode T30</p> <p>BP-2</p> <p>Range: 6 m LED: P</p> |
|---|---|



Right-Angle Base-Mount Rectangular Sensors Q40

- Specially designed optics and electronics for reliable sensing without adjustments
- Features rectangular 40 mm plastic housing with 30 mm threaded mounting base in opposed, retroreflective and fixed-field modes
- Completely epoxy-encapsulated to provide superior durability, even in harsh sensing environments; rated to IP69K
- Uses an innovative dual-indicator system reduce complexity of monitoring sensor performance
- Models available for ac or dc power
- Uses advanced diagnostics to warn of marginal sensing conditions or output overload (dc models)

Photoelectrics Sensors

Fiber Optic Sensors

Special Purpose Sensors

Measurement & Inspection Sensors

Vision

Wireless

Lighting & Indicators

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

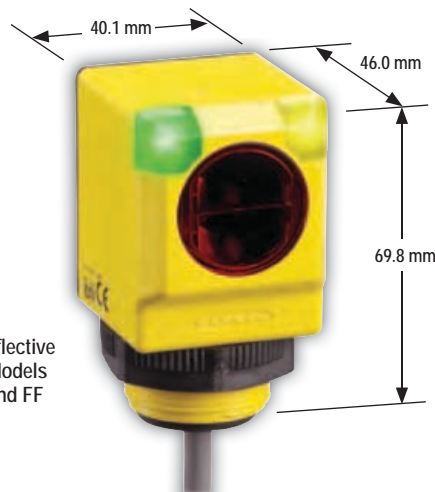
Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
page 181

ONLINE
AUTOCAD, STEP, IGES & PDF

Opposed, Polarized Retroreflective and Fixed-field Models Suffix E, R, LP and FF



Q40, 10-30V dc

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|--------------------|-------------------|---------------|----------------|--------------|----------------|---------------|
| <p>OPPOSED</p> | 60 m | 2 m | Q406E Emitter | | EGC-1 (p. 182) | BP-1 (p. 182) |
| | | 4-Pin Euro QD | Q406EQ Emitter | | | |
| | | 2 m | Q40SN6R | Q40SP6R | | |
| | | 4-Pin Euro QD | Q40SN6RQ | Q40SP6RQ | | |
| <p>POLAR RETRO</p> | 6 m [†] | 2 m | Q40SN6LP | Q40SP6LP | EGC-2 (p. 182) | BP-2 (p. 182) |
| | | 4-Pin Euro QD | Q40SN6LPQ | Q40SP6LPQ | | |
| <p>FIXED-FIELD</p> | 0 - 200 mm Cutoff | 2 m | Q40SN6FF200 | Q40SP6FF200 | EGC-3 (p. 182) | — |
| | | 4-Pin Euro QD | Q40SN6FF200Q | Q40SP6FF200Q | | |
| | 0 - 400 mm Cutoff | 2 m | Q40SN6FF400 | Q40SP6FF400 | EGC-4 (p. 182) | — |
| | | 4-Pin Euro QD | Q40SN6FF400Q | Q40SP6FF400Q | | |
| | 0 - 600 mm Cutoff | 2 m | Q40SN6FF600 | Q40SP6FF600 | EGC-5 (p. 182) | — |
| | | 4-Pin Euro QD | Q40SN6FF600Q | Q40SP6FF600Q | | |



More on next page

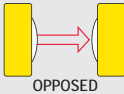

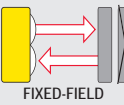
Connection options: A model with a QD requires a mating cordset (see page 181).


For 9 m cable, add suffix W/30 to the 2 m model number (example, Q40SN6R W/30).

[†] Retroreflective range is specified using a BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Q40, 20-250V ac (cont'd)

 Infrared LED  Visible Red LED

| Sensing Mode/LED | Range | Connection | Models LO | Models DO | Excess Gain | Beam Pattern |
|--|----------------------|----------------|-----------------|---------------|-------------------|------------------|
|  OPPOSED | 60 m | 2 m | Q403E Emitter | | EGC-1 (p. 182) | BP-1 (p. 182) |
| | | 4-Pin Micro QD | Q403EQ1 Emitter | | | |
| | | 2 m | Q40AW3R | Q40RW3R | | |
| | | 4-Pin Micro QD | Q40AW3RQ1 | Q40RW3RQ1 | | |
|  POLAR RETRO | 6 m [†] | 2 m | Q40AW3LP | Q40RW3LP | EGC-2 (p. 182) | BP-2 (p. 182) |
| | | 4-Pin Micro QD | Q40AW3LPQ1 | Q40RW3LPQ1 | | |
|  FIXED-FIELD | 0 - 200 mm Cutoff | 2 m | Q40AW3FF200 | Q40RW3FF200 | EGC-3 (p. 182) | — |
| | | 4-Pin Micro QD | Q40AW3FF200Q1 | Q40RW3FF200Q1 | | |
| | 0 - 400 mm Cutoff | 2 m | Q40AW3FF400 | Q40RW3FF400 | EGC-4 (p. 182) | — |
| | | 4-Pin Micro QD | Q40AW3FF400Q1 | Q40RW3FF400Q1 | | |
| | 0 - 600 mm Cutoff | 2 m | Q40AW3FF600 | Q40RW3FF600 | EGC-5 (p. 182) | — |
| | | 4-Pin Micro QD | Q40AW3FF600Q1 | Q40RW3FF600Q1 | | |




 Connection options: A model with a QD requires a mating cordset (see page 181).


For 9 m cable, add suffix W/30 to the 2 m model number (example, Q40AW3FF200 W/30).

[†] Retroreflective range is specified using a BRT-3 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Q40 DC Specifications

| | |
|--------------------------------|---|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple); Supply current (exclusive of load current): Opposed Emitters: 25 mA Opposed Receivers: 20 mA Polarized Retroreflective: 30 mA Fixed-field: 35 mA |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models The Dark Operate (DO) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply |
| Output Rating | 150 mA max. (each) in standard hookup; When wired for alarm output, the total load may not exceed 150 mA OFF-state leakage current: less than 1 µA at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 150 mA dc |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs |
| Output Response Time | Opposed: 3 milliseconds ON; 1.5 milliseconds OFF Polarized Retroreflective and Fixed-field: 3 milliseconds ON/OFF |
| Delay at Power-up | 100 milliseconds; outputs are non-conducting during this time |
| Repeatability | Opposed: 375 microseconds Polarized Retroreflective and Fixed-field: 750 microseconds Repeatability and response are independent of signal strength |
| Indicators | Two LEDs: Green and Yellow Green: Power ON Yellow: Light Operate (LO) output energized See data sheet for detailed information |
| Construction | Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included. |
| Environmental Rating | Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9. |
| Connections | 2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 181. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation) |
| Certifications |    |
| Hookup Diagrams | Emitters: DC02 (p. 758) NPN Models: DC05 (p. 759) PNP Models: DC06 (p. 759) |


| Q40 AC Specifications | |
|--------------------------------|--|
| Supply Voltage and Current | 20 to 250V ac (50/60 Hz) Average current: 20 mA Peak current: 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac |
| Supply Protection Circuitry | Protected against transient voltages |
| Output Configuration | Solid-state ac switch; three-wire hookup; choose Light Operate (LO) or Dark Operate (DO) models Light Operate: Output conducts when the sensor sees its own (or the emitter's) modulated light Dark Operate: Output conducts when sensor sees dark |
| Output Rating | 300 mA max. (continuous) Fixed-field: derate 5 mA/° C above +50° C Inrush capability: 1 amp for 20 milliseconds, non-repetitive OFF-state leakage current: less than 100 µA ON-state voltage drop: 3V at 300 mA ac; 2V at 15 mA ac |
| Output Protection Circuitry | Protected against false pulse on power-up |
| Output Response Time | Opposed: 16 milliseconds ON; 8 milliseconds OFF Polarized Retroreflective and Fixed-field: 16 milliseconds ON/OFF |
| Delay at Power-up | 100 milliseconds |
| Repeatability | Opposed: 2 milliseconds Polarized Retroreflective and Fixed-field: 4 milliseconds Repeatability and response are independent of signal strength |
| Indicators | Two LEDs: Green: Power ON Yellow: Light sensed See data sheet for detailed information |
| Construction | Housings are thermoplastic polyester. Lenses are polycarbonate or acrylic; one jam nut included. |
| Environmental Rating | Leakproof design rated NEMA 6P, IP67. QD models rated IP69K per DIN 40050-9. |
| Connections | 2 m or 9 m attached cable, or 4-pin Micro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 181. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max, double amplitude 0.06-inch acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation) |
| Certifications |  |
| Hookup Diagrams | Cabled Emitters: AC03 (p. 764) Cabled Models: AC05 (p. 765) QD Emitters: AC07 (p. 765) QD Models: AC06 (p. 765) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40**
- PicoDot
- QM42/QMT42
- FULLSIZE

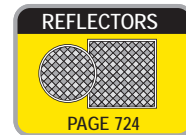
Cordsets

| Euro QD to Flying Leads | | |
|-------------------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |





 Additional cordset information available. See page 693.




| Micro QD | | |
|----------------|----------|-------------|
| See page 712 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQAC-406 | MQAC-406RA |
| 4.57 m | MQAC-415 | MQAC-415RA |
| 9.14 m | MQAC-430 | MQAC-430RA |



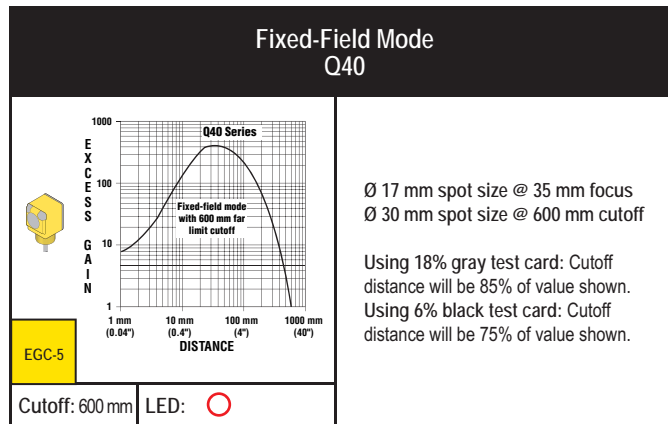
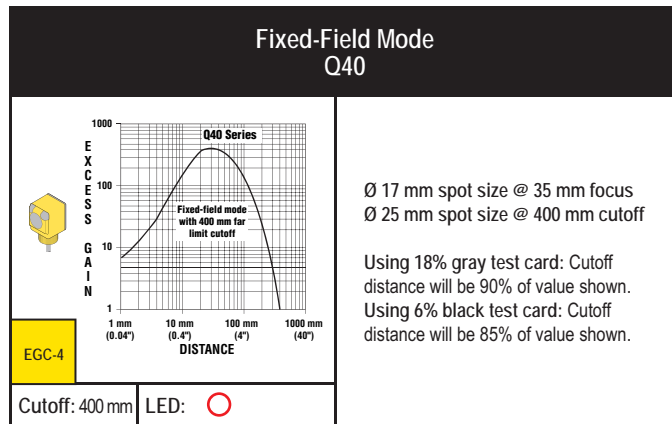
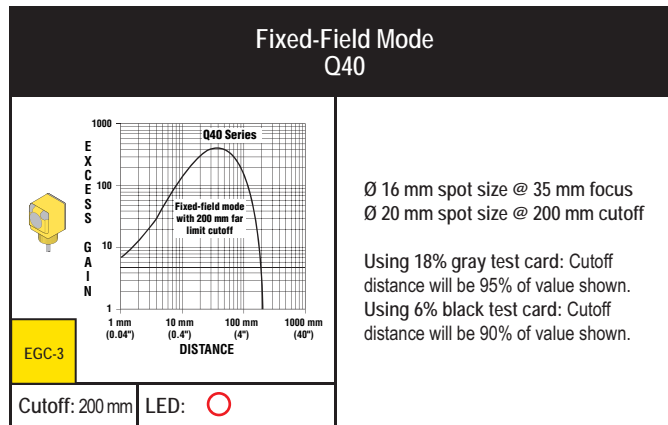
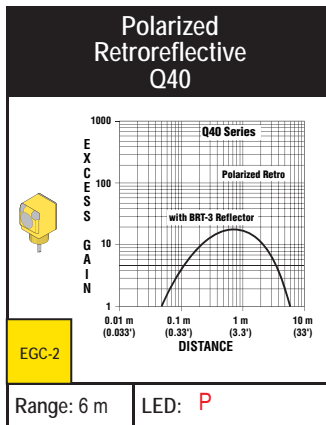
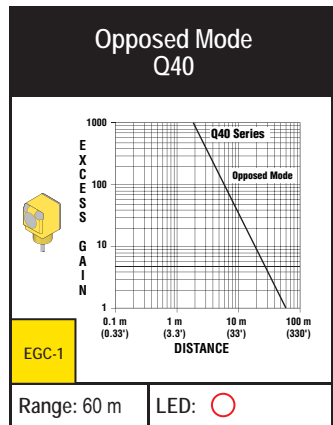
Brackets

| Q40 | | | |
|--|---|---|---|
|  |  |  |  |
| pg. 653 | pg. 653 | pg. 654 | pg. 661 |
| SMB30A | SMB30FA.. | SMB30SC | SMBAMS30P |

 Additional brackets and information available. See page 632.

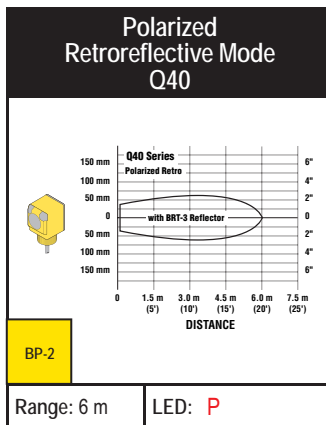
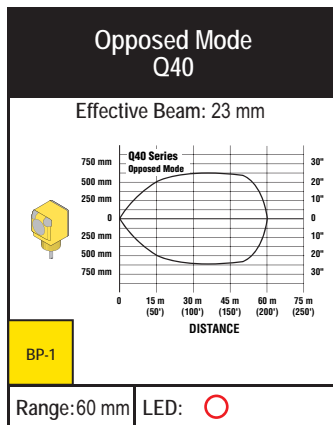
Excess Gain Curves (Fixed-field mode performance based on 90% reflectance white test card)

○ = Infrared LED P = Visible Red LED Polarized



Beam Patterns

○ = Infrared LED P = Visible Red LED Polarized





Laser Precision Sensors PicoDot®

- Convergent-mode laser sensor delivers precise position detection, inspection and counting
- Powerful retroreflective models offer long-range retroreflective sensing
- Fixed-field technology in the convergent-mode models ignores objects beyond the maximum sensing distance
- Convergent models have precise 0.25 mm beam width at the convergent focus point
- Retroreflective models have a precise, narrow beam to sense small objects at close range or larger objects to 10.6 m
- All models have a gain sensitivity potentiometer for fine tuning sensor performance
- Models are available with compact light-weight housing (PD45) or with environmentally sealed housing (PD49)

Photoelectronics Sensors

- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 185



PD45 Models



PD49 Models

MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

T30

Q40

PicoDot

QM42/QMT42

FULLSIZE

PicoDot®, 10-30V dc

➔ Visible Red LED



| Sensing Mode/LED | Range or Focus | Connection | Housing Rating | NPN Models | PNP Models | Excess Gain | Beam Pattern |
|----------------------------------|-----------------------------|-----------------------|----------------|--------------|--------------|-------------------------------|---------------|
| CLASS 2 LASER POLAR RETRO | 0.2 m - 10.6 m [†] | 2 m | IP54, NEMA 3 | PD45VN6LLP | PD45VP6LLP | EGC-1, EGC-2 & EGC-3 (p. 186) | — |
| | | 5-pin Euro Pigtail QD | | PD45VN6LLPQ | PD45VP6LLPQ | | |
| | | 2 m | IP67, NEMA 6 | PD49VN6LLP | PD49VP6LLP | | |
| | | 5-pin Euro Pigtail QD | | PD49VN6LLPQ | PD49VP6LLPQ | | |
| CLASS 2 LASER CONVERGENT | 50 mm | 2 m | IP54, NEMA 3 | PD45VN6C50 | PD45VP6C50 | EGC-4 (p. 186) | BP-1 (p. 186) |
| | | 5-pin Euro Pigtail QD | | PD45VN6C50Q | PD45VP6C50Q | | |
| | | 2 m | IP67, NEMA 6 | PD49VN6C50 | PD49VP6C50 | | |
| | | 5-pin Euro Pigtail QD | | PD49VN6C50Q | PD49VP6C50Q | | |
| | 102 mm | 2 m | IP54, NEMA 3 | PD45VN6C100 | PD45VP6C100 | EGC-5 (p. 186) | BP-2 (p. 186) |
| | | 5-pin Euro Pigtail QD | | PD45VN6C100Q | PD45VP6C100Q | | |
| | | 2 m | IP67, NEMA 6 | PD49VN6C100 | PD49VP6C100 | | |
| | | 5-pin Euro Pigtail QD | | PD49VN6C100Q | PD49VP6C100Q | | |

➔ More on next page

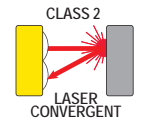
➔ Connection options: A model with a QD requires a mating cordset (see page 185).


For 9 m cable, add suffix W/30 to the 2 m model number (example, PD45VN6LLP W/30).

[†] Tested using a BRT-36X40BM retro target (included with each sensor). Actual range depends on the efficiency and size of the retroreflective target. Some targets have produced ranges up to 40 m.

PicoDot®, 10-30V dc (cont'd)

 Visible Red LED

| Sensing Mode/LED | Range or Focus | Connection | Housing Rating | NPN Models | PNP Models | Excess Gain | Beam Pattern |
|---|----------------|-----------------------|-----------------|--------------|--------------|-------------------|------------------|
|  | 203 mm | 2 m | IP54, NEMA 3 | PD45VN6C200 | PD45VP6C200 | EGC-6 (p. 186) | BP-3 (p. 186) |
| | | 5-pin Euro Pigtail QD | | PD45VN6C200Q | PD45VP6C200Q | | |
| | | 2 m | IP67, NEMA 6 | PD49VN6C200 | PD49VP6C200 | | |
| | | 5-pin Euro Pigtail QD | | PD49VN6C200Q | PD49VP6C200Q | | |
| | 305 mm | 2 m | IP54, NEMA 3 | PD45VN6C300 | PD45VP6C300 | EGC-7 (p. 186) | BP-4 (p. 186) |
| | | 5-pin Euro Pigtail QD | | PD45VN6C300Q | PD45VP6C300Q | | |
| 2 m | | IP67, NEMA 6 | PD49VN6C300 | PD49VP6C300 | | | |
| 5-pin Euro Pigtail QD | | | PD49VN6C300Q | PD49VP6C300Q | | | |

 Connection options: A model with a QD requires a mating cordset (see page 185).

For 9 m cable, add suffix W/30 to the 2 m model number (example, PD45VN6C100 W/30).


ACCESSORIES

page
185

PicoDot® Specifications

| | |
|-----------------------------|---|
| Supply Voltage and Current | 10 to 30V dc (10% max ripple) at less than 20 mA, exclusive of load |
| Beam Size at Aperture | 3.75 x 1.85 mm (Retroreflective Models) |
| Beam Divergence | Approx. 1 milliradian (Retroreflective Models) |
| Laser Classification | Class 2 safety (CDRH (FDA) 1040.10 and IEC 60875-1) |
| Supply Protection Circuitry | Protected against reverse polarity, over voltage, and transient voltages |
| Delay at Power-up | < 1 second |
| Output Configuration | Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models |
| Output Rating | 150 mA max. (each output) OFF-state leakage current: less than μ A at 30V dc ON-state saturation voltage: less than 0.3V at 10 mA dc; less than 0.8V at 150 mA dc |
| Output Protection | Protected against continuous overload or short-circuit of outputs; Overload trip point \geq 220 milliamps |
| Output Response Time | 0.2 milliseconds (200 microseconds) ON/OFF |
| Repeatability | 50 microseconds; Rep Rate 20 KHz |
| Spot Size at Focus | 0.25 mm |
| Range | C50 models: 25 to 58 mm; focus at 50 mm \pm 5 mm C100 models: 25 to 115 mm; focus at 102 mm \pm 5 mm C200 models: 25 to 216 mm; focus at 203 mm \pm 5 mm C300 models: 25 to 317 mm; focus at 305 mm \pm 5 mm LLP models: 0.2 to 10.6 m, using supplied retroreflective target |
| Adjustments | 12-turn slotted brass Gain (sensitivity) adjustment potentiometer |
| Extinguishing Wire | Gray wire held "low" for laser operation; "high" to turn laser OFF; Low \leq 1.0V dc; High \geq Vsupply -4.0V dc (< 30V dc) or disconnect wire; 100 milliseconds delay upon enable |
| Indicators | Two LEDs: Green: Power ON Yellow: Light sensed; Light Operate (LO) output conducting See data sheet for detailed information |
| Construction | PD45: Housings are heat-resistant ABS, UL94-VO rated; acrylic lens cover PD49: Housings are sealed, heat resistant ABS/polycarbonate alloy, UL94-VO rated, acrylic lens cover |
| Environmental Rating | PD45: IP54; NEMA 3 PD49: IP67; NEMA 6 |

 More
on next
page

| PicoDot® Specifications (cont'd) | |
|----------------------------------|---|
| Connections | 2 m or 9 m attached cable, or 5-pin Euro-style 150 mm pigtail quick-disconnect fitting; mating cordsets for QD models are ordered separately. See page 185. |
| Operating Conditions | Temperature: -10° to +45° C Relative humidity: 90% at 50° C (non-condensing) |
| Weight | PD45: Sensor only: 22 g PD49: Sensor only: 28 g Sensor plus 2 m cable: 62 g Sensor plus 2 m cable: 68 g |
| Application Notes | False pulse may occur less than 1 second after power-up |
| Certifications |  |
| Hookup Diagrams | DC12 (p. 760) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Class 2 Laser Safety Notes

Low-power lasers are by definition incapable of causing eye injury within the duration of the blink (aversion response) of 0.25 seconds. They also must emit only visible wavelengths (400 - 700 nm). Therefore, an ocular hazard can exist only if an individual overcomes their natural aversion to bright light and stares directly into the laser beam.

For safe laser use:

- Do not permit a person to stare at the laser from within the beam.
- Do not point the laser at a person's eye at close range.
- The beam emitted by a Class 2 laser product should be terminated at the end of its useful path. Open laser beam paths should be located above or below eye level where practical.



LASER LIGHT
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

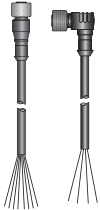
Avoid exposure - laser light emitted from this aperture


PEAK POWER 2 mW
20KHz 10% DUTY CYCLE
660 - 680 nm
COMPLIES TO 21 CFR PART 1040.10 AND EN60825-1:1994

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- O40
- PicoDot
- QM42/QMT42
- FULLSIZE

Cordsets





| Euro QD | | |
|----------------|-------------|-------------|
| See page 699 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 0.5 m | MQDC1-501.5 | - |
| 1.83 m | MQDC1-506 | MQDC1-506RA |
| 4.57 m | MQDC1-515 | MQDC1-515RA |
| 9.14 m | MQDC1-530 | MQDC1-530RA |






Additional cordset information available. See page 693.

Brackets

| PicoDot | | | |
|---|---|---|---|
|  |  |  |  |
| pg. 657 | pg. 657 | pg. 657 | pg. 658 |
| SMB46A | SMB46S | SMB46L | SMB46U |



Additional bracket information available. See page 632.

REFLECTORS



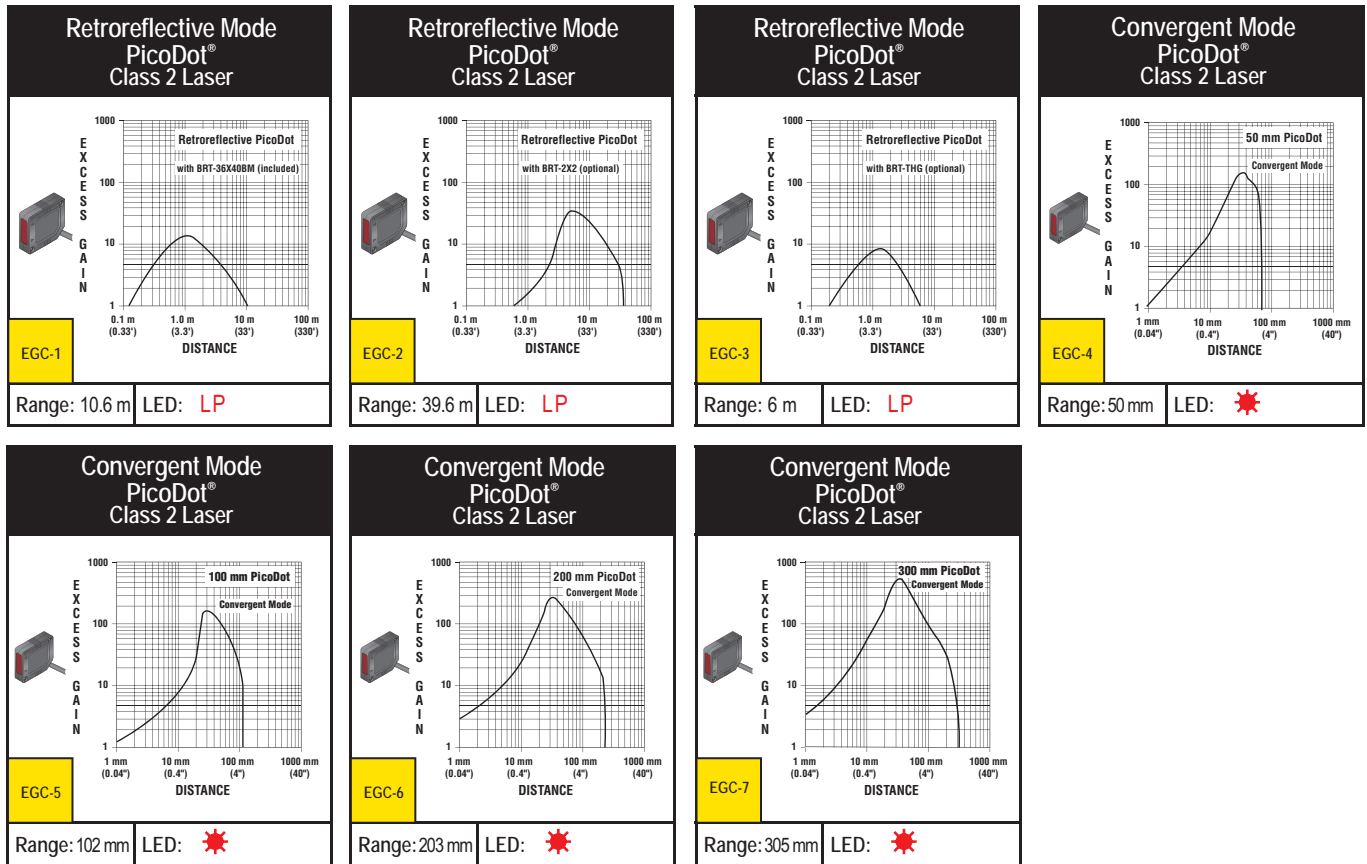
PAGE 724

Excess Gain Curves

(Convergent mode performance based on 90% reflectance white test card)

LP = Visible Red Laser LED Polarized

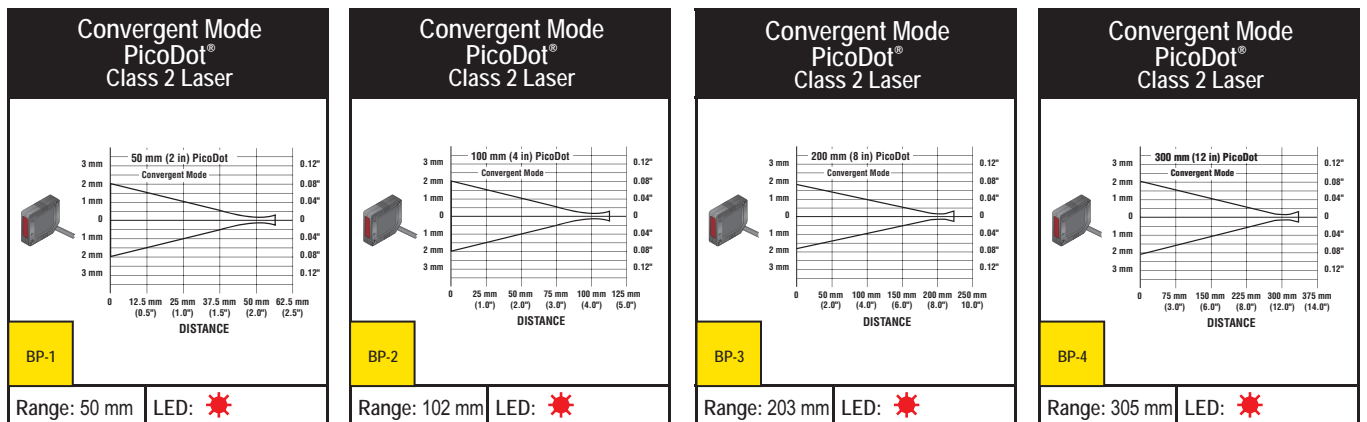
☀ = Visible Red Laser LED



Beam Patterns

(Convergent mode performance based on 90% reflectance white test card)

☀ = Visible Red Laser LED





Rugged Die-Cast Family of Sensors QM42 and QMT42

- Features compact, low-cost dc sensors in NEMA 6 (IEC IP67) die-cast housings
- Delivers outstanding immunity to electrical noise
- Includes marginal and Power ON gain indicator
- QM42 series: Available in opposed, polarized retroreflective, diffuse, short-range adjustable-field and plastic fiber optic modes
- QMT42 series (slightly larger): Available in fixed-field, diffuse and long-range adjustable-field modes

Photoelectronics Sensors

Fiber Optic Sensors

Special Purpose Sensors

Measurement & Inspection Sensors

Vision

Wireless

Lighting & Indicators

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

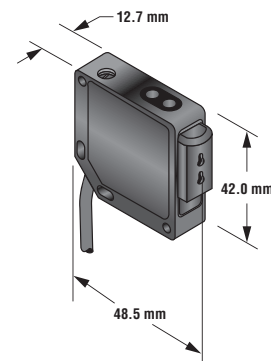
ACCESSORIES
page 189



QMT42 Long-range Diffuse, Fixed-field and Adjustable-field Model Suffix DX, FF and AFV400



QM42 Opposed, Retroreflective, Short-range Diffuse, and Short-range Adjustable-field Model Suffix E, R, LP, D, AFV150 and FP



QM42 Plastic Fiber Optic Models Suffix FP

MINIATURE

COMPACT

MIDSIZE

WORLD-BEAM QS30

S30

SM30/SMI30

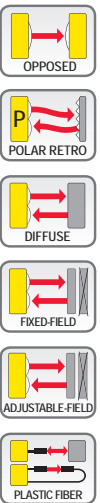
T30

Q40

PicoDot

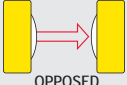
QM42/QMT42

FULLSIZE



QM42 and QMT42, 10-30V dc

→ Infrared LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|---|-------|---------------|-----------------|------------|----------------|---------------|
|  OPPOSED | 10 m | 2 m | QM426E Emitter | | EGC-1 (p. 190) | BP-1 (p. 191) |
| | | 4-Pin Euro QD | QM426EQ Emitter | | | |
| | | 2 m | QM42VN6R | QM42VP6R | | |
| | | 4-Pin Euro QD | QM42VN6RQ | QM42VP6RQ | | |


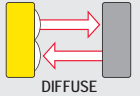
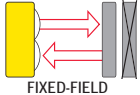
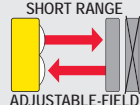
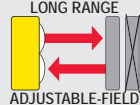
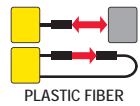
More on next page

Connection options: A model with a QD requires a mating cordset (see page 189).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QM42VN6R W/30).

QM42 and QMT42, 10-30V dc (cont'd)

 Infrared LED  Visible Red LED

| Sensing Mode/LED | Range | Connection | Models NPN | Models PNP | Excess Gain | Beam Pattern |
|---|--|---------------|-----------------|-----------------|--|-------------------------------------|
|  POLAR RETRO | 3 m† | 2 m | QM42VN6LP | QM42VP6LP | EGC-2 (p. 190) | BP-2 (p. 191) |
| | | 4-Pin Euro QD | QM42VN6LPQ | QM42VP6LPQ | | |
|  DIFFUSE | Short-Range 400 mm | 2 m | QM42VN6D | QM42VP6D | EGC-3 (p. 190) | BP-3 (p. 191) |
| | | 4-Pin Euro QD | QM42VN6DQ | QM42VP6DQ | | |
| | Long-Range 10 mm- 6 m | 2 m | QMT42VN6DX | QMT42VP6DX | EGC-4 (p. 190) | BP-4 (p. 191) |
| | | 4-Pin Euro QD | QMT42VN6DXQ | QMT42VP6DXQ | | |
|  FIXED-FIELD | 50 - 500 mm Cutoff | 2 m | QMT42VN6FF500 | QMT42VP6FF500 | EGC-7 (p. 190) | — |
| | | 4-Pin Euro QD | QMT42VN6FF500Q | QMT42VP6FF500Q | | |
| | 50 - 750 mm Cutoff | 2 m | QMT42VN6FF750 | QMT42VP6FF750 | EGC-8 (p. 190) | — |
| | | 4-Pin Euro QD | QMT42VN6FF750Q | QMT42VP6FF750Q | | |
| | 50 - 1000 mm Cutoff | 2 m | QMT42VN6FF1000 | QMT42VP6FF1000 | EGC-9 (p. 190) | — |
| | | 4-Pin Euro QD | QMT42VN6FF1000Q | QMT42VP6FF1000Q | | |
| | 50 - 1500 mm Cutoff | 2 m | QMT42VN6FF1500 | QMT42VP6FF1500 | EGC-10 (p. 190) | — |
| | | 4-Pin Euro QD | QMT42VN6FF1500Q | QMT42VP6FF1500Q | | |
| | 50 - 2000 mm Cutoff | 2 m | QMT42VN6FF2000 | QMT42VP6FF2000 | EGC-11 (p. 190) | — |
| | | 4-Pin Euro QD | QMT42VN6FF2000Q | QMT42VP6FF2000Q | | |
|  SHORT RANGE ADJUSTABLE-FIELD | 5 mm to Cutoff point (adjustable from 50 to 150 mm) | 2 m | QM42VN6AFV150 | QM42VP6AFV150 | EGC-5 (p. 190) Cutoff Point Deviation Curve CPDC-1 (p. 191) | — |
| | | 4-Pin Euro QD | QM42VN6AFV150Q | QM42VP6AFV150Q | | |
|  LONG RANGE ADJUSTABLE-FIELD | 25 mm to Cutoff point (adjustable from 125 to 400 mm) | 2 m | QMT42VN6AFV400 | QMT42VP6AFV400 | EGC-6 (p. 190) Cutoff Point Deviation Curve CPDC-2 (p. 191) | — |
| | | 4-Pin Euro QD | QMT42VN6AFV400Q | QMT42VP6AFV400Q | | |
|  PLASTIC FIBER | Range varies by sensing mode and fiber optics used | 2 m | QM42VN6FP | QM42VP6FP | EGC-12 (p. 190) & EGC-13 (p. 190) | BP-5 (p. 191) & BP-6 (p. 191) |
| | | 4-Pin Euro QD | QM42VN6FPQ | QM42VP6FPQ | | |

 Connection options: A model with a QD requires a mating cordset (see page 189).


For 9 m cable, add suffix W/30 to the 2 m model number (example, QM42VN6LP W/30).

† Tested using a BRT-3 retroreflector. Actual range depends on the efficiency and reflective area of the retroreflector in use. See Accessories for more information.

QM42 and QMT42 Specifications

| | |
|-----------------------------|--|
| Sensing Beam | Opposed, Diffuse, Retroreflective, Fixed-field and Fiber Optic: Infrared, 880 nm; Visible Red, 660 nm Adjustable-field: Visible Red, 680 nm |
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at less than: Opposed: 30 mA (emitter), 10 mA (receiver) Short-range diffuse and retroreflective: 20 mA Fiber optic: 30 mA Adjustable-field: 50 mA Fixed-field and long-range diffuse: 40 mA |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Solid-state complementary; choose NPN (current sinking) or PNP (current sourcing) models |

 More on next page

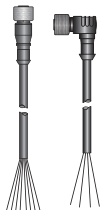
| QM42 and QMT42 Specifications (cont'd) | |
|--|---|
| Output Rating | 100 mA max. (each output) OFF-state leakage current: less than μA at 30V dc ON-state saturation voltage: less than 1V at 10 mA dc; less than 1.5V at 100 mA dc |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point ≥ 150 mA, typical at 20° C |
| Output Response Time | Opposed: 1 millisecond ON; 0.5 millisecond OFF Diffuse, Retroreflective, Adjustable-field and Fixed-field: 1 millisecond ON/OFF Plastic Fiber Optic: 0.25 millisecond ON/OFF |
| Delay at Power-up | 100 milliseconds; outputs are non-conducting during this time |
| Repeatability | Opposed: 120 microseconds Diffuse, Retroreflective, Adjustable-field and Fixed-field: 250 microseconds Fiber Optic: 60 microseconds. Repeatability and response are independent of signal strength |
| Sensing Hysteresis | Long-range diffuse: less than 20% of set sensing distance Adjustable-field: less than 7% of set cutoff distance Fixed-field: 2000 mm models – less than 5% of set cutoff distance 1500 mm models – less than 4% of set cutoff distance 1000 mm models – less than 3% of set cutoff distance 750 mm models – less than 2% of set cutoff distance 500 mm models – less than 1% of set cutoff distance |
| Cutoff Point Tolerance | Fixed-field: $\pm 10\%$ of nominal cutoff distance |
| Adjustments | All models (except emitters, Adjustable-field, Fixed-field and Long-range Diffuse): 15-turn slotted brass GAIN (sensitivity) adjustment potentiometer 150 mm Adjustable-field: 12-turn slotted brass cutoff distance adjustment potentiometer 400 mm Adjustable-field: 15-turn slotted brass cutoff distance adjustment potentiometer Long-range diffuse: 4-turn slotted GAIN (sensitivity) adjustment potentiometer Fixed-field: No adjustments See data sheet for detailed information |
| Indicators | Two LEDs: Green and Yellow Green: Power ON; Opposed emitters: Green power ON Yellow: Light sensed; Light Operate (LO) See data sheet for detailed information |
| Construction | Housings are die-cast zinc alloy with black acrylic polyurethane finish; lenses are acrylic |
| Environmental Rating | IP67; NEMA 6 |
| Connections | 2 m or 9 m attached cable, or 4-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 189. |
| Operating Conditions | Temperature: Long-range Diffuse, Adjustable-field and Fixed-field: -20° to +55° C All others: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Certifications |  |
| Hookup Diagrams | Emitters: DC02 (p. 758) All others: DC03 (p. 764) |


- Photoelectrics Sensors
- Fiber Optic Sensors
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- Vision
- Wireless
- Lighting & Indicators
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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- WORLD-BEAM QS30
- S30
- SM30/SMI30
- T30
- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE





Cordsets

| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |



| | |
|--|---|
|  Additional options: | Additional cordset information available. See page 693. |
|--|---|

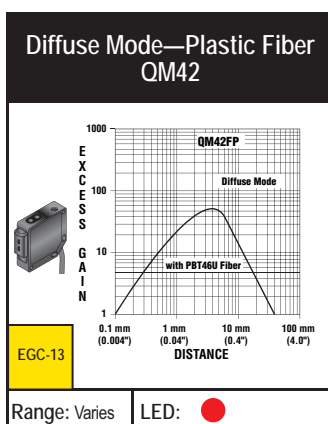
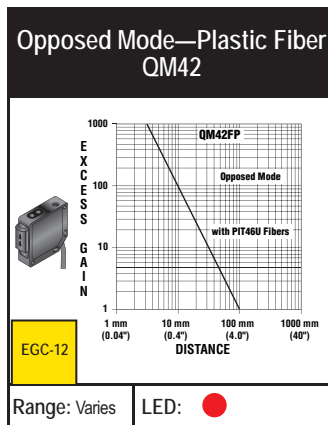
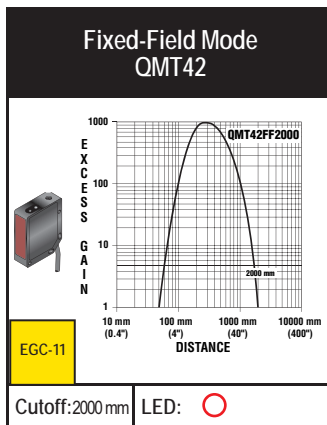
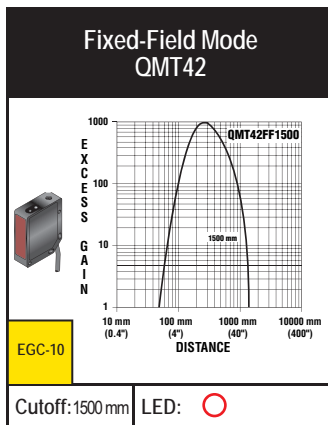
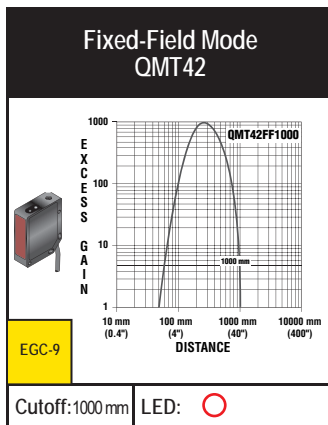
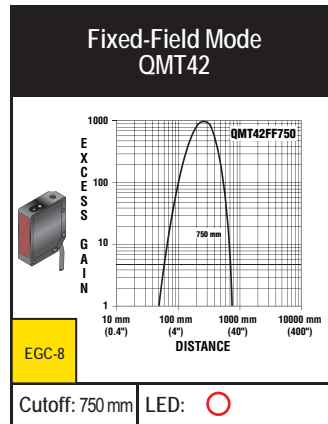
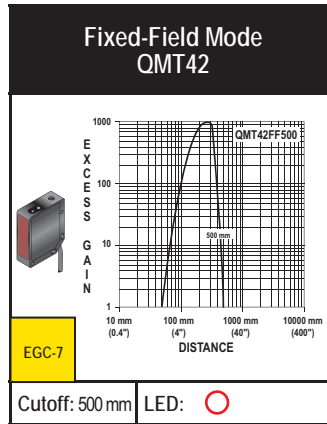
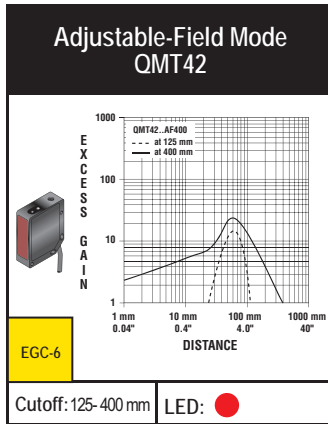
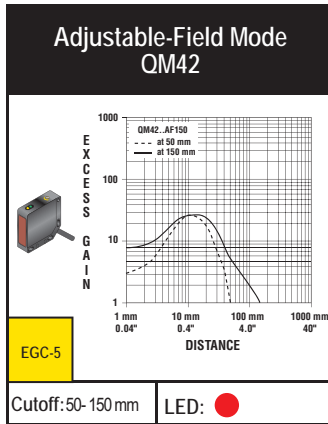
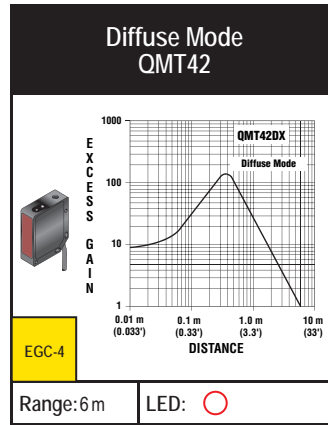
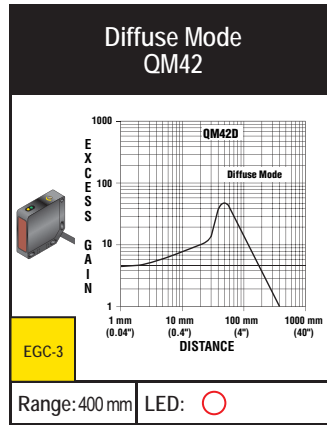
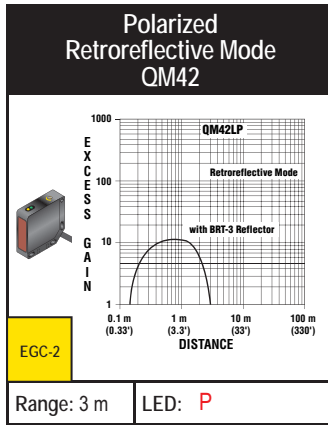
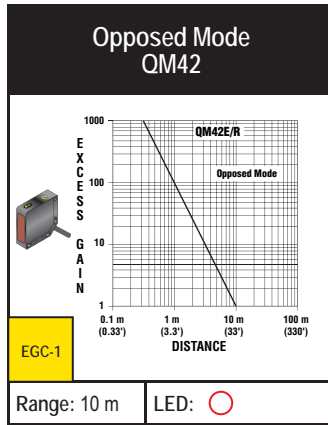
Brackets

| QM42/QMT42 | | |
|---|--|---|
|  pg. 654 SMB30SK |  pg. 657 SMB46S |  pg. 657 SMB46L |
|  Additional options: | Additional brackets and information available. See page 632. | |



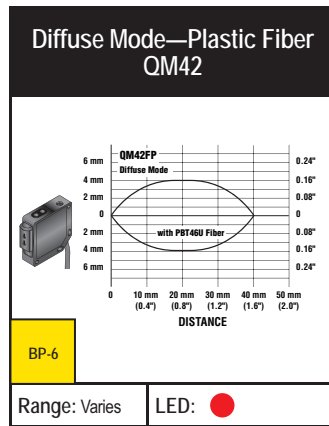
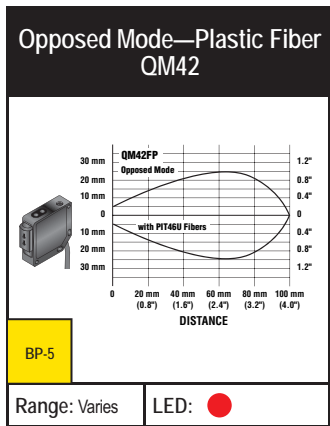
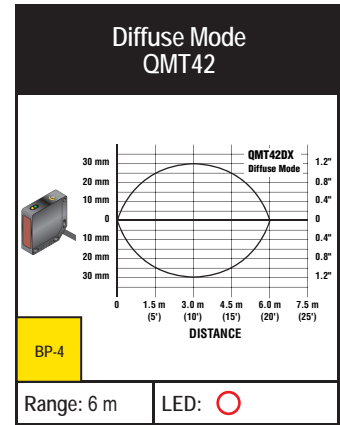
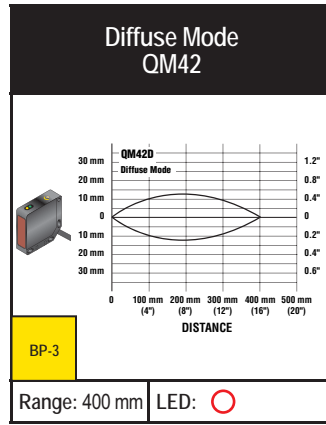
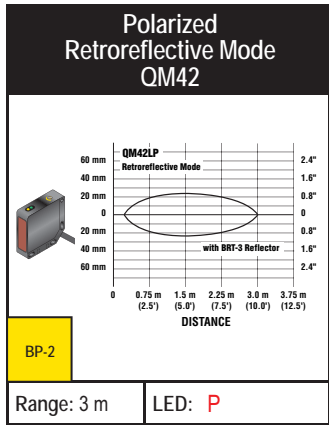
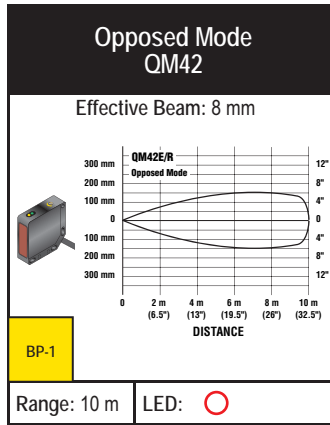
Excess Gain Curves (Diffuse, Adjustable-field and Fixed-field mode performance based on 90% reflectance white test card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized



Beam Patterns (Diffuse mode performance based on 90% reflectance white test card)

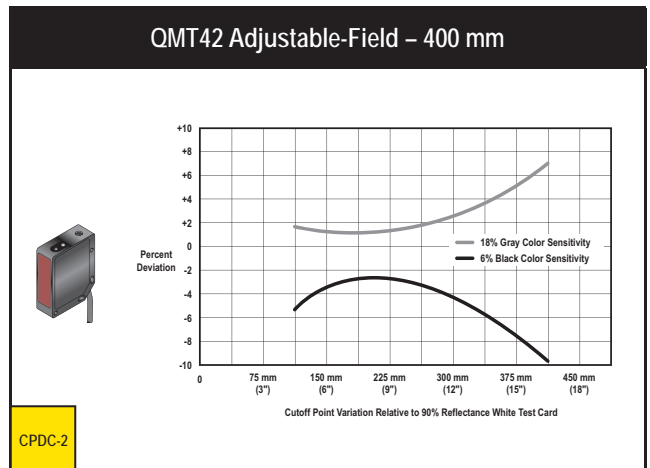
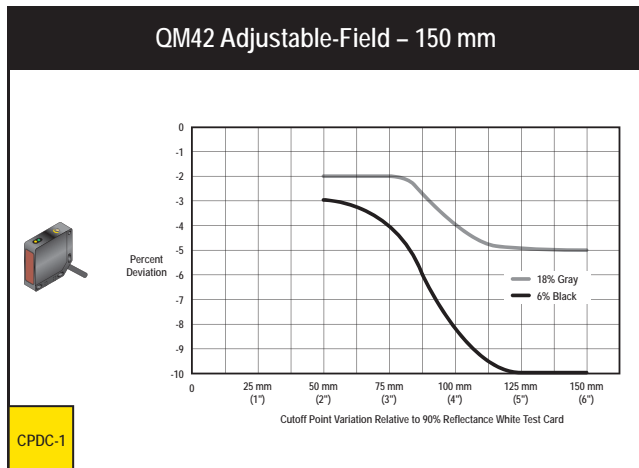
○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized



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- Q40
- PicoDot
- QM42/QMT42
- FULLSIZE

Cutoff Point Deviations



WORLD-BEAM® QS30H20 Opposed-Mode Water Sensors



High-power, infrared sensor for reliable detection of water and water-based liquids

The WORLD-BEAM® QS30H20 Sensor uses a 1450 nm sensing beam to burn through many types of thin-walled glass and plastic containers, creating contrast for reliable liquid detection. The QS30H20 Sensor is an innovative addition to Banner's complete line of cost-effective, rugged and powerful WORLD-BEAM photoelectric sensors.

Liquid detection for challenging clear or translucent plastic or glass containers

- ▶ Emits light that water-based liquids will attenuate, enhancing contrast in challenging low-contrast applications
- ▶ Burns through many plastic and glass containers
- ▶ Detects water-based liquids including liquor, beer, shampoos, conditioners, lotions and sauces
- ▶ Penetrates many labels (material thickness and type dependent)
- ▶ Features WORLD-BEAM QS30 housing with popular 30 mm threaded lens and side mount
- ▶ Specified ranges of up to 4 m (longer range possible)
- ▶ Offers built-in electronic crosstalk avoidance
- ▶ Resists harsh environments with rugged IP67 (NEMA 6) housing and encapsulated electronics
- ▶ Rated PW12 (1200 psi washdown)
- ▶ Offers choice of 10 to 30V dc operation with bipolar, NPN (sinking) and PNP (sourcing) output or 15 to 30V dc with analog (0-10V) output
- ▶ Delivers highly visible power and output status indicators
- ▶ Includes accessory apertures to attenuate or shape the beam

bannerengineering.com

Reliable liquid detection in WORLD-BEAM® housing



Detect water and water-based liquids inside containers

- ▶ Fluid filled IV bags
- ▶ HDPE milk containers
- ▶ Clear glass test tubes
- ▶ Colored PET beverage bottles
- ▶ Etched or frosted glass containers
- ▶ Liquid point level in sight glass
- ▶ Thin walled PFA/FEP tubes
- ▶ Nozzle spray verification



Versatile models to meet demanding requirements

- ▶ Robust housing with 30 mm threaded barrel and integrated side mount
- ▶ Receivers with a choice of outputs and range
 - Models with bipolar NPN/PNP output and 2 m range
 - High-gain models with bipolar NPN/PNP output and 4 m range
 - Analog (0-10V) output with 4 m range
- ▶ Light operate (LO) or dark operate (DO), depending on model (discrete only)
- ▶ Operating temperature from -20° to 60° C
- ▶ Large output status indicator on back of receiver
- ▶ Bright LED status indicators on sensor top
- ▶ 2 m or 9 m attached cable or 5-pin Euro-style pigtail quick-disconnect

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1.888.373.6767

BANNER®

more sensors, more solutions

FULLSIZE SENSORS

Q45



OMNI-BEAM™



Q60

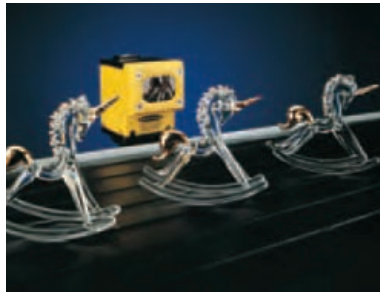


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- Emergency Stop & Stop Control



Q45 page 194

- Extremely rugged design that exceeds NEMA 6P and IEC IP67 standards, and withstands 1200 psi washdown
- Standard models accommodate output timing logic or expansion for a 7-segment LED display of signal strength
- Available in opposed, polarized and non-polarized retroreflective, diffuse, convergent, and glass and plastic fiber optic modes
- Available in models for dc, ac or ac/dc universal voltage power
- A laser retroreflective version for extended 70 m sensing range



OMNI-BEAM™ page 211

- Advanced modular design for customized configuration at user level
- Sensor heads in opposed, retroreflective, diffuse, convergent, and glass and plastic fiber optic modes
- For use with analog ac or dc power blocks



Q60 page 221

- Available in both Class 1 or extended-range Class 2 laser and visible red or infrared LED formats
- Adjustable-field setpoints from 200 to 2000 mm
- Advanced background suppression technology to ignore objects beyond the setpoint

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE

Advanced One-Piece Sensors Q45

- Uses extremely rugged design that exceeds NEMA 6P and IEC IP67 standards and withstands 1200 psi washdown
- Features highly visible Power, Signal and Output indicator LEDs
- Accommodates output timing logic or 7-segment LED signal strength display on standard models
- Available in opposed, polarized and non-polarized retroreflective, diffuse, convergent, and glass and plastic fiber optic modes
- Models available for dc, ac or ac/dc universal voltage power
- Available in laser diode retroreflective and NAMUR models
- Features triple LED multi-function indicators under gasketed transparent cover



ACCESSORIES
page 206



Q45 Sensing Modes



page 194

Q45 DC or AC

- Models for ac/dc power
- Opposed, retroreflective, diffuse, convergent, laser, and glass and plastic fiber optic modes
- Electromechanical or solid-state outputs



page 194

Q45 Retroreflective Laser

- Extended 70 m sensing range
- Visible laser beam for easy target alignment
- Precision small object or edge detection



page 198

Q45 Universal Voltage

- Models for ac/dc power
- Opposed, retroreflective, diffuse, convergent, and glass and plastic fiber optic modes
- A variety of cable and connector options



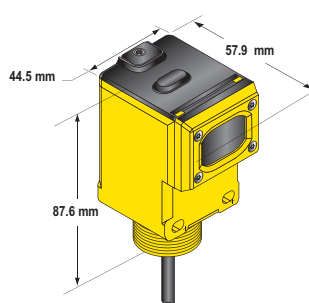
page 204

Q45 NAMUR

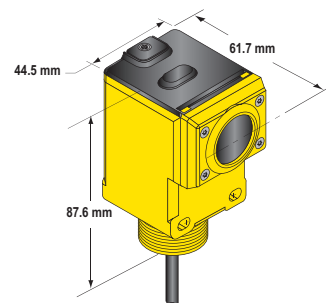
- Intrinsically safe dc models for potentially explosive environments
- 1.2 mA output or less in dark condition and 2.1 mA or more in light condition
- For use with approved DIN 19 234 switching amplifiers



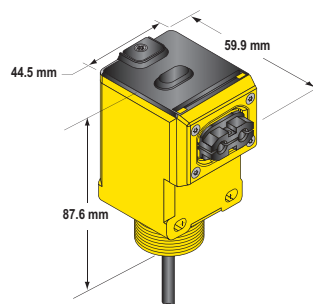
Opposed, Retroreflective and Diffuse Models
Suffix E, R, D, DL, DX, LV and LP



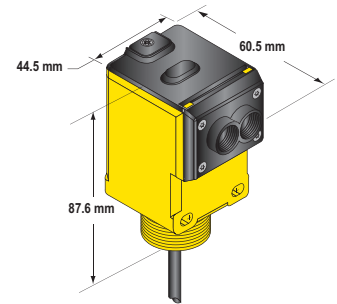
Retroreflective Laser Models
Suffix LL and LLP



Convergent Models
Suffix CV and CV4



Plastic Fiber Model
Suffix FP



Glass Fiber Models
Suffix F and FV

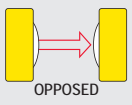
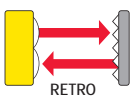

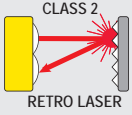
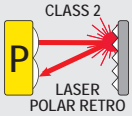
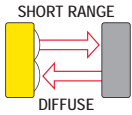
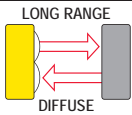
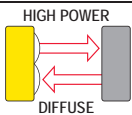
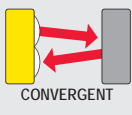
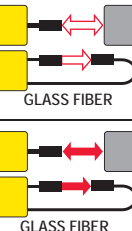


Q45, 10-30V dc

⇨ Infrared LED

➔ Visible Red LED

➔ Visible Red Laser

| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern |
|---|--|---------------|-----------------|-----------------|--------------------------|------------------------|
|  OPPOSED | 60 m | 2 m | Bipolar NPN/PNP | Q456E Emitter | EGC-1 (p. 206) | BP-1 (p. 208) |
| | | 4-Pin Mini QD | | Q456EQ Emitter | | |
| | | 4-Pin Euro QD | | Q456EQ5 Emitter | | |
| | | 2 m | | Q45BB6R | | |
| | | 4-Pin Mini QD | | Q45BB6RQ | | |
| | | 4-Pin Euro QD | | Q45BB6RQ5 | | |
|  RETRO | 0.08 - 9 m [†] | 2 m | Bipolar NPN/PNP | Q45BB6LV | EGC-3 (p. 206) | BP-3 (p. 208) |
| | | 4-Pin Mini QD | | Q45BB6LVQ | | |
| | | 4-Pin Euro QD | | Q45BB6LVQ5 | | |
|  POLAR RETRO | 0.15 - 6 m [†] | 2 m | Bipolar NPN/PNP | Q45BB6LP | EGC-4 (p. 206) | BP-4 (p. 208) |
| | | 4-Pin Mini QD | | Q45BB6LPQ | | |
| | | 4-Pin Euro QD | | Q45BB6LPQ5 | | |
|  RETRO LASER | 0.3 - 70 m [†] | 2 m | Bipolar NPN/PNP | Q45BB6LL | EGC-5 (p. 206) | BP-5 (p. 209) |
| | | 5-Pin Mini QD | | Q45BB6LLQ | | |
| | | 5-Pin Euro QD | | Q45BB6LLQ6 | | |
|  LASER POLAR RETRO | 0.6 - 40 m [†] | 2 m | Bipolar NPN/PNP | Q45BB6LLP | EGC-6 (p. 206) | BP-5 (p. 209) |
| | | 5-Pin Mini QD | | Q45BB6LLPQ | | |
| | | 5-Pin Euro QD | | Q45BB6LLPQ6 | | |
|  DIFFUSE | 450 mm | 2 m | Bipolar NPN/PNP | Q45BB6D | EGC-9 (p. 207) | BP-8 (p. 209) |
| | | 4-Pin Mini QD | | Q45BB6DQ | | |
| | | 4-Pin Euro QD | | Q45BB6DQ5 | | |
|  DIFFUSE | 1.8 m | 2 m | Bipolar NPN/PNP | Q45BB6DL | EGC-10 (p. 207) | BP-9 (p. 209) |
| | | 4-Pin Mini QD | | Q45BB6DLQ | | |
| | | 4-Pin Euro QD | | Q45BB6DLQ5 | | |
|  DIFFUSE | 3 m | 2 m | Bipolar NPN/PNP | Q45BB6DX | EGC-11 (p. 207) | BP-10 (p. 209) |
| | | 4-Pin Mini QD | | Q45BB6DXQ | | |
| | | 4-Pin Euro QD | | Q45BB6DXQ5 | | |
|  CONVERGENT | 38 mm | 2 m | Bipolar NPN/PNP | Q45BB6CV | EGC-14 (p. 207) | BP-13 (p. 209) |
| | | 4-Pin Mini QD | | Q45BB6CVQ | | |
| | | 4-Pin Euro QD | | Q45BB6CVQ5 | | |
| | 100 mm | 2 m | | Q45BB6CV4 | EGC-15 (p. 207) | BP-14 (p. 209) |
| | | 4-Pin Mini QD | | Q45BB6CV4Q | | |
| | | 4-Pin Euro QD | | Q45BB6CV4Q5 | | |
|  GLASS FIBER | Range varies by sensing mode and fiber optics used | 2 m | Bipolar NPN/PNP | Q45BB6F | EGC-18 & EGC-19 (p. 207) | BP-17 & BP-18 (p. 209) |
| | | 4-Pin Mini QD | | Q45BB6FQ | | |
| | | 4-Pin Euro QD | | Q45BB6FQ5 | | |
| | | 2 m | | Q45BB6FV | EGC-20 & EGC-21 (p. 207) | BP-19 & BP-20 (p. 209) |
| | | 4-Pin Mini QD | | Q45BB6FVQ | | |
| | | 4-Pin Euro QD | | Q45BB6FVQ5 | | |

Photoelectronics Sensors

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ACCESSORIES
page 206

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

➔ More on next page

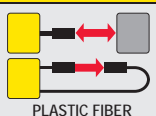
Connection options: A model with a QD requires a mating cordset (see page 206).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45BB6LV W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector (BRT-2X2 for Q45BB6LL models). Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Q45, 10-30V dc (cont'd)

➔ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern |
|--|--|---------------|--------------------|------------|-----------------------------------|---------------------------------|
|  <p>PLASTIC FIBER</p> | Range varies by sensing mode and fiber optics used | 2 m | Bipolar NPN/PNP | Q45BB6FP | EGC-26 & EGC-27 (p. 208) | BP-25 & BP-26 (p. 210) |
| | | 4-Pin Mini QD | | Q45BB6FPQ | | |
| | | 4-Pin Euro QD | | Q45BB6FPQ5 | | |

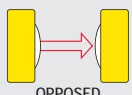


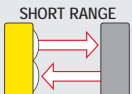
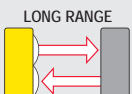
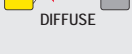
➔ Connection options: A model with a QD requires a mating cordset (see page 206).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45BB6FP W/30).

Q45, 90-250V ac

➔ Infrared LED ➔ Visible Red LED

ACCESSORIES
page
206

| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern | | | | |
|--|-------------------------|--|-------------------------|-----------------|--------------------|------------------|-------------|------------|-------------------|------------------|
|  <p>OPPOSED</p> | 60 m | 2 m | — | Q452E Emitter | EGC-1 (p. 206) | BP-1 (p. 208) | | | | |
| | | 3-Pin Mini QD | | Q452EQ Emitter | | | | | | |
| | | 4-Pin Micro QD | | Q452EQ1 Emitter | | | | | | |
| | |  <p>RETRO</p> | 0.08 - 9 m [†] | 2 m | | | SPDT | Q45VR2LV | EGC-3 (p. 206) | BP-3 (p. 208) |
| | | | | 5-Pin Mini QD | | | e/m Relay | Q45VR2LVQ | | |
| | | | | 2 m | | | SPST | Q45BW22LV | | |
| | | | | 3-Pin Mini QD | | | Solid-state | Q45BW22LVQ | | |
|  <p>POLAR RETRO</p> | 0.15 - 6 m [†] | 2 m | SPDT | Q45VR2LP | EGC-4 (p. 206) | BP-4 (p. 208) | | | | |
| | | 5-Pin Mini QD | e/m Relay | Q45VR2LPQ | | | | | | |
| | | 2 m | SPST | Q45BW22LP | | | | | | |
| | | 3-Pin Mini QD | Solid-state | Q45BW22LPQ | | | | | | |
|  <p>SHORT RANGE DIFFUSE</p> | 450 mm | 2 m | SPDT | Q45VR2D | EGC-9 (p. 207) | BP-8 (p. 219) | | | | |
| | | 5-Pin Mini QD | e/m Relay | Q45VR2DQ | | | | | | |
| | | 2 m | SPST | Q45BW22D | | | | | | |
| | | 3-Pin Mini QD | Solid-state | Q45BW22DQ | | | | | | |
|  <p>LONG RANGE DIFFUSE</p> | 1.8 m | 2 m | SPDT | Q45VR2DL | EGC-10 (p. 207) | BP-9 (p. 209) | | | | |
| | | 5-Pin Mini QD | e/m Relay | Q45VR2DLQ | | | | | | |
| | | 2 m | SPST | Q45BW22DL | | | | | | |
| | | 3-Pin Mini QD | Solid-state | Q45BW22DLQ | | | | | | |
|  <p>LONG RANGE DIFFUSE</p> | 1.8 m | 4-Pin Micro QD | Relay | Q45BW22DLQ1 | | | | | | |

➔ Connection options: A model with a QD requires a mating cordset (see page 206).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45VR2LV W/30).

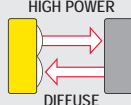
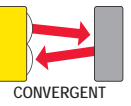
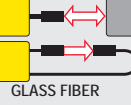
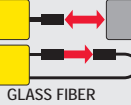
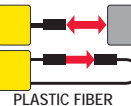
[†] Retroreflective range is specified using one model BRT-3 retroreflector.

Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

➔ More on next page

Q45, 90-250V ac (cont'd)

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern |
|--|--|----------------|-------------|-----------------------------|-----------------------------|---------------------------|
|  <p>HIGH POWER DIFFUSE</p> | 3 m | 2 m | SPDT | Q45VR2DX | EGC-11 (p. 207) | BP-10 (p. 209) |
| | | 5-Pin Mini QD | e/m Relay | Q45VR2DXQ | | |
| | | 2 m | SPST | Q45BW22DX | | |
| | | 3-Pin Mini QD | Solid-state | Q45BW22DXQ | | |
| | | 4-Pin Micro QD | Relay | Q45BW22DXQ1 | | |
|  <p>CONVERGENT</p> | 38 mm | 2 m | SPDT | Q45VR2CV | EGC-14 (p. 207) | BP-13 (p. 209) |
| | | 5-Pin Mini QD | e/m Relay | Q45VR2CVQ | | |
| | | 2 m | SPST | Q45BW22CV | | |
| | | 3-Pin Mini QD | Solid-state | Q45BW22CVQ | | |
| | | 4-Pin Micro QD | Relay | Q45BW22CVQ1 | | |
| | 100 mm | 2 m | SPDT | Q45VR2CV4 | EGC-15 (p. 207) | BP-14 (p. 209) |
| | | 5-Pin Mini QD | e/m Relay | Q45VR2CV4Q | | |
| | | 2 m | SPST | Q45BW22CV4 | | |
| | | 3-Pin Mini QD | Solid-state | Q45BW22CV4Q | | |
| | | 4-Pin Micro QD | Relay | Q45BW22CV4Q1 | | |
|  <p>GLASS FIBER</p> | Range varies by sensing mode and fiber optics used | 2 m | SPDT | Q45VR2F | EGC-18 & EGC-19 (p. 207) | BP-17 & BP-18 (p. 209) |
| | | 5-Pin Mini QD | e/m Relay | Q45VR2FQ | | |
| | | 2 m | SPST | Q45BW22F | | |
| | | 3-Pin Mini QD | Solid-state | Q45BW22FQ | | |
| | | 4-Pin Micro QD | Relay | Q45BW22FQ1 | | |
|  <p>GLASS FIBER</p> | | 2 m | SPDT | Q45VR2FV | EGC-20 & EGC-21 (p. 207) | BP-19 & BP-20 (p. 209) |
| | | 5-Pin Mini QD | e/m Relay | Q45VR2FVQ | | |
| | | 2 m | SPST | Q45BW22FV | | |
| | | 3-Pin Mini QD | Solid-state | Q45BW22FVQ | | |
| | | 4-Pin Micro QD | Relay | Q45BW22FVQ1 | | |
|  <p>PLASTIC FIBER</p> | 2 m | SPDT | Q45VR2FP | EGC-26 & EGC-27 (p. 208) | BP-25 & BP-26 (p. 208) | |
| | 5-Pin Mini QD | e/m Relay | Q45VR2FPQ | | | |
| | 2 m | SPST | Q45BW22FP | | | |
| | 3-Pin Mini QD | Solid-state | Q45BW22FPQ | | | |
| | 4-Pin Micro QD | Relay | Q45BW22FPQ1 | | | |

Connection options: A model with a QD requires a mating cordset (see page 206).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45VR2DX W/30).

Photoelectronics Sensors

- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

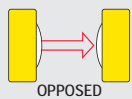
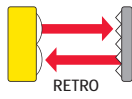

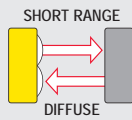
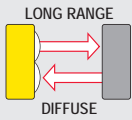
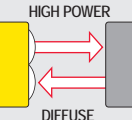
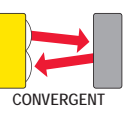
ACCESSORIES
page 206

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

Q45 Universal Voltage, 12-250V dc or 24-250V ac

⇨ Infrared LED ⇨ Visible Red LED

ACCESSORIES
page
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| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern |
|---|-------------------------|---------------|---------------------------|----------------|--------------------|-------------------|
|  <p>OPPOSED</p> | 60 m | 2 m | — | Q453E Emitter | EGC-1 (p. 206) | BP-1 (p. 208) |
| | | 3-Pin Mini QD | | Q453EQ Emitter | | |
| | | 2 m | SPDT e/m Relay | Q45VR3R | | |
| | | 5-Pin Mini QD | | Q45VR3RQ | | |
| | | 2 m | SPST Solid-state Relay | Q45BW13R | | |
| 4-Pin Mini QD | Q45BW13RQ | | | | | |
|  <p>RETRO</p> | 0.08 - 9 m [†] | 2 m | SPDT e/m Relay | Q45VR3LV | EGC-3 (p. 206) | BP-3 (p. 208) |
| | | 5-Pin Mini QD | | Q45VR3LVQ | | |
| | | 2 m | SPST Solid-state Relay | Q45BW13LV | | |
| | | 4-Pin Mini QD | | Q45BW13LVQ | | |
|  <p>POLAR RETRO</p> | 0.15 - 6 m [†] | 2 m | SPDT e/m Relay | Q45VR3LP | EGC-4 (p. 206) | BP-4 (p. 208) |
| | | 5-Pin Mini QD | | Q45VR3LPQ | | |
| | | 2 m | SPST Solid-state Relay | Q45BW13LP | | |
| | | 4-Pin Mini QD | | Q45BW13LPQ | | |
|  <p>SHORT RANGE DIFFUSE</p> | 450 mm | 2 m | SPDT e/m Relay | Q45VR3D | EGC-9 (p. 207) | BP-8 (p. 209) |
| | | 5-Pin Mini QD | | Q45VR3DQ | | |
| | | 2 m | SPST Solid-state Relay | Q45BW13D | | |
| | | 4-Pin Mini QD | | Q45BW13DQ | | |
|  <p>LONG RANGE DIFFUSE</p> | 1.8 m | 2 m | SPDT e/m Relay | Q45VR3DL | EGC-10 (p. 207) | BP-9 (p. 209) |
| | | 5-Pin Mini QD | | Q45VR3DLQ | | |
| | | 2 m | SPST Solid-state Relay | Q45BW13DL | | |
| | | 4-Pin Mini QD | | Q45BW13DLQ | | |
|  <p>HIGH POWER DIFFUSE</p> | 3 m | 2 m | SPDT e/m Relay | Q45VR3DX | EGC-11 (p. 207) | BP-10 (p. 209) |
| | | 5-Pin Mini QD | | Q45VR3DXQ | | |
| | | 2 m | SPST Solid-state Relay | Q45BW13DX | | |
| | | 4-Pin Mini QD | | Q45BW13DXQ | | |
|  <p>CONVERGENT</p> | 38 mm | 2 m | SPDT e/m Relay | Q45VR3CV | EGC-14 (p. 207) | BP-13 (p. 209) |
| | | 5-Pin Mini QD | | Q45VR3CVQ | | |
| | | 2 m | SPST Solid-state Relay | Q45BW13CV | | |
| | | 4-Pin Mini QD | | Q45BW13CVQ | | |
| | 100 mm | 2 m | SPDT e/m Relay | Q45VR3CV4 | EGC-15 (p. 207) | BP-14 (p. 209) |
| | | 5-Pin Mini QD | | Q45VR3CV4Q | | |
| | | 2 m | SPST Solid-state Relay | Q45BW13CV4 | | |
| | | 4-Pin Mini QD | | Q45BW13CV4Q | | |

More on next page

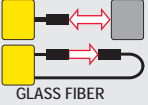
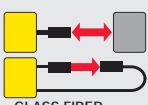
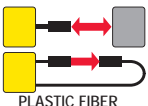
Connection options: A model with a QD requires a mating cordset (see page 206).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45VR3R W/30).

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Q45 Universal Voltage, 12-250V dc or 24-250V ac (cont'd)

⇨ Infrared LED ⇨ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern |
|---|--|-------------------|-------------------|--------------------------|--------------------------|------------------------|
|  GLASS FIBER | Range varies by sensing mode and fiber optics used | 2 m | SPDT | Q45VR3F | EGC-18 & EGC-19 (p. 207) | BP-17 & BP-18 (p. 220) |
| | | 5-Pin Mini QD | e/m Relay | Q45VR3FQ | | |
| | | 2 m | SPST | Q45BW13F | | |
| | | 4-Pin Mini QD | Solid-state Relay | Q45BW13FQ | | |
|  GLASS FIBER | | 2 m | SPDT | Q45VR3FV | EGC-20 & EGC-21 (p. 207) | BP-19 & BP-20 (p. 220) |
| | | 5-Pin Mini QD | e/m Relay | Q45VR3FVQ | | |
| | | 2 m | SPST | Q45BW13FV | | |
| | | 4-Pin Mini QD | Solid-state Relay | Q45BW13FVQ | | |
|  PLASTIC FIBER | 2 m | SPDT | Q45VR3FP | EGC-26 & EGC-27 (p. 208) | BP-25 & BP-26 (p. 210) | |
| | 5-Pin Mini QD | e/m Relay | Q45VR3FPQ | | | |
| | 2 m | SPST | Q45BW13FP | | | |
| | 4-Pin Mini QD | Solid-state Relay | Q45BW13FPQ | | | |

Connection options: A model with a QD requires a mating cordset (see page 206).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45VR3F W/30).







- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

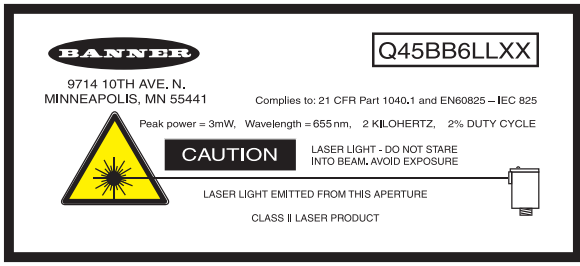
ACCESSORIES
page 206

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

| Q45 DC Specifications | |
|-----------------------------|---|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple), at less than 50 mA (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Bipolar: one current sourcing (PNP) and one current sinking (NPN) open-collector transistor |
| Output Rating | 250 mA max. each output up to 50° C, derated to 150 mA at 70° C (derate 5 mA/° C) OFF-state leakage current: less than 1 A Output saturation voltage (both outputs): less than 1 volt at 10 mA and less than 2 volts at 250 mA |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs |
| Output Response Time | Opposed: 2 milliseconds ON and 1 millisecond OFF Laser Retroreflective: less than 2 milliseconds All others: 2 milliseconds ON/OFF |
| Delay at Power-up | 100 milliseconds; output does not conduct during this time |
| Repeatability | Opposed: 0.25 milliseconds All others: 0.5 milliseconds Response time and repeatability specifications are independent of signal strength |
| Adjustments | Light Operate (LO), Dark Operate (DO) select switch and multi-turn sensitivity control. Optional logic and logic/display modules have adjustable timing functions. See data sheet for detailed information. |
| Indicators | Power (Green): LED lights whenever 10 to 30V dc power is applied, and flashes to indicate output overload or output short circuit Signal (Red): LED lights whenever the sensor sees its modulated light source, and pulses at a rate proportional to the strength of the received light signal Load (Yellow): LED lights whenever an output is conducting Optional 7-element: LED signal strength display module |

More on next page



| Q45 DC Specifications (cont'd) | | | | | |
|---|---|---|---|--------------------------------|--|
| Construction | Molded reinforced thermoplastic polyester housing, o-ring sealed transparent polycarbonate cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a 1/2" NPS integral internal conduit thread. | | | | |
| Environmental Rating | IP67; NEMA 6P | | | | |
| Laser Classification (Laser Retroreflective models only) | Class II laser product. US Safety Standards 21 CFR 1040.10 and 1040.11; European Standards EN 60825 and IEC 60825 | | | | |
| Connections | PVC-jacketed 4-wire (5-wire for Laser Retroreflective) 2 m or 9 m cables. For 4-pin Mini-style QD use "Q" suffix, (5-pin Mini-style QD for Laser Retroreflective use "Q" suffix) or for 4-pin Euro-style use "Q5" suffix (5-pin Euro-style QD for Laser Retroreflective use "Q6" suffix). QD cordsets are ordered separately. See page 202. | | | | |
| Operating Conditions | Temperature: -40° to +70° C (-10° to +40° C for Retroreflective Laser models) Relative humidity: 90% at 50° C (non-condensing) | | | | |
| Application Notes | Optional logic timing modules are available. See page 199 for more information. | | | | |
| Certifications | <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"> Retroreflective Laser:  </td> <td style="width: 50%;"> All others:  </td> </tr> </table> | Retroreflective Laser:  | All others:  | | |
| Retroreflective Laser:  | All others:  | | | | |
| Hookup Diagrams | <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Emitters: DC02 (p. 758)</td> <td style="width: 50%;">Laser Retroreflective Models: DC13 (p. 761)</td> </tr> <tr> <td colspan="2">Other DC Models: DC04 (p. 758)</td> </tr> </table> | Emitters: DC02 (p. 758) | Laser Retroreflective Models: DC13 (p. 761) | Other DC Models: DC04 (p. 758) | |
| Emitters: DC02 (p. 758) | Laser Retroreflective Models: DC13 (p. 761) | | | | |
| Other DC Models: DC04 (p. 758) | | | | | |



| Q45 AC Specifications | |
|-----------------------------|---|
| Supply Voltage and Current | 90 to 250V ac (50 - 60 Hz) Average current: 20 mA. Peak current: 500 mA at 120V ac, 750 mA at 250V ac |
| Supply Protection Circuitry | Protected against transient voltages |
| Output Configuration | Q45VR2 models: SPDT (single-pole double-throw) electromechanical relay output (except emitters) Q45BW22 models: Short circuit/overload protected FET solid-state relay |
| Output Rating | <p>Q45VR2 models:</p> <ul style="list-style-type: none"> Max. switching power (resistive load): 150W, 600 VA Max. switching voltage (resistive load): 250V ac or 30V dc Max. switching current (resistive load): 5A @ 250V ac Min. voltage and current: 5V dc, 0.1 mA Mechanical life of relay: 10,000,000 operations Electrical life of relay at full resistive load: 100,000 operations <p>Q45BW22 models:</p> <ul style="list-style-type: none"> Continuous current: 300 mA max. to 50° C (derate to 200 mA at 70° C, 5 mA/° C) Inrush current: 3A max. for 100 milliseconds, 5A max. for 1 millisecond OFF-state leakage current: less than 100 µA Saturation voltage: less than 3V at 200 mA |



Q45 AC Specifications (cont'd)

| | |
|-----------------------------|--|
| Output Protection Circuitry | Q45VR2 models: Protected against false pulse on power-up Q45BW22 models: Manually-resettable output latch-out trips in the event of an output overload or short circuit condition. The green Power LED flashes to indicate the latch-out. To reset the output, remove power to the sensor and load for 5 seconds, then restore power. |
| Output Response Time | Q45VR2 models: 15 milliseconds ON/OFF Q45BW22 models: Opposed: 2 milliseconds ON, 1 millisecond OFF All others: 2 milliseconds ON/OFF |
| Delay at Power-up | 100 milliseconds; output does not conduct during this time |
| Repeatability | Opposed: 0.25 milliseconds; All others: 0.5 milliseconds Response time and repeatability specifications are independent of signal strength |
| Adjustments | Light Operate (LO), Dark Operate (DO) select switch and multi-turn sensitivity control, optional logic and logic/display modules have adjustable timing functions. See data sheet for detailed information. |
| Indicators | Power (Green): LED lights whenever 90-250V ac power is applied, and flashes to indicate output overload or output short circuit Signal (Red): LED lights whenever the sensor sees its modulated light source, and pulses at a rate proportional to the strength of the received light signal Load (Yellow): LED lights whenever an output relay is energized Optional 7-element: LED signal strength display module |
| Construction | Molded reinforced thermoplastic polyester housing, o-ring sealed transparent polycarbonate cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a 1/2" NPS integral internal conduit thread. |
| Environmental Rating | NEMA 6P; IEC IP67 |
| Connections | Q45VR2 models: PVC-jacketed 2-wire emitters or 5-wire (all others) 2 m or 9 m unterminated cables, or 3-pin (emitters) or 5-pin (all others) Mini-style quick-disconnect (QD) fittings are available ("Q" suffix models). QD cordsets are ordered separately. See page 206. Q45BW22 models: PVC-jacketed 2 m or 9 m cables, or 3-pin Mini-style ("Q" suffix models) or 4-pin Micro-style ("Q1" suffix models) quick-disconnect (QD) fittings are available. QD cordsets are ordered separately. See page 202. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Application Notes | Transient suppression is recommended for contacts switching inductive loads. Optional logic timing modules are available. See page 203 for more information. |
| Certifications | Q45VR2 models:  Q45BW22 models:  |
| Hookup Diagrams | VR2 Models: Emitters: AC03 (p. 764) Other VR2 Models: AC08 (p. 765) BW22 Models: Cabled & Mini QD: AC05 (p. 765) Micro QD: AC06 (p. 765) Cabled & Mini QD Emitters: AC03 (p. 764) Micro QD Emitters: AC07 (p. 765) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

Q45 Universal Voltage Specifications

| | |
|-----------------------------|--|
| Supply Voltage and Current | 24 to 250V ac, 50/60 Hz or 12 to 250V dc (1.5 watts max.) |
| Supply Protection Circuitry | Protected against transient voltages. DC hookup is without regard to polarity. |
| Output Configuration | Q45VR3 models: SPDT (Single-Pole, Double-Throw) electromechanical relay output. All models except emitters. Q45BW13 models: Optically isolated SPST solid-state switch. All models except emitters. |

More on next page

Q45 Universal Voltage Specifications (cont'd)

| | |
|-----------------------------|--|
| Output Rating | <p>Q45VR3 models: Max. switching power (resistive load): 1250VA, 150W Max. switching voltage (resistive load): 250V ac, 125V dc Max. switching current (resistive load): 5A @ 250V ac, 5A @ 30V dc derated to 200 mA @ 125V dc Min. voltage and current: 5V dc, 10 mA Mechanical life of relay: 50,000,000 operations Electrical life of relay at full resistive load: 100,000 operations</p> <p>Q45BW13 models: 250V ac, 250V dc, 300 mA Output saturation voltage: 3V at 300 mA, 2V at 15 mA OFF-state leakage current: less than 50 μA Inrush current: 1 amp for 20 milliseconds, non-repetitive</p> |
| Output Protection Circuitry | Protected against false pulse on power-up |
| Output Response Time | <p>Q45VR3 models: 15 milliseconds ON/OFF NOTE: 100 millisecond delay on power-up. Relay is de-energized during this time. Q45BW13 models: Opposed: 2 milliseconds ON, 1 millisecond OFF All others: 2 milliseconds ON/OFF</p> |
| Delay at Power-up | 100 milliseconds; output does not conduct during this time |
| Repeatability | <p>Opposed: 0.25 milliseconds All others: 0.5 milliseconds Response time and repeatability specifications are independent of signal strength</p> |
| Adjustments | Light Operate (LO), Dark Operate (DO) select switch and multi-turn sensitivity control on top of sensor, optional logic and logic/display modules have adjustable timing functions. See data sheet for detailed information. |
| Indicators | <p>Power (Green) LED lights whenever 24 to 250V ac, or 12 to 250V dc power is applied Signal (Red) LED lights whenever the sensor sees its modulated light source, and pulses at a rate proportional to the strength of the received light signal Load (Yellow) LED lights whenever the output relay is energized Optional 7-element LED signal strength display module</p> |
| Construction | Molded reinforced thermoplastic polyester housing, o-ring-sealed transparent polycarbonate cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a 1/2" NPS integral internal conduit thread. |
| Environmental Rating | IP67; NEMA 6P |
| Connections | <p>Q45VR3 models: PVC-jacketed 2 m or 9 m unterminated cables, or 5-pin Mini-style quick-disconnect (QD) fittings are available ("Q"- suffix models). QD cordsets are ordered separately. See page 206.</p> <p>Q45BW13 models: PVC-jacketed 2 m or 9 m unterminated cables, or 4-pin Mini-style quick-disconnect (QD) fittings are available ("Q"- suffix models). QD cordsets are ordered separately. See page 206.</p> |
| Operating Conditions | Temperature: -25° to +55° C Relative humidity: 90% at 50° C (non-condensing) |
| Application Notes | Transient suppression is recommended for contacts switching inductive loads. Optional output timing modules are available. See page 203 for more information. |
| Certifications | <p>Q45VR3 models:  Q45BW13 models: </p> |
| Hookup Diagrams | <p>VR3 Models: Emitters: UN02 (p. 767) Other VR3 Models: UN01 (p. 767) BW13 Models: Emitters: UN02 (p. 767) Other AC/DC Models: UN07 (p. 768)</p> |

45LM Series Modules

Q45 sensors easily accept the addition of output timing logic and signal strength display functions. Display models have a 7-element display which gives a "finer" indication of excess gain than does the LED that is standard on most Q45 sensors. The modules listed below may be used with all Q45 sensors except NAMUR models.

| Function | Model | Timing Logic Functions | | | |
|---|--------------------|---|----------------------|--------------------|-----------------|
| Programmable output timing logic | 45LM58 | <ul style="list-style-type: none"> Models with programmable output timing provide the following timing logic functions: <ul style="list-style-type: none"> - ON delay - OFF delay - ON/OFF delay - Retriggerable one-shot - Non-retriggerable one-shot - Delayed one-shot - ON delayed one-shot - Repeat cycle timer - Limit timer - Rate sensor - Flip-flop (alternate action) Selectable timing ranges: <table border="0" style="width: 100%;"> <tr> <td>0.01 to 0.15 seconds</td> <td>0.1 to 1.5 seconds</td> <td>1 to 15 seconds</td> </tr> </table> Delay and hold time ranges may be individually selected and times precisely set using 15-turn adjustment potentiometers. Delay or hold time may also be displayed (zero seconds). Module allows sensor output to be programmed for normally-open or normally-closed operation. Models with signal strength display gives precise indication of excess gain; see page 203 for more information. Valuable for sensor setup and alignment, critical evaluation of alternative sensing schemes and close monitoring of sensing performance over time (example, dirt build-up on lenses or progressive misalignment). | 0.01 to 0.15 seconds | 0.1 to 1.5 seconds | 1 to 15 seconds |
| 0.01 to 0.15 seconds | 0.1 to 1.5 seconds | | 1 to 15 seconds | | |
| Programmable output timing, plus signal strength display | 45LM58D | | | | |
| Signal strength display, only (no programmable functions) | 45LMD | | | | |


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

45LM Series Module Specifications

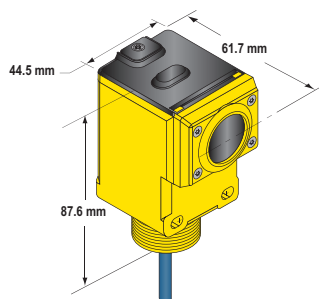
| | |
|-----------------------|---|
| Operating Temperature | -40° to +70° C |
| Timing Adjustments | Two 15-turn clutched potentiometers with brass elements, accessible from outside at the top of the sensor, beneath an o-ring sealed polycarbonate cover. |
| Timing Repeatability | Plus or minus 2% of the timing range (max.); assumes conditions of constant temperature and power supply. |
| Useful Time Range | Useful time range is from maximum time down to 5% of maximum. When the timing potentiometer is set fully counterclockwise, time will be approximately 5% of maximum. |
| Response Time | When the delay time is switched OFF, the card adds no measurable sensing response time. |
| LED Display | 7-element LED display, visible through transparent top sensor cover. The more LEDs that are lit, the stronger is the received light signal; three LEDs lit is equivalent to an excess gain of about 1x. |

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

Signal Strength Display

| LED Number | Approximate Gain | Display |
|------------|------------------|--|
| #1 | 0.25x |  |
| #2 | 0.5x | |
| #3 | 1.0x | |
| #4 | 2.0x | |
| #5 | 4.0x | |
| #6 | 6.0x | |
| #7 | 8.0x | |

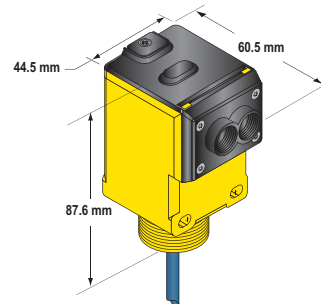
Q45 NAMUR Sensors



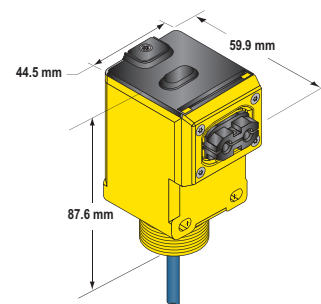
Convergent Models
Suffix CV and CV4



Opposed, Retroreflective and Diffuse Models
Suffix E, R, D, DL, LV and LP



Glass Fiber Models
Suffix F and FV



Plastic Fiber Model
Suffix FP

ACCESSORIES
page
206

Q45 NAMUR, 5-15V dc

⇒ Infrared LED → Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern |
|---------------------------|------------------|---------------|---|----------------|--------------------|-------------------|
| OPPOSED | 6 m | 2 m | Constant Current ≤1.2 mA dark ≥2.1 mA light | Q459E Emitter | EGC-2 (p. 206) | BP-2 (p. 208) |
| | | 4-Pin Euro QD | | Q459EQ Emitter | | |
| 2 m | Q45AD9R | | | | | |
| RETRO | 9 m [†] | 2 m | | Q45AD9LV | EGC-7 (p. 206) | BP-6 (p. 209) |
| | | 4-Pin Euro QD | | Q45AD9LVQ | | |
| POLAR RETRO | 6 m [†] | 2 m | | Q45AD9LP | EGC-8 (p. 206) | BP-7 (p. 209) |
| | | 4-Pin Euro QD | | Q45AD9LPQ | | |
| DIFFUSE | 300 mm | 2 m | | Q45AD9D | EGC-12 (p. 207) | BP-11 (p. 209) |
| | | 4-Pin Euro QD | | Q45AD9DQ | | |
| LONG-RANGE DIFFUSE | 1 m | 2 m | | Q45AD9DL | EGC-13 (p. 207) | BP-12 (p. 209) |
| | | 4-Pin Euro QD | Q45AD9DLO | | | |

More on next page

Connection options: A model with a QD requires a mating cordset (see page 206).

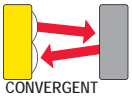
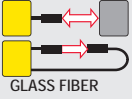
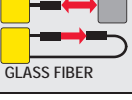
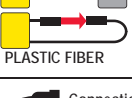
For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45AD9LV W/30).

[†] Retroreflective range is specified using one model BRT-3 retroreflector.
Actual sensing range may differ, depending on efficiency and reflective area of the retroreflector in use. See Accessories for more information.

Q45 NAMUR, 5-15V dc (cont'd)

↔ Infrared LED

→ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain | Beam Pattern |
|---|--|---|---|--|--------------------------------|------------------------------|
|  CONVERGENT | 38 mm | 2 m 4-Pin Euro QD | Constant Current ≤1.2 mA dark ≥2.1 mA light | Q45AD9CV Q45AD9CVQ | EGC-16 (p. 207) | BP-15 (p. 209) |
| | 100 mm | 2 m 4-Pin Euro QD | | Q45AD9CV4 Q45AD9CV4Q | EGC-17 (p. 207) | BP-16 (p. 209) |
|  GLASS FIBER | Range varies by sensing mode and fiber optics used | 2 m 4-Pin Euro QD | | Q45AD9F Q45AD9FQ | EGC-22 & EGC-23 (p. 207) | BP-21 & BP-22 (p. 210) |
| | | 2 m 4-Pin Euro QD | | Q45AD9FV Q45AD9FVQ | EGC-24 & EGC-25 (p. 207) | BP-23 & BP-24 (p. 210) |
|  GLASS FIBER | | 2 m 4-Pin Euro QD | | Q45AD9FP Q45AD9FPQ | EGC-28 & EGC-29 (p. 207) | BP-27 & BP-28 (p. 210) |
| | |  PLASTIC FIBER | | Range varies by sensing mode and fiber optics used | | |

Connection options: A model with a QD requires a mating cordset (see page 206).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45AD9LV W/30).

Photoelectrics Sensors

Fiber Optic Sensors

Special Purpose Sensors

Measurement & Inspection Sensors

Vision

Wireless

Lighting & Indicators

Safety Light Screens

Safety Laser Scanners







Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

ACCESSORIES
page 206

| Q45 NAMUR Specifications | |
|----------------------------|---|
| Supply Voltage and Current | 5 to 15V dc. Supply voltage is provided by the amplifier to which the sensor is connected. |
| Output | Constant current output: 1.2 mA in the dark condition and ≥ 2.1 mA in the light condition |
| Output Response Time | Opposed receiver: 2 milliseconds ON/0.4 milliseconds OFF All others: 5 milliseconds ON/OFF (does not include amplifier response) |
| Adjustments | Multi-turn sensitivity control on top of sensor |
| Indicators | Power (Red): LED (emitters only) lights whenever 5 - 15V dc power is applied Signal (Red): LED lights whenever the sensor sees its modulated light source |
| Construction | Molded thermoplastic polyester housing, o-ring sealed transparent Lexan® top cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a 1/2" NPS integral internal conduit thread. |
| Environmental Rating | IP67; NEMA 6P |
| Connections | PVC-jacketed 2 m or 9 m cables, or 4-pin Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 206. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Design Standards | Q45AD9 Series sensors comply with the following standards: DIN 19234, EN 50 014: 1977, EN 50 020: 2002 |
| Certifications |       |
| Hookup Diagrams | SP01 (p. 756) |

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MINIATURE

COMPACT

MIDSIZE

FULLSIZE

Q45

OMNI-BEAM

Q60

| APPROVALS | | | |
|--------------------|--|----------------------|--------------------------------------|
| CSA: #LR 41887 | Intrinsically Safe, with Entity for Class I, Groups A-D Class I, Div. 2, Groups A-D | KEMA: #03 ATEX 1441x | II IG EEx ia IICTC |
| FM: #J.I. 5Y3A4.AX | Intrinsically Safe, with Entity for Class I, II, III, Div. 1, Groups A-G Class I, II, III, Div. 2, Groups A-D and G | ETL: #558044 | Tested per FM and CSA as shown above |

Cordsets

| Euro QD | | |
|----------------|-----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC1-506 | MQDC1-506RA |
| 4.57 m | MQDC1-515 | MQDC1-515RA |
| 9.14 m | MQDC1-530 | MQDC1-530RA |




| NAMUR Euro QD | | |
|----------------|----------|-------------|
| See page 697 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MOD9-406 | MOD9-406RA |
| 4.57 m | MOD9-415 | MOD9-415RA |

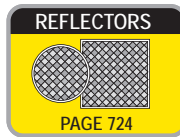
| Micro QD | | |
|----------------|----------|-------------|
| See page 712 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQAC-406 | MQAC-406RA |
| 4.57 m | MQAC-415 | MQAC-415RA |
| 9.14 m | MQAC-430 | MQAC-430RA |

| Mini QD | |
|--------------|-------------------|
| See page 714 | |
| 3-Pin | |
| Length | Threaded Straight |
| 1.83 m | MBCC-306 |
| 3.66 m | MBCC-312 |
| 9.14 m | MBCC-330 |
| 4-Pin | |
| Length | Threaded Straight |
| 1.83 m | MBCC-406 |
| 3.66 m | MBCC-412 |
| 9.14 m | MBCC-430 |
| 5-Pin | |
| Length | Threaded Straight |
| 1.83 m | MBCC-506 |
| 3.66 m | MBCC-512 |
| 9.14 m | MBCC-530 |

Additional cordset information available. See page 693.

Brackets

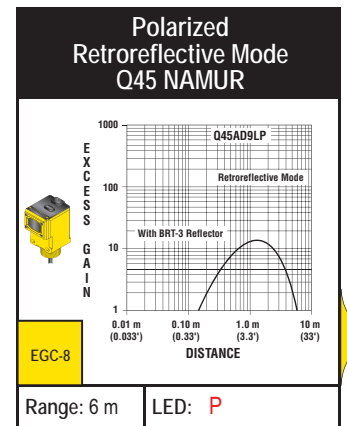
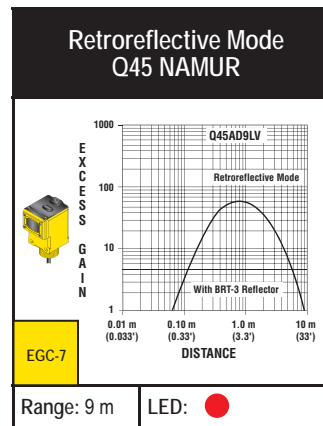
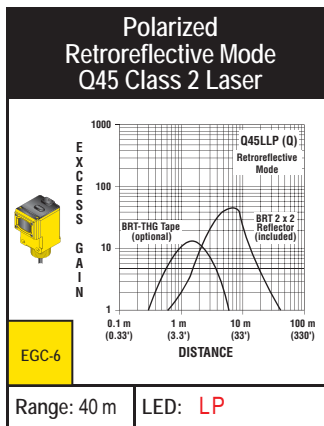
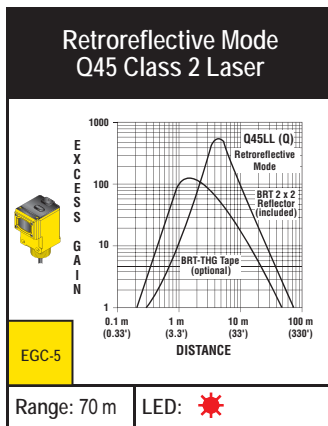
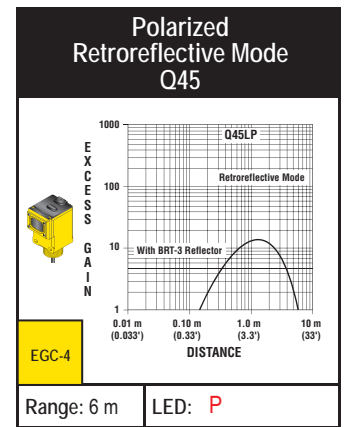
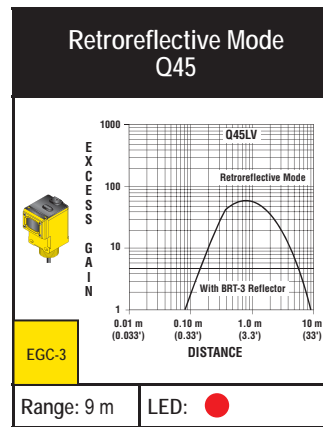
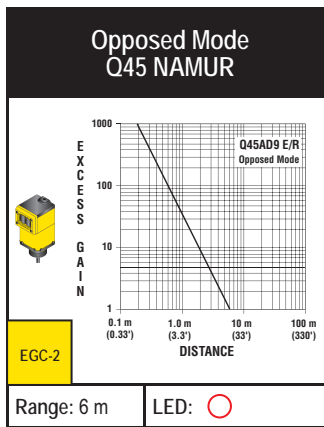
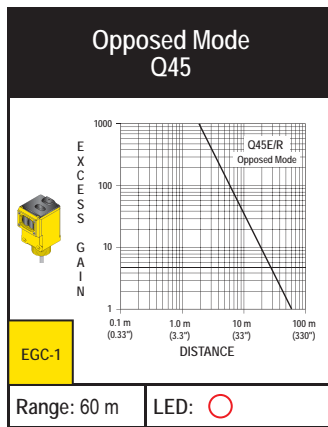
| Q45 | | |
|---|---|---|
|  |  |  |
| pg. 653 | pg. 653 | pg. 654 |
| SMB30A | SMB30FA.. | SMB30SC |



Additional brackets and information available. See page 632.

Excess Gain Curves

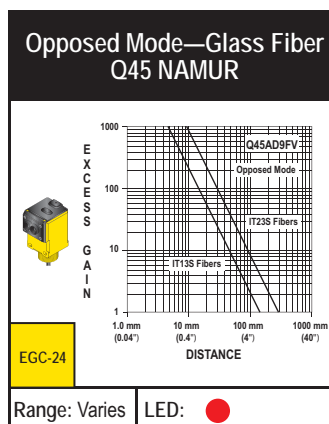
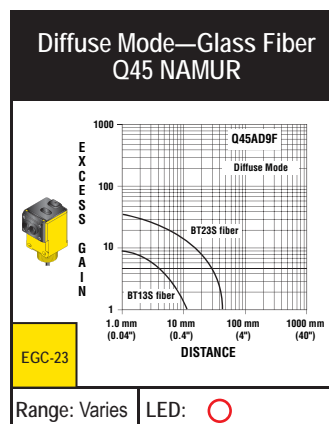
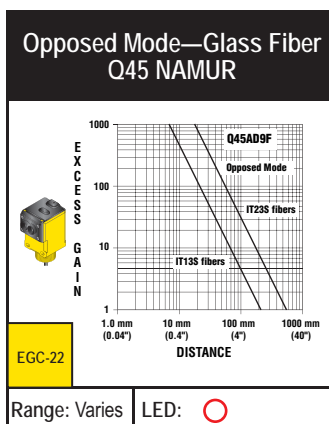
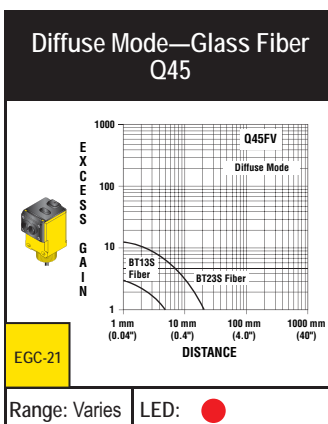
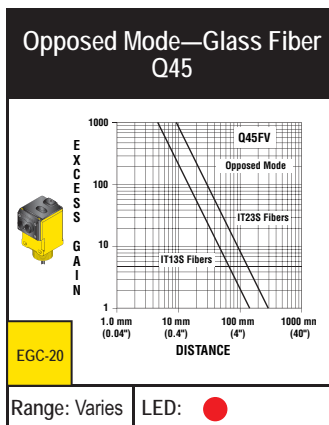
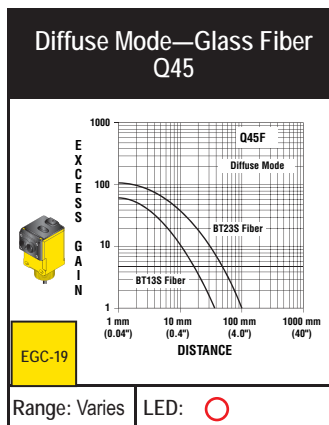
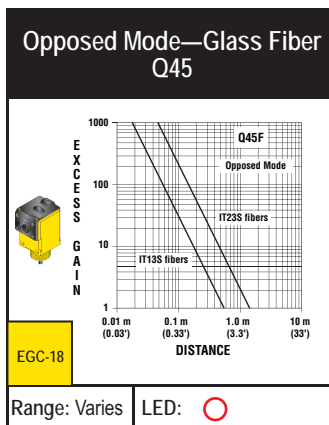
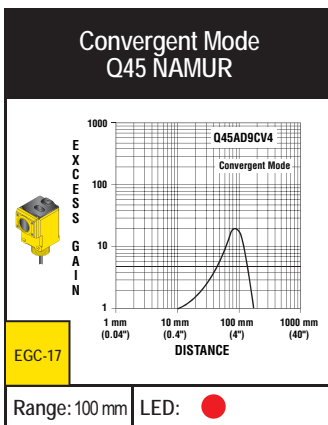
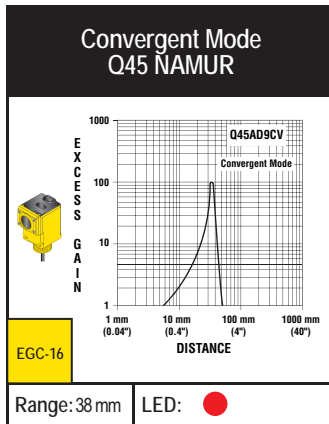
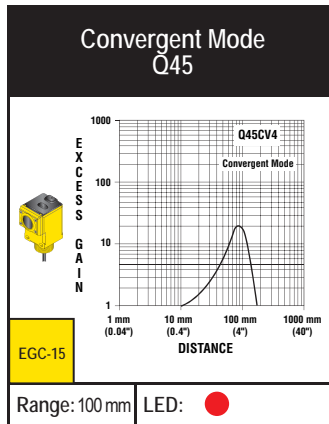
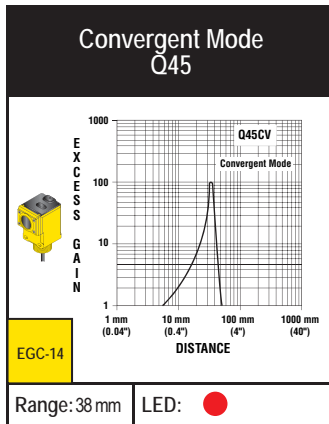
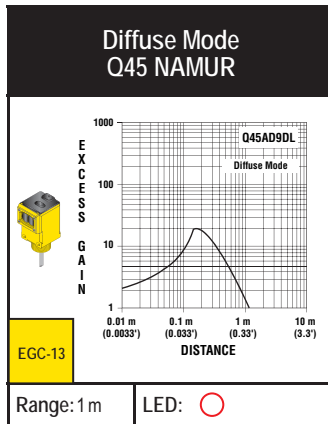
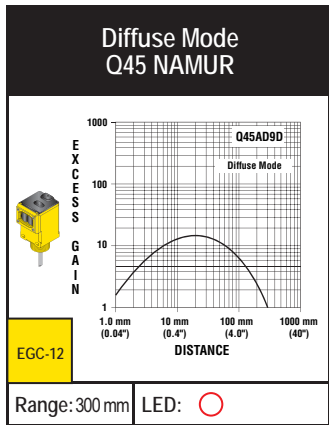
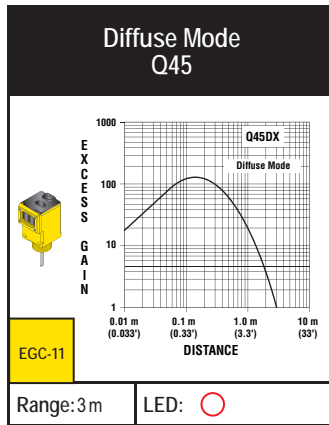
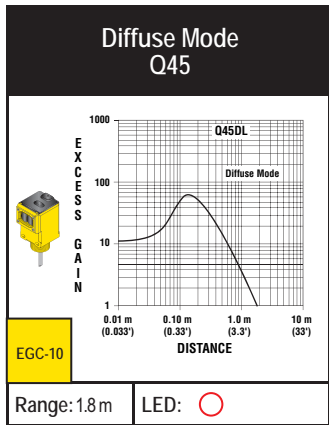
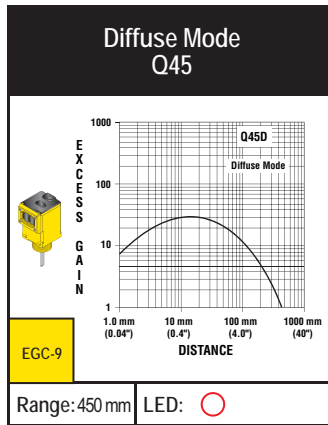
○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized LP = Visible Red Laser Polarized ★ = Visible Red Laser



More on next page

Excess Gain Curves (Diffuse and Convergent mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED



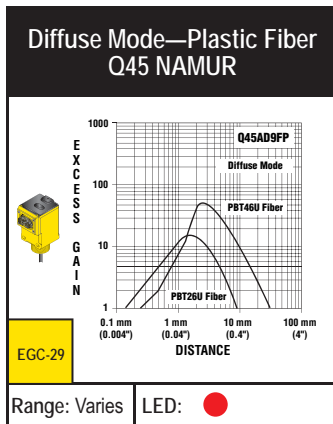
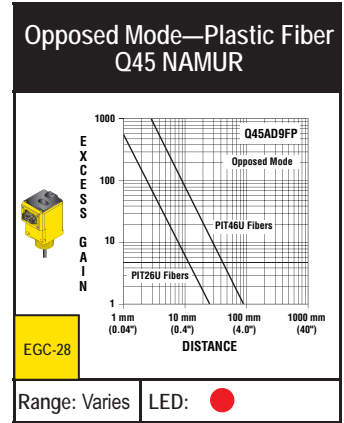
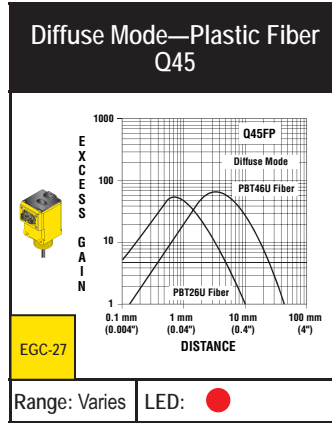
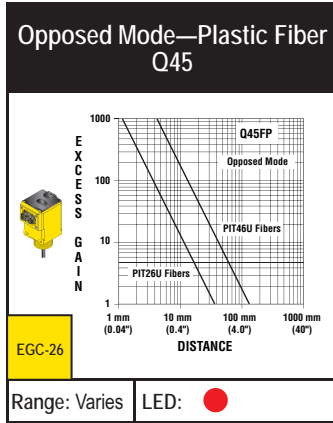
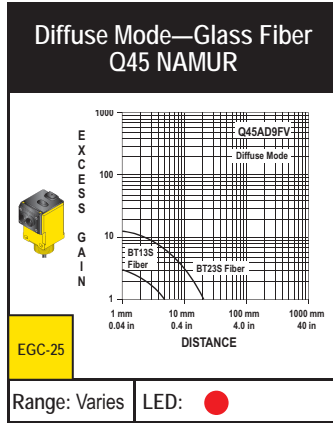
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60



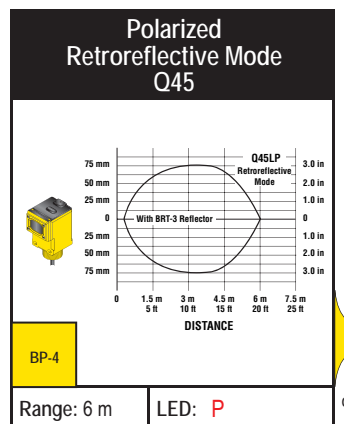
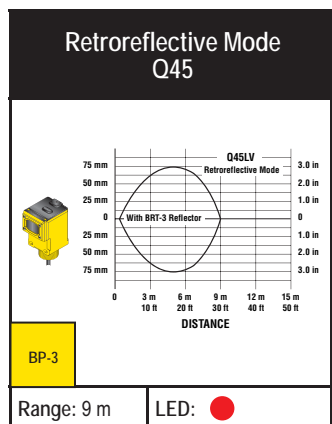
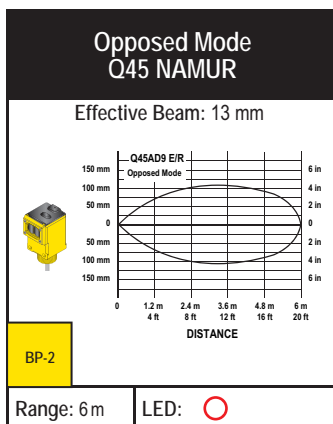
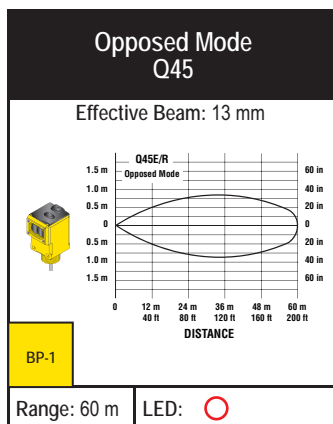
Excess Gain Curves (Diffuse mode performance based on 90% reflectance white card)

● = Visible Red LED



Beam Patterns

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized



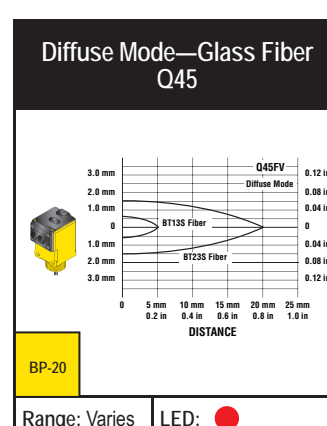
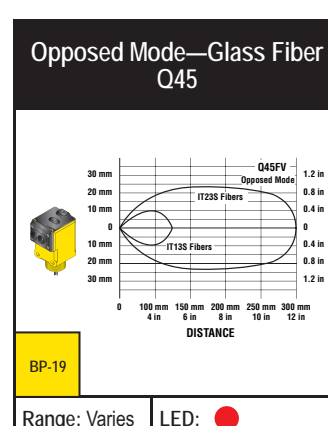
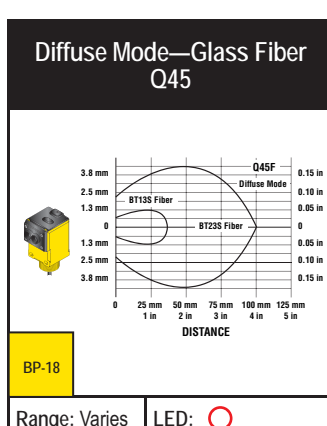
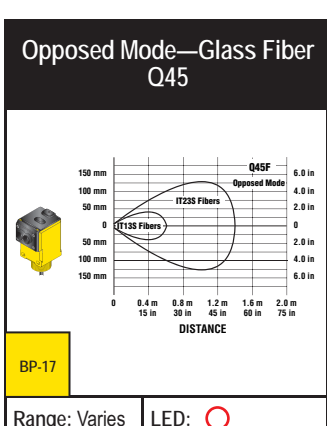
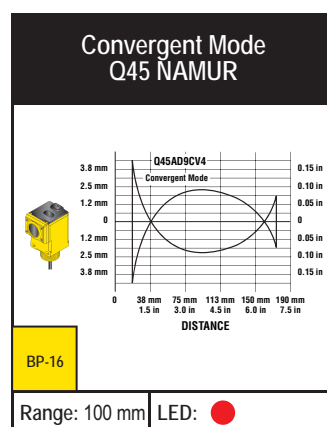
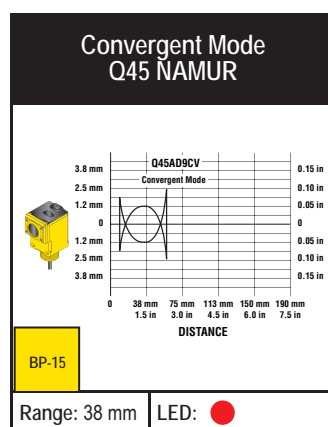
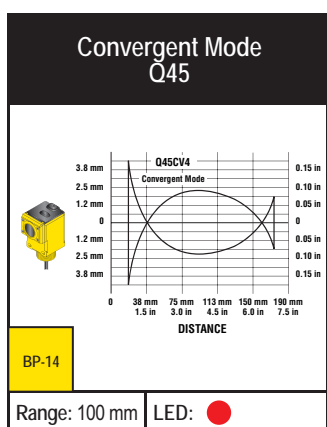
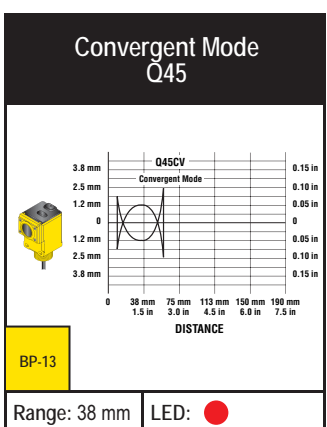
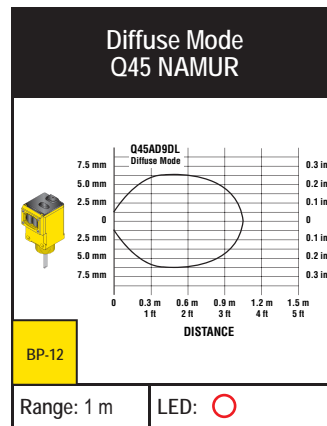
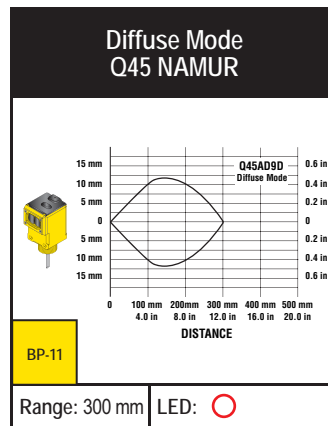
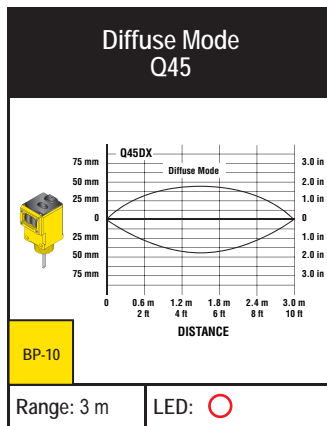
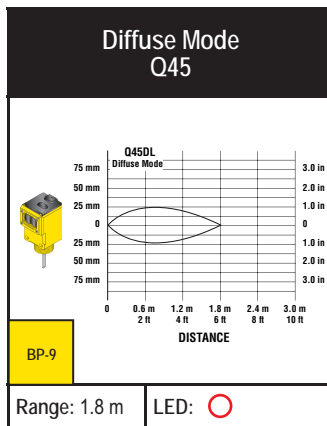
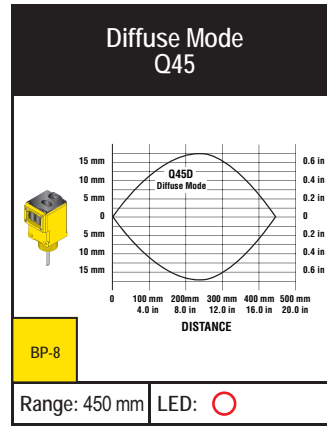
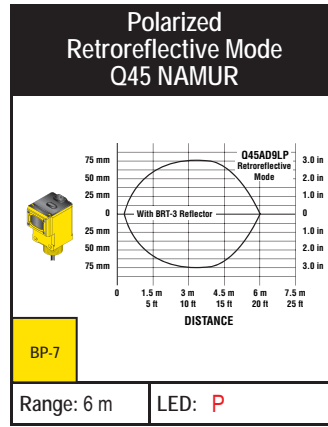
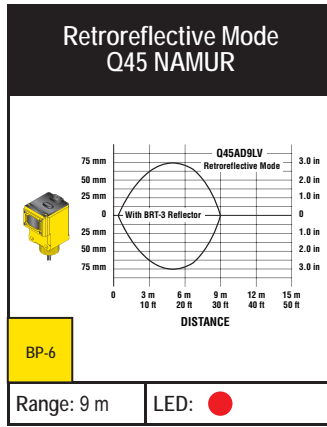
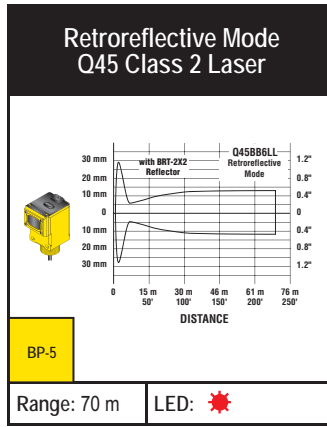
More on next page

Beam Patterns

(Diffuse and Convergent mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized

☀ = Visible Red Laser



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

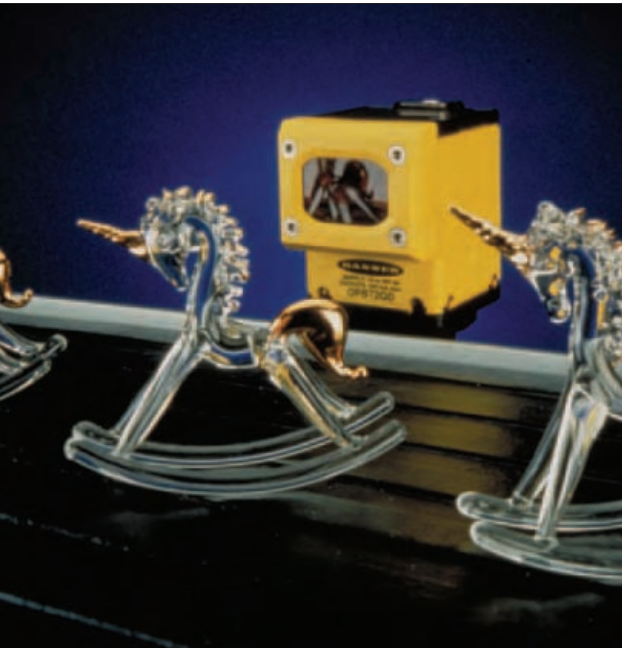
- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60



Beam Patterns (Diffuse mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED

| | | | |
|---|---|---|---|
| <p>Opposed Mode—Glass Fiber Q45 NAMUR</p> <p>BP-21</p> <p>Range: Varies LED: ○</p> | <p>Diffuse Mode—Glass Fiber Q45 NAMUR</p> <p>BP-22</p> <p>Range: Varies LED: ○</p> | <p>Opposed Mode—Glass Fiber Q45 NAMUR</p> <p>BP-23</p> <p>Range: Varies LED: ●</p> | <p>Diffuse Mode—Glass Fiber Q45 NAMUR</p> <p>BP-24</p> <p>Range: Varies LED: ●</p> |
| <p>Opposed Mode—Plastic Fiber Q45</p> <p>BP-25</p> <p>Range: Varies LED: ●</p> | <p>Diffuse Mode—Plastic Fiber Q45</p> <p>BP-26</p> <p>Range: Varies LED: ●</p> | <p>Opposed Mode—Plastic Fiber Q45 NAMUR</p> <p>BP-27</p> <p>Range: Varies LED: ●</p> | <p>Diffuse Mode—Plastic Fiber Q45 NAMUR</p> <p>BP-28</p> <p>Range: Varies LED: ●</p> |



Modular Limit-Switch Style Sensors OMNI-BEAM™

- Modular self-contained photoelectric sensors that you can customize for a specific application
- Includes a sensor head and a power block; timing logic module is optional
- Offers interchangeable ac or dc power blocks
- Features exclusive multiple-LED system that displays received signal strength, sensing contrast and seven different warnings
- Easily field-programmable for sensing hysteresis, signal strength display scale factor and light/dark operate
- Available in opposed, retroreflective, diffuse, convergent and fiber optic modes
- Available in convergent and fiber optic models with choice of red, blue or green LED for color-differentiation applications

| | |
|----------------------|----------|
| Sensor Heads | page 212 |
| Timing Logic Modules | 214 |
| Power Blocks | 214 |

- Photoelectrics Sensors
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- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

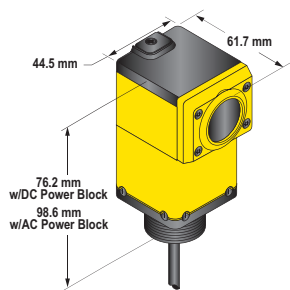
ACCESSORIES
page 217

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

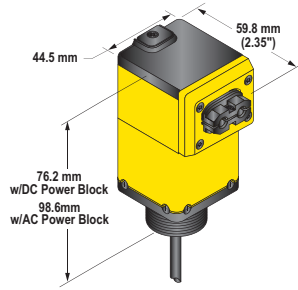


ONLINE
AUTOCAD, STEP, IGES & PDF

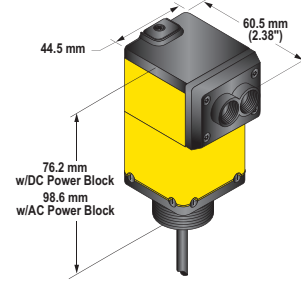
AC Model (shown)
Opposed, Retroreflective and Diffuse Models
Suffix E, R, D, DX, LV, LVAG and LVAGC



Convergent Models
Suffix CV, CVB and CVG



Plastic Fiber Models
Suffix FP, FPB and FPG

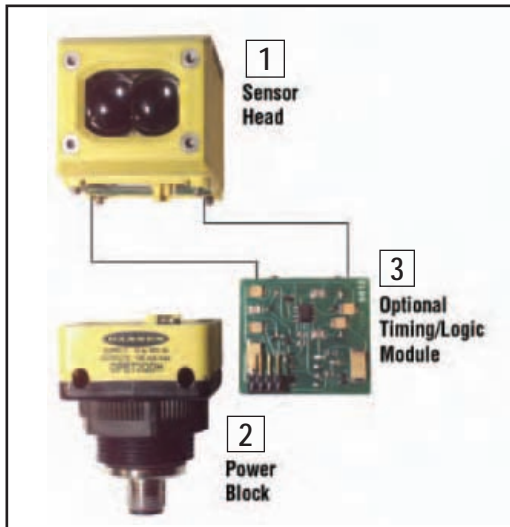


Glass Fiber Models
Suffix F, FAC, FX, FV, FVB, FVG, EF and RF



Selecting Components for OMNI-BEAM™ Sensors

OMNI-BEAM™ sensors are modular self-contained photoelectric sensors that you can customize for a specific application.



STEP 1:

Choose a sensor head with the required sensing mode.

STEP 2:

Choose a power block for the required sensor power (ac or dc) and interface.

STEP 3:

Choose an optional timing logic module.

STEP 4:

Plug and bolt components together without interwiring.

OMNI-BEAM modular components are sold separately. The three modular components, and the lenses, can be replaced in the field.

ACCESSORIES
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OMNI-BEAM™ Sensor Heads

⇒ Infrared LED → Visible Red LED

| Sensing Mode/LED | Range | Supply Voltage | Response & Repeatability | Models | Excess Gain | Beam Pattern |
|--------------------------|------------|--|--|----------------------|----------------|---------------|
| OPPOSED | 45 m | Provided by Power Block (see page 210) | Response: 2 ms Repeatability: 0.01 ms | OSBE Emitter OSBR | EGC-1 (p. 217) | BP-1 (p. 219) |
| RETRO | 0.15-9 m† | | Response: 4 ms Repeatability: 0.2 ms | OSBLV | EGC-2 (p. 217) | BP-2 (p. 219) |
| POLAR RETRO | 0.3-4.5 m† | | OSBLVAG | EGC-3 (p. 217) | BP-3 (p. 219) | |
| CLEAR-OBJECT POLAR RETRO | 4 m† | | OSBLVAGC | EGC-4 (p. 217) | — | |
| HIGH-SPEED DIFFUSE | 300 mm | | Response: 2 ms Repeatability: 0.1 ms | OSBD | EGC-5 (p. 218) | BP-4 (p. 219) |
| HIGH-POWER DIFFUSE | 2 m | | Response: 15 ms Repeatability: 1 ms | OSBDX | EGC-6 (p. 218) | BP-5 (p. 219) |

† Retroreflective range is specified using one model BRT-3 retroreflector. Actual sensing range may differ, depending on efficiency and reflective area of the retroreflector in use. See Accessories for more information.

NOTE: Sensor heads require a power block. See page 214.

More on next page

OMNI-BEAM™ Sensor Heads (cont'd)

Infrared LED
 Visible Red LED
 Visible Green LED
 Visible Blue LED

| Sensing Mode/LED | Range | Supply Voltage | Response & Repeatability | Models | Excess Gain | Beam Pattern | |
|-----------------------------------|--|---|---|-----------------------------|--|--|---------------------------|
| CONVERGENT | 38 mm | Provided by Power Block (see page 210) | Response: 4 ms Repeatability: 0.2 ms | OSBCV | EGC-7 (p. 218) | BP-6 (p. 219) | |
| CONVERGENT | | | | OSBCVB | EGC-8 (p. 218) | BP-7 (p. 219) | |
| CONVERGENT | | | | OSBCVG | EGC-9 (p. 218) | BP-8 (p. 219) | |
| HIGH-SPEED GLASS FIBER | Range varies by sensing mode and fiber optics used | | Response: 2 ms Repeatability: 0.1 ms | OSBF | EGC-10 & EGC-11 (p. 218) | BP-9 & BP-10 (p. 220) | |
| HIGH-SPEED GLASS FIBER | | | | OSBFV | EGC-12 & EGC-13 (p. 218) | BP-11 & BP-12 (p. 220) | |
| HIGH-SPEED GLASS FIBER | | | | OSBFVB | EGC-14 (p. 218) | BP-13 (p. 220) | |
| HIGH-SPEED GLASS FIBER | | | | OSBFVG | EGC-15 (p. 218) | BP-14 (p. 220) | |
| HIGH-POWER GLASS FIBER | | | | OSBFX | Response: 15 ms Repeatability: 1 ms | EGC-16 & EGC-17 (p. 218) | BP-15 & BP-16 (p. 220) |
| AC-COUPLED GLASS FIBER | | | | OSBFAC | Response: 1 ms Repeatability: 0.01 ms | Maximum Range: IT23S fibers, opposed mode: 180 mm | |
| GLASS FIBER | | | | OSBEF | Response: 2 ms Repeatability: 0.01 ms | EGC-18 & EGC-19 (p. 218) | BP-17 & BP-18 (p. 220) |
| | | OSBRF | | | | | |
| PLASTIC FIBER | Range varies by sensing mode and fiber optics used | Response: 2 ms Repeatability: 0.1 ms | OSBFP | EGC-20 & EGC-21 (p. 218) | BP-19 & BP-20 (p. 220) | | |
| PLASTIC FIBER | | | OSBFPB | EGC-22 (p. 219) | BP-21 (p. 220) | | |
| PLASTIC FIBER | | | OSBFPG | EGC-23 (p. 219) | BP-22 (p. 220) | | |

NOTE: Sensor heads require a power block. See page 214.

- Photoelectrics Sensors
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- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
 page 217

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60


OMNI-BEAM™ Timing Logic Modules

| Type | Logic Function | Timing Ranges | Models | Timing Diagrams |
|--------------------------|--|---|--------|---|
| Delay Timer Logic Module | ON-DELAY or OFF-DELAY or ON/OFF DELAY | ON-Delay: 0.01-1 sec., 0.15-15 sec., or none OFF-Delay: 0.01-1 sec., 0.15-15 sec., or none | OLM5 | For information on Timing Diagrams, see data sheets |
| Pulse Timer Logic Module | ONE-SHOT pulse timer or DELAYED ONE-SHOT logic timer | Delay: 0.01-1 sec., 0.15-15 sec., or none Pulse: 0.01-1 sec., 0.15-15 sec. | OLM8 | |
| Pulse Timer Logic Module | ONE-SHOT pulse timer or DELAYED ONE-SHOT logic timer | Delay: 0.002-0.1 sec., 0.03-1.5 sec., or none Pulse: 0.002-0.1 sec., 0.03-1.5 sec. | OLM8M1 | |

OMNI-BEAM™ Power Blocks, DC Voltage

ACCESSORIES
page
217


| Connection | Supply Voltage | Models | Output Type |
|---------------|----------------|----------|---|
| 2 m | 10-30V dc | OPBT2 | Bi-Modal™ NPN or PNP Two outputs: Load and Alarm |
| 4-Pin Mini QD | | OPBT2QD | |
| 4-Pin Euro QD | | OPBT2QDH | |
| 2 m | | OPBTE | No output: for powering emitter-only sensor heads |
| 4-Pin Mini QD | | OPBTEQD | |
| 4-Pin Euro QD | | OPBTEQDH | |

 Connection options: A model with a QD requires a mating cordset (see page 217).

For 9 m cable, add suffix W/30 to the 2 m model number (example, OPBT2 W/30).

OMNI-BEAM™ Power Blocks, AC Voltage

| Connection | Supply Voltage | Models | Output Type |
|---------------|----------------|---------|--|
| 2 m | 105-130V ac | OPBA2 | SPST solid-state ac relay Two outputs: Load and Alarm |
| 5-Pin Mini QD | | OPBA2QD | |
| 2 m | 210-250V ac | OPBB2 | |
| 5-Pin Mini QD | | OPBB2QD | |
| 2 m | 105-130V ac | OPBAE | No output: for powering emitter only sensor heads |
| 5-Pin Mini QD | | OPBAEQD | |
| 2 m | 210-250V ac | OPBBE | |
| 5-Pin Mini QD | | OPBBEQD | |

 Connection options: A model with a QD requires a mating cordset (see page 217).

For 9 m cable, add suffix W/30 to the 2 m model number (example, OPBA2 W/30).


| OMNI-BEAM™ Sensor Head Specifications | |
|---------------------------------------|---|
| Supply Voltage and Current | Supplied by OMNI-BEAM power block. See page 214. |
| Output Response Time | See individual sensing heads for response times. See page 212. |
| Delay at Power-up | 200 milliseconds; outputs are non-conducting during this time |
| Adjustments | <p>Four programming DIP switches</p> <p>SWITCH #1 selects the amount of sensing hysteresis</p> <p>SWITCH #2 selects the alarm output configuration</p> <p>SWITCH #3 selects Light Operate (switch #3 OFF) or Dark Operate (switch #3 ON)</p> <p>SWITCH #4 selects the STANDARD (switch #4 OFF) or Fine (switch #4 ON) scale factor for the D.A.T.A. light signal strength indicator array</p> <p>Sensitivity: 15-turn slotted brass screw Gain (sensitivity) adjustment potentiometer</p> |
| Indicators | <p>Sense and Load indicator LEDs are located on the top of the sensor head on either side of the D.A.T.A. array</p> <p>Sense LED indicates when a target has been sensed</p> <p>Load LED lights whenever the load (sensor output) is energized</p> <p>Also, Banner's exclusive, D.A.T.A. sensor self-diagnostic system located on the top of the sensor head warns of marginal sensing conditions usually before a sensing failure occurs (except on model OSBFAC)</p> |
| Construction | Sensor heads are molded of rugged thermoplastic polyester; top view window is polycarbonate; acrylic lenses; stainless steel hardware |
| Environmental Rating | Meets NEMA standards 1, 2, 3, 3S, 4, 12, and 13; IEC IP66 when assembled to power block |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Certifications | |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


| OMNI-BEAM™ Timing Logic Module Specifications | |
|---|--|
| Response Time | A disabled timing function adds no measurable sensing response time |
| Timing Adjustments | All logic modules feature 15-turn clutched potentiometers for accurate timing adjustments. The logic module slides into the sensor head housing and interconnects without wires. Timing adjustments are easily accessible at the top of the sensor head and are protected by the sensor's transparent cover. |
| Timing Repeatability | ± 2% of timing range (max.); assumes conditions of constant temperature and power supply |
| Time Range | Useful range is from maximum time down to 10% of maximum (all models); when timing potentiometer is set fully counterclockwise, time will be approximately 1% of maximum for models OLM5 and OLM8, and 2% of maximum for model OLM8M1 |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Certifications | |

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

OMNI-BEAM™ DC Power Block Specifications

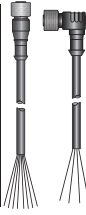
| | |
|-----------------------------|---|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at less than 80 mA (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | OPBT2, OPBT2QD, OPBT2QDH: Bi-Modal™ NPN or PNP, depending upon hookup to power supply (see hookup diagrams) OPBTE, OPBTEQD, OPBTEQDH: No output - for use with emitters only |
| Output Rating | 100 mA max. OFF-state leakage current: less than 100 µA Output saturation voltage (NPN or PNP outputs): less than 1 volt at 10 mA and less than 1.5 volts at 100 mA |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short-circuit of outputs |
| Construction | Reinforced thermoplastic polyester housing with totally epoxy-encapsulated circuitry, and 30 mm threaded hub for swivel bracket or through-hole mounting |
| Environmental Rating | Meets NEMA standards 1, 2, 3, 3S, 4, 12, and 13; IEC IP66 when assembled to sensor head |
| Connections | PVC-jacketed 2 m or 9 m cables, or 4-pin Mini- or Euro-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 217. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Application Notes | Interface to TTL logic is not direct (contact factory). When the load and the OMNI-BEAM do not share a common power supply, load voltage must be ≤ the sensor supply voltage |
| Certifications |  |
| Hookup Diagrams | Emitters: DC02 (p. 758) Other DC Models: DC14 (p. 761) |

OMNI-BEAM™ AC Power Block Specifications


| | |
|-----------------------------|--|
| Supply Voltage and Current | 120V models: 105 to 130V ac, 50/60 Hz, 4 watts (excluding load) 220/240V models: 210 to 250V ac, 50/60 Hz, 4 watts (excluding load) |
| Supply Protection Circuitry | Protected against transient voltages |
| Output Configuration | OPBA2, OPBA2QD, OPBB2 and OPBB2QD: Isolated SPST solid-state ac relay OPBAE, OPBAEQD, OPBBE and OPBBEQD: No output - for use with emitter only |
| Load Output Rating | 500 mA max to 25° C, derated 1% per ° C to 70° C; 7 amps max inrush for 1 second or 20 amps max for one cycle (non-repeating) OFF-state leakage current: less than 100 µA max. ON-state voltage drop: less than 3V ac at full load |
| Alarm Output Rating | 200 mA max to 25° C, derated 2% per ° C to 70° C; 2 amps max inrush for 1 second or 3 amps max for 1 cycle (non-repeating) OFF-state leakage current: less than 100 µA max. ON-state voltage drop: less than 2.5V ac at full load |
| Output Protection Circuitry | Protected against false pulse on power-up |
| Construction | Reinforced thermoplastic polyester housing with totally epoxy-encapsulated circuitry, and 30 mm threaded hub for swivel bracket or through-hole mounting |
| Environmental Rating | Meets NEMA standards 1, 2, 3, 3S, 4, 12, and 13; IEC IP66 when assembled with sensor head |
| Connections | PVC-jacketed 2 m or 9 m cables, or 5-pin Mini-style quick-disconnect (QD) fitting are available. QD cordsets are ordered separately. See page 217. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Certifications |  |
| Hookup Diagrams | Emitters: AC03 (p. 764) Other AC Models: AC09 (p. 766) |


Cordsets

| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MODC-406 | MODC-406RA |
| 4.57 m | MODC-415 | MODC-415RA |
| 9.14 m | MODC-430 | MODC-430RA |







| Mini QD | | |
|--------------|----------------|----------------|
| See page 715 | | |
| | Threaded 4-Pin | Threaded 5-Pin |
| Length | Straight | |
| 1.83 m | MBCC-406 | MBCC-506 |
| 3.66 m | MBCC-412 | MBCC-512 |
| 9.14 m | MBCC-430 | MBCC-530 |

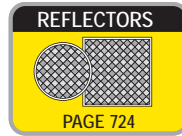


 Additional cordset information available. See page 693.

Brackets

| OMNI-BEAM | | |
|--|---|---|
|  |  |  |
| pg. 653 | pg. 653 | pg. 654 |
| SMB30A | SMB30FA.. | SMB30SC |

 Additional brackets and information available. See page 632.

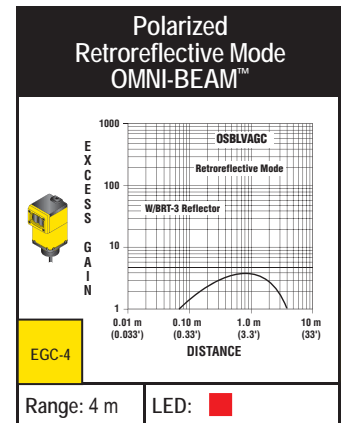
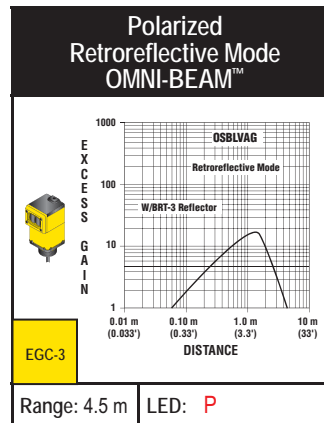
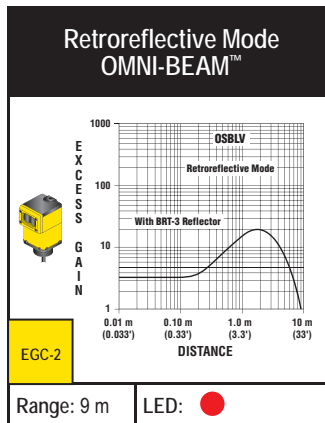
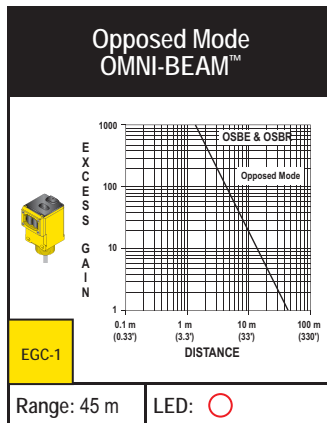


- Photoelectrics Sensors
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- MINIATURE
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- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

Excess Gain Curves

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ■ = Visible Red Clear Object Detection Polarized

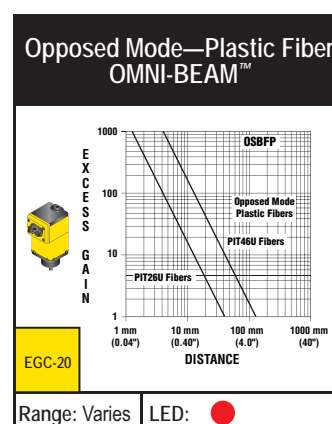
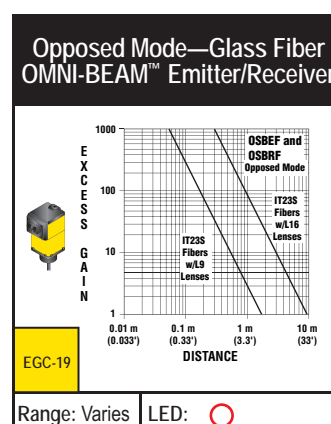
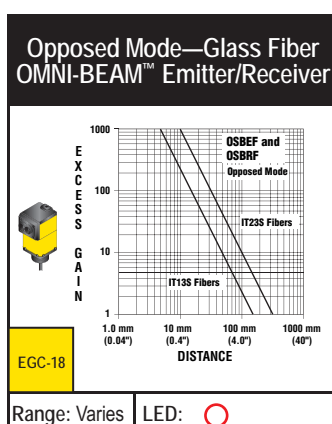
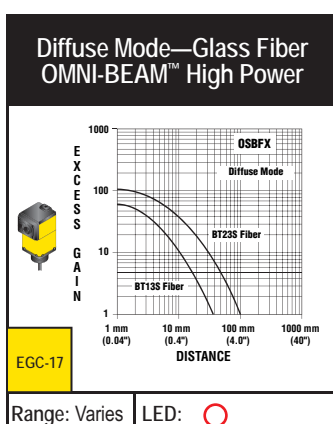
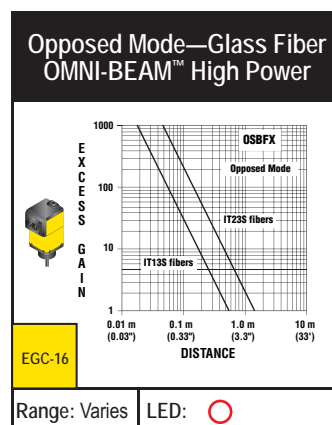
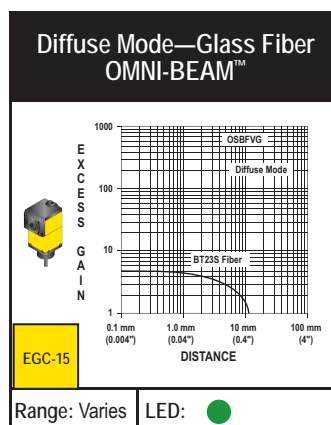
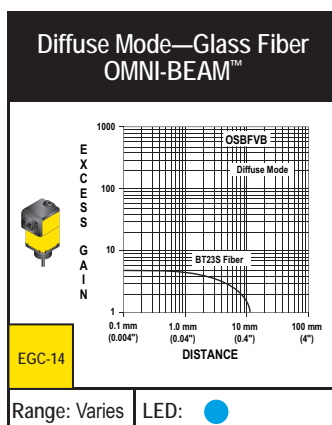
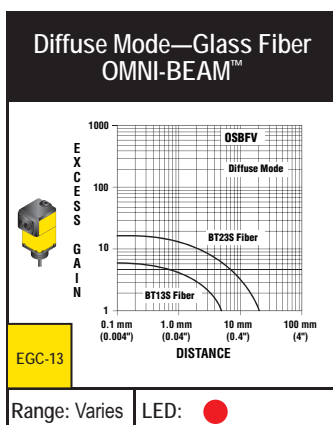
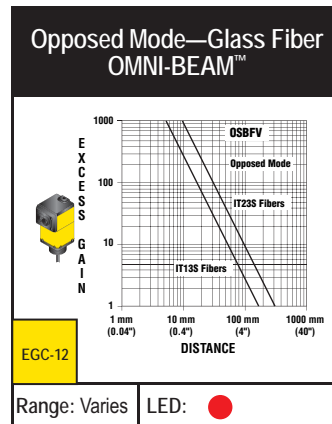
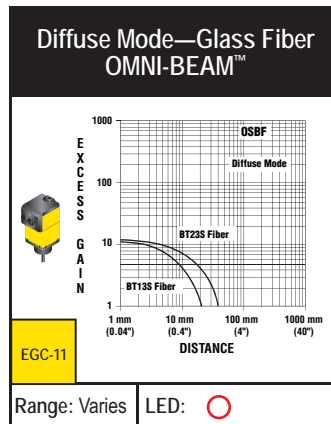
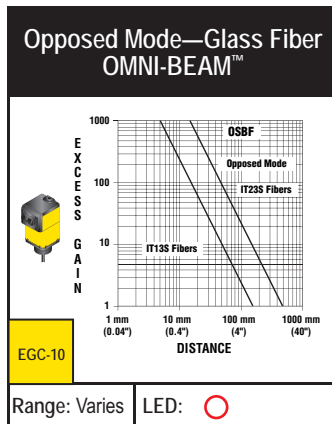
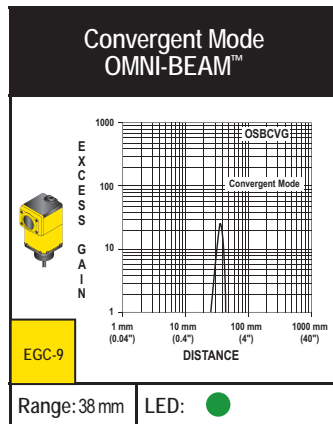
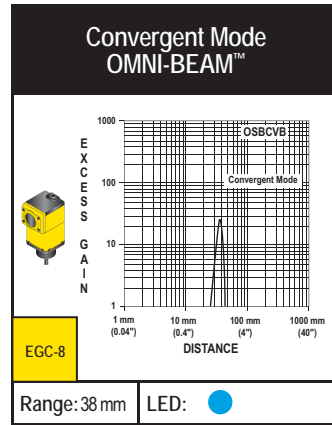
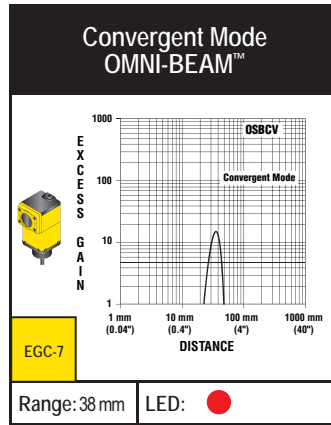
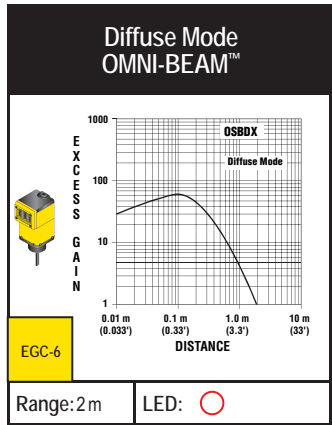
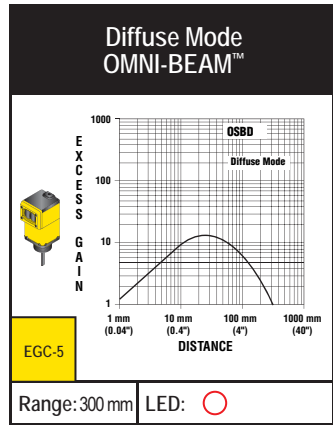


More on next page

Excess Gain Curves (Diffuse and Convergent mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED ● = Visible Blue LED ● = Visible Green LED

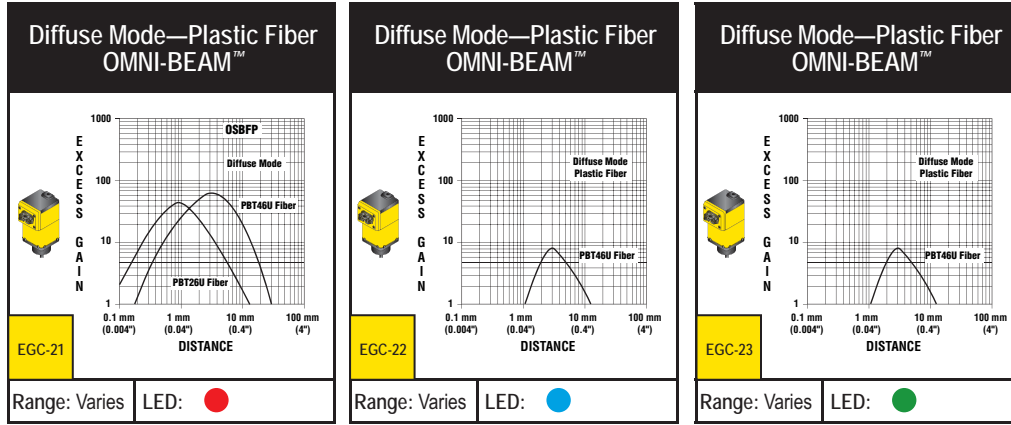
SENSORS



More on next page

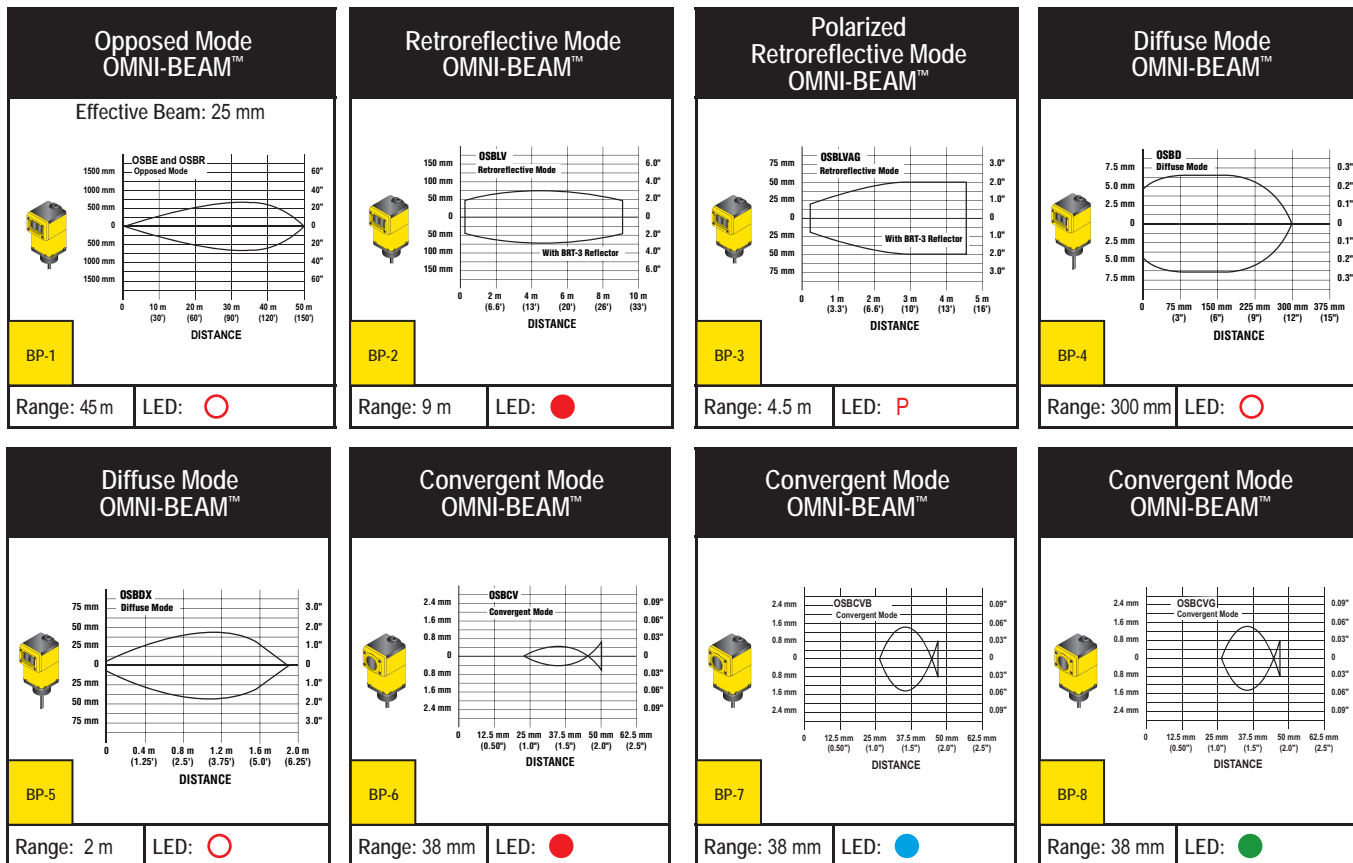
Excess Gain Curves (Diffuse mode performance based on 90% reflectance white card)

● = Visible Red LED ● = Visible Blue LED ● = Visible Green LED



Beam Patterns (Diffuse and Convergent mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED P = Visible Red LED Polarized ● = Visible Blue LED ● = Visible Green LED



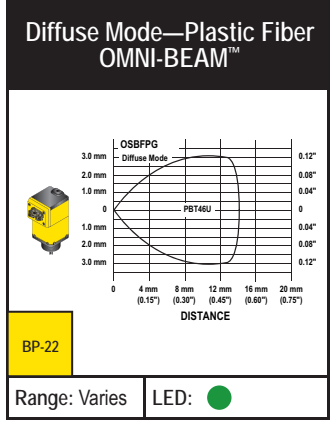
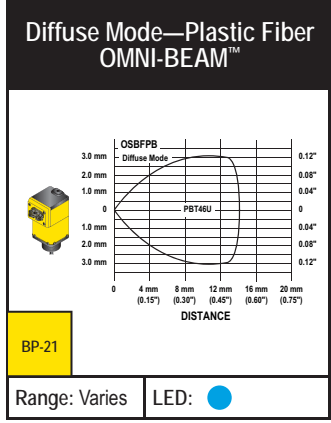
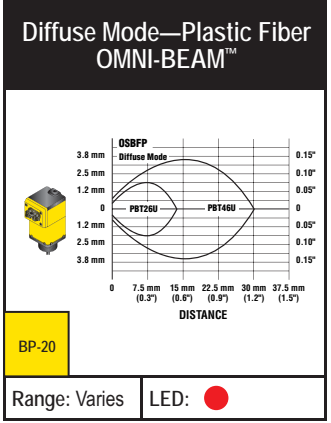
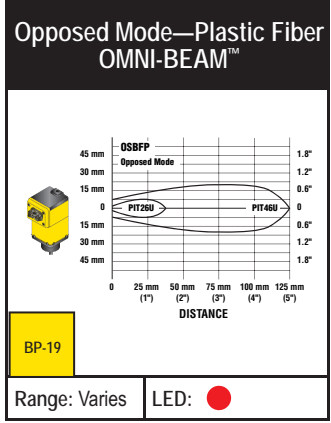
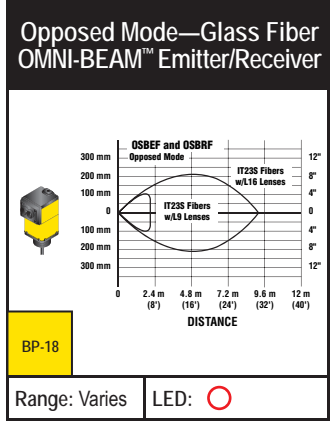
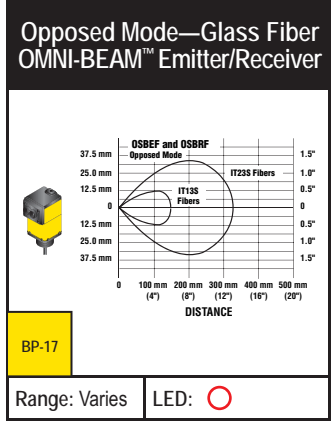
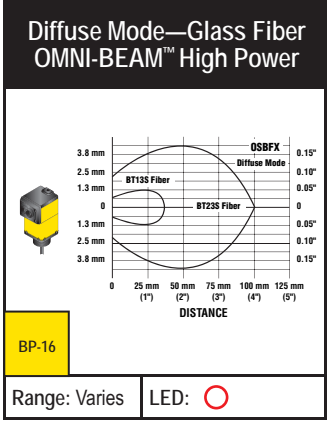
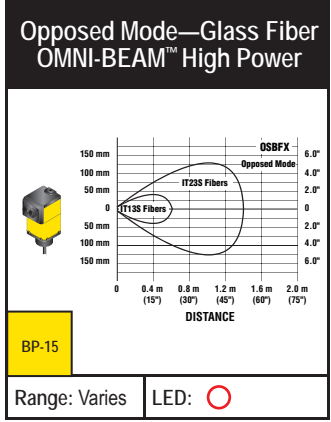
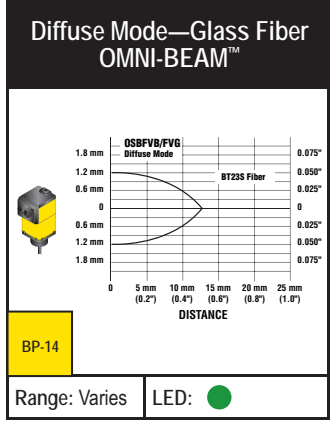
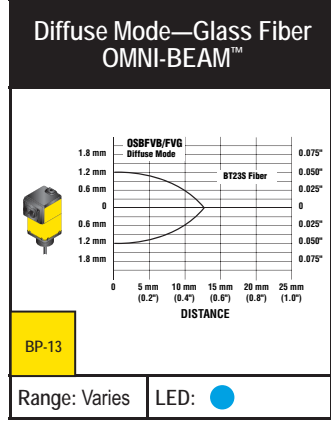
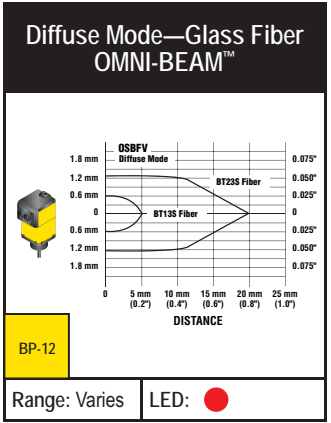
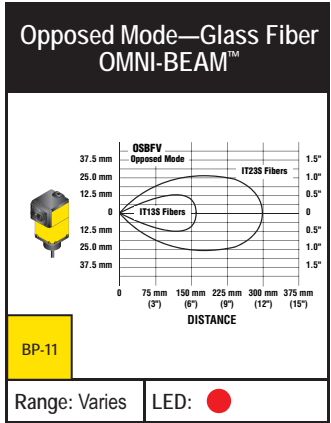
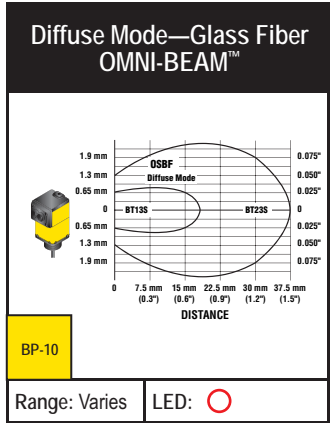
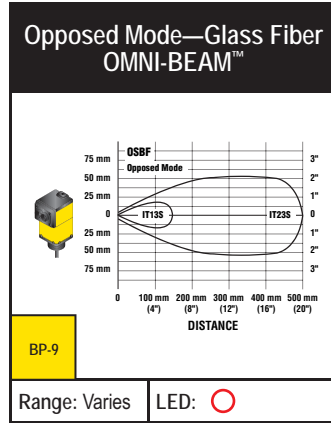
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

Beam Patterns (Diffuse mode performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED ● = Visible Blue LED ● = Visible Green LED

SENSORS





Long-Range Adjustable-Field Sensors Q60

- Detects objects within a defined sensing field, ignoring objects located just beyond the sensing field cutoff point
- Features two-turn, logarithmic adjustment of sensing field cutoff point from 0.2 to 2 m, making it easy to set a cutoff point
- Offers infrared, visible red LED or laser sensing beam
- Uses rotating pointer to indicate relative cutoff point setting within sensing range
- Features easy push-button or remote programming of Light/Dark Operate and output timing
- Uses continuous status indicators to verify all settings at a glance
- Models available for dc or ac/dc universal voltage operation
- Models available with visible red lasers for small part detection from long distances

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
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- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 224



Adjustable-field Models
Suffix AF, AFV and LAF



- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60



Q60, 10-30V dc

⇨ Infrared LED

➔ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain and Cutoff Point Deviation |
|------------------|---|---------------|-----------------|----------------|--|
| | Min.: 65 - 130 mm [†] Cutoff: 200 - 1000 mm | 2 m | Bipolar NPN/PNP | Q60BB6AFV1000 | EGC-1 (p. 224) |
| | | 5-Pin Euro QD | | Q60BB6AFV1000Q | Cutoff Point Deviation Curves CPD-3 & CPD-4 (p. 225) |
| | Min.: 50 - 125 mm [†] Cutoff: 200 - 2000 mm | 2 m | | Q60BB6AF2000 | EGC-2 (p. 224) |
| | | 5-Pin Euro QD | | Q60BB6AF2000Q | Cutoff Point Deviation Curves CPD-1 & CPD-2 (p. 225) |

➔ More on next page

Connection options: A model with a QD requires a mating cordset (see page 224).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q60BB6AF2000 W/30).

[†] Minimum range varies by established cutoff point (see excess gain curves, page 224 and cutoff point deviation curves, page 225).

Q60, 10-30V dc (cont'd)

Visible Red Laser

| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain and Cutoff Point Deviation |
|---|--|---------------|-----------------|----------------|--|
| CLASS 1 LASER LASER ADJUSTABLE-FIELD | Min.: 100 - 260 mm [†] Cutoff: 200 - 1400 mm | 2 m | Bipolar NPN/PNP | Q60BB6LAF1400 | EGC-3 (p. 224) |
| | | 5-Pin Euro QD | | Q60BB6LAF1400Q | Cutoff Point Deviation Curves CPD-5 & CPD-6 (p. 225) |
| CLASS 2 LASER LASER ADJUSTABLE-FIELD | Min.: 75 - 240 mm [†] Cutoff: 200 - 2000 mm | 2 m | | Q60BB6LAF2000 | EGC-4 (p. 224) |
| | | 5-Pin Euro QD | | Q60BB6LAF2000Q | Cutoff Point Deviation Curves CPD-5 & CPD-6 (p. 225) |

Connection options: A model with a QD requires a mating cordset (see page 224).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q60BB6LAF2000 W/30).

[†] Minimum range varies by established cutoff point (see excess gain curves, page 224 and cutoff point deviation curves, page 225).

ACCESSORIES
page 224

Q60 Universal Voltage, 12-250V dc or 24-250V ac

Infrared LED Visible Red LED Visible Red Laser

| Sensing Mode/LED | Range | Connection | Output Type | Models | Excess Gain and Cutoff Point Deviation |
|---|--|----------------|----------------|-----------------|--|
| ADJUSTABLE-FIELD | Min.: 65 - 130 mm [†] Cutoff: 200 - 1000 mm | 2 m | SPDT e/m Relay | Q60VR3AFV1000 | EGC-1 (p. 224) |
| | | 4-Pin Micro QD | SPST e/m Relay | Q60VR3AFV1000Q1 | Cutoff Point Deviation Curves CPD-3 & CPD-4 (p. 225) |
| ADJUSTABLE-FIELD | Min.: 50 - 125 mm [†] Cutoff: 200 - 2000 mm | 2 m | SPDT e/m Relay | Q60VR3AF2000 | EGC-2 (p. 224) |
| | | 4-Pin Micro QD | SPST e/m Relay | Q60VR3AF2000Q1 | Cutoff Point Deviation Curves CPD-1 & CPD-2 (p. 225) |
| CLASS 1 LASER LASER ADJUSTABLE-FIELD | Min.: 100 - 260 mm [†] Cutoff: 200 - 1400 mm | 2 m | SPDT e/m Relay | Q60VR3LAF1400 | EGC-3 (p. 224) |
| | | 4-Pin Micro QD | SPST e/m Relay | Q60VR3LAF1400Q1 | Cutoff Point Deviation Curves CPD-5 & CPD-6 (p. 225) |
| CLASS 2 LASER LASER ADJUSTABLE-FIELD | Min.: 75 - 240 mm [†] Cutoff: 200 - 2000 mm | 2 m | SPDT e/m Relay | Q60VR3LAF2000 | EGC-4 (p. 224) |
| | | 4-Pin Micro QD | SPST e/m Relay | Q60VR3LAF2000Q1 | Cutoff Point Deviation Curves CPD-5 & CPD-6 (p. 225) |

Connection options: A model with a QD requires a mating cordset (see page 224).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q60VR3AFV1000 W/30).

[†] Minimum range varies by established cutoff point (see excess gain curves, page 224 and cutoff point deviation curves, page 225).

Q60 Specifications

| | |
|-----------------------------|---|
| Supply Voltage and Current | Q60BB6AF and Q60BB6AFV models: 10 to 30V dc (10% max. ripple) at less than 50 mA exclusive of load Q60BB6LAF models: 10 to 30V dc (10% max. ripple) at less than 35 mA exclusive of load Q60VR3LAF and Q60VR3AFV Universal models: 12 to 250V dc or 24 to 250V ac, 50/60 Hz Input power 1.5 W max. |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages (Q60VR3 model's dc hookup is without regard to polarity) |

More on next page

| Q60 Specifications (cont'd) | |
|-----------------------------|---|
| Output Configuration | Q60BB6AF, Q60BB6AFV and Q60BB6LAF models: Bipolar: one NPN (current sinking) and one PNP (current sourcing) open-collector transistor Q60VR3AF, Q60VR3LAF and Q60VR3AFV cabled models: E/M Relay (SPDT), normally closed and normally open contacts Q60VR3AFQ1, Q60VR3AFVQ1 and Q60VR3LAFQ1 (QD) models: E/M Relay (SPST), normally open contact |
| Output Rating | DC models: 150 mA max. each output @ 25 °C OFF-state leakage current: less than 5 µA @ 30V dc Output saturation NPN: less than 200 mV @ 10 mA; less than 1V @ 150 mA Output saturation PNP: less than 1V at 10 mA; less than 1.5V at 150 mA Universal Voltage models: Min. voltage and current: 5V dc, 10 mA Mechanical life of relay: 50,000,000 operations Electrical life of relay at full resistive load: 100,000 operations Max. switching power (resistive load): Cabled models: 1250VA, 150 W QD models: 750VA, 90W Max. switching voltage (resistive load): Cabled models: 250V ac, 125V dc QD models: 250V ac, 125V dc Max. switching current (resistive load): Cabled models: 5 A @ 250V ac, 5 A @ 30V dc derated to 200 mA @ 125V dc QD models: 3 A @ 250V ac, 3 A @ 30V dc derated to 200 mA @ 125V dc |
| Output Protection Circuitry | Q60BB6AF, Q60BB6LAF and Q60BB6AFV models: Protected against continuous overload or short circuit of outputs All models: Protected against false pulse on power-up |
| Output Response Time | Q60BB6AF, Q60BB6LAF and Q60BB6AFV models: 2 milliseconds ON/OFF Q60VR3AF, Q60VR3LAF and Q60VR3AFV Universal models: 15 milliseconds ON/OFF |
| Delay at Power-up | 150 milliseconds (Q60BB6LAF has 1 second max.); outputs do not conduct during this time |
| Repeatability | 500 microseconds |
| Sensing Hysteresis | For Infrared models, see chart HC-2; for Visible Red models, see chart HC-1; and for Laser models, see chart HC-3, all on page 221 2000 mm cutoff - less than 3% of set cutoff distance 1600 mm cutoff - less than 2.25% of set cutoff distance 1200 mm cutoff - less than 1.30% of set cutoff distance 800 mm cutoff - less than 0.5% of set cutoff distance 400 mm cutoff - less than 0.25% of set cutoff distance |
| Adjustments | 2 momentary push buttons: ON-delay and OFF-delay ON Delay select: 8 milliseconds to 16 seconds LO/DO select OFF Delay select: 8 milliseconds to 16 seconds Push-button lockout: for security Slotted, geared, 2-turn, cutoff range adjustment screw (mechanical stops on both ends of travel) |
| Indicators | Q60AF, Q60AFV and Q60LAF models: ON-Delay Green ON Steady: Run mode, ON-delay is active Green Flashing: ON-delay Selection mode is active OFF-Delay Green ON Steady: Run mode, OFF-delay is active Green Flashing: OFF-delay Selection mode is active 5-Segment Light Bar*: Indicates relative delay time during ON/OFF-delay Selection modes Output Amber ON Steady: Outputs are conducting Green ON Steady: During ON/OFF-delay Selection modes Dark Operate Green ON Steady: Dark Operate is selected Lockout Green ON Steady: Buttons are locked out Light Operate Green ON Steady: Light Operate is selected Signal Green ON Steady: Sensor is receiving signal Green Flashing: Marginal signal (1.0 to 2.25 excess gain) *Output, Dark Operate, Lockout, Light Operate and Signal indicators function as 5-Segment Light Bar during ON/OFF-delay Selection modes |
| Laser Characteristics | Spot Size: approximately 4 x 2 mm throughout range (collimated beam) Angle of Divergence: 5 milliradians NOTE: Contact factory for custom laser spot size. |
| Construction | Housing: ABS polycarbonate blend Lens: acrylic Cover: Clear ABS |
| Environmental Rating | IEC IP67; NEMA 6 |
| Connections | 2 m or 9 m integral cable. DC models offer a 5-pin Euro-style QD fitting. AC models offer 4-pin Micro-style QD fitting. QD cordsets are ordered separately. See page 224. |
| Operating Conditions | Temperature: Q60BB6LAF (DC) models: -10° to +50° C Q60VR3LAF Universal models: -10° to +45° C All others: -20° to +55° C Relative humidity: 90% at 50° C (non-condensing) |

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- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60



Q60 Specifications (cont'd)

| | | | |
|-----------------|-------------------|---------------------------------|-----------------------------|
| Certifications | | | |
| Hookup Diagrams | DC: DC08 (p. 759) | Universal Cabled: UN01 (p. 767) | Universal QD: UN08 (p. 768) |

CLASS 1 LASER PRODUCT

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated 7-26-01.

BANNER

Pulse Power < 5.6 mW, 650 - 670 nm, 15 kHz, 4.5 uS Pulse. Complies to 21 CFR 1040.10 & EN60825-1:2001 except for deviations pursuant to laser notice No. 50, dated 7-26-01.

LASER LIGHT - DO NOT STARE INTO BEAM

CLASS 2 LASER PRODUCT

Class 1 Lasers

Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

For safe laser use:

- Do not permit a person to stare at the laser from within the beam.
- Do not point the laser at a person's eye at close range.
- Locate open laser beam paths either above or below eye level, where practical.

Class 2 Lasers

Lasers that emit visible radiation in the wavelength range from 400 nm to 700 nm where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

For safe laser use:

- Do not permit a person to stare at the laser from within the beam.
- Do not point the laser at a person's eye at close range.
- Locate open laser beam paths either above or below eye level, where practical.

Cordsets

| Euro QD | | | Micro QD | | |
|----------------|-----------|-------------|----------------|----------|-------------|
| See page 699 | | | See page 712 | | |
| Threaded 5-Pin | | | Threaded 4-Pin | | |
| Length | Straight | Right-Angle | Length | Straight | Right-Angle |
| 1.83 m | MQDC1-506 | MQDC1-506RA | 1.83 m | MQAC-406 | MQAC-406RA |
| 4.57 m | MQDC1-515 | MQDC1-515RA | 4.57 m | MQAC-415 | MQAC-415RA |
| 9.14 m | MQDC1-530 | MQDC1-530RA | 9.14 m | MQAC-430 | MQAC-430RA |

Additional cordset information available. See page 693.

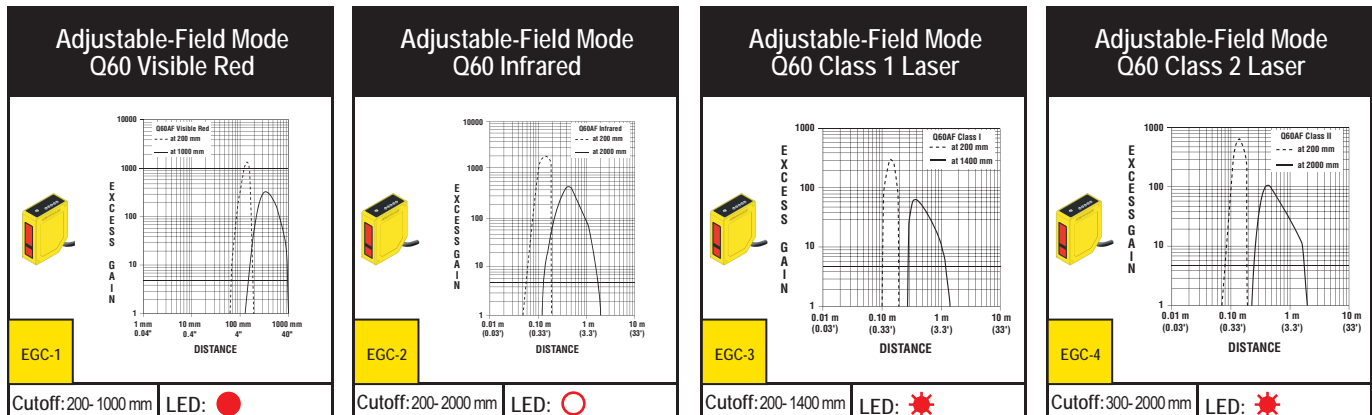
Brackets

| Q60 | | |
|----------------------------|---------------------------|-----------------------|
| pg. 664 SMBAMSQ60IP | pg. 664 SMBAMSQ60P | pg. 683 SMBQ60 |

Additional bracket information available. See page 632.

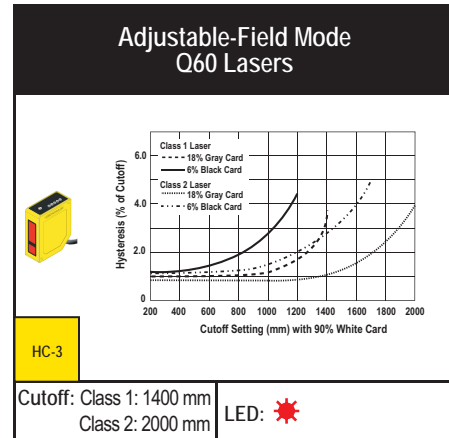
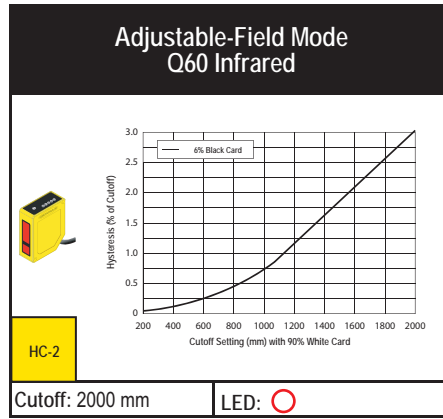
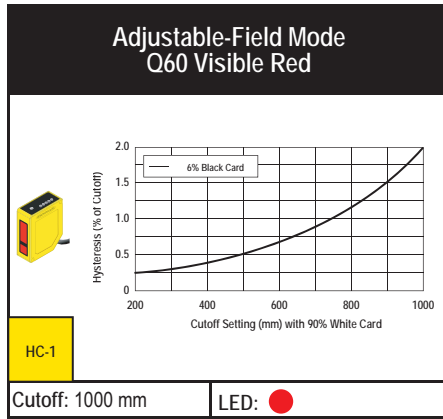
Excess Gain (Performance based on 90% reflectance white card)

○ = Infrared LED ● = Visible Red LED ☀ = Visible Red Laser



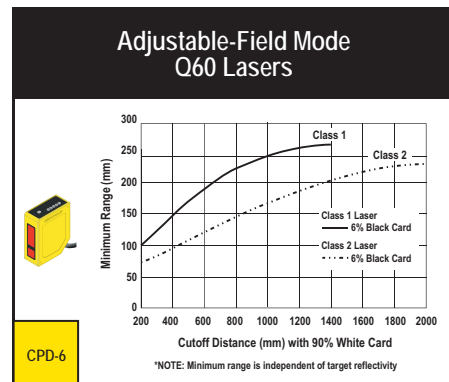
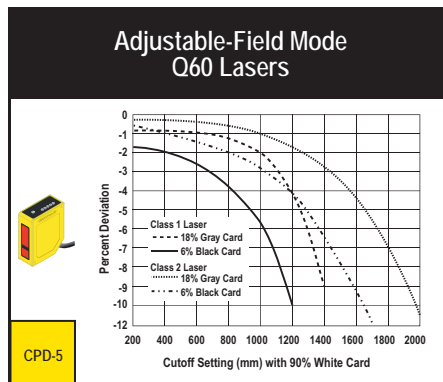
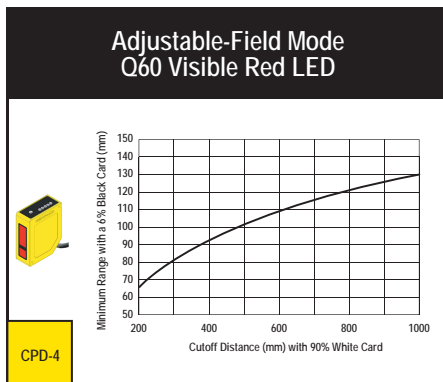
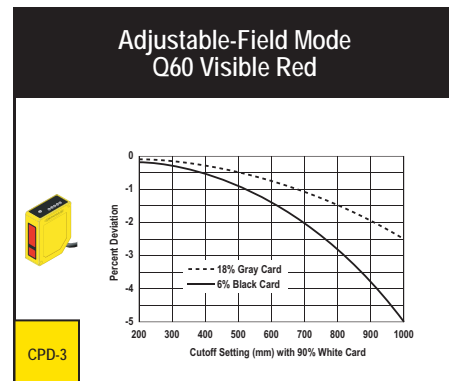
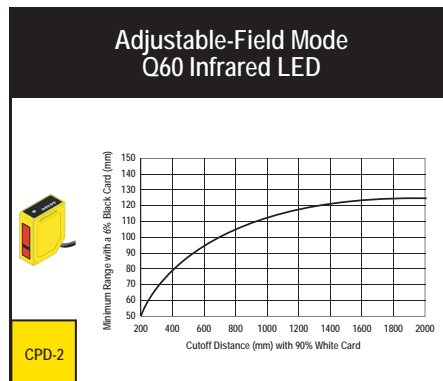
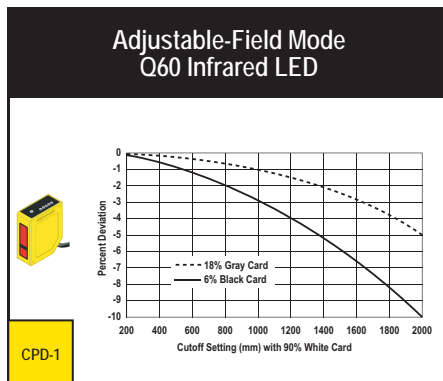
Hysteresis Curves

○ = Infrared LED ● = Visible Red LED ✶ = Visible Red Laser



- Photoelectrics Sensors
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Cutoff Point Deviation Curves



See data sheet for detailed deviation information.

- MINIATURE
- COMPACT
- MIDSIZE
- FULLSIZE
- Q45
- OMNI-BEAM
- Q60

FIBER OPTIC SENSORS

DF-G1



D10



D12



R55F



DF-G1 page 229

- Simple user interface ensures easy sensor set-up and programming
- Expert TEACH and SET for low contrast applications
- Thermally stable electronics minimize warm-up drift and the effect of side-by-side mounting of multiple fiber amplifiers



D10 page 234

- Advanced amplifier for use with plastic fibers
- High-performance, low-contrast sensor with numeric or bargraph display
- Models with push-button programming or manual gain adjustment
- Bussable power models for simplified wiring



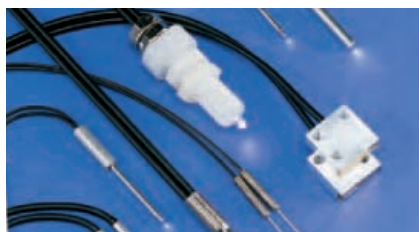
D12 page 243

- Glass and plastic fiber optic models
- Models for standard applications, high-speed response and increased power
- AC-coupled for high-sensitivity applications



R55F page 248

- Green, blue, white, red or infrared LED colors
- For mounting flat or to a 35 mm DIN rail
- Models for glass and plastic fiber optics



Plastic Fibers page 252

- Inexpensive and easily cut to length during installation
- Very bendable, for a precise fit
- Available coiled, for applications requiring articulated or reciprocating motion
- Diameters of 0.25, 0.5, 1.0 or 1.5 mm



Glass Fibers page 269

- For hostile environments: high temperatures, corrosive materials, extreme moisture and high levels of shock and vibration
- Inherent immunity to extreme electrical noise
- Quickly custom designed and built for your unique applications

DF-G1 Expert™

Dual Display Fiber Amplifier



Dual digital display provides constant feedback



Syringe Presence Detection
The DF-G1 sensor can be easily configured for detection of small targets like syringes in a limited space packaging process. The high flex plastic fiber also provides easy mounting at the sensing point.



Small Part Counting
Small part counting applications are easy to set up and calibrate. The timing can be easily adjusted for various part sizes.

Easy-to-use dual display fiber optic amplifier with high performance and energy savings

The DF-G1 Expert Dual Display Fiber Amplifier is an easy-to-use fiber optic system that can be set up quickly to reduce installation time. The user interface is intuitive and the amplifier features a dual display screen, indicating the signal level and threshold simultaneously for simple operation. The DF-G1 has minimal warm-up drift, taking only minutes to start up and operate at full performance.

- ▶ Easy-to-read dual digital display indicates signal level and threshold simultaneously for simple operation
- ▶ Simple user interface ensures easy sensor set up and programming for reduced installation time
- ▶ User has complete control over operating parameters, including switch point threshold, Light Operate or Dark Operate, output timing functions, gain level, and response speed
- ▶ Thermally stable electronics minimize warm-up drift and allows for side-by-side mounting of multiple fiber amplifiers
- ▶ ECO (economy) display mode reduces amplifier power consumption by 25%
- ▶ Cross-talk avoidance algorithm allows two sensors to operate in close proximity for many applications
- ▶ Expert TEACH and SET methods ensure optimal gain and threshold for all applications, especially low contrast applications
- ▶ Secure and reliable fiber clamping
- ▶ Sleek 10 mm wide housing mounts to 35 mm DIN rail
- ▶ Visible red LED sensing beam makes alignment easy

40-plus years of sensor design experience, quality control, sales support and cost-effective solutions:

- ▶ Banner quality products with global availability
- ▶ Rapid customization with most products shipping in 3 days or less
- ▶ Industry's largest force of application engineers to solve your toughest challenges
- ▶ More than 3,000 factory and local field representatives to serve you

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more sensors, more solutions

bannerengineering.com

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- FIBER SENSORS**
- PLASTIC FIBERS
- GLASS FIBERS

The broadest selection of fiber systems in the world.

Fiber Systems

Two-part fiber systems include the sensor and the separately purchased application-specific fiber.

1. Sensors

The sensor contains all the electronics, the amplifier and the mechanical interface to the fiber. Some models are sealed and rated IP67 to mount directly on a machine; others are designed to be DIN-rail mounted in a centralized control enclosure.

2. Fibers

Sensing fibers are non-electronic, light-transmitting, optical-quality glass or plastic strands encased in cladding that reflects light to the core. Fibers transmit and/or receive light from the LED of a sensor. Glass fibers are arranged in bundles, and plastic fibers are typically packaged as monofilaments with a protective jacket of polyethylene, PVC, stainless-steel braid or other material. Fiber sensing tips have a wide variety of shapes and configurations.









When to Use Fiber Systems

- **Confined areas.** The small size and flexibility of fibers allows precise positioning where space is limited.
- **High temperatures.** Fiber optic assemblies can tolerate elevated temperatures—in some cases as high as 480° C.
- **High vibration and shock.** The low mass of fibers enables them to withstand extreme vibration and mechanical shock.
- **Corrosive and wet environments.** Special-purpose fibers withstand corrosive materials, moisture and even repeated washdown.
- **Explosive environments.** Fibers are passive and can safely pipe light to and from hazardous areas.
- **Noisy environments.** Fibers are non-electronic mechanical components and are completely immune to electrical noise.
- **Unique target shapes and requirements.** Fiber optic sensing heads can be custom designed and optimally shaped to the physical and optical requirements of a specific application.



















Typical Applications

- Punch presses
- Vibratory feeders
- Conveyors
- Web control
- Tablet counting
- Ovens
- Semiconductor processing equipment
- Liquid level

DIN Rail Mountable Amplifiers for use with Fibers

| Sensor Model | Models for Plastic Fibers | Models for Glass Fibers | Page Number |
|--------------|--|---|-------------|
| DF-G1 |  |  | page 229 |
| D10 |  | | page 234 |
| D12 |  |  | page 243 |
| R55F |  |  | page 248 |
| D11 |  | | page 365 |

Sealed Machine Mountable Sensors for use with Fibers

| Sensor Model | Models for Plastic Fibers | Models for Glass Fibers | Page Number |
|------------------|---|---|----------------|
| WORLD-BEAM® QS18 |  |  | page 90 |
| MINI-BEAM® |  |  | page 112 |
| QM42 |  | | page 187 |
| Q45 |  |  | page 194 |
| OMNI-BEAM™ |  |  | page 211 |
| FI22 |  | | page 365 |
| ECONO-BEAM® |  |  | page 365 |
| MAXI-BEAM® |  |  | page 365 |
| MULTI-BEAM® | |  | page 365 |
| PC44 |  | | See data sheet |
| VALU-BEAM® |  |  | page 365 |

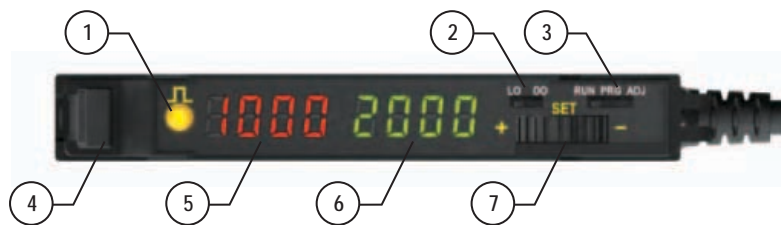


Expert Dual Display Fiber Amplifier DF-G1 Series

- Easy to read dual digital displays show both signal level and threshold simultaneously
- Lever action fiber clamp provides stable, reliable, and trouble-free fiber clamping
- Simple user interface ensures easy sensor set-up and programming via displays and switches/buttons, remote input teach wire, or IO-Link (coming soon)
- Expert TEACH and SET methods ensure optimal gain and threshold for all applications, especially low contrast applications
- User has full control over all operating parameters: threshold, Light or Dark Operate, output timing functions, gain level, and response speed
- Thermally stable electronics minimize warm-up drift and the effect of side-by-side mounting of multiple fiber amplifiers
- ECO (economy) display mode reduces amplifier power consumption by 25%
- Cross talk avoidance algorithm allows two sensors to operate in close proximity for many applications
- Response speeds of: 200 μ s (High Speed), 500 μ s (Standard Speed), 2 ms (Long Range), and 5 ms (Extra Long Range) allow operator to optimize for fast or long distance applications
- Sleek 10 mm wide housing mounts to standard 35 mm DIN rail
- Visible red LED sensing beam for easy alignment to the target

Photoelectrics Sensors
Fiber Optic Sensors
 Special Purpose Sensors
 Measurement & Inspection Sensors
 Vision
 Wireless
 Lighting & Indicators
 Safety Light Screens
 Safety Laser Scanners
 Safety Controllers & Modules
 Safety Two-Hand Control Modules
 Safety Interlock Switches
 Emergency Stop & Stop Control

ACCESSORIES
 page 233



| | |
|---|--------------------------|
| 1 | Output LED |
| 2 | LO/DO Switch |
| 3 | RUN/PRG/ADJ Mode Switch |
| 4 | Lever Action Fiber Clamp |
| 5 | Red Signal Level |
| 6 | Green Threshold |
| 7 | +/Set/- Rocker Button |


FIBER SENSORS
DF-G1
 D10
 D12
 R55F
 PLASTIC FIBERS
 GLASS FIBERS

DF-G1, 10-30V dc

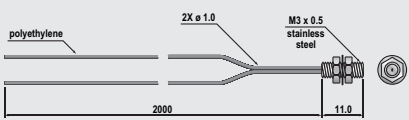
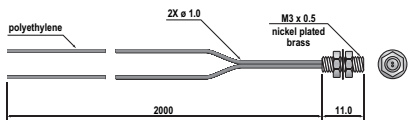
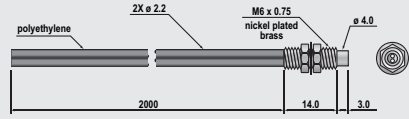
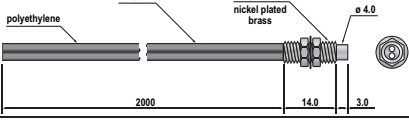
| Sensing Mode/LED | Connection | Range | Output | Model |
|----------------------|---------------------------------------|---|-------------|-------------|
| <p>PLASTIC FIBER</p> | 2 m | Range varies by Speed Selection used and with fiber optics used. See fibers section on page 230 or reference website for range information. | NPN | DF-G1-NS-2M |
| | Integral M8 Pico connector | | PNP | DF-G1-PS-2M |
| | 150mm PVC pigtail, M12 Euro connector | | NPN | DF-G1-NS-Q7 |
| | PNP | | DF-G1-PS-Q7 | |
| | | | IO-Link | DF-G1-KS-Q5 |

Connection options: A model with a QD requires a mating cordset (see page 233).
 For 9 m cable, change the suffix 2M to 9M in the 2 m model number (example, DF-G1-NS-9M).
 For M8 Pico pigtail change the suffix 2M to Q3 in the 2 m model number (example, DF-G1-NS-Q3).
 For M12 Euro pigtail change the suffix 2M to Q5 in the 2 m model number (example, DF-G1-NS-Q5).

DF-G1 Specifications

| | |
|-----------------------------|---|
| Supply Voltage and Current | 10 to 30V dc (10% max ripple) @ less than 100 mA exclusive of load Standard Mode: 960 mW, Current consumption < 40 mA @ 24V dc ECO Mode: 720 mW, Current consumption < 30 mA @ 24V dc |
| Supply Protection Circuitry | Protected against reverse polarity, over voltage, and transient voltages |
| Output Configuration | 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model |
| Output Rating | 100 mA max. load (derate 1 mA per °C above 30° C) OFF-state leakage current: < 5 µA at 30V dc ON-state saturation voltage: NPN: < 1.5V; PNP: < 2V |
| Output Protection Circuitry | Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up |
| Output Response Time | High Speed: 200 us Standard: 500 us Long Range: 2 ms Extra Long Range: 5 ms |
| Delay at Power-up | 500 milliseconds max.; outputs do not conduct during this time |
| Adjustments | 3-way RUN/PRG/ADJ Mode Switch 2-way LO/DO Switch 3-way +/SET/- Rocker Button See data sheet for detailed information. |
| Indicators | Red 4-digit Display: Signal Level Green 4-digit Display: Threshold (In Program Mode, Red and Green displays are used for programming menus) Yellow LED: Output conducting |
| Construction | Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover |
| Environmental Rating | IEC IP50, NEMA 1 |
| Connections | PVC-jacketed 2 or 9 m 4-wire integral cable, integral 4-pin Pico-style QD, Pico-style QD or Euro QD. See page 233. |
| Operating Conditions | Temperature: -10° to +55° C Storage: -20° to +85° C Relative Humidity: 95% @ 60° C (non-condensing) |
| Certifications |  |
| Hookup Diagrams | DC07 (p. 759) |

DF-G1 Range with Selected Fiber Optics (See page 252 for other fibers)

| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical DF-G1 Range (mm) |
|-----------------------------|---|----------------|-----------------------|----------------------|-----------|---|
| Plastic Diffuse Standard |  | 0.25 | 8 | • Thread | ✓ | Standard or High Speed: 5 Long Range: 10 Extra Long Range: 12 |
| |  | 0.5 | 12 | • Thread | ✓ | Standard or High Speed: 20 Long Range: 70 Extra Long Range: 80 |
| |  | 1.0 | 25 | • Thread | ✓ | Standard or High Speed: 100 Long Range: 190 Extra Long Range: 220 |
| |  | 1.5 | 38 | • Thread; long range | ✓ | Standard or High Speed: 160 Long Range: 270 Extra Long Range: 310 |



* Fibers can be free cut using fiber cutter (see page 268).

DF-G1 Range with Selected Fiber Optics (See page 252 for other fibers) (cont'd)

| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical DF-G1 Range (mm) | |
|-------------------|---------------------------|-------------------|-----------------------|--|---|---|---|
| Plastic Diffuse | Coaxial | PLI-A10 | 0.5 9X 0.25 | 12 | • Anodized AL tip; ø 0.5-3.2 mm beam spot • Glass lens | ✓ | |
| | | PBCT26UMFR | 0.5 10X 0.25 | 12 | • Thread • Overmolded flex relief | ✓ | Standard or High Speed: 42 Long Range: 75 Extra Long Range: 80 |
| | | PBCT26UM4M2.5 | 0.5 9X 0.25 | 12 | • Thread | ✓ | Standard or High Speed: 44 Long Range: 80 Extra Long Range: 90 |
| | | PBCT46U | 1.0 16X 0.265 | 25 | • Thread | ✓ | Standard or High Speed: 100 Long Range: 190 Extra Long Range: 220 |
| | | PBCT46UMFR | 1.0 16X 0.265 | 25 | • Thread • Overmolded flex relief | ✓ | Standard or High Speed: 100 Long Range: 110 Extra Long Range: 230 |
| | High Flex | PBT46UHF | 1.0 | 1 | • Thread | ✓ | Standard or High Speed: 65 Long Range: 120 Extra Long Range: 140 |
| | | PBT26UHF | 0.5 | 1 | • Thread | ✓ | Standard or High Speed: 20 Long Range: 35 Extra Long Range: 40 |
| | | PBAT46UHFMTA | 1.0 | 2 | • Threaded right angle • Stainless steel | ✓ | Standard or High Speed: 60 Long Range: 100 Extra Long Range: 120 |
| | STEELSKIN™ | PBT43TMB5 | 1.0 | 12 | • Threaded • Stainless steel | | Standard or High Speed: 80 Long Range: 180 Extra Long Range: 230 |
| | | PBAT43TMB5MTA | 1.0 | 12 | • Threaded right angle • Stainless steel | | Standard or High Speed: 70 Long Range: 160 Extra Long Range: 210 |
| PBCT23TMB5MTA | | 0.5 & 9x 0.25 | 12 | • Threaded right angle • Stainless steel • Coaxial | | Standard or High Speed: 30 Long Range: 60 Extra Long Range: 80 | |
| PBCT23TMB5 | | 0.5 & 9x 0.25 | 12 | • Threaded • Stainless steel • Coaxial | | Standard or High Speed: 40 Long Range: 80 Extra Long Range: 110 | |

* Fibers can be free cut using fiber cutter (see page 268). Indicates lens available for model. See page 260 for details.

Photoelectrics Sensors
Fiber Optic Sensors
Special Purpose Sensors
Measurement & Inspection Sensors
Vision
Wireless
Lighting & Indicators
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

FIBER SENSORS
DF-G1
D10
D12
R55F
PLASTIC FIBERS
GLASS FIBERS



DF-G1 Range with Selected Fiber Optics (See page 252 for other fibers) (cont'd)

| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical DF-G1 Range (mm) | |
|--------------|---------------------------|----------------|-----------------------|----------|---|--------------------------|--|
| Standard | PILS-1 | | 0.5 | 12 | <ul style="list-style-type: none"> Low beam divergence angle of 2° Ideal for wafer mapping | ✓ | Standard or High Speed: 860 Long Range: 1690 Extra Long Range: 2090 |
| | PIT26UMFR | | 0.5 | 12 | <ul style="list-style-type: none"> Thread Overmolded flex relief | ✓ | Standard or High Speed: 60 Long Range: 170 Extra Long Range: 220 |
| | PIT16U | | 0.25 | 8 | <ul style="list-style-type: none"> Thread | ✓ | Standard or High Speed: 20 Long Range: 47 Extra Long Range: 58 |
| | PIT26U | | 0.5 | 12 | <ul style="list-style-type: none"> Thread | ✓ | Standard or High Speed: 60 Long Range: 170 Extra Long Range: 220 |
| | PIL46U | | 1.0 | 25 | <ul style="list-style-type: none"> Plastic lens; ultra-long range Lens available separately, see page 257 | ✓ | Standard or High Speed: 2000 Long Range: 3000 Extra Long Range: 4000 |
| | PIT46UMFR | | 1.0 | 25 | <ul style="list-style-type: none"> Thread Overmolded flex relief | ✓ | Standard or High Speed: 300 Long Range: 640 Extra Long Range: 840 |
| | PIT46U | | 1.0 | 25 | <ul style="list-style-type: none"> Thread | ✓ | Standard or High Speed: 300 Long Range: 630 Extra Long Range: 820 |
| | PIT66U | | 1.5 | 38 | <ul style="list-style-type: none"> Thread; long range | ✓ | Standard or High Speed: 400 Long Range: 1130 Extra Long Range: 1320 |
| High Flex | PIT46UHF | | 1.0 | 1 | <ul style="list-style-type: none"> Thread | ✓ | Standard or High Speed: 170 Long Range: 340 Extra Long Range: 440 |
| | PIAT46UHFMFTA | | 1.0 | 2 | <ul style="list-style-type: none"> Right angle; threaded, stainless steel | ✓ | Standard or High Speed: 190 Long Range: 390 Extra Long Range: 490 |
| Array | PIRS1X166U | | 16X 0.265 | 25 | <ul style="list-style-type: none"> Ultra-compact head; side exit; 5.25 mm width | ✓ | Standard or High Speed: 240 Long Range: 490 Extra Long Range: 640 |
| Slot | PDIS46UM12 | | 1.0 | 25 | <ul style="list-style-type: none"> Easy mount "fork" head; DURA-BEND fiber | ✓ | |

* Fibers can be free cut using fiber cutter (see page 268).

Indicates lens available for model. See page 260 for details.

More on next page

DF-G1 Range with Selected Fiber Optics (See page 252 for other fibers) (cont'd)

| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical DF-G1 Range (mm) | |
|-----------------|---------------------------|----------------|-----------------------|----------|-----------|--|---|
| Plastic Opposed | STEEL-SKIN™ | PIT43TMB5 | | 1.0 | 12 | <ul style="list-style-type: none"> Threaded Stainless steel | Standard or High Speed: 280 Long Range: 580 Extra Long Range: 740 |
| | | PIAT43TMB5MTA | | 1.0 | 12 | <ul style="list-style-type: none"> Threaded right angle Stainless steel | Standard or High Speed: 280 Long Range: 580 Extra Long Range: 470 |
| Glass Diffuse | Standard | BAT16.6ST5MTA | | 1.7 | 12 | <ul style="list-style-type: none"> Threaded right angle Stainless steel | Standard or High Speed: 110 Long Range: 230 Extra Long Range: 270 |
| | | BT13.5ST5 | | 1.5 | 19 | <ul style="list-style-type: none"> Threaded Stainless steel | Standard or High Speed: 100 Long Range: 200 Extra Long Range: 240 |
| Glass Opposed | Standard | IA.31.7ST5ETA | | 0.9 | 12 | <ul style="list-style-type: none"> Smooth ferrule Side exit Stainless steel | Standard or High Speed: 65 Long Range: 130 Extra Long Range: 170 |
| | | IA.82.5PT5 | | 1.3 | 16 | <ul style="list-style-type: none"> Smooth ferrule 90° angle Stainless steel | Standard or High Speed: 290 Long Range: 620 Extra Long Range: 810 |
| | | IA.83.3ST5ETA | | 1.3 | 12 | <ul style="list-style-type: none"> Smooth ferrule Side exit Stainless steel | Standard or High Speed: 300 Long Range: 640 Extra Long Range: 810 |

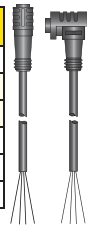
* Fibers can be free cut using fiber cutter (see page 268). Indicates lens available for model. See page 260 for details.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- FIBER SENSORS
- DF-G1
- D10
- D12
- R55F
- PLASTIC FIBERS
- GLASS FIBERS

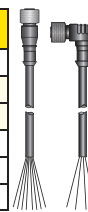
Cordsets

| Pico QD | | | | |
|--------------|---------------|-------------|----------------|-------------|
| See page 694 | | | | |
| Length | Snap-on 4-Pin | | Threaded 4-Pin | |
| | Straight | Right-Angle | Straight | Right-Angle |
| 2.00 m | PKG4-2 | PKW4Z-2 | PKG4M-2 | PKW4M-2 |
| 5.00 m | PKG4-5 | — | PKG4M-5 | PKW4M-5 |
| 9.00 m | PKG4-9 | — | PKG4M-9 | PKW4M-9 |





Additional cordset information available. See page 693.

| Euro QD | | |
|--------------|----------------|-------------|
| See page 696 | | |
| Length | Threaded 4-Pin | |
| | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |



Brackets

| DF-G1 | |
|---|--|
|  pg. 641 |  pg. 648 |
| DIN-35.. | SA-DIN-BRACKET |

Additional bracket information available. See page 632.

Clamps

| DF-G1 |
|---|
|  |
| SA-DIN-CLAMP |

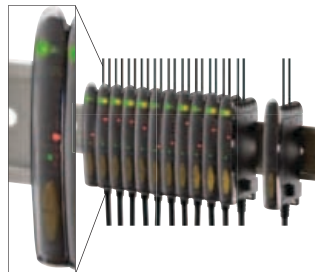
High-Performance Fiber Optic Sensing D10 Series

- Features advanced fiber optic amplifier for use with plastic fibers
- Available in bipolar, discrete and analog/discrete output models
- Available with a numeric or bargraph display on *Expert™* models
- Delivers high-performance, low-contrast sensing with automatic TEACH options or manual adjustment
- Available with visible red or green beam
- Available in Light or Dark Operate
- Includes specially designed models for reliable detection of objects as small as 1.5 mm
- Features bussable models for side-by-side mounting and simplified wiring of up to 16 sensors
- Features thin 10 mm housing for standard 35 mm DIN-rail mounting



**D10 *Expert™* with
Numeric Display**
page 235

- Numeric display of signal strength and operating status
- Two output options: two discrete outputs in the same sensor; or discrete output and either a 4-20 mA current or a 0-10V dc voltage analog output in the same sensor
- Push buttons for easy-to-set static, dynamic light set, dark set and window set programming
- Manual fine tuning and remote configuration using TEACH wire
- Four mode power and speed selection with automatic crosstalk avoidance circuitry
- Response times as fast as 50 microseconds



**D10 *Expert™* with
Bargraph Display**
page 236

- Easy-to-read 8-segment light bar display indicator for TEACH and signal strength
- Bipolar discrete outputs: one current sourcing (PNP) and one current sinking (NPN)
- Push buttons for easy-to-set static, dynamic light set, dark set and window SET programming
- Manual fine tuning
- Bussable power models with improved temperature compensation for side-by-side mounting and simplified wiring of up to 16 sensors
- Selectable high-speed mode option for 200 microsecond response



D10—Discrete Output
page 236

- 12-turn manual sensitivity adjustment
- Pulse rate LED indicator for signal strength
- Bipolar discrete outputs: one current sourcing (PNP) and one current sinking (NPN)
- Response time as fast as 200 microseconds



**D10 *Expert™*
Small Object Counter**
page 267

- Reliable low-contrast sensing for small object counting
- Easy-to-set selectable threshold with automatic compensation algorithm to compensate for dust or contamination on the fiber optic array and for ambient temperature changes
- Single discrete output plus Health mode output to indicate preventative maintenance is required
- A choice of three standard size fiber optic assemblies
- Custom size fibers for your application
- User-configurable Dynamic Event Stretcher (DES) to prevent double counting of objects
- Push buttons or remote wire for easy sensor configuration



D10 Expert™ with Numeric Display—Dual Discrete, 12-24V dc

➔ Visible Red LED ➔ Visible Green LED

| Sensing Mode/LED | Range | Connection | Models Dual NPN | Models Dual PNP |
|-------------------|--|-----------------------|-----------------|-----------------|
| PLASTIC FIBER | Range varies by Power Level/Speed Selection used and with fiber optics used. See data sheet for range information. | 2 m | D10DNFP | D10DPFP |
| | | 6-pin Snap-on Pico QD | D10DNFPQ | D10DPFPQ |
| PLASTIC FIBER | | 2 m | D10DNFPG | D10DPFPG |
| | | 6-pin Snap-on Pico QD | D10DNFPGQ | D10DPFPGQ |

D10 Expert™ with Numeric Display—Analog/Discrete, 12-24V dc

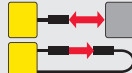
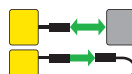
➔ Visible Red LED ➔ Visible Green LED

| Sensing Mode/LED | Range | Connection | Analog Output | Models NPN | Models PNP |
|-------------------|--|-----------------------|---------------|------------|------------|
| PLASTIC FIBER | Range varies by Power Level/Speed Selection used and with fiber optics used. See data sheet for range information. | 2 m | 4-20 mA | D10INFP | D10IPFP |
| | | 6-pin Snap-on Pico QD | | D10INFPO | D10IPFPO |
| PLASTIC FIBER | | 2 m | 4-20 mA | D10INFPG | D10IPFPG |
| | | 6-pin Snap-on Pico QD | | D10INFPGQ | D10IPFPGQ |

➔ Connection options: A model with a QD requires a mating cordset (see page 241).
 For 9 m cable, add suffix W/30 to the 2 m model number (example, D10DNFP W/30).

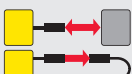
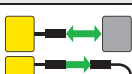
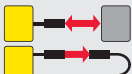
D10 Expert™ with Numeric Display—Analog/Discrete, 15-24V dc

➔ Visible Red LED ➔ Visible Green LED

| Sensing Mode/LED | Range | Connection | Analog Output | Models NPN | Models PNP |
|--|--|-----------------------|---------------|------------|------------|
|  PLASTIC FIBER | Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 252 or reference data sheet for range information. | 2 m | 0-10V | D10UNFP | D10UPFP |
| | | 6-pin Snap-on Pico QD | | D10UNFPQ | D10UPFPQ |
|  PLASTIC FIBER | | 2 m | 0-10V | D10UNFPG | D10UPFPG |
| | | 6-pin Snap-on Pico QD | | D10UNFPGQ | D10UPFPGQ |

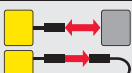
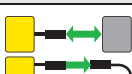
D10 Expert™ with Bargraph Display—Discrete

➔ Visible Red LED ➔ Visible Green LED

| Sensing Mode/LED | Range | Connection | Output Type | Supply Voltage | Description | Models | Excess Gain | Beam Pattern |
|--|--|-----------------------|-----------------|----------------|-----------------|----------|-------------------------|-----------------------|
|  PLASTIC FIBER | Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 252 or reference data sheet for range information. | 2 m | Bipolar NPN/PNP | 10 to 30V dc | Standard models | D10BFP | EGC-1 to EGC-4 (p. 241) | BP-1 to BP-4 (p. 242) |
| | | 6-pin Snap-on Pico QD | | | | D10BFPO | | |
|  PLASTIC FIBER | | 2 m | | | | D10BFPG | EGC-5 to EGC-8 (p. 241) | BP-5 to BP-8 (p. 242) |
| | | 6-pin Snap-on Pico QD | | | | D10BFPGQ | | |
| Bussable Power Models | | | | | | | | |
|  PLASTIC FIBER | Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 252 or reference data sheet for range information. | 2 m | Bipolar NPN/PNP | 12 to 30V dc | Main unit | D10B5FP | EGC-1 to EGC-4 (p. 233) | BP-1 to BP-4 (p. 242) |
| | | | PNP | | Sub unit | D10B2PFP | | |
| | | | NPN | | Sub unit | D10B2NFP | | |

D10—Discrete, 10-30V dc

➔ Visible Red LED ➔ Visible Green LED

| Sensing Mode/LED | Range | Connection | Output Type | Response Time | Models |
|--|--|-----------------------|-----------------|------------------|----------|
|  PLASTIC FIBER | Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 252 or reference data sheet for range information. | 2 m | Bipolar NPN/PNP | 500 microseconds | D10AFP |
| | | 4-pin Snap-on Pico QD | | | D10AFPQ |
|  PLASTIC FIBER | | 2 m | | | D10AFPG |
| | | 4-pin Snap-on Pico QD | | | D10AFPGQ |

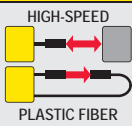
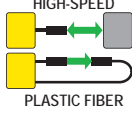
➔ More on next page

➔ Connection options: A model with a QD requires a mating cordset (see page 241).

For 9 m cable, add suffix W/30 to the 2 m model number (example, D10UNFP W/30).

D10—Discrete, 10-30V dc (cont'd)

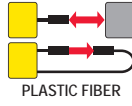
➔ Visible Red LED ➔ Visible Green LED

| Sensing Mode/LED | Range | Connection | Output Type | Response Time | Models |
|--|--|-----------------------|-----------------|------------------|-----------|
|  <p>HIGH-SPEED PLASTIC FIBER</p> | Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 252 or reference data sheet range information. | 2 m | Bipolar NPN/PNP | 200 microseconds | D10AFPY |
| | | 4-pin Snap-on Pico QD | | | D10AFPYQ |
|  <p>HIGH-SPEED PLASTIC FIBER</p> | | 2 m | | | D10AFPGY |
| | | 4-pin Snap-on Pico QD | | | D10AFPGYQ |

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

D10 Expert™ Small Object Counter with Numeric Display—Discrete, 12-24V dc

➔ Visible Red LED

| Sensing Mode/LED | Connection | Output | Sensor Models |
|--|-----------------------|---------------------------|---------------|
|  <p>PLASTIC FIBER</p> | 2 m | NPN | D10DNCFP |
| | 6-pin Snap-on Pico QD | | D10DNCFPQ |
| | 2 m | PNP | D10DPCFP |
| | 6-pin Snap-on Pico QD | | D10DPCFPQ |
| Fiber Optic Arrays | | | |
| Detection Window Dimensions** | Fiber Exit | Minimum Object Detection† | Array Models* |
| 10 x 25 mm | Side Exit | 1.5 mm | PFCVA-10X25-S |
| | End Exit | | PFCVA-10X25-E |
| 25 x 25 mm | Side Exit | 3 mm | PFCVA-25X25-S |
| | End Exit | | PFCVA-25X25-E |
| 34 x 25 mm | Side Exit | 4 mm | PFCVA-34X25-S |
| | End Exit | | PFCVA-34X25-E |

ACCESSORIES
page 241

- FIBER SENSORS
- DF-G1
- D10**
- D12
- R55F
- PLASTIC FIBERS
- GLASS FIBERS

➔ Connection options: A model with a QD requires a mating cordset (see page 241).

For 9 m cable, add suffix W/30 to the 2 m model number (example, D10DNDFP W/30).

* Custom fiber arrays and mounting configurations are possible. Consult factory for assistance with your small object counting application.

** Detailed dimension drawings for fibers are on page 267.


† With 2% Threshold Offset Percentage

D10 Expert™ with Numeric Display—Dual-Discrete Specifications


| | |
|-----------------------------|---|
| Required Fiber Optic Cable | Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 252) |
| Supply Voltage and Current | 12 to 24V dc (10% max. ripple) at less than 65 mA, exclusive of load |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltage |
| Output Configuration | Two independently configured current sourcing (PNP) or current sinking (NPN) solid-state transistors, depending on model |
| Output Rating | 150 mA max. load OFF-state leakage current: less than 10 µA at 24V dc ON-state saturation voltage: NPN: less than 1.5V at 150 mA load PNP: less than 2.5V at 150 mA load |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous short-circuit |

➔ More on next page

D10 Expert™ with Numeric Display—Dual-Discrete Specifications (cont'd)

| | | | |
|----------------------|--|-------------------------------------|--------------------------------|
| Output Response Time | Programmable, 50 microseconds, 200 microseconds, 1 millisecond, 2.5 milliseconds | | |
| Delay at Power-up | Less than 1 second; outputs do not conduct during this time | | |
| Adjustments | Two push buttons or remote programming of (TEACH) switching threshold response time, OFF-delay, light/dark operate, and display | | |
| Indicators | Four-digit digital display plus LED indicators for active channel, push-button lockout, OFF-delay and light/dark operate selection; two yellow LED output indicators | | |
| Construction | Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover | | |
| Environmental Rating | IEC IP50; NEMA 1 | | |
| Connections | PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 241. | | |
| Operating Conditions | Temperature: -20° to +55° C | Storage Temperature: -20° to +80° C | Relative humidity: 90% @ 50° C |
| | Number of Devices Stacked | Ambient Temperature Rating | Load Specification |
| | 3 | 55° C | 150 mA |
| | 7 | 50° C | 50 mA |
| | 10 | 45° C | 50 mA |
| Installation | 35 mm DIN rail or included mounting bracket | | |
| Certifications |  | | |
| Hookup Diagrams | DC15 (p. 761) | | |

D10 Expert™ with Numeric Display—Analog/Discrete Specifications

| | | | |
|-----------------------------|---|---|--------------------------------|
| Required Fiber Optic Cable | Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 252) | | |
| Supply Voltage and Current | 4-20 mA Analog Models: 12-24V dc (10% max. ripple) at less than 65 mA exclusive of load 0-10V dc Analog Models: 15-24V dc (10% max. ripple) at less than 70 mA exclusive of load | | |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltage | | |
| Output Configuration | Two independently configurable outputs, depending on model: NPN w/analog (4-20 mA or 0-10V) or PNP w/analog (4-20 mA or 0-10V) | | |
| Output Rating | Discrete Output: 150 mA, max. load OFF-state leakage current: less than 10 µA at 24V dc ON-state saturation voltage: NPN: < 1.5V @ 150 mA PNP: < 2.5V @ 150 mA | Analog Output: 4-20 mA or 0-10V dc Load: 4-20 mA Models: 100Ω max. impedance 0-10V dc Models: 1 MΩ min. impedance | |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous short-circuit | | |
| Output Response Time | Discrete Output: Programmable, 50 microseconds, 200 microseconds, 1 millisecond, 2.5 milliseconds Analog Output: 1 millisecond | | |
| Delay at Power-up | Less than 1 second; outputs do not conduct during this time | | |
| Adjustments | Push-button or remote programming of (TEACH) switching threshold response time, OFF-delay, light/dark operate, and display | | |
| Indicators | Four-digit digital display plus LED indicators for active channel, push-button lockout, OFF-delay and light/dark operate selection; two yellow output indicators | | |
| Construction | Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover | | |
| Environmental Rating | IEC IP50; NEMA 1 | | |
| Connections | PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect. QD cordsets are ordered separately. See page 241. | | |
| Operating Conditions | Temperature: -20° to +55° C | Storage Temperature: -20° to +80° C | Relative humidity: 90% @ 50° C |
| | Number of Devices Stacked | Ambient Temperature Rating | Load Specification |
| | 3 | 55° C | 150 mA |
| | 7 | 50° C | 50 mA |
| | 10 | 45° C | 50 mA |
| Installation | 35 mm DIN rail or included mounting bracket | | |
| Certifications |  | | |
| Hookup Diagrams | NPN Models: DC16 (p. 761) PNP Models: DC17 (p. 762) | | |

D10 Expert™ with Bargraph Display—Discrete Specifications

| | Standard Sensors | Models with Bussable Power |
|-----------------------------|--|---|
| Required Fiber Optic Cable | Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 241) | |
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at less than 45 mA, exclusive of load | 12 to 30V dc (10% max. ripple) at less than 45 mA, exclusive of load |
| Supply Protection Circuitry | Protected against reverse polarity, over voltage and transient voltage | |
| Delay at Power Up | 200 milliseconds max.; outputs do not conduct during this time | 850 milliseconds max.; outputs do not conduct during this time |
| Output Configuration | Bipolar: 1 current sourcing (PNP) and 1 current sinking (NPN) | Main units: Bipolar; 1 current sourcing (PNP) and 1 current sinking (NPN) Sub-units: 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model |
| Output Rating | 150 mA max. load @ 25° C (derate 1 mA per ° C increase) OFF-state leakage current: less than 5 µA at 30V dc ON-state saturation voltage: NPN: less than 200 mV at 10 mA and 1V at 150 mA load PNP: less than 1V at 10 mA and 1.5V at 150 mA load | 100 mA max. load (derate 1 mA per ° C) OFF-state leakage current: less than 5 µA at 30V dc ON-state saturation voltage: NPN: less than 1.5V PNP: less than 2V Less than 15V supply (9 m cable): up to 4 units with 100 mA outputs up to 8 units with 50 mA outputs |
| Output Protection Circuitry | Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power-up | |
| Output Response Time | 500 microseconds (normal mode) or 200 microseconds (high-speed mode) | |
| Repeatability | 100 microseconds (normal mode) or 66 microseconds (high-speed mode) | |
| Adjustments | Two push buttons and remote wire <ul style="list-style-type: none"> • Expert-style configuration (Static and Dynamic TEACH, light SET, dark SET and Windows SET) • Manually Adjust (+/-) sensitivity (from buttons only) • LO/DO, OFF-Delay, and response speed configurable (from buttons or remote wire) • Push-button lockout (from remote wire only) Factory Default Settings: Light Operate, Normal Speed, No Delay | |
| Indicators | 8-segment red bargraph* Green Status Indicators: LO, DO, High Speed (HS) and OFF-Delay Green LED: Power ON Yellow LED: Output conducting *See data sheet for detailed information | |
| Construction | Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover. | |
| Environmental Rating | IEC IP50, NEMA 1 | |
| Connections | PVC-jacketed 2 m or 9 m 6-wire integral cable, or integral 6-pin Pico-style quick-disconnect. QD cordsets are ordered separately. See page 241. | Main units: PVC-jacketed 2 m or 9 m 5-wire integral cable Sub-units: PVC-jacketed 2 m or 9 m 2-wire integral cable |
| Operating Conditions | Temperature: -10° to +55° C Storage Temperature: -20° to +85° C | Relative humidity: 90% @ 55° C |
| Installation | 35 mm DIN rail or included mounting bracket | |
| Certifications | | |
| Hookup Diagrams | Standard Models and Main Unit: DC08 (p. 759) | Sub-Units: DC09 (p. 760) |

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


- FIBER SENSORS
- DF-G1
- D10**
- D12
- R55F
- PLASTIC FIBERS
- GLASS FIBERS

D10—Discrete Specifications


| | |
|-----------------------------|--|
| Required Fiber Optic Cable | Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 252) |
| Supply Voltage & Current | 10 to 30V dc (10% max. ripple) @ less than 25 mA, exclusive of load |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltage |
| Output Configuration | Bipolar: 1 current sourcing (PNP) and 1 current sinking (NPN) |
| Output Rating | 100 mA per output with short circuit protection OFF-state leakage current: less than 10 µA sourcing; 200 µA sinking ON-state saturation voltage: NPN: 1.6V @ 100 mA PNP: 2.0V @ 100 mA |
| Output Protection Circuitry | Protected against output short-circuit and false pulse on power up |
| Delay at Power-up | Max. 100 milliseconds; outputs do not conduct during this time |

More on next page

D10—Discrete Specifications (cont'd)

| | |
|----------------------|---|
| Output Response Time | Standard models (with crosstalk avoidance circuitry): 500 microseconds High-speed models: 200 microseconds |
| Repeatability | Standard models: 95 microseconds High-speed models: 50 microseconds |
| Adjustments | 12-turn Sensitivity potentiometer with relative position indicator; LO/DO Selection switch; 0 or 40 milliseconds OFF-delay switch NOTE: Use proper ESD techniques while making adjustments under cover. |
| Indicators | Two LEDs: Green and Yellow Green: Power ON Yellow: Light Sensed Signal strength indicator See data sheet for detailed information |
| Construction | Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover. |
| Environmental Rating | IEC IP50; NEMA 1 |
| Connections | PVC-jacketed 2 m or 9 m attached cable, or 4-pin Pico-style quick-disconnect fitting. QD cordsets are ordered separately. See page 241. |
| Operating Conditions | Temperature: -10° to +55° C Storage: -20° to +85° C Relative humidity: 90% @ 55° C (non-condensing) |
| Certifications |  |
| Hookup Diagrams | DC04 (p. 758) |

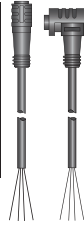
D10 Expert™ Small Object Counter—Numeric Display Specifications

| Required Fiber Optics | PFCVA models (Custom fiber arrays and mounting configurations are possible. Consult factory for assistance with your small object counting application.) | | | | | | | | | | | | | | |
|-----------------------------|--|----------------------------|----------------------------|--------------------|---|-------|--------|---|-------|-------|----|-------|-------|--|--|
| Sensing Beam | Visible red, 680 nm | | | | | | | | | | | | | | |
| Supply Voltage and Current | 12 to 24V dc (10% maximum ripple) at less than 65 mA, exclusive of load | | | | | | | | | | | | | | |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltage | | | | | | | | | | | | | | |
| Output Configuration | 2 NPN or 2 PNP, depending on model | | | | | | | | | | | | | | |
| Output Rating | 150 mA maximum load OFF-state leakage current: < 10 µA at 24V dc ON-state saturation voltage: NPN < 1.5V at 150 mA load PNP < 2.5V at 150 mA load | | | | | | | | | | | | | | |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous short-circuit | | | | | | | | | | | | | | |
| Output Response Time | Programmable, 150 microseconds, 225 microseconds, 300 microseconds | | | | | | | | | | | | | | |
| Delay at Power-up | Less than 1 second; outputs do not conduct during this time. | | | | | | | | | | | | | | |
| Adjustments | Push-button or remote programming of threshold offset percentage, light/dark operate, Dynamic Event Stretcher (DES), display, and power/speed | | | | | | | | | | | | | | |
| Indicators | Four-digit digital display, 2 arrow icons, push-button lockout, Dynamic Event Stretcher, light/dark operate selection and 2 amber output LEDs | | | | | | | | | | | | | | |
| Construction | Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover | | | | | | | | | | | | | | |
| Environmental Rating | NEMA 1; IEC IP50 | | | | | | | | | | | | | | |
| Connections | PVC-jacketed 2 m or 9 m 6-wire integral cable or integral 6-pin Pico-style quick-disconnect. QD cordsets are ordered separately. See page 241. | | | | | | | | | | | | | | |
| Operating Conditions | Temperature: -20° to +55° C Storage Temperature: -20° to +80° C Relative Humidity: 90% @ 50° C (non-condensing) | | | | | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Number of Devices, Stacked</th> <th>Ambient Temperature Rating</th> <th>Load Specification</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>55° C</td> <td>150 mA</td> </tr> <tr> <td>7</td> <td>50° C</td> <td>50 mA</td> </tr> <tr> <td>10</td> <td>45° C</td> <td>50 mA</td> </tr> </tbody> </table> | Number of Devices, Stacked | Ambient Temperature Rating | Load Specification | 3 | 55° C | 150 mA | 7 | 50° C | 50 mA | 10 | 45° C | 50 mA | | |
| Number of Devices, Stacked | Ambient Temperature Rating | Load Specification | | | | | | | | | | | | | |
| 3 | 55° C | 150 mA | | | | | | | | | | | | | |
| 7 | 50° C | 50 mA | | | | | | | | | | | | | |
| 10 | 45° C | 50 mA | | | | | | | | | | | | | |
| Installation | 35 mm DIN rail or included mounting bracket | | | | | | | | | | | | | | |
| Certifications |  | | | | | | | | | | | | | | |
| Hookup Diagrams | DC18 (p. 762) | | | | | | | | | | | | | | |

Cordsets

| Pico QD | | | | |
|--------------|---------------|-------------|---------------|-------------|
| See page 695 | | | | |
| Length | Snap-on 4-Pin | | Snap-on 6-Pin | |
| | Straight | Right-Angle | Straight | Right-Angle |
| 2.00 m | PKG4-2 | PKW4Z-2 | PKG6Z-2 | PKW6Z-2 |
| 9.00 m | — | — | PKG6Z-9 | PKW6Z-9 |

Additional cordset information available. See page 693.



Brackets

| D10 | | |
|-----------|-----------|-----------|
| | | |
| pg. 641 | pg. 686 | pg. 686 |
| DIN-35... | SMBR55F01 | SMBR55FRA |

Additional bracket information available. See page 632.

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Excess Gain Curves (Diffuse-mode performance based on 90% reflectance white test card)

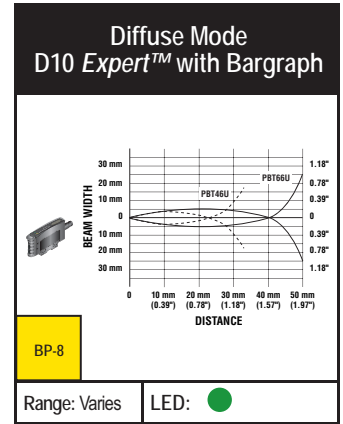
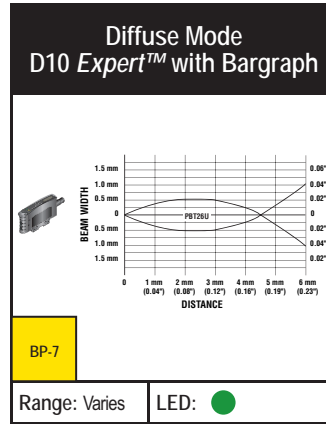
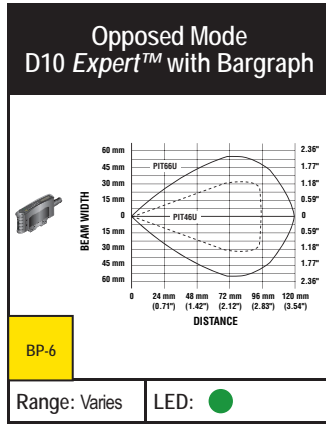
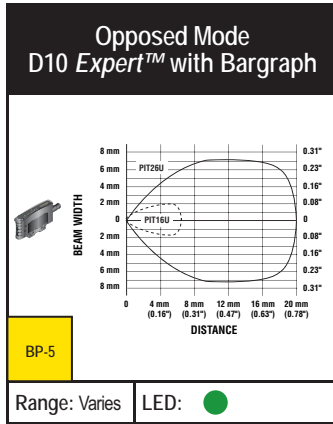
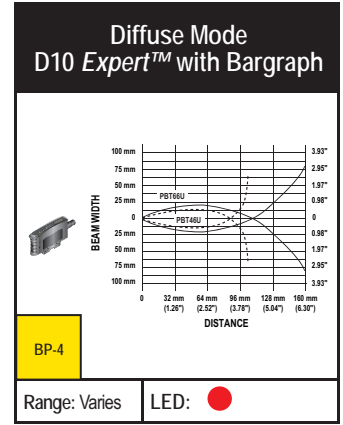
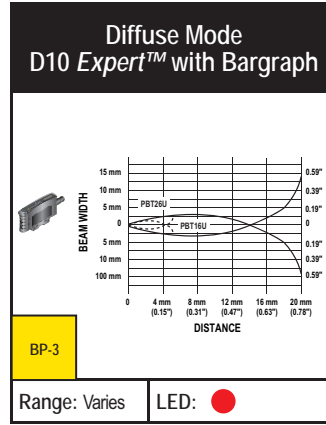
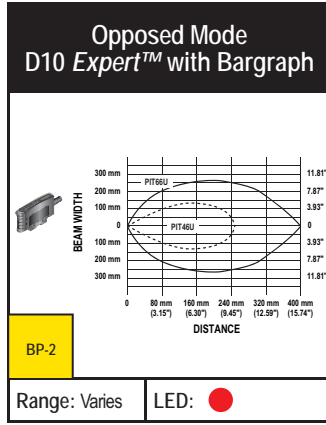
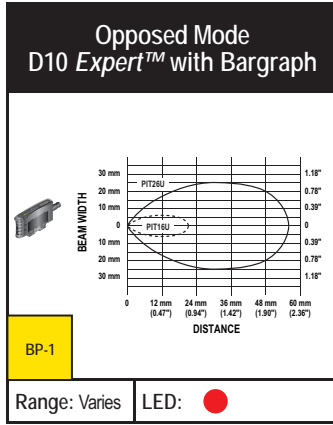
● = Visible Red LED ● = Visible Green LED

| | | | |
|--|--|--|--|
| <p style="text-align: center;">Opposed Mode D10 Expert™ with Bargraph</p> <p style="text-align: center;">EGC-1</p> <p>Range: Varies LED: ●</p> | <p style="text-align: center;">Opposed Mode D10 Expert™ with Bargraph</p> <p style="text-align: center;">EGC-2</p> <p>Range: Varies LED: ●</p> | <p style="text-align: center;">Diffuse Mode D10 Expert™ with Bargraph</p> <p style="text-align: center;">EGC-3</p> <p>Range: Varies LED: ●</p> | <p style="text-align: center;">Diffuse Mode D10 Expert™ with Bargraph</p> <p style="text-align: center;">EGC-4</p> <p>Range: Varies LED: ●</p> |
| <p style="text-align: center;">Opposed Mode D10 Expert™ with Bargraph</p> <p style="text-align: center;">EGC-5</p> <p>Range: Varies LED: ●</p> | <p style="text-align: center;">Opposed Mode D10 Expert™ with Bargraph</p> <p style="text-align: center;">EGC-6</p> <p>Range: Varies LED: ●</p> | <p style="text-align: center;">Diffuse Mode D10 Expert™ with Bargraph</p> <p style="text-align: center;">EGC-7</p> <p>Range: Varies LED: ●</p> | <p style="text-align: center;">Diffuse Mode D10 Expert™ with Bargraph</p> <p style="text-align: center;">EGC-8</p> <p>Range: Varies LED: ●</p> |

- FIBER SENSORS
- DF-G1
- D10**
- D12
- R55F
- PLASTIC FIBERS
- GLASS FIBERS

Beam Patterns (Diffuse-mode performance based on 90% reflectance white test card)

● = Visible Red LED ● = Visible Green LED



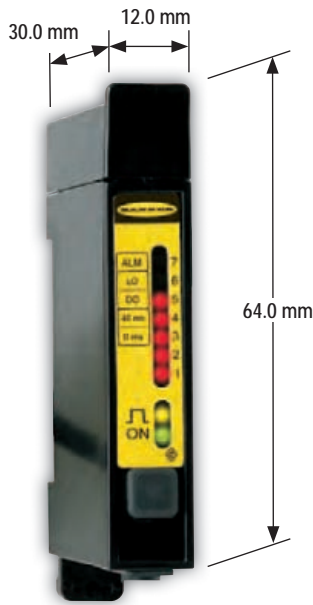


Complete Family of Plastic and Glass Fiber Optic Sensors D12

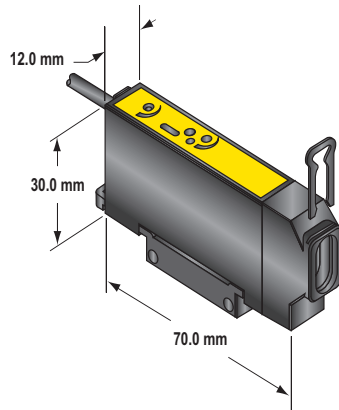
- Features LED bargraph that indicates signal strength, sensing contrast, programming status and diagnostic warnings, when not in high-speed mode
- Available in glass and plastic fiber optic models
- Includes marginal gain indicator with alarm output
- Solves routine applications with economical standard models
- Features high-speed sensing response and higher sensing power in some models
- Excels in low-contrast applications with ac-coupled models
- Features easy push-button TEACH-mode setup on D12E *Expert*™ models
- Easily mounts to standard 35 mm DIN-rail mounting

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 247



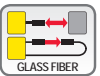
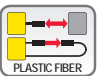
Plastic Fiber Models
Suffix FP and FPY



Glass Fiber Models
Suffix FV and FVY



- FIBER SENSORS
- DF-G1
- D10
- D12**
- R55F
- PLASTIC FIBERS
- GLASS FIBERS



D12 *Expert*™, 10-30V dc

➔ Visible Red LED

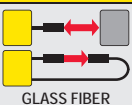
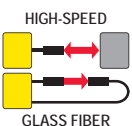
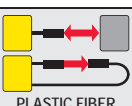
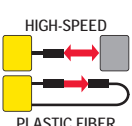
| Sensing Mode/LED | Maximum Range | Switching Threshold Setting | Connection | Models NPN | Models PNP |
|-------------------|--|--|------------|------------|------------|
| GLASS FIBER | Range varies by sensing mode and fiber optics used. See data sheet for maximum range specifications. | Just above the "dark" condition | 2 m | D12EN6FV | D12EP6FV |
| | | Midway between "dark" and "light" conditions | | D12E2N6FV | D12E2P6FV |
| PLASTIC FIBER | | Just above the "dark" condition | | D12EN6FP | D12EP6FP |
| | | Midway between "dark" and "light" conditions | | D12E2N6FP | D12E2P6FP |

Connection options: A model with a QD requires a mating cordset (see page 247).

For 9 m cable, add suffix W/30 to the 2 m model number (example, D12EN6FV W/30).

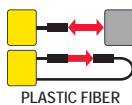
D12 and D12 High-Speed, 10-30V dc

→ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Response | Models NPN | Models PNP | Excess Gain | |
|--|--|--|---|--------------|--------------|------------------------|------------------------|
|  GLASS FIBER | Range varies by sensing mode and fiber optics used | 2 m | 500 μ s | D12SN6FV | D12SP6FV | EGC-1 & EGC-2 (p. 247) | |
| | | 4-Pin Pico Pigtail QD | | D12SN6FVQ | D12SP6FVQ | | |
|  HIGH-SPEED GLASS FIBER | | 2 m | Selectable 50 μ s or 500 μ s* | D12SN6FVY | D12SP6FVY | EGC-3 & EGC-4 (p. 247) | |
| | | 4-Pin Pico Pigtail QD | | D12SN6FVYQ | D12SP6FVYQ | | |
| | | 2 m | | D12SN6FVY1† | D12SP6FVY1† | | |
| | | 4-Pin Pico Pigtail QD | | D12SN6FVY1Q† | D12SP6FVY1Q† | | |
|  PLASTIC FIBER | | Range varies by sensing mode and fiber optics used | 2 m | 500 μ s | D12SN6FP | D12SP6FP | EGC-5 & EGC-6 (p. 247) |
| | | | 4-Pin Pico Pigtail QD | | D12SN6FPQ | D12SP6FPQ | |
|  HIGH-SPEED PLASTIC FIBER | 2 m | | Selectable 50 μ s or 500 μ s* | D12SN6FPY | D12SP6FPY | EGC-7 & EGC-8 (p. 247) | |
| | 4-Pin Pico Pigtail QD | | | D12SN6FPYQ | D12SP6FPYQ | | |
| | 2 m | | | D12SN6FPY1† | D12SP6FPY1† | | |
| | 4-Pin Pico Pigtail QD | | | D12SN6FPY1Q† | D12SP6FPY1Q† | | |

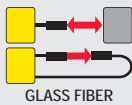
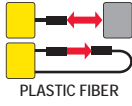
D12 High-Power, 10-30V dc

→ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Response | Models NPN | Models PNP | Excess Gain |
|--|--|-----------------------|-----------------|------------|------------|-------------------------|
|  PLASTIC FIBER | Range varies by sensing mode and fiber optics used | 2 m | 500 μ s | D12SN6FPH | D12SP6FPH | EGC-9 & EGC-10 (p. 247) |
| | | 4-Pin Pico Pigtail QD | | D12SN6FPHQ | D12SP6FPHQ | |

D12 AC-Coupled, 10-30V dc

→ Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Output Response | Models |
|--|--|-----------------------|--------------------|-----------------|------------|
|  GLASS FIBER | Range varies by Power Level/Speed Selection used and with fiber optics used. See data sheet for range information. | 2 m | Bipolar NPN/PNP | 50 μ s | D12DAB6FV |
| | | 4-Pin Pico Pigtail QD | | | D12DAB6FVQ |
|  PLASTIC FIBER | | 2 m | | | D12DAB6FP |
| | | 4-Pin Pico Pigtail QD | | | D12DAB6FPQ |

Connection options: A model with a QD requires a mating cordset (see page 247).

For 9 m cable, add suffix W/30 to the 2 m model number (example, D12SN6FV W/30).

† Y1 models have 20 milliseconds output pulse stretcher.
 * When 50 microseconds is selected, bargraph is disabled.

D12 Expert™ Specifications

| | |
|-------------------------------|--|
| Supply Voltage and Current | 10 to 30V dc at 45 mA max. (exclusive of load); 10% max. ripple |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | NPN open collector (both outputs) or PNP open collector (both outputs), depending on model Load output: Normally open and programmable Light or Dark Operate; Alarm output: Normally open |
| Output Rating | 150 mA max. each output OFF-state leakage current: less than 10 µA at 30V dc ON-state saturation voltage: less than 1 volt at 10 mA dc; less than 1.5 volts at 150 mA dc The total load may not exceed 150 mA |
| Output Protection Circuitry | Protected against false pulse on power-up and short circuit of outputs (trips at 175 mA) |
| Output Response Time | 200 microseconds ON/OFF (40 milliseconds OFF when OFF-delay selected) NOTE: False pulse protection circuit causes a 0.1 second delay on power-up |
| Output Operation Mode | Light or Dark Operate: selected by push button |
| Output Timing Functions | ON/OFF (no delay) or fixed 40 millisecond OFF-delay; selected by push button |
| Repeatability | 66 microseconds |
| Adjustments | Push-button TEACH-mode sensitivity setting; Remote teaching input is provided |
| Indicators | Green: power ON and flashes when ready for TEACH mode Yellow: output conducting 7-segment moving dot red LED See data sheet for detailed information |
| Mounting Bracket | D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware |
| Construction | Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is acetal |
| Environmental Rating | IEC IP11; NEMA 2 |
| Connections | PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cordsets are ordered separately. See page 247. |
| Operating Conditions | Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Certifications (except D10E2) | |
| Hookup Diagrams | DC19 (p. 762) |

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


- FIBER SENSORS
- DF-G1
- D10
- D12**
- R55F
- PLASTIC FIBERS
- GLASS FIBERS

D12 Standard, High-Speed and High-Power Specifications


| | |
|-----------------------------|---|
| Supply Voltage and Current | 10 to 30V dc at 45 mA max. (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Outputs are NPN (sinking) or PNP (sourcing), depending on model Complementary: one normally open (NO) and the other normally closed (NC); NC output may be wired as diagnostic alarm output by reversing power supply connections except high speed "Y" and "Y1" suffix models (see hookups) |
| Output Rating | 150 mA max. each output OFF-state leakage current: less than 10 µA at 30V dc ON-state saturation voltage: less than 1 volt at 10 mA dc; less than 1.5 volts at 150 mA dc The total load may not exceed 150 mA |
| Output Protection Circuitry | Protected against false pulse on power-up and short circuit of outputs |
| Output Response Time | Standard and High-Power Models: 500 microseconds ON/OFF High-Speed Models: selectable 50 or 500 microseconds ON/OFF NOTE: False pulse protection circuit causes a 0.1 second delay on power-up |
| Output Timing Functions | "Y1" models have fixed 20 milliseconds pulse stretcher (OFF-delay) when 50 microseconds mode is used |
| Repeatability | 130 microseconds; "Y" and "Y1" models have selectable 50 microseconds/500 microseconds response; repeatability in 50 microseconds mode is 15 microseconds |
| Adjustments | 15-turn adjustment sensitivity; "Y" and "Y1" (high speed models) also have a response mode selector switch |

More on next page

D12 Standard, High-Speed and High-Power Specifications (cont'd)

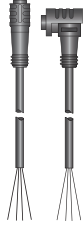
| | |
|----------------------|--|
| Indicators | Two top-mounted LED indicators: one yellow and one green, and one 7-segment red LED moving dot bargraph; Note that the 7-segment bargraph and marginal excess gain indication (bargraph segment #7) are inoperative in the 50 μ s response mode of "Y" and "Y1" models Green: LED lights for DC Power ON Yellow: LED lights for normally open output conducting On all models in 500 microseconds response mode, the 7-segment moving dot red LED bargraph lights to indicate relative received light signal strength; On all models in 50 and 500 microseconds response mode, segment #1 flashes to indicate OUTPUT OVERLOAD; On all models in the 500 microseconds response mode, segment #7 flashes to indicate MARGINAL EXCESS GAIN; On standard and high power models, a flashing LED corresponds to the "ON" state of the alarm output; (Alarm output not available on Y & Y1 models) |
| Mounting Bracket | D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware |
| Construction | Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is acetal |
| Environmental Rating | IEC IP11; NEMA 2 |
| Connections | PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cordsets are ordered separately. See page 247. |
| Operating Conditions | Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Certifications |  |
| Hookup Diagrams | NPN Models: DC05 (p. 759) PNP Models: DC06 (p. 759) |


D12 AC-Coupled Specifications

| | |
|-----------------------------|---|
| Supply Voltage and Current | 10 to 30V dc at 60 mA max. (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Bipolar: one NPN (current sinking) and one PNP (current sourcing) open-collector transistor |
| Output Rating | 150 mA max. each output OFF-state leakage current: less than 10 μ A at 30V dc ON-state saturation voltage: less than 1 volt at 10 mA dc; less than 1.5 volts at 150 mA dc The total load may not exceed 150 mA |
| Output Protection Circuitry | Protected against false pulse on power-up and short circuit of outputs |
| Output Response Time | 50 microseconds ON/OFF NOTE: False pulse protection circuit causes a 0.1 second delay on power-up |
| Output Operation Mode | Light operate or dark operate: selected by switch |
| Output Timing Functions | Pulse output; adjustable from 1 to 70 milliseconds |
| Repeatability | 15 microseconds ON |
| Adjustments | Three top-panel controls: SENSITIVITY control (15-turn slotted brass screw, clutched at both ends of adjustment), a light- or dark-operate select switch, and an OUTPUT PULSE adjustment (3/4-turn potentiometer) |
| Indicators | Three top-mounted LED indicators: Green LED: Lights to indicate dc Power ON Yellow LED: Lights for Output Conducting Red LED: Lights whenever AGC system is locked onto the signal |
| Mounting Bracket | D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware |
| Construction | Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is acetal |
| Environmental Rating | IEC IP11; NEMA 2 |
| Connections | PVC-jacketed 2 m or 9 m cables, or 150 mm pigtail with 4-pin Pico-style quick-disconnect (QD) are available. QD cordsets are ordered separately. See page 247. |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Application Note | D12 AC-coupled sensors should not be used in areas of known electrical "noise" or RF fields. |
| Certifications |  |
| Hookup Diagrams | DC04 (p. 758) |




Cordsets


| Pico QD | | |
|---------------|----------|-------------|
| See page 695 | | |
| Snap-on 4-Pin | | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG4-2 | PKW4Z-2 |




 Additional cordset information available. See page 693.

Brackets

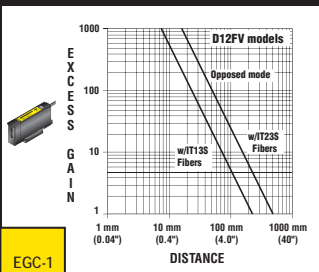
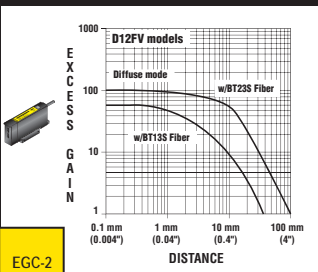
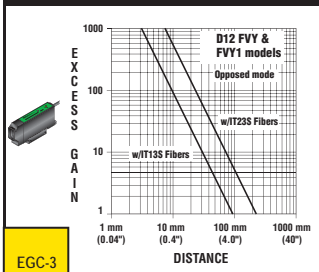
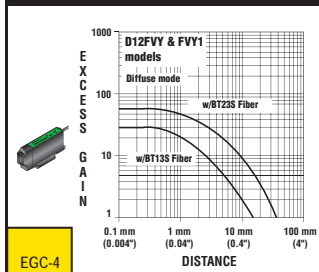
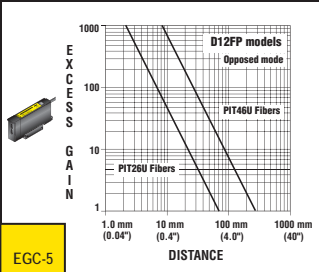
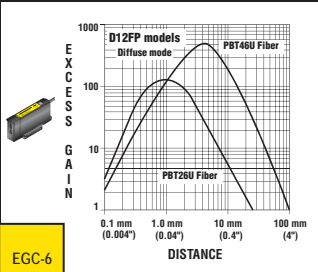
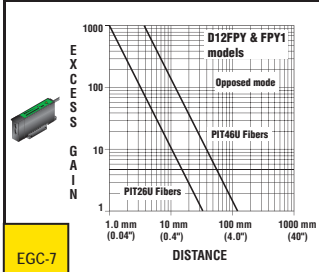
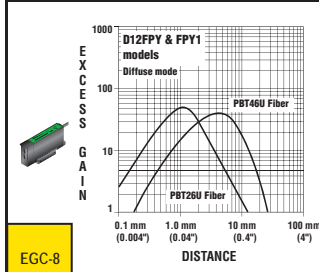
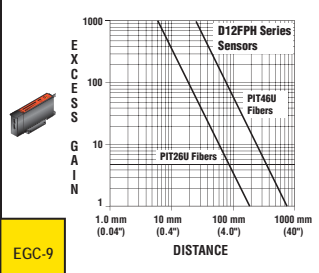
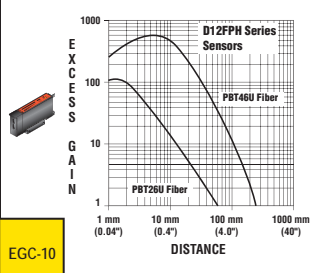
| D12 | | |
|---|--|---|
|  |  |  |
| pg. 641 | pg. 686 | pg. 686 |
| DIN-35... | SMBR55F01 | SMBR55FRA |


 Additional bracket information available. See page 632.

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Excess Gain Curves (Diffuse-mode performance based on 90% reflectance white test card)

● = Visible Red LED

| | | | |
|--|--|--|---|
| <h3>Opposed Mode—Glass Fiber D12 Standard</h3>  <p>EGC-1</p> <p>Range: Varies LED: ●</p> | <h3>Diffuse Mode—Glass Fiber D12 Standard</h3>  <p>EGC-2</p> <p>Range: Varies LED: ●</p> | <h3>Opposed Mode—Glass Fiber D12 High Speed</h3>  <p>EGC-3</p> <p>Range: Varies LED: ●</p> | <h3>Diffuse Mode—Glass Fiber D12 High Speed</h3>  <p>EGC-4</p> <p>Range: Varies LED: ●</p> |
| <h3>Opposed Mode—Plastic Fiber D12 Standard</h3>  <p>EGC-5</p> <p>Range: Varies LED: ●</p> | <h3>Diffuse Mode—Plastic Fiber D12 Standard</h3>  <p>EGC-6</p> <p>Range: Varies LED: ●</p> | <h3>Opposed Mode—Plastic Fiber D12 High Speed</h3>  <p>EGC-7</p> <p>Range: Varies LED: ●</p> | <h3>Diffuse Mode—Plastic Fiber D12 High Speed</h3>  <p>EGC-8</p> <p>Range: Varies LED: ●</p> |
| <h3>Opposed Mode—Plastic Fiber D12 High Power</h3>  <p>EGC-9</p> <p>Range: Varies LED: ●</p> | <h3>Diffuse Mode—Plastic Fiber D12 High Power</h3>  <p>EGC-10</p> <p>Range: Varies LED: ●</p> | | |

- FIBER SENSORS
- DF-G1
- D10
- D12**
- R55F
- PLASTIC FIBERS
- GLASS FIBERS

Glass or Plastic Fiber Optic Sensors R55F

- Delivers outstanding color contrast sensitivity
- Features innovative TEACH function with two options for setting the sensing threshold
- Reliably detects 16 levels of grayscale at up to 10,000 actuations per second
- Available in two fiber types: economical plastic for repeated flexing and glass for harsh conditions
- Easily mounts in confined areas, either flat or to 35 mm DIN rail
- Provides bipolar (NPN/PNP) outputs with delay settings of 0, 20 and 40 milliseconds
- Clearly displays relative received signal strength with 10-element indicator bargraph



ACCESSORIES
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PLASTIC FIBERS
PAGE 252

GLASS FIBERS
PAGE 252

PLASTIC FIBER

GLASS FIBER



R55F Fiber Optic, 10-30V dc

⇨ Infrared LED

⇨ Visible Red LED

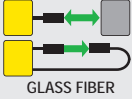
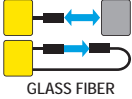
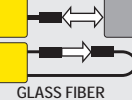
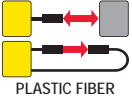
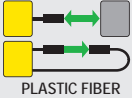
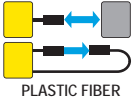
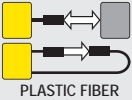
| Sensing Mode/LED | Range | Connection | Output Type | Models |
|--------------------|---|---------------|-----------------|--------|
| <p>GLASS FIBER</p> | Range varies by sensing mode and fiber optics used. | 2 m | Bipolar NPN/PNP | R55F |
| | | 5-pin Euro QD | | R55FQ |
| <p>GLASS FIBER</p> | | 2 m | | R55FV |
| | | 5-pin Euro QD | | R55FVQ |


Connection options: A model with a QD requires a mating cordset (see page 250).

For 9 m cable, add suffix W/30 to the 2 m model number (example, R55F W/30).

R55F Fiber Optic, 10-30V dc

→ Visible Green LED
 → Visible Blue LED
 ⇄ Visible White LED
 → Visible Red LED

| Sensing Mode/LED | Range | Connection | Output Type | Models |
|---|---|---------------|--------------------|---------|
|  GLASS FIBER | Range varies by sensing mode and fiber optics used. | 2 m | Bipolar NPN/PNP | R55FVG |
| | | 5-pin Euro QD | | R55FVGQ |
|  GLASS FIBER | | 2 m | | R55FVB |
| | | 5-pin Euro QD | | R55FVBQ |
|  GLASS FIBER | | 2 m | | R55FVW |
| | | 5-pin Euro QD | | R55FVWQ |
|  PLASTIC FIBER | | 2 m | | R55FP |
| | | 5-pin Euro QD | | R55FPQ |
|  PLASTIC FIBER | | 2 m | | R55FPG |
| | | 5-pin Euro QD | | R55FPGQ |
|  PLASTIC FIBER | | 2 m | | R55FPB |
| | | 5-pin Euro QD | | R55FPBQ |
|  PLASTIC FIBER | | 2 m | | R55FPW |
| | | 5-pin Euro QD | | R55FPWQ |

 Connection options: A model with a QD requires a mating cordset (see page 250).
 For 9 m cable, add suffix W/30 to the 2 m model number (example, R55F W/30).

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

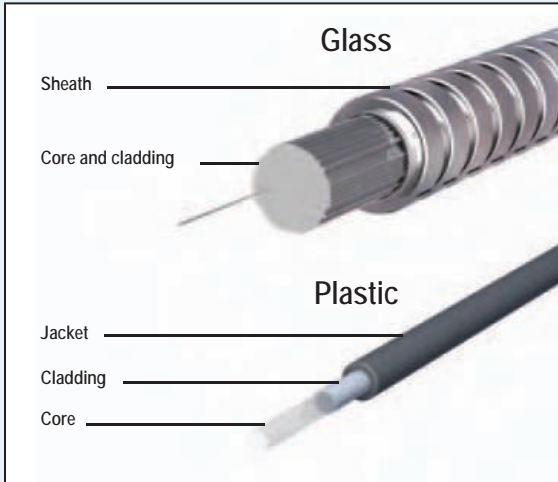
ACCESSORIES
 page 250

- FIBER SENSORS
- D10
- D12
- R55F**
- PLASTIC FIBERS
- GLASS FIBERS

| R55F Fiber Optic Specifications | |
|---------------------------------|--|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at less than 70 mA, exclusive of load |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor |
| Output Rating | 150 mA max each output @ 25° C (derate 1 mA per ° C increase) OFF-state leakage current: less than 5 µA @ 30V dc ON-state saturation voltage: PNP: less than 1V @ 10 mA; 1.5V @ 150 mA NPN: less than 200 mV @ 10 mA; 1V @ 150 mA |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short-circuit of outputs |
| Output Response Time | 50 microseconds |
| Delay at Power-up | 100 milliseconds; outputs do not conduct during this time. |


 More on next page

Fiber Construction



| | |
|---------------|---|
| Core | Thin glass or plastic center of the fiber through which light travels. |
| Cladding | Outer optical material surrounding the core that reflects light back into the core. |
| Jacket/Sheath | Protective layer to protect fiber from damage and moisture. |

Choosing Plastic or Glass

Plastic fibers are for general purpose use. They tolerate severe flexing, can be cut to length in the field and cost less than glass fibers. Glass fibers are the best choice for challenging environments such as high temperatures, corrosive materials and moisture.



- Plastic fibers** page 252
- Inexpensive and easily cut to length during installation
 - Bend for a precise fit
 - Available in high-flex models to withstand flexing
 - Offered with special jackets that withstand corrosion, impact and abrasion
 - Available in coiled versions for applications requiring articulated or reciprocating motion
 - Available in diameters of 0.25, 0.5, 1.0 or 1.5 mm
 - Can be quickly custom designed and built for your unique applications

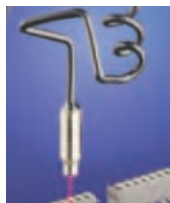


- Glass fibers** page 269
- Solve numerous challenging sensing requirements
 - Ideal for hostile environments such as high temperatures to 480° C, corrosive materials and extreme moisture
 - Withstand high levels of shock and vibration
 - Inherently immune to extreme electrical noise
 - Available with choice of sheathings: standard stainless-steel flexible conduit, PVC or other flexible tubing
 - Can be quickly custom designed

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Special Purpose Sensors
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- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- FIBER SENSORS**
- PLASTIC FIBERS
- GLASS FIBERS

Specialty fibers for specific sensing applications.



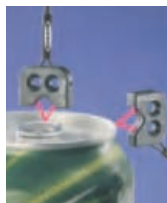
DURA-BEND™ for extremely tight radius bends



Fluoropolymer encapsulated fibers



Focused beam fibers



Convergent beam fibers



Linear array fibers



Liquid level detection fibers



High temperature fibers



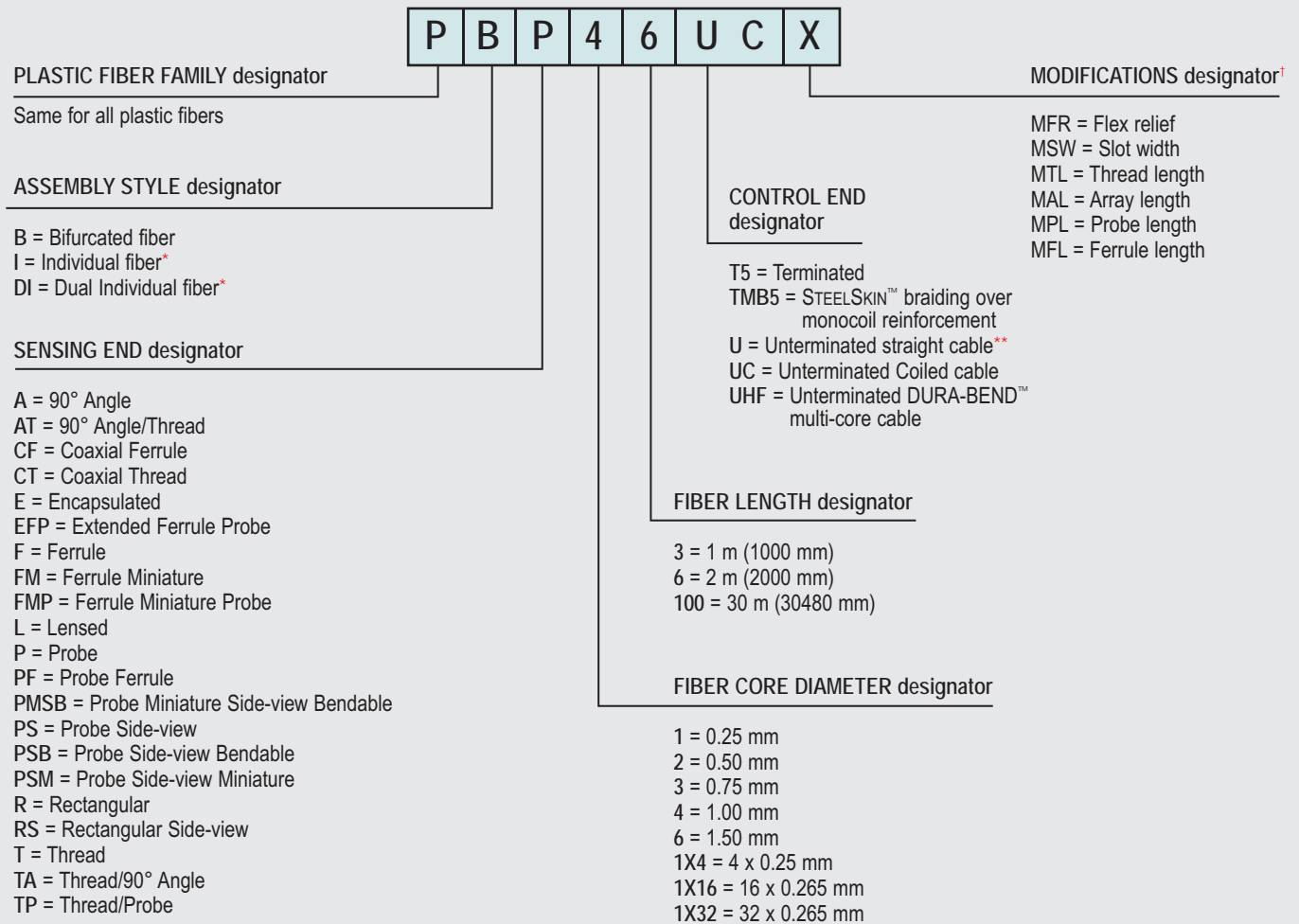
STEELSKIN™ for impact and abrasion

Plastic Fiber Optics

- Provide an economical alternative to glass fiber optics for piping photoelectric sensing light to and from confined areas with suitable environments
- Ideal for detecting small objects
- Withstand repeated flexing and bending
- Available in individual or bifurcated styles*
- Available with optional DURA-BEND™ fibers for improved flexibility in difficult-to-access locations, without the decreased performance to which excessively bent standard plastic fibers optics are prone
- Available with core diameters of 0.25, 0.50, 0.75, 1.0 and 1.5 mm



Plastic Fiber Optic Model Key



* All individual plastic fiber optics are sold and used in pairs. Bifurcated fibers are two-way fibers with a single sensing end that both emits and receives light and with dual-control sensor ends that attach separately to the sensor's LED and photodetector.

** Plastic fibers with "U" in the suffix of the model numbers have unterminated control ends; cut them to the required length using the supplied cutter.

† Not all modifications can be applied to all fiber assemblies. Please consult factory for verification of modifications.

| Plastic Fiber Optics Specifications | |
|-------------------------------------|---|
| Construction | Optical Fiber: acrylic (PMMA) monofilament, except as noted Protective Jacket: black polyethylene, except as noted Threaded End Tips and Hardware: nickel-plated brass, except as noted Probe End Tips: annealed (bendable) 304 stainless steel Angled End tips: hardened 304 stainless steel Ferrule End Tips: 303 stainless steel |
| Sensing Range | Refer to the specific fiber optic/sensor combination |
| Implied Dimensional Tolerance | All dimensions are in millimeters: x = ±2.5 mm, x.x = ±0.25 mm and x.xx = ±0.12 mm, unless specified. "L" = ±40 mm per meter |
| Minimum Bend Radius | 8 mm for 0.25 mm diameter fibers 12 mm for 0.5 mm diameter fibers (except DURA-BEND™) 25 mm for 1.0 mm diameter fibers (except DURA-BEND™) 38 mm for 1.5 mm diameter fibers |
| Repeat Bending/Flexing | Life expectancy of plastic fiber optic cable is in excess of one million cycles at bend radii of no less than the minimum and a bend of 90° or less. Avoid stress at the point where the cable enters the sensor ("control end") and at the sensing end tip. Coiled plastic fiber optic assemblies are recommended for any application requiring reciprocating fiber motion. |
| Chemical Resistance | The acrylic core of the monofilament optical fiber will be damaged by contact with acids, strong bases (alkalis) and solvents. The polyethylene jacket will protect the fiber from most chemical environments. However, materials may migrate through the jacket with long term exposure. Samples of fiber optic material are available from Banner for testing and evaluation. |
| Temperature Extremes | Temperatures below -30° C will cause embrittlement of the plastic materials but will not cause transmission loss. Temperatures above +70° C will cause both transmission loss and fiber shrinkage. |
| Operating Temperature | -30° to +70° C, unless otherwise specified |

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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- FIBER SENSORS
- PLASTIC FIBERS**
- Diffuse
- Opposed
- Accessories
- GLASS FIBERS

▲ APPLICATION NOTES AND WARNINGS ▲

- 1** Plastic fiber assemblies with "U" in the suffix of the model numbers have unterminated control ends (the end that is coupled to the photoelectric sensor). The customer can cut these fiber optic assemblies to the required length using the supplied cutter. Use only the supplied cutter to ensure optimal light coupling efficiency.
- 2** Terminated plastic fiber assemblies are optically ground and polished and cannot be shortened, spliced or otherwise modified.
- 3** Do not subject the plastic fibers to sharp bends, pinching, high tensile loads or high levels of radiation.
- 4** When ordering fiber lengths in excess of 2 m, take into account light signal attenuation due to the additional length.
- 5** Due to their light transmission properties, plastic fiber optics are recommended for use only with visible light fiber optic sensors.
- 6** Use caution when applying fiber optics in hazardous locations. Although fiber optic assemblies are, by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT. Alternatively, fiber optics may be used with NAMUR sensor model Q45AD9FP (page 204). Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.



| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) |
|---------------|---------------------------|----------------|-----------------------|---------------------------------------|-----------|--------------------|
| PBF16U | | 0.25 | 8 | • Smooth ferrule | ✓ | |
| PBF26U | | 0.5 | 12 | • Smooth ferrule | ✓ | |
| PBF46U | | 1.0 | 25 | • Smooth ferrule | ✓ | |
| PBF46UM3MJ1.3 | | 1.0 | 25 | • Smooth ferrule; thin jacket (ø 1.3) | ✓ | |
| PBF66U | | 1.5 | 38 | • Smooth ferrule; long range | ✓ | |
| PBFM16U | | 0.25 | 8 | • Non-bendable miniature tip | ✓ | |
| PBFM46U | | 1.0 | 25 | • Smooth ferrule | ✓ | |
| PBT16U | | 0.25 | 8 | • Thread | ✓ | |
| PBT26U | | 0.5 | 12 | • Thread | ✓ | |
| PBT26UMFR | | 0.5 | 12 | • Thread • Overmolded flex relief | ✓ | |
| PBT46U | | 1.0 | 25 | • Thread | ✓ | |
| PBT46UMFR | | 1.0 | 25 | • Thread • Overmolded flex relief | ✓ | |

NA: WORLD-BEAM QS18 not recommended.

* Fibers can be free cut using fiber cutter (see page 268).

More on next page



| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) |
|--------------|---------------------------|----------------|-----------------------|-------------------------------------|-----------|--------------------|
| Standard | PBT66U | 1.5 | 38 | • Thread; long range | ✓ | |
| | PBEFF26U | 0.5 | 12 | • Smooth ferrule; non-bendable tip | ✓ | |
| Probe | PBFMP16UMIP2 | 0.25 | 8 | • Smooth ferrule; non-bendable tip | ✓ | |
| | PBP16U | 0.25 | 8 | • Thread; bendable tip | ✓ | |
| | PBP26U | 0.5 | 12 | • Thread; bendable tip | ✓ | |
| | PBP46U | 1.0 | 25 | • Thread; bendable tip | ✓ | |
| | PBPF26U | 0.5 | 12 | • Thread; bendable tip | ✓ | |
| | PBPF26UUMB | 0.5 | 12 | • Flat mounting block; bendable tip | ✓ | |
| | PBPMSB36U | 0.75 | 20 | • Smooth ferrule; bendable tip | ✓ | |
| Side-View | PBPS26U | 0.5 | 12 | • Smooth ferrule; bendable tip | ✓ | |
| | PBPS46U | 1.0 | 25 | • Smooth ferrule; bendable tip | ✓ | |
| | PBPS46UMT | 1.0 | 25 | • Thread; non-bendable tip | ✓ | |

NA: WORLD-BEAM QS18 not recommended.

* Fibers can be free cut using fiber cutter (see page 268).

- Photoelectrics Sensors
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- Safety Two-Hand Control Modules
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- FIBER SENSORS
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- Opposed
- Accessories
- GLASS FIBERS





| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) | |
|--------------------------------------|---------------------------|----------------|-----------------------|--|--------------------------------------|--------------------|--|
| Side-View PBPS66U | | 1.5 | 38 | • Smooth ferrule; non-bendable tip | ✓ | | |
| Right-Angle PBAT46UHMTA | | 1.0 | 2 | • Right Angle, threaded, stainless steel | ✓ | | |
| Diffuse Coaxial | PBCF21X46U | | 0.5 4X 0.25 | 12 | • Miniature probe tip | ✓ | |
| | PBCF46U | | 1.0 16X 0.265 | 25 | • Smooth ferrule | ✓ | |
| | PBCT21X46U | | 0.5 4X 0.25 | 12 | • Miniature thread | ✓ | |
| | PBCT26U | | 0.5 9X 0.25 | 12 | • Thread | ✓ | |
| | PBCT26UMFR | | 0.5 10X 0.25 | 12 | • Thread • Overmolded flex relief | ✓ | |
| | PBCT26UM3 | | 0.5 9X 0.25 | 12 | • Miniature thread | ✓ | |
| | PBCT26UM4M2.5 | | 0.5 9X 0.25 | 12 | • Thread | ✓ | |
| | PBCT46U | | 1.0 16X 0.265 | 25 | • Thread | ✓ | |
| | PBCT46UMFR | | 1.0 16X 0.265 | 25 | • Thread • Overmolded flex relief | ✓ | |

NA: WORLD-BEAM QS18 not recommended. Indicates lens available for model. See page 260 for details.

* Fibers can be free cut using fiber cutter (see page 268).

More on next page



| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) | |
|----------------------|---------------------------|----------------|-----------------------|--|---------------------------------|--------------------|--------|
| High-Flex | PBFM1X43T5 | 4X 0.25 | 8 | • Best for repetitive flexing (1,000s of cycles) | | NA NA | |
| | PBP46UC | 1.0 | 25 | • For applications involving reciprocating motion | ✓ | | |
| | PBT46UC | 1.0 | 25 | • For applications involving reciprocating motion | ✓ | | |
| Convergent Beam Spot | PLI-A10 | 0.5 9X 0.25 | 12 | • Anodized AL tip; ϕ 0.5-3.2 mm beam spot • Glass lens | ✓ | | |
| | DURA-BEND™ | PBF46UHF | 1.0 | 1 | • Smooth ferrule | ✓ | |
| PBFM46UHF | | 1.0 | 1 | • Smooth ferrule | ✓ | | |
| PBP46UHF | | 1.0 | 1 | • Thread; bendable tip | ✓ | | |
| PBPS46UHF | | 1.0 | 1 | • Smooth ferrule; non-bendable tip | ✓ | | |
| PBT26UHF | | 0.5 | 1 | • Thread | ✓ | NA | |
| PBT46UHF | | 1.0 | 1 | • Thread | ✓ | | |
| Area Sensing (Array) | | PBR1X326U | 32X 0.265 | 25 | • Rectangular tip | ✓ | NA |
| | | PBRS1X326U | 32X 0.265 | 25 | • Rectangular tip; side sensing | ✓ | NA |

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FIBER SENSORS
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NA: WORLD-BEAM QS18 not recommended. NA: MINI-BEAM Expert not recommended.
 * Fibers can be free cut using fiber cutter (see page 268).

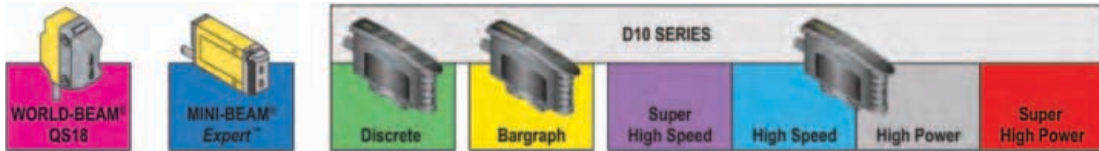




| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) |
|-----------------------|---------------------------|----------------|-----------------------|--|-----------|--------------------|
| Mechanical Convergent | P22-C1 | 0.5 | 12 | • Straight exit with lenses; 3 mm range; DURA-BEND fiber | ✓ | |
| | P12-C1 | 0.5 | 12 | • Side exit with lenses; 3 mm range; DURA-BEND fiber | ✓ | |
| | P32-C6 | 1.0 | 25 | • Flat mount; 6 mm range; lensed convergent optics | ✓ | |
| Diffuse | PBAT43TMB5 | 1.0 | 12 | • 90° angle/thread | | |
| | PBCT23TMB5 | 0.5 9X 0.25 | 12 | • Miniature thread | | |
| | PBCT23TMB5M4 | 0.5 9X 0.25 | 12 | • Thread | | |
| | PBF43TMB5 | 1.0 | 12 | • Smooth ferrule | | |
| | PBPS43TMB5 | 1.0 | 12 | • Smooth ferrule; non-bendable tip | | |
| | PBT43TMB5 | 1.0 | 12 | • Thread | | |
| | PBTA43TMB5 | 1.0 | 12 | • Thread/90° angle | | |

NA: WORLD-BEAM QS18 not recommended. Indicates lens available for model. See page 260 for details. * Fibers can be free cut using fiber cutter (see page 268).

More on next page



| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) | | |
|--------------|---------------------------|--------------------|-----------------------|----------|-----------|--|----------------------------------|---|
| Diffuse | STEELSKIN™ | PBTP43TMB5 | | 1.0 | 12 | • Thread; bendable tip | | |
| | | High-Temp | PBT46UHT1 | | 1.0 | 25 | • Thread; withstands 105° C | |
| | Liquid Level | PBE46UTMLLP | | 1.0 | 25 | • Fluoropolymer encapsulated • Sensor switches when tip of fiber is immersed in liquid | ✓ | |
| | | PBE46UTMLLPHT1 | | 1.0 | 25 | • Fluoropolymer encapsulated; withstands 105° C • Sensor switches when tip of fiber is immersed in liquid | ✓ | |
| | | PBT26U6M.1 | | 0.5 | 12 | • Quartz probe; polypropylene housing • Sensor switches when tip of quartz is immersed in liquid | ✓ | |
| | | TGR38MPFMQ | | 0.5 | 12 | • Sensor switches when tip of quartz is immersed in liquid | | |
| | | PDI46U-LLD | | 1.0 | 1 | • Clear tube mount; DURA-BEND fiber • Sensor switches when liquid meniscus reaches optical axis | ✓ | |
| | Flat Pack | PBR26U | | 0.5 | 12 | • 3.2 mm thickness; DURA-BEND fiber | ✓ | |
| | | Chemical Resistant | PBE46UTMML | | 1.0 | 25 | • Fluoropolymer encapsulated tip | ✓ |

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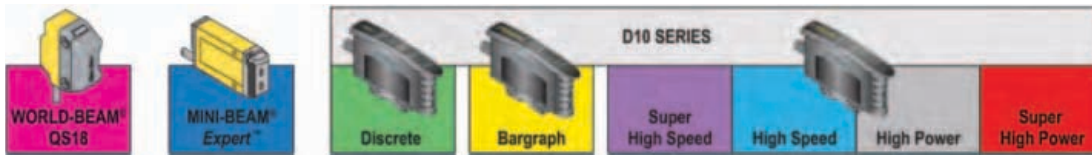
FIBER SENSORS
PLASTIC FIBERS
 Diffuse
 Opposed
 Accessories
GLASS FIBERS

NA: WORLD-BEAM QS18 not recommended.
 NA: D10-Discrete not recommended.
 * Fibers can be free cut using fiber cutter (see page 268).

More on next page



| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) |
|---------------------------------|---------------------------|---------------------|-----------------------|--|-----------|--------------------|
| Diffuse Convergent Spot Lens | L4C6 | ref. model PBCT26U | ref. model PBCT26U | • Anodized AL housing; \varnothing 0.25 mm beam spot @ 6 mm • Fixed focus | | |
| | L4C20 | ref. model PBCT26U | ref. model PBCT26U | • Anodized AL housing; \varnothing 4 mm beam spot @ 20 mm • Fixed focus | | |
| | LZ3C8 | ref. model PBT26UM3 | ref. model PBCT26UM3 | • Anodized AL housing; \varnothing 0.5 - 3.2 mm adj. beam spot • Adjustable focus | | |

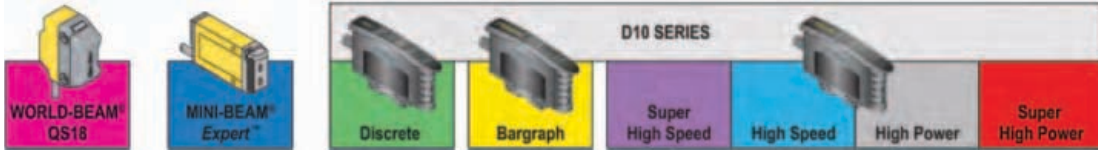


| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) |
|---------------------|---------------------------|----------------|-----------------------|--------------------|-----------|--------------------|
| Opposed Standard | PIA16U | 0.25 | 8 | • 90° angle | ✓ | |
| | PIA26U | 0.5 | 12 | • 90° angle | ✓ | |
| | PIAT16U | 0.25 | 8 | • 90° angle/thread | ✓ | |
| | PIAT26U | 0.5 | 12 | • 90° angle/thread | ✓ | |
| | PIAT46U | 1.0 | 25 | • 90° angle/thread | ✓ | |
| | PIAT46UM-4X-4MIT | 10. | 25 | • 90° angle/thread | ✓ | |

NA: WORLD-BEAM QS18 not recommended. Indicates lens available for model. See page 266 for details.

* Fibers can be free cut using fiber cutter (see page 268).

More on next page



Photoelectrics
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Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) |
|---------------------|---------------------------|----------------|-----------------------|---|-----------|--------------------|
| Opposed Standard | | 1.5 | 38 | • 90° angle/thread; long range | ✓ | |
| | | 0.25 | 8 | • Smooth ferrule | ✓ | |
| | | 0.5 | 12 | • Smooth ferrule | ✓ | |
| | | 0.5 | 12 | • Smooth ferrule; thick jacket (ø 2.2 mm) | ✓ | |
| | | 1.0 | 25 | • Smooth ferrule | ✓ | |
| | | 1.5 | 38 | • Smooth ferrule; long range | ✓ | |
| | | 1.0 | 25 | • Smooth ferrule; miniature tip | ✓ | |
| | | 1.0 | 25 | • Plastic lens; ultra-long range • Lens available separately, see page 257 | ✓ | |
| | | 0.25 | 8 | • Thread | ✓ | |
| | | 0.5 | 12 | • Thread | ✓ | |
| | | 0.5 | 12 | • Thread • Overmolded flex relief | ✓ | |

FIBER SENSORS
PLASTIC FIBERS
Diffuse
Opposed
Accessories
GLASS FIBERS



NA: WORLD-BEAM QS18 not recommended. Indicates lens available for model. See page 266 for details.
* Fibers can be free cut using fiber cutter (see page 268).



| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) |
|--------------|---------------------------|----------------|-----------------------|--|-----------|--------------------|
| Standard | PIT46U | 1.0 | 25 | • Thread | ✓ | |
| | PIT46UMFR | 1.0 | 25 | • Thread • Overmolded flex relief | ✓ | |
| | PIT66U | 1.5 | 38 | • Thread; long range | ✓ | |
| Probe | PIP16U | 0.25 | 8 | • Smooth ferrule; non-bendable tip | ✓ | |
| | PIP26U | 0.5 | 12 | • Thread; bendable tip | ✓ | |
| | PIP46U | 1.0 | 25 | • Thread; bendable tip | ✓ | |
| Side-View | PLIS-1 | 0.5 | 12 | • Low beam divergence angle of 2° • Ideal for wafer mapping | ✓ | |
| | PIPS26U | 0.5 | 12 | • Smooth ferrule; non-bendable tip | ✓ | |
| | PIPS46U | 1.0 | 25 | • Smooth ferrule; non-bendable tip | ✓ | |
| | PIPS66U | 1.5 | 38 | • Smooth ferrule; non-bendable tip | ✓ | |
| | PIPSB46U | 1.0 | 25 | • Smooth ferrule; bendable tip | ✓ | |

NA: WORLD-BEAM QS18 not recommended.
* Fibers can be free cut using fiber cutter (see page 268).





| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) |
|--------------|---------------------------|-------------------|-----------------------|---|-----------|--------------------|
| Side-View | PIPSM26U | 0.5 | 12 | • Miniature smooth ferrule; non-bendable tip | | |
| | L2RA | ref. model PIT46U | ref. model PIT46U | • Compact glass prism • M2.5 thread | ✓ | |
| Right-Angle | PIA46UHFMBX12 | 1.0 | 2 | • Right angle; side exit; Delrin | ✓ | |
| | PIAT46UHFMETA | 1.0 | 2 | • Right angle; threaded, stainless steel | ✓ | |
| High-Flex | PIF1X46U | 4X 0.25 | 8 | • Best for repetitive flexing (1,000s of cycles) | ✓ | |
| | PIT1X46U | 4X 0.25 | 8 | • Best for repetitive flexing (1,000s of cycles) | ✓ | |
| | PIP46UC | 1.0 | 25 | • For applications involving reciprocating motion | ✓ | |
| | PIT46UC | 1.0 | 25 | • For applications involving reciprocating motion | ✓ | |
| DURA-BEND™ | PIAT46UH | 1.0 | 1 | • 90° angle/thread | ✓ | |
| | PIF46UH | 1.0 | 1 | • Smooth ferrule | ✓ | |

NA: WORLD-BEAM QS18 not recommended.

Indicates lens available for model. See page 266 for details.

* Fibers can be free cut using fiber cutter (see page 268).

Photoelectrics Sensors
Fiber Optic Sensors
 Special Purpose Sensors
 Measurement & Inspection Sensors
 Vision
 Wireless
 Lighting & Indicators
 Safety Light Screens
 Safety Laser Scanners
 Safety Controllers & Modules
 Safety Two-Hand Control Modules
 Safety Interlock Switches
 Emergency Stop & Stop Control

FIBER SENSORS
PLASTIC FIBERS
 Diffuse
 Opposed
 Accessories
GLASS FIBERS

More on next page



| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) |
|-----------------------|---------------------------|----------------|-----------------------|--|-----------|--------------------|
| DURA-BEND™ Opposed | PIFM46UHF | 1.0 | 1 | • Smooth ferrule; miniature tip | ✓ | |
| | PIP46UHF | 1.0 | 1 | • Thread; bendable tip | ✓ | |
| | PIPS46UHF | 1.0 | 1 | • Smooth ferrule; non-bendable tip | ✓ | |
| | PIPSB46UHF | 1.0 | 1 | • Smooth ferrule; bendable tip | ✓ | |
| | PIT26UHF | 0.5 | 1 | • Thread | ✓ | |
| | PIT46UHF | 1.0 | 1 | • Thread | ✓ | |
| Chemical Resistant | PIE46UT | 1.0 | 25 | • Fluoropolymer encapsulated; lens | ✓ | |
| | PIE66UTMNL | 1.5 | 38 | • Fluoropolymer encapsulated; lens | ✓ | |
| | PIES46UT | 1.0 | 25 | • Fluoropolymer encapsulated; side-view prism | ✓ | |
| Area Sensing (Array) | PIRX166U | 16X 0.265 | 25 | • Ultra-compact head; straight exit; 5.25 mm width | ✓ | |
| | PIRS166U | 16X 0.265 | 25 | • Ultra-compact head; side exit; 5.25 mm width | ✓ | |

NA: WORLD-BEAM QS18 not recommended.

Indicates lens available for model. See page 266 for details.

* Fibers can be free cut using fiber cutter (see page 268).

More on next page



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) |
|----------------------|---------------------------|----------------|-----------------------|---|----------------------------------|--------------------|
| Area Sensing (Array) | PIRS1X166UM.4 | 16X 0.265 | 25 | • Compact head; side exit; 10 mm width | ✓ | |
| | PIRS1X166UMPM.75 | 16X 0.265 | 25 | • Side exit; 19 mm width | ✓ | |
| | PIRS1X166UMPMAL | 16X 0.265 | 25 | • Side exit; 34 mm width | ✓ | |
| High-Temp | PIT46UHT1 | 1.0 | 25 | • Thread; withstands 105° C | ✓ | |
| | Slot | PDIS16UM5 | 0.25 | 10 | Easy mount "fork" head; 5 mm gap | ✓ |
| PDIS16UM10 | | 0.25 | 10 | Easy mount "fork" head; 10 mm gap | ✓ | |
| PDIS46UM12 | | 1.0 | 25 | • Easy mount "fork" head; DURA-BEND fiber | ✓ | |
| PDISM46UM5MA | | 1.0 | 25 | • 90° angle; compact "fork" head; DURA-BEND fiber | ✓ | |

- FIBER SENSORS
- PLASTIC FIBERS
- Diffuse
- Opposed
- Accessories
- GLASS FIBERS

NA: WORLD-BEAM QS18 not recommended. Indicates lens available for model. See page 266 for details.
 * Fibers can be free cut using fiber cutter (see page 268).

More on next page



| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) | |
|---------------------|---------------------------|----------------|-----------------------|-------------------|---|--------------------|------------------------------------|
| STEEL SKIN™ | PIAT43TMB5 | | 1.0 | 12 | • 90° angle/thread | | |
| | PIF43TMB5 | | 1.0 | 12 | • Smooth ferrule | | |
| | PIPS43TMB5 | | 1.0 | 12 | • Smooth ferrule; non-bendable tip | | |
| | PIT43TMB5 | | 1.0 | 12 | • Thread | | |
| | PITA43TMB5 | | 1.0 | 12 | • Thread/90° angle | | |
| | PITP43TMB5 | | 1.0 | 12 | • Thread; bendable tip | | |
| Dual Individual | PDIT26T5 | | 0.5 | 12 | • Accomplish two inspections using only one sensor | | |
| | PDIT4100U | | 1.0 | 25 | • 30 m duplex fiber cable | ✓ | Contact factory for sensing range. |
| Vacuum | PIF66UM152M19D | | 1.5 | 38 | • For use with VFT-M8MVS (ambient side) See page 265. | ✓ | Contact factory for sensing range. |
| Extended Range Lens | L2 | | ref. model PIT46U | ref. model PIT46U | • Range-extending lens • M2.5 thread | | |
| | L08FP | | ref. model PIL46U | ref. model PIL46U | • Ultra-long range-extending lens; use with raw plastic fiber | | |

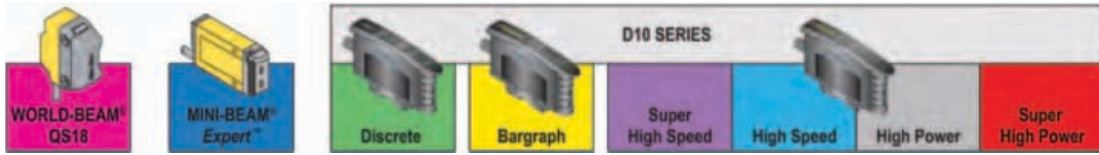
NA: WORLD-BEAM QS18 not recommended.

NA: MINI-BEAM Expert not recommended.

Indicates lens available for model. See page 266 for details.

* Fibers can be free cut using fiber cutter (see page 268).

More on next page



| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Free Cut* | Typical Range (mm) |
|--------------|---------------------------|----------------|-----------------------|----------|--|--------------------|
| Diffuse | High-Temp BMT16.6S-HT | | 1.57 | 19 | <ul style="list-style-type: none"> High performance glass fiber optics for use with Banner D10 plastic fiber sensors Miniature thread; end tip withstands 315° C | |
| | | | | | | |

NA: WORLD-BEAM QS18 not recommended. NA: MINI-BEAM Expert not recommended.
 * Fibers can be free cut using fiber cutter (see page 268).
 † Fibers are sold separately, must order two fibers to form a pair.

D10 Expert™ Small Object Counter Fiber Optic Arrays


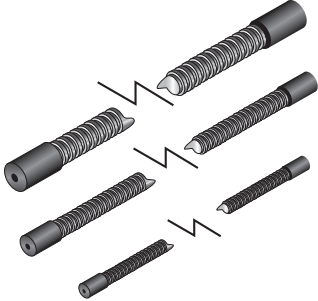
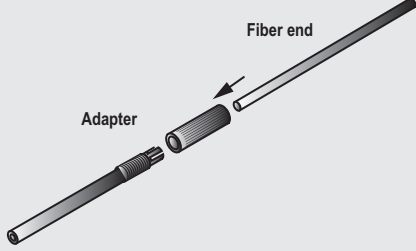
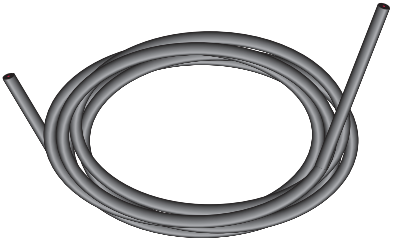
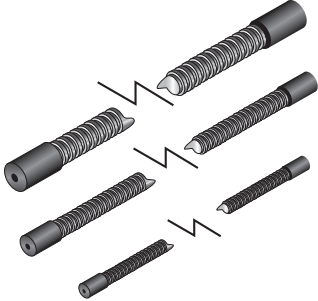
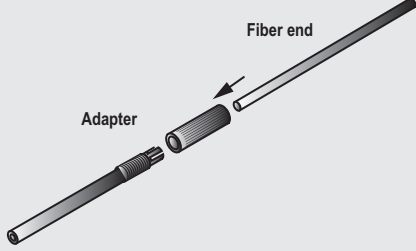
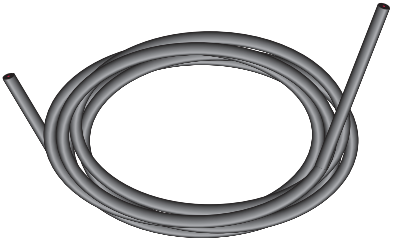
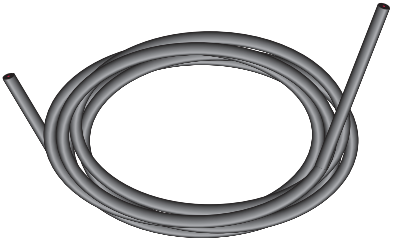
| Model Number* | Fiber Exit | Drawing & Dimensions (mm) | Detection Window | Minimum Object Detection† | Used With |
|---------------|------------|---------------------------|------------------|---------------------------|---|
| PFCVA-10X25-S | Side Exit | | 10 x 25 mm | 1.5 mm | <ul style="list-style-type: none"> D10DNCFF... D10DPCFP... (see page 229) |
| PFCVA-10X25-E | End Exit | | | | |
| PFCVA-25X25-S | Side Exit | | 25 x 25 mm | 3 mm | |
| PFCVA-25X25-E | End Exit | | | | |
| PFCVA-34X25-S | Side Exit | | 34 x 25 mm | 4 mm | |
| PFCVA-34X25-E | End Exit | | | | |

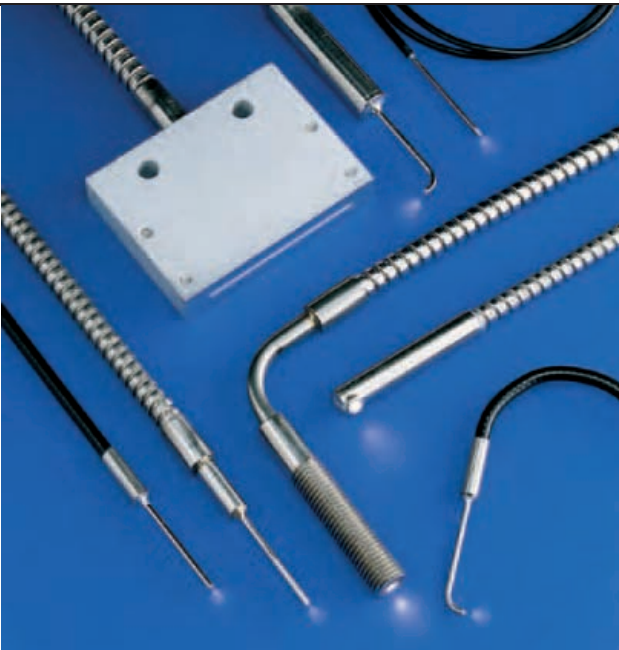
* Custom fiber arrays and mounting configurations are possible. Contact factory with your small object counting application.
 † With 2% Threshold Offset Percentage

- Photoelectrics Sensors
- Fiber Optic Sensors
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- Safety Two-Hand Control Modules
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- Emergency Stop & Stop Control

- FIBER SENSORS
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Fiber Optic Accessories

| Model Number | | Model Specific Features | General Features | | Drawings | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|------------|--|---|--------|---|---|----------|--|---|------|---|---|--|----------|---|------------------------|---|--|---|---------|--|------------|---|--------------|------|---------|--------|------|---------|---|---------|--------|---------|--------|---|---------|--------|---------|--------|-----|--------|---------|------|---------|--------|-----|--------|---------|------|---------|--------|
| Fiber Cutters | PFK20 | <ul style="list-style-type: none"> For use with 0.25 and 0.5 mm diameter cables. | <ul style="list-style-type: none"> These kits are used with unterminated plastic fiber cables. Each kit contains 40 bushings and 10 cutter assemblies (cutters can be purchased separately in packages of 25 - reference model PFC-2-25). | |  <p>NOTE: Bushings used with Q45, OMNI-BEAM, ECONO-BEAM, MAXI-BEAM and VALU-BEAM sensors only.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PFK40 | <ul style="list-style-type: none"> For use with 1 and 1.5 mm diameter cables. | | | | Plastic Fiber Field-Installable Sheathing | PFS69S6T | <ul style="list-style-type: none"> May be used with bifurcated fiber assemblies having M6 x 0.75 threaded end tips (e.g., PBCT46U, PBP46U, PBT46UHT1 and PBT66U). | <ul style="list-style-type: none"> Stainless steel sheathing with stainless steel end fittings (one end internally threaded to capture fiber end tips, other end non-threaded) is used in applications where protection is required for plastic fiber optic cables. All models listed are 1.8 m in length. Other lengths are available by contacting Banner Applications Department. | |  | PFS53S6T | <ul style="list-style-type: none"> May be used with individual or bifurcated fiber assemblies having M4 x 0.7 threaded end tips (e.g., PBCT26U, PBP26U, PIP46U, PIT46U and PIT66U). | PFS44S6T | <ul style="list-style-type: none"> May be used with individual fiber assemblies having M3 x 0.5 threaded end tips (e.g., PIP26U, PIT26U and PIT1X46U). | Plastic Fiber Adapters | UPFA-1-100 | <ul style="list-style-type: none"> Use to adapt plastic fiber optic cables with outside jacket diameter of 1.0 mm, such as PIT26U and PBP16U. | <ul style="list-style-type: none"> Compression fitting adapters are used with small-diameter unterminated plastic fiber cables. Use when interfacing small-diameter plastic fibers to D10, D11, D12, QM42, QS18, R55F, FI22 and MINI-BEAM plastic fiber sensor families. Each kit contains 100 pairs of adapters. One pair will interface either one bifurcated fiber optic cable or a pair of individual cables to a fiber optic amplifier. | |  | UPFA-2-100 | <ul style="list-style-type: none"> Use to adapt plastic fiber optic cables with outside jacket diameter of 1.25 mm or 1.3 mm, such as PBCT26U and PBF46UM3MJ1.3. | Model Number | Core | | Length | Type | Drawing | Unterminated Individual and Bifurcated Plastic Fibers | PIU230U | 0.5 mm | 9 m | Single |  | PIU260U | 18 m | PIU430U | 1.0 mm | 9 m | Single | PIU460U | 18 m | PIU630U | 1.5 mm | 9 m | Single | PIU660U | 18 m | PBU430U | 1.0 mm |
| Plastic Fiber Field-Installable Sheathing | PFS69S6T | <ul style="list-style-type: none"> May be used with bifurcated fiber assemblies having M6 x 0.75 threaded end tips (e.g., PBCT46U, PBP46U, PBT46UHT1 and PBT66U). | <ul style="list-style-type: none"> Stainless steel sheathing with stainless steel end fittings (one end internally threaded to capture fiber end tips, other end non-threaded) is used in applications where protection is required for plastic fiber optic cables. All models listed are 1.8 m in length. Other lengths are available by contacting Banner Applications Department. | |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PFS53S6T | <ul style="list-style-type: none"> May be used with individual or bifurcated fiber assemblies having M4 x 0.7 threaded end tips (e.g., PBCT26U, PBP26U, PIP46U, PIT46U and PIT66U). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PFS44S6T | <ul style="list-style-type: none"> May be used with individual fiber assemblies having M3 x 0.5 threaded end tips (e.g., PIP26U, PIT26U and PIT1X46U). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plastic Fiber Adapters | UPFA-1-100 | <ul style="list-style-type: none"> Use to adapt plastic fiber optic cables with outside jacket diameter of 1.0 mm, such as PIT26U and PBP16U. | <ul style="list-style-type: none"> Compression fitting adapters are used with small-diameter unterminated plastic fiber cables. Use when interfacing small-diameter plastic fibers to D10, D11, D12, QM42, QS18, R55F, FI22 and MINI-BEAM plastic fiber sensor families. Each kit contains 100 pairs of adapters. One pair will interface either one bifurcated fiber optic cable or a pair of individual cables to a fiber optic amplifier. | |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | UPFA-2-100 | <ul style="list-style-type: none"> Use to adapt plastic fiber optic cables with outside jacket diameter of 1.25 mm or 1.3 mm, such as PBCT26U and PBF46UM3MJ1.3. | | | | Model Number | Core | | Length | Type | Drawing | Unterminated Individual and Bifurcated Plastic Fibers | PIU230U | 0.5 mm | 9 m | Single |  | PIU260U | 18 m | PIU430U | 1.0 mm | 9 m | Single | PIU460U | 18 m | PIU630U | 1.5 mm | 9 m | Single | | PIU660U | 18 m | PBU430U | 1.0 mm | | 9 m | Duplex | PBU460U | 18 m | | | | | | | | | | | | |
| Model Number | Core | | Length | Type | Drawing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unterminated Individual and Bifurcated Plastic Fibers | PIU230U | 0.5 mm | 9 m | Single |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PIU260U | | 18 m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PIU430U | 1.0 mm | 9 m | Single | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PIU460U | | 18 m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PIU630U | 1.5 mm | 9 m | Single | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PIU660U | | 18 m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PBU430U | 1.0 mm | 9 m | Duplex | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | PBU460U | | 18 m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



Glass Fiber Optics

- Solve numerous challenging sensing applications in the most hostile environments, including temperatures up to 480° C, corrosive materials and extreme moisture
- Withstand severe shock and vibration
- Ignore extreme electrical noise
- Constructed of a combination of optical glass fiber, stainless steel, PVC, brass, molded thermoplastics and optical-grade epoxy

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Glass Fiber Optic Model Key

I A T 2 3 S X X

ASSEMBLY STYLE designator

B = Bifurcated fiber
I = Individual fiber*

SENSING END TIP STYLE designator

A = 90° Angle
AM = Miniature 90° Angle
AT = 90° Angle/Thread
F = Ferrule
M = Miniature Tip
MP = Miniature Probe
MT = Miniature Thread
R = Rectangular Bundle Termination
T = Thread
TA = Thread/90° Angle
TETA = Thread and Extra Tight 90° Angle

MODIFICATIONS designator

"MXX" = Sensing end tip modification
"M600" = Sensing end withstands 315° C
"M900" = Sensing end withstands 480° C

SHEATHING MATERIAL designator

S = Stainless steel flexible conduit
P = PVC with galvanized monocoil reinforcing wire

OVERALL LENGTH designator (in feet)

2 = 2 ft. = 610 mm ±38 mm
3 = 3 ft. = 914 mm ±38 mm

FIBER BUNDLE DIAMETER designator

.44 = 0.7 mm
.5 = 0.8 mm
.75 = 1.2 mm
1 = 1.6 mm
1.5 = 2.3 mm
2 = 3.2 mm
2.5 = 4.0 mm

* Individual glass fibers are packaged separately.

- FIBER SENSORS
- PLASTIC FIBERS
- GLASS FIBERS**
- Diffuse
- Opposed

Glass Fiber Optics Specifications

| | |
|--------------------------------|---|
| Construction | Combination of optical glass fiber, stainless steel or PVC, brass, molded thermoplastics, and optical-grade epoxy. Optical fiber is F2 core, EN1 clad, approx. 50 μ m diameter per strand. Flexible steel interlock sheathing is 302 stainless. |
| Sensing Range | Refer to the specific fiber optic to be used |
| Bend Radius | Inside bend radius must be 12 mm or greater for PVC covered fiber optic assemblies, and 25 mm or greater for stainless steel armored cable covered fibers |
| Length | Standard length for assemblies is 915 mm; see dimension diagrams. Most models are available from the factory with shorter or longer cable lengths, up to 18 m max. |
| Length Dimension Tolerance | Overall assembly length: ± 12 mm per 300 mm of length Shrink junction dimensions: ± 12 mm |
| Implied Dimensional Tolerances | All dimensions are in millimeters: $x = \pm 2.5$ mm, $x.x = \pm 0.25$ mm and $x.xx = \pm 0.12$ mm, unless specified. |
| Operating Conditions | Fiber assemblies with stainless-steel (SS) sheathing and metal end tips: -140° to $+249^{\circ}$ C Fiber assemblies with PVC sheathing and/or plastic end tips: -40° to $+105^{\circ}$ C Special order assemblies with SS sheathing and metal end tips and model suffix "M600": -140° to $+315^{\circ}$ C* Special order assemblies with SS sheathing and metal end tips and model suffix "M900": -140° to $+480^{\circ}$ C*; note dimensional changes from STD models * sensing end tip only |

⚠ Application Notes and Warnings ⚠

- 1 The ends of glass fiber optic assemblies are optically ground and polished. Care taken in this manufacturing process accounts for the light coupling efficiency of the fiber optic assembly. As a result, glass fiber assemblies cannot be shortened, spliced or otherwise modified.
- 2 Use caution when applying fiber optics in hazardous locations. Although fiber optic assemblies are by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT. Alternatively, fiber optics may be used with sensor model SM1912FQD (page 365). This sensor is approved for use inside hazardous areas when used with an appropriate intrinsic barrier. Also, see NAMUR sensor models Q45AD9F (page 204) and MIAD9F (page 121). Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.
- 3 In applications where glass fibers to insulate the control from high voltage, specify silicone rubber, Teflon[®], or high-density polyethylene sheathing with no reinforcing wire in the cable. It is the responsibility of the user to test each fiber optic assembly for insulation capacity.
- 4 Do not subject the fibers to sharp bends, pinching, repeated flexing or high levels of radiation.
- 5 When ordering fiber lengths in excess of 1 m, take into account light signal reduction of 5 percent per 300 mm of additional length.

Teflon[®] is a registered trademark of Dupont[™].



Indicates lenses available for model. See page 272 for details.

M600 Available 315° C models. Add M600 to end of model number (example, BA23SM600).

M900 Available 480° C models. Add M900 to end of model number (example, BA23SM900). Dimensions may vary for these models.

Photoelectrics Sensors

Fiber Optic Sensors

Special Purpose Sensors

Measurement & Inspection Sensors

Vision

Wireless

Lighting & Indicators

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Stop Control

FIBER SENSORS

PLASTIC FIBERS

GLASS FIBERS

Diffuse

Opposed

| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Typical Range (mm) | |
|----------------------|---------------------------|----------------|-----------------------|----------|---|----|
| Standard | BA23S | | 3.18 | 19 | • 90° angle M600 M900 | |
| | BAT23S | | 3.18 | 19 | • 90° angle/thread M600 M900 | |
| | BF23P | | 3.18 | 19 | • Smooth ferrule | |
| | BMT.442P | | 0.69 | 9.5 | • Miniature thread | NA |
| | BT23S | | 3.18 | 19 | • Thread M600 M900 | |
| | BTA23S | | 3.18 | 19 | • Thread/90° angle M600 M900 | |
| Miniature Probe | BAM.752S | | 1.17 | 19 | • ø 1.5 mm non-bendable probe; 90° angle M600 | NA |
| | BM.752S | | 1.17 | 19 | • ø 1.5 mm non-bendable probe M600 | NA |
| | BMP.753P | | 1.17 | 9.5 | • ø 1.5 mm non-bendable probe | NA |
| Area Sensing (Array) | BR2.53S | | 3.96 | 19 | • Straight exit; 38 mm width M600 | |
| | BR23S | | 3.18 | 19 | • Straight exit; 10 mm width M600 | |

NA: WORLD-BEAM QS18 not recommended.





M600 Available 315° C models. Add M600 to end of model number (example, BA23SM600).

| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Typical Range (mm) |
|-----------------------------|---------------------------|--------------------------------------|--------------------------------------|--|------------------------------------|
| Diffuse Side-View | BA1.53SMETA | 2.29 | 19 | <ul style="list-style-type: none"> Ultra-compact head M600 | |
| | BA1.53SMTA | 2.29 | 19 | <ul style="list-style-type: none"> Compact head M600 | |
| | BTE1A1.53S | 2.29 | 19 | <ul style="list-style-type: none"> Ultra-compact head; thread M600 | |
| Vacuum BMT13SMVF | | 1.57 | 19 | <ul style="list-style-type: none"> Miniature thread; entire cable withstands 480° C | Contact factory for sensing range. |
| Convergent Beam Spot L10 | | ref. glass fiber key or call factory | ref. glass fiber key or call factory | <ul style="list-style-type: none"> Glass lens; withstands 315° C Focuses light to .80 mm with ø 1.6 mm fiber | |



Glass Fiber Optics—Additional Models Available

In addition to the configurations shown, Banner offers thousands of readily available alternative fiber models:

- Substitute PVC over monocoil sheathing for stainless steel.
- Reduce or increase glass fiber optic bundle diameters.
Example: Change ø 3.18 mm bundle to ø 1.57 mm.
- Substitute a rectangular-shaped fiber bundle (0.5 x 2.5 mm) for a circular bundle.
- Change endtip material from brass to stainless steel.
- Modify straight or angled probe tip dimensions.
- Modify overall fiber length in intervals of 305 mm (standard lengths are 914 and 610 mm).



Indicates lenses available for model. See page 272 for details.

M600 Available 315° C models. Add M600 to end of model number (example, BA23SM600).

M900 Available 480° C models. Add M900 to end of model number (example, BA23SM900). Dimensions may vary for these models.

- Photoelectrics Sensors
- Fiber Optic Sensors**
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Typical Range (mm) |
|----------------------|---------------------------|----------------|-----------------------|---|--------------------|
| Standard | IA23S | 3.18 | 19 | • 90° angle M600 M900 | |
| | IAT23S | 3.18 | 19 | • 90° angle/thread M600 M900 | |
| | IF23P | 3.18 | 19 | • Smooth ferrule M600 M900 | |
| | IMT.442P | 0.69 | 9.5 | • Miniature thread NA | |
| | IT23S | 3.18 | 19 | • Thread M600 M900 | |
| | ITA23S | 3.18 | 19 | • Thread/90° angle M600 M900 | |
| Miniature Probe | IAM.752S | 1.17 | 19 | • ø 1.5 mm non-bendable probe; 90° angle M600 | |
| | IM.752S | 1.17 | 19 | • ø 1.5 mm non-bendable probe M600 | NA |
| | IMP.753P | 1.17 | 9.5 | • ø 1.5 mm non-bendable probe NA | |
| Area Sensing (Array) | IR2.53S | 3.69 | 19 | • Straight exit; 38 mm width M600 | |
| | IR23S | 3.18 | 19 | • Straight exit; 10 mm width M600 | |

NA: WORLD-BEAM QS18 not recommended.



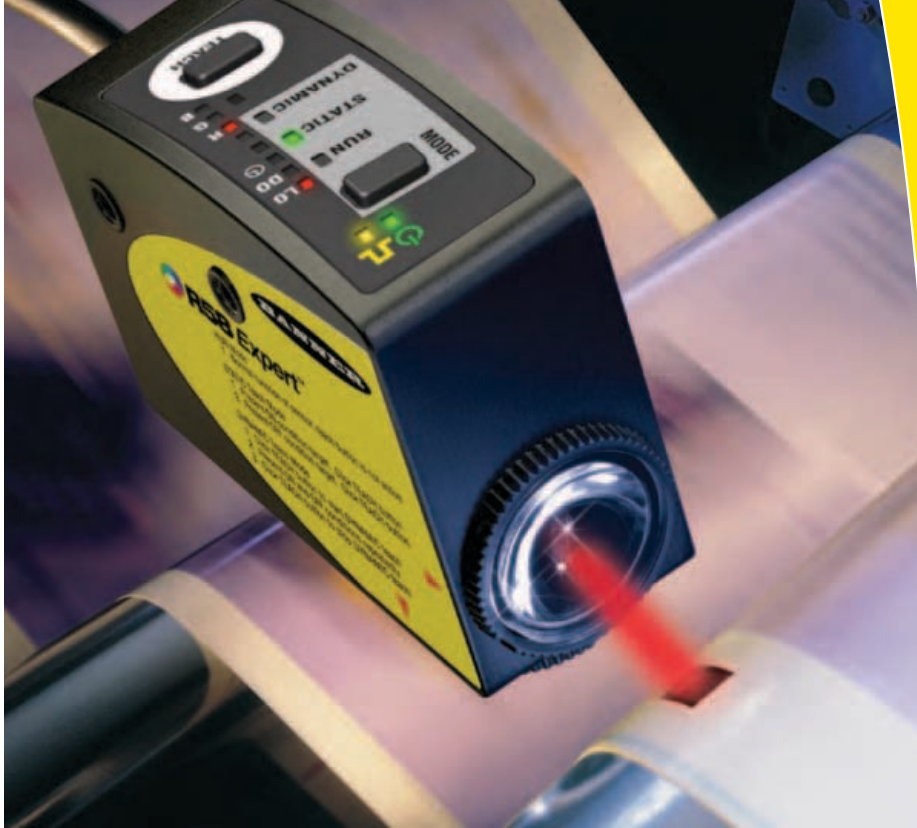


M600 Available 315° C models. Add M600 to end of model number (example, BA23SM600).

| Model Number | Drawing & Dimensions (mm) | Core Dia. (mm) | Min. Bend Radius (mm) | Features | Typical Range (mm) | |
|-----------------------------|---------------------------|----------------|-----------------------|---|---|--|
| Side-View | | 2.29 | 19 | <ul style="list-style-type: none"> Ultra-compact head | | |
| | | 2.29 | 19 | <ul style="list-style-type: none"> Compact head | | |
| | | 2.29 | 19 | <ul style="list-style-type: none"> Ultra-compact head; thread | | |
| Vacuum | | 1.27 | 19 | <ul style="list-style-type: none"> Miniature thread; entire cable withstands 480° C | Contact factory for sensing range. | |
| Opposed Extended Range Lens | L9 | | ref. model IT23S | ref. model IT23S | <ul style="list-style-type: none"> Glass lens; withstands 315° C | |
| | L16F | | ref. model IT23S | ref. model IT23S | <ul style="list-style-type: none"> Plastic housing; withstands 105° C | |
| | L16FAL | | ref. model IT23S | ref. model IT23S | <ul style="list-style-type: none"> Aluminum housing; withstands 315° C | |
| | L16FSS | | ref. model IT23S | 19 | <ul style="list-style-type: none"> Stainless steel housing withstands 480° C | |
| Vacuum Feed Through | | 3.56 | — | <ul style="list-style-type: none"> Seals to 1 x 10⁻⁹ torr; withstands 120° C | | |
| Liquid Level | | 3.18 | — | <ul style="list-style-type: none"> Use with BT23S Sensor switches when tip of glass rod is immersed in liquid | | |

R58 Registration Mark Sensors

Provide High-Speed, Low-Contrast Sensitivity



Two Sensors Detect all Registration Marks on Hard-To-Read Surfaces.

R58 Registration Mark Sensors detect subtle registration marks in common printing and material registration applications often found in the printing, packaging and pharmaceutical industries. The excellent contrast sensitivity of the R58, coupled with its small 1.2 x 3.8 mm sensing image, makes it easy to detect critical features even on difficult-to-sense material.

- Outstanding color contrast sensitivity; detecting contrasts as low as 2% over a wide range of colors
- Excellent performance in low-contrast or high-gloss applications
- Ultra-fast 10 kHz switching frequency (10,000 actuations per second); 15 μ s repeatability
- Rugged, mechanical housing to withstand ambient electrical noise and vibration; rated IP67
- High-quality acrylic lens suitable for food processing applications
- Choice of high-performance, *Expert*[™] push-button models or easy-to-apply and cost-effective potentiometer setup models
- Fast warm-up and excellent temperature stability
- Bright, highly visible LEDs for easy configuration and monitoring during operation
- Bipolar NPN/PNP with selectable light/dark operate (LO/DO)

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Detect small color marks and differentiate low-contrast colors

Fast and reliable detection of registration marks in variety of industries



High-Speed Detection in Printing and Labeling



Splice Detection



Tube Filling

Range and application tolerant

- ▶ Tolerates a +/-3 mm shift from the 10 mm focal point
- ▶ Accommodates web flutter and similar variations in the target's location



Convenient and flexible mounting

- ▶ Includes two lens locations on each sensor
- ▶ Offers threaded lens and cap for easy exchange without tools
- ▶ Available with a vertical or horizontal light spot, depending on model
- ▶ Includes industry standard mounting holes



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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- FIBER SENSORS
- PLASTIC FIBERS
- GLASS FIBERS

Part & Area page 277
 • LX



Slot & Label page 279
 • SLM
 • SL



Registration & Color page 287
 • R58
 • QC50/QCX50



Luminescence page 293
 • QL50
 • QL56

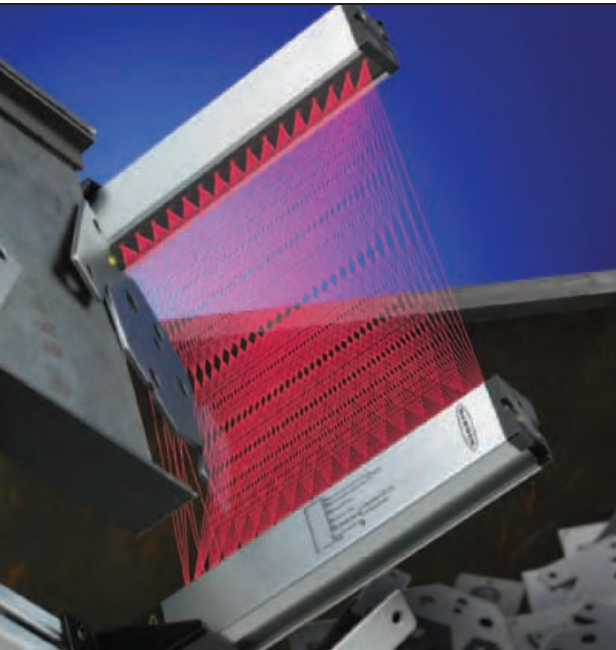


Optical Touch Buttons page 477
 • OTB/LTB
 • VTB
 • STB



Pick-to-Light Sensors page 465

- K50 and K80 low-cost, self-contained sensors for bin-picking operations
- Ultra-bright optical touch buttons for indicating bin-picking sequences
- Two- or one-component light sensors for part assembly and error proofing



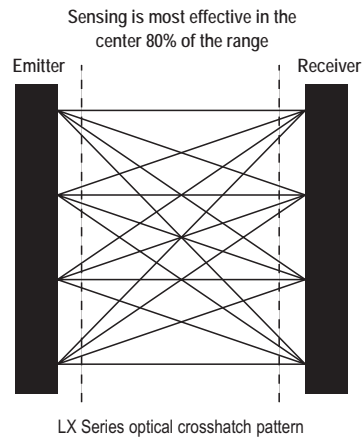
High-Speed Part-Sensing Light Screen LX

- Ideal for die-protection (part ejection verification), small part or pill counting, parcel handling and sorting by height
- Generates a multiple-beam infrared pattern for extraordinary sensitivity to small objects
- Detects objects as small as 5.6 mm and extremely flat objects that pass anywhere through the light screen
- Responds in 0.8 to 6.4 milliseconds—faster than comparable products, even at its slowest response speed
- Enables automated systems to operate at peak efficiency
- Features rugged silver anodized housing with IP65 rating
- Uses integrated T-slot mounting channel for unique mounting flexibility

- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors**
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Control Stop

ACCESSORIES
page 278

| Models | Length (L) |
|--------|------------|
| LX3 | 113.4 mm |
| LX6 | 189.6 mm |
| LX9 | 265.8 mm |
| LX12 | 342.0 mm |
| LX15 | 418.2 mm |
| LX18 | 494.4 mm |
| LX21 | 570.6 mm |
| LX24 | 646.8 mm |



- PART & AREA
- LX**
- SLOT & LABEL
- REGISTRATION & COLOR
- LUMINESCENCE
- OPTICAL TOUCH BUTTONS


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LX Light Screens, 10-30V dc

| Sensing Array Length | Short-Range (75-200 mm) Min object detection size: 5.6 mm dia. | | Standard Range (150 mm - 2 m) Min object detection size: 9.5 mm dia. | | Connection | Output Type |
|----------------------|---|-----------|---|-----------|------------|-----------------|
| | Emitters | Receivers | Emitters | Receivers | | |
| 67 mm | LX3ESR | LX3RSR | LX3E | LX3R | 2 m | Bipolar NPN/PNP |
| 143 mm | LX6ESR | LX6RSR | LX6E | LX6R | | |
| 218 mm | - | - | LX9E | LX9R | | |
| 295 mm | LX12ESR | LX12RSR | LX12E | LX12R | | |
| 371 mm | - | - | LX15E | LX15R | | |
| 447 mm | - | - | LX18E | LX18R | | |
| 523 mm | - | - | LX21E | LX21R | | |
| 599 mm | - | - | LX24E | LX24R | | |

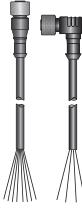
Connection options: A model with a QD requires a mating cordset (see page 278).

For 5-pin 150 mm Euro-style Pigtail QD, add suffix Q to the 2 m model number (example, LX3EQ).

| LX Specifications | | | | | | | |
|--|--|--|--|--|--|--------------------------------------|---------------|
| Sensing Range | <table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">Normal (see hookups)</td> <td style="text-align: center;">Reduced</td> </tr> <tr> <td>Short-range models: 100 to 200 mm</td> <td>75 to 150 mm</td> </tr> <tr> <td>Standard-range models: 300 mm to 2 m</td> <td>150 to 600 mm</td> </tr> </table> | Normal (see hookups) | Reduced | Short-range models: 100 to 200 mm | 75 to 150 mm | Standard-range models: 300 mm to 2 m | 150 to 600 mm |
| Normal (see hookups) | Reduced | | | | | | |
| Short-range models: 100 to 200 mm | 75 to 150 mm | | | | | | |
| Standard-range models: 300 mm to 2 m | 150 to 600 mm | | | | | | |
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at less than 1 watt each for emitter and receiver (exclusive of load) | | | | | | |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages | | | | | | |
| Output Configuration | Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor | | | | | | |
| Output Rating | 125 mA max. each output OFF-state leakage current: less than 5 μ A Output saturation voltage (PNP output): less than 1 volt at 10 mA and less than 1.5 volts at 100 mA Output saturation voltage (NPN output): less than 0.5 volts at 10 mA and less than 0.6 volts at 100 mA | | | | | | |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of outputs | | | | | | |
| Output Response Time | LX3: 0.8 milliseconds ON-time; 6 milliseconds OFF-time (5 milliseconds OFF-delay) LX6: 1.6 milliseconds ON-time; 7 milliseconds OFF-time (5 milliseconds OFF-delay) LX9: 2.4 milliseconds ON-time; 7.5 milliseconds OFF-time (5 milliseconds OFF-delay) LX12: 3.2 milliseconds ON-time; 8.5 milliseconds OFF-time (5 milliseconds OFF-delay) LX15: 4.0 milliseconds ON-time; 9 milliseconds OFF-time (5 milliseconds OFF-delay) LX18: 4.8 milliseconds ON-time; 10 milliseconds OFF-time (5 milliseconds OFF-delay) LX21: 5.6 milliseconds ON-time; 11 milliseconds OFF-time (5 milliseconds OFF-delay) LX24: 6.4 milliseconds ON-time; 11.5 milliseconds OFF-time (5 milliseconds OFF-delay) | | | | | | |
| Minimum Object Detection Size | Smallest diameter rod that can be detected in sensing range: 5.6 mm (short-range) or 9.5 mm (standard-range), depending on model | | | | | | |
| Indicators | <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> Emitter: LED1 (Green) ON: Power ON, good sensor OFF: Reduced Range </td> <td style="vertical-align: top;"> LED2 (Red) ON: Reduced range OFF: Normal range Flashing: Emitter hardware failure </td> </tr> <tr> <td style="vertical-align: top;"> Receiver: LED1 (Yellow) ON: Output conducting OFF: Output not conducting </td> <td style="vertical-align: top;"> LED2 (Bicolor Green/Red) Green: Normal range Red: Reduced range Flashing Red: Receiver hardware failure </td> </tr> </table> | Emitter: LED1 (Green) ON: Power ON, good sensor OFF: Reduced Range | LED2 (Red) ON: Reduced range OFF: Normal range Flashing: Emitter hardware failure | Receiver: LED1 (Yellow) ON: Output conducting OFF: Output not conducting | LED2 (Bicolor Green/Red) Green: Normal range Red: Reduced range Flashing Red: Receiver hardware failure | | |
| Emitter: LED1 (Green) ON: Power ON, good sensor OFF: Reduced Range | LED2 (Red) ON: Reduced range OFF: Normal range Flashing: Emitter hardware failure | | | | | | |
| Receiver: LED1 (Yellow) ON: Output conducting OFF: Output not conducting | LED2 (Bicolor Green/Red) Green: Normal range Red: Reduced range Flashing Red: Receiver hardware failure | | | | | | |
| Construction | Aluminum housing, die-cast zinc with black e-coated painted encaps, acrylic lens window | | | | | | |
| Environmental Rating | IEC IP65 | | | | | | |
| Connections | 2 m 5-conductor (with drain) PVC-jacketed cable or 150 mm pigtail with 5-pin Euro-style quick-disconnect fitting, depending on model. Cordsets are ordered separately. See page 278. | | | | | | |
| Operating Conditions | Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing) | | | | | | |
| Application Notes | 1. The best sensing resolution occurs within the center 80% of the sensing range 2. Low-profile packages can be reliably detected 3. Outputs are active while the light screen is interrupted 4. For reliable detection, successive parts must be spaced up to the total of ON-time plus OFF-time apart. (i.e., 12 milliseconds for the LX12) | | | | | | |
| Certifications |  | | | | | | |
| Hookup Diagrams | SP02 (p. 770) | | | | | | |



Cordsets


| Euro QD (with Shield) | | |
|-----------------------|------------|--------------|
| See page 701 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDEC2-506 | MQDEC2-506RA |
| 4.57 m | MQDEC2-515 | MQDEC2-515RA |
| 9.14 m | MQDEC2-530 | MQDEC2-530RA |



Additional cordset information available. See page 693.

Brackets

| LX | |
|---|--|
|  pg. 672 SMBLX |  pg. 672 SMBLXR |



Additional bracket information available. See page 632.

SLOT & LABEL SENSORS



SLM page 280

- Available in eight slot widths, from 10 to 220 mm
- Installs easily using molded-in beam guides that simplify beam placement
- Includes single-turn potentiometer sensitivity adjustment and visible red beam
- Features sealed die-cast metal housing rated IEC IP67; NEMA 6
- Ideal for counting, sensing parts on conveyor rails and belts, detecting edges and gear teeth, and other applications



SL page 283

- Self-contained fixed-distance opposed-mode slot sensors
- Rugged U-shaped housings
- Molded-in beam guides to simplify mounting and beam placement
- Models with 10 and 30 mm wide slots
- Fixed sensitivity, potentiometer sensitivity adjustment or push-button programming, depending on model

| |
|----------------------------------|
| Photoelectric Sensors |
| Fiber Optic Sensors |
| Special Purpose Sensors |
| Measurement & Inspection Sensors |
| Vision |
| Wireless |
| Lighting & Indicators |
| Safety Light Screens |
| Safety Laser Scanners |
| Safety Controllers & Modules |
| Safety Two-Hand Control Modules |
| Safety Interlock Switches |
| Emergency Stop & Control Stop |

| |
|-----------------------|
| PART & AREA |
| SLOT & LABEL |
| SLM |
| SL |
| REGISTRATION & COLOR |
| LUMINESCENCE |
| OPTICAL TOUCH BUTTONS |

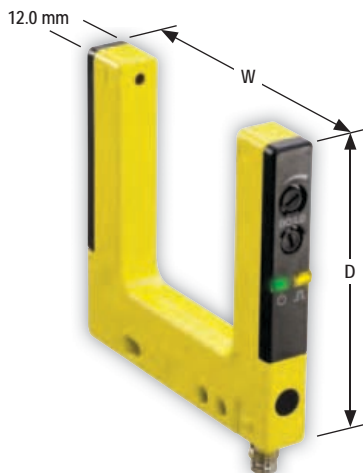
Rugged Metal Fixed-distance Slot Sensors

SLM

- Senses objects that pass between the fixed-distance, opposed-mode emitter and receiver
- Requires no alignment or fibers
- Delivers a fast response time of 500 microseconds
- Available in painted or nickel-plated die-cast metal housings
- Mounts easily and economically, using molded-in beam guides that simplify beam placement
- Available with current sourcing (PNP), current sinking (NPN) or bipolar (one NPN and one PNP) output, depending on model
- Features a single-turn potentiometer sensitivity adjustment and a visible red beam
- Offers Light or Dark Operate, selected with a sealed switch
- Features rugged, sealed, die-cast metal housing rated IEC IP67 (NEMA 6)



ACCESSORIES
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Nickel-plated models available for ESD sensitive applications or cleanroom locations.

SLM, 10-30V dc

→ Visible Red LED

| Sensing Mode/LED | Slot Width/Depth | Overall Width (W) | Overall Depth (D) | Connection | Response | Models [†] NPN | Models [†] PNP |
|------------------|-------------------|-------------------|-------------------|-----------------------|----------|-------------------------------|-------------------------|
| | 10 mm/ 60.8 mm | 42 mm | 80 mm | 2 m | 500 μs | SLM10B6 (Bipolar NPN/PNP) | |
| | | | | 4-Pin Euro Pigtail QD | | SLM10B6QPMA (Bipolar NPN/PNP) | |
| | | | | 3-Pin Pico QD | | SLM10N6Q | SLM10P6Q |
| | 20 mm/ 60.8 mm | 52 mm | 80 mm | 2 m | | SLM20B6 (Bipolar NPN/PNP) | |
| | | | | 4-Pin Euro Pigtail QD | | SLM20B6QPMA (Bipolar NPN/PNP) | |
| | | | | 3-Pin Pico QD | | SLM20N6Q | SLM20P6Q |

Connection options: A model with a QD requires a mating cordset (see page 282).

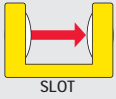
For 9 m cable, add suffix W/30 to the 2 m model number (example, SLM10B6 W/30).

[†] Standard models have yellow painted surface. For models with nickel-plated surface, add the suffix N to the model number (example, SLM10P6QN).

More
on next
page

SLM, 10-30V dc (cont'd)

➔ Visible Red LED

| Sensing Mode/LED | Slot Width/Depth | Overall Width (W) | Overall Depth (D) | Connection | Response | Models [†] NPN | Models [†] PNP |
|--|---------------------|-------------------|-------------------|-----------------------|----------|--------------------------------|----------------------------|
|  | 30 mm/ 60.8 mm | 62 mm | 80 mm | 2 m | 500 μs | SLM30B6 (Bipolar NPN/PNP) | |
| | | | | 4-Pin Euro Pigtail QD | | SLM30B6QPMA (Bipolar NPN/PNP) | |
| | | | | 3-Pin Pico QD | | SLM30N6Q | SLM30P6Q |
| | 50 mm/ 60.8 mm | 82 mm | 80 mm | 2 m | | SLM50B6 (Bipolar NPN/PNP) | |
| | | | | 4-Pin Euro Pigtail QD | | SLM50B6QPMA (Bipolar NPN/PNP) | |
| | | | | 3-Pin Pico QD | | SLM50N6Q | SLM50P6Q |
| | 80 mm/ 60.8 mm | 112 mm | 80 mm | 2 m | | SLM80B6 (Bipolar NPN/PNP) | |
| | | | | 4-Pin Euro Pigtail QD | | SLM80B6QPMA (Bipolar NPN/PNP) | |
| | | | | 3-Pin Pico QD | | SLM80N6Q | SLM80P6Q |
| | 120 mm/ 120.7 mm | 152 mm | 140 mm | 2 m | | SLM120B6 (Bipolar NPN/PNP) | |
| | | | | 4-Pin Euro Pigtail QD | | SLM120B6QPMA (Bipolar NPN/PNP) | |
| | | | | 3-Pin Pico QD | | SLM120N6Q | SLM120P6Q |
| | 180 mm/ 120.7 mm | 202 mm | 140 mm | 2 m | | SLM180B6 (Bipolar NPN/PNP) | |
| | | | | 4-Pin Euro Pigtail QD | | SLM180B6QPMA (Bipolar NPN/PNP) | |
| | | | | 3-Pin Pico QD | | SLM180N6Q | SLM180P6Q |
| | 220 mm/ 120.7 mm | 252 mm | 140 mm | 2 m | | SLM220B6 (Bipolar NPN/PNP) | |
| | | | | 4-Pin Euro Pigtail QD | | SLM220B6QPMA (Bipolar NPN/PNP) | |
| | | | | 3-Pin Pico QD | | SLM220P6Q | SLM220N6Q |

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- PART & AREA
- SLOT & LABEL
- SLM
- SL
- REGISTRATION & COLOR
- LUMINESCENCE
- OPTICAL TOUCH BUTTONS

➔ Connection options: A model with a QD requires a mating cordset (see page 282).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SLM10B6 W/30).

† Standard models have yellow painted surface. For models with nickel-plated surface, add the suffix N to the model number (example, SLM10P6QN).

| SLM Specifications | | | | | | | | |
|--|--|----------|----------|----------|----------|-----------|-----------|-----------|
| Slot Opening | 10, 20, 30, 50, 80, 120, 180 or 220 mm (depending on model); beam is 5 mm from outer edge | | | | | | | |
| Supply Voltage and Current | 10 to 30V dc (10% ripple) @ less than 25 mA, exclusive of load. | | | | | | | |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages. | | | | | | | |
| Output Configuration | Cabled and Euro-style QD models: Bipolar: One current sourcing (PNP) and one current sinking (NPN) Pico-style QD models: Current sourcing (PNP) or current sinking (NPN), depending on model | | | | | | | |
| Output Rating | 100 mA with short circuit protection OFF-state leakage current: less than 10 μA sourcing; less than 200 μA sinking ON-state saturation voltage: NPN: 1.6V @ 100 mA PNP: 2.0V @ 100 mA | | | | | | | |
| Output Protection Circuitry | Protected against output short-circuit and false pulse on power up. 100 milliseconds max. delay at power up; outputs do not conduct during this time. | | | | | | | |
| Minimum Object Detection* at Max. Gain | SLM10... | SLM20... | SLM30... | SLM50... | SLM80... | SLM120... | SLM180... | SLM220... |
| | 1.00 mm | 1.25 mm | 1.50 mm | 1.65 mm | 1.80 mm | 1.80 mm | 1.80 mm | 2.40 mm |
| Minimum Object Detection* at 2X Excess gain | 0.30 mm | 0.30 mm | 0.40 mm | 0.60 mm | 0.75 mm | 0.90 mm | 0.90 mm | 1.00 mm |
| Hysteresis** | 0.10 mm | 0.10 mm | 0.10 mm | 0.10 mm | 0.20 mm | 0.20 mm | 0.20 mm | 0.20 mm |
| Repeatability*** | 0.02 mm | 0.02 mm | 0.02 mm | 0.04 mm | 0.06 mm | 0.08 mm | 0.08 mm | 0.08 mm |

* Minimum Object Detection: Smallest diameter rod that can be detected when passed slowly through sensing beam.
NOTE: Minimum object detection is measured midway between the emitter and receiver. For best results, objects to be detected should be placed in the midway position when possible. The minimum object detection size may increase if the object is very close to the receiver side.
** Hysteresis: Distance an object must move to toggle between output OFF and output ON conditions.
*** Repeatability: Variation in switching distance for a standard target at controlled sensing conditions.

➔ More on next page

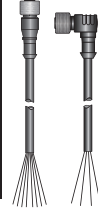
| SLM Specifications (cont'd) | |
|-----------------------------|--|
| Output Response Time | 500 microseconds |
| Repeatability | 95 microseconds |
| Adjustments | 1-turn potentiometer Sensitivity adjustment Light Operate / Dark Operate Selection switch |
| Indicators | Two LED Indicators: Green: Power ON Yellow: Output activated See data sheet for detailed information |
| Construction | Housing: Die-cast zinc with yellow paint; models with "N" at the end of the model number have nickel plating Endcaps: ABS Optic windows: Acrylic |
| Environmental Rating | IEC IP67; NEMA 6 |
| Connections | Cabled models: 2 m or 9 m 4-conductor, PVC-jacketed cable Pico-style QD models: 3-pin, threaded (see page 282) Euro-style QD models: 4-pin, threaded 150 mm pigtail with polyurethane (PUR) cable (see page 282) |
| Operating Conditions | Temperature: -20° to +60° C Relative humidity: 95% @ 55° C (non-condensing) |
| Certifications | CE |
| Hookup Diagrams | Bipolar Models: DC04 (p. 758) All others: DC01 (p. 758) |

Cordsets

| Pico QD | | |
|--------------|----------------|-------------|
| See page 693 | | |
| | Threaded 3-Pin | |
| Length | Straight | Right-Angle |
| 2.00 m | PKG3M-2 | PKW3M-2 |
| 5.00 m | PKG3M-5 | PKW3M-5 |
| 7.00 m | PKG3M-7 | — |
| 9.00 m | PKG3M-9 | PKW3M-9 |
| 10.0 m | PKG3M-10 | — |



| Euro QD | | |
|--------------|----------------|-------------|
| See page 696 | | |
| | Threaded 4-Pin | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |



Additional cordset information available. See page 693.

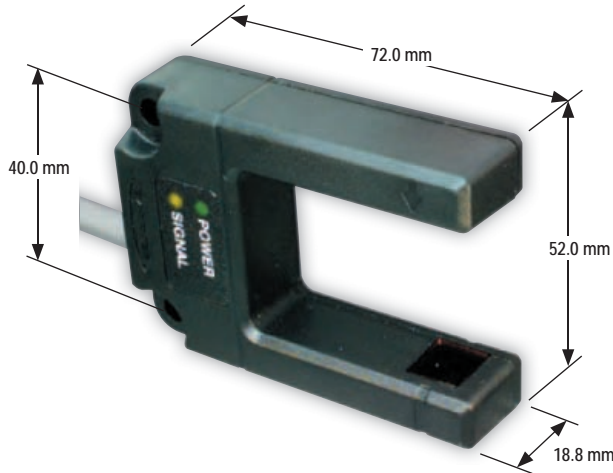


Opposed-Mode Fixed-Distance Sensors SL30 and SL10

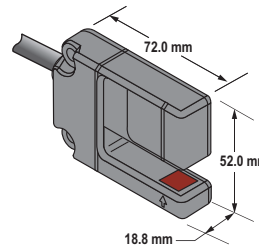
- Ideal for registration mark detection, hole detection, gear tooth detection, edge guiding and counting
- Provides easy-to-use self-contained opposed-mode sensor pair in a rugged U-shaped housing
- Uses molded-in beam guides to simplify beam placement
- Provides an economical choice for many OEM applications with fixed sensitivity (SLO model)
- Available in 10 mm-wide sensing slot (SL10 models) or 30 mm-wide sensing slot (SL30 models)
- Uses visible red sensing beam (infrared on SLO models)
- Features manual sensitivity adjustment or easy push-button TEACH-mode setup, depending on model

Photoelectrics
Sensors
Fiber Optic
Sensors
**Special Purpose
Sensors**
Measurement &
Inspection Sensors
Vision
Wireless
Lighting &
Indicators
Safety
Light Screens
Safety
Laser Scanners
Safety Controllers &
Modules
Safety Two-Hand
Control Modules
Safety Interlock
Switches
Emergency Stop &
Control Stop

ACCESSORIES
page
285



SL30, SLO30 and SLE30 Models



SL10 and SLE10 Models

PART & AREA
SLOT & LABEL
SLM
SL
REGISTRATION &
COLOR
LUMINESCENCE
OPTICAL TOUCH
BUTTONS



SL30 and SL10, 10-30V dc

➔ Visible Red LED

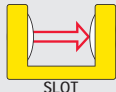
| Sensing Mode/LED | Slot Width | Connection | Output Type | Response | Repeatability | Models |
|------------------|------------|---------------|-----------------|----------|---------------|------------|
| | 30 mm | 2 m | Bipolar NPN/PNP | 1 ms | 250 μs | SL30VB6V |
| | | 5-Pin Euro QD | | | | SL30VB6VQ |
| | | 2 m | | | | SL30VB6VY |
| | | 5-Pin Euro QD | | | | SL30VB6VYQ |
| | 10 mm | 2 m | Bipolar NPN/PNP | 1 ms | 250 μs | SL10VB6V |
| | | 5-Pin Euro QD | | | | SL10VB6VQ |
| | | 2 m | | | | SL10VB6VY |
| | | 5-Pin Euro QD | | | | SL10VB6VYQ |


Connection options: A model with a QD requires a mating cordset (see page 285).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SL30VB6V W/30).

SLO30, 10-30V dc


 Infrared LED

| Sensing Mode/LED | Slot Width | Connection | Output Type | Response | Repeatability | Models |
|---|------------|---------------|-----------------|----------|---------------|------------|
|  | 30 mm | 2 m | Bipolar NPN/PNP | 1 ms | 250 µs | SLO30VB6 |
| | | 5-Pin Euro QD | | | | SLO30VB6Q |
| | | 2 m | | 300 µs | 75 µs | SLO30VB6Y |
| | | 5-Pin Euro QD | | | | SLO30VB6YQ |

 Connection options: A model with a QD requires a mating cordset (see page 285).

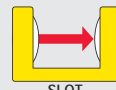
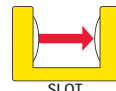
For 9 m cable, add suffix W/30 to the 2 m model number (example, SLO30VB6 W/30).

SL30, SL10 and SLO30 Specifications

| | | |
|-----------------------------|--|---|
| Supply Voltage and Current | 10 to 30V dc, 30 mA | |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages | |
| Output Configuration | Bipolar: One current sinking (NPN) and one current sourcing (PNP) open-collector transistor | |
| Output Rating | 150 mA, each output | |
| Output Protection Circuitry | Protected against false pulse on power-up and short-circuit of outputs | |
| Output Response Time | 1 millisecond or 300 microseconds, depending on model | |
| Repeatability | 250 microseconds or 75 microseconds, depending on model | |
| Adjustments | SL30 and SL10: 4-turn clutched potentiometer sensitivity adjustment SLO30: None | |
| Indicators | Green: Power ON/OFF indicator Yellow: Signal condition indicator | |
| Construction | Housing: ABS/polycarbonate Lenses: Acrylic | |
| Environmental Rating | IP67; NEMA 6 | |
| Connections | 2 m or 9 m 5-conductor PVC-jacketed attached cable, or 5-pin Euro-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 285. | |
| Operating Conditions | Temperature: -40° to +70° C | Relative humidity: 90% @ 50° C (non-condensing) |
| Certifications |  | |
| Hookup Diagrams | SP03 (p. 770) | |


SLE30 and SLE10 Expert™, 10-30V dc

 Visible Red LED

| Sensing Mode/LED | Slot Width | Connection | Output Type | Response | Repeatability | Models |
|---|------------|---------------|-----------------|----------|---------------|------------|
|  | 30 mm | 2 m | Bipolar NPN/PNP | 500 µs | 100 µs | SLE30B6V |
| | | 5-Pin Euro QD | | | | SLE30B6VQ |
| | | 2 m | | 150 µs | 75 µs | SLE30B6VY |
| | | 5-Pin Euro QD | | | | SLE30B6VYQ |
|  | 10 mm | 2 m | Bipolar NPN/PNP | 500 µs | 100 µs | SLE10B6V |
| | | 5-Pin Euro QD | | | | SLE10B6VQ |
| | | 2 m | | 150 µs | 75 µs | SLE10B6VY |
| | | 5-Pin Euro QD | | | | SLE10B6VYQ |

 Connection options: A model with a QD requires a mating cordset (see page 285).

For 9 m cable, add suffix W/30 to the 2 m model number (example, SLE30B6V W/30).

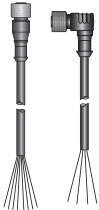
| SLE30 and SLE10 Expert™ Specifications | |
|--|---|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at less than 45 mA, exclusive of load |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor |
| Output Rating | 150 mA max. each output at 25° C, derated to 100 mA at 70° C (derate ≈1 mA per ° C) OFF-state leakage current: less than 5 μA @ 30V dc ON-state saturation current: less than 1V @ 10 mA; less than 1.5V @ 150 mA |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short-circuit of outputs |
| Output Response Time | Sensors will respond to either a "light" or a "dark" signal of 500 microseconds (or 150 microseconds, depending on model) or longer duration, 1 kHz max |
| Delay at Power-up | 1 second; outputs are non-conducting during this time |
| Repeatability | 100 microseconds or 75 microseconds, depending on model |
| Adjustments | Push-button TEACH-mode sensitivity setting; remote TEACH-mode input |
| Indicators | Two LEDs: Yellow and Bicolor Green/Red Green (RUN Mode): ON when power is applied Flashes when received light level approaches the switching threshold Red (TEACH Mode): OFF when no signal is received. Pulses to indicate signal strength (received light level). Rate is proportional to signal strength (the stronger the signal, the faster the pulse rate). This is a function of Banner's Alignment Indicating Device (AID™). Alternating Red/Green: Microprocessor memory error Flashing Yellow (Static TEACH): ON to indicate sensor is ready to learn output ON condition OFF to indicate sensor is ready to learn output OFF condition Yellow (Dynamic TEACH): Pulses at 0.5 Hz when ready to sample ON to indicate Dynamic TEACH sampling OFF to indicate sampling was accepted Yellow (RUN Mode): ON when outputs are conducting |
| Construction | Housing: ABS/polycarbonate Lenses: Acrylic |
| Environmental Rating | IEC IP67; NEMA 6 |
| Connections | PVC-jacketed 5-conductor 2 m or 9 m unterminated cable, or 5-pin Euro-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 285. |
| Operating Conditions | Temperature: -20° to +70° C Relative humidity: 90% at 50° C (non-condensing) |
| Application Notes | The first condition presented during TEACH mode becomes the output ON condition |
| Certifications |  |
| Hookup Diagrams | DC08 (p. 759) |


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors**
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Control Stop

- PART & AREA
- SLOT & LABEL**
- SLM
- SL**
- REGISTRATION & COLOR
- LUMINESCENCE
- OPTICAL TOUCH BUTTONS


Cordsets


| Euro QD | | |
|----------------|-------------|-------------|
| See page 699 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 0.50 m | MQDC1-501.5 | - |
| 1.83 m | MQDC1-506 | MQDC1-506RA |
| 4.57 m | MQDC1-515 | MQDC1-515RA |
| 9.14 m | MQDC1-530 | MQDC1-530RA |



 Additional cordset information available. See page 693.

Brackets

| SL | |
|---|--|
|  | |
| pg. 687 | |
| SMBSL | |

 Additional bracket information available. See page 632.

REGISTRATION MARK & COLOR

R58



QC50/QCX50



R58

page 287

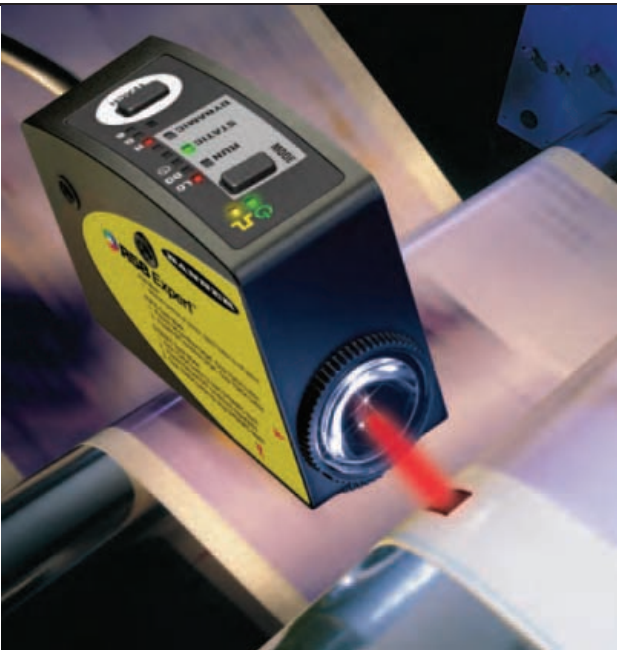
- Outstanding color contrast sensitivity even in low-contrast or high-gloss applications
- Ultra-fast 10 kHz switching frequency
- Models with push-button or potentiometer configuration
- Bipolar discrete outputs: one current sourcing (PNP) and one current sinking (NPN)



QC50/QCX50

page 291

- For comparing three different colors or shades of one color
- Models for challenging applications such as differentiating dark blue from black
- Easy to set and program
- Three programming parameters: channel, sensing mode and tolerance level



Registration Mark Sensors R58

- Outstanding color contrast sensitivity; detecting contrasts as low as 2% over a wide range of colors
- Excellent performance in low-contrast or high-gloss applications
- Ultra-fast 10 kHz switching frequency (10,000 actuations per second); 15 μs repeatability
- Rugged, mechanical housing to withstand ambient electrical noise and vibration; rated IP67
- High-quality acrylic lens suitable for food processing applications
- Provides a sensing image that measures 1.2 by 3.8 mm at 10 mm from lens
- Models with push-button or potentiometer configuration
- Fast warm-up and excellent temperature stability
- Bright, highly visible LEDs for easy configuration and monitoring during operation
- Bipolar NPN/PNP with selectable Light/Dark Operate (LO/DO)
- Models with OFF-delay for applications requiring a delay for reliable detection

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors**
- Measurement & Inspection Sensors
- Vision
- Wireless
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- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Control Stop

ACCESSORIES
page 290



R58E Expert™ page 288

- Senses a variety of color marks without changing sensors
- Automatically selects the correct LED to optimize contrast for each application
- Features easy-to-set TEACH options: Dynamic or Static using push buttons, or remote switch
- Provides easy-to-read, 8-segment bargraph display for TEACH and signal strength



R58B page 288

- Detects contrasts as low as 2%
- Excellent performance in low-contrast or high-gloss applications
- Ultra-fast switching frequency
- Rugged, mechanical housing to withstand ambient electrical noise and vibration
- High-quality acrylic lens suitable for food processing applications
- Fast warm-up and excellent temperature stability



R58A page 288

- Provides a single emitter color; red or green, depending on model
- Delivers a simplified setup with potentiometer adjustment of switching threshold and switch selectable Light/Dark Operate (LO/DO)
- Includes easy-to-see output and setup indicators

- PART & AREA
- SLOT & LABEL
- REGISTRATION & COLOR
- R58
- QC50/QCX50
- LUMINESCENCE
- OPTICAL TOUCH BUTTONS



R58E interface



R58B interface



R58A interface

Convenient and flexible mounting

- Two lens locations on each sensor
- Threaded lens and cap for easy exchange without tools
- Vertical or horizontal light spot, depending on model
- Industry standard mounting holes



Range and application tolerant

- Tolerates a +/-3 mm shift from the 10 mm focal point
- Accommodates for web flutter and similar variations in the target's location



R58 Sensors



R58 Expert™ Sensors



R58B Sensors



R58A Sensors



ACCESSORIES

page
290

R58E Expert™, 10-30V dc

Visible Red, Green or Blue LED, depending on registration mark

| Sensing Mode/LED | Focus | Connection | Output Type | Sensing Image Orientation | Models |
|------------------|-------|-----------------------|--------------------|---|------------|
| | 10 mm | 2 m | Bipolar NPN/PNP | Parallel to sensor length | R58ECRGB1 |
| | | 5-pin Euro Pigtail QD | | | R58ECRGB1Q |
| | | 2 m | | Perpendicular to sensor length | R58ECRGB2 |
| | | 5-pin Euro Pigtail QD | | | R58ECRGB2Q |

Connection options: A model with a QD requires a mating cordset (see page 281)

For 9 m cable, add suffix W/30 to the 2 m model number (example, R58ECRGB1 W/30).
 QD models: For integral 5-pin Euro-style QD, add suffix Q8 to the 2 m model number (example R58ECRGB1Q8).

R58B Expert™, 10-30V dc

Visible Red, Green or Blue LED, depending on registration mark

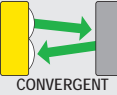
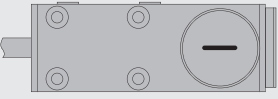
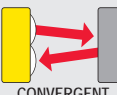
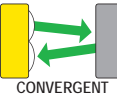
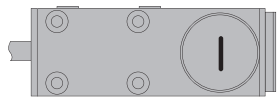
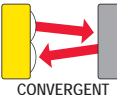
| Sensing Mode/LED | Focus | Connection | Output Type | Sensing Image Orientation | Models |
|------------------|-------|-----------------------|-------------|---|-------------|
| | 10 mm | 2 m | PNP | Parallel to sensor length | R58BPCRGB1 |
| | | | NPN | | R58BNCRGB1 |
| | | 5-pin Euro Pigtail QD | PNP | | R58BPCRGB1Q |
| | | | NPN | | R58BNCRGB1Q |
| | | 2 m | PNP | Perpendicular to sensor length | R58BPCRGB2 |
| | | | NPN | | R58BNCRGB2 |
| | | 5-pin Euro Pigtail QD | PNP | | R58BPCRGB2Q |
| | | | NPN | | R58BNCRGB2Q |

Connection options: A model with a QD requires a mating cordset (see page 281)

For 9 m cable, add suffix W/30 to the 2 m model number (example, R58BPCRGB1 W/30).
 QD models: For integral 5-pin Euro-style QD, add suffix Q8 to the 2 m model number (example R58BPCRGB1Q8).

R58A, 10-30V dc

→ Visible Red LED → Visible Green LED

| Sensing Mode/LED | Focus | Connection | Output Type | Sensing Image Orientation | OFF-Delay | Models | |
|--|-------|-----------------------|--------------------|--|-----------|-----------|-----------|
|  CONVERGENT | 10 mm | 2 m | Bipolar NPN/PNP |  Parallel to sensor length | 0 ms | R58ACG1 | |
| | | 4-pin Euro Pigtail QD | | | | R58ACG1Q | |
| | | 2 m | | | 20 ms | R58ACG1D | |
| | | 4-pin Euro Pigtail QD | | | | R58ACG1DQ | |
|  CONVERGENT | | 2 m | | | 0 | R58ACR1 | |
| | | 4-pin Euro Pigtail QD | | | | R58ACR1Q | |
| | | 2 m | | | | 20 ms | R58ACR1D |
| | | 4-pin Euro Pigtail QD | | | | | R58ACR1DQ |
|  CONVERGENT | 10 mm | 2 m | Bipolar NPN/PNP |  Perpendicular to sensor length | 0 | R58ACG2 | |
| | | 4-pin Euro Pigtail QD | | | | R58ACG2Q | |
| | | 2 m | | | 20 ms | R58ACG2D | |
| | | 4-pin Euro Pigtail QD | | | | R58ACG2DQ | |
|  CONVERGENT | | 2 m | | | 0 | R58ACR2 | |
| | | 4-pin Euro Pigtail QD | | | | R58ACR2Q | |
| | | 2 m | | | | 20 ms | R58ACR2D |
| | | 4-pin Euro Pigtail QD | | | | | R58ACR2DQ |

Connection options: A model with a QD requires a mating cordset (see page 290)

For 9 m cable, add suffix W/30 to the 2 m model number (example, R58ACG1 W/30).
 QD models: For integral 4-pin Euro-style QD, add suffix Q8 to the 2 m model number (example, R58ACG1Q8).

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors**
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Control Stop

ACCESSORIES
page 290


- PART & AREA
- SLOT & LABEL
- REGISTRATION & COLOR
- R58
- QC50/QCX50
- LUMINESCENCE
- OPTICAL TOUCH BUTTONS

R58 Specifications

| | |
|-----------------------------|---|
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | R58 Expert & R58A: Bipolar: One current sourcing (PNP) and one current sinking (NPN) R58B: Single output: One current sourcing (PNP) or one current sinking (NPN) |
| Output Rating | R58 Expert & R58B: 100 mA max. (each output) OFF-state leakage current: NPN less than 200 µA; PNP less than 10 µA NPN saturation: less than 1.6V @ 100 mA PNP saturation: less than 3V @ 100 mA R58A: 150 mA max. (each output) OFF-state leakage current: less than 10 µA NPN saturation: less than 200 mV @ 10 mA and less than 1V @ 150 mA PNP saturation: less than 1V @ 10 mA and less than 2V @ 150 mA |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short-circuit of outputs |
| Output Response Time | 50 microseconds |
| Delay at Power-up | 100 milliseconds; outputs do not conduct during this time. |
| Repeatability | 15 microseconds |

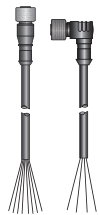
More on next page

R58 Specifications (cont'd)

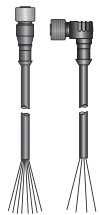
| | |
|----------------------|--|
| Sensing Image | Rectangular: 1.2 x 3.8 mm at 10 mm from face of lens; image oriented either parallel or perpendicular to sensor length, depending on model |
| Adjustments | R58 Expert & R58B: 2 push buttons and remote wire for sensor TEACH programming and configuration. See data sheet for detailed information. R58A: Light/Dark Operate (LO/DO) select switch, and 15-turn switchpoint adjustment potentiometer |
| Indicators | R58 Expert: 8-segment Bargraph display: Green: Power ON Yellow: Outputs ON 2-position Green: LED ON next to DO for dark operate LED ON next to LO for light operate 2-position Green: LED ON next to ON for ON-delay LED ON next to OFF for OFF-delay R58B: Green: Power ON Amber: Output active R58A: Amber: Output active Green: Switchpoint threshold adjustment indicators See data sheet for detailed information. |
| Construction | Zinc alloy die-cast housing with black painted finish and o-ring sealed lens port cap. Lens: Acrylic Lens port cap and lens holder: ABS Sensitivity and LO/DO adjusters: Acetal QD: Anodized aluminum |
| Environmental Rating | IEC IP67 |
| Connections | PVC-jacketed 4-conductor 2 m or 9 m attached cable with internal strain relief, integrated 4-pin Euro-style QD fitting or 150 mm pigtail with 4-pin Euro-style quick-disconnect. QD cordsets are ordered separately. See page 290. |
| Operating Conditions | Temperature: -10° to +50° C Relative humidity: 90% at 50° C (non-condensing) Storage temperature: -20° to +80° C |
| Shock and Vibration | All models meet IEC 68-2-6 and IEC 68-2-27 testing criteria. |
| Certification |  |
| Hookup Diagrams | DC04 (p. 758) |


Cordsets

| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |








| Euro QD (With Shield) | | |
|-----------------------|------------|--------------|
| See page 701 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDEC2-506 | MQDEC2-506RA |
| 4.57 m | MQDEC2-515 | MQDEC2-515RA |
| 9.14 m | MQDEC2-530 | MQDEC2-530RA |



 Additional cordset information available. See page 693.

Brackets

| R58E/R58A | | | |
|---|---|---|---|
|  |  |  |  |
| pg. 658 | pg. 659 | pg. 658 | pg. 659 |
| SMB55A | SMB55RA | SMB55F | SMB55S |

 Additional bracket information available. See page 632.



True Color Sensor QC50/QCX50

- Accurately analyzes and compares colors or varying intensities of color
- Available in two versions for application flexibility: QC50 models for most applications and QCX50 models for challenging applications such as differentiating dark blue from black
- Offers easy-to-set push-button programming options for up to three colors
- Features compact, self-contained design
- Offers fast sensing response time of 335 microsecond (QC50) and 5 milliseconds (QCX50)
- Includes three programming parameters: channel, sensing mode and tolerance level
- Available in models with three NPN or three PNP outputs, one for each color channel
- Provides bright LED indicators for output of programmed color
- Includes a 3-position swivel connector for installation flexibility

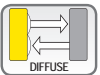
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors**
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Control Stop

ACCESSORIES
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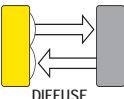
ONLINE
AUTOCAD, STEP, IGES & PDF

- PART & AREA
- SLOT & LABEL
- REGISTRATION & COLOR
- R58
- QC50/QCX50
- LUMINESCENCE
- OPTICAL TOUCH BUTTONS




QC50/QCX50, 10-30V dc

⇒ Visible White LED

| Sensing Beam | Range | Connection | Response Time | Output Type | Models |
|---|---|---------------|-------------------------|-----------------|---------------|
|  <p>DIFFUSE</p> | 20 mm typical; varies according to sensor configuration | 8-pin Euro QD | 335 μs | NPN, 3 channels | QC50A3N6XDWQ |
| | | | | PNP, 3 channels | QC50A3P6XDWQ |
| | | | Selectable 5 ms or 1 ms | NPN, 3 channels | QCX50A3N6XDWQ |
| | | | | PNP, 3 channels | QCX50A3P6XDWQ |

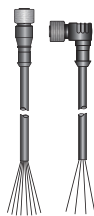
Connection options: A model with a QD requires a mating cordset (see page 290)

QC50/QCX50 Specifications

| | | | | | | | |
|---------------------------------|--|-------------|--------------|--------------------------------|------------------|---------------------------------|------------------|
| Sensing Receiver | Solid-state photodiode device with R, G, B filters | | | | | | |
| Minimum Spot Diameter | 4 mm | | | | | | |
| Supply Voltage and Current | 10 to 30V dc, 2 V pp max ripple 40 mA max @ 24V dc (excluding output current) | | | | | | |
| Supply Protection Circuitry | Protected against reverse polarity, over-voltage, and transient voltage | | | | | | |
| Output Configuration | 3 PNP or 3 NPN outputs, depending on model 30V dc max. Saturation voltage: less than 2V | | | | | | |
| Output Rating | 100 mA max. load per output channel | | | | | | |
| Output Protection Circuitry | Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power-up | | | | | | |
| Output Response Time | QC50 models: 335 microseconds QCX50 models: Selectable 5 milliseconds (normal) or 1 millisecond <table border="0" style="margin-left: 40px;"> <tr> <td style="padding-right: 40px;">QC50 models</td> <td>QCX50 models</td> </tr> <tr> <td>Gate ON-time: 335 microseconds</td> <td>700 microseconds</td> </tr> <tr> <td>Gate OFF-time: 170 microseconds</td> <td>400 microseconds</td> </tr> </table> | QC50 models | QCX50 models | Gate ON-time: 335 microseconds | 700 microseconds | Gate OFF-time: 170 microseconds | 400 microseconds |
| QC50 models | QCX50 models | | | | | | |
| Gate ON-time: 335 microseconds | 700 microseconds | | | | | | |
| Gate OFF-time: 170 microseconds | 400 microseconds | | | | | | |
| Delay at Power-up | 500 milliseconds; outputs do not conduct during this time | | | | | | |
| Data Retention | EEPROM nonvolatile memory | | | | | | |
| Ambient Light Rejection | According to EN 609475-2 | | | | | | |
| Adjustments | 2 push buttons (Set and Select) • Color, scanning, color modes, delay and tolerance • Manual adjustment of color channels, sensing mode and tolerance level | | | | | | |
| Indicators | 4-Digit LCD Display: indicates sensing mode, run status, tolerance level, output status Yellow Output LED: ON when any output is conducting 3 Green Channel Output Status LEDs: ON when its corresponding output is conducting | | | | | | |
| Construction | ABS shock-resistant housing; glass window and lens | | | | | | |
| Environmental Rating | IEC IP62 | | | | | | |
| Connections | 8-pin Euro-style swivel quick-disconnect fitting. QD cordsets are ordered separately. See page 292. | | | | | | |
| Operating Conditions | Temperature: -10° to +55° C Relative humidity: 90% at 50° C (non-condensing) | | | | | | |
| Shock Resistance | Approx. 30 G; 3 shocks per axis; 11 milliseconds duration | | | | | | |
| Vibration | 0.5 mm amplitude; 10 to 60 Hz frequency; 30 minutes for each X, Y, Z axis | | | | | | |
| Certifications |  | | | | | | |
| Hookup Diagrams | NPN Models: SP05 (p. 771) PNP Models: SP06 (p. 771) | | | | | | |

Cordsets

| Euro QD (Open-Shield) | |
|-----------------------|------------|
| See page 704 | |
| Threaded 8-Pin | |
| Length | Straight |
| 1.83 m | MQDC2S-806 |
| 4.57 m | MQDC2S-815 |
| 9.14 m | MQDC2S-830 |
| 15.2 m | MQDC2S-850 |



Additional cordset information available.
See page 693.

Brackets

| QC50/QCX50 |
|---|
|  |
| pg. 683 |
| SMBQC50 |



Additional bracket information available.
See page 632.

LUMINESCENCE SENSORS

QL50



QL56



QL50 page 294

- Cost-effective, compact and simplified set up
- Sensing range of 40 mm
- Shock resistant, ABS plastic housing
- 3-position swivel QD connector



QL56 page 296

- IP67-rated housing for use in rugged industrial environments
- Push buttons to adjust switchpoint sensitivity and OFF-delay
- Choice of operating distance, depending on model
- 5-position swivel QD connection

Photoelectric Sensors
Fiber Optic Sensors

Special Purpose Sensors

Measurement & Inspection Sensors

Vision

Wireless

Lighting & Indicators

Safety Light Screens

Safety Laser Scanners

Safety Controllers & Modules

Safety Two-Hand Control Modules

Safety Interlock Switches

Emergency Stop & Control Stop

PART & AREA

SLOT & LABEL

REGISTRATION & COLOR

LUMINESCENCE

OPTICAL TOUCH BUTTONS

Luminescence Sensors

QL50 and QL56

- Features compact, self-contained design
- Detects luminescence inherent in a material or luminophores added to a material to make it luminescent
- Senses luminescent marks, even on luminescent backgrounds and reflective surfaces such as ceramic, metal or mirrored glass
- Includes easy-to-set programming options
- Responds in 250 microseconds
- Available in models with NPN or PNP discrete outputs or with selectable NPN or PNP outputs



ACCESSORIES
page
297



QL50 Sensors



QL50 Models page 294
QL56 Models 296



QL50, 10-30V dc

➔ Black Ultraviolet LED ⇐ Returned Luminescence

| Sensing Beam/LED | Range | Connection | Models NPN | Models PNP |
|------------------|---------|---------------|---------------|---------------|
| | 0-40 mm | 4-pin Euro QD | QL50AN6XD20BQ | QL50AP6XD20BQ |

➔ Connection options: A model with a QD requires a mating cordset (see page 297)

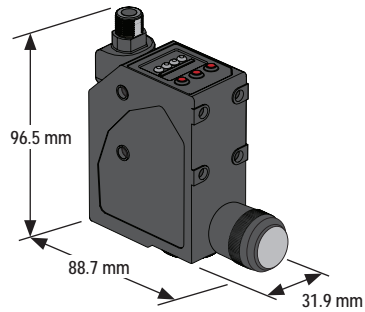
QL50 Specifications

| | |
|-----------------------------|---|
| Spot Diameter | 1.5 mm @ 10 mm |
| Supply Voltage and Current | 10 to 30V dc, 2V max. ripple 30 mA max. @ 30V dc (excluding output current) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | PNP or NPN discrete output, depending on model 30V dc max Leakage current: less than 1 μ A |
| Output Rating | 100 mA max. load |
| Output Protection | Protected against output overload and short circuit |
| Output Response Time | 250 microseconds |
| Response Curve | See chart RC-1 on page 290 |
| Data Retention | EEPROM nonvolatile memory |
| Ambient Light Rejection | According to EN 60947-5-2 |
| Adjustments | 1 push button (set), and remote program wire: <ul style="list-style-type: none"> • Fine-detect autoselect for Light Operate or Dark Operate • 20 milliseconds output OFF-delay • Remote wire to +V dc for remote programming and/or push-button lockout |
| Indicators | Yellow Output LED: ON when output is conducting Bicolor Ready/Error LED: Green ON: Default and Quick-Set programming RUN mode Green OFF: Threshold Green Flashing: Fine-Detection Program mode/Delay status Green/Red bicolor flashing: programming error |
| Construction | ABS shock-resistant housing; glass lens and window (tilted, antireflective) |
| Environmental Rating | IEC IP62 |
| Connections | 4-pin Euro-style swivel quick-disconnect fitting. QD cordsets are ordered separately. See page 289. |
| Operating Conditions | Temperature: -25° to +55° C Relative humidity: 90% at 50° C non-condensing |
| Shock Resistance | Approx. 30 G; 3 shocks per axis; 11 milliseconds duration |
| Vibration | 0.5 mm amplitude; 10 to 60 Hz frequency; 30 minutes for each X, Y, Z axis |
| Certifications |   |
| Hookup Diagrams | SP07 (p. 771) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors**
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Control Stop

- PART & AREA
- SLOT & LABEL
- REGISTRATION & COLOR
- LUMINESCENCE
- QL50
- QL56
- OPTICAL TOUCH BUTTONS

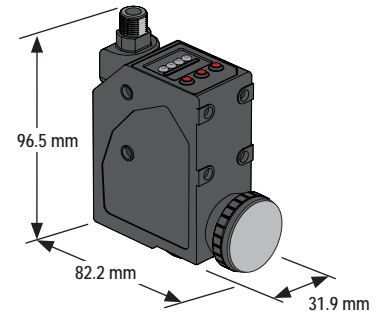
QL56 Sensors



QL56M6XD30BQ8 Models



QL56M6XD15BQ8 Models



QL56M6XD40BQ8 Models




ACCESSORIES
page
297

QL56, 15-30V dc

➔ Black Ultraviolet LED ⇨ Returned Luminescence

| Sensing Beam/LED | Range | Connection | Output Type | Models |
|------------------|----------|---------------|---|--------------|
| | 10-20 mm | 5-pin Euro QD | Bipolar NPN/PNP plus one 0.75-5.5V dc analog | QL56M6XD15BQ |
| | 20-40 mm | | | QL56M6XD30BQ |
| | 30-50 mm | | | QL56M6XD40BQ |

➔ Connection options: A model with a QD requires a mating cordset (see page 297).

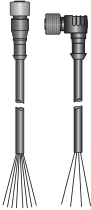
| QL56 Specifications | |
|-----------------------------|--|
| Sensing Beam | LED UV, 375 nm; class 1 |
| Supply Voltage and Current | 15 to 30V dc, (2 V pp max ripple); 50 mA max @ 24V dc (excluding output current) |
| Supply Protection Circuitry | Protected against reverse polarity |
| Output Configuration | Bipolar (1 NPN & 1 PNP), plus 0.75 to 5.5V dc analog output |
| Analog Output | 0.75 to 5.5V dc max |
| Analog Output Impedance | 2.2 kΩ (short-circuit protection) |
| Output Rating | 100 mA max. |
| Output Saturation Voltage | ≤ 2V |
| Output Protection Circuitry | Overload and short circuit protection |
| Output Response Time | 250 microseconds |
| Response Time | See charts RC-3, RC-4 and RC-5 on page 298 |
| Ambient Light Rejection | According to EN 60947-5-2 |
| Adjustments | "+" and "-" push buttons determine sensitivity "Set" push button activates delay and keylock function |
| Switching Frequency | 2 kHz |
| Delay at Power-up | 0 milliseconds (default) or 20 milliseconds user selectable |
| Indicators | Green Ready LED: ON indicates power ON Yellow Output LED: ON indicates output conducting Green Ready LED: ON indicates power on; Flashing indicates output overload Orange Delay LED: ON indicates 20 milliseconds delay activated Orange Keylock LED: ON indicates push buttons are unlocked 5-segment bar graph: Indicates sensitivity |
| Construction | Aluminum housing, glass lens; mass 180 g. max. |
| Environmental Rating | IP67 |
| Connections | 5-pin Euro-style (M12). QD cordsets are ordered separately. See page 297. |
| Operating Conditions | Temperature: -10° to +55° C Storage Temperature: -20° to 70° C |
| Minimum Spot Dimensions | 2 x 8 mm @ 10 mm (QL56M6XD15BQ) 3 x 11 mm @ 24 mm (QL56M6XD30BQ) 4 x 15 mm @ 50 mm (QL56M6XD40BQ) |
| Shock Resistance | 30 G; 6 shocks per axis; 11 milliseconds duration (EN60068-2-27) |
| Vibration | 0.5 mm amplitude; 10 to 55 Hz frequency; per axis (EN60068-2-6) |
| Application Notes | The lens must be used in the lower position, and the cap must remain in place on the end position. |
| Certifications |  |
| Hookup Diagrams | SP07 (p. 771) |


| |
|----------------------------------|
| Photoelectrics Sensors |
| Fiber Optic Sensors |
| Special Purpose Sensors |
| Measurement & Inspection Sensors |
| Vision |
| Wireless |
| Lighting & Indicators |
| Safety Light Screens |
| Safety Laser Scanners |
| Safety Controllers & Modules |
| Safety Two-Hand Control Modules |
| Safety Interlock Switches |
| Emergency Stop & Control Stop |

| |
|-----------------------|
| PART & AREA |
| SLOT & LABEL |
| REGISTRATION & COLOR |
| LUMINESCENCE |
| QL50 |
| QL56 |
| OPTICAL TOUCH BUTTONS |





Cordsets


| Euro QD | | |
|----------------|-----------|-------------|
| See page 699 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC1-506 | MQDC1-506RA |
| 4.57 m | MQDC1-515 | MQDC1-515RA |
| 9.14 m | MQDC1-530 | MQDC1-530RA |



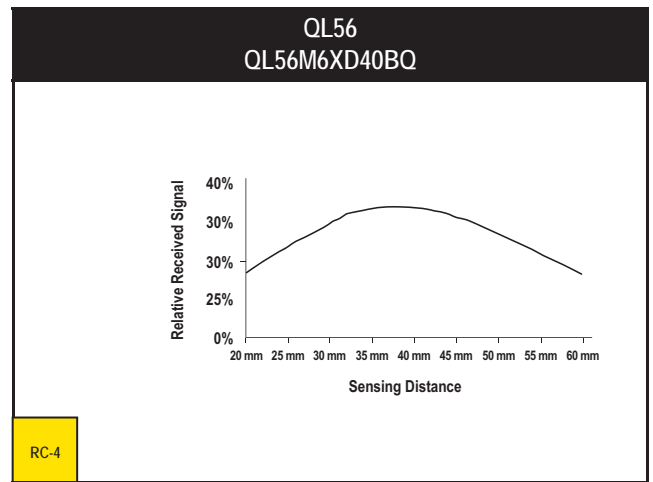
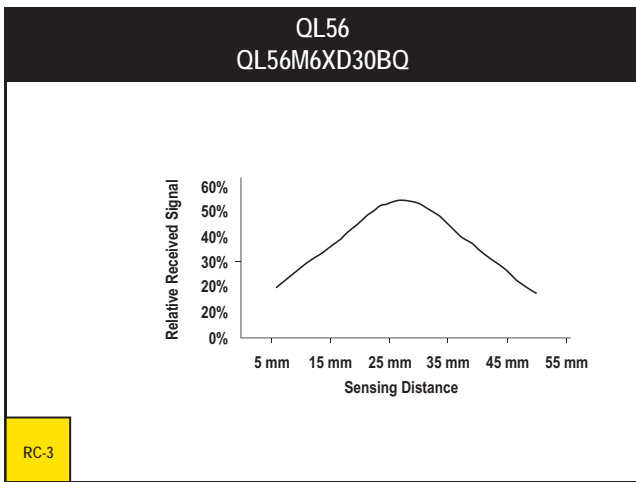
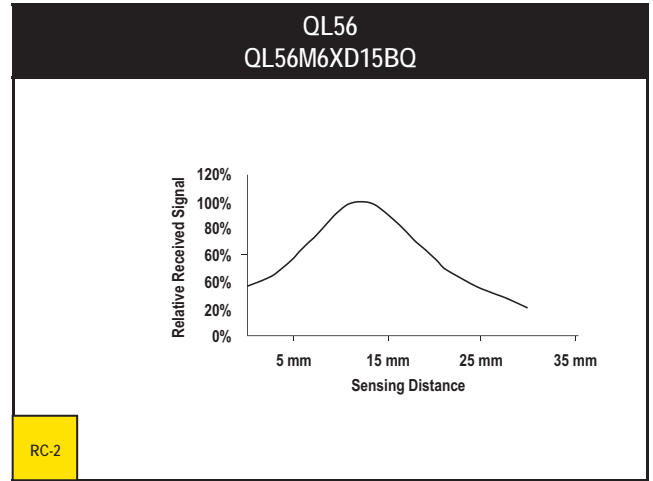
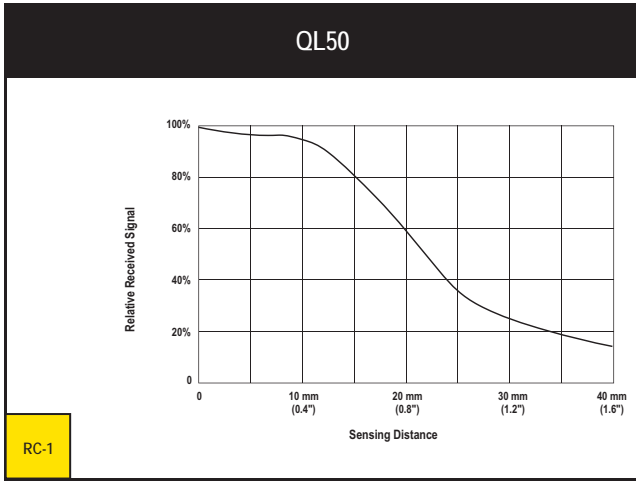
 Additional cordset information available. See page 693.

Brackets

| QL50/QL51/QL56 | | | |
|---|---|---|---|
|  |  |  |  |
| pg. 658 | pg. 659 | pg. 658 | pg. 659 |
| SMB55A | SMB55RA | SMB55F | SMB55S |

 Additional bracket information available. See page 632.

Response Curves



OPTICAL TOUCH BUTTONS

OTB/LTB



VTB



STB



OTB/LTB page 477

- Replaces mechanical push buttons
- Features ergonomic design to prevent repetitive motion stress
- Senses light, not pressure
- Provides a choice of momentary-action or alternate-action touch buttons



VTB page 475

- Bright, easy-to-see sequence indicators
- A cost-effective and easy-to-install solution for areas that cannot accommodate a light screen
- No physical pressure to operate, reducing hand, wrist and arm stress



STB page 481

- Self-checking for use with safety controls
- LED power, output and fault indicators
- 10 to 30V dc or 20 to 30V ac/dc
- Housing sealed to IP66
- Optional field cover colors

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors**
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Control Stop

- PART & AREA
- SLOT & LABEL
- REGISTRATION & COLOR
- LUMINESCENCE
- OPTICAL TOUCH BUTTONS**

MEASUREMENT & INSPECTION

Light Gauging

page 303

- LT3
- LT7
- LH
- LG



Ultrasonic

page 316

- QT50U
- S18U
- QS18U
- T30U/T30UX
- M25U
- T18U
- Q45U
- Q45UR



Measuring Arrays

page 348

- EZ-ARRAY™
- High-Resolution MIN-ARRAY®
- MINI-ARRAY®



Radar

page 362

- QT50R

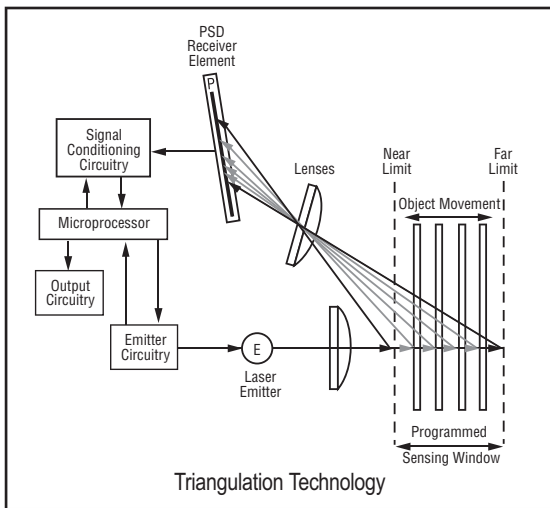


Light Gauging Sensors

Light gauging sensors utilize either "Time of Flight" or triangulation technology to detect the presence and position of targets.

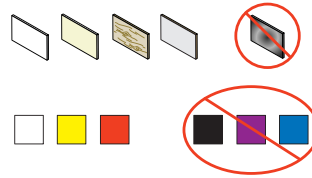
Time of Flight: Measurement of the amount of time that it takes emitted light to travel to the target and return to the sensor. This technology is used in long-range sensing applications.

Triangulation: An emitter transmits visible light through a lens, towards a target. The beam bounces off the target, returning some of the light to the sensor's Position Sensitive Device (PSD) receiver element. The target's distance from the receiver determines the angle at which the light travels to the receiver element. This angle, in turn, determines where the received light will fall along the PSD receiver element. The position of the light on the PSD receiver element is processed through analog and/or digital electronics to calculate the appropriate output value.

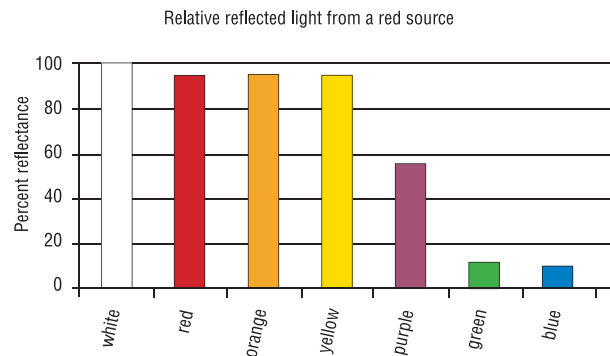


Color Effects

The color of the object being measured can affect the resolution and accuracy of the readings. White, red, yellow and orange targets will reflect more light than green, blue or black targets. The resolution for dark targets may be up to four times less than for white targets.



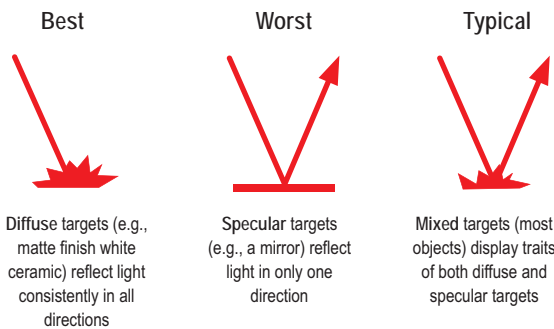
The graph below shows the relative amount of received light that is reflected from various target colors, using visible red light. The resolution is roughly affected according to the square of the received light. For example, reducing the amount of light by a factor of nine will degrade the resolution by a factor of three.



Surface Reflectivity and Texture

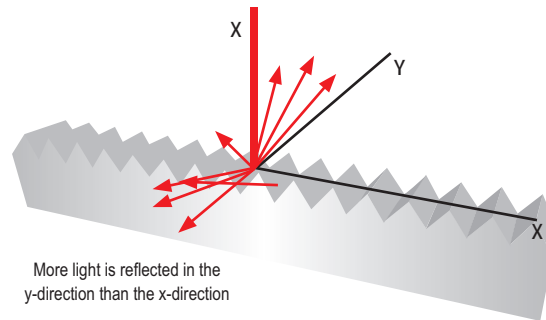
Triangulation sensors depend on the diffuse reflections of light from the target. A diffuse reflection is one in which the light tends to scatter equally in all directions from the target. If the target surface is mirror-like, then light will tend to reflect in only one direction (If this target is not perpendicular to the sensor, the light will be reflected away from the sensor).

Triangulation sensors also require a non-porous, opaque surface for accurate operation. Measurement errors will result from semi-transparent targets such as clear plastic, or from porous materials such as foam.



Metal Surfaces

Bare metal surfaces do not exhibit consistent reflectivity across their surfaces. As a result, the repeatability from one point on a metal surface to another, even at the same distance from the sensor, will degrade. This effect varies from metal to metal and is dependent upon surface finish.



Total Expected Measurement Error

Keep in mind that the overall expected accuracy of an analog sensor is the combination of several performance parameters, not simply the sensor's resolution. Linearity and temperature effect can also affect accuracy.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

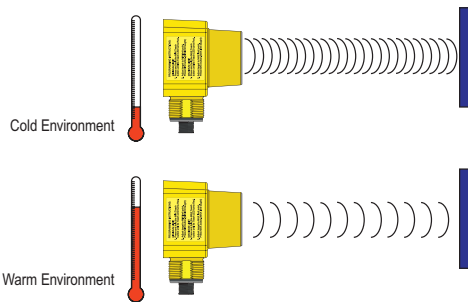
- LIGHT GAUGING
- ULTRASONIC
- MEASURING ARRAYS
- RADAR

Ultrasonic Sensors

Ultrasonic sensors emit a pulse of energy which travels at the speed of sound. A portion of this energy is reflected off of a target and travels back to the sensor. The sensor measures the total time required for the energy to reach the target and return to the sensor and calculates the distance from the sensor to the target.

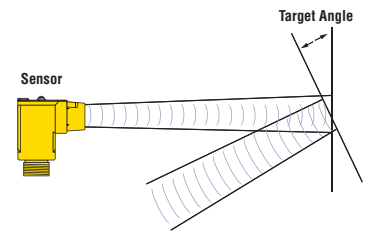
Temperature Effect

The speed of sound depends on chemical composition, pressure and temperature of the gas in which it is traveling. In most ultrasonic applications, the composition and pressure of the gas are relatively fixed, while the temperature is not. The speed of sound increases roughly 1% per 10° F (6° C) temperature increase.



Target Angle

A flat target that is perpendicular to the beam axis will reflect the most sound energy back to the sensor. As the target angle increases, the amount of energy received by the sensor decreases. For most ultrasonic sensors, the target angle should be 10° or less.

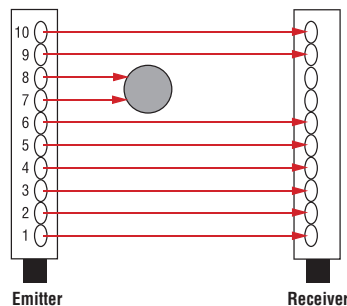


Air Currents

Air currents due to wind, fans, pneumatic equipment or other sources can deflect or disturb the path of the ultrasonic energy, so a sensor may fail to recognize the correct location of the target.

Measuring Light Screens

Banner light screens have a vertical array of photoelectric emitters and receivers: The emitters in one housing, the receivers in another. An object placed between the emitter and receiver will block the emitted light from reaching the corresponding receivers.



Synchronous Scanning

Identifies which of the beams is blocked, by enabling one emitter channel to pulse light while simultaneously directing its corresponding receiver to look for a signal. The system records which beam channels are blocked and which are clear, and then outputs a signal, either analog or discrete.

Sensor Response Time

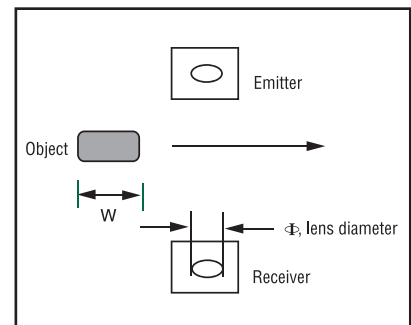
The time required for an array system to "see" an object varies depending on which channel is blocked, when the object blocks a particular channel and when that particular channel is scanned. The result is that the minimum response time is equal to 1 ms; the maximum response time is equal to twice the scan time. The scan time, in turn, varies according to array length and scanning mode, and is specified in the product literature.

Minimum Object Detection

The minimum object detection size is a function of the lens diameter for an individual channel and the spacing between channels. The minimum object detection size is defined as the smallest diameter rod that can be detected reliably.

Maximum Part Speed

The maximum speed of a passing part is a function of the part size, the lens diameter and the maximum response time of the system.



Measuring Modes

Banner's measuring light screens can be configured, with a simple Windows setup program, for several measuring modes for both analog and discrete outputs. For example, the output can be based on the:

- First beam blocked
- Last beam blocked
- Total number of beams blocked
- First beam made
- Last beam made
- Total number of beams made
- Center beam of several blocked beams
- Number of transitions from blocked to made
- Highest number of contiguous beams blocked

L-GAGE® LIGHT GAUGING SENSORS

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Interlock & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

LT3



LT7



LH



LG



LT3 page 304

- Exceptionally accurate advanced time-of-flight sensing technology provides precise measurements over long ranges
- Retroreflective mode sensor has 50 m range
- Ranges with diffuse-mode sensor are 5 m for white targets and 3 m for gray targets
- Sensors offer either analog and discrete, or dual-discrete output with independent window limits



LT7 page 308

- Extremely long-range sensor uses a Class 1 laser beam for accuracy over long distances
- Retroreflective-mode sensor has 250 m range
- Ranges with diffuse-mode sensor are up to 10 m for white, 7 m for gray and 3 m for black targets
- Models are available with discrete output only or with discrete and analog output
- RS-422 or SSI compatible serial connections are provided



LH page 311

- High-precision laser displacement sensor provides reliable measurement results on real-world targets, such as machined metal, wood, ceramic and paper
- Non-contact sensor provides precise measurement on moving processes, hot parts, machined parts, and soft or sticky parts
- Ranges are up to 200 mm, depending on model
- Two sensors self-synchronize for easy thickness measurements and calculations



LG page 313

- One-piece laser gauging system requires no separate controller
- Ultra narrow beam delivers precise distance, height and thickness measurement and gauging
- Two sensing ranges are available: 45 to 60 mm and 75 to 125 mm

- LIGHT GAUGING**
- ULTRASONIC
- MEASURING ARRAYS
- RADAR

Laser Distance-Gauging Sensors L-GAGE® LT3

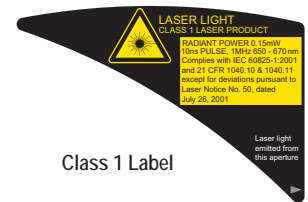
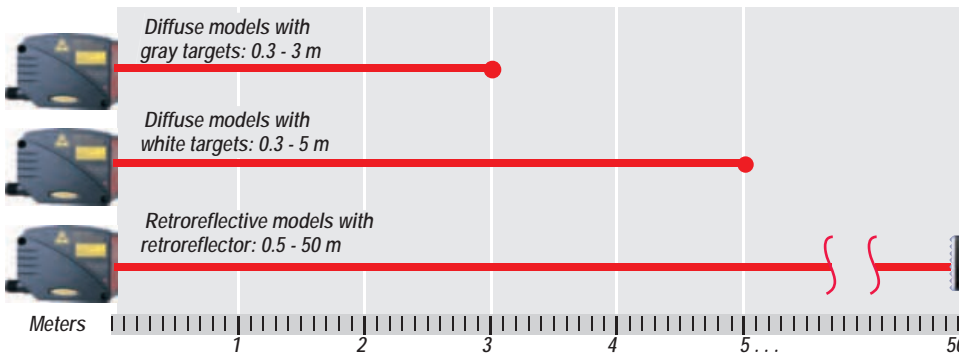
- Uses advanced “time-of-flight” technology for precise, long-distance gauging at the speed of light
- Available in diffuse-mode models with ranges to 5 m and retroreflective models with a 50 m range
- Offered in dual-discrete or analog/discrete models
- Features push-button TEACH-mode programming for custom sensing windows
- Offers remote programming for added security and convenience
- Includes push-button programming for three output response speeds
- Simplifies alignment with a bright, visible laser spot
- Emits one million pulses per second
- Reliably detects angled targets
- Uses rugged construction to withstand demanding sensing environments—rated IEC IP67; NEMA 6



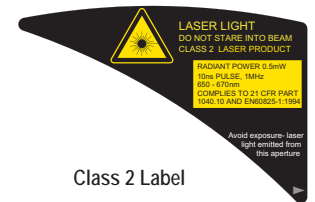
ACCESSORIES
page
307



LT3 Sensing Ranges



Class 1 Label



Class 2 Label



L-GAGE® LT3, 12-24V dc



| Sensing Mode/LED | Laser Class | Sensing Distance | Connection | Analog Output | Models NPN | Models PNP |
|----------------------|-------------|---|---------------|---------------|---------------------------------------|------------|
| <p>DIFFUSE LASER</p> | Class 2 | 0.3 to 5 m for 90% reflectivity white card (see Performance Curve RRC-1 on page 299 for more information) | 2 m | None | LT3BD (Dual NPN or PNP selectable) | |
| | | | 8-pin Euro QD | | LT3BDQ (Dual NPN or PNP selectable) | |
| | | | 2 m | 0 to 10V dc | LT3NU | LT3PU |
| | | | 8-pin Euro QD | | LT3NUQ | LT3PUQ |
| | | | 2 m | 4 to 20 mA | LT3NI | LT3PI |
| | | | 8-pin Euro QD | | LT3NIQ | LT3PIQ |
| <p>LASER RETRO</p> | Class 1 | 0.5 to 50 m† (see Performance Curve RRC-2 on page 299 for more information) | 2 m | None | LT3BDLV (Dual NPN or PNP selectable) | |
| | | | 8-pin Euro QD | | LT3BDLVQ (Dual NPN or PNP selectable) | |
| | | | 2 m | 0 to 10V dc | LT3NULV | LT3PULV |
| | | | 8-pin Euro QD | | LT3NULVQ | LT3PULVQ |
| | | | 2 m | 4 to 20 mA | LT3NILV | LT3PILV |
| | | | 8-pin Euro QD | | LT3NILVQ | LT3PILVQ |

Connection options: A model with a QD requires a mating cordset (see page 307).

For 9 m cable, add suffix W/30 to the 2 m model number (example, LT3BD W/30).

† Retroreflective range is specified using a BRT-TVHG-8X10P high-grade target. Actual sensing range may differ, depending on the efficiency and reflective area of the retroreflector used. See Accessories for more information.

Photoelectrics Sensors
Fiber Optic Sensors
Special Purpose Sensors

Measurement & Inspection Sensors

Vision
Wireless
Lighting & Indicators
Safety Light Screens
Safety Laser Scanners
Safety Interlock & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control




LIGHT GAUGING
LT3
LT7
LH
LG
ULTRASONIC
MEASURING ARRAYS
RADAR

L-GAGE® LT3 Specifications

| | | |
|-----------------------------|---|---|
| Sensing Beam | Typical beam diameter: 6 mm @ 3 m Typical laser lifetime: 75,000 hours Diffuse: 658 nm visible red IEC and CDRH Class 2 laser; 0.5 mW max. radiant output power Retroreflective: 658 nm visible red IEC and CDRH Class 1 laser, 0.15 mW max. radiant output power | |
| Sensing Range | Diffuse: 90% white card: 0.3 to 5 m 18% gray card: 0.3 to 3 m 6% black card: 0.3 to 2 m | Retroreflective: 0.5 to 50 m (using supplied target) |
| Supply Voltage and Current | 12 to 24V dc (10% max. ripple); 108 mA max. @ 24V dc or [2600V dc] mA | |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages | |
| Delay at Power-up | 1 second; outputs do not conduct during this time | |
| Output Rating | Discrete (switched) output: 100 mA max. OFF-state leakage current: less than 5 µA Output saturation NPN: less than 200 mV @ 10 mA; less than 600 mV @ 100 mA Output saturation PNP: less than 1.2V at 10 mA; less than 1.6V at 100 mA Analog voltage output: 2.5 k min. load impedance (voltage sourcing) Analog current output: 1 k max. @ 24V; max. load resistance = $[V_{cc}-4.5/0.02]$ (current sourcing) | |
| Output Configuration | Discrete (switched): Solid-state switch; NPN (current sinking) or PNP (current sourcing), depending on model. Dual-discrete models feature selectable NPN or PNP, depending on wiring hookup. Analog output: 0 to 10V dc or 4 to 20 mA | |
| Output Protection | Protected against short circuit conditions | |





More on next page

| L-GAGE® LT3 Specifications (cont'd) | | | | | |
|---|---|---|--|--|--------------------|
| Output Response Time | <p>Discrete output Fast: 1 millisecond ON/OFF Medium: 10 milliseconds ON/OFF Slow: 100 milliseconds ON/OFF</p> <p>Diffuse Analog Voltage output (-3 dB) Fast: 450 Hz (1 millisecond average/1 millisecond update rate) Medium: 45 Hz (10 milliseconds average/2 milliseconds update rate) Slow: 4.5 Hz (100 milliseconds average/4 milliseconds update rate)</p> <p>Retroreflective Analog Voltage output (-3 dB) Fast: 114 Hz (6 milliseconds average/ 1 millisecond update rate) Medium: 10 Hz (48 milliseconds average/ 1 millisecond update rate) Slow: 2.5 Hz (192 milliseconds average/ 1 millisecond update rate)</p> | | | | |
| Resolution/Repeatability | See charts RRC-1 and RRC-2 on page 299 | | | | |
| Color Sensitivity (typical) | Diffuse: 90% white to 18% gray: less than 10 mm; 90% white to 6% black: less than 20 mm. See chart CSC-1 on page 299. | | | | |
| Analog Linearity | <p>Retroreflective: ± 60 mm from 0.5 to 50 m (0.12% of full scale) (Specified @ 24V dc, 22° C using supplied BRT-TVHG-8X10P retroreflector)</p> <p>Diffuse: ± 30 mm from 0.3 to 1.5 m; ± 20 mm from 1.5 to 5 m (Specified @ 24V dc, 22° C using a 90% reflectance white card)</p> | | | | |
| Discrete Output Hysteresis | <table border="0"> <tr> <td style="vertical-align: top;"> <p>Diffuse Fast: 10 mm Medium: 5 mm Slow: 3 mm</p> </td> <td style="vertical-align: top;"> <p>Retroreflective Fast: 20 mm Medium: 10 mm Slow: 6 mm</p> </td> </tr> </table> | <p>Diffuse Fast: 10 mm Medium: 5 mm Slow: 3 mm</p> | <p>Retroreflective Fast: 20 mm Medium: 10 mm Slow: 6 mm</p> | | |
| <p>Diffuse Fast: 10 mm Medium: 5 mm Slow: 3 mm</p> | <p>Retroreflective Fast: 20 mm Medium: 10 mm Slow: 6 mm</p> | | | | |
| Temperature Effect | <table border="0"> <tr> <td style="vertical-align: top;">Diffuse: less than 2 mm/ ° C</td> <td style="vertical-align: top;">Retroreflective: less than 3 mm/° C</td> </tr> </table> | Diffuse: less than 2 mm/ ° C | Retroreflective: less than 3 mm/° C | | |
| Diffuse: less than 2 mm/ ° C | Retroreflective: less than 3 mm/° C | | | | |
| Minimum Window Size | <table border="0"> <tr> <td style="vertical-align: top;">Diffuse: 20 mm</td> <td style="vertical-align: top;">Retroreflective: 40 mm</td> </tr> </table> | Diffuse: 20 mm | Retroreflective: 40 mm | | |
| Diffuse: 20 mm | Retroreflective: 40 mm | | | | |
| Remote TEACH Input | 18 k min. (65 k at 5V dc) | | | | |
| Remote TEACH | To teach: Connect yellow wire to +5 to 24V dc To disable: Connect yellow wire to 0 to +2V dc (or open connection) | | | | |
| Adjustments | <p>Response speed: Push button toggles between fast, medium and slow (see Output Response Time)</p> <p>Window limits (analog or discrete): TEACH-mode programming of near and far window limits. Limits may also be taught remotely using TEACH input.</p> <p>Analog output slope: The first limit taught is assigned to minimum output current or voltage (4 mA or 0V dc)</p> | | | | |
| Laser Control | Connect red wire to +5 to 24V dc to enable laser beam; connect to 0 to +1.8V dc (or open connection) to disable. See data sheet for delay time on enable. | | | | |
| Indicators | <p>Green Power ON LED: Indicates when power is ON, overloaded output and laser status</p> <p>Yellow Output LED: Indicates when discrete load output is conducting</p> <p>Red Signal LED: Indicates target is within sensing range and the condition of the received light signal</p> <p>Yellow Speed LED: Indicates the response speed setting</p> <p>Red/Yellow TEACH LEDs: In programming mode; indicate active output(s)</p> | | | | |
| Construction | <p>Housing: ABS/polycarbonate blend</p> <p>Window: Acrylic</p> <p>Quick-disconnect: ABS/polycarbonate blend</p> | | | | |
| Environmental Rating | IP67; NEMA 6 | | | | |
| Connections | 2 m or 9 m shielded 7-conductor (with drain) PVC-jacketed attached cable, or 8-pin Euro-style quick-disconnect. QD cordsets are ordered separately. See page 307. | | | | |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% at 50° C (non-condensing) | | | | |
| Application Notes | <ul style="list-style-type: none"> • For best accuracy, allow 30-minute warm-up before programming or operating • Retroreflective performance specifications are based on use with supplied BRT-TVHG-8X10P high-grade target. Results may vary with other retroreflective target materials. | | | | |
| Certifications |  | | | | |
| Hookup Diagrams | <table border="0"> <tr> <td style="vertical-align: top;">Discrete/Analog Models: NPN: MI01 (p. 772)</td> <td style="vertical-align: top;">PNP: MI02 (p. 772)</td> </tr> <tr> <td style="vertical-align: top;">Dual-Discrete Models: NPN: MI03 (p. 772)</td> <td style="vertical-align: top;">PNP: MI04 (p. 772)</td> </tr> </table> | Discrete/Analog Models: NPN: MI01 (p. 772) | PNP: MI02 (p. 772) | Dual-Discrete Models: NPN: MI03 (p. 772) | PNP: MI04 (p. 772) |
| Discrete/Analog Models: NPN: MI01 (p. 772) | PNP: MI02 (p. 772) | | | | |
| Dual-Discrete Models: NPN: MI03 (p. 772) | PNP: MI04 (p. 772) | | | | |





Cordsets


| Euro QD (With Shield) | |
|-----------------------|----------------|
| See page 703 | |
| | Threaded 8-Pin |
| Length | Straight |
| 2 m | MQDC-806 |
| 5 m | MQDC-815 |
| 9 m | MQDC-830 |



 Additional cordset information available. See page 693.

Brackets

| LT3 | | | |
|---|---|---|--|
|  |  |  |  |
| pg. 664 | pg. 671 | pg. 671 | pg. 671 |
| SMBAMSLT3IP | SMLT31 | SMLT32 | SMLT31P |

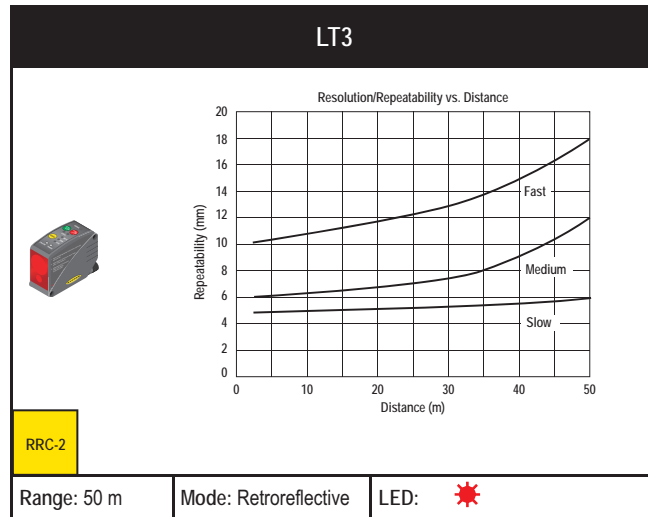
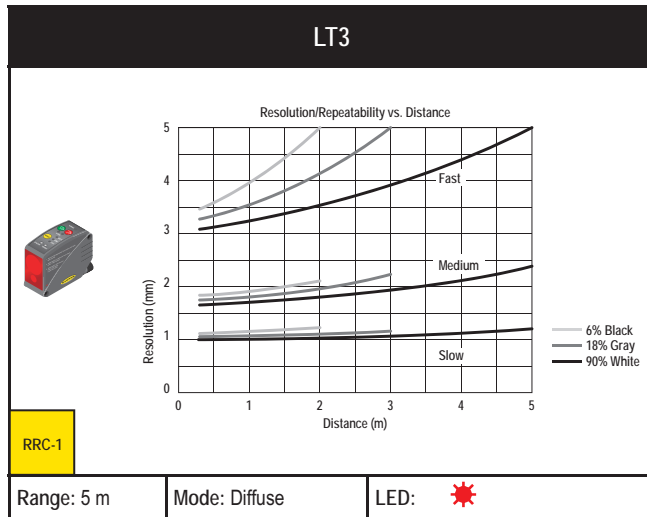
 Additional brackets and information available. See page 632.



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Repeatability/Resolution Curves

* = Visible Red Laser

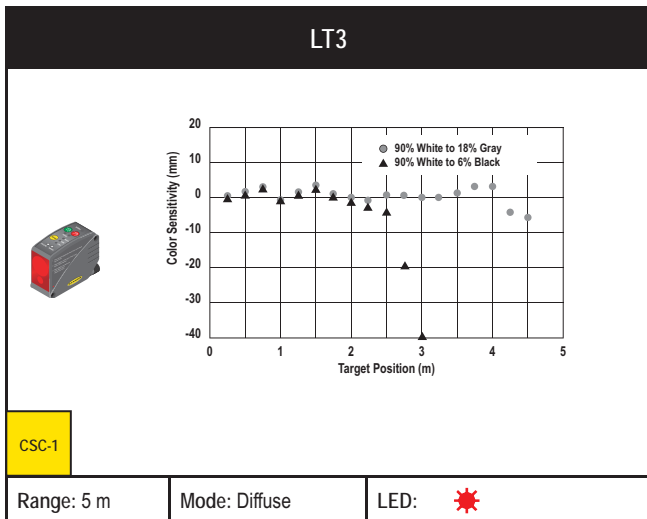


LIGHT GAUGING

- LT3
- LT7
- LH
- LG
- ULTRASONIC
- MEASURING ARRAYS
- RADAR

Color Sensitivity Curves

* = Visible Red Laser



Highly Accurate Time-of-Flight Laser Gauging Sensors

L-GAGE® LT7

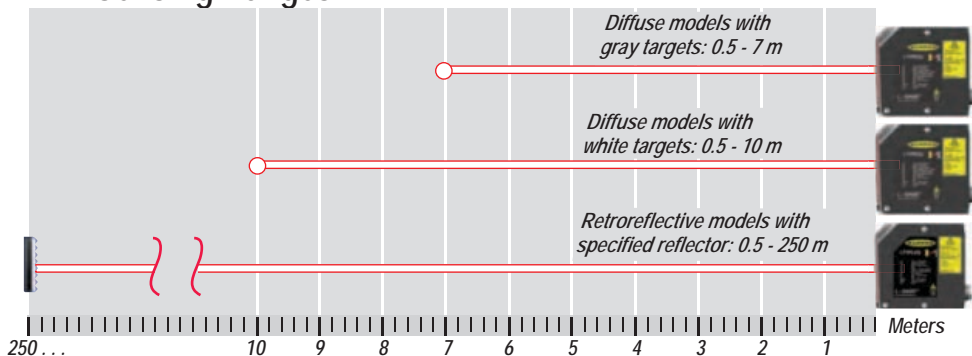
- Available in extremely long-range retroreflective models with ranges up to 250 m or in diffuse models with ranges up to 10 m
- Provides two alarm outputs with ongoing LCD display for easy troubleshooting
- Uses visible Class 2 alignment laser for accurate alignment
- Provides quick warm-up to minimize drift
- Offered in dual-discrete or analog/discrete models
- Features TEACH-mode programming using integrated push buttons or a serial interface
- Continually displays sensing distance in millimeters or hundredths of an inch
- Delivers excellent ± 10 mm linearity
- Offers choice of RS-422 or SSI-compatible serial connection




ACCESSORIES
page
310



LT7 Sensing Ranges





Operating Mode
Laser Class 1

Setup Mode
Laser Class 2
Do not stare into beam

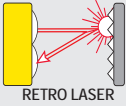
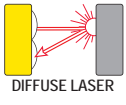
λ : 650nm
 t_r : 0,3 μ s; T: 1 μ s
 P_{max} : 3mW

EN 60825-1. 03/97.



L-GAGE® LT7, 18-30V dc

Infrared Laser

| Sensing Mode/LED | Laser Class | Sensing Distance* | Connection | Discrete Output | Analog Output | Models | Serial |
|---|---|-------------------|---------------|-----------------|---------------|---------|---------------|
|  RETRO LASER | Class 1 Sensing Laser (Class 2 Alignment Laser) | 0.5 to 250 m | 12-pin M16 QD | 2 PNP | — | LT7PLVQ | RS-422 or SSI |
|  DIFFUSE LASER | | 0.5 to 10 m | | | 4-20 mA | LT7PIDQ | |

Connection options: A model with a QD requires a mating cordset (see page 310).

* Diffuse-mode range specified using a 90% reflectance white card. Retroreflective range is specified using a BRT-250, BRT-540 or BRT-700 retroreflective target (see page 724).

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


ACCESSORIES
page 310

L-GAGE® LT7 Specifications

| | | | |
|-------------------------------------|---|--------------------------|------------|
| Sensing Range | LT7PLVQ: 0.5 to 250 m (using specified reflector) LT7PIDQ: 6% Black card: 0.5 to 3 m 18% Gray card: 0.5 to 7 m 90% White card: 0.5 to 10 m | | |
| Supply Voltage and Current | 18 to 30V dc (10% max. ripple) | | |
| Power Consumption | Less than 4.5 W @ 25° C | | |
| Measuring Laser | Infrared, 900 nm, Class 1 | | |
| Laser Control | Measurement laser is ON when sensor is ON. Pilot (visible) laser enabled during Programming mode; alternates with measurement laser. | | |
| Spot Size | Distance | Spot Size | |
| | LT7PLVQ: | 10 m | ø 20 mm |
| | | 50 m | ø 100 mm |
| | | 100 m | ø 200 mm |
| | | 250 m | ø 500 mm |
| | LT7PIDQ: | 4 m | 3 x 10 mm |
| | | 6 m | 4 x 12 mm |
| | | 10 m | 10 x 20 mm |
| Pilot Laser (Alignment) | Visible red, 650 nm, Class 2 | | |
| Discrete & Analog Output Protection | Protected against continuous overload and short circuit | | |
| Discrete Outputs | (2) 100 mA, PNP | | |
| Discrete Switch Points | Adjustable in 1 mm steps | | |
| Discrete Output Hysteresis | Adjustable, 10 mm min. | | |
| Alarm Outputs | 50 mA, PNP (NO) | | |
| Analog Output | LT7PLVQ: None LT7PIDQ: 4-20 mA | | |
| Maximum Cordset Length | 100 m | | |
| Output Response Time | 12 milliseconds | | |
| Linearity | ±10 mm | | |
| Resolution/Repeatability | LT7PLVQ: ±2 mm | LT7PIDQ: ±4 mm | |
| Color Sensitivity | LT7PLVQ: Not Applicable | LT7PIDQ: Contact Factory | |
| Temperature Effect | Less than ± 5 mm over the total sensing range | | |

More on next page


- LIGHT GAUGING
- LT3
- LT7
- LH
- LG
- ULTRASONIC
- MEASURING ARRAYS
- RADAR

| L-GAGE® LT7 Specifications (cont'd) | |
|-------------------------------------|--|
| Minimum Analog Window Size | LT7PLVQ: Not Applicable LT7PIDQ: 300 mm |
| Adjustments | Push-button-directed password enable/disable, measurement unit select, offset value select, output limits set, output mode select, analog output slope select (diffuse models only) and output limit manual adjust. See data sheet for information. |
| Serial Interface | RS-422 or SSI compatible |
| Serial Measurement Speed | SSI: 1.4 milliseconds (SSI cycle 80 microseconds) RS-422: 2.9 milliseconds @ 57.6 kBaud |
| Indicators | 4 LEDs: Green: Power ON/OFF Red: Alarm (Error) LED Orange: Output 1 and Output 2 conducting LEDs 2-line digital LCD display. See data sheet for detailed information. |
| Construction | ABS shock-resistant housing; PMMA window; polycarbonate displays |
| Weight | Approximately 230 g |
| Environmental Rating | IEC IP67 |
| Connections | 12-pin M16 connector; 100 m max. cable length; use only cables listed on page 310 |
| Operating Conditions | Temperature: -10° to +50° C in continuous operation |
| Storage Temperature | -30° to +75° C |
| Vibration/Shock | EN 60947-5-2 |
| Application Notes | <ul style="list-style-type: none"> • All specifications are based on the specified surface at constant ambient conditions and following a minimum operating time of 15 minutes • For best accuracy, allow a 15 minute warm-up before programming or operating • Crosstalk avoidance: Light spots must be separated by at least 200 mm |
| Certifications |  |
| Hookup Diagrams | MI05 (p. 773) |


Cordsets

| M16 QD | | |
|-----------------|-------------|-------------|
| See page 711 | | |
| Threaded 12-Pin | | |
| Length | Straight | Right-Angle |
| 3 m | MQDC-1210ST | MQDC-1210RA |
| 10 m | MQDC-1230ST | MQDC-1230RA |
| 30 m | — | MQDC-1290RA |





 Additional cordset information available. See page 693.

Brackets

| LT7 |
|---|
|  |
| pg. 672 |
| SMBLT7 |



 Additional brackets and information available. See page 632.



Operating Mode
Laser Class 1

Setup Mode
Laser Class 2
Do not stare into beam

λ : 650nm
 t_p : 0,3 μ s; T: 1 μ s
 P_{max} : 3mW

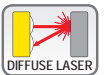
EN 60825-1. 03/97.

Class 1 (Infrared Sensing Laser)

Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.

Class 2 (Visible Alignment Laser)

Lasers that emit visible radiation in the wavelength range from 400 to 700 nm where eye protection is normally afforded by aversion responses, including the blink reflex. This reaction may be expected to provide adequate protection under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing. Reference 60825-1 Amend. 2 © IEC:2001(E), section 8.2.



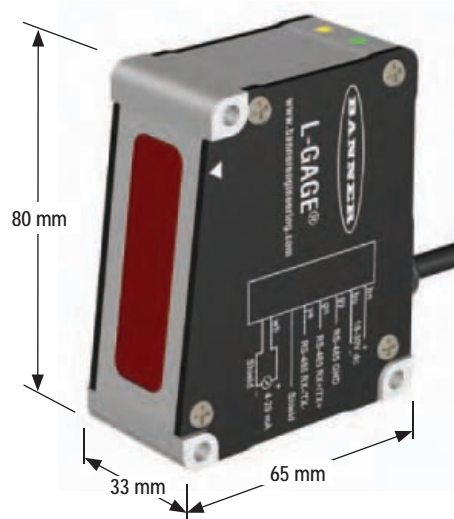
High-Precision Laser Sensors for Displacement & Thickness Measurements

L-GAGE® LH




- High-precision laser technology provides reliable and accurate measurement on virtually any material, including machined metal, wood, ceramic, paper and painted targets
- Extremely accurate, robust and self-contained laser displacement sensor with a 1024 pixel CMOS linear imager
- Non-contact precise measurement on moving processes, hot parts, machined parts, and soft or sticky parts
- Precise red laser spot for easy alignment to the target
- Target displacement or thickness measurement with high-resolution 4-20 mA or RS-485 serial communication outputs
- Automatic laser power and measurement rate control for reliable measurement under changing or challenging target conditions
- Two sensors self-synchronize for thickness measurements and thickness calculation within the sensors without the need for an external controller
- A network of up to 32 sensors can be setup for combined measurement in multi-task or process control applications
- Dedicated software for sensor setup and performance monitoring

Two sensors self-synchronize for thickness measurements and calculation within the sensors without the need for an external controller.



L-GAGE® LH, 18-30V dc

Visible Red Laser

| Sensing Mode/LED | Laser Class | Measurement Span | Start of Measurement Range | Reference Distance | End of Measuring Range | Connection | Output | Spot Size at Reference Distance | Models |
|---|-------------|------------------|----------------------------|--------------------|------------------------|-----------------------|-------------------------|---------------------------------|--------------|
|  DIFFUSE LASER | Class 2 | 10 mm | 25 mm | 30 mm | 35 mm | 8-pin Euro Pigtail QD | Analog 4-20 mA & RS-485 | 50 micron | LH30IX485QP |
| | | 40 mm | 60 mm | 80 mm | 100 mm | | | 125 micron | LH80IX485QP |
| | | 100 mm | 100 mm | 150 mm | 200 mm | | | 225 micron | LH150IX485QP |

Connection options: A model with a QD requires a mating cordset (see page 312).

| L-GAGE® LH Specifications | |
|--------------------------------|--|
| Sensing Beam | 670 nm (1mW) visible red IEC and CDRH Class 2 laser |
| Supply Voltage and Current | 18 to 30V dc (10% maximum ripple); 250 mA max @ 24V dc (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient over voltages |
| Delay at Power-up | 1.25 seconds |
| Temperature Effect | 0.01% of measurement range/°C |
| Linearity | 0.1% of measurement range |
| Resolution | LH30: 1 µm LH80: 4 µm LH15: 10 µm Resolution obtained with an average of 64 readings on a white ceramic target |
| Ambient Light | ≤ 3000 Lux |
| Measurement Frequency | Dynamically adjusted from 300 to 4000 Hz depending on target conditions, or locked via LH Series configurator square |
| Adjustments | None on sensor; Configuration through LH Series Configurator Software |
| Indicators | Green: Power ON; Flashing = target at reference distance Orange: Target inside measurement range |
| Construction | Housing: Aluminum Cover: Aluminum Lens: Glass Cable: PVC and nickel-plated brass |
| Environmental Rating | IP67 |
| Connections | 150 mm 8-pin M12/Euro-style pigtail quick-disconnect. Mating QD cordsets are ordered separately. See page 312. |
| Output Configuration | Analog current output: 4 to 20 mA (current sourcing) Analog output rating: 1 kΩ max @ 24V dc, max load resistance = $[(V_{cc}-4.5)/0.02]\Omega$ |
| Output Response | User adjustable output filtering via LH series configurator software |
| Serial Communication Interface | RS-485, optically isolated, up to 230 Kbaud |
| Data Formats | LH-Ring Serial Protocol |
| Operating Conditions | Operating Temperature: -10° to +45° C Storage Temperature: 0° to +80° C Maximum relative humidity: 85% at +50° C, non-condensing |
| Vibration and Mechanical Shock | Vibration: 60 Hz, 30 minutes, 3 axes Shock: 30G for 11 milliseconds, half sine wave, 3 axes |
| Application Notes | Allow 30-minute warm-up for specified performance |
| Factory Default Settings | Mode: Displacement Mode Sensor Address: Unset (address 0) Baud Rate: 115200 Analog Output: 4-20 mA, positive slope, full range |
| Certifications | |
| Hookup Diagrams | MI06 (p. 773) |

Cordsets

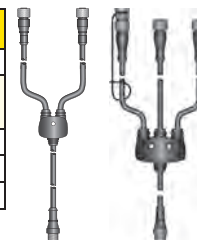
| Euro QD (With Shield) | |
|-----------------------|----------------|
| See page 703 | |
| Length | Threaded 8-Pin |
| | Straight |
| 2 m | MQLH-806-F |
| 5 m | MQLH-815-F |
| 9 m | MQLH-830-F |



| Euro QD—Double Ended (With Shield) | | |
|------------------------------------|----------------------------------|--------------------------------|
| See page 703 | | |
| Length | Threaded 8-Pin | |
| | Straight Male to Straight Female | Straight Male to Straight Male |
| 0.3 m | — | MOLH-801-MM |
| 2 m | MQLH-806-MF | — |
| 5 m | MQLH-815-MF | — |
| 9 m | MQLH-830-MF | — |



| Euro QD—Splitter | | |
|------------------|----------------|--------------------|
| See page 706 | | |
| Length | Threaded 8-Pin | |
| | Trunk | Branches |
| 2 x 0 m | 0.0 m | CSB-M1280M1280-LH |
| 2 x 0.6 m | 0.3 m | CSB-M1281M1282-LH |
| 3 x 0.6 m | 0.3 m | CSB3-M1281M1282-LH |



Additional cordset information available. See page 693.

Brackets

| LH | | | |
|---------|---------|---------|----------|
| | | | |
| pg. 670 | pg. 670 | pg. 670 | pg. 670 |
| SMBLH1 | SMBLH30 | SMBLH80 | SMBLH150 |

Additional brackets and information available. See page 632.

Serial Adapters

| See page 739 | | Model |
|--------------|---|--------------|
| | <ul style="list-style-type: none"> Easy configuration of a single sensor or network of sensors USB to RS-485 serial adapter with integral communication cordset and USB cable | INTUSB485-LH |
| | <ul style="list-style-type: none"> Converts an LH Network to the Modbus 485-RTU protocol Supports baud rates up to 230,400 baud Supports LH Networks with up to 32 sensors | INTMOD485-LH |



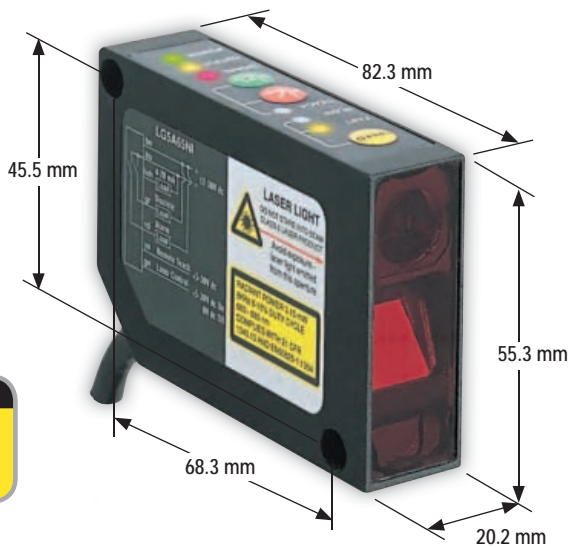
Short-range Laser Sensors

L-GAGE® LG

- Non-contact precise measurement on moving processes, hot parts and sticky parts
- Replaces large, two-piece laser gauging sensors with a completely self-contained, compact housing
- Houses discrete (switched) and analog outputs in the same unit, each independently programmable
- Automatically scales the analog output over the width of the programmed sensing window
- Features an outstanding maximum resolution of 3 µm for flat white targets
- Uses an ultra-narrow beam for applications requiring precise measurement of distance, height or thickness as well as gauging applications
- Can easily select the exact range needed with the push of a button
- Offers remote programming for added security and convenience
- Uses push-button programming for other output response speeds

- Photoelectronics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 315



LASER LIGHT

DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

Avoid exposure - laser light emitted from this aperture

RADIANT POWER 0.2 mW
9.8KHz 11-20% DUTY CYCLE
660 - 680 nm
COMPLIES WITH 21 CFR 1040.10 AND EN60825-1:1994

ONLINE
AUTOCAD, STEP, IGES & PDF

- LIGHT GAUGING
- LT3
- LT7
- LH
- LG**
- ULTRASONIC
- MEASURING ARRAYS
- RADAR



L-GAGE® LG5, 12-30V dc


Visible Red Laser

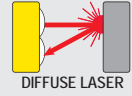
| Sensing Beam/LED | Laser Class | Sensing Distance | Beam Size | Connection | Analog Output | Models NPN | Models PNP |
|-------------------|-------------|------------------|--|-----------------------|---------------|------------|------------|
| DIFFUSE LASER | Class 2 | 45-60 mm | At 53 mm: 0.4 mm x 0.6 mm Focus: 70 mm | 2 m | 0-10V dc | LG5A65NU | LG5A65PU |
| | | | | 8-pin Euro Pigtail QD | | LG5A65NUQ | LG5A65PUQ |
| | | | | 2 m | 4-20 mA | LG5A65NI | LG5A65PI |
| | | | | 8-pin Euro Pigtail QD | | LG5A65NIQ | LG5A65PIQ |
| DIFFUSE LASER | Class 2 | 45-60 mm | At 53 mm: 0.1 mm Focus: 53 mm | 2 m | 0-10V dc | LG5B65NU | LG5B65PU |
| | | | | 8-pin Euro Pigtail QD | | LG5B65NUQ | LG5B65PUQ |
| | | | | 2 m | 4-20 mA | LG5B65NI | LG5B65PI |
| | | | | 8-pin Euro Pigtail QD | | LG5B65NIQ | LG5B65PIQ |

Connection options: A model with a QD requires a mating cordset (see page 315).

For 9 m cable, add suffix W/30 to the 2 m model number (example, LG5A65PU W/30).

L-GAGE® LG10, 12-30V dc

 Visible Red Laser

| Sensing Beam/LED | Laser Class | Sensing Distance | Beam Size | Connection | Analog Output | Models NPN | Models PNP |
|--|-------------|------------------|--|-----------------------|---------------|------------|------------|
|  DIFFUSE LASER | Class 2 | 75-125 mm | At 125 mm: 0.6 mm x 0.8 mm Focus: 180 mm | 2 m | 0-10V dc | LG10A65NU | LG10A65PU |
| | | | | 8-pin Euro Pigtail QD | | LG10A65NUQ | LG10A65PUQ |
| | | | | 2 m | 4-20 mA | LG10A65NI | LG10A65PI |
| | | | | 8-pin Euro Pigtail QD | | LG10A65NIQ | LG10A65PIQ |

Connection options: A model with a QD requires a mating cordset (see page 315).


For 9 m cable, add suffix W/30 to the 2 m model number (example, LG10A65PU W/30).

L-GAGE® LG5 and LG10 Specifications

| | | |
|---|---|--|
| Sensing Beam | 650 nm visible Red IEC and CDRH Class 2 laser; 0.20 mW max. radiant output power | |
| Supply Voltage and Current | 12 to 30V dc (10% max. ripple); 50 mA max @ 24V dc (exclusive of load) | |
| Supply Protection Circuitry | Protected against reverse polarity and transient overvoltages | |
| Delay at Power-up | 1.25 second | |
| Output Rating | Discrete (switched) and Alarm outputs: 100 mA max. OFF-state leakage current: less than 5 µA Output saturation voltage PNP outputs: less than 1.2V at 10 mA and less than 1.6V at 100 mA NPN outputs: less than 200 mV at 10 mA and less than 600 mV at 100 mA Analog Current output: 1 k max @ 24V dc, max load resistance = [(Vcc - 4.5)/0.02] Analog Voltage output: 2.5 k min. load impedance | |
| Output Configuration | Discrete (switched) & alarm outputs: Solid-state switch; choose NPN (current sinking) or PNP (current sourcing) models Analog output: 4 to 20 mA (current sourcing) or 0 to 10V dc (voltage sourcing), depending on model | |
| Output Protection | Discrete and alarm outputs are protected against continuous overload and short circuit | |
| Output Response Time | Discrete Outputs (ON/OFF) Fast: 2.0 milliseconds Medium: 10 milliseconds Slow: 100 milliseconds Analog Output (-3dB) Fast: 450 Hz (1 millisecond average/1 millisecond update rate) Medium: 45 Hz (10 millisecond average/2 millisecond update rate) Slow: 4.5 Hz (100 millisecond average/5 millisecond update rate) | |
| Analog Resolution and Repeatability of Discrete Trip Point* | LG5: Fast: Less than 40 µm @ 50 mm Medium: Less than 12 µm @ 50 mm Slow: Less than 3 µm @ 50 mm See chart RRC-1 on page 307 | LG10: Fast: Less than 150 µm @ 100 mm Medium: Less than 50 µm @ 100 mm Slow: Less than 10 µm @ 100 mm See chart RRC-2 on page 307 |
| Analog Linearity* | LG5: +/- 60 µm over 45 to 60 mm sensing window +/- 10 µm over 49 to 51 mm sensing window | LG10: +/- 200 µm over 75 to 125 mm sensing window +/- 20 µm over 95 to 100 mm sensing window |
| *Resolution and linearity specified @ 24V dc, 22° C, using a white ceramic test surface (see Application Notes) | | |
| Minimum Window Size (Analog or Discrete) | LG5: 1.5 mm | LG10: 5 mm |
| Discrete Output Hysteresis | LG5: Less than 0.2 mm | LG10: Less than 1.0 mm |
| Color Sensitivity (typical) | LG5: Less than 75 µm for white to dark gray ceramic target | LG10: Less than 100 µm for white to dark gray ceramic target |
| Temperature Effect | LG5: +/- 7 µm/° C | LG10: +/- 25 µm/° C |
| Remote TEACH and Laser Control Input Impedance | 18 k min. (65 k min. at 5V dc) | |
| Remote TEACH | To teach: Connect yellow wire to +5 to 30V dc To disable: Connect yellow wire to 0 to +2V dc (or open connection) | |

More on next page 

ACCESSORIES
page 315


| L-GAGE® LG5 and LG10 Specifications (cont'd) | |
|--|--|
| Adjustments | Response speed: Push button toggles between Slow, Medium, and Fast (see Output Response Time) Window limits (analog or discrete): TEACH-mode programming of near and far window limits. Limits may also be taught remotely using TEACH wire. Analog output slope: The first limit taught is assigned to the minimum analog output (0V dc or 4 mA). |
| Laser Control | To enable laser: Connect green wire to +5 to 30V dc To disable laser: Connect green wire to 0 to +2V dc (or open connection) 250 millisecond delay upon enable/disable |
| Indicators | Green Power ON LED: Indicates when power is ON, overloaded output and laser status Yellow Output LED: Indicates when discrete load output is conducting Red Signal LED: Indicates when target is within sensing range and the condition of the received light signal Tri-color Red/Green/Yellow TEACH LED: Indicates sensor is ready for programming each limit (indicates Red for analog output, Green for discrete, and Yellow for simultaneous analog and discrete) Yellow Fast/Slow LEDs: Combination of 2 lights ON or OFF indicates 1 of 3 response speeds |
| Construction | Housing: Zinc alloy die-cast, plated and painted finish Cover plate: aluminum with painted finish Lens: acrylic |
| Environmental Rating | IP67; NEMA 6 |
| Connections | 2 m or 9 m 7-conductor shielded PVC-jacketed attached cable, or 150 mm 8-pin Euro-style pigtail quick-disconnect. Mating QD cordsets are purchased separately. See page 307. |
| Operating Conditions | Temperature: -10° to +50° C Relative humidity: 90% at 50° C (non-condensing) |
| Vibration and Mechanical Shock | Vibration: 60 Hz, 30 minutes, 3 axes Shock: 30G for 11 milliseconds, half sine wave, 3 axes |
| Application Notes | For comparison, a white ceramic test surface has approximately 91% of the reflectivity of a white Kodak test card with a matte finish. A dark gray ceramic test surface has approximately 11% of the reflectivity of a white Kodak test card with a matte finish. (Allow 15-minute warm-up for maximum linearity.) |
| Certifications |  |
| Hookup Diagrams | NPN Models: MI06 (p. 773) PNP Models: MI07 (p. 773) |


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LIGHT GAUGING**
- LT3
- LT7
- LH
- LG**
- ULTRASONIC**
- MEASURING ARRAYS
- RADAR



Cordsets


| Euro QD (With Shield) | |
|-----------------------|-------------------|
| See page 703 | |
| 8-Pin | |
| Length | Threaded Straight |
| 2 m | MQDC-806 |
| 5 m | MQDC-818 |
| 9 m | MQDC-830 |



 Additional cordset information available. See page 693.

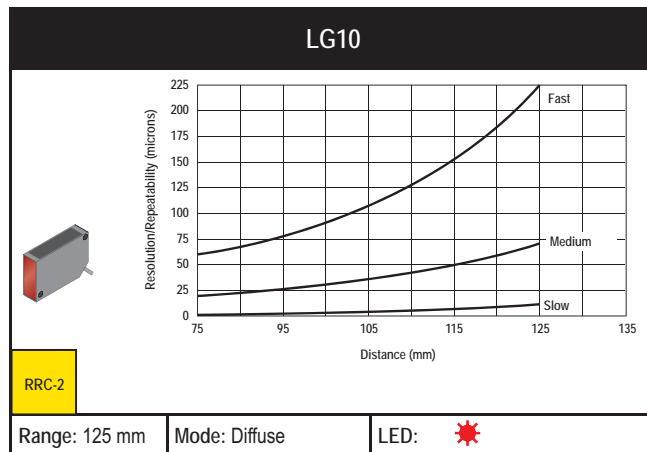
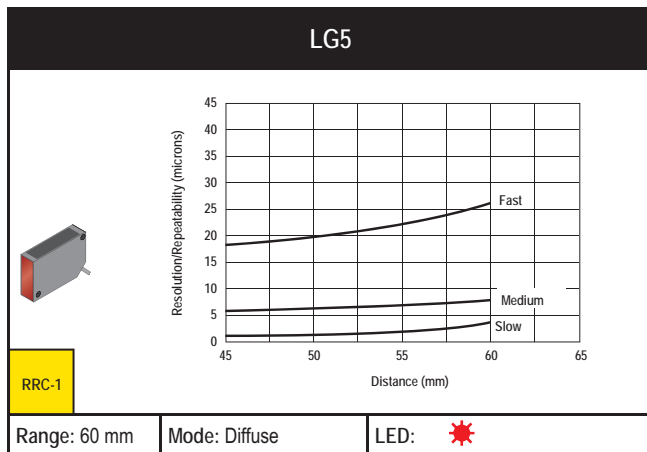
Brackets

| LG5/LG10 | |
|---|--|
|  pg. 669 SMBLG |  pg. 670 SMBLGA |

 Additional brackets and information available. See page 632.

Repeatability/Resolution Curves

★ = Visible Red Laser



U-GAGE® ULTRASONIC SENSORS



QT50U page 317

- Long-range ac or dc sensor with 8 m range and minimal dead zone
- Advanced programming capability with a unique temperature compensation feature
- Retrosonic mode with a reduced dead zone
- Two independent near and far limits for each output
- Optional Teflon® coating for resistance to harsh chemicals



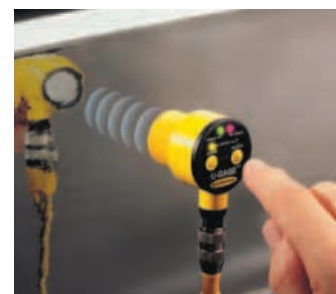
S18U page 322

- Compact 18 mm straight or right-angle housing
- Highly accurate detection from 30 to 300 mm
- Wide range of mounting options



QS18U page 325

- Compact 18 mm universal housing
- Compensation for air temperature fluctuations
- Encapsulated models for a range of harsh conditions



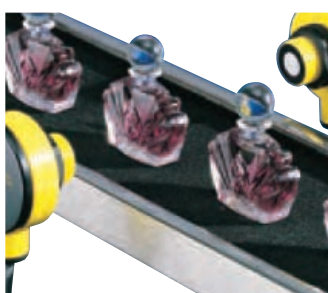
T30U/T30UX page 328

- Right-angle T-style housing with 30 mm threaded lens
- Analog and discrete outputs in the same sensor
- A choice of programmable sensing windows, depending on response time
- T30UX models with temperature compensation, longer sensing ranges and shorter dead zones
- Optional Teflon® coating for resistance to harsh chemicals



M25U page 336

- Features smooth 316 stainless steel construction to withstand tough sanitary environments
- Rated IP69K with fully encapsulated electronics
- Withstands high-temperature sprays of up to 80° C and 1500 psi



T18U page 338

- Dual range, opposed ultrasonic sensors
- Two combinations of range and response time in the same unit
- Ideal for sensing under bright lighting and for clear materials
- T-style sensor with 18 mm threaded lens



Q45U page 340

- Operating window limits from 100 mm to 3 m
- Discrete output models for ON/OFF presence detection or HIGH/LOW level control
- Programmable response time



Q45UR page 344

- Ultra-accurate remote gauging
- Compact housing with choice of three remote sensing heads
- Compensation for temperature variations at remote head

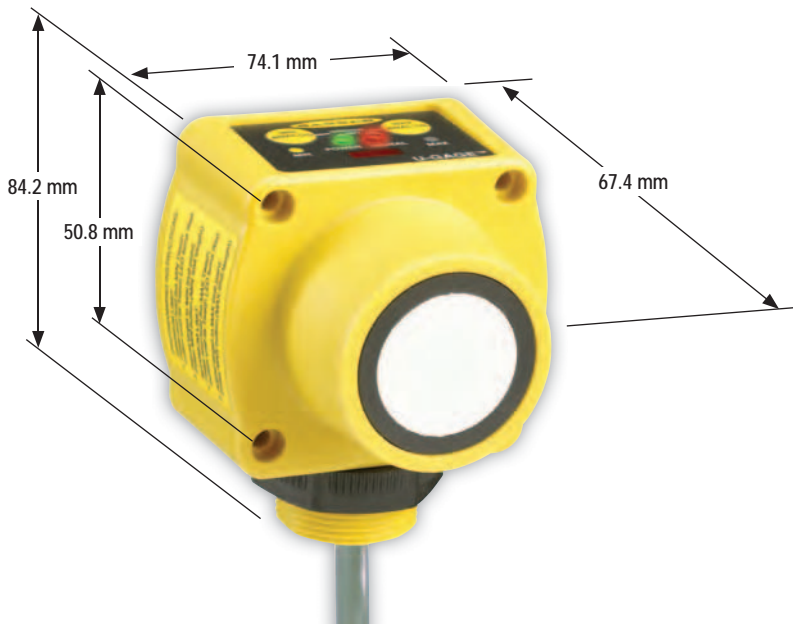
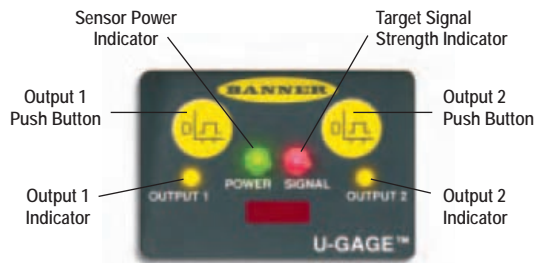
Teflon® is a registered trademark of Dupont™.



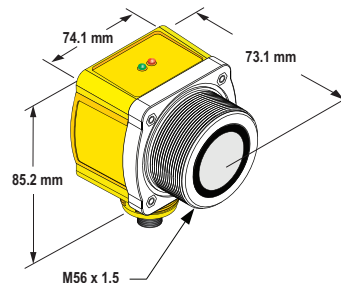
Long-Range Ultrasonic Sensor U-GAGE® QT50U

- Senses extended range of up to 8 m
- Features ultrasonic dead-zone of only 2.5% of the total range—75% less than comparable products
- Available in analog or discrete dc models and in ac/dc universal voltage models with electromechanical relay output
- Offers retrosonic sensing mode
- Features a completely sealed, shock-resistant housing that is ideal for monitoring levels of liquids as well as solids
- Uses a narrow sensing beam to detect targets at long range within confined areas—such as a storage tank—without interference from the tank walls
- Available in a chemically resistant model with a Teflon® coating to protect the transducer
- Features push-button programming for easy setup
- Provides continuous monitoring (analog model)
- Offers dual-discrete option for setting independent near and far limits for both outputs, for applications requiring high and low-limit sensing
- Compensates for temperature for greatest sensing accuracy

Chemically resistant models



DC and Universal Voltage Models



Teflon®-protected Models
(Suffix -CRFV)

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- OS18U
- T30U/T30UX
- M25U
- T18U
- O45U
- O45UR
- MEASURING ARRAYS
- RADAR


Teflon® is a registered trademark of Dupont™.

U-GAGE® QT50U, 10-30V dc

| Range | Connection | Output | Models* |
|--------------|---------------|---|-----------|
| 200 mm - 8 m | 2 m | Selectable 0 to 10V dc or 4 to 20 mA | QT50ULB |
| | 5-pin Mini QD | | QT50ULBQ |
| | 5-pin Euro QD | | QT50ULBQ6 |
| 200 mm - 8 m | 2 m | Selectable Dual NPN or PNP | QT50UDB |
| | 5-pin Mini QD | | QT50UDBQ |
| | 5-pin Euro QD | | QT50UDBQ6 |

U-GAGE® QT50U Universal Voltage, 85-264V ac/24-250V dc

| Range | Connection | Output Operation Mode | Output | Models* |
|--------------|----------------|---|-------------------|-------------|
| 200 mm - 8 m | 2 m | Window-limit (complementary outputs) | SPDT e/m relay | QT50UVR3W |
| | 5-pin Micro QD | | | QT50UVR3WQ1 |
| | 5-pin Mini QD | | | QT50UVR3WQ |
| 200 mm - 8 m | 2 m | Pump/level control (pump-in and pump-out logic) | SPDT e/m relay | QT50UVR3F |
| | 5-pin Micro QD | | | QT50UVR3FQ1 |
| | 5-pin Mini QD | | | QT50UVR3FQ |

 Connection options: A model with a QD requires a mating cordset (see page 320).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QT50ULB W/30).

* For sensors with Teflon®-protected face and transducer, add suffix -CRFV to the model number (example, QT50ULB-CRFV).
Teflon® is a registered trademark of Dupont®.

| U-GAGE® QT50U DC Specifications | |
|---------------------------------|---|
| Effective Beam | See Charts EBPC-1, EBPC-2 and EBPC-3 on page 321 |
| Supply Voltage and Current | Analog models: 10 - 30V dc (10% max. ripple); 100 mA max @ 10V, 40 mA max. @ 30V (exclusive of load) Dual-discrete models: 10 to 30V dc (10% max. ripple); 100 mA max. @ 10V, 40 mA @ 30V (exclusive of load) |
| Ultrasonic Frequency | 75 kHz burst, rep. rate 96 milliseconds |
| Supply Protection Circuitry | Protected against reverse polarity and transient overvoltages |
| Output Protection | Protected against short circuit conditions |
| Delay at Power-up | 1.5 seconds |
| Output Configuration | Analog models: Voltage sourcing: 0 to 10V dc Current sourcing: 4 to 20 mA Dual-discrete models: Dual PNP or NPN, selectable using DIP switch |
| Output Ratings | Analog Voltage Output: 0 to 10V dc Minimum load resistance = 500 Ω Minimum required supply voltage for full 0-10V output span = $(\frac{1000}{R_{LOAD}} + 13)V$ dc Analog Current Output: 4 to 20 mA Maximum load resistance = 1 kΩ or $(\frac{V_{supply} - 5}{0.02})$ Ω, whichever is lower Minimum required supply voltage for full 4-20 mA output span = 10V dc or $[(R_{Load} \times 0.02) + 5]V$ dc, whichever is greater. 4-20 mA output calibrated at 25° C with 250 Ω load. Discrete Output: 150 mA max. OFF-State leakage current: less than 5 μA Output saturation: NPN: less than 200 mV @ 10 mA; less than 650 mV @ 150 mA PNP: less than 1.2V @ 10 mA; less than 1.65V @ 150 mA |
| Temperature Effect | Uncompensated: 0.2% of distance/° C Compensated: 0.02% of distance/° C |



U-GAGE® QT50U DC Specifications (cont'd)

| | | |
|--------------------------------|---|---|
| Linearity (Analog Models) | +/- 0.2% of span from 200 to 8000 mm; +/- 0.1% of span from 500 to 8000 mm (1 mm minimum) | |
| Resolution/Repeatability | 1.0 mm | |
| Hysteresis | 5 mm | |
| Output Response Time | Analog models: 100 to 2300 milliseconds Dual-discrete models: 100 to 1600 milliseconds | |
| Minimum Window Size | 20 mm | |
| Adjustments | Sensing window limits: TEACH-Mode programming of near and far window limits may be set using the push buttons or remotely using TEACH input. | |
| Indicators | <p>Green Power ON LED: Indicates power is ON Red Signal LED: Indicates target is within sensing range, and the condition of the received signal TEACH/Output indicator (bicolor Yellow/Red):</p> <p>Yellow–Target is within taught limits Yellow OFF (Discrete)–Target is outside taught window limits Red–Sensor is in TEACH mode Yellow Flashing (Analog)–Target is outside taught window limits</p> | |
| Remote TEACH | See data sheet | |
| Construction | Transducer: Ceramic/Epoxy composite Membrane Switch: Polyester | Housing: ABS/Polycarbonate Lightpipes: Acrylic |
| Environmental Rating | Leakproof design is rated IEC IP67; NEMA 6P | |
| Connections | 2 m or 9 m shielded 5-conductor (with drain) PVC jacketed attached cable, or 5-pin Euro-style quick-disconnect or 5-pin Mini-style quick-disconnect. QD cordsets are ordered separately. See page 320. | |
| Operating Conditions | Temperature: -20° to +70° C | Relative humidity: 100% |
| Vibration and Mechanical Shock | All models meet Mil Std. 202F requirements. Method 201A (vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave. | |
| Temperature Warmup Drift | Less than 0.8% of sensing distance upon power-up with Temperature Compensation enabled | |
| Application Notes | <ul style="list-style-type: none"> • Objects passing inside the specified near limit (200 mm) may produce a false response • For best accuracy, allow 30 minute warm-up before programming or operating | |
| Certifications | | |
| Hookup Diagrams | Analog Models: MI09 (p. 774) | Discrete Models: MI10 (p. 774) |


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- OS18U
- T30U/T30UX
- M25U
- T18U
- O45U
- O45UR
- MEASURING ARRAYS
- RADAR

U-GAGE® QT50U Universal Voltage Specifications

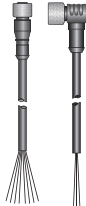
| | | |
|-----------------------------|--|------------------------------------|
| Effective Beam | See Charts EBPC-1, EBPC-2 and EBPC-3 on page 313 | |
| Supply Voltage | 85 to 264V ac, 50/60 Hz / 24 to 250V dc (1.5 watts max., exclusive of load) | |
| Ultrasonic Frequency | 75 kHz burst, rep. rate 96 milliseconds | |
| Supply Protection Circuitry | Protected against transient over voltages. DC hookup is without regard to polarity. | |
| Output Protection | Protected against short circuit conditions | |
| Delay at Power-up | 1.5 seconds | |
| Output Configuration | SPDT (Single-Pole, Double-Throw) electromechanical relay output. One normally open (NO) and one normally closed (NC). | |
| Output Ratings | <p>Max. switching power (resistive load): 2000 VA, 240 W (1000 VA, 120 W for sensors with Micro QD) Max. switching voltage (resistive load): 250V ac, 125V dc Max. switching current (resistive load): 8A @ 250V ac, 8A @ 30V dc derated to 200 mA @ 125V dc (4A max. for sensors with Micro QD) Min. voltage and current: 5V dc, 10 mA Mechanical life of relay: 50,000,000 operations Electrical life of relay at full resistive load: 100,000 operations</p> <p>NOTE: Transient suppression is recommended when switching inductive loads.</p> | |
| Temperature Effect | Uncompensated: 0.2% of distance/° C | Compensated: 0.02% of distance/° C |
| Repeatability | 1.0 mm | |



| U-GAGE® QT50U Universal Voltage Specifications (cont'd) | |
|---|--|
| Hysteresis | Window-limit sensor models: 5 mm Fill-level control sensor models: 0 mm |
| Output Response Time | Selectable 1600, 400 or 100 milliseconds |
| Minimum Window Size | 20 mm |
| Adjustments | Sensing limits: TEACH-Mode programming of near and far limits may be set using the TEACH push button Sensor configuration: Output response time and temperature compensation mode may be set using the Speed push button Factory default settings: 400 milliseconds output response time; temperature compensation enabled |
| Indicators | Green Power ON LED: Indicates power is ON Red Signal LED: Indicates target is within sensing range, and the condition of the received signal Output indicator (bicolor Yellow/Red): Indicates output status or TEACH mode Response indicator (bicolor Yellow/Red): Indicates output response time selection |
| Construction | Transducer: Ceramic/Epoxy composite Housing: ABS Membrane Switch: Polyester |
| Environmental Rating | Leakproof design is rated IEC IP67; NEMA 6P |
| Connections | 2 m or 9 m shielded 5-conductor (with drain) PVC jacketed attached cable, or 5-pin Micro-style quick-disconnect or 5-pin Mini-style quick-disconnect. QD cordsets are ordered separately. See page 320. |
| Operating Conditions | Temperature: -20° to +70° C Relative humidity: 100% |
| Vibration and Mechanical Shock | All models meet Mil Std. 202F requirements. Method 201A (vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave |
| Temperature Warmup Drift | Less than 1.0% of sensing distance upon power-up with Temperature Compensation enabled |
| Application Notes | Objects passing inside the specified minimum sensing distance (200 mm) may produce a false response |
| Certifications |  |
| Hookup Diagrams | UN09 (p. 769) |

Cordsets

| Euro QD (With Shield) | | |
|-----------------------|------------|--------------|
| See page 701 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 2 m | MODEC2-506 | MODEC2-506RA |
| 5 m | MODEC2-515 | MODEC2-515RA |
| 9 m | MODEC2-530 | MODEC2-530RA |




| Micro QD (With Shield) | | |
|------------------------|------------|--------------|
| See page 713 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 2 m | MQVR3S-506 | MQVR3S-506RA |
| 5 m | MQVR3S-515 | MQVR3S-515RA |
| 10 m | MQVR3S-530 | MQVR3S-530RA |







| Mini QD (With Shield) | |
|-----------------------|-----------|
| See page 713 | |
| Threaded 5-Pin | |
| Length | Straight |
| 2 m | MBCC2-506 |
| 4 m | MBCC2-512 |
| 10 m | MBCC2-530 |



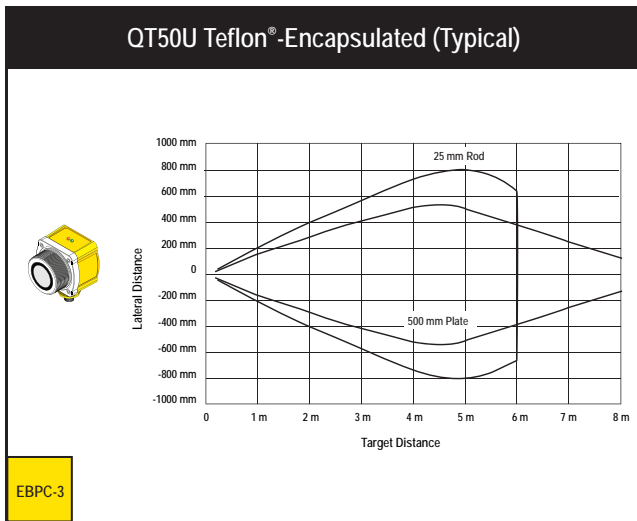
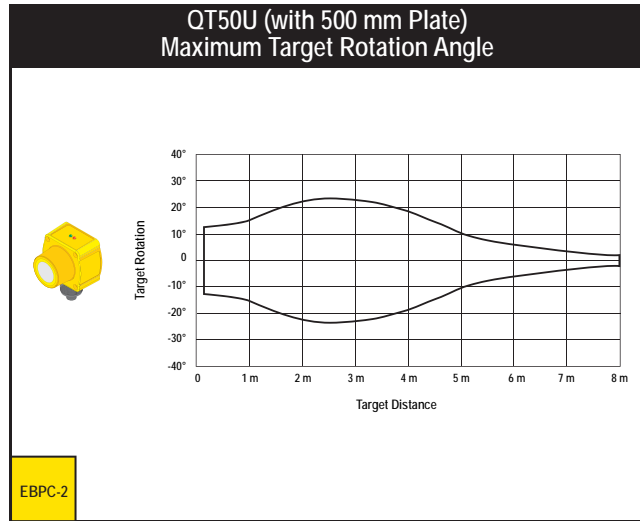
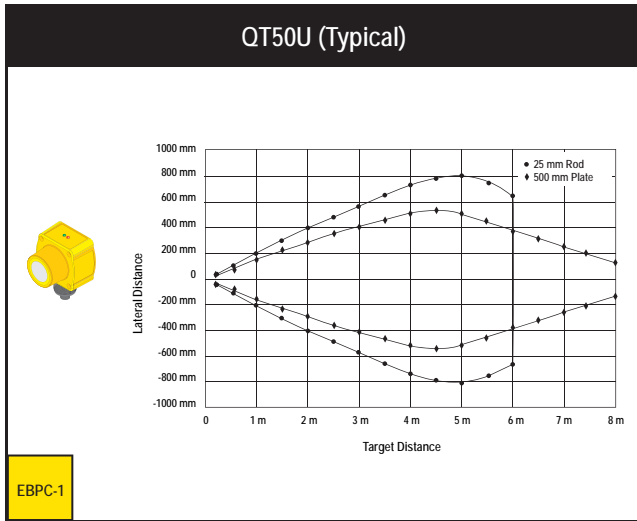
 Additional cordset information available. See page 693.

Brackets

| QT50U | | |
|--|--|--|
|  pg. 653 |  pg. 653 |  pg. 654 |
| SMB30A | SMB30MM | SMB30SC |

 Additional brackets and information available. See page 632.

Effective Beam Patterns



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- QS18U
- T30U/T30UX
- M25U
- T18U
- Q45U
- Q45UR
- MEASURING ARRAYS
- RADAR

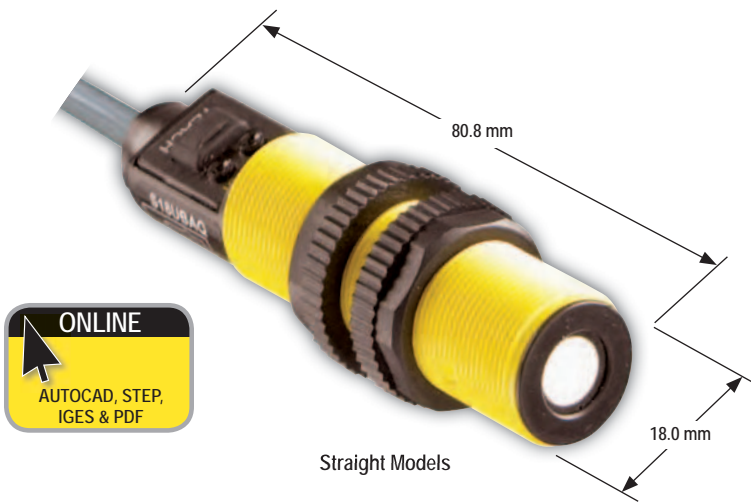
Compact Barrel-Mount Ultrasonic Sensor

U-GAGE® S18U

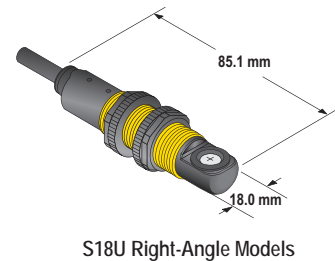
- Ideal for material handling and packaged goods applications, such as bottling or liquid level detection and as a control for small containers
- Features minimal dead zone and can eliminate dead zone if used in retrosonic mode
- Senses from 30 to 300 mm
- Available in analog or discrete models
- Available in straight or right-angle versions with a wide variety of mounting hardware for enhanced sensing versatility
- Offers programmable background suppression
- Compensates for temperature for greatest sensing accuracy
- Simplifies setup with push-button and remote TEACH-mode programming
- Shows status during setup and operation, using highly visible LED indicators



ACCESSORIES
page 324



Accessory wave guides are available for narrowing sensing beam. (see page 324)



ONLINE
AUTOCAD, STEP, IGES & PDF

U-GAGE® S18U, 10-30V dc

| Range | Connections | Output | Housing Configuration | Models |
|-------------|---------------|-----------------|-----------------------|----------|
| 30 - 300 mm | 2 m | 0 to 10V dc | Straight | S18UUA |
| | 5-pin Euro QD | | | S18UUAQ |
| | 2 m | 4 to 20 mA | | S18UIA |
| | 5-pin Euro QD | | | S18UIAQ |
| 30 - 300 mm | 2 m | 0 to 10V dc | Right-Angle | S18UUAR |
| | 5-pin Euro QD | | | S18UUARQ |
| | 2 m | 4 to 20 mA | | S18UIAR |
| | 5-pin Euro QD | | | S18UIARQ |
| 30 - 300 mm | 2 m | Bipolar NPN/PNP | Straight | S18UBA |
| | 5-pin Euro QD | | | S18UBAQ |
| | 2 m | | Right-Angle | S18UBAR |
| | 5-pin Euro QD | | | S18UBARQ |

Connection options: A model with a QD requires a mating cable (see page 324).

For 9 m cable, add suffix W/30 to the 2 m model number (example, S18UUA W/30).

U-GAGE® S18U Specifications

| | | |
|---|---|--|
| Effective Beam | See Charts EBPC-1 and EBPC-2 on page 316. | |
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple); 65 mA max. (exclusive of load), 40 mA typical @ 25V input | |
| Ultrasonic Frequency | 300 kHz, rep. rate 2.5 milliseconds | |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages | |
| Output Protection | Protected against short circuit conditions | |
| Output Ratings | <p>Analog:</p> <p style="padding-left: 40px;">Analog Voltage Output: 2.5 kΩ min. load resistance Minimum supply for a full 10V output is 12V dc (for supply voltages between 10 and 12, V out max is at least V supply -2)</p> <p style="padding-left: 40px;">Analog Current Output: 1 kΩ max @ 24V input Max load resistance = (Vcc-4)/0.02 Ω</p> <p>Discrete: 100 mA max. OFF-state leakage current: less than 5 μA NPN saturation: less than 200 mV @ 10 mA and less than 600 mV @ 100 mA PNP saturation: less than 1.2V @ 10 mA and less than 1.6V @ 100 mA</p> | |
| Output Configuration | Analog: 0 to 10V dc or 4 to 20 mA, depending on model Discrete: Bipolar: One NPN (current sinking) and one PNP (current sourcing) output in each model. Solid-state switch conducts when target is sensed within sensing window. | |
| Output Response Time | Analog: 30 milliseconds: Black wire at 0-2V dc (or open) 2.5 milliseconds: Black wire at 5-30V dc | Discrete: 5 milliseconds |
| Delay at Power-up | 300 milliseconds | |
| Linearity* (Analog output models) | 2.5 milliseconds response: ± 1 mm 30 milliseconds response: ± 0.5 mm | |
| Resolution* (Analog output models) | 2.5 milliseconds response: 1 mm 30 milliseconds response: 0.5 mm | |
| Repeatability (Discrete models) | 0.5 mm | |
| Temperature Effect | 0.02% of distance/ ° C | |
| Temperature Warmup Drift | Less than 1.7% of sensing distance upon power-up | |
| Minimum Window Size | 5 mm | |
| Switching Hysteresis (Discrete output models) | 0.7 mm | |
| Adjustments | Sensing window limits: TEACH-Mode programming of near and far window limits may be set using the push-button or remotely using TEACH input | |
| Indicators | <p>Power/Signal Strength (Red/Green)</p> <p>Green—Target is within sensing range Red—Target is outside sensing range OFF—Sensing power is OFF</p> <p>TEACH/Output Indicator (Yellow/Red)</p> <p>Yellow —Target is within taught limits OFF—Target is outside taught window limits Red—Sensor is in TEACH mode</p> | |
| Remote TEACH Input | Impedance: 12 k | |
| Construction | Threaded Barrel: Thermoplastic polyester Push Button: Santoprene | Push-Button Housing: ABS/PC Lightpipes: Acrylic |
| Environmental Rating | Leakproof design is rated IEC IP67; NEMA 6P | |
| Connections | 2 m or 9 m shielded 5-conductor (with drain) PVC jacketed attached cable, or 5-pin Euro-style quick-disconnect. QD cordsets are ordered separately. See page 324. | |
| Operating Conditions | Temperature: -20° to +60° C | Relative humidity: 100% |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U**
- QS18U
- T30U/T30UX
- M25U
- T18U
- Q45U
- Q45UR
- MEASURING ARRAYS
- RADAR



More on next page

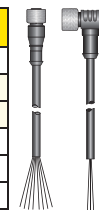
* Linearity and resolution are specified using a 50 x 50 mm aluminum plate at 22° C under fixed sensing conditions.

U-GAGE® S18U Specifications (cont'd)

| | | |
|--------------------------------|---|--------------------------------|
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave | |
| Application Notes | Objects passing inside the specified near limit may produce a false response. | |
| Certifications |   | |
| Hookup Diagrams | Analog Models: MI11 (p. 774) | Discrete Models: MI10 (p. 774) |




Cordsets

| Euro QD (With Shield) | | |
|-----------------------|------------|--------------|
| See page 701 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 2 m | MQDEC2-506 | MQDEC2-506RA |
| 5 m | MQDEC2-515 | MQDEC2-515RA |
| 9 m | MQDEC2-530 | MQDEC2-530RA |




Additional cordset information available. See page 693.

Brackets

| S18U | | |
|---|---|--|
|  |  |  |
| pg. 650 | pg. 651 | pg. 652 |
| SMB18A | SMB18FM | SMB18SF |

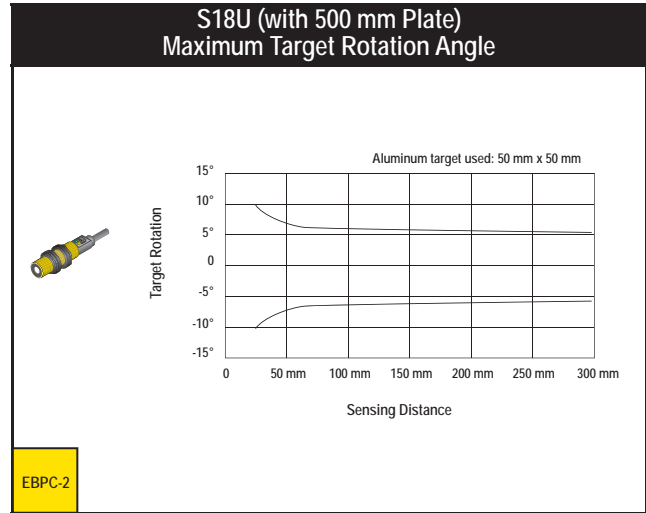
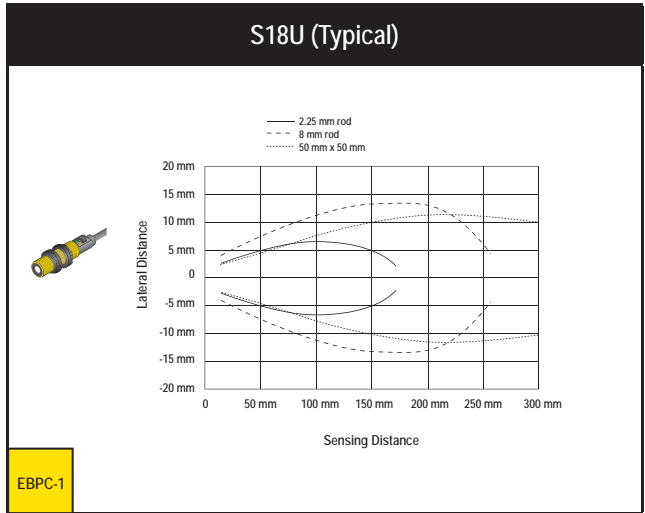
Additional brackets and information available. See page 632.

Ultrasonic Wave Guides

| Inside Diameter | Model |  |
|-----------------|-----------|---|
| 5.0 mm | UWG18-5.0 | |
| 6.4 mm | UWG18-6.4 | |
| | | |

pg. 327

Effective Beam Patterns



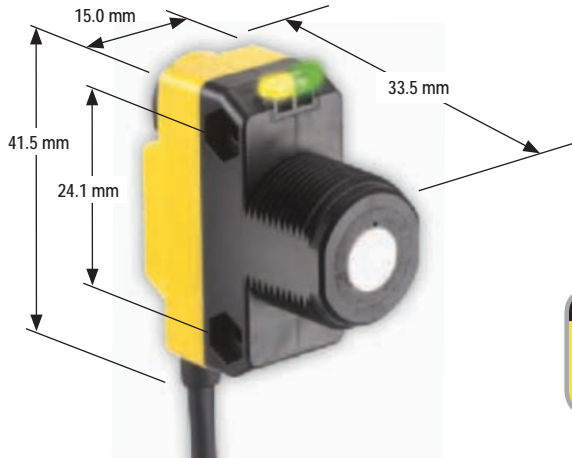


Ultrasonic WORLD-BEAM® Sensor QS18U

- Senses clear and transparent materials, as well as color variations, including clear web material, clear or shiny bottles, highly reflective surfaces and liquid or dry bulk materials inside cramped locations
- Features a universal housing with an 18 mm threaded lens or side mounts
- Senses within a 50 to 500 mm window and has a 15 millisecond response time
- Delivers high accuracy in wet or dirty environments
- Available in encapsulated IP68 models rated for a range of harsh conditions
- Features push-button TEACH for easy programming at the sensor or remotely
- Featuring wide operating range of -20° to +60° C
- Offers retrosonic sensing mode
- Delivers bright LED operating indicators visible from 360°

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 327



ONLINE
AUTOCAD, STEP, IGES & PDF

Accessory wave guides are available for narrowing sensing beam. (see page 327)

- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- QS18U**
- T30U/T30UX
- M25U
- T18U
- Q45U
- Q45UR
- MEASURING ARRAYS
- RADAR

WORLD-BEAM® QS18U, 12-30V dc


| Range | Connection | TEACH Options | Models NPN | Models PNP |
|-------------|---------------|---|-------------|-------------|
| 50 - 500 mm | 2 m | Integral push button and remote TEACH (IP67; NEMA 6P) | QS18UNA | QS18UPA |
| | 4-pin Euro QD | | QS18UNAQ8 | QS18UPAQ8 |
| 50 - 500 mm | 2 m | Remote TEACH (epoxy-encapsulated, IP68; NEMA 6P) | QS18UNAE† | QS18UPAE† |
| | 4-pin Euro QD | | QS18UNAEQ8† | QS18UPAEQ8† |

Connection options: A model with a QD requires a mating cordset (see page 327).

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS18UNA W/30).
 QD models:
 • For 4-pin integral Euro-style QD, add suffix Q8 (example, QS18UNAQ8). • For 4-pin 150 mm Euro-style pigtail, add suffix Q5 (example, QS18UNAQ5).
 • For 4-pin integral Pico-style QD, add suffix Q7 (example, QS18UNAQ7). • For 4-pin 150 mm Pico-style pigtail, add suffix Q (example, QS18UNAQ0).

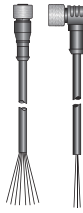
† Models are epoxy-encapsulated, IP68; NEMA 6P with remote TEACH programming

WORLD-BEAM® QS18U Specifications

| | | |
|--------------------------------|---|---|
| Effective Beam | See Charts EBPC-1 and EBPC-2 on page 327. | |
| Sensing Range | 50 to 500 mm | |
| Supply Voltage and Current | 12 to 30V dc (10% max. ripple); 25 mA max. (exclusive of load) | |
| Ultrasonic Frequency | 300 kHz, rep. rate 7.5 milliseconds | |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages | |
| Output Protection | Protected against short circuit conditions | |
| Delay at Power-Up | 300 milliseconds | |
| Output Configurations | Solid-state switch conducts when target is sensed within sensing window; one NPN (current sinking) or one PNP (current sourcing), depending on model | |
| Temperature Effect | Non-encapsulated models: $\pm 0.05\%$ per °C from -20° to +50° C, $\pm 0.1\%$ per °C from +50° to +60° C Encapsulated models: $\pm 0.05\%$ per °C from 0° to +60° C, $\pm 0.1\%$ per °C from -20° to 0° C | |
| Repeatability | 0.7 mm | |
| Hysteresis | 1.4 mm | |
| Output Ratings | 100 mA max. (see Application Note 1) OFF-state leakage current: less than 10 μ A (sourcing); less than 200 μ A (sinking); See Application Note 2 NPN ON-state saturation voltage: less than 1.6V @ 100 mA PNP ON-state saturation voltage: less than 2.0V @ 100 mA | |
| Output Response Time | 15 milliseconds | |
| Minimum Window Size | 5 mm | |
| Adjustments | Sensing window limits: TEACH-Mode programming of near and far window limits may be set using the push button or remotely using TEACH input | |
| Indicators | Range Indicator (Red/Green) Green—Target is within sensing range Red—Target is outside sensing range OFF—Sensing power is OFF | TEACH/Output Indicator (Yellow/Red) Yellow—Target is within taught limits OFF—Target is outside taught window limits Red—Sensor is in TEACH mode |
| Construction | Housing: ABS Push Button: TPE | Push-Button Housing: ABS Lightpipes: Polycarbonate |
| Environmental Rating | Leakproof design, rated IEC IP67 or IP68; NEMA 6P, depending on model; UL type 1 | |
| Connections | 2 m or 9 m 4-conductor PVC jacketed attached cable, or 4-pin Euro-style integral QD (Q8), or 4-pin Pico-style integral QD (Q7), or 4-pin Euro-style 150 mm pigtail QD (Q5), or 4-pin Pico-style 150 mm pigtail QD (Q), depending on model. See page 327. | |
| Operating Conditions | Temperature: -20° to +60° C | Relative humidity: 100% (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 milliseconds duration, half sine wave. | |
| Temperature Warmup Drift | See data sheet | |
| Application Notes | 1. If supply voltage is > 24V dc, derate maximum output current 5 mA/°C above 50°C. 2. NPN OFF-state leakage current is < 200 μ A for load resistances > 3 k Ω or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current. 3. Objects passing inside the specified near limit may produce a false response. | |
| Certifications |  | |
| Hookup Diagrams | M113 (p. 775) | |


Cordsets

| Euro QD (With Shield) | | |
|-----------------------|------------|--------------|
| See page 697 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 2 m | MQDEC2-406 | MQDEC2-406RA |
| 5 m | MQDEC2-415 | MQDEC2-415RA |
| 9 m | MQDEC2-430 | MQDEC2-430RA |







| Pico QD (With Shield) | | |
|-----------------------|----------|-------------|
| See page 695 | | |
| Snap-On 4-Pin | | |
| Length | Straight | Right-Angle |
| 2 m | PKG4S-2 | PKW4ZS-2 |




 Additional cordset information available. See page 693.

Brackets

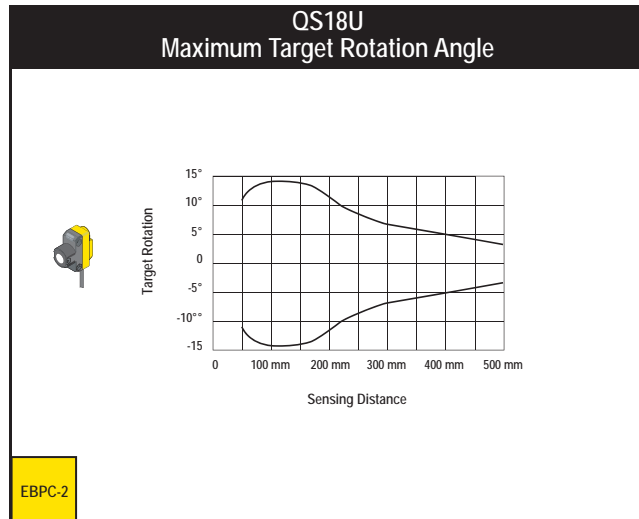
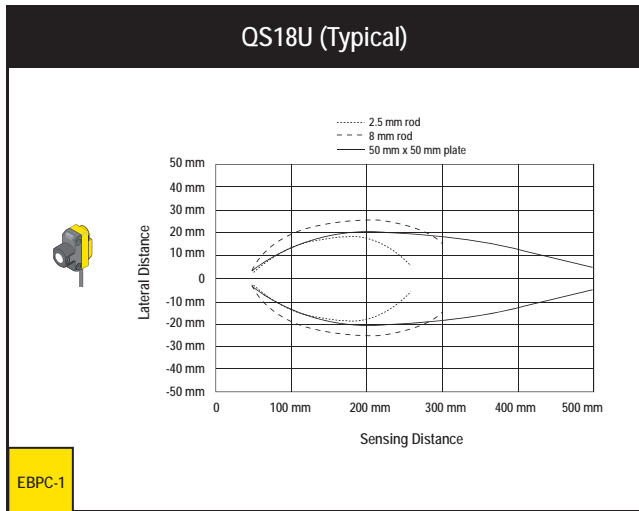
| QS18U | | |
|--|---|---|
|  |  |  |
| pg. 650 | pg. 651 | pg. 652 |
| SMB18A | SMB18FA.. | SMB18SF |

 Additional brackets and information available. See page 632.

Ultrasonic Wave Guides

| Inside Diameter | Model |  |
|-----------------|-----------|---|
| 5.0 mm | UWG18-5.0 | |
| 6.4 mm | UWG18-6.4 | |

Effective Beam Patterns



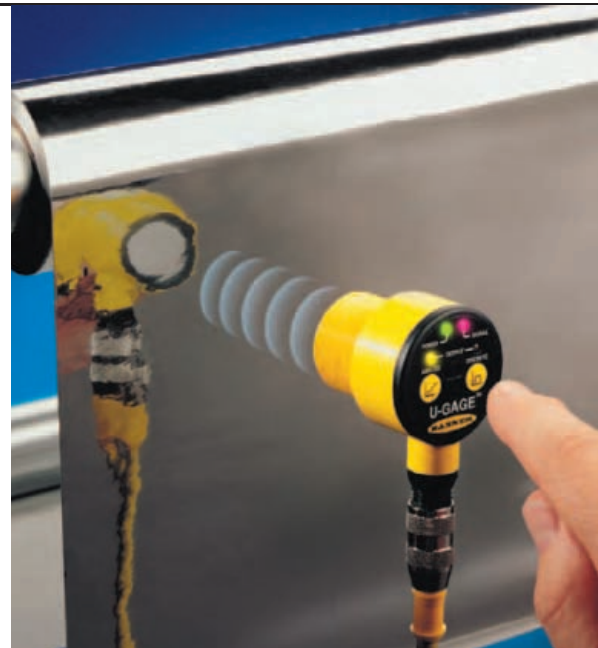
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- QS18U**
- T30U/T30UX
- M25U
- T18U
- Q45U
- Q45UR
- MEASURING ARRAYS
- RADAR

Compact Sensors in Universal Housing

U-GAGE® T30UX/T30U

- Features T-style right-angle sensor package with popular 30 mm threaded barrel and a wide variety of mounting brackets
- Offers choice of three ranges for reliable sensing from 100 mm to 3 m
- Includes models with a single analog or single discrete, two discrete, or analog and discrete in the same sensor
- Simplifies setup with push-button TEACH programming of custom sensing window
- Allows remote programming with an external switch, computer or controller for added security and convenience
- Presents sensor operating status using highly visible indicators LEDs
- Resists harsh environments with rugged IP67 (NEMA 6) housing and fully encapsulated electronics
- Provides digital filtering for exceptional electrical and noise immunity



ACCESSORIES
page 333



T30UX

- Built-in temperature compensation for high-accuracy across a wide range of ambient temperatures
- Extended sensing ranges and short dead zones with 100 mm to 1 m, 200 mm to 2 m or 300 mm to 3 m
- Models with either analog or configurable discrete output
- Analog output models for applications requiring a continuous current or voltage output
- Wide operating temperature range of -40° to +70° C



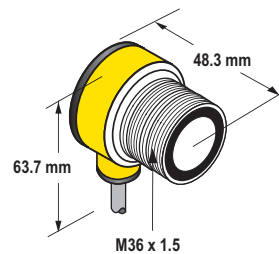
T30U

- Range of 150 mm to 1 m or 300 mm to 2 m, depending on model
- Models with either dual-discrete or analog/discrete outputs
- Dual-discrete models for ON/OFF switching or pump/level control
- Independently programmable outputs
- Analog output models for applications requiring a continuous current or voltage output
- Chemically resistant models with a Teflon® coating to protect the transducer

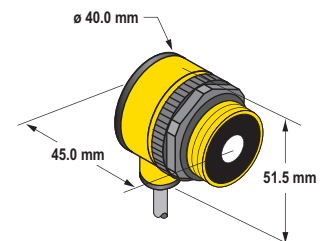
U-GAGE® T30UX/T30U Sensors



T30UX and T30U (Long-range) Models



T30U Teflon-protected Models Suffix -CRFV



T30U (Short-range) Models

U-GAGE® T30UX, 10-30V dc

| Range | Frequency | Connection | Response Time | Output | Models* | |
|---------------|-----------|---------------|--------------------------|---|---------------------|---------|
| 100 mm to 1 m | 224 kHz | 2 m | 45 ms | Discrete: NPN, PNP, NO, NC, Selectable | T30UXDA | |
| | | 4-Pin Euro QD | | | T30UXDAQ8 | |
| 200 mm to 2 m | 174 kHz | 2 m | 92 ms | | T30UXDB | |
| | | 4-Pin Euro QD | | | T30UXDBQ8 | |
| 300 mm to 3 m | 114 kHz | 2 m | 135 ms | | T30UXDC | |
| | | 4-Pin Euro QD | | | T30UXDCQ8 | |
| 100 mm to 1 m | 224 kHz | 2 m | Selectable 45 or 105 ms | | Analog: 0 to 10V dc | T30UXUA |
| | | 4-Pin Euro QD | | | T30UXUAQ8 | |
| | | 2 m | | | Analog: 4 to 20 mA | T30UXIA |
| | | 4-Pin Euro QD | | | T30UXIAQ8 | |
| 200 mm to 2 m | 174 kHz | 2 m | Selectable 92 or 222 ms | | Analog: 0 to 10V dc | T30UXUB |
| | | 4-Pin Euro QD | | | T30UXUBQ8 | |
| | | 2 m | | Analog: 4 to 20 mA | T30UXIB | |
| | | 4-Pin Euro QD | | T30UXIBQ8 | | |
| 300 mm to 3 m | 114 kHz | 2 m | Selectable 135 or 318 ms | Analog: 0 to 10V dc | T30UXUC | |
| | | 4-Pin Euro QD | | T30UXUCQ8 | | |
| | | 2 m | | Analog: 4 to 20 mA | T30UXIC | |
| | | 4-Pin Euro QD | | T30UXICQ8 | | |

Connection options: A model with a QD requires a mating cordset (see page 333).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T30UXDA W/30).
 QD models: For a 4-pin 150 mm Euro-style PUR pigtail QD, add suffix QPMA the 2 m model number (example, T30UXDAQPMA).

* Contact factory to request chemically resistant flange or fill-level control models.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 333

- LIGHT GAUGING
- ULTRASONIC
- QT50U
- S18U
- OS18U
- T30U/T30UX**
- M25U
- T18U
- O45U
- O45UR
- MEASURING ARRAYS
- RADAR

U-GAGE® T30U, 12-24V dc

| Range | Frequency | Connection | Response Time | Discrete Output(s) | Analog Output | Models* | |
|---------------------------|-----------|---------------|---------------|--------------------|---------------|------------|----------|
| 150 mm - 1 m | 228 kHz | 2 m | 48 ms | NPN | 4 to 20 mA | T30UINA | |
| | | 5-pin Euro QD | | | | T30UINAQ | |
| | | 2 m | | PNP | | T30UIPA | |
| | | 5-pin Euro QD | | | | T30UIPAQ | |
| 300 mm - 2 m [†] | 128 kHz | 2 m | 96 ms | NPN | | 4 to 20 mA | T30UINB |
| | | 5-pin Euro QD | | | | | T30UINBQ |
| | | 2 m | | PNP | | | T30UIPB |
| | | 5-pin Euro QD | | | | | T30UIPBQ |
| 150 mm - 1 m | 228 kHz | 2 m | 48 ms | Dual NPN | None | T30UDNA | |
| | | 5-pin Euro QD | | | | T30UDNAQ | |
| | | 2 m | | Dual PNP | | T30UDPA | |
| | | 5-pin Euro QD | | | | T30UDPAQ | |

Connection options: A model with a QD requires a mating cordset (see page 333).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T30UINA W/30).

* For sensors with Teflon®-protected face and transducer (long-range models only), add suffix -CRFV to the model number (example, T30UINB-CRFV).

[†] Teflon®-encapsulated models have a range of 300 mm - 1.5 m.

Teflon® is a registered trademark of Dupont®.

U-GAGE® T30U, 12-24V dc

| Range | Frequency | Connection | Response Time | Discrete Output(s) | Analog Output | Models* |
|---------------|-----------|---------------|---------------|-----------------------------|---------------|----------|
| 300 mm - 2 m† | 128 kHz | 2 m | 96 ms | Dual NPN | None | T30UDNB |
| | | 5-pin Euro QD | | | | T30UDNBQ |
| | | 2 m | | Dual PNP | | T30UDPB |
| | | 5-pin Euro QD | | | | T30UDPBQ |
| 150 mm - 1 m | 228 kHz | 2 m | 48 ms | Pump/Level Control Dual NPN | None | T30UHNA |
| 5-pin Euro QD | T30UHNAQ | | | | | |
| 300 mm - 2 m† | 128 kHz | 2 m | 96 ms | Dual NPN | | T30UHNB |
| | | 5-pin Euro QD | | | | T30UHNBQ |
| 150 mm - 1 m | 228 kHz | 2 m | 48 ms | Pump/Level Control Dual PNP | None | T30UHPA |
| 5-pin Euro QD | T30UHPAQ | | | | | |
| 300 mm - 2 m† | 128 kHz | 2 m | 96 ms | Dual PNP | | T30UHPB |
| | | 5-pin Euro QD | | | | T30UHPBQ |

Connection options: A model with a QD requires a mating cordset (see page 333).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T30UDNB W/30).

* For sensors with Teflon®-protected face and transducer (long-range models only), add suffix -CRFV to the model number (example, T30UDNB-CRFV).

† Teflon®-encapsulated models have a range of 300 mm - 1.5 m.

ACCESSORIES
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333

U-GAGE® T30U, 15-24V dc

| Range | Frequency | Connection | Response Time | Analog Output | Models* NPN | Models* PNP |
|---------------|-----------|---------------|---------------|---------------|-------------|-------------|
| 150 mm - 1 m | 228 kHz | 2 m | 48 ms | 0 to 10V dc | T30UUNA | T30UUPA |
| | | 5-pin Euro QD | | | T30UUNAQ | T30UUPAQ |
| 300 mm - 2 m† | 128 kHz | 2 m | 96 ms | 0 to 10V dc | T30UUNB | T30UUPB |
| | | 5-pin Euro QD | | | T30UUNBQ | T30UUPBQ |

Connection options: A model with a QD requires a mating cordset (see page 333).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T30UUNA W/30).

* For sensors with Teflon®-protected face and transducer (long-range models only), add suffix -CRFV to the model number (example, T30UUNB-CRFV).

† Teflon®-encapsulated models have a range of 300 mm - 1.5 m.

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U-GAGE® T30UX Specifications

| | |
|-----------------------------|---|
| Effective Beam | See Chart EPBC-1 to EPBC-6 on page 326. |
| Sensing Range | "A" suffix models: 100 mm to 1 m "B" suffix models: 200 mm to 2 m "C" suffix models: 300 mm to 3 m |
| Ultrasonic Frequency | "A" suffix models: 224 kHz "B" suffix models: 174 kHz "C" suffix models: 114 kHz |
| Supply Voltage and Current | 10 to 30V dc (10% max. ripple) at 40 mA, exclusive of load |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | Discrete (switched) output models: SPST solid-state switch. Configurable as NPN (sinking) or PNP (sourcing) via Mode push button. Normally Open (NO) or Normally Closed (NC) operation is also selectable via Mode push button. The default setting is PNP/NO. Analog output models: 0 to 10V dc or 4 to 20 mA, depending on model |



U-GAGE® T30UX Specifications

| | |
|---|--|
| Output Ratings | <p>Discrete output models: 100 mA max. OFF-state leakage current: NPN: < 200 μA @ 30V dc (see NOTE 1) PNP: < 10 μA @ 30V dc ON-state saturation voltage: NPN: < 1.6V @ 100 mA PNP: < 3V @ 100 mA</p> <p>Analog output models: Analog Voltage Output: 2.5 kΩ min. load resistance Minimum supply for a full 10V output is 12V dc (for supply voltages between 10 and 12, V out max. is at least V supply -2) Analog Current Output: 1 kΩ max. @ 24V input; max. load resistance = (Vcc-4)/0.02Ω For current output (4-20 mA) models, ideal results are achieved when the total load resistance R = [(Vin - 4)/0.020]Ω. Example, at Vin = 24V dc, R \approx 1 kΩ (1 watt)</p> |
| Output Protection Circuitry | Protected against short circuit conditions |
| Output Response Time | <p>"A" suffix models: 45 milliseconds "B" suffix models: 92 milliseconds "C" suffix models: 135 milliseconds</p> |
| Delay at Power-up | 500 milliseconds |
| Temperature Effect | 0.02% of distance/ $^{\circ}$ C |
| Linearity (analog models) | 0.25% of distance |
| Repeatability/Resolution | <p>"A" suffix models: 0.1% of distance (0.5 mm min.) "B" suffix models: 0.1% of distance (1.0 mm min.) "C" suffix models: 0.1% of distance (1.5 mm min.)</p> |
| Sensing Hysteresis (discrete models) | <p>"A" suffix models: 2 mm "B" suffix models: 3 mm "C" suffix models: 4 mm</p> |
| Minimum Window Size | 10 mm |
| Adjustments | <p>Sensing window limits: TEACH-Mode configuration of near and far window limits may be set using the push button or remotely via TEACH input</p> <p>Discrete output models: Output Configuration: NPN, PNP, Normally Open (NO), Normally Closed (NC) select Advanced configuration options: Push button enabled/disabled, temperature compensation enabled/disabled</p> <p>Analog output models: Response speed selection: Fast or Slow Advanced configuration options: Analog output slope, push button enabled/disabled, temperature compensation enabled/disabled</p> |
| Indicators | <p>Green Power LED ON: Power ON, RUN mode Red Signal LED: Target signal strength Amber Output LED: Output enabled; sensor receiving a signal within the window limits Amber Mode LED: Currently selected mode</p> |
| Loss of Signal Indication (analog models) | <p>0 to 10V dc models: Analog output goes to 0V 4 to 20 mA models: Analog output goes to 3.6 mA</p> |
| Construction | <p>Housing: PBT polyester Push buttons: polyester Transducer: epoxy /ceramic composite</p> |
| Environmental Rating | Leakproof design, rated IEC IP67 (NEMA 6) |
| Connections | 2 m or 9 m shielded 4-conductor (with drain) PVC cable, 150 mm PUR Euro-style pigtail (QPMA), or 4-pin integral Euro-style connector (Q8). QD cordsets ordered separately. See page 325. |
| Operating Conditions | Temperature: -40 $^{\circ}$ to +70 $^{\circ}$ C Relative humidity: 95% at 50 $^{\circ}$ C non-condensing |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave. |
| Application Notes | The temperature warmup drift upon power-up is less than 1% of the sensing distance. |
| Certifications | |
| Hookup Diagrams | <p>Discrete Models: MI13 (p. 775) Analog Models: MI14 (p. 775)</p> |

NOTE: NPN < 200 μ A for load impedance > 3 k Ω ; for load current of 100 mA, leakage < 1% of load current


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- OS18U
- T30U/T30UX**
- M25U
- T18U
- Q45U
- Q45UR
- MEASURING ARRAYS
- RADAR

U-GAGE® T30U Specifications

| | |
|--|--|
| Effective Beam | See Chart EPBC-7 to EPBC-11 on page 327. |
| Sensing Range | <p>"A" suffix models: 150 mm min. near limit; 1 m max. far limit</p> <p>"B" suffix models: 300 mm min. near limit; 2 m max. far limit</p> <p>"-CRFV" models: 300 mm min. near limit; 1.5 m max. far limit</p> |
| Supply Voltage and Current | <p>Current sourcing analog output models: 12 to 24V dc (10% max. ripple); 90 mA (exclusive of load)</p> <p>Voltage sourcing analog output models: 15 to 24V dc (10% max. ripple); 90 mA (exclusive of load)</p> <p>Dual-discrete output models: 12 to 24V dc (10% max. ripple); 90 mA (exclusive of load)</p> |
| Ultrasonic Frequency | <p>Short Range: 228 kHz</p> <p>Long Range: 128 kHz</p> |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Protection | Protected against continuous overload and short-circuit; transient over-voltage; no false pulse on power-up |
| Output Configuration | <p>Discrete (switched) output: Solid-state switch conducts when target is sensed within sensing window; choose NPN (current sinking) or PNP (current sourcing) models.</p> <p>Analog output: Choose 0 to 10V dc sourcing or 4 to 20 mA sourcing output models; output slope may be selected using TEACH sequence.</p> |
| Output Ratings | <p>Discrete (switched) output: 100 mA max., total—both outputs</p> <p>OFF-state leakage current: less than 10 μA</p> <p>ON-state saturation voltage: less than 1V at 10 mA and less than 1.5V at 100 mA</p> <p>Analog Output:</p> <p>Voltage sourcing: 0 to 10V dc (at 1 kΩ min. resistance)</p> <p>Current sourcing: 4 to 20 mA, 1 Ω to Rmax.</p> $R_{max} = \frac{V_{supply} - 7V}{20 \text{ mA}}$ |
| Output Response Time | <p>Discrete output: "A" suffix models: 48 milliseconds</p> <p>"B" suffix models: 96 milliseconds</p> <p>Analog output: "A" suffix models: 48 milliseconds average, 16-millisecond update</p> <p>"B" suffix models: 96 milliseconds average, 32-millisecond update</p> |
| Sensing Performance (Specified using a 100 x 100 mm aluminum target at 25° C under fixed sensing conditions.) | <p>Analog sensing resolution or discrete output repeatability: $\pm 0.25\%$ of measured distance</p> <p>"A" suffix models: .5 mm min</p> <p>"B" suffix models: 1 mm min</p> <p>Analog linearity: $\pm 0.5\%$ of full-scale span</p> <p>Min. window size: 10 mm</p> <p>Hysteresis of discrete output: 2.5 mm</p> <p>Temperature effect: 0.2% of sensing distance per ° C</p> |
| Adjustments | <p>Sensing window limits (analog or discrete): TEACH-mode programming of near and far window limits may be set using membrane push buttons on sensor or remotely using TEACH input. Window limits may be programmed separately, or together.</p> <p>Analog output slope: the first limit taught is assigned to the minimum output value (4 mA or 0V).</p> |
| Indicators | <p>Four status LEDs: In RUN mode:</p> <p>Green ON Steady: Power ON, RUN mode</p> <p>Green Flashing: Discrete output is overloaded</p> <p>Red Flashing: Relative received signal strength</p> <p>Yellow analog ON Steady: Target is inside window limits</p> <p>Yellow discrete ON Steady: Output conducting</p> <p>In Program mode:</p> <p>Green OFF: PROGRAM mode</p> <p>Red Flashing: Relative received signal strength</p> <p>Yellow ON Steady: Ready for first window limit</p> <p>Yellow Flashing: Ready for second limit</p> <p>Yellow OFF: Not teaching this output</p> |
| Construction | Molded reinforced thermoplastic polyester housing |
| Environmental Rating | Leakproof design is rated IEC IP67; NEMA 6P |
| Connections | 2 m or 9 m 5-conductor PVC-covered attached cable, or 5-pin Euro-style quick-disconnect fitting. QD cordsets are ordered separately. See page 325. |
| Operating Conditions | Temperature: -20° to +70° C Relative humidity: 100% |

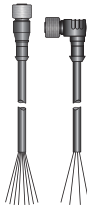
U-GAGE® T30U Specifications (cont'd)


| | |
|--------------------------------|--|
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave. |
| Application Notes | Objects passing inside the specified near limit will produce a false response. NOTE: For more information about out-of-range and signal loss response of the analog output, see product literature. |
| Certifications |  |
| Hookup Diagrams | Analog/Discrete Models: MI16 (p. 775) Dual-Discrete Models: MI15 (p. 775) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control




Cordsets


| Euro QD (With Shield) | | | | |
|-----------------------|----------------|--------------|----------------|--------------|
| See page 697 | | | | |
| Length | Threaded 4-Pin | | Threaded 5-Pin | |
| | Straight | Right-Angle | Straight | Right-Angle |
| 2 m | MQDEC2-406 | MQDEC2-406RA | MQDEC2-506 | MQDEC2-506RA |
| 5 m | MQDEC2-415 | MQDEC2-415RA | MQDEC2-515 | MQDEC2-515RA |
| 9 m | MQDEC2-430 | MQDEC2-430RA | MQDEC2-530 | MQDEC2-530RA |



 Additional cordset information available. See page 693.

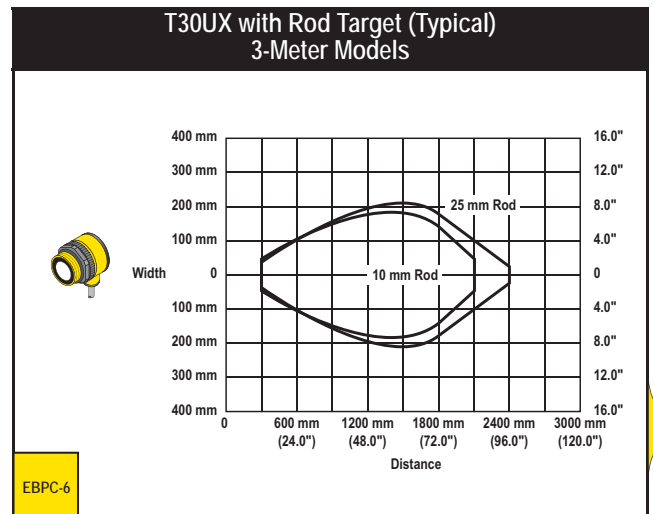
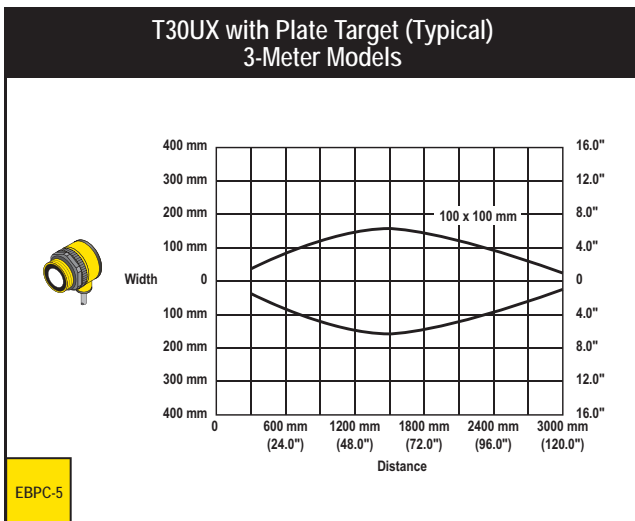
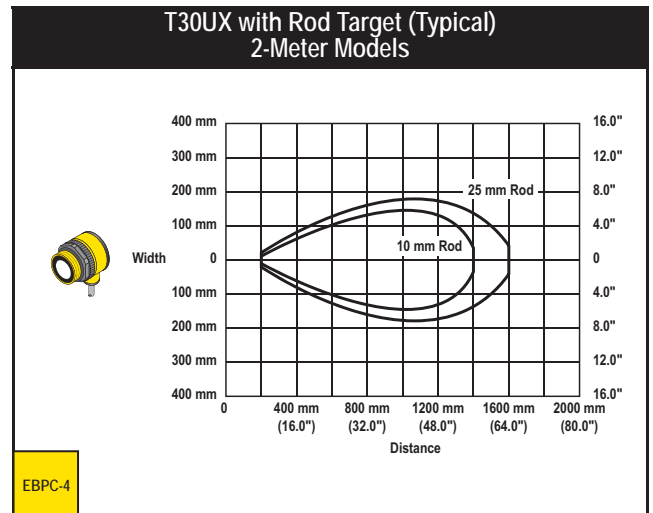
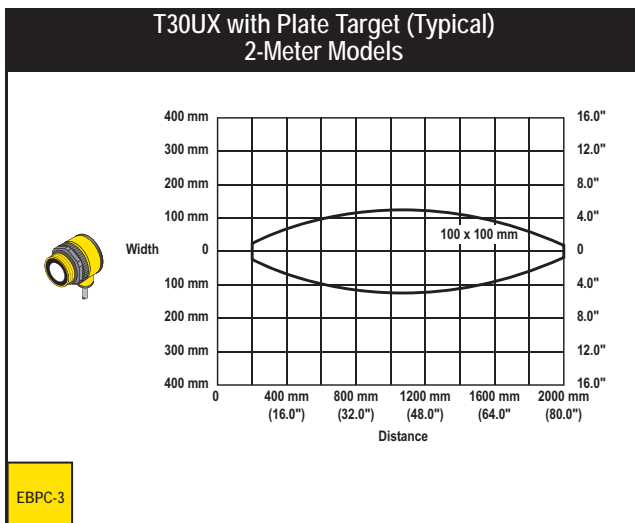
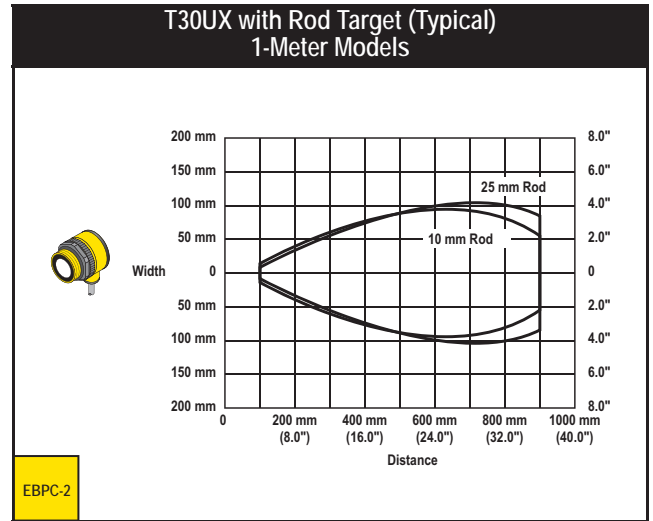
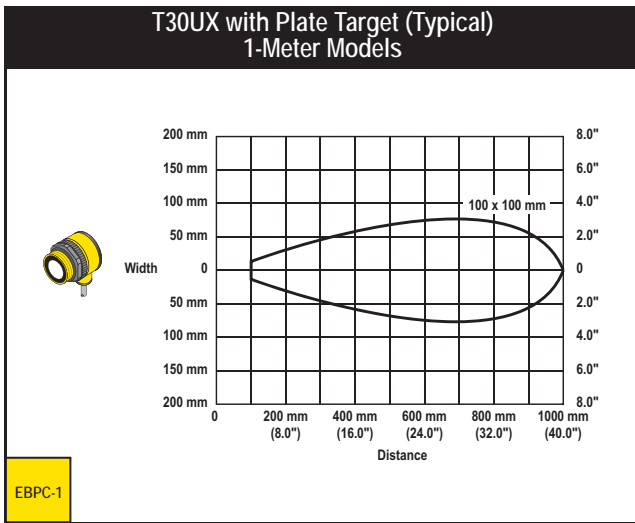
Brackets

| T30UX/T30U | | |
|--|--|--|
|  pg. 650 |  pg. 653 |  pg. 653 |
| SMB1815SF | SMB30A | SMB30FA.. |

 Additional brackets and information available. See page 632.

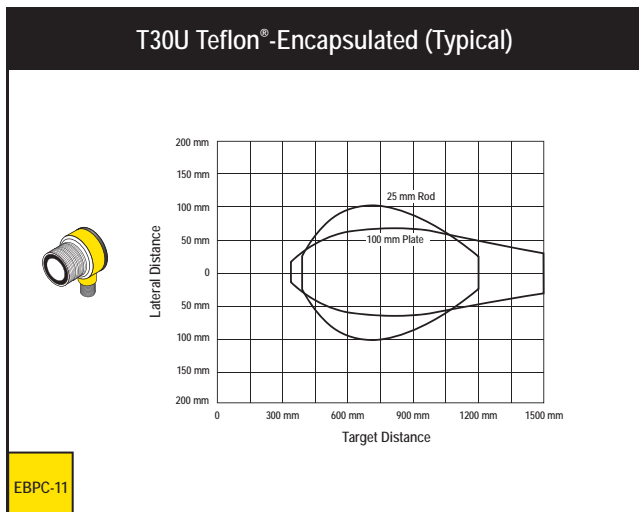
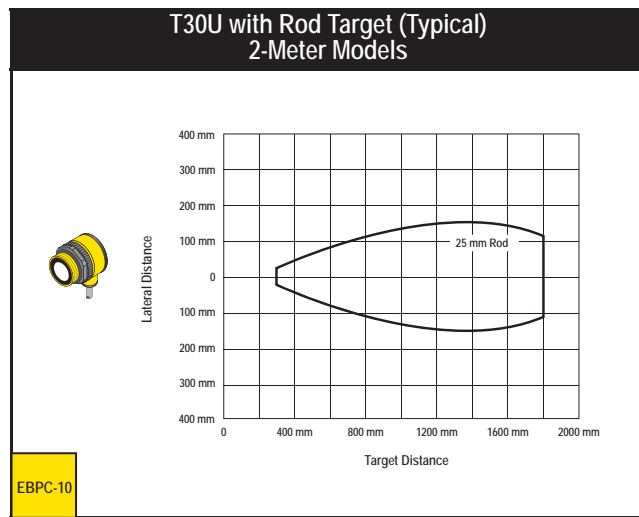
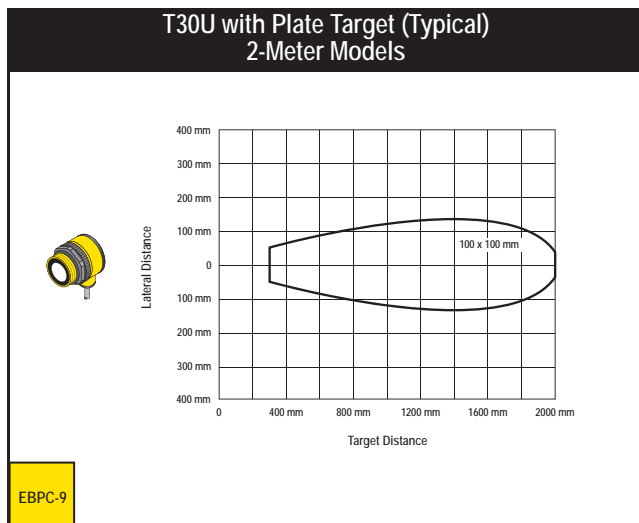
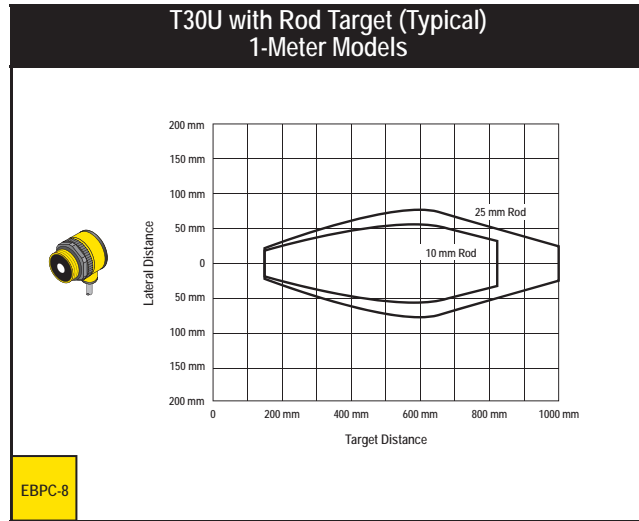
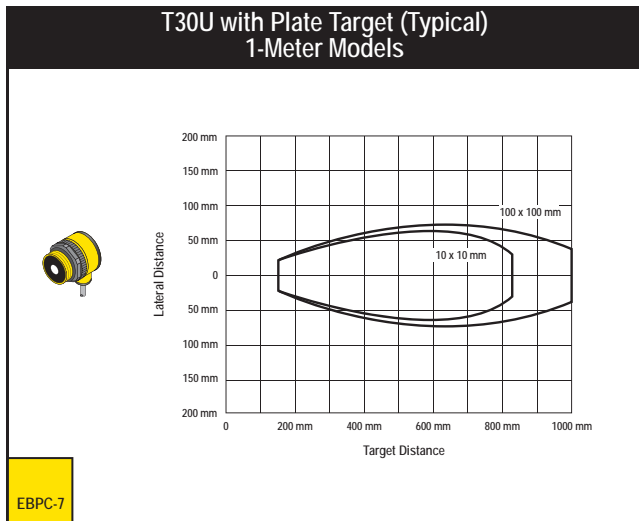
- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- OS18U
- T30U/T30UX**
- M25U
- T18U
- O45U
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- MEASURING ARRAYS
- RADAR

Effective Beam Patterns



More on next page

Effective Beam Patterns



- Photoelectrics
- Sensors
- Fiber Optic
- Sensors
- Special Purpose
- Sensors
- Measurement & Inspection Sensors**
- Vision
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- Safety Light Screens
- Safety Laser Scanners
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- Safety Two-Hand Control Modules
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- O45UR
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- RADAR

Stainless Steel Opposed-Mode Ultrasonic Sensors

U-GAGE® M25U

- Features smooth 316 series stainless steel construction to withstand the toughest sanitary challenges
- Cleans easily with no thread, gaps or seams to trap debris
- Constructed with FDA approved materials
- Disinfects and cleans up with minimal effort
- Offers user-selectable dual range, depending on response time
- Rated IP69K, IEC IP67 (NEMA 6) with fully encapsulated electronics
- Withstands high-temperature sprays of up to 80° C and 1500 psi occurring every few hours
- Features high immunity to ambient electrical and sonic noise
- Provides a wide standard operating temperature range of -20° to +70°C
- Indicates status using highly visible LEDs protected by a sealed, transparent cover



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M-GAGE® M25U, 10 to 30V dc

| Range* | Frequency | Connection | Output | Response Time | Models |
|--|-----------|---------------|--------------------|--|-------------------|
| Normal Speed: 500 mm High Speed: 250 mm | 140 kHz | 4-pin Euro QD | — | — | M25UEQ8 Emitter |
| | | 5-pin Euro QD | Bipolar NPN/PNP | Normal Speed: 4.0 ms High Speed: 3.0 ms | M25URBQ8 Receiver |

Connection options: A model with a QD requires a mating cordset (see page 337).

* M25U receivers may be wired for either of two speed modes: Normal or High, depending on hookup. The Normal-Speed mode offers a sensing range of 500 mm. The Normal-Speed mode maximizes sensing energy, as is required in demanding environments. The High-Speed mode offers a sensing range of 250 mm. The High-Speed mode maximizes sensing response, as is needed in high-speed counting applications.

U-GAGE® M25U Specifications

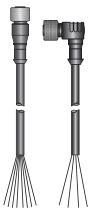
| | |
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| Sensing Range | Normal Speed: 500 mm High Speed: 250 mm 140KHz |
| Supply Voltage and Current | Emitter: 10 to 30V dc (10% max. ripple) at less than 85 mA Receiver: 10 to 30V dc (10% max. ripple) at less than 38 mA (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Receiver Output Configuration | Bipolar (1 NPN & 1 PNP) solid-state output; Normally Closed (output is activated when an object blocks the sensing beam) |
| Output Rating | 100 mA (each output) with short circuit protection; see Note 1 OFF-state leakage current: NPN: < 200 µA sinking PNP: < 10 µA sourcing ON-state saturation voltage: NPN: < 1.6V @ 100 mA PNP: < 3.0V @ 100 mA |
| Output Protection Circuitry | Protected against short circuit conditions |
| Output Response Time | Normal Speed: 4.0 milliseconds High Speed: 3.0 milliseconds |
| Repeatability | 1 millisecond |
| Delay at Power-up | < 250 milliseconds |
| Delay for Switching Between Normal and High Speed | 20 milliseconds |
| Indicators | Green Power LED: indicates Power ON Amber Output LED: indicates output activated |
| Construction | Housing: 316 Stainless Steel LED window: Polysulfone |
| Connections | Emitter: 4-pin Euro-Style QD Receiver: 5-pin Euro-Style QD QD cordsets ordered separately. See page 337. |
| Environmental Rating | Leakproof design, rated IEC IP67 (NEMA 6), IP69K |
| Operating Conditions | Temperature: -20° to +70° C Max. Relative Humidity: 95% at 50° C non-condensing |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max. amplitude 0.06", max. acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration. |
| Certifications |  |
| Notes | 1. NPN < 200 µA for load impedance > 3 KΩ; for load current of 100 mA, leakage < 1% of load current 2. When mounting the M25U, care should be taken to acoustically isolate the emitter and receiver to eliminate sound energy coupling between the sensor pair. This is best accomplished with elastomeric materials between the sensor and rigid mounting brackets. |
| Hookups Diagrams | Emitter Models: MI21 (p. 777) Receiver Models: MI17 (p. 776) |

- Photoelectrics Sensors
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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- QS18U
- T30U/T30UX
- M25U**
- T18U
- O45U
- O45UR
- MEASURING ARRAYS
- RADAR


Cordsets

| Euro QD (With Shield) | | |
|-----------------------|------------|--------------|
| See page 701 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 2 m | MQDEC2-506 | MQDEC2-506RA |
| 5 m | MQDEC2-515 | MQDEC2-515RA |
| 9 m | MQDEC2-530 | MQDEC2-530RA |






| Washdown Euro QD | |
|------------------|------------|
| See page 700 | |
| Threaded 5-Pin | |
| Length | Straight |
| 2 m | MQDCWD-506 |
| 9 m | MQDCWD-530 |



 Additional cordset information available. See page 693.

Brackets

| M25U | |
|--|---|
|  |  |
| pg. 673 | pg. 673 |
| SMBM25A | SMBM25B |

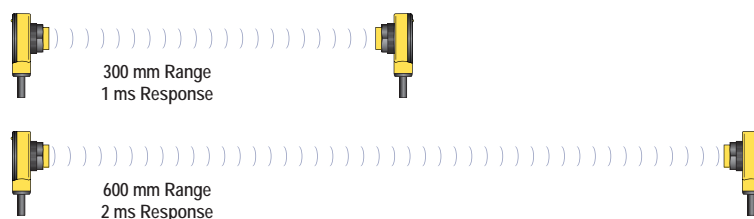
 Additional bracket information available. See page 632.

Opposed Dual Range Sensors U-GAGE® T18U

- Offers response time of 2 milliseconds and range of 600 mm for longer-range applications
- Features ultra-fast response time of 1 millisecond with a range of 300 mm for high-speed applications such as counting
- Uses high-frequency acoustic emitter and tuned receiver for accurate sensing in bright light and for reliable detection of clear materials such as glass
- Offers high immunity to electrical and acoustic noise
- Operates at temperature range from -40° to +70° C
- Includes signal strength indicator to make alignment easy
- Housed in T-style right-angle sensor package with 18 mm threaded mounting hub, for versatile mounting



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U-GAGE® T18U, 12-30V dc

| Range [†] | Connection | Response Time | Models* NPN | Models* PNP |
|--|---------------|--|-----------------|----------------|
| NORMAL resolution: 600 mm HIGH resolution: 300 mm | 2 m | NORMAL resolution: 2 ms or HIGH resolution: 1 ms | T186UE Emitter | |
| | 4-pin Euro QD | | T186UEQ Emitter | |
| | 2 m | | T18VN6UR | T18VP6UR |
| | 4-pin Euro QD | | T18VN6URO | T18VP6URO |

Connection options: A model with a QD requires a mating cordset (see page 339).

For 9 m cable, add suffix W/30 to the 2 m model number (example, T18VN6UR W/30).

[†] Receivers may be wired for either resolutions: Normal or High.
* Sensor pair requires one emitter and one receiver.

U-GAGE® T18U Specifications

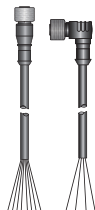
| | |
|--|--|
| Sensing Range (no minimum range) | NORMAL resolution mode: to 600 mm HIGH resolution mode: to 300 mm |
| Supply Voltage and Current | 12 to 30V dc, 10% max. ac ripple 50 mA (emitters); 35 mA (receivers), exclusive of output load |
| Ultrasonic Frequency | 230 kHz |
| Minimum spacing (adjacent pairs) | 50 mm for emitter-to-receiver separations of up to 150 mm Add 10 mm of adjacent-pair spacing for every 100 mm of emitter-to-receiver spacing beyond 150 mm |
| Receiver Output Configuration | T18VN models: NPN sinking, NO and NC (complementary) T18VP models: PNP sourcing, NO and NC (complementary) |
| Receiver Output Rating | 150 mA max. each output at 25° C, derated to 100 mA at 70° C (derate ≈ 1 mA per ° C). Both outputs may be used simultaneously. ON-state saturation voltage: less than 1.5V at 10 mA; less than 2.0 V at 150 mA OFF-state leakage current: less than 1 µA at 30V dc Output protection: Overload and short-circuit protected. No false pulse upon receiver power-up: false pulse protection causes a 100 millisecond delay upon power-up. |
| Output Response Time | NORMAL resolution mode: 2 milliseconds ON/OFF HIGH resolution mode: 1 millisecond ON/OFF |
| Rep Rate | NORMAL resolution mode: 125 Hz max. HIGH resolution mode: 200 Hz max. |
| Mechanical Sensing Repeatability at 300 mm range | NORMAL resolution mode: less than 2 mm HIGH resolution mode: less than 1 mm |
| Beam Angle (-3dB full angle) | 15 ± 2° |
| Indicators | Emitters have a green LED for dc power ON. Receivers have two LEDs, one yellow and one green. Green: power ON Yellow: sonic signal received (flash rate is proportional to received signal strength; flash is from full to half intensity). See data sheet for detailed information. |
| Construction | T-style yellow PBT polyester housing with black PBT polyester back cover. Transducer housing is threaded M18 x 1. Mating jam nut is supplied for mounting. Acoustic face is epoxy reinforced. Circuitry is epoxy-encapsulated. |
| Environmental Rating | IEC IP67; NEMA 6P |
| Connections | Emitters: 2 m long attached PVC- covered 2-wire cable or 4-pin Euro-style quick-disconnect fitting. Receivers: 2 m long attached PVC-covered 4-wire cable or 4-pin Euro-style quick-disconnect fitting. 9 m long cables are available by request. Mating Euro-style quick-disconnect cordsets are also available. See page 339. |
| Operating Temperature | -40° to +70° C |
| Vibration and Mechanical Shock | All models meets Mil.Std 202F requirements method 201A (Vibration: frequency 10 to 60 Hz, max., and double amplitude 0.06", maximum acceleration 10G) and method 213B conditions H&I (Shock: 75G with unit operation; 100G for non-operation). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave. |
| Certifications | |
| Hookup Diagrams | Emitter Models: MI21 (p. 777) NPN Models: MI19 (p. 776) PNP Models: MI20 (p. 776) |

- Photoelectrics Sensors
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- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- QS18U
- T30U/T30UX
- M25U
- T18U**
- Q45U
- Q45UR
- MEASURING ARRAYS
- RADAR

Cordsets

| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 2 m | MQDC-406 | MQDC-406RA |
| 5 m | MQDC-415 | MQDC-415RA |
| 9 m | MQDC-430 | MQDC-430RA |



Additional cordset information available. See page 693.

Brackets

| T18U | | |
|---------|-----------|-----------|
| | | |
| pg. 650 | pg. 650 | pg. 651 |
| SMB18A | SMB18155F | SMB18FA.. |

Additional brackets and information available. See page 632.

Flexible Ultrasonic Sensors

U-GAGE® Q45U

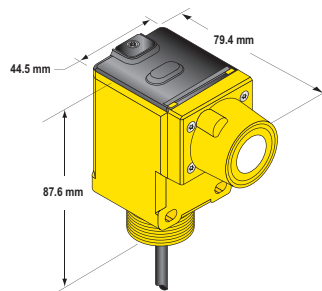
- Available ranges include 100 to 1400 mm for the short-range models and 0.25 to 3.0 m for the long-range models
- Push-button TEACH programming makes it extremely simple to set the near/far limits of the sensing window
- Bipolar discrete models have switches for ON/OFF presence detection and HIGH/LOW level control
 - In ON/OFF mode, bipolar discrete models detect when the target is within the set range or when it is outside the range
 - In HIGH/LOW mode, bipolar discrete models detect when the target is outside the configured range, for fill level control, web tensioning control and similar applications
- Response time is programmed with switches in discrete models and with a potentiometer in analog models
- For remote programming, analog models can be wired directly to an external switch, controller or computer to set window limits—ideal for inaccessible applications such as roll diameter detection for overhead cranes



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Short-range Models



Long-range Models

Program storage cards

After you set up window limits, you can store the limits on circuit cards with non-volatile memory for fast setup. Just store the settings from any Q45U sensor on the Q45UML card, and then transfer the settings to any Q45U sensor with the same available sensing range.



U-GAGE® Q45U Discrete Output, 12-24V dc

| Range | Temperature Compensation | Connection | Output Type | Response Time | Models |
|----------------|--------------------------|---------------|-----------------|--|---------------|
| 100 mm - 1.4 m | No | 2 m | Bipolar NPN/PNP | Programmable for 20, 40, 160 or 640 ms | Q45UBB63DA |
| | | 5-pin Mini QD | | | Q45UBB63DAQ |
| | | 5-pin Euro QD | | | Q45UBB63DAQ6 |
| | Yes | 2 m | | | Q45UBB63DAC |
| | | 5-pin Mini QD | | | Q45UBB63DACQ |
| | | 5-pin Euro QD | | | Q45UBB63DACQ6 |

More on next page

Connection options: A model with a QD requires a mating cordset (see page 343).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45UBB63DA W/30).

U-GAGE® Q45U Discrete Output, 12-24V dc (cont'd)

| Range | Temperature Compensation | Connection | Output Type | Response Time | Models |
|---------------|--------------------------|---------------|--------------------|---|--------------|
| 250 mm - 3 m† | Yes | 2 m | Bipolar NPN/PNP | Programmable for 40, 80, 320 or 1280 ms | Q45UBB63BC |
| | | 5-pin Mini QD | | | Q45UBB63BCQ |
| | | 5-pin Euro QD | | | Q45UBB63BCQ6 |

U-GAGE® Q45U Analog Output, 15-24V dc

| Range | Temperature Compensation | Connection * | Output Type | Response Time | Models |
|----------------|--------------------------|---------------|---|----------------------------------|----------------|
| 100 mm - 1.4 m | Yes | 2 m | Selectable 0 to 10V dc or 4 to 20 mA | Adjustable from 40 to 1280 ms | Q45ULIU64ACR |
| | | 5-pin Mini QD | | | Q45ULIU64ACRQ |
| | | 5-pin Euro QD | | | Q45ULIU64ACRQ6 |
| 250 mm - 3 m† | Yes | 2 m | | Adjustable from 80 to 2560 ms | Q45ULIU64BCR |
| | | 5-pin Mini QD | | | Q45ULIU64BCRQ |
| | | 5-pin Euro QD | | | Q45ULIU64BCRQ6 |

Connection options: A model with a QD requires a mating cordset (see page 343).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45UBB63DA W/30).

† The far limit may be extended as far as 3.9 m for good acoustical targets—hard surfaces with area greater than 100 cm².

Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
**Measurement &
Inspection Sensors**
Vision
Wireless
Lighting &
Indicators
Safety
Light Screens
Safety
Laser Scanners
Safety Controllers &
Modules
Safety Two-Hand
Control Modules
Safety Interlock
Switches
Emergency Stop &
Stop Control


ACCESSORIES
page
343

LIGHT GAUGING
ULTRASONIC
QT50U
S18U
QS18U
T30U/T30UX
M25U
T18U
Q45U
Q45UR
MEASURING
ARRAYS
RADAR

| U-GAGE® Q45U Specifications | |
|-----------------------------|--|
| Sensing Range | Short Range: Near limit: 100 mm min. Long Range: Near limit: 250 mm min. Short Range: Far limit: 1.4 m max. Long Range: Far limit: 3.0 m max. NOTE: The far limit may be extended on long range units, as far as 3.9 m for good acoustical targets (hard surfaces with area greater than 100 cm ²) |
| Supply Voltage and Current | Discrete: 12 to 24V dc (10% max. ripple); 100 mA (exclusive of load) Analog: 15 to 24V dc (10% max. ripple); 100 mA (exclusive of load) |
| Ultrasonic Frequency | Long Range: 128 kHz Short Range: 230 kHz |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short-circuit of outputs |
| Output Configuration | Discrete: Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor Analog: One voltage sourcing and one current sourcing; one or the other output is enabled by internal programming switch #2. |
| Output Ratings | Discrete: 150 mA max. (each) OFF-state leakage current: less than 25 µA at 24V dc ON-state saturation voltage: less than 1.5V at 10 mA; less than 2.0V at 150 mA Analog: Voltage sourcing: 0 to 10V dc, 10 mA max. Current sourcing: 4 to 20 mA, 1 to 500 Ω impedance |

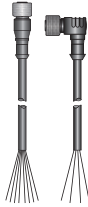
More on next page

U-GAGE® Q45U Specifications (cont'd)

| Performance Specifications | Short Range | Long Range |
|--------------------------------|--|--|
| | Analog resolution or discrete repeatability: $\pm 0.1\%$ of sensing distance (± 0.25 mm min.) | $\pm 0.1\%$ of sensing distance (± 0.5 mm min.) |
| | Analog Linearity: 1% of full scale | 1% of full scale |
| | Temperature effect: 0.05% of sensing distance/° C with temp. comp. 0.2% of sensing distance/° C without temp. comp. | 0.05% of sensing distance/° C |
| | Min. window size: 10 mm | 25 mm |
| | Hysteresis (discrete output): 5 mm | 10 mm |
| Effective Beam | See EBPC-1 to EBPC-4 on page 343. | |
| Adjustments | <p>The following may be selected by a 4-position DIP switch.</p> <p>Discrete: Switch 1: Output normally open/normally closed (pump in/pump out) Switch 2: High/Low level control mode or ON/OFF presence sensing mode Switch 3 & 4: Response speed selection (digital filter)</p> <p>Analog: Switch 1: Output slope positive or output slope negative Switch 2: Current output mode or voltage output mode Switch 3: Loss of echo min/max mode or loss of echo Hold Mode Switch 4: Loss of echo min/max default output value</p> | |
| Indicators | <p>Discrete: Three status LEDs: Green: power ON Yellow: outputs are conducting (Yellow LED also indicates programming status during setup mode) Red: indicates relative strength of received echo</p> <p>Analog: Three status LEDs: Green: power ON Yellow: target is sensed within the window limits (Yellow LED also indicates programming status during setup mode) Red flashing: indicates relative strength of received echo</p> <p>5-segment moving dot LED indicates the position of the target within the sensing window. See data sheet for detailed information.</p> | |
| Construction | Molded PBT polyester thermoplastic polyester housing, o-ring sealed transparent acrylic top cover, and stainless steel hardware. Q45U sensors are designed to withstand 1200 psi washdown. The base of cabled models has a 1/2"-14NPS internal conduit thread. | |
| Environmental Rating | Leakproof design is rated IEC IP67; NEMA 6P | |
| Connections | 2 m or 9 m attached cable, or 5-pin Mini-style or 5-pin Euro-style QD fitting. QD cordsets are ordered separately. See pages 343. | |
| Operating Conditions | Temperature: -25° to +70° C | Relative humidity: 100% |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Method 213B conditions H & I (Shock: 75G with unit operating; 100G for non-operation). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave. | |
| Application Notes | <p>Short Range: Min. target size: 10 x 10 mm aluminum plate at 500 mm 35 x 35 mm aluminum plate at 1.4 m</p> <p>Long Range: Min. target size: 50 x 50 mm aluminum plate at 3 m</p> <p>Discrete: Enable/Disable; Connect yellow wire to +5 to 24V dc to enable sensor and 0 to +2V dc to disable sensor. When the sensor is disabled, the last output state is held until the sensor is re-enabled. The wire must be held to the appropriate voltage for at least 40 milliseconds for the sensor to enable or disable.</p> | |
| Certifications |  | |
| Hookup Diagrams | MI18 (p. 776) | |

Cordsets

| Euro QD (With Shield) | | |
|-----------------------|------------|--------------|
| See page 701 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 2 m | MQDEC2-506 | MQDEC2-506RA |
| 5 m | MQDEC2-515 | MQDEC2-515RA |
| 9 m | MQDEC2-530 | MQDEC2-530RA |






| Mini QD (With Shield) | |
|-----------------------|-----------|
| See page 715 | |
| Threaded 5-Pin | |
| Length | Straight |
| 2 m | MBCC2-506 |
| 4 m | MBCC2-512 |
| 10 m | MBCC2-530 |



Additional cordset information available. See page 693.

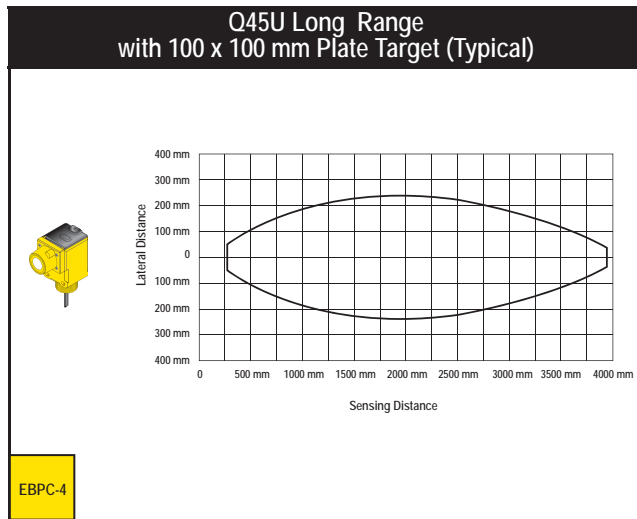
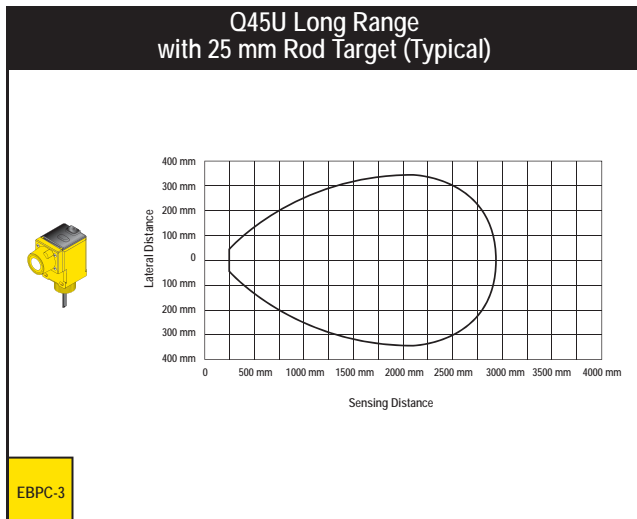
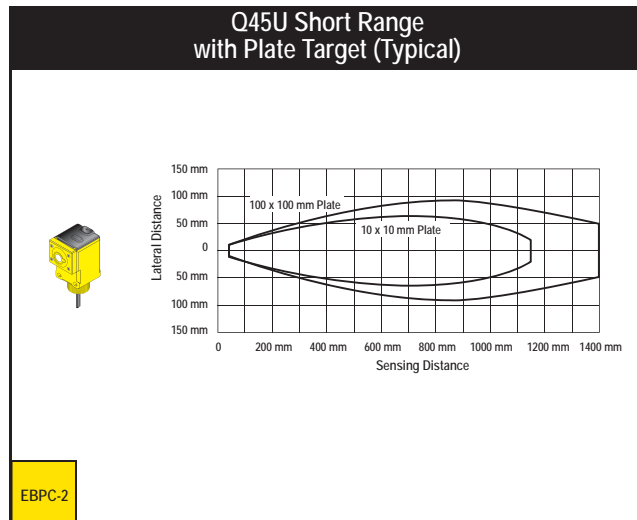
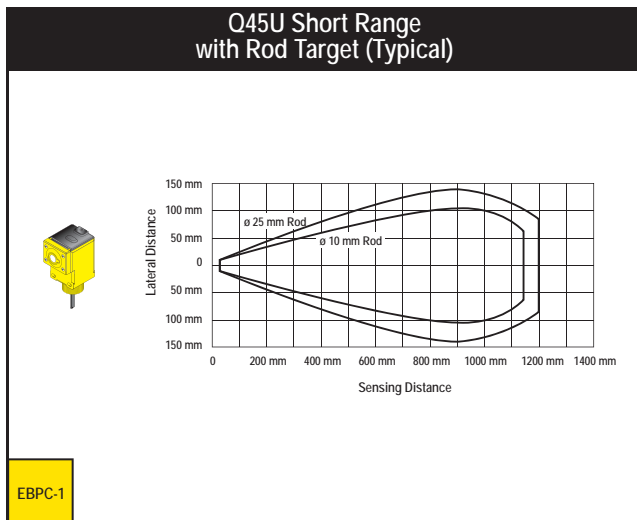
Brackets

| Q45U | | |
|--|---|---|
|  |  |  |
| pg. 653 | pg. 653 | pg. 654 |
| SMB30A | SMB30MM | SMB30SC |

Additional bracket information available. See page 632.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Effective Beam Patterns



- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- QS18U
- T30U/T30UX
- M25U
- T18U
- Q45U**
- Q45UR
- MEASURING ARRAYS
- RADAR

Remote Ultrasonic Sensors

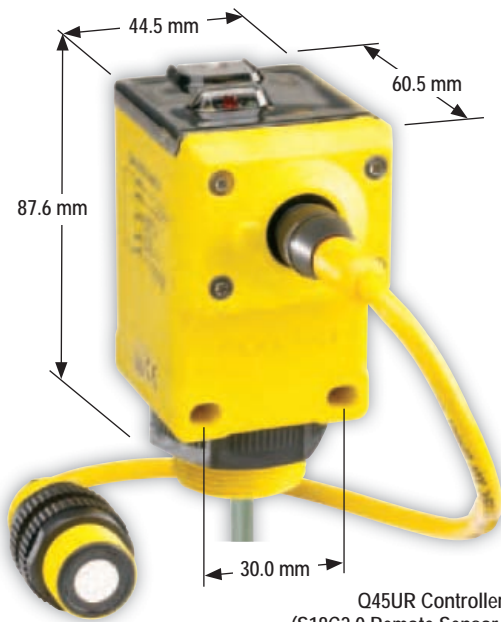
U-GAGE® Q45UR

- Sensing head choices are 18 mm diameter threaded barrel housing in plastic or stainless steel, or ultra-compact plastic Flat-Pak
- Sensing range is 50 to 250 mm
- All models feature built-in temperature compensation and an operating temperature range from -25° to +70° C
- Analog models feature a selectable positive or negative output slope
- Resolution is 0.1 mm for analog models and 0.6 mm for bipolar discrete models
- Push-button TEACH-mode programming enables exact programming of sensing ranges and sensing windows
- Environmental rating is IEC IP65 and NEMA 4
- Digital filtering provides immunity from random electrical and acoustic noise
- Response time is programmed with switches in discrete models and with a potentiometer in analog models

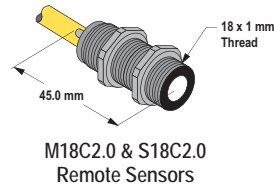


ACCESSORIES
page
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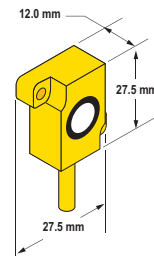
ONLINE
AUTOCAD, STEP,
IGES & PDF



Q45UR Controllers
(S18C2.0 Remote Sensor separate)



M18C2.0 & S18C2.0 Remote Sensors



Q13C2.0 Remote Sensors

U-GAGE® Q45UR Discrete Output, 12-24V dc

| Sensor Range | Controller Connection | Controller Output | Kit Models | Kit Includes | | |
|--------------|-----------------------|-------------------|-----------------|-------------------|---------------|--------------------------------|
| | | | | Controller Models | Sensor Models | |
| 50 - 250 mm | 2 m | Bipolar NPN/PNP | Q45UR3BA63CK | Q45UR3BA63C | | M18C2.0 Stainless Steel Barrel |
| | 5-pin Mini QD | | Q45UR3BA63CQK | Q45UR3BA63CQ | | |
| | 5-pin Euro QD | | Q45UR3BA63CQ6K | Q45UR3BA63CQ6 | | |
| 50 - 250 mm | 2 m | Bipolar NPN/PNP | Q45UR3BA63CKQ | Q45UR3BA63C | | Q13C2.0 Flat-Pak |
| | 5-pin Mini QD | | Q45UR3BA63CQKQ | Q45UR3BA63CQ | | |
| | 5-pin Euro QD | | Q45UR3BA63CQ6KQ | Q45UR3BA63CQ6 | | |
| 50 - 250 mm | 2 m | Bipolar NPN/PNP | Q45UR3BA63CKS | Q45UR3BA63C | | S18C2.0 Molded Barrel |
| | 5-pin Mini QD | | Q45UR3BA63CQKS | Q45UR3BA63CQ | | |
| | 5-pin Euro QD | | Q45UR3BA63CQ6KS | Q45UR3BA63CQ6 | | |

Connection options: A model with a QD requires a mating cordset (see page 347).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45UR3BA63CK W/30).

U-GAGE® Q45UR Analog Output, 15-24V dc

| Sensor Range | Controller Cable | Controller Output | Kit Models | Kit Includes | | |
|--------------|------------------|---|------------------|-------------------|---------------|--------------------------------------|
| | | | | Controller Models | Sensor Models | |
| 50 - 250 mm | 2 m | Selectable 0 to 10V dc or 4 to 20 mA | Q45UR3LIU64CK | Q45UR3LIU64C | | M18C2.0 Stainless Steel Barrel |
| | 5-pin Mini QD | | Q45UR3LIU64CQK | Q45UR3LIU64CQ | | |
| | 5-pin Euro QD | | Q45UR3LIU64CQ6K | Q45UR3LIU64CQ6 | | |
| 50 - 250 mm | 2 m | | Q45UR3LIU64CKQ | Q45UR3LIU64C | | Q13C2.0 Flat-Pak |
| | 5-pin Mini QD | | Q45UR3LIU64CQKQ | Q45UR3LIU64CQ | | |
| | 5-pin Euro QD | | Q45UR3LIU64CQ6KQ | Q45UR3LIU64CQ6 | | |
| 50 - 250 mm | 2 m | | Q45UR3LIU64CKS | Q45UR3LIU64C | | S18C2.0 Molded Barrel |
| | 5-pin Mini QD | | Q45UR3LIU64CQKS | Q45UR3LIU64CQ | | |
| | 5-pin Euro QD | | Q45UR3LIU64CQ6KS | Q45UR3LIU64CQ6 | | |

Connection options: A model with a QD requires a mating cordset (see page 347).

For 9 m cable, add suffix W/30 to the 2 m model number (example, Q45UR3BA63CK W/30).

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 347

U-GAGE® Q45UR High-Gain Controllers

| Product P/N | Version | |
|-------------|----------------------|----------|
| 63060 | Q45UR3BA63CQ6-63060 | Discrete |
| 63667 | Q45UR3LIU64CQ6-63667 | Analog |

NOTE: Special High-Gain controllers are available for small object detection. Contact factory for more information.

- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- QS18U
- T30U/T30UX
- M25U
- T18U
- Q45U
- Q45UR**
- MEASURING ARRAYS
- RADAR

| U-GAGE® Q45UR Remote Sensors Specifications | |
|---|--|
| Supply Voltage and Current | Discrete: 12 to 24V dc (10% max. ripple); 100 mA (exclusive of load) Analog: 15 to 24V dc (10% max. ripple); 100 mA (exclusive of load) |
| Ultrasonic Frequency | 400 kHz |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Protection Circuitry | Both outputs are protected against continuous overload and short circuit |
| Output Rating | Discrete: 150 mA max. (each output) OFF-state leakage current: less than 25 µA at 24V dc ON-state saturation voltage: less than 1.5V at 10 mA; less than 2.0V at 150 mA Analog: Voltage sourcing: 0 to 10V dc, 10 mA max. Current sourcing: 4 to 20 mA, 1 to 500 Ω impedance |
| Output Configuration | Discrete: Bipolar: One current sourcing (PNP) and one current sinking (NPN) open collector transistor Analog: One voltage sourcing and one current sourcing; one or the other output is enabled by internal programming switch #2 |

More on next page


U-GAGE® Q45UR Remote Sensors Specifications (cont'd)

| | |
|--------------------------------|---|
| Performance Specifications | <p>Discrete:</p> <p>Response Speed: 40 or 160 milliseconds (switch selectable)</p> <p>Repeatability*: $\pm 0.2\%$ of measured distance</p> <p>Temperature stability: $\pm 0.03\%$ of the window limit positions per ° C from 0° to 50° C, ($\pm 0.05\%$ per ° C over remainder of operating temperature range)</p> <p>Sensing window width: 5 to 200 mm, when independent near and far limits are taught; 1, 2, 3, or 4 mm (switch selectable), when a sensing distance set point is taught</p> <p>Hysteresis: 0.5 mm</p> <p>Ultrasonic beam angle: $\pm 3.5^\circ$</p> <p>Analog:</p> <p>Response Speed: 10 to 320 milliseconds (2 to 64 cycles) selectable</p> <p>Resolution*: 0.2% of sensing distance at 320 milliseconds response, 0.4% of sensing distance at 10 milliseconds response</p> <p>Linearity*: 1% of full scale</p> <p>Temperature stability: $\pm 0.03\%$ of sensing distance per ° C from 0° to 50° C, ($\pm 0.05\%$ per ° C over remainder of operating temperature)</p> <p>Ultrasonic beam angle: $\pm 3.5^\circ$</p> <p>* Repeatability and analog resolution and linearity are specified using a 50 x 50 mm aluminum plate at 22° C under fixed sensing conditions (Analog: using the 4 to 20 mA output @ 15V dc)</p> |
| Effective Beam | See page 347. |
| Adjustments | <p>Discrete: The following may be selected by a 4-position DIP switch</p> <p>Switch 1: Output normally open (output is energized when target is within sensing window limits), or normally closed (output is energized when target is outside sensing window limits)</p> <p>Switches 2 & 3: Sensing window size (1, 2, 3 or 4 mm)</p> <p>Switch 4: Response speed selection (40 or 160 milliseconds)</p> <p>Analog: Push-button TEACH-mode programming of window limits. The following may be selected by a 4-position DIP switch located on top of the controller, beneath a transparent o-ring sealed acrylic cover and beneath the black inner cover</p> <p>Switch 1: Output slope: output value increases or decreases with distance</p> <p>Switch 2: Output mode: current output or voltage output</p> <p>Switches 3 & 4: Response to loss of echo</p> <p>Response Speed Adjustment: Single-turn potentiometer selects six response values from 10 to 320 milliseconds</p> |
| Indicators | <p>Discrete: Three status LEDs:</p> <p>Green: Power ON</p> <p>Yellow: Output are conducting (Yellow also indicates programming status during setup)</p> <p>Red: Relative strength of received echo</p> <p>5-segment moving dot LED indicates the position of the target within the sensing window</p> <p>Analog: Three status LEDs:</p> <p>Green: Power ON</p> <p>Yellow: Target is sensed within the window limits (Yellow LED also indicates programming status during setup mode)</p> <p>Red: Relative strength of received echo</p> <p>5-segment moving dot LED indicates the position of the target within the sensing window</p> <p>See data sheet for detailed information</p> |
| Construction | <p>Controller: Molded thermoplastic polyester housing, o-ring sealed transparent acrylic top cover, and stainless steel hardware</p> <p>Sensors:</p> <p>M18C2.0: Stainless steel M18 threaded barrel housing and jam nuts, polyetherimide front cover, ceramic transducer, polyurethane rear cover</p> <p>S18C2.0: Thermoplastic polyester S18 threaded barrel housing and jam nuts, polyetherimide front cover, ceramic transducer, polyurethane rear cover</p> <p>Q13C2.0: Molded 30% glass reinforced thermoplastic polyester housing, ceramic transducer, fully epoxy-encapsulated</p> |
| Environmental Rating | Controller: IEC IP67; NEMA 6P Sensor: IEC IP65; NEMA 4 |
| Connections | Controller: 2 m or 9 m attached cable, or 5-pin Mini-style or Euro-style quick-disconnect fitting. See page 339. Sensor: 2 m attached PVC cable terminated with 4-pin Euro-style quick-disconnect fitting for connection to controller. |
| Operating Conditions | Controller and sensor: -25° to +70° C Relative humidity: 85% (non-condensing) |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements. Method 201A Vibration: 10 to 60Hz max., double amplitude 0.06" (maximum acceleration 10G). Method 213B conditions H & I (Shock: 75G with unit operating; 100G for non-operation). Also meets IEC 947-5-2 requirements: 30G, 11 milliseconds duration, half sine wave. |



More on next page

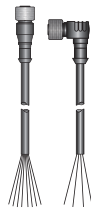
U-GAGE® Q45UR Remote Sensors Specifications (cont'd)

| | |
|--------------------------|--|
| Application Notes | <p>Discrete: The TEACH-mode function of the controller is used to set the sensing distance set point. The sensing window size is set using DIP switches #2 and #3. The sensing distance set point is centered within the sensing window. The size of the sensing window may be adjusted at any time, with or without power applied, and without re-teaching the sensing distance set point. The controller has non-volatile memory which remembers the last sensing distance set point setting if power is removed and later reapplied. The sensing distance set point may be programmed using the Remote TEACH input (see hookup diagrams). Acceptable target angle is within $\pm 5^\circ$ of normal for a smooth, flat target; target rotation does affect the apparent target location with respect to the sensor.</p> <p>Analog: The controller has non-volatile memory which remembers the last sensing distance set point setting if power is removed and later reapplied. The sensing distance set point may be programmed using the Remote TEACH input (see hookup diagrams). Acceptable target angle is within $\pm 5^\circ$ of normal for a smooth, flat target; target rotation does affect the apparent target location with respect to the sensor.</p> |
| Certifications |  |
| Hookup Diagrams | MI18 (p. 776) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


Cordsets

| Euro QD (With Shield) | | |
|-----------------------|------------|--------------|
| See page 701 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 2 m | MQDEC2-506 | MQDEC2-506RA |
| 5 m | MQDEC2-515 | MQDEC2-515RA |
| 9 m | MQDEC2-530 | MQDEC2-530RA |







| Mini QD (With Shield) | |
|-----------------------|-----------|
| See page 715 | |
| Threaded 5-Pin | |
| Length | Straight |
| 2 m | MBCC2-506 |
| 4 m | MBCC2-512 |
| 10 m | MBCC2-530 |



 Additional cordset information available. See page 693.

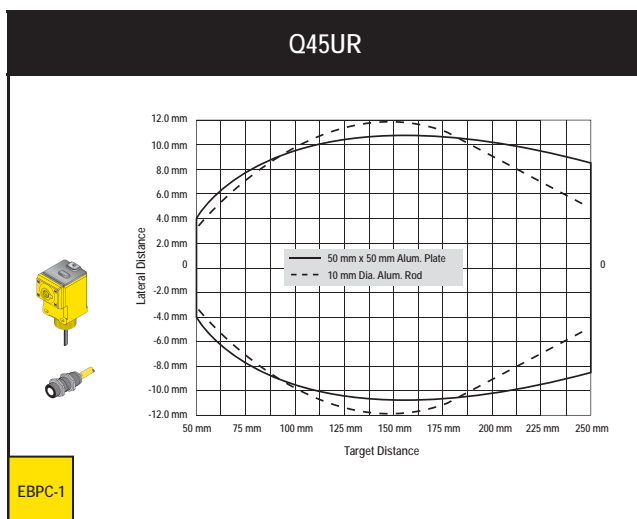
Brackets

| Q45UR | | |
|--|---|---|
|  |  |  |
| pg. 653 | pg. 653 | pg. 654 |
| SMB30A | SMB30MM | SMB30SC |

 Additional bracket information available. See page 632.

- LIGHT GAUGING
- ULTRASONIC**
- QT50U
- S18U
- QS18U
- T30U/T30UX
- M25U
- T18U
- Q45U
- Q45UR**
- MEASURING ARRAYS
- RADAR

Effective Beam Patterns

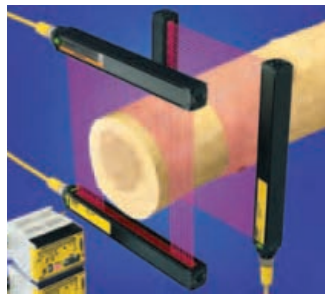


MEASURING ARRAYS



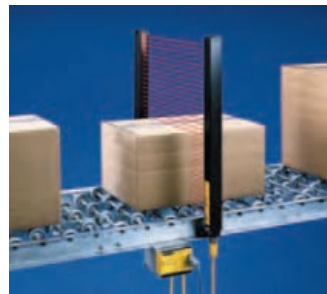
EZ-ARRAY™ page 349

- Applications include edge and center-guiding, loop tension control, hole sizing, parts counting and on-the-fly product sizing and profiling.
- Closely spaced infrared beams detect objects as small as 5 mm wide; edge resolution is 2.5 mm.
- Controller functionality is built into the receiver, so basic setup requires no controller, software or PC.
- Easy-to-use software is included for advanced configuration, using a PC.
- Configuration options include 14 measurement modes, three scanning methods, two analog and two discrete outputs and a serial output.
- Range is 4 meters.
- Array heights range from 150 to 2400 mm.



High-Resolution MINI-ARRAY® page 352

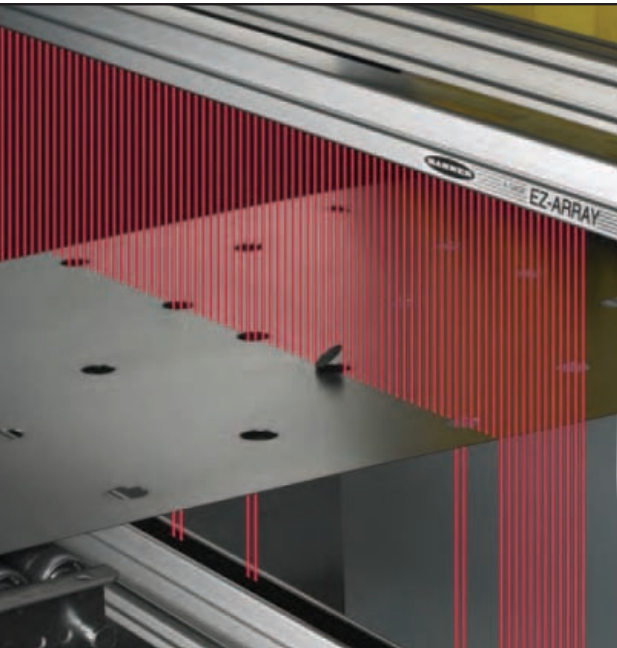
- High-resolution array excels at high-speed, precise process monitoring and inspection applications.
- Available heights range from 163 to 1951 mm.
- Closely spaced beams detect objects as small as 2.5 mm.
- Emitters and receivers can be up to 1.8 m apart.
- Controllers can be configured for a variety of measurement modes, scan modes and output configurations.



MINI-ARRAY® page 356

- Low-profile light screen pairs are designed for profiling and inspections.
- Available heights range from 133 to 1819 mm.
- Depending on the model's beam spacing, the array detects objects as small as 19 to 38 mm.
- Emitters and receivers can be up to 6 m apart or up to 17 m apart, depending on model.
- Configuration options include blanking, sensitivity and scanning mode.
- Controllers are available with DeviceNet™ -compatible output.

DeviceNet™ is a trademark of Open DeviceNet Vendor Association Inc.



Two-Piece Measuring Light Screens A-GAGE® EZ-ARRAY™

- Applications include edge and center guarding, loop tension control, hole sizing, part counting and on-the-fly product sizing and profiling
- Two-piece design eliminates the need for a separate controller
- Two push buttons are provided for gain method selection and alignment/ blanking
- High-excess-gain option for detecting opaque objects and maximizing range in dirty environments
- Edge resolution of 2.5 mm on opaque objects in single and double edge scan mode
- Low-contrast sensing of semi-transparent materials and objects as small as 5 mm
- Seven Zone LEDs provide instant alignment and beam blockage information
- Remote TEACH-wire option is included for alignment, blanking, sensitivity, inverted display and DIP switch enabled/disabled
- Aluminum housing is compact and rugged for demanding applications

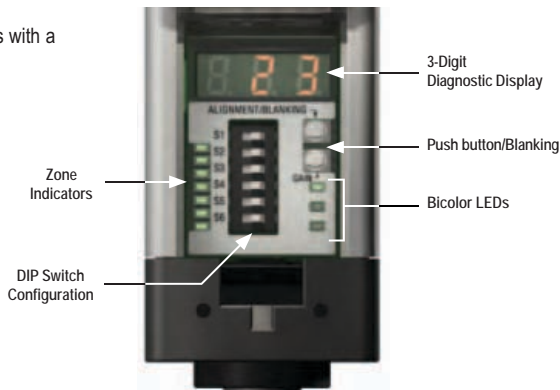
Photoelectrics Sensors
Fiber Optic Sensors
Special Purpose Sensors

Measurement & Inspection Sensors

Vision
Wireless
Lighting & Indicators
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

Provides powerful configuration capabilities

- Straightforward applications can be configured using six-position DIP switch on front of the receiver.
- Easy-to-use graphic user interface software is included for advanced configuration using a PC (USB serial adapter required—sold separately).
- Integrated 3-digit diagnostic display indicates number of beams blocked, blanking configuration and troubleshooting codes.
- Bicolor LEDs indicate system and serial communication status.
- Array lengths range from 150 to 2400 mm
- Standard working range is 0.4 to 4 m, with 5 mm beam spacing
- Shorter range models with a 0.3 to 1.5 m working range are available



EZ-ARRAY Light Screen
W=36.0mm D = 45.2 mm



ACCESSORIES
page 351

LIGHT GAUGING
ULTRASONIC
MEASURING ARRAYS
EZ-ARRAY
High-Resolution MINI-ARRAY
MINI-ARRAY
RADAR

Specialty Application Solutions

Clear Object Detection



Clear plate glass profiling (Measure width of glass)



Clear plastic bottle detection (Detect presence/absence of bottle)

- Clear object models (0.3 m to 1.5 m) are designed to detect low-contrast, translucent objects in clean industrial environments.
- Short-range and low-contrast models are available for plate glass, clear film and bottle detection.

Carpet Edge Detection



Air-to-backing and backing-to-tufting monitoring

- Short-range models with carpet-specific algorithm automatically detect both the carpet tufting and backing edges.
- Kits are available with an emitter, short-range receiver and mounting bracket for ease of installation and alignment.

Contact Banner Engineering at 1-888-373-6767 or visit bannerengineering.com/ezarray for detailed application and ordering information.

A-GAGE® EZ-ARRAY™, 12-30V dc–5 mm Beam Spacing

| Housing Length (L) | Array Length | Total Beams | Connection | Range* | Analog Output | Emitter Model | Receiver Model NPN Outputs | Receiver Model PNP Outputs |
|--------------------|--------------|-------------|-------------------|-----------|-------------------|-----------------|----------------------------|----------------------------|
| 227 mm | 150 mm | 30 | 8-pin Euro QD | 0.4–4 m | Current (4–20 mA) | EA5E150Q | EA5R150NIXMODQ | EA5R150PIXMODQ |
| | | | | | Voltage (0–10V) | | EA5R150NUXMODQ | EA5R150PUXMODQ |
| 379 mm | 300 mm | 60 | | | Current (4–20 mA) | EA5E300Q | EA5R300NIXMODQ | EA5R300PIXMODQ |
| | | | | | Voltage (0–10V) | | EA5R300NUXMODQ | EA5R300PUXMODQ |
| 529 mm | 450 mm | 90 | | | Current (4–20 mA) | EA5E450Q | EA5R450NIXMODQ | EA5R450PIXMODQ |
| | | | | | Voltage (0–10V) | | EA5R450NUXMODQ | EA5R450PUXMODQ |
| 678 mm | 600 mm | 120 | | | Current (4–20 mA) | EA5E600Q | EA5R600NIXMODQ | EA5R600PIXMODQ |
| | | | | | Voltage (0–10V) | | EA5R600NUXMODQ | EA5R600PUXMODQ |
| 828 mm | 750 mm | 150 | | | Current (4–20 mA) | EA5E750Q | EA5R750NIXMODQ | EA5R750PIXMODQ |
| | | | | | Voltage (0–10V) | | EA5R750NUXMODQ | EA5R750PUXMODQ |
| 978 mm | 900 mm | 180 | | | Current (4–20 mA) | EA5E900Q | EA5R900NIXMODQ | EA5R900PIXMODQ |
| | | | | | Voltage (0–10V) | | EA5R900NUXMODQ | EA5R900PUXMODQ |
| 1128 mm | 1050 mm** | 210 | | | Current (4–20 mA) | EA5E1050Q | EA5R1050NIXMODQ | EA5R1050PIXMODQ |
| | | | | | Voltage (0–10V) | | EA5R1050NUXMODQ | EA5R1050PUXMODQ |
| 1278 mm | 1200 mm** | 240 | | | Current (4–20 mA) | EA5E1200Q | EA5R1200NIXMODQ | EA5R1200PIXMODQ |
| | | | | | Voltage (0–10V) | | EA5R1200NUXMODQ | EA5R1200PUXMODQ |
| 1578 mm | 1500 mm** | 300 | | | Current (4–20 mA) | EA5E1500Q | EA5R1500NIXMODQ | EA5R1500PIXMODQ |
| | | | | | Voltage (0–10V) | | EA5R1500NUXMODQ | EA5R1500PUXMODQ |
| 1878 mm | 1800 mm** | 360 | | | Current (4–20 mA) | EA5E1800Q | EA5R1800NIXMODQ | EA5R1800PIXMODQ |
| | | | | | Voltage (0–10V) | | EA5R1800NUXMODQ | EA5R1800PUXMODQ |
| 2178 mm | 2100 mm** | 420 | Current (4–20 mA) | EA5E2100Q | EA5R2100NIXMODQ | EA5R2100PIXMODQ | | |
| | | | Voltage (0–10V) | | EA5R2100NUXMODQ | EA5R2100PUXMODQ | | |
| 2478 mm | 2400 mm** | 480 | Current (4–20 mA) | EA5E2400Q | EA5R2400NIXMODQ | EA5R2400PIXMODQ | | |
| | | | Voltage (0–10V) | | EA5R2400NUXMODQ | EA5R2400PUXMODQ | | |

QD models: A model with a QD requires a mating cordset (see page 351).

* Models with a range of 100 mm to 1.5 m models are available upon request. Contact factory at 1-888-373-6767 for more information.

** Models with array lengths 1050 mm and longer ship with a center bracket and two end-cap brackets.

A-GAGE® EZ-ARRAY™ Specification

| | |
|----------------------------------|---|
| Supply Voltage (Limit Values) | Emitter: 12 to 30V dc Receiver Analog Current Models: 12 to 30V dc Receiver Analog Voltage Models: 15 to 30V dc |
| Supply Power Requirements | Emitter/Receiver Pair (Exclusive of discrete load): Less than 9 watts Power-up delay: 2 seconds |
| Emitter/Receiver Range | 400 mm to 4 m |
| Field of View | Nominally ± 3° |
| Beam Spacing | 5 mm |
| Light Source | Infrared LED |
| Minimum Object Detection Size | Straight Scan, Low-Contrast: 5 mm Straight Scan, High-Excess-Gain: 10 mm |
| Sensor Positional Resolution | Straight Scan: 5 mm Double-Edge Scan: 2.5 mm Single-Edge Scan: 2.5 mm |
| Teach Input (Receiver Gray Wire) | Low: 0 to 2 volts High: 6 to 30 volts or open (input impedance 22 k Ω) |
| Two Discrete Outputs | Solid-State NPN or PNP (current sinking or sourcing) Rating: 100 mA max. each output OFF-State Leakage Current: NPN: less than 200 uA @ 30V dc PNP: less than 10 uA @ 30V dc ON-State Saturation Voltage: NPN: less than 1.6V @ 100 mA PNP: less than 2.0V @ 100 mA Protected against false pulse on power-up and continuous overload or short circuit. |
| Two Analog Outputs | Voltage Sourcing: 0 to 10V (maximum current load of 5 mA) Current Sourcing: 4 to 20 mA (maximum resistance load = $(V_{supply} - 3) / 0.020$) |

More on next page

A-GAGE® EZ-ARRAY™ Specification (cont'd)

| | |
|---|--|
| Serial Communication Interface | EIA-485 Modbus RTU (up to 15 nodes per communication ring) RTU binary format Baud Rate: 9600, 19.2K or 38.4K 8 Data Bits, 1 Stop Bit, and Even, Odd, or 2 Stop Bits and No Parity |
| Scan Time | Scan times depend on scan mode and sensor length. Straight scan times range from 2.8 to 26.5 milliseconds. |
| Status Indicators | Emitter: Red Status LED ON Steady—Status Flashing at 1 hz—Error Receiver: 7 Zone Indicators Red—Blocked channels within zone Green—All channels clear within zone 3-digit 7-segment indicators for measurement mode/diagnostic information Sensor Status Bicolor Indicator LED Red—Hardware Error or Marginal Alignment Green—OK Modbus Activity Indicator LED: Yellow Modbus Error Indicator LED: Red |
| System Configuration (Receiver Interface) | 6-position DIP switch: Used to set scanning type, measurement modes, analog slope and discrete output 2 function. Alternate software GUI interface provides additional options; see full manual. Push Buttons Two momentary push buttons for alignment and gain level selection. |
| Connections | Serial communication: The receiver uses a PVC-jacketed, 5-conductor 22-gauge quick-disconnect cable, 5.4 mm diameter. QD cordsets are ordered separately. See page 351. Other Sensor connections: 8-conductor quick-disconnect cordsets (one each for emitter and receiver), ordered separately (may not exceed 75 m long), PVC-jacketed cordsets measure 5.8 mm diameter, have shield wire; 22-gauge conductors. QD cordsets are ordered separately. See page 351. |
| Construction | Aluminum housing with clear-anodized finish; acrylic lens cover |
| Environmental Rating | IEC IP65 |
| Operating Conditions | Temperature: -40° to +70° C Relative humidity: 95% at 50° C (non-condensing) |
| Certification | CE |
| Hookup Diagrams | NPN models: MI23 (p. 777) PNP models: MI24 (p. 777) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

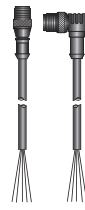
- LIGHT GAUGING
- ULTRASONIC
- MEASURING ARRAYS
- EZ-ARRAY**
- High-Resolution MINI-ARRAY
- MINI-ARRAY
- RADAR

Cordsets

| Euro QD (With Shield) | |
|-----------------------|----------------|
| See page 703 | |
| | Threaded 8-Pin |
| Length | Straight |
| 4.58 m | MAQDC-815 |
| 9.14 m | MAQDC-830 |
| 15.2 m | MAQDC-850 |



| Communication Cordsets | | |
|------------------------|----------------|-------------|
| See page 717 | | |
| | Threaded 5-Pin | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDMC-506 | MQDMC-506RA |
| 4.57 m | MQDMC-515 | MQDMC-515RA |
| 9.14 m | MQDMC-530 | MQDMC-530RA |



Additional cordset information available. See page 693.

ENCLOSURES

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STANDS

PAGE 736

LENS SHIELDS

PAGE 746

Brackets

| EZ-ARRAY™ | |
|------------|----------|
| | |
| pg. 642 | pg. 669 |
| EZA-MBK-20 | SMLBLCZB |

Additional brackets and information available. See page 632.

Serial Adapters

| See page 739 | | Model |
|--------------|--|---------------|
| | USB to RS-485 serial adapter with integral communication cordset and USB cable for advanced configuration with a PC. | EZA-USB485-01 |
| | USB to RS-485 serial adapter for advanced configuration with a PC. NOTE: Communication cordset ordered separately. | INTUSB485-1 |

High-Resolution Inspection and Profiling Light Screen

A-GAGE® High-Resolution MINI-ARRAY®

- Excels at high-speed, precise monitoring and inspection applications, including on-the-fly sizing, profiling, precision edge and center guiding, and hole detection
- Requires a controller, emitter/receiver pair and interconnecting cordsets for a complete system
- Offers programmable controller with a selection of measurement modes, scan modes and output configurations
- Provides 120 sensing beams per foot, for reliable detection of objects as small as 2.5 mm
- Features a 1.8 m range with a very forgiving alignment
- Offers programmable blanking, hysteresis and serial communications
- Includes advanced software for system configuration using a PC
- Makes status monitoring simple by having indicators visible from three sides of emitter/receiver



ACCESSORIES
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Emitters/Receivers



| High-Resolution MINI-ARRAY Sensors | |
|------------------------------------|-------------|
| W=38.1mm | D = 38.1 mm |

A-GAGE® High-Resolution MINI-ARRAY® Emitters/Receivers–2.5 mm Beam Spacing

| Housing Length (L) | Array Length | Total Beams | Connection | Range | Minimum Object Size | Models* |
|--------------------|--------------|-------------|---------------|-------------|---------------------|------------------|
| 236 mm | 163 mm | 64 | 5-pin Mini QD | 0.4 - 1.8 m | 2.5 mm | MAHE6A MAHR6A |

More on next page

QD models: A model with a QD requires a mating cordset (see page 355).

* "E" and "R" in model numbers denotes "Emitter" and "Receiver" respectively. Sold separately.

A-GAGE® High-Resolution MINI-ARRAY® Emitters/Receivers–2.5 mm Beam Spacing (cont'd)

| Housing Length (L) | Array Length | Total Beams | Connection | Range | Minimum Object Size | Models* |
|--------------------|--------------|-------------|---------------|-------------|---------------------|---------|
| 399 mm | 325 mm | 128 | 5-pin Mini QD | 0.4 - 1.8 m | 2.5 mm | MAHE13A |
| | | | | | | MAHR13A |
| 561 mm | 488 mm | 192 | | | | MAHE19A |
| | | | | | | MAHR19A |
| 724 mm | 650 mm | 256 | | | | MAHE26A |
| | | | | | | MAHR26A |
| 887 mm | 813 mm | 320 | | | | MAHE32A |
| | | | | | | MAHR32A |
| 1049 mm | 975 mm | 384 | | | | MAHE38A |
| | | | | | | MAHR38A |
| 1215 mm | 1138 mm | 448 | | | | MAHE45A |
| | | | | | | MAHR45A |
| 1377 mm | 1300 mm | 512 | | | | MAHE51A |
| | | | MAHR51A | | | |
| 1540 mm | 1463 mm | 576 | MAHE58A | | | |
| | | | MAHR58A | | | |
| 1703 mm | 1626 mm | 640 | MAHE64A | | | |
| | | | MAHR64A | | | |
| 1865 mm | 1788 mm | 704 | MAHE70A | | | |
| | | | MAHR70A | | | |
| 2028 mm | 1951 mm | 768 | MAHE77A | | | |
| | | | MAHR77A | | | |

QD models: A model with a QD requires a mating cordset (see page 355).

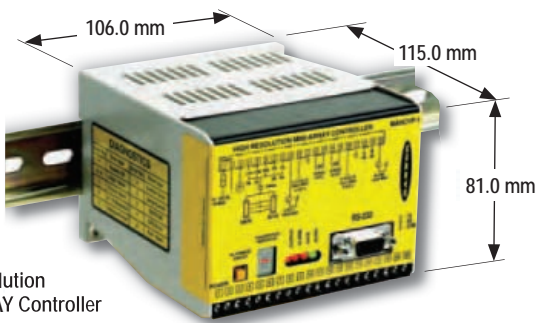
* "E" and "R" in model numbers denotes "Emitter" and "Receiver" respectively. Sold separately.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
 page 355

- LIGHT GAUGING
- ULTRASONIC
- MEASURING ARRAYS
- EZ-ARRAY
- High-Resolution MINI-ARRAY
- MINI-ARRAY
- RADAR

Controllers




High-Resolution MINI-ARRAY Controller

A-GAGE® High-Resolution MINI-ARRAY® Controllers†, 16-30V dc


| Inputs | Solid-State Discrete Outputs | Analog Outputs | Serial Output | Controller Models |
|--------------------------------|------------------------------|---------------------|-----------------|-------------------|
| 1 Sensor pair & Trigger (Gate) | 2 PNP | (2) 0-10V Sourcing | RS-232 & RS-485 | MAHCVP-1 |
| | 2 NPN | (2) 0-10V Sourcing | | MAHCVN-1 |
| | 2 PNP | (2) 4-20 mA Sinking | | MAHCIP-1 |
| | 2 NPN | (2) 4-20 mA Sinking | | MAHCIN-1 |

† One controller and an emitter/receiver pair (of matching length) required per system.

A-GAGE® High-Resolution MINI-ARRAY® Emitter/Receiver Specifications

| | |
|----------------------------|---|
| Emitter/Receiver Range | 380 mm to 1.8 m |
| Minimum Object Sensitivity | 2.5 mm |
| Sensor Scan Time | 1.8 to 58.4 milliseconds, depending on scanning method and sensor length plus 1 millisecond post processing time for controller |
| Power Requirements | 12V dc \pm 2%, supplied by controller |
| Connections | Sensors connect to controller using two 5-conductor quick-disconnect cordset (one each for emitter and receiver), ordered separately. Use only Banner cordset, which incorporate a "twisted pair" for noise immunity. Cordsets measure 8.1 mm in diameter and are shielded and PVC-jacketed. Conductors are 20 gauge (0.9 mm). Emitter and receiver cordset may not exceed 75 m long, each. See page 355. |
| Status Indicators | Emitter: Red LED lights to indicate proper emitter operation Receiver: Green indicates sensors aligned Yellow indicates marginal alignment of one or more beams Red indicates sensors misaligned or one or more beam(s) blocked |
| Construction | Aluminum, with black anodized finish; acrylic lens cover |
| Environmental Rating | NEMA 4, 13; IP65 |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 95% at 50° C (non-condensing) |
| Certifications |  |

A-GAGE® High-Resolution MINI-ARRAY® Controller Specifications

| | |
|-----------------------------|---|
| Power Requirements | 16 to 30V dc @ 1.0 A (typical: 0.5 A @ 16V dc) |
| Inputs | Sensor input: Emitter and receiver wire in parallel to five terminals. Trigger (Gate) input: Optically isolated, requires 10 to 30V dc (7.5 k Ω impedance) for gate signal Remote alignment input: Optically isolated, requires 10 to 30V dc (7.5 k Ω impedance) for alignment sequence signal |
| Discrete (Switched) Outputs | NPN outputs: Open collector NPN transistor rated at 30V dc max., 150 mA max. PNP outputs: Open collector PNP transistor rated at 30V dc max., 150 mA max. All discrete outputs: OFF-state leakage current: less than 10 μ A @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5V @ 150 mA |
| Serial Data Outputs | RS-232 or RS-485 interface. (Up to 15 control modules may be given unique addresses on one RS-485 party line.) ASCII or binary data format 9600, 19.2K or 39.4K baud rate 8 data bits, stop bit, and even, odd or no parity |
| Analog Outputs | Voltage-sourcing outputs: 0 to 10V dc (25 mA current limit) Current-sinking outputs: 4 to 20 mA (16 to 30V dc input) Resolution: Span / Number of sensing channels Linearity: 0.1% of full scale Temperature variation: 0.01% of full scale per ° C |
| Output Configuration | MAHCVP-1: Two PNP discrete (switched), two 0-10V voltage sourcing MAHCVN-1: Two NPN discrete (switched), two 0-10V voltage sourcing MAHCIP-1: Two PNP discrete (switched), two 4-20 mA current sinking MAHCIN-1: Two NPN discrete (switched), two 4-20 mA current sinking |
| System Programming | Via RS-232 interface to PC-compatible computer running Windows® 95, 98, NT, ME, XP or 2000 and using software supplied with each control module |
| Status Indicators | Output 1 (Red): Lights to indicate Discrete Output #1 is active Alarm (Red): Lights to indicate Discrete Output #2 is active Gate (Red): Lights to indicate Trigger (Gate) is active Align (Green): Lights to indicate emitter and receiver are aligned Diagnostics indicator: (Key on controller side label) Identifies System errors and status |
| Construction | Polycarbonate housing; mounts to flat surface or directly onto 35-mm DIN rail |
| Environmental Rating | NEMA 1; IP20 |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 95% @ 50° C (non-condensing) |
| Certifications |  |
| Hookup Diagrams | 0-10V sourcing: MI25 (p. 778) 4 to 20 mA voltage: MI26 (p. 778) |

Cordsets

Mini QD (Shielded with Twisted Pair)


| | |
|----------------|-------------|
| See page 716 | |
| Threaded 5-Pin | |
| Length | Straight |
| 4.57 m | QDC-515C |
| 7.62 m | QDC-525C |
| 15.2 m | QDC-550C |
| 22.9 m | MAQDC-575C |
| 30.5 m | MAQDC-5100C |
| 38.1 m | MAQDC-5125C |
| 45.7 m | MAQDC-5150C |



DB9 Communication

| | |
|--------------|----------|
| See page 718 | |
| 9-Pin | |
| Length | Straight |
| 2.00 m | MASC |




 Additional cordset information available. See page 693.

Brackets

High-Resolution MINI-ARRAY®

| | |
|--|---|
|  |  |
| pg. 628 | pg. 633 |
| DIN-35-.. | MSMB-3 |

 Additional bracket information available. See page 620.



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LIGHT GAUGING
- ULTRASONIC
- MEASURING ARRAYS**
- EZ-ARRAY
- High-Resolution MINI-ARRAY
- MINI-ARRAY
- RADAR

Inspection and Profiling Light Screens

A-GAGE® MINI-ARRAY®

- Features low-profile, programmable measuring light screen for inspections and profiling
- Requires a controller, emitter/receiver pair and interconnecting cordsets for a complete system
- Offers programmable controller with a selection of measurement modes, scan modes and output configurations
- Offers emitters/receivers for detecting objects as small as 12.7 mm
- Available with 9.5 or 19 mm beam spacing
- Features ranges to 17 m, depending on length and beam spacing
- Includes advanced software for system configuration using a PC
- Available in models for central monitoring and control over a DeviceNet™ control network
- Features optional heated enclosures for outdoor applications
- Makes status monitoring easy with indicators visible from three sides of emitter/receiver



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Emitters/Receivers



| MINI-ARRAY Sensors | |
|--------------------|-------------|
| W=38.1mm | D = 38.1 mm |

A-GAGE® MINI-ARRAY® Emitters/Receivers–19.1 mm Beam Spacing

| Housing Length (L) | Array Length | Total Beams | Connection | Minimum Object Size | Range | Models* |
|--------------------|--------------|-------------|------------------|--|------------|-----------|
| 201 mm | 133 mm | 8 | 5-pin Mini QD | 38.1 mm Interlaced Mode: 25.4 mm | 0.9 - 17 m | BMEL616A |
| 356 mm | 286 mm | 16 | | | | BMRL616A |
| | | | | | | BMEL1216A |
| 505 mm | 438 mm | 24 | BMRL1216A | | | |
| | | | BMEL1816A | | | |
| | | | | | | BMRL1816A |

More on next page

QD models: A model with a QD requires a mating cordset (see page 361).

* "E" and "R" in model numbers denotes "Emitter" and "Receiver" respectively. Sold separately. DeviceNet™ is a trademark of the Open DeviceNet Vendor Association, Inc.

A-GAGE® MINI-ARRAY® Emitters/Receivers–19.1 mm Beam Spacing (cont'd)

| Housing Length (L) | Array Length | Total Beams | Connection | Minimum Object Size | Range | Models* |
|--------------------|--------------|-------------|---------------|--|------------|-----------|
| 659 mm | 591 mm | 32 | 5-pin Mini QD | 38.1 mm Interlaced Mode: 25.4 mm | 0.9 - 17 m | BMEL2416A |
| | | | | | | BMRL2416A |
| 810 mm | 743 mm | 40 | | | | BMEL3016A |
| | | | | | | BMRL3016A |
| 963 mm | 895 mm | 48 | | | | BMEL3616A |
| | | | | | | BMRL3616A |
| 1115 mm | 1048 mm | 56 | | | | BMEL4216A |
| | | | | | | BMRL4216A |
| 1267 mm | 1200 mm | 64 | 5-pin Mini QD | 38.1 mm Interlaced Mode: 25.4 mm | 0.9 - 14 m | BMEL4816A |
| | | | | | | BMRL4816A |
| 1572 mm | 1505 mm | 80 | | | | BMEL6016A |
| | | | | | | BMRL6016A |
| 1877 mm | 1810 mm | 96 | | | | BMEL7216A |
| | | | | | | BMRL7216A |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
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A-GAGE® MINI-ARRAY® Emitters/Receivers–9.5 mm Beam Spacing

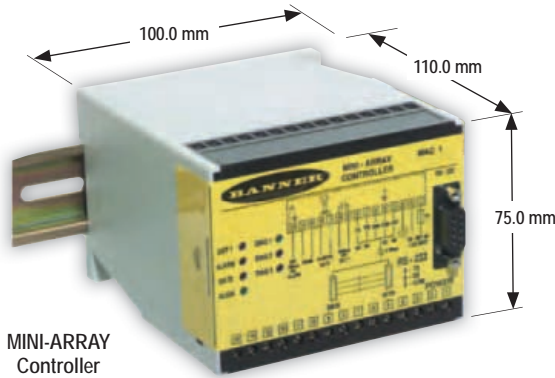
| Housing Length (L) | Total Beams | Array Length | Connection | Minimum Object Size | Range | Models* |
|--------------------|-------------|--------------|---------------|--|-------------|-----------|
| 201 mm | 16 | 143 mm | 5-pin Mini QD | 19.1 mm Interlaced Mode: 12.7 mm | 0.6 - 6.1 m | BMEL632A |
| | | | | | | BMRL632A |
| 356 mm | 32 | 295 mm | | | | BMEL1232A |
| | | | | | | BMRL1232A |
| 505 mm | 48 | 448 mm | | | | BMEL1832A |
| | | | | | | BMRL1832A |
| 659 mm | 64 | 600 mm | | | | BMEL2432A |
| | | | | | | BMRL2432A |
| 810 mm | 80 | 752 mm | | | BMEL3032A | |
| | | | | | BMRL3032A | |
| 963 mm | 96 | 905 mm | | | BMEL3632A | |
| | | | | | BMRL3632A | |
| 1115 mm | 112 | 1057 mm | | | BMEL4232A | |
| | | | | | BMRL4232A | |
| 1267 mm | 128 | 1210 mm | | | BMEL4832A | |
| | | | | | BMRL4832A | |
| 1572 mm | 160 | 1514 mm | BMEL6032A | | | |
| | | | BMRL6032A | | | |
| 1877 mm | 192 | 1819 mm | BMEL7232A | | | |
| | | | BMRL7232A | | | |

QD models: A model with a QD requires a mating cordset (see page 361).

* "E" and "R" in models numbers denotes "Emitter" and "Receiver" respectively. Sold separately.

- LIGHT GAUGING
- ULTRASONIC
- MEASURING ARRAYS**
- EZ-ARRAY
- High-Resolution MINI-ARRAY
- MINI-ARRAY**
- RADAR

Controllers



A-GAGE® MINI-ARRAY® Controllers†, 16-30V dc

ACCESSORIES
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| Inputs | Solid-State Discrete Outputs | Analog Outputs | Serial Output | Controller Models |
|--------------------------------|------------------------------|---------------------|-----------------|-------------------|
| 1 Sensor pair & Trigger (Gate) | 1 Reed & 1 NPN | – | RS-232 & RS-485 | MAC-1 |
| | 2 NPN | – | | MACN-1 |
| | 2 PNP | – | | MACP-1 |
| | 1 NPN | (2) 0-10V Sourcing | RS-232 | MACV-1 |
| | 1 NPN | (2) 4-20 mA Sinking | | MACI-1 |
| 1 Sensor pair & Trigger (Gate) | 16 NPN | – | RS-232 | MAC16N-1 |
| | 16 PNP | – | | MAC16P-1 |
| 1 Sensor pair & Trigger (Gate) | 2 NPN | – | – | MACNXDN-1* |
| | 2 PNP | – | – | MACPXDN-1* |

* DeviceNet™ models

† One controller and an emitter/receiver pair (of matching length and resolution) required per system. DeviceNet™ is a trademark of the Open DeviceNet Vendor Association, Inc.

A-GAGE® MINI-ARRAY® Emitter/Receiver Specifications

| | | |
|---|---|--|
| Emitter/Receiver Range Max range is specified at the point where 3x excess gain remains. | 9.5 mm beam spacing Array Length 143 to 1057 mm: 0.6 to 6.1 m Array Length 1210 to 1819 mm: 0.6 to 4.6 m | 19.1 mm beam spacing Array Length 133 to 1057 mm: 0.9 to 17 m Array Length 1200 to 1810 mm: 0.9 to 14 m |
| Minimum Object Sensitivity | 9.5 mm Beam Spacing Straight, Edge Modes: 19.1 mm Interlaced Mode: 12.7 mm* With DeviceNet Controller: Straight, Edge Modes: 19.1 mm Skip Mode: Multiply the above by the number of skipped beams, plus 1 Interlaced Mode: 12.7 mm* | 19.1 mm Beam Spacing Straight, Edge Modes: 38.1 mm Interlaced Mode: 25.4 mm* With DeviceNet Controller: Straight, Edge Modes: 38.1 mm Skip Mode: Multiply the above by the number of skipped beams, plus 1 Interlaced Mode: 25.4 mm* |
| Sensor Scan Time | 55 microseconds per beam, plus 1 millisecond post process time per scan DeviceNet: Post process time will vary, based on the number of channels interrogated during each scan | |
| Power Requirements †Maximum current is for a 6' sensor. | 9.5 mm beam spacing 12V dc ±2%, supplied by controller Emitter: 0.10 A @ 12V dc Receiver: 0.75 A @ 12V dc† | 19.1 mm beam spacing 12V dc ±2%, supplied by controller Emitter: 0.10 A @ 12V dc Receiver: 0.50 A @ 12V dc† |



A-GAGE® MINI-ARRAY® Emitter/Receiver Specifications (cont'd)

| | |
|----------------------|---|
| Connections | Sensors connect to controller using 5-conductor Mini-style quick-disconnect cordsets (one each for emitter and receiver), ordered separately. Use only Banner cordsets, which incorporate a "twisted pair" for noise immunity. Cordsets measure 8.1 mm dia. and are shielded and PVC-jacketed. Conductors are 20 gauge. Emitter and receiver cordsets may not exceed 75 m long, each. See page 361. |
| Status Indicators | <p>Emitter: Red LED lights to indicate proper emitter operation</p> <p>Receiver: Green indicates sensors aligned (> 3x excess gain) Yellow indicates marginal alignment of one or more beams (1x -3x excess gain) Red indicates sensors misaligned or one or more beam(s) blocked</p> |
| Construction | Aluminum, with black anodized finish; acrylic lens cover |
| Environmental Rating | NEMA 4, 13; IP65 |
| Certification | |
| Operating Conditions | Temperature: -20° to +70° C Relative humidity: 95% at 50° C (non-condensing) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Interlock & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

A-GAGE® MINI-ARRAY® Controller with DeviceNet™ Specifications


| | |
|--------------------------|--|
| DeviceNet Configurations | <p>Vendor code: 12 (Banner Corp.)</p> <p>Device type: 110</p> <p>Product code: 1 (MACNXDN-1) 2 (MACPXDN-1)</p> <p>Connection types supported: Explicit Message, Poll, COS</p> <p>Network address: 0-63 (network configured), default = 63</p> <p>Baud rate supported: 125K, 250K, 500K (network configured), default = 125K</p> |
| Output Configurations | <p>MACPXDN-1: Two PNP discrete (switched)</p> <p>MACNXDN-1: Two NPN discrete (switched)</p> |
| Power Requirements* | Controller, emitter and receiver: 16 to 30V dc @ 1.2 A max. (typical: 0.5 A @ 16V dc) |
| DeviceNet Power* | 11 to 25V dc - supplied by DeviceNet BUS Network |
| Inputs | <p>Sensor input: Emitter and receiver wire in parallel to five terminals.</p> <p>Trigger (Gate) input: Optically isolated, requires 10 to 30V dc (7.5 kΩ impedance) for gate signal</p> |
| Discrete Outputs | <p>NPN outputs: Open collector NPN transistor rated at 30V dc max., 150 mA max.</p> <p>PNP outputs: Open collector PNP transistor rated at 30V dc max., 150 mA max.</p> <p>All discrete outputs: OFF-state leakage current: less than 10 µA @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5V @ 150 mA</p> |
| System Programming | Via DeviceNet interface and supplied EDS files. |
| System Status Indicators | <p>Output (steady red): Output #1 energized.</p> <p>Alarm (flashing red): Output #2 energized.</p> <p>Gate (steady red): Trigger (Gate) input status.</p> <p>Alignment (steady green): Proper emitter/receiver alignment and a clear, unblocked light screen (ON) when green or green/yellow receiver LEDs are ON.</p> <p>Diag 1 (Green), Diag 2 (Red), Diag 3 (Red): Used in combination to display System status</p> |
| Network Status Indicator | <p>Bicolored (Red/Green) LED visible on the control module front panel indicates network status:</p> <p>Steady Green: On-line, connected to master</p> <p>Flashing Green: On-line, address and baud rate OK</p> <p>Steady Red: Critical network fault or duplicate node address detected</p> <p>Flashing Red: Connection timeout</p> <p>OFF: No network power or off-line</p> |
| Construction | Polycarbonate housing; mounts to flat surface or directly onto 35-mm DIN rail |
| Environmental Rating | NEMA 1; IP20 |
| Operating Conditions | Temperature: -20° to +70° C Relative humidity: 95% @ 50° C (non-condensing) |
| Application Note* | * The controller must be powered up before the DeviceNet connection in every power-up situation for proper operation |
| Hookup Diagrams | MI30 (p. 779) |

- LIGHT GAUGING
- ULTRASONIC
- MEASURING ARRAYS**
- EZ-ARRAY
- High-Resolution MINI-ARRAY
- MINI-ARRAY**
- RADAR

DeviceNet™ is a trademark of the Open DeviceNet Vendor Association, Inc.

| A-GAGE® MINI-ARRAY® Controller Specifications | | | | | | | | | | | | | | | | | |
|---|--|-------------|---------------|-------------|-------------|------------------|----|-----|-----|----------------|----|----|-----|---------------|----|-----|----|
| Power Requirements | 16 to 30V dc @ 1.25 amps max. (see current requirements for sensors); controller alone, (without sensors connected) requires 0.1 amp. | | | | | | | | | | | | | | | | |
| Inputs | Sensor input (5 connections): Emitter and receiver wire in parallel to five terminals Trigger (Gate) input: Optically isolated, requires 10 to 30V dc (7.5K input impedance) for gate signal | | | | | | | | | | | | | | | | |
| Discrete Outputs | <p>MAC-1: Output 1 (OUT 1) - Reed relay contact rated 125V ac/dc max., 10 VA max. resistive load (non-inductive). Output 2 (ALARM) - Open collector NPN transistor rated 30V dc max., 150 mA max, short-circuit protected; may be configured as a second data analysis output, a system alarm output, or a scan trigger output for a parallel array OFF-state leakage current: less than 10 µA @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5V @ 150 mA</p> <p>MACN-1: (2) Open collector NPN transistor outputs MACP-1: (2) Open collector PNP transistor outputs; transistor rated 30V dc max. 150 mA max, short circuit protected; may be configured as a second data analysis output, a system alarm output, or a scan trigger output for a parallel array OFF-state leakage current: less than 10 µA @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5 V @ 150 mA</p> <p>MACV-1/MACI-1: Alarm - Open collector NPN transistor rated 30V dc max. 150 mA max, short circuit protected; may be configured as a data analysis output, a system alarm output, or a scan trigger output for a parallel array OFF-state leakage current: less than 10 µA @ 30V dc ON-state saturation voltage: less than 1V @ 10 mA; less than 1.5 V @ 150 mA</p> <p>MAC16P-1: Sixteen open collector PNP transistor outputs MAC16N-1: Sixteen open collector NPN transistor outputs 30V dc max, 150 mA max., short circuit protected OFF-state leakage current: less than 10 µA ON-state saturation voltage: less than 1V @ 10 mA; less than 1.9V @ 150 mA</p> | | | | | | | | | | | | | | | | |
| Serial Data Outputs | RS-232, ASCII or binary data format Baud Rate: 9600, 19.2K, or 38.4K, 8 data bits, 1 start bit, 1 stop bit, even parity Clear data may be suppressed Header string may be suppressed in binary format MAC-1: Up to 15 controllers may be given unique address for RS-485 party line | | | | | | | | | | | | | | | | |
| Analog Outputs | MACV-1: 0-10 Volts sourcing adjustable Null and Span (20 mA current limit) MACI-1: 4-20 mA current sinking adjustable Null and Span (16 to 30V input) Resolution: Span/(Number of sensor channels) Linearity: 0.1% of Full Scale Temperature variation: 0.01% of Full Scale/° C | | | | | | | | | | | | | | | | |
| Controller Programming | All models: Via RS-232 PC-compatible computer running Windows® 95, 98, NT, ME, XP or 2000 operating system and using Banner supplied software | | | | | | | | | | | | | | | | |
| Sensor Scan Time | All models: 55 microseconds per beam plus processing time. The processing time is dependent on the scan analysis and the number of active outputs. This timing assumes a straight scan, continuous, and TBB mode MAC-1, MACN-1 & MACP-1: 1 millisecond processing time MACV-1 & MACI-1: 1.5 milliseconds processing time MAC16N-1 & MAC16P-1: 2.3 to 7 milliseconds processing time | | | | | | | | | | | | | | | | |
| System Response Time | Outputs are not active for 5 seconds after system power up. Maximum response time for the system is two sensor scan cycles. A scan cycle includes a sensor scan plus any serial data transmission. Serial transmission (if activated) follows every sensor scan. | | | | | | | | | | | | | | | | |
| Status Indicators | <p>The following status LEDs are located on the top surface of the module:</p> <p>MACV-1 & MACI-1: V OUT (Red) - (also called I OUT) Indicates that the analog outputs are active MAC-1, MACN-1 & MACP-1: OUT 1 (Red) - Indicates that output 1 is energized MAC16N-1 & MAC16P-1: OUT (Red) - Indicates that at least one output is active ALARM (Red) - Indicates that Output 2 is active/MAC16N-1 & MAC16P-1: Indicates output 16 is active GATE (Red) - Indicates voltage is applied to Trigger (Gate) input ALIGN (Green) - Indicates sensor aligned (excess gain > 1x)</p> <table border="1"> <thead> <tr> <th>Condition</th> <th>DIAG1 (Green)</th> <th>DIAG2 (Red)</th> <th>DIAG3 (Red)</th> </tr> </thead> <tbody> <tr> <td>Normal condition</td> <td>on</td> <td>off</td> <td>off</td> </tr> <tr> <td>Receiver error</td> <td>on</td> <td>on</td> <td>off</td> </tr> <tr> <td>Emitter error</td> <td>on</td> <td>off</td> <td>on</td> </tr> </tbody> </table> <p>DIAG1 (Green) - Indicates power is applied to the module DIAG2 (Red) - Indicates receiver failure DIAG3 (Red) - Indicates emitter failure</p> | Condition | DIAG1 (Green) | DIAG2 (Red) | DIAG3 (Red) | Normal condition | on | off | off | Receiver error | on | on | off | Emitter error | on | off | on |
| Condition | DIAG1 (Green) | DIAG2 (Red) | DIAG3 (Red) | | | | | | | | | | | | | | |
| Normal condition | on | off | off | | | | | | | | | | | | | | |
| Receiver error | on | on | off | | | | | | | | | | | | | | |
| Emitter error | on | off | on | | | | | | | | | | | | | | |




| A-GAGE® MINI-ARRAY® Controller Specifications (cont'd) | |
|--|--|
| Construction | Polycarbonate |
| Environmental Rating | NEMA 1; IP20 |
| Operating Conditions | Temperature: -20° to +70° C Relative humidity: 95% (non-condensing) |
| Certifications |  |
| Hookup Diagram | MAC-1: MI27 (p. 778) MACN-1/MACP-1: MI28 (p. 778) MACV-1/MACI-1: MI29 (p. 779) MAC16N-1/MAC16P-1: MI31 (p. 779) |


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
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- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


Cordsets

| Mini QD (Shielded with Twisted Pair) | |
|--------------------------------------|----------------|
| See page 716 | |
| | Threaded 5-Pin |
| Length | Straight |
| 4.57 m | QDC-515C |
| 7.62 m | QDC-525C |
| 15.2 m | QDC-550C |
| 22.9 m | MAQDC-575C |
| 30.5 m | MAQDC-5100C |
| 38.1 m | MAQDC-5125C |
| 45.7 m | MAQDC-5150C |



| DB9 Communication | |
|-------------------|----------|
| See page 718 | |
| | 9-Pin |
| Length | Straight |
| 2.00 m | MASC |



| | |
|--|---|
|  | Additional cordset information available. See page 693. |
|--|---|

ENCLOSURES



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STANDS



PAGE 736



LENS SHIELDS




PAGE 746

- LIGHT GAUGING
- ULTRASONIC
- MEASURING ARRAYS**
- EZ-ARRAY
- High-Resolution MINI-ARRAY
- MINI-ARRAY**
- RADAR

Brackets

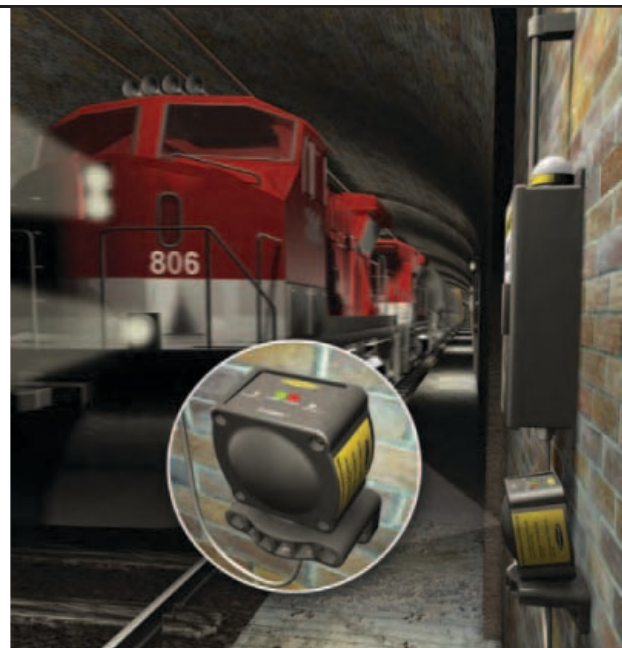
| MINI-ARRAY® | |
|--|---|
|  |  |
| pg. 641 | pg. 646 |
| DIN-35-.. | MSMB-3 |

| | |
|--|---|
|  | Additional bracket information available. See page 632. |
|--|---|

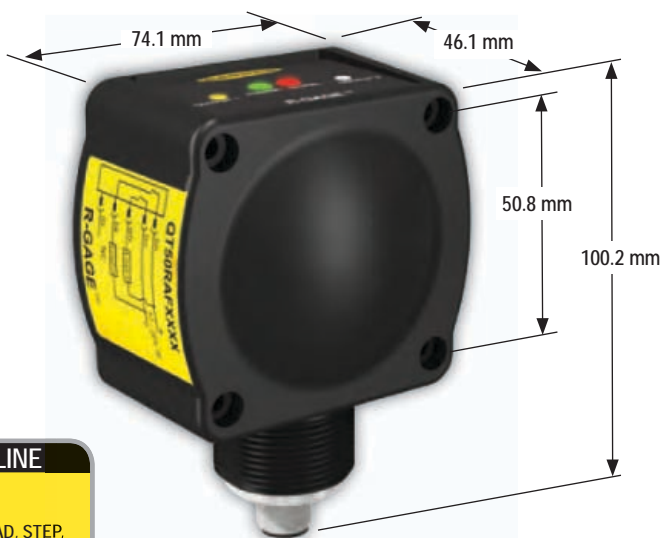
Radar-Based Adjustable-Field & Retroreflective Sensors

R-GAGE™ QT50R

- Uses Frequency Modulated Continuous Wave (FMCW) technology for detecting moving or stationary targets
- Provides presence, absence or change information for a detected target
 - Adjustable-field sensors detect objects up to a set distance, ignoring objects and backgrounds beyond the setpoint
 - Retro-wave sensors detect objects in front of a retroflective target, ignoring objects behind the retroflective target
- Operates at 24 GHz in the Industrial, Scientific and Medical (ISM) telecommunication band and does not require special licensing
- Rated IP67 for harsh environments
- Withstands extreme temperatures, rain, fog, snow, humidity and strong wind
- Detects vehicles at distances up to 15 m
- Includes DIP switches for sensing distance, sensitivity and output configuration
- Features extremely bright LED indicators for simple status monitoring



ACCESSORIES
page
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ONLINE
AUTOCAD, STEP,
IGES & PDF

Presence sensing in a broad range of weather conditions

- Vehicle detection on roads and near intersections (AF)
- Boat detection for locks and dams (AF)
- Proximity detection for large shipyard cranes (AF)
- Car detection and counting for tollbooths, parking ramps, gated access and drive-thrus (RW/AF)
- Train, subway and light rail detection for underground tunnels and shipyard logistics (RW/AF)
- Truck trailer detection at loading docks (RW/AF)

R-GAGE™ QT50R Adjustable Field, 12-30V dc

| Sensing Mode/LED | Max Range† | Connection | Telecom Approval | Output | Model |
|-------------------------|------------|------------|---|--|------------|
| <p>ADJUSTABLE-FIELD</p> | 15 m | 2 m | US, Canada, Mexico and Brazil | Bipolar NPN/PNP Selectable NO or NC | QT50RAF-US |
| | | | Europe (except UK), Australia and New Zealand | | QT50RAF-EU |
| | | | China | | QT50RAF-CN |
| | | | UK | | QT50RAF-UK |

More on next page

QD models: A model with a QD requires a mating cordset (see page 364).

QD models: For 5-pin Euro-style QD, add Q to the 2 m model (example, QT50RAFO-US).

† Range is dependent on target object.
Contact factory at 1-888-373-6767 for additional models.

R-GAGE™ QT50R Retroreflective, 12-30V dc (cont'd)

| Sensing Mode/LED | Max Range† | Connection | Telecom Approval | Output | Model |
|------------------|------------|------------|---|---------------------|--------------|
| | 12 m | 2 m | US, Canada, Mexico and Brazil | Bipolar NPN/PNP | QT50RAF-US-R |
| | | | Europe (except UK), Australia and New Zealand | | QT50RAF-EU-R |
| | | | China | Selectable NO or NC | QT50RAF-CN-R |
| | | | UK | | QT50RAF-UK-R |

QD models: A model with a QD requires a mating cordset (see page 364).

QD models: For 5-pin Euro-style QD, add Q to the 2 m model (example, QT50RAFQ-US-R).

† Range is dependent on target object.
Contact factory at 1-888-373-6767 for additional models.

R-GAGE™ QT50R Specifications

| | |
|-----------------------------|--|
| Range | Sensor will detect a proper object (see below) up to 12 or 15 m, depending on model and target |
| Effective Beam | See charts EBPC-1 and EBPC-2 on page 356 |
| Detectable Objects | Objects containing metal, water or similar high-dielectric material |
| Operating Principle | Frequency Modulated Continuous Wave (FMCW) radar |
| Operating Frequency | 24.00-24.25 GHz, ISM Band (varies slightly by model and national telecom regulations) |
| Supply Voltage | 12 to 30V dc, less than 100 mA (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient overvoltages |
| Delay at Power-up | Less than 2 seconds |
| Output Configuration | Bipolar NPN/PNP outputs, 150 mA; DIP Switch 7 selects NO (default) or NC operation |
| Output Protection | Protected against short circuit conditions |
| Indicators | Power LED: Green (Power ON) Signal Strength LED: Red, flashes in proportion to signal strength Output LEDs: Yellow (output energized)/Red (configuration) See data sheets for more detailed information |
| Response Time | DIP-switch 8 selects ON/OFF response time |
| Adjustments | Adjustable-field: DIP-switch-configurable sensitivity, sensing distance and output configuration Retroreflective: DIP-switch-configurable sensitivity and output configuration; remote line TEACH of the retroreflective target |
| Construction | Housing: ABS/polycarbonate Lightpipes: Acrylic Access Cap: Polyester |
| Operating Temperature | -40° to +65° C |
| Environmental Rating | IP67 |
| Connections | 2 m, 5-wire, shielded, cordset or 5-pin Euro-style QD. Mating QD cordsets are ordered separately. See page 364. |
| Certifications | and ETSI/EN 300 440 or FCC Part 15, depending on model (consult factory for other certifications) |
| Hookup Diagram | MI22 (p. 777) |

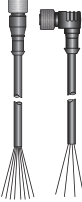
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors**
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 364

- LIGHT GAUGING
- ULTRASONIC
- MEASURING ARRAYS
- TEMPERATURE
- RADAR**
- QT50R


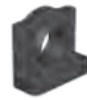

Cordsets

| Euro QD (With Shield) | | |
|-----------------------|------------|--------------|
| See page 701 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDEC2-506 | MQDEC2-506RA |
| 4.57 m | MQDEC2-515 | MQDEC2-515RA |
| 9.14 m | MQDEC2-530 | MQDEC2-530RA |




Additional cordset information available. See page 693.

Brackets

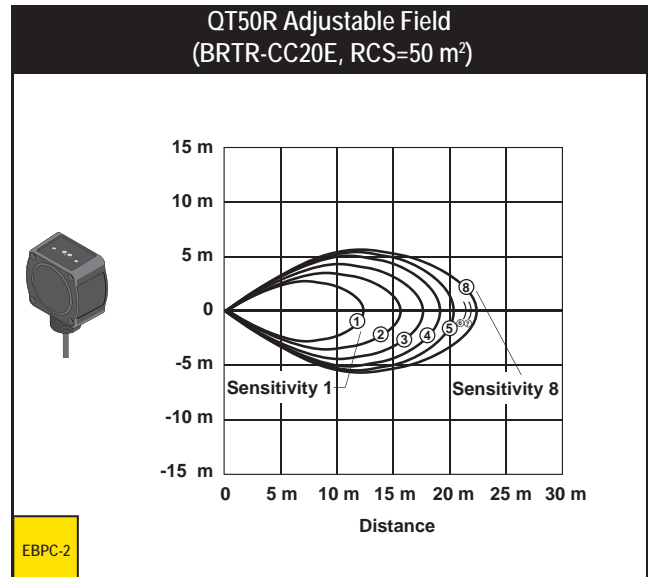
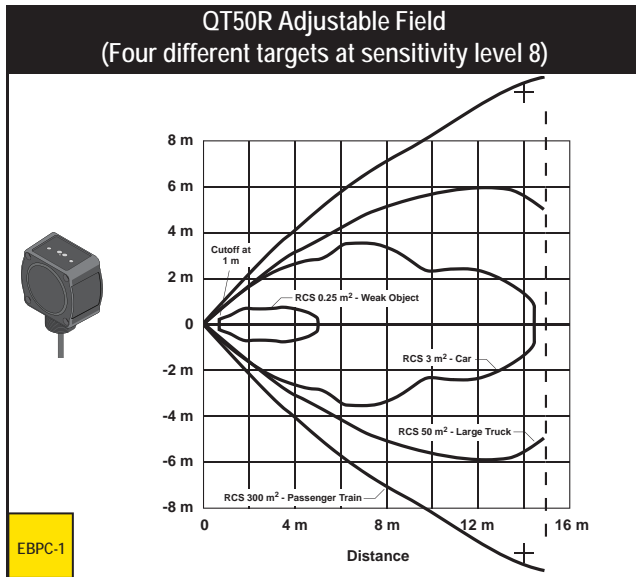
| QT50R | | |
|---|---|---|
|  |  |  |
| pg. 653 | pg. 654 | pg. 653 |
| SMB30A | SMB30SC | SMB30MM |

Additional brackets and information available. See page 632.

| Weather Deflector Kit | |
|---|--|
|  | <p>QT50RCK</p> <ul style="list-style-type: none"> Required if R-GAGE is exposed to rain and snow Prevents buildup of water or ice on sensor face |

| Radar Target | |
|---|---|
|  | <p>BRTR-CC20E</p> <ul style="list-style-type: none"> Large corner-cube reflector in protective plastic enclosure 7x excess gain at 6 m distance |

Effective Beam Patterns

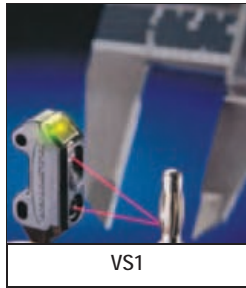


The following standard products are still available from Banner.
Please go online to bannerengineering.com for full descriptions and technical references.

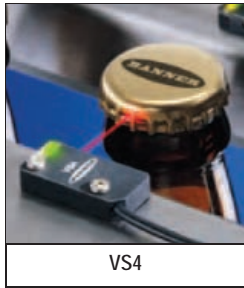
- Photoelectrics Sensors
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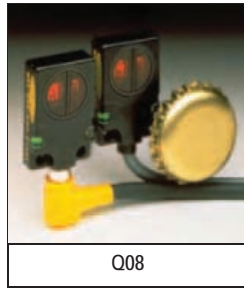
MINI-BEAM®2 QS12



VS1



VS4



Q08



Q10/Q14



FI22 Expert™



D11/D11E



ECONO-BEAM®



M12 & S18 Laser Emitters



VALU-BEAM®



Q85



Analog OMNI-BEAM™



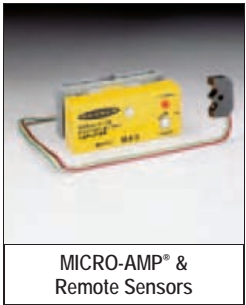
MAXI-BEAM®



MULTI-BEAM®



MAXI-AMP™



MICRO-AMP® & Remote Sensors



Bus-compatible Sensors



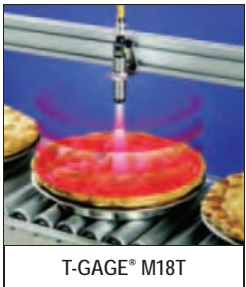
R55 & R55 Expert™



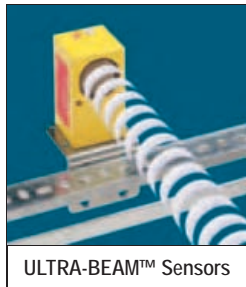
Magnetic Sensors



L-GAGE® Q50



T-GAGE® M18T



ULTRA-BEAM™ Sensors



LS

iVu Image Sensor Touch Screen Bar Code Reader



iVu Image Sensor Solves Complex Bar Code Reading Applications.

The iVu Bar Code Reader (BCR) reads eleven industry-standard bar codes to facilitate advanced traceability—a critical strategy for ensuring the highest product quality in packaging, material handling, automotive, pharmaceutical and many industrial applications. The iVu BCR, with an integrated or remote touch screen, and intuitive interface allows users to efficiently configure, monitor and modify an inspection without a PC or external controller.

- ▶ First-time users can have it up and running in minutes, without training.
- ▶ Using the touch screen and intuitive interface, inspection parameters are easily configured and quickly deployable without a PC or external controller.
- ▶ Intuitive functions allow inspections to be applied and staff-supported right on the factory floor.
- ▶ Sensor is available with a remote touch screen for setup and inspection monitoring when the sensor is difficult to access.
- ▶ Software emulator lets users perfect their application and preload parameters offline.
- ▶ Sensor will read up to ten bar codes and a variety of bar code types at one time.
- ▶ Compact, rugged IP67-rated housing is available with or without an integrated ring light.
- ▶ RS-232 serial communication port is provided for exporting bar code data.
- ▶ Three different trigger modes are available to determine how the sensor captures and processes images.

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High-performance reading of industry standard bar codes

Reads and compares 1D and 2D bar codes in all industries

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- ▶ Code 128
- ▶ Code 39
- ▶ Codabar
- ▶ Interleaved 2 of 5
- ▶ EAN-13
- ▶ EAN-8
- ▶ UPCE
- ▶ Postnet
- ▶ IMB
- ▶ Pharmacode



Integrated Touch Screen Models

Touch Screen for Remote Monitoring

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more sensors, more solutions



iVu Series Image Sensor page 372

- Integrated or remote touch screen and intuitive interface to easily configure and quickly deploy without a PC or external controller
- Easy configuration: install/connect iVu, select sensor or bar code type (depending on model), acquire image and set inspection parameters
- Menu-driven tools to guide you as you set up your inspection
- Models with four sensors in one rugged package: Match, Blemish, Area and Sort
- Bar Code Reader (BCR) models to solve a variety of 2D and 1D bar code applications
- Compact, rugged housing with or without an integrated light
- iVu Plus models support TCP/IP, EtherNet/IP or Modbus/TCP protocols



Lighting page 427

- A complete selection of lighting, including IP68-rated lights
- Rugged, maintenance-free LED lighting in red, green, blue, white and infrared
- High-intensity lighting with built-in universal strobe control and power regulation; no external controller or power supply required



PresencePLUS® Pro I & P4 Vision Sensor page 378

- A complete family of multi-application or application-specific sensors for a wide range of applications
- Full-featured two-piece or one-piece models
- Universal PresencePLUS software for the entire Pro I & P4 series
- Gray scale, color, VGA and high-resolution 1.3 megapixel models
- Sealed, IP68-rated housings available
- Optional bar code tool for locating, reading and grading 2D and 1D linear bar codes
- Optional OCR/OCV tool for optical character recognition and verification
- Optional Bead tool for material tracking



Lens page 381

- Microvideo lenses for use with iVu Series Image Sensors
- Standard, high-performance and megapixel C-mount lenses for use with PresencePLUS Vision Sensors



Accessories page 388

- Cordsets for sensor, serial, Ethernet and video connection
- Broad offering of brackets, fixtures and mounting systems
- Monitors for viewing PresencePLUS inspections
- Enclosures for protecting sensors and lights
- A variety of power supplies and interface modules for sensors and lights

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- iVu Sensors
- PresencePLUS
- Accessories
- Lighting

Vision Sensors

Vision sensing is electronic imaging, applied in a manufacturing setting for the purpose of control. Process, machine, robotic and quality control are typical applications on the plant floor. Vision is comprised of two major elements: A hardware element (camera, controller and lighting) and a software element (control system, image algorithms and graphical user interface).

Inspection

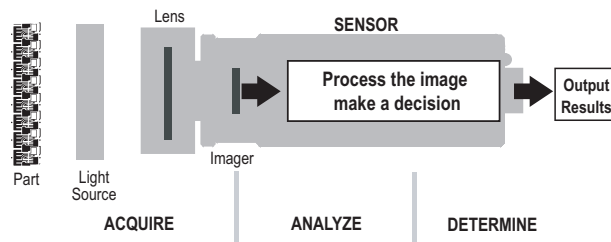
"Visual inspection" refers to the process of acquiring an image, analyzing that image based on set parameters and reporting the results. A digital camera captures images and the sensor software analyzes the images using vision tools to pass or fail the product.

Vision tools are specific software algorithms used to analyze an image. Each vision sensor uses a specific tool set to extract and isolate certain features within the image in order to determine whether a part passes or fails an inspection.

Process

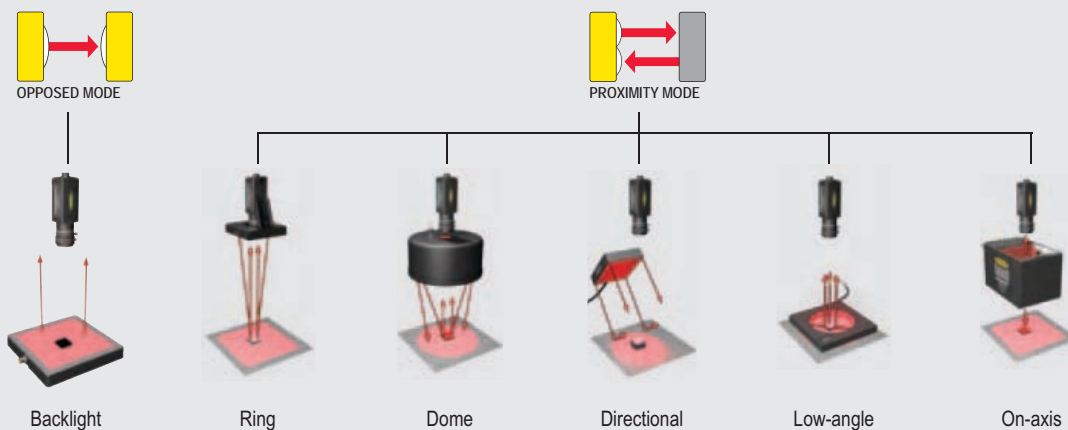
Visual inspection is a three-step process:

1. The sensor acquires an image of the part.
2. The microprocessor analyzes the image.
3. The microprocessor determines if the inspection passes or fails based on a set of parts, and reports the results to the manufacturing line. The part is then either passed to the next process, or it is rejected and removed.



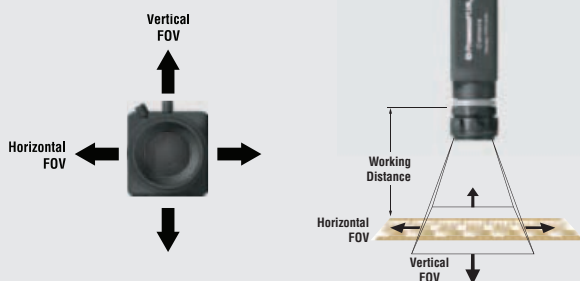
Parts

1. **Light Source:** The light source is a critical component of any vision inspection system. Lighting is the most powerful tool for creating contrast to amplify the feature of interest, while minimizing other features of the part. Selecting the best light source depends on the shape, surface texture, color and opacity of the part.



2. **Lens:** The lens focuses the light onto the sensor's imager. The main consideration for selecting a lens is focal length. To determine the focal length, the field-of-view and working distance must be determined. The field-of-view is the area of the inspection captured on the sensor's imager. The working distance is the distance between the back of the lens and the target object.

Field of View and Working Distance



3. **Sensor:** The sensor contains the imager, microprocessors and I/O.

The imager has an array of tiny light-sensitive cells that converts the target into an image.

Microprocessors analyze the image and make determinations about it based on user-determined tolerances and criteria.





The sensor exports the inspection results through some type of I/O (example, Discrete or Ethernet).

Vision Tools

Vision tools are software algorithms used to analyze an image. A vision sensor uses a set of tools to create an inspection. Using one or several tools, a user can extract and isolate certain features of an image in order to determine whether a part passes or fails an inspection. Several inspections involving different vision tools can be performed on a single image.






LOCATION TOOLS

compensate for translational and rotational movement








-  **GEO Find:** Determines translation and rotation movement of a part up to 360° by detecting relative movement of a pattern
-  **Locate:** Determines translation and rotation by detecting relative movement of edges
-  **Pattern Find:** Determines translation and rotation by detecting relative movement of a pattern
-  **Blob Find:** Determines translation and rotation by detecting the presence, connectivity, size, shape and location of selected features

Analysis TOOLS

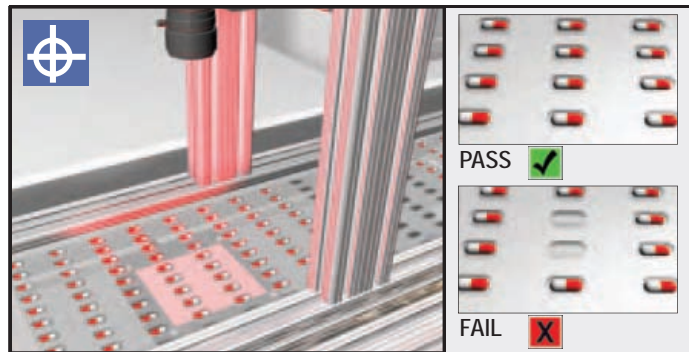
measure and evaluate the results of the vision tools








-  **Communication:** Sends images or results of selected location, vision and analysis tools over Ethernet or RS-232 serial communication ports to industrial Ethernet or PC networks
-  **Math:** Performs arithmetic functions using tool outputs or constants
-  **Measure:** Measures distance and angles between two prescribed points, lines or curves
-  **Test:** Evaluates results of selected vision and analysis tools to determine whether an inspection passes or fails and activates outputs
-  **String:** Performs string comparison and substring search operations on string constants and tools that produce string results

VISION TOOLS analyze the image

-  **Average Color:** Tests or communicates color content values sensed in a selected area
-  **Color Blob:** Determines the presence, connectivity, size and location of selected features with one or more colors
-  **Color Match:** Inspects for matching hue and intensity
-  **Average Gray Scale:** Determines the gray scale value of an area
-  **Bar Code:** Finds, decodes and grades 2D and 1D linear bar codes
-  **Bead Tool:** Monitors a track of material for width, consistency and location
-  **Blob Detect:** Determines the presence, connectivity, size and location of selected features

Applications Examples



-  **Edge:** Determines the presence, number, classification and location of edges
-  **GEO Count:** Detects the presence and location of a target pattern in any orientation
-  **Object:** Determines the presence, number, classification, size and location of objects
-  **OCR/OCV:** Reads and verifies optical characters
-  **Pattern Count:** Determines the presence, number and location of pattern(s)
-  **Circle Detect:** Determines radius, center point and other characteristics of a circle or arc
-  **Line Detect:** Determines length, end points and other characteristics of a line segment

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision**
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- IVu Sensors
- PresencePLUS
- Accessories
- Lighting

Vision Lighting

A vision sensor captures and then analyzes an electronic image. The quality of the inspections depends on the image's contrast. Dedicated lighting can guarantee constant, consistent light conditions that can be manipulated to create a high-contrast image.

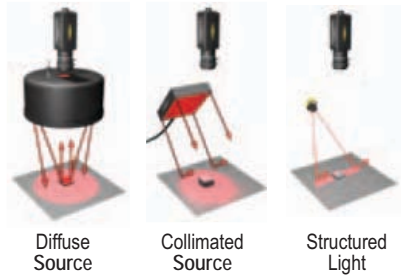
Here are some factors to consider when choosing lighting:

1. Lighting geometry
2. Techniques
3. Optical properties of the part

Lighting Geometry

The geometry of propagation refers to how light energy leaves the source. Light can come from a point, diffuse or collimated source. When you understand how to manipulate lighting geometry, you can:

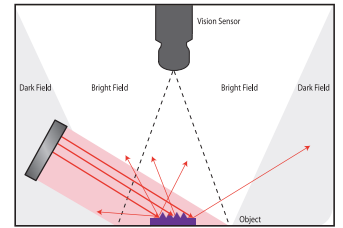
- Maximize contrast
- Eliminate glare
- Eliminate hot spots
- Minimize unimportant features



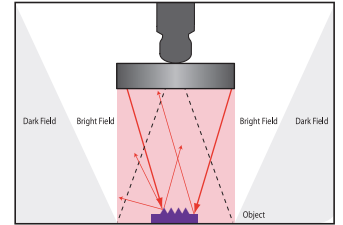
Lighting Techniques

Lighting techniques refer to how the light source is mounted in relation to the target object and the sensor.

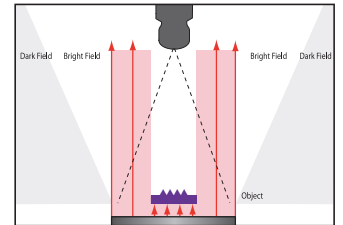
- Dark-Field:** Illuminate objects with indirect light.
- Casts shadows
 - Highlights height changes
 - Textured surfaces are bright



- Bright-Field:** Illuminate objects with direct light.
- Detect color change
 - Smooth surfaces are bright



- Backlight:** Transmit light from behind the object.
- Highlights outlines and profiles
 - Highest contrast



Optical Properties of a Target

Optical properties of a part can be used in conjunction with lighting to highlight features.

| | | Backlight | Directional | Ring | Low-Angle | Diffused | On-Axis | Structured |
|--|---|---|--|-----------------------|---|--|---|--------------------------------------|
| The main goal of lighting in a vision application is to create contrast between the features and the background. | | | | | | | | |
| Optical Properties | Example Parts | | | | | | | |
| Shape | Notches Stampings Embossing | Highlights outlines and profiles | Casts shadows to highlight height changes | — | Height changes are bright Flat surfaces are dark | Lowers contrast between shapes | Flat surfaces are bright Height changes are dark | Highlights changes in height of part |
| Surface Texture | Polished metal Sandpaper | — | Textured surfaces are bright Smooth surfaces are dark | — | Diffuse surfaces are brighter than reflective | Lowers contrast between reflective and textured surfaces | Reflective surface are brighter than diffuse | — |
| Color | Wires Printing Plastic UV Coatings | — | Based on target color | Based on target color | — | Based on target color | Based on target color | — |
| Translucency | Drilled hole Plastics | Solid parts block light, clear parts transmit light | — | — | — | — | — | — |

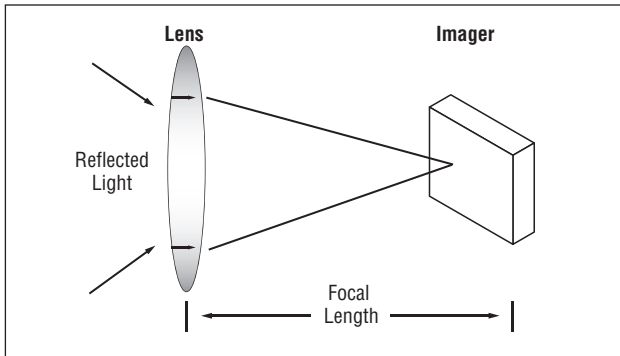
Vision Lenses

The sensor's lens focuses the reflected light onto the imager chip. The quality of the lens will influence the quality of the image.

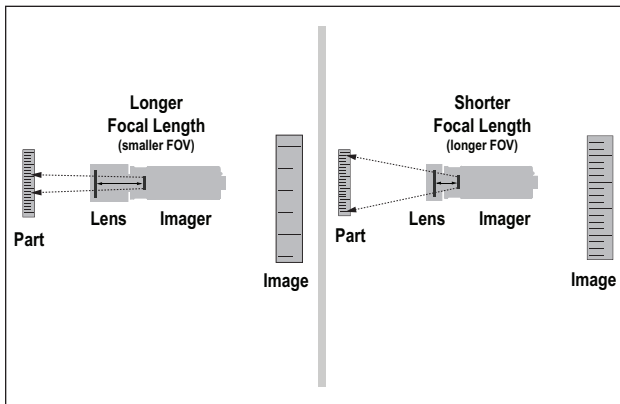
Lenses have one main function: To create a 2D image of the scene, by focusing the entire field-of-view (FOV) on the imager chip.

Lens Basics

Focal Length: The distance from the lens to the camera's imager. It is specified in millimeters. Focal length determines the relationship between working distance and the field of view(FOV). Shorter focal length results in wider FOV.



Field of View: Field of view indicates how much of the visual scene can be captured by the lens at a given distance.



Working Distance: The distance from the camera to the target object under inspection.

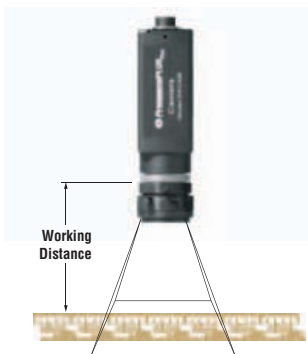
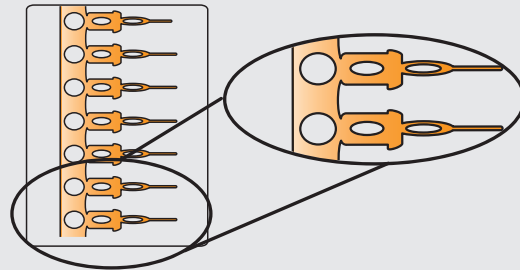


Image Quality

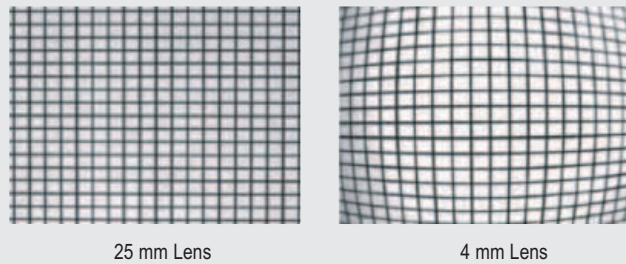
A camera that captures a high quality image assures the most accurate information for later analysis. To insure a high image quality, choose a lens that:

- Magnifies the feature of interest to fill the FOV
- Captures required FOV without adding distortion to the image
- Optimizes your FOV based on working distance
- Focuses entire scene of inspection

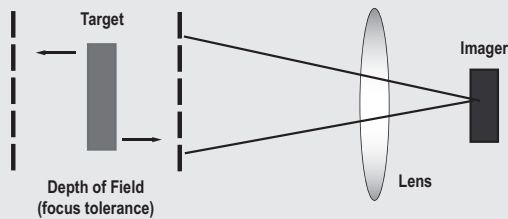
Resolution: The ability of a vision sensor to differentiate between two features that are close together. If the features blur together, a higher resolution lens is required.



Distortion: The lens can influence image quality by how it collects and focuses light on the imager chip. Different lenses have different degrees of optical distortion, or undesired change in the shape of an image.



Depth of Field: The in-focus range of a vision system that includes the areas which remain in focus behind and in front of the target.



- Photoelectrics
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- Emergency Stop & Stop Control

- iVu Sensors
- PresencePLUS
- Accessories
- Lighting

iVu Image Sensors

- The first touch screen image sensor brings the simplicity of a photoelectric sensor and the intelligence of a vision sensor, providing high-performance inspection capabilities at your fingertips.
- Powerful and affordable inspection solution solves a wide variety of complex applications, including:
 - Label alignment inspection
 - Date/lot code inspection
 - Blister pack inspection
 - Stamped hole inspection
 - Part sorting
 - Packaging verification
 - Vial cap inspection
 - Injection molding verification
 - End-of-mail indication
 - 1D and 2D bar code reading
- First-time users can have it up and running in minutes, without training.
- Using the touch screen and intuitive interface, inspection parameters are easily configured and quickly deployable without a PC or external controller.
- Intuitive functions allow inspections to be applied and staff-supported right on the factory floor.
- iVu Plus models support the ability to obtain results and command rapid product changovers over TCP/IP, EtherNet/IP or Modbus/TCP protocols.
- Available for use in multiple languages, with translated text, buttons, commands and icons in the respective language
- The multiple inspection option of the iVu Plus provide the capability of storing and controlling up to 30 inspections for fast product change over.
- Software emulator lets you perfect your application offline.



ACCESSORIES
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No PC required to configure, change or monitor

- Built-in or remote touch screen
- Self-contained sensor with easy configuration and convenient monitoring right on the sensor



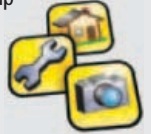
Installation and configuration in 4 easy steps

1. Install and connect the sensor
2. Select the sensor or bar code type, depending on model
3. Acquire a good image
4. Set inspection parameters



Intuitive operation with menu driven tools to guide you through setup

- Define region of interest
- Adjust intensity/contrast
- Define the pass criteria



iVu TG & iVu Plus TG

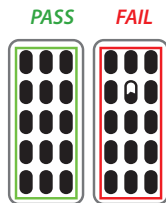
- Up to four advanced sensors in one compact and rugged package
- Monitors parts for type, size, orientation and shape in four broad application categories:

A Match sensor that compares a part to a reference to determine if there is a match



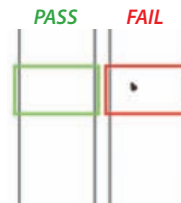
Match
(pattern, shape or orientation)

An Area sensor that detects whether a particular feature (features) is present



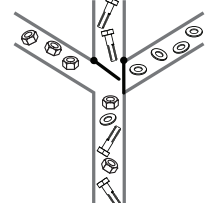
Area
(feature presence and size)

A Blemish sensor to find flaws on parts



Blemish
(presence and absence)

A Sort sensor (Plus only) to recognize and sort up to ten different patterns in the same inspection



Sort
(recognize and sort)



iVu & iVu Plus Bar Code Readers (BCR)

Conducts high-performance reading of industry standard bar codes.
Reads up to ten 1D linear and 2D bar codes at one time.

2D Bar Codes

Data Matrix (ECC200)

1D Bar Codes

| | |
|--------------------|------------|
| Code 128 | EAN-8 |
| Code 39 | UPCE |
| Codabar | IMB |
| Interleaved 2 of 5 | Postnet |
| EAN-13 (UPC-A) | Pharmacode |

- Includes several trigger modes to determine how the sensor captures and processes images: External (Single), External (Gated), Continuous, Remote Command and Industrial Ethernet Only (only on PLUS models)
- Includes ability to compare barcode with user set constant or remotely set compare data



Photoelectrics Sensors
Fiber Optic Sensors
Special Purpose Sensors
Measurement & Inspection Sensors

Vision

Wireless
Lighting & Indicators
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
page 376

iVu Sensors
PresencePLUS
Accessories
Lighting

iVu & iVu Plus Image Sensors



Sensors with Integrated Touch Screen (Standard iVu model shown)



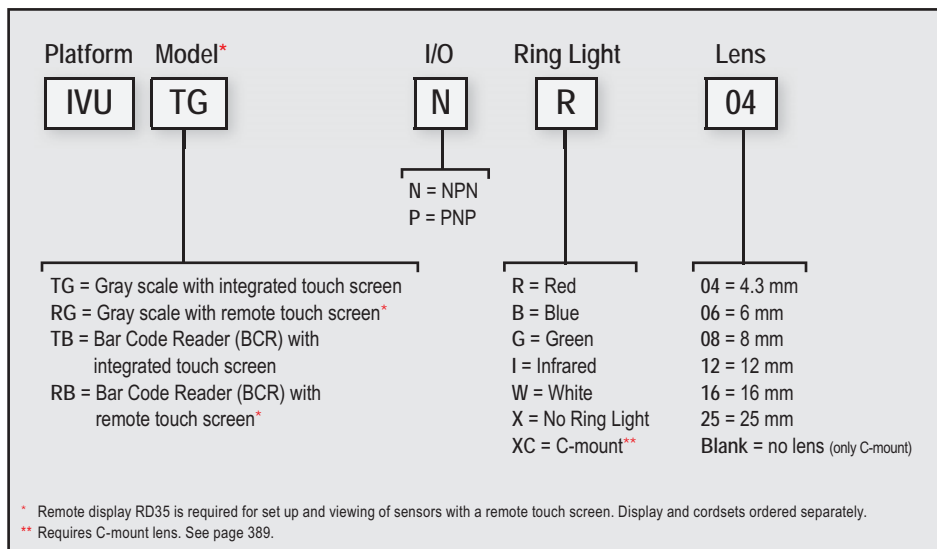
(back)

RD35 Remote Touch Screen (sold separately)

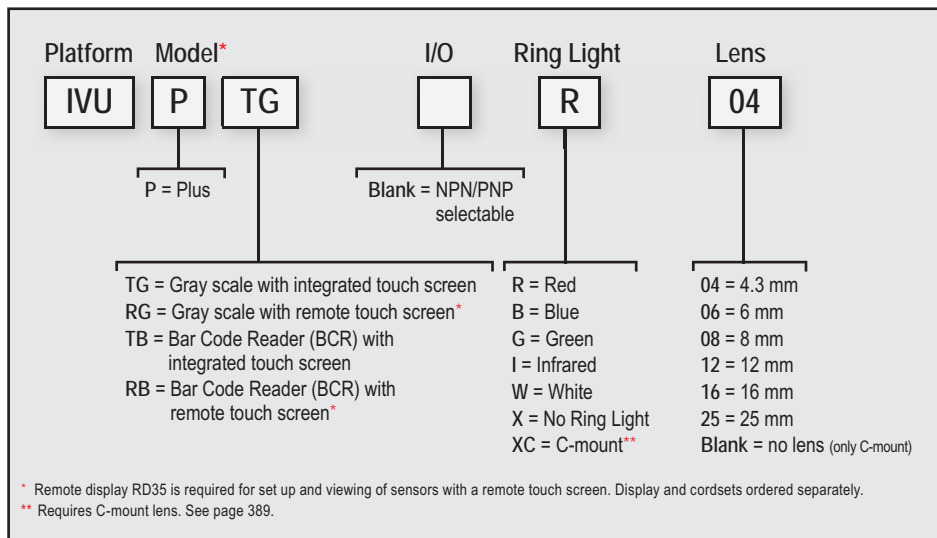


Sensors with Remote Touch Screen

iVu Image Sensor Model Key, 10 to 30V dc



iVu Plus Image Sensor Model Key, 10 to 30V dc




Remote Display Touch Screen



| Description | | Model | |
|--|---------------|-----------------|-------------|
| 3.5" diagonal remote touch screen | | RD35 | |
| Swivel mounting platform for SMBRD35 | | SMBKS | |
| Remote Display Accessory Kit ¹ | | Straight | Right-Angle |
| 1 m cordset, SMBRD35 bracket/docking station, stylus and hardware | IVURD-MXK-803 | IVURD-MXK-803RA | |
| 2 m cordset, SMBRD35 bracket/docking station, stylus and hardware | IVURD-MXK-806 | IVURD-MXK-806RA | |
| 5 m cordset, SMBRD35 bracket/docking station, stylus and hardware | IVURD-MXK-815 | IVURD-MXK-815RA | |
| 9 m cordset, SMBRD35 bracket/docking station, stylus and hardware | IVURD-MXK-830 | IVURD-MXK-830RA | |
| 16 m cordset, SMBRD35 bracket/docking station, stylus and hardware | IVURD-MXK-850 | IVURD-MXK-850RA | |

¹ SMBRD35 bracket/docking station and cordsets are sold individually (see page 376).

| iVu & iVu Plus Specifications | |
|---|---|
| General | |
| Supply Voltage | 10-30V dc |
| Demo Mode | Full tool functionality on canned images |
| Sensor Lock | Optional password protection |
| Integrated Ring Light | Red, IR, Green, Blue, White or no integrated ring light |
| Imager | 1/3 inch CMOS 752 x 480 pixels; adjustable Field-of-View (FOV) |
| Lens Mount | M12 X 1 mm thread(c-mount lens); microvideo lens 4.3, 6, 8, 12, 16, 25 mm |
| Output Rating | 150 mA |
| Exposure Time | 0.1 milliseconds to 1.049 seconds |
| Construction | Black Valox™ sensor housing; acrylic window iVu Plus Integrated: Die cast zinc and Black Valox™ |
| External Strobe Output | + 5V dc |
| Environmental Rating | IP67 |
| Model Specific | |
| Power Connection | iVu TG (integrated touch screen): 8-pin Euro-style (M12) male connector iVu TG (remote touch screen) & iVu BCR (integrated and remote touch screen): 12-pin Euro-style (M12) male connector iVu Plus TG & iVu Plus BCR (integrated and remote touch screen): 12-pin Euro-style (M12) male connector Accessory cordset required for operation; QD cordsets are ordered separately. See page 376. |
| Supply Current | iVu TG and iVu BCR: 800 mA max. (exclusive of I/O load) iVu Plus TG: 850 mA max. (exclusive of I/O load) iVu Plus BCR: 850 mA max. (exclusive of I/O load) |
| USB 2.0 Host | iVu TG and iVu BCR (integrated touch screen): 8-pin Euro-style (M12) female connector iVu TG and iVu BCR (remote touch screen): 4-pin Pico-style (M8) female connector iVu Plus TG and iVu Plus BCR (integrated and remote touch screen): 4-pin Pico-style (M8) female connector Optional USB cordset required for operation of USB Thumb Drive. QD cordsets are ordered separately. See page 376. |
| Ethernet Connection | iVu Plus TG & iVu Plus BCR: 4-pin Pico-style (M8) male connector. Ethernet cordsets are ordered separately. See page 376 |
| Output Configuration | iVu TG & iVu BCR: NPN or PNP determined by model iVu Plus TG & iVu Plus BCR: NPN or PNP, software selectable |
| Tools | iVu TG: Area, Blemish and Match iVu Plus TG: Area, Blemish, Match and Sort iVu BCR and iVu Plus BCR: Bar Code |
| Display | Integrated touch screen: 68.5 mm (2.7") LCD Color Integrated Display 320 x 240 pixels Remote touch screen: See RD35 Remote Display specifications (page 376). |
| Acquisition | iVu BCR (integrated touch screen): 50 fps (frames per second) max. iVu BCR (remote touch screen): 50 fps (frames per second) max. iVu TG (integrated and remote touch screen): 100 fps (frames per second) max. iVu Plus TG & iVu Plus BCR (integrated and remote touch screen): 100 fps (frames per second) max. |
| Operating conditions | Stable Ambient Temperature: iVu TG & BCR: 0° to +50° C iVu Plus TG (integrated touch screen): 0° to +50° C iVu Plus TG (remote touch screen): 0° to +40° C iVu Plus BCR (integrated touch screen): 0° to +50° C iVu Plus BCR (remote touch screen): 0° to +40° C |
| Remote Display connection (Remote Touch Screen Models Only) | 8-pin Euro-style (M12) female connector Accessory cordset required for remote display; QD cordsets are ordered separately. See page 376. |
| Certifications |  NOTE: iVu Plus remote must use Euro QD power cordset for CE compliance. See page 376. |
| Hookup Diagrams | iVu Plus: NPN: VS01 (p. 780) PNP: VS02 (p. 780) iVu (Integrated Touch Screen): NPN: VS05 (p. 781) PNP: VS06 (p. 781) All others: NPN: VS03 (p. 780) PNP: VS04 (p. 780) |

- Photoelectrics Sensors
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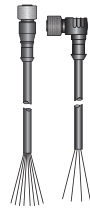
- iVu Sensors**
- PresencePLUS
- Accessories
- Lighting

iVu Remote Display Specifications

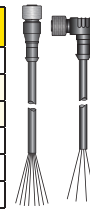
| | |
|-------------------------|---|
| Screen Size | 3.5" diagonal |
| LCD Aspect Ratio | 4:3 |
| Display Resolution | 320 x 240 RGB |
| Viewing Angle | 60 degrees left, and 60 degrees right, 50 degrees up, and 55 degrees down |
| Housing Material | Polycarbonate |
| Bracket Material | Delrin |
| Stylus | Delrin |
| Display Weight | 4.8 oz |
| Bracket & Stylus Weight | 1.1 oz |
| Connection | Molex HandyLink connector |
| Operating Temperature | 0° to + 50° C |

Cordsets

| Euro QD—Power | | | | |
|---------------|---|--------------|---|---------------|
| See page 704 | | | See page 710* | |
| | Threaded 8-Pin (Open Shield) Used for TG models only | | Threaded 12-Pin (Open Shield) Used with iVu Plus for CE compliance | |
| Length | Straight | Right-Angle | Straight | Right-Angle |
| 1.83 m | MQDC2S-806 | MQDC2S-806RA | MQDC2S-1206 | MQDC2S-1206RA |
| 4.57 m | MQDC2S-815 | MQDC2S-815RA | MQDC2S-1215 | MQDC2S-1215RA |
| 9.14 m | MQDC2S-830 | MQDC2S-830RA | MQDC2S-1230 | MQDC2S-1230RA |
| 15.2 m | MQDC2S-850 | MQDC2S-850RA | MQDC2S-1250 | MQDC2S-1250RA |



| Power | | |
|--------------|--------------------|-------------|
| See page 710 | | |
| | Threaded 12-Pin QD | |
| Length | Straight | Right-Angle |
| 1.83 m | IVUC-1206 | IVUC-1206RA |
| 4.57 m | IVUC-1215 | IVUC-1215RA |
| 9.14 m | IVUC-1230 | IVUC-1230RA |
| 15.2 m | IVUC-1250 | IVUC-1250RA |

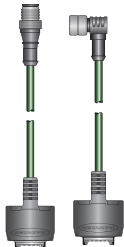


| Ethernet Communication | |
|------------------------|-----------------------|
| See page 719 | |
| | RJ45 to 4-Pin Pico QD |
| Length | Straight |
| 2.00 m | IVUC-E-406 |
| 5.00 m | IVUC-E-415 |
| 9.00 m | IVUC-E-430 |
| 16.00 m | IVUC-E-450 |
| 23.00m | IVUC-E-475 |



* Required for CE compliance

| Remote Display | | |
|----------------|------------------------|----------------|
| See page 708 | | |
| | 8-Pin Euro QD to Molex | |
| Length | Straight | Right-Angle |
| 0.91 m | IVURD-MX-803 | IVURD-MX-803RA |
| 1.83 m | IVURD-MX-806 | IVURD-MX-806RA |
| 4.57 m | IVURD-MX-815 | IVURD-MX-815RA |
| 9.14 m | IVURD-MX-830 | IVURD-MX-830RA |
| 15.2 m | IVURD-MX-850 | IVURD-MX-850RA |



| USB | | | |
|--------------|--|------------------|---|
| See page 707 | | See page 695 | |
| | 8-Pin Euro QD to USB | | 4-Pin Pico QD to USB |
| | Used with: iVu TG & BCR (Integrated Touch Screen) | | Used with: iVu TG & BCR (Remote Touch Screen) and iVu Plus |
| Length | Straight | Right-Angle | Straight |
| 0.15 m | MQDEC-8005-USB | MQDEC-8005RA-USB | PSG-4M-4005-USB |
| 0.30 m | MQDEC-801-USB | MQDEC-801RA-USB | PSG-4M-401-USB |
| 0.90 m | MQDEC-803-USB | MQDEC-803RA-USB | PSG-4M-403-USB |
| 3.00 m | MQDEC-810-USB | MQDEC-810RA-USB | PSG-4M-410-USB |



Additional cordset information available. See page 693.




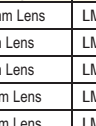
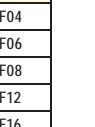

Brackets

| iVu & iVu Plus | | | | Remote Display | |
|----------------|------------|---------|---------|----------------|-------|
| | | | | | |
| pg. 668 | pg. 668 | pg. 667 | pg. 668 | | |
| SMBIVURAL* | SMBIVURAR* | SMBIVUB | SMBIVUU | SMBRD35 | SMBKS |

Additional bracket information available. See page 632.



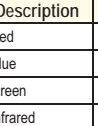
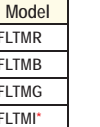
* For orientation see page 668.

Lenses

| iVu & iVu Plus | | |
|---|-------------|--------|
| Description | Model | |
|  | 4.3 mm Lens | LMF04 |
|  | 6 mm Lens | LMF06 |
|  | 8 mm Lens | LMF08 |
|  | 12 mm Lens | LMF12 |
|  | 16 mm Lens | LMF16 |
|  | 25 mm Lens | LMF25* |

* 25mm filter holder is purchased separately.

Filter Kits†

| iVu & iVu Plus | | |
|--|----------|--------|
| Description | Model | |
|  | Red | FLTMR |
|  | Blue | FLTMB |
|  | Green | FLTMG |
|  | Infrared | FLTMI* |


* Infrared pass filters are preinstalled on infrared ring light models.

† Filter kits include 1 color and two sizes of filter holders.

Replacement Windows

| iVu & iVu Plus Replacement Windows | |
|--|--------|
| Description | Model |
| Focusing ring with optically clear glass | IVUW-G |
| Focusing ring with plastic window | IVUW |
| Replacement cover for touch screen | IVUBC |


Sensor Interface Module

| See page 739 | |
|--|---|
|  | <ul style="list-style-type: none"> Sensor interface module for simplified wiring of iVu sensors in an electrical box |



USB Drive

| 2 Gb USB Drive | |
|---|------------|
| Description | Model |
|  | IVU-USBFD2 |

Stylus

| Stylus | |
|---|--------------------|
| Description | Model |
|  | STYLUS-1 (Qty 1) |
| | STYLUS-10 (Qty 10) |

C-mount Lens Covers

| iVu & iVu Plus | | |
|--|-----------------------------------|------------|
| Description | Model | |
|  | Lens cover 50 mm - plastic window | IVUSLC50-P |
|  | Lens cover 75 mm - plastic window | IVUSLC75-P |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision**
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- iVu Sensors**
- PresencePLUS
- Accessories
- Lighting

General-Purpose Sensors

PresencePLUS® ProII and P4

- Full-featured sensor with a complete suite of location, inspection, analysis and geometric tools; all can be used simultaneously for inspecting multiple features and solving complex applications
- Premium tools for enhanced inspection capabilities; including Bar Code Reading (BCR), Optical Character Reading and Verification (OCR/OCV), and Bead inspection
- Standard or high-resolution 1.3 megapixel gray scale, and color models for nearly any inspection challenge
- Sealed IP68-rated models for machine vision inspections in dirty or washdown environments
- Proven user interface common to all *PresencePLUS* sensors
- Intuitive Wizard-like setup procedure and common graphical interface; supports nine languages
- Ethernet, serial and flexible discrete I/O in the same full-featured sensor
- ActiveX utilities for exporting inspections, images and results
- Real-time video output for direct connection to a conventional monitor without a PC
- A choice of a two-piece system with compact camera and separate DIN-mountable controller or economical one-piece design
- Complete selection of lenses, lighting, brackets and accessories



ACCESSORIES
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PresencePLUS® ProII

- Compact camera with separate DIN-mountable controller
- A choice of standard or Mini anodized aluminum camera, or IP68-rated nickel-plated aluminum or stainless steel cameras
- VGA, color and high-resolution models
- Convenient 20-pin removable terminal block
- 14 configurable discrete I/O (NPN/PNP)
- Six bright bicolor LED indicators



PresencePLUS® P4

- Economical one-piece design
- In-line or right-angle housing
- A choice of anodized aluminum or IP68-rated nickel-plated aluminum housing
- VGA, color and high-resolution models
- 7 configurable discrete I/O (NPN/PNP)
- Three bright bicolor LED indicators



Software Tools

One Advanced Software Platform

- Seamless functionality across the entire *Pro* and *P4* vision sensor series
- Remote TEACH input similar to a photoelectric sensor self-learns the inspection tolerances of your application
- Easy, menu-driven, point-and-click interface on a PC
- Free ActiveX utilities for linking and embedding images and results
- Direct connectivity to EtherNet/IP and Modbus TCP industrial networks
- In nine languages including English, Simplified Chinese, Traditional Chinese, French, German, Italian, Japanese, Portuguese and Spanish with translated text, buttons, commands and icons in the respective language
- Free web download or CD-ROM; includes all Banner vision sensor manuals, troubleshooting guides, and lens and lighting selection guides
- Free firmware and software upgrades

| |
|----------------------------------|
| Photoelectrics Sensors |
| Fiber Optic Sensors |
| Special Purpose Sensors |
| Measurement & Inspection Sensors |
| Vision |
| Wireless |
| Lighting & Indicators |
| Safety Light Screens |
| Safety Laser Scanners |
| Safety Controllers & Modules |
| Safety Two-Hand Control Modules |
| Safety Interlock Switches |
| Emergency Stop & Stop Control |

VISION TOOLS analyze the image



Average Color: Tests or communicates color content values sensed in a selected area



Color Blob: Determines the presence, connectivity, size and location of selected features with one or more colors



Color Match: Inspects for matching hue and intensity



Average Gray Scale: Determines the gray scale value of an area



Bar Code: Finds, decodes and grades 2D and 1D linear bar codes



Bead Tool: Monitors a track of material for width, consistency and location



Blob Detect: Determines the presence, connectivity, size and location of selected features



Edge: Determines the presence, number, classification and location of edges



GEO Count: Detects the presence and location of a target pattern in any orientation



Object: Determines the presence, number, classification, size and location of objects



OCR/OCV: Reads and verifies optical characters



Pattern Count: Determines the presence, number and location of pattern(s)



Circle Detect: Determines radius, center point and other characteristics of a circle or arc



Line Detect: Determines length, end points and other characteristics of a line segment

LOCATION TOOLS compensate for translational and rotational movement



GEO Find: Determines translation and rotation movement of a part up to 360° by detecting relative movement of a pattern



Locate: Determines translation and rotation by detecting relative movement of edges



Pattern Find: Determines translation and rotation by detecting relative movement of a pattern



Blob Find: Determines translation and rotation by detecting the presence, connectivity, size, shape and location of selected features

ANALYSIS TOOLS measure and evaluate the results of the vision tools



Communication: Sends images or results of selected location, vision and analysis tools over the Ethernet or RS-232 serial communication ports to industrial Ethernet or PC networks



Math: Performs arithmetic functions on any tool or constant



Measure: Measures distance and angles between two prescribed points, lines or curves



Test: Evaluates results of selected vision and analysis tools to determine whether an inspection passes or fails and activates outputs



String: Performs string comparison and substring search operations on string constants and tools that produce string results

| |
|---------------------|
| IVu Sensors |
| PresencePLUS |
| Accessories |
| Lighting |

PresencePLUS® ProII Series



Controller Models



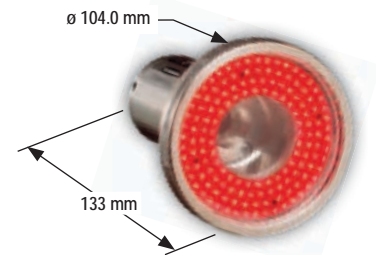
Standard Camera Models
(shown with lens—sold separately)



Mini Camera Models
(shown with lens—sold separately)



IP68-Rated Camera Models
(shown with cover)



IP68 Rated Camera Models
(shown with ring light)

VISION

ACCESSORIES
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PresencePLUS® P4 OMNI Series



IP68-Rated
Right-Angle Models
(shown with cover and lens—sold separately)



Right-Angle Sensor Models
(shown with lens—sold separately)



In-line Sensor Models
(shown with lens—sold separately)

PresencePLUS ProII Controllers & Cameras, 10-30V dc

| Model | PPROCTL | PPROCTL1.3 | PPROCTLC | Add premium tools to model (example, PPROCTL-BCBDOC) | | |
|--|-------------------------|---------------------------|---------------------------------|--|-----------------|-------------------------|
| Resolution | 640 x 480 Gray Scale | 1280 x 1024 Gray Scale | 752 x 480 Color & Gray Scale | BC = Bar Code Reader BD = Bead Tool OC = OCR/OCV | | |
| | | | | BCBD = Bar Code Reader & Bead Tool | | |
| | | | | BCOC = Bar Code Reader & OCR/OCV | | |
| | | | | BDOC = Bead Tool & OCR/OCV | | |
| | | | | BCBDOC = Bar Code Reader, Bead Tool & OCR/OCV | | |
| Pro Camera Model Numbers | | | | | | |
| | Gray Scale | Gray Scale 1.3 | Color | Ring Light | Window | Housing |
|  | PPROMCAMQ | PPROMCAM1.3Q | PPROMCAMCQ | — | — | Black Anodized Aluminum |
|  | PPROCAMQ | PPROCAM1.3Q | PPROCAMCQ | — | — | Black Anodized Aluminum |
| IP68 Pro Camera Model Numbers | | | | | | |
| | Gray Scale | Gray Scale 1.3 | Color | Ring Light | Window* | Housing |
|  | PPROCAMSC-G | PPROCAM1.3SC-G | PPROCAMCSC-G | 50 mm ¹ long Lens Cover (No Light) | Glass | Nickel-plated Aluminum |
| | PPROCAMSC-P | PPROCAM1.3SC-P | PPROCAMCSC-P | | Plastic | |
| | PPROCAMSSC-G | PPROCAM1.3SSC-G | PPROCAMCSSC-G | | Glass | Stainless Steel |
| | PPROCAMSSC-P | PPROCAM1.3SSC-P | PPROCAMCSSC-P | | Plastic | |
|  | PPROCAMSR-G | PPROCAM1.3SR-G | — | Red | Glass | Nickel-plated Aluminum |
| | PPROCAMSR-P | PPROCAM1.3SR-P | | | Plastic | |
| | PPROCAMSSR-G | PPROCAM1.3SSR-G | | | Stainless Steel | |
| | PPROCAMSSR-P | PPROCAM1.3SSR-P | | | | |
|  | PPROCAMSI-G | PPROCAM1.3SI-G | — | Infrared | Glass | Nickel-plated Aluminum |
| | PPROCAMSI-P | PPROCAM1.3SI-P | | | Plastic | |
| | PPROCAMSSI-G | PPROCAM1.3SSI-G | | | Stainless Steel | |
| | PPROCAMSSI-P | PPROCAM1.3SSI-P | | | | |
|  | PPROCAMSB-G | PPROCAM1.3SB-G | — | Blue | Glass | Nickel-plated Aluminum |
| | PPROCAMSB-P | PPROCAM1.3SB-P | | | Plastic | |
| | PPROCAMSSB-G | PPROCAM1.3SSB-G | | | Stainless Steel | |
| | PPROCAMSSB-P | PPROCAM1.3SSB-P | | | | |
|  | PPROCAMSG-G | PPROCAM1.3SG-G | — | Green | Glass | Nickel-plated Aluminum |
| | PPROCAMSG-P | PPROCAM1.3SG-P | | | Plastic | |
| | PPROCAMSSG-G | PPROCAM1.3SSG-G | | | Stainless Steel | |
| | PPROCAMSSG-P | PPROCAM1.3SSG-P | | | | |
|  | PPROCAMSW-G | PPROCAM1.3SW-G | PPROCAMCSW-G | White | Glass | Nickel-plated Aluminum |
| | PPROCAMSW-P | PPROCAM1.3SW-P | PPROCAMCSW-P | | Plastic | |
| | PPROCAMSSW-G | PPROCAM1.3SSW-G | PPROCAMCSSW-G | | Stainless Steel | |
| | PPROCAMSSW-P | PPROCAM1.3SSW-P | PPROCAMCSSW-P | | | |

* Windows are factory replaceable, contact factory at 1-888-373-6767.



† Camera without lens cover and 75 mm long lens covers are available. Contact factory at 1-888-373-6767 for additional information.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision**
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 388

- iVu Sensors
- PresencePLUS**
- ProII**
- P4
- Accessories
- Lighting

P4 OMNI Sensors, 10-30V dc

| Vision Tools | | Housing | Resolution (pixels) | Model Number |
|---|-----------------|-------------|---------------------|--------------|
|  | OMNI Gray Scale | Right-Angle | 640 x 480 | P4OR |
| | | In-Line | | P4OI |
| | | Right-Angle | 1280 x 1024 | P4O1.3R |
| | | In-Line | | P4O1.3I |
|  | COLOR OMNI | Right-Angle | 752 x 480 | P4COR |
| | | In-Line | | P4COI |

Add premium tools to model (example, P4OR-BC)

BC = Bar Code Reader

BD = Bead Tool

OC = OCR/OCV


BCBD = Bar Code Reader & Bead Tool

BCOC = Bar Code Reader & OCR/OCV

BDOC = Bead Tool & OCR/OCV

BCBDOC = Bar Code Reader, Bead Tool & OCR/OCV

Sealed P4 OMNI (IP68) Sensors, 10-30V dc

| Vision Tools | | Housing | Resolution (pixels) | Model Number |
|--|-----------------|-------------|---------------------|--------------|
|  | OMNI Gray Scale | Right-Angle | 640 x 480 | P4ORS |
| | OMNI Gray Scale | | 1280 x 1024 | P4O1.3RS |
| | COLOR OMNI | | 752 x 482 | P4CORS |

Add premium tools to model (example, P4ORS-BC)

BC = Bar Code Reader

BD = Bead Tool

OC = OCR/OCV

BCBD = Bar Code Reader & Bead Tool

BCOC = Bar Code Reader & OCR/OCV

BDOC = Bead Tool & OCR/OCV

BCBDOC = Bar Code Reader, Bead Tool & OCR/OCV

PresencePLUS® P4 OMNI Specifications

| | | |
|----------------------------|---|---|
| Supply Voltage and Current | 10 to 30V dc (24V dc $\pm 10\%$ if the sensor powers a light source) P4OR, P4OI & P4ORS: less than 650 mA (exclusive of lights and I/O load) P4O1.3R, P4O1.3I, P4COR, P4COI, P4CORS & P4O1.3RS: less than 550 mA (exclusive of lights and I/O load) | |
| Memory | 32 MB Inspection (jobs): 999 max. | |
| Input/Output Configuration | NPN (sinking) or PNP (sourcing) software selectable | |
| Output Rating | 150 mA max. each output OFF-state leakage current: less than 100 μ A ON-state saturation voltage: NPN—less than 1V @ 150 mA max. PNP—greater than V+ -2V | |
| Bicolor Status Indicators | PASS/FAIL: Green ON steady—PASS POWER/ERROR: Green ON steady—POWER READY/TRIGGER: Green ON steady—READY | Red ON steady—FAIL Red ON steady—ERROR Yellow ON steady—TRIGGER |
| Display Options | PC or NTSC video (uses 9 m max. BNC cordset) | |
| Discrete I/O | 1 Trigger IN 1 Strobe OUT 4 Programmable I/O 1 Product Change IN 1 Remote TEACH IN | |
| Communications | 10/100 Ethernet connection for running PresencePLUS P4 software and/or output inspection results P4OR, P4OI, P4O1.3R, P4O1.3I, P4COR & P4COI: RJ-45 connector P4ORS, P4O1.3RS & P4CORS: 8-pin M12/Euro-style (female) connector RS-232 connection for output of inspection results | |
| Imager Resolution | P4OR, P4OI & P4ORS: 640 x 480 pixels P4O1.3R, P4O1.3I & P4O1.3RS: 1280 x 1024 pixels P4COR, P4COI & P4CORS: 752 x 480 pixels | |

More on next page

| PresencePLUS® P4 OMNI Specifications (cont'd) | |
|---|--|
| Pixel Size | P4OR, P4OI, P4COR, P4COI & P4ORS: 7.4 x 7.4 µm P4O1.3R, P4O1.3I & P4O1.3RS: 6.7 x 6.7 µm P4CORS: 6.0 X 6.0 µm |
| Imager Size | P4OR, P4OI & P4ORS: 4.8 x 3.6 mm, 5.9 mm diagonal (1/3 inch CCD) P4O1.3R, P4O1.3I & P4O1.3RS: 8.6 x 6.9 mm, 11 mm diagonal (2/3 inch CMOS) P4COR, P4COI & P4CORS: 4.5 x 2.9 mm, 5.4 mm diagonal (1/3 inch CMOS) |
| Levels of Gray Scale or Color | P4OR, P4OI, P4O1.3R, P4O1.3I, P4ORS & P4O1.3RS: 256 Gray Scale P4COR, P4COI & P4CORS: 256 Red, Green and Blue |
| Exposure Time | P4OR, P4OI & P4ORS: 0.1 to 2830 milliseconds P4O1.3R, P4O1.3I & P4O1.3RS: 0.1 to 1670 milliseconds P4COR, P4COI & P4CORS: 0.1 to 1000 milliseconds |
| Full Image Acquisition | P4OR, P4OI & P4ORS: 48 frames per second max.* P4O1.3R, P4O1.3I & P4O1.3RS: 26.8 frames per second max.* P4COR, P4COI & P4CORS: 17 frames per second max.* |
| Lens Mount | Standard C-mount (1 inch—32 UN) |
| Construction | P4OR, P4OI, P4O1.3R, P4O1.3I, P4COR & P4COI: Black anodized aluminum housing, glass lens P4ORS, P4O1.3RS & P4CORS: Die-cast nickel-plated aluminum housing, glass or acrylic window |
| Weight | P4OI, P4O1.3I & P4COI: 293 g P4OR, P4O1.3R & P4COR: 385 g P4ORS, P4O1.3RS & P4CORS: 430 g |
| Environmental Rating | P4OR, P4OI, P4O1.3R, P4O1.3I, P4COR & P4COI: IEC IP20; NEMA 1 P4ORS, P4O1.3RS & P4CORS: IEC IP68 |
| Operating Conditions | Stable ambient temperature: 0° to +50° C Stable ambient lighting: No large, quick changes in light level; no direct or reflected sunlight Relative humidity: P4OR, P4OI, P4O1.3R, P4O1.3I, P4COR & P4COI: 35-90% (non-condensing) |
| Certifications | |
| Hookup Diagrams | NPN: VS09 (p. 782) PNP: VS10 (p. 782) |


* A reduced Field-of-View (FOV) dramatically increases acquisition rates.

- Photoelectrics Sensors
- Fiber Optic Sensors
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- Vision**
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- iVu Sensors
- PresencePLUS**
- Accessories
- Lighting

| PresencePLUS® ProII Controller Specifications | |
|---|---|
| Supply Voltage and Current | PPROCTL: 10 to 30V dc @ less than 1.5 A (exclusive of load) PPROCTL1.3 & PPROCTL1.3C: 10 to 30V dc @ less than 1.2 A (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Memory | Storage: 64 MB Inspections (jobs): 999 max. |
| Input/Output Configuration | NPN (sinking) or PNP (sourcing) software selectable |
| Output Rating | 150 mA max. each output OFF-state leakage current: less than 100 µA ON-state saturation voltage: NPN—less than 1V @ 150 mA PNP—greater than V+ -2V |
| Input Specifications | NPN: ON—less than 3V OFF-state voltage—greater than 10V @ 4 mA max PNP: ON—greater than (+V -2)V @ 1 mA max. OFF-state voltage—less than 3V @ 6 mA max. |
| Indicators | 6 LED indicators: Trigger, Ready, Power, Pass, Fail, Error |
| Display Options | PC or NTSC video (uses 9 m max. BNC cordset) |
| Discrete I/O | 1 Trigger IN (pin 3), 1 Strobe OUT (pin 4), 1 Remote TEACH IN (pin 6), 6 Programmable I/O (pins 9-14), 1 Product Change IN (pin 15), 4 Product Select IN (pins 16-19) |
| Communications | 1 RJ-45 10/100 Ethernet connection for running PresencePLUS Pro software and/or output inspection results 1 RS-232 DB-9 port for output of inspection results |
| Construction | Steel with black zinc plating |
| Weight | Approx. 0.55 kg |
| Environmental Rating | IEC IP20; NEMA 1 |
| Operating Conditions | Stable Ambient Temperature: 0° to +50° C Relative Humidity: 90% (non-condensing) Stable Ambient Lighting: No large, quick changes in light level; no direct or reflected sunlight |
| Certifications | |

PresencePLUS® ProII Camera Specifications

| | |
|-------------------------------|---|
| Image Resolution | PPROCAMQ & PPROCAMS(S): 640 x 480 pixels PPROMCAMQ, PPROCAMCQ, PPROCAMCQ & PPROCAMCS(S): 752 x 480 pixels PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S): 1280 x 1024 pixels |
| Pixel Size | PPROCAMQ & PPROCAMS(S): 7.4 x 7.4 µm PPROMCAMQ, PPROCAMCQ, PPROCAMCQ & PPROCAMCS(S): 6.0 x 6.0 µm PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S): 6.7 x 6.7 µm |
| Imager Size | PPROCAMQ & PPROCAMS(S): 4.8 x 3.6 mm, 6 mm diagonal (1/3 inch CCD) PPROMCAMQ, PPROCAMCQ, PPROCAMCQ & PPROCAMCS(S): 4.5 x 2.9 mm, 5.4 mm diagonal (1/3 inch CMOS) PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S): 8.6 x 6.9 mm, 11 mm diagonal (2/3 inch CMOS) |
| Levels of Gray Scale or Color | PPROMCAMQ, PPROCAMQ, PPROCAM1.3Q, PPROCAM1.3Q, PPROCAMS(S) & PPROCAM1.3S(S): 256 Gray Scale PPROMCAMCQ, PPROCAMCQ & PPROCAMCS(S): 256 Red, Green and Blue |
| Exposure Time | PPROCAMQ & PPROCAMS(S): 0.10 to 2830 milliseconds PPROMCAMQ, PPROCAMCQ, PPROCAMCQ & PPROCAMCS(S): 0.10 to 1040 milliseconds PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S): 0.10 to 1670 milliseconds |
| Full Image Acquisition* | PPROMCAMQ, PPROCAMQ & PPROCAMS(S): 48 frames per second PPROMCAMCQ: 55 frames per second max. PPROCAMCQ & PPROCAMCS(S): 17 frames per second max. PPROMCAM1.3Q, PPROCAM1.3Q & PPROCAM1.3S(S): 18 frames per second max. |
| Interface | LVDS |
| Lens Mount | Standard C-mount (1 inch—32UN) |
| Construction | PPROMCAMQ, PPROCAMQ, PPROCAM1.3Q, PPROCAM1.3Q, PPROCAMCQ & PPROCAMCQ: black anodized aluminum and black painted die cast zinc PPROCAMS, PPROCAM1.3S & PPROCAMCS: nickel-plated aluminum (Lens covers and ring lights are nickel-plated aluminum with glass or polycarbonate window) PPROCAMSS, PPROCAM1.3SS & PPROCAMCSS: 316 stainless steel (Lens covers and ring lights are stainless steel with glass or polycarbonate window) |
| Max. Cordset Length | 10 m |
| Weight | PPROMCAMQ, PPROCAM1.3Q & PPROCAMCQ: approx. 96 g PPROCAMQ, PPROCAM1.3Q & PPROCAMCQ: approx. 113 g PPROCAMS, PPROCAM1.3S & PPROCAMCS: Camera only—approx. 288 g Camera with cover—approx. 348 g Camera with ring light—approx. 585 g PPROCAMSS, PPROCAM1.3SS & PPROCAMCSS: Camera only—723 g Camera with cover—904 g Camera with ring light—1480 g |
| Environmental Rating | PPROMCAMQ, PPROCAMQ, PPROCAM1.3Q, PPROCAM1.3Q, PPROCAMCQ & PPROCAMCQ: IEC IP20; NEMA 1 PPROCAMS, PPROCAM1.3S & PPROCAMCS: IEC IP68; NEMA 6P PPROCAMSS, PPROCAM1.3SS & PPROCAMCSS: IEC IP68; NEMA 6P and NEMA 4X |
| Outside Temperature | 0° to +50° C |
| Relative Humidity | PPROMCAMQ, PPROCAMQ, PPROCAM1.3Q, PPROCAM1.3Q, PPROCAMCQ & PPROCAMCQ: 90% (non-condensing) |
| Certifications |  |
| Hookup Diagrams | NPN: VS07 (p. 781) PNP: VS08 (p. 781) |

* A reduced Field-of-View (FOV) dramatically increases acquisition rates.



Dedicated-Function Sensors

PresencePLUS® P4

- Four models with Locate, Measure, Math, Test, Communications and simplified suite of vision tools
- High-performance vision inspections in self-contained in-line or right-angle housing styles that fit in the palm of your hand
- Standardized GUI supports nine languages
- Remote TEACH function for inspection changeovers without a PC
- Connects directly to real-time video display without a PC
- Communicates over Ethernet, configurable discrete I/O and RS-232 serial lines
- Provides direct connectivity to EtherNet/IP and Modbus/TCP industrial networks
- ActiveX utilities for custom operator controls
- Available with a variety of mounting brackets, lenses and lighting accessories

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision**
- Wireless
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- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
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PresencePLUS® P4 AREA

- Uses Blob and Gray Scale tools for basic inspections of defined areas
- High-speed analysis up to 10,000 parts per minute
- Standard resolution: 128 X 100
- High-resolution: 1280 X 1024



PresencePLUS® P4 GEO

- Uses GEO Count tool to detect presence, location and rotation of a target pattern (360°)
- Standard resolution: 128 X 100
- High-resolution: 1280 X 1024



PresencePLUS® P4 EDGE

- Uses Edge and Object tools to validate height, width, location and edges
- High-speed analysis faster than 10,000 parts per minute
- Standard resolution: 128 X 100
- High-resolution: 1280 X 1024



PresencePLUS® P4 BCR

- Finds and decodes 2D and 1D linear bar codes
- Industry standard bar code metrics and grading
- Standard resolution: 640 X 480
- High-resolution: 1280 X 1024

- iVu Sensors
- PresencePLUS**
- ProII
- P4**
- Accessories
- Lighting







In-line Sensor Models
(shown with lens—sold separately)



Right-Angle Sensor Models
(shown with lens—sold separately)

P4 Sensors with Dedicated-Function Tool Set, 10-30V dc

| Vision Tools | | Housing | Resolution | Model Number |
|---|--|-------------|-------------|--------------|
|  | AREA Blob & Gray Scale | Right-Angle | 128 x 100 | P4AR |
| | | In-Line | | P4AI |
| | | Right-Angle | 1280 x 1024 | P4A1.3R |
| | | In-Line | | P4A1.3I |
|  | GEO Geometric Pattern Count & Find | Right-Angle | 128 x 100 | P4GR |
| | | In-Line | | P4GI |
| | | Right-Angle | 1280 x 1024 | P4G1.3R |
| | | In-Line | | P4G1.3I |
|  | EDGE Edge & Object | Right-Angle | 128 x 100 | P4ER |
| | | In-Line | | P4EI |
| | | Right-Angle | 1280 x 1024 | P4E1.3R |
| | | In-Line | | P4E1.3I |
|  | BCR Bar Code Reader | Right-Angle | 640 x 480 | P4BCR* |
| | | In-Line | | P4BCI* |
| | | Right-Angle | 1280 x 1024 | P4BC1.3R* |
| | | In-Line | | P4BC1.3I* |


* To add the OCR/OCV premium tool to any P4 BCR model, add suffix -OC to the model number (example, P4BCR-OC).

PresencePLUS[®] P4 Dedicated-Function Specifications

| | | |
|----------------------------|--|---|
| Supply Voltage and Current | 10 to 30V dc (24V dc \pm 10% if the sensor powers a light source) BCR: less than 650 mA (exclusive of lights and I/O load) AREA, GEO & EDGE: less than 500 mA (exclusive of lights and I/O load) AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: less than 550 mA (exclusive of lights and I/O load) | |
| Memory | Storage: AREA, GEO, EDGE & BCR—8 MB AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3—32 MB | Inspection (jobs): 999 max. Inspection (jobs): 999 max. |
| Input/Output Configuration | NPN (sinking) or PNP (sourcing) software selectable | |
| Output Rating | 150 mA max. each output OFF-state leakage current: less than 100 μ A ON-state saturation voltage: NPN—less than 1V @ 150 mA max. PNP—greater than V+ -2V | |
| Bicolor Status Indicators | PASS/FAIL: Green ON steady—PASS POWER/ERROR: Green ON steady—POWER READY/TRIGGER: Green ON steady—READY | Red ON steady—FAIL Red ON steady—ERROR Yellow ON steady—TRIGGER |
| Display Options | PC or NTSC video (uses 9 m max. BNC cordset) | |
| Discrete I/O | 1 Trigger IN 1 Strobe OUT 4 Programmable I/O 1 Product Change IN 1 Remote TEACH IN | |
| Communications | RJ-45 10/100 Ethernet connection for running PresencePLUS P4 software and/or output inspection results RS-232 connection for output of inspection results | |
| Imager Resolution | BCR: 640 x 480 pixels AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: 1280 x 1024 pixels AREA, GEO & EDGE: 128 x 100 pixels | |
| Pixel Size | BCR: 7.4 x 7.4 μ m AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: 6.7 x 6.7 μ m AREA, GEO & EDGE: 20 x 20 μ m | |

More
on next
page

PresencePLUS® P4 Dedicated-Function Specifications (cont'd)

| | |
|------------------------|---|
| Imager Size | BCR: 4.8 x 3.6 mm, 6 mm diagonal (1/3 inch CCD) AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: 8.6 x 6.9 mm, 11 mm diagonal (2/3 inch CMOS) AREA, GEO & EDGE: 2.6 x 2.0 mm, 3.3 mm diagonal (1/5 inch CMOS) |
| Levels of Gray | 256 Gray Scale |
| Exposure Time | BCR: 0.1 to 2830 milliseconds AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: 0.1 to 1670 milliseconds AREA, GEO & EDGE: 0.1 to 20.47 milliseconds |
| Full Image Acquisition | BCR: 48 frames per second max.* AREA, GEO & EDGE: 500 frames per second max. AREA 1.3, GEO 1.3, EDGE 1.3 & BCR 1.3: 27 frames per second max.* |
| Lens Mount | Standard C-mount (1 inch—32 UN) |
| Construction | Black anodized aluminum housing, glass lens |
| Weight | In-line: 293 g Right-angle: 385 g |
| Environmental Rating | IEC IP20; NEMA 1 |
| Operating Temperature | Stable ambient temperature: 0° to +50° C Stable ambient lighting: No large, quick changes in light level; no direct or reflected sunlight Relative humidity: 90% (non-condensing) |
| Certifications |  |
| Hookup Diagrams | NPN: VS09 (p. 782) NPN: VS10 (p. 782) |


* A reduced Field-of-View (FOV) dramatically increases acquisition rates.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision**
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control


- iVu Sensors
- PresencePLUS**
- Accessories
- Lighting

PresencePLUS ProII & P4 Cordsets


| ProII Camera-to-Controller | | |
|----------------------------|----------|-------------|
| See page 710 | | |
| 12-Pin Euro QD to DB15 | | |
| Length | Straight | Right-Angle |
| 1.83 m | PPC06SHF | PPC06SRAHF |
| 3.96 m | PPC13SHF | PPC13SRAHF |
| 7.01 m | PPC23SHF | PPC23SRAHF |
| 9.75 m | PPC32SHF | PPC32SRAHF |



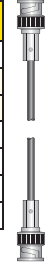
| P4 Power | |
|--------------|----------|
| See page 711 | |
| 12-Pin QD | |
| Length | Straight |
| 1.83 m | P4C06 |
| 7.01 m | P4C23 |
| 9.75 m | P4C32 |
| 15.2 m | P4C50 |
| 22.9 m | P4C75 |
| 34.0 m | P4C110 |




| Sealed P4 Power | |
|-----------------|-------------|
| See page 711 | |
| 12-Pin Euro QD | |
| Length | Straight |
| 1.83 m | MQDC2S-1206 |
| 5.57 m | MQDC2S-1215 |
| 9.14 m | MQDC2S-1230 |
| 15.2 m | MQDC2S-1250 |
| 22.9 m | MQDC2S-1275 |




| ProII & P4 Video | |
|------------------|----------|
| See page 716 | |
| BNC to BNC | |
| Length | Straight |
| 1.83 m | BNC06 |
| 5.57 m | BNC06 |
| 9.14 m | BNC30 |
| 14.6 m | BNC48 |




| ProII & P4 Ethernet Communication | | |
|-----------------------------------|----------|--------------------|
| See page 719 | | |
| RJ45 to RJ45 | | |
| Length | Shielded | Shielded Crossover |
| 2.13 m | STP07 | STPX07 |
| 7.62 m | STP25 | STPX25 |
| 15.2 m | STP50 | STPX50 |
| 22.9 m | STP75 | STPX75 |



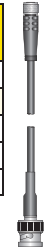
| Sealed P4 Ethernet Communication | |
|----------------------------------|-----------------------|
| See page 719 | |
| Length | RJ45 to 8-Pin Euro QD |
| 1.83 m | STP-MAQDC-806 |
| 4.57 m | STP-MAQDC-815 |
| 9.14 m | STP-MAQDC-830 |




| ProII Serial Communication | |
|----------------------------|------------|
| See page 718 | |
| Length | DB9 to DB9 |
| 1.83 m | DB9P06 |
| 4.57 m | DB9P15 |
| 9.14 m | DB9P30 |













| Sealed P4 Video | |
|-----------------|----------------|
| See page 717 | |
| Length | Pico QD to BNC |
| 2.00 m | PKG4M-2/CS |
| 5.00 m | PKG4M-5/CS |
| 9.00 m | PKG4M-9/CS |




 Additional cordset information available. See page 693.


Brackets

| ProII Controller | | ProII Cameras | | |
|---|---|---|---|---|
|  |  |  |  |  |
| pg. 675 | pg. 675 | pg. 676 | pg. 677 | pg. 678 |
| SMBPPDH | SMBPPDE | SMBPPLU | SMBPPRA | SMBPPU |

| ProII Mini Camera | Sealed ProII Camera | P4 | | Sealed P4 |
|---|---|---|---|---|
|  |  |  |  |  |
| pg. 677 | pg. 677 | pg. 674 | pg. 674 | pg. 675 |
| SMBPPROMRA | SMBPPSU | SMBP4RAB | SMBP4RAS | SMBP4SRAF |


 Additional brackets and information available. See page 632.

Lens Covers

| Sealed ProII & P4 Lens Covers | | | | |
|--|------------------------|------------------------|--------------------------|------------------------|
|  | Length | | Works with | Model |
| | 50 mm | Nickel-plated aluminum | P4 | P4SLC50-G P4SLC50-P |
| Pro | | | PPSLC50-G PPSLC50-P | |
| 75 mm | Nickel-plated aluminum | Pro & P4 | PPSLC75-G PPSLC75-P | |
| | | Pro | PPSSLC50-G PPSSLC50-P | |
| 50 mm | Stainless Steel | Pro | PPSSLC50-G PPSSLC50-P | |



Sensor Interface Modules and Power Supplies

See page 753



- Sensor interface modules for simplified wiring of P4 sensors in an electrical box
- Lighting interface for strobe operation of Banner lighting with any vision sensor
- Strobe control module for control of specialty strobe lights


Monitors

| | | Model* |
|--|---------------------------------------|--------|
|  | 9" Black and White NTSC Video Monitor | PPM9 |
|  | 8" Flat Panel NTSC Video Monitor | PPM8 |

* Monitors require a BNC cordset for connection to a PresencePLUS Sensor (see page 716).

Adjustable Mounting System


See page 738



- 3" and 6" column, base and knuckle kits for positioning of sensor and lights
- Bogen arm with clamp for added flexibility in mounting
- 2" pivoting knuckle assembly for positioning spot light


Enclosures

See page 742



- Offers models for sensors and lights
- Provides protection in rugged or harsh environments
- Prevents tampering

Accessories for C-Mount Lenses


|  | Description | Format Size | Model | Used With |
|---|---|-------------|-------|-------------------------|
| | Extension Kit (0.5, 1.0, 5.0, 10, 20 and 40 mm) | — | LEK | All Lenses |
| | Extension Kit (0.25 and 0.5 mm) | | LEKS | |
| | Lens Extender (increases focal length 2X) | | LCF2X | |
| | UV Lens Filter, Clear Glass | 2/3" | FLTUV | Tamron Megapixel Lenses |

C-Mount Filters


| Description | Models |
|--|--------|
| Infrared (≥ 760 nm) High-pass filter blocks visible light and passes infrared light. Included with all Banner Infrared light sources. | FLTI |
| Blue (400-525 nm) Band-pass filter improves quality by helping to reduce ambient light; it passes blue and infrared light. | FLTB |

| Description | Models |
|---|----------|
| Green (400-575 nm) Band-pass filter improves quality by helping to reduce ambient light; it passes green and infrared light. | FLTG |
| Red (≥ 600 nm) High-pass filter improves quality by helping to reduce ambient light; it passes red and infrared light. | FLTR |
| Polarizing filter kit for 80 x 80 Ring Lights | LEDRRPFK |


C-Mount Standard Lenses

|  | Description | Format Size | Model | Used With |
|--|--|-------------|-----------|-----------------------------------|
| | 4 mm | 1/3" | LCF04 | All (except 1.3 megapixel models) |
| | 8 mm | | LCF08 | |
| | 12 mm with Focus Locking | | LCF12 | |
| | 16 mm with Focus Locking | | LCF16 | |
| | 25 mm with Focus Locking (Rainbow) | 1" | LCF25R | |
| | 25 mm with Focus and Aperture Locking, Metal Housing (Rainbow) | | LCF25LR | |
| | 50 mm with Focus and Aperture Locking (Rainbow) | 2/3" | LCF50L1R* | |
| | 50 mm with Focus Locking, Metal Housing (Rainbow) | 1" | LCF50L2R* | |
| | 75 mm with Focus and Aperture Locking, Metal Housing (Rainbow) | | LCF75LR* | |

C-Mount Specialty Lenses

|  | Description | Format Size | Model | Used With |
|---|---|-------------|------------|-----------------------------------|
| | 3.5 mm with Focus and Aperture Locking (Kowa) | 1/2" | LCF03LT | All (except 1.3 megapixel models) |
| | 6 mm with Focus and Aperture Locking (Kowa) | | LCF06LK | |
| | 10 – 40 mm with Zoom, and Focus and Aperture Locking (Tamron) | | LCF1040LT* | |
| | 50 mm Telecentric (Navitar) | 2/3" | LCF50TELN | |

C-Mount Megapixel Lenses with Focus and Aperture Locking

|  | Description | Format Size | Model | Used With |
|--|------------------------|-------------|------------|-----------|
| | 8 mm (Tamron) | 2/3" | LCF08LTMP | All |
| | 16 mm (Tamron) | | LCF16LTMP | |
| | 25 mm (Tamron) | | LCF25LTMP | |
| | 50 mm (Tamron) | | LCF50LTMP† | |
| | 16 mm (Pentax) | 2/3" | LCF16LMP | |
| | 25 mm (Pentax) | | LCF25LMP | |
| | 35 mm (Pentax) | | LCF35LMP | |
| | 50 mm (Pentax) | | LCF50LMP | |
| | 5 mm (Computar) | 1/2" | LCF05LCMP | |
| | 8 mm (Computar) | 2/3" | LCF08LMP | |
| | 12 mm (Computar) | | LCF12LMP | |
| | 16 mm (Computar) | | LCF16LCMP | |
| | 25 mm (Computar) | | LCF25LCMP | |
| | 35 mm (Computar) | | LCF35LCMP† | |
| | 50 mm (Computar) | | LCF50LCMP† | |
| | 75 mm (Computar) | | LCF75LCMP† | |
| | 8.5 mm (Edmund Optics) | 2/3" | LCF08LEMP | |
| | 12 mm (Edmund Optics) | | LCF12LEMP | |
| | 16 mm (Edmund Optics) | | LCF16LEMP | |
| | 25 mm (Edmund Optics) | | LCF25LEMP | |
| | 35 mm (Edmund Optics) | | LCF35LEMP† | |

* Lens models will not fit in opening of Banner Ring Lights.

† Lenses require a 75 mm cover when used with a Sealed Pro or P4 Camera (see page 388)

Photoelectrics Sensors
 Fiber Optic Sensors
 Special Purpose Sensors
 Measurement & Inspection Sensors
Vision
 Wireless
 Lighting & Indicators
 Safety Light Screens
 Safety Laser Scanners
 Safety Controllers & Modules
 Safety Two-Hand Control Modules
 Safety Interlock Switches
 Emergency Stop & Stop Control

iVu Sensors
 PresencePLUS
Accessories
 Lighting

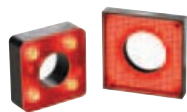
Vision Lighting

Critical Role in Successful Vision Sensing

No matter how powerful or robust a sensor is, successfully solving challenging vision applications relies heavily on matching the vision application with appropriate lighting. A properly chosen light can guarantee constant, consistent light conditions and can be used to create an optimally contrasted image. The correct light will highlight the features under inspection, disregard background objects and overpower any ambient light in the mix.

Banner offers a wide selection of high-intensity LED lights with built-in current and strobe control. A variety of specialty lights are available, including fluorescent lights. A complete selection of polarizing filter kits, colored filters and lighting diffusers are offered to improve lighting quality.

The innovation leader with more than 40 years of sensor development, Banner understands the challenges of the factory floor. Banner has over 3,000 factory and field representatives worldwide, as well as the largest force of application engineers in the industry who solve thousands of the most challenging applications every year. Banner offers one of the industry's most extensive selections of vision lighting solutions and continues its commitment of providing solutions for a variety of sensing needs.



Ring Lights page 430
Mounts directly to the sensor for easy setup and illuminates any object directly in front of the sensor



Area Lights page 432
Provides even illumination in a concentrated area



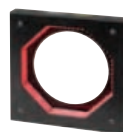
Backlights page 434
Installs behind the target, directly facing the sensor; has a highly diffused surface and uniform brightness



Linear Array Lights page 435
Provides high-intensity illumination of large areas, at long distances



On-Axis Lights page 436
Provides collimated illumination along the same optical path as camera



Low-Angle Ring Lights page 436
Illuminates nearly perpendicular to the direction of an inspection



Spot Lights page 437
Provides even illumination in a small concentrated spot



Tubular Fluorescent Lights page 438
Features flicker-free high-intensity illumination of large areas



Structured Lights page 438
Uses Class 2 laser line for 3-dimensional sensing

WIRELESS SENSOR NETWORKS



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless**
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllocks & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



Performance page 393

- Networks formed using a Gateway and one or more Nodes operating in the same frequency band
- Selectable transmit power levels up to 1 Watt to extend the network's range
- Optional "E" housing model includes a battery integrated into the housing
- Universal analog inputs allow the customer to select between mA or V dc



DX80 page 396

- Networks formed using a Gateway and one or more Nodes operating in the same frequency band
- Nodes and *FlexPower* Nodes may be combined in each network
- Input and output options include discrete, analog and discrete, temperature, and M-GAGE magnetometer
- Gateways directly connect to Modbus RTU, EtherNet/IP, Modbus TCP/IP, and other industrial protocols



DX99 page 404

- Certified for operation in Class I, Division 1 and ATEX Zone 0 locations
- Radio communication and external sensing device powered by a battery integrated into the housing
- Available accessories include installation brackets and antenna feed throughs
- Networks formed using DX80 Gateways installed beyond the hazardous area and one or more Nodes operating in the same frequency band
- DX99 Nodes are certified for operation in Class I, Division 1 and ATEX Zone 0 locations



MultiHop page 406

- Selectable transmit power levels up to 1 Watt; license-free operation up to 4 Watt EIRP, with a high-gain antenna, in the U.S. and Canada for 900 MHz
- *FlexPower* power input options allow for 10 to 30V dc, solar, or battery power sources
- Networks formed using one master MultiHop radio and up to 50 MultiHop repeater or slave radios operating in the same frequency band

- WIRELESS**
- Performance
- DX80
- DX99
- MultiHop
- Ethernet Radio
- DX70



Ethernet Radio page 408

- Long-range point-to-multipoint wireless ethernet network with up to 16 subscriber units
- RF transmission rate is 1.5 MBPS
- Built-in spectrum analyser



DX70 page 409

- Gateway and Node pair on the same radio frequency band
- Plug-and-play installation with direct I/O mapping between the Gateway and Node
- Discrete and analog I/O in the same unit
- Built-in LED indicates radio signal strength



Accessories page 411

- A wide selection of power supplies for Gateways, Nodes and sensors
- Modbus RTU remote I/O for expanding Gateway I/O capacity
- A complete selection of cordsets for easy wiring
- Antennas, cables and accessories for virtually every location challenge

Wireless Solutions

Specify Your Wireless Solution in 3 Simple Steps

1. Radio and Antenna Options
2. Wireless Network Architectures
3. SureCross Wireless family features

1. Radio and Antenna Options

Banner recommends conducting a site survey to verify range in your location.



900 MHz — recommended for use in North America



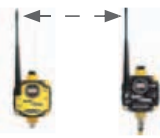
2.4 GHz — Global wireless standard



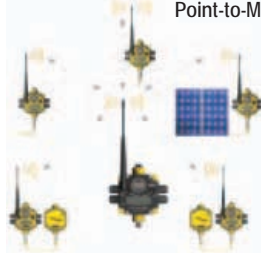
Antenna Options
Internal
External
High-gain remote

2. Wireless Network Architectures

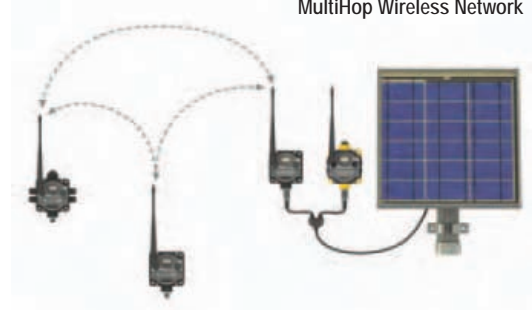
DX70 Point-to-Point



DX80 and DX99 Point-to-Multipoint



MultiHop Wireless Network



3. SureCross™ Wireless Family Features

| Performance IP67 | | DX80 IP67 | | DX99 IP67 CID1 | MultiHop IP67 | Ethernet Radio IP67 | DX70 IP67 |
|--|--|--|--|---|---|--|-------------------------|
| | | | | | | | |
| Gateways <i>FlexPower</i> : 10 to 30V dc Solar | Nodes <i>FlexPower</i> : 10 to 30V dc Battery Solar | Gateways <i>FlexPower</i> : 10 to 30V dc Solar | Nodes <i>FlexPower</i> : 10 to 30V dc Battery Solar | Intrinsically Safe Nodes <i>FlexPower</i> : Battery | <i>FlexPower</i> : 10 to 30V dc Battery Solar | <i>FlexPower</i> : 10 to 30V dc | Power: 10 to 30V dc |
| I/O: Discrete Analog Networks: Modbus RTU Master & Slave EtherNet/IP Modbus TCP/IP | I/O: Discrete Analog Temp: Thermocouple RTD Thermistor | I/O: Discrete Analog Networks: Modbus RTU Master & Slave EtherNet/IP Modbus TCP/IP | I/O: Discrete Analog Counter Temp: Thermocouple RTD Temp & relative humidity | I/O: Discrete Analog Temp: Thermocouple RTD | I/O: Discrete Analog Counter H-Bridge SDI-12 Temp: Thermocouple RTD Data: RS-232 RS-485 | Data: Ethernet (900 MHz only) | I/O: Discrete Analog |



Performance Wireless I/O Network

- Networks formed using a Gateway and one or more Nodes operating in the same frequency band
- Selectable transmit power levels up to 1 Watt to extend the network's range
- Optional "E" housing model includes a battery integrated into the housing
- Universal analog inputs allow the customer to select between mA or V dc
- Nodes and *FlexPower* Nodes may be combined in each network
- Gateways directly connect to Modbus RTU, EtherNet/IP, Modbus TCP/IP, and other industrial protocols

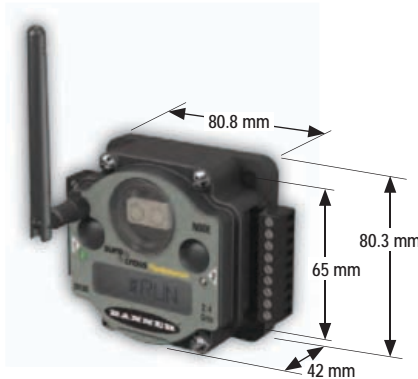
- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless**
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 411

ONLINE
AUTOCAD, STEP, IGES & PDF



IP67 Housing



IP20 "C" Housing
(External terminal strips are removable)



IP54 "E" Housing with Integrated Battery


WIRELESS

- Performance
- DX80**
- DX99
- MultiHop
- Ethernet Radio
- DX70

DX80 EtherNet/IP and Modbus TCP Gateways

| | Freq | I/O | Models | |
|--|----------|---|---|-------|
| | 900 MHz | DX80 GatewayPro Modbus/TCP to EtherNet/IP protocol converter | DX80P9T6S-P | |
| | 2.4 GHz | | DX80P2T6S-P | |
| | 900 MHz | DX80 GatewayPro (Modbus/TCP) with advanced web-based configuration capabilities | DX80P9A6S-P | |
| | 2.4 GHz | | DX80P2A6S-P | |
| | No Radio | | Protocol Conversion: Modbus RTU to Modbus TCP/IP or EtherNet/IP | DX83T |
| | | | Advanced user configuration model | DX83A |


SureCross Performance Gateways

| | Freq | Power | Discrete | | Analog | | Model Number |
|---|---------|-----------|----------|---------|---------------|-------------|---------------|
| | | | Inputs | Outputs | Inputs | Outputs | |
|  <p>IP67 Housing</p> <p>IP20 "C" Housing</p> | 900 MHz | FlexPower | — | — | — | — | DX80G9M2S-P |
| | 2.4 GHz | | | | | | DX80G2M2S-P |
| | 900 MHz | 10-30V dc | 4 ** | 4 PNP | 2 Universal * | Two 0–20 mA | DX80G9M6S-P2 |
| | 2.4 GHz | | | | | | DX80G9M6S-P2C |
| | 2.4 GHz | | | | | | DX80G2M6S-P2C |
| | 900 MHz | FlexPower | 6 NPN† | 6 NMOS† | — | — | DX80G9M2S-P7 |
| | 2.4 GHz | | | | | | DX80G9M2S-P7C |
| | 2.4 GHz | | | | | | DX80G2M2S-P7C |
| | 900 MHz | 10-30V dc | 6 PNP† | 6 PNP† | — | — | DX80G9M2S-P8 |
| | 2.4 GHz | | | | | | DX80G9M2S-P8C |
| | 2.4 GHz | | | | | | DX80G2M2S-P8C |

* Universal analog inputs can be configured in the field to be either 0–20 mA or 0–10V.
 ** Discrete inputs can be selected to be either PNP and NPN
 † 6 IN/6 OUT is factory default. I/O can be configured up to 12 points.
 "C" Models have IP20 housings and are meant to be installed into a suitable enclosure.

ACCESSORIES
page 411




SureCross Performance Nodes

| | Freq | Power | Discrete | | Analog | | Other | Model Number | | | |
|---|---------|------------------|--|-----------------------|-----------------------------|------------|--|---------------------|---|---------------|---------------|
| | | | Inputs | Outputs | Inputs | Outputs | | | | | |
|  <p>IP67 Housing</p> <p>IP20 "C" Housing</p> <p>IP54 "E" Housing with Integrated Battery</p> | 900 MHz | FlexPower | Discrete Mode: 2 ** Analog Mode: 2 ** | Discrete Mode: 2 NMOS | Discrete Mode: 2 Thermistor | — | Discrete Mode: 2 Switch Power Outputs Analog Mode: 1 Switch Power Outputs | DX80N9X2S-P1 | | | |
| | | Internal battery | | | | | | DX80N9X2S-P1C | | | |
| | 2.4 GHz | FlexPower | | | | | | Analog Mode: 2 NMOS | Analog Mode: 2 Universal*, 2 Thermistor | — | DX80N9X1S-P1E |
| | | Internal battery | | | | | | | | | DX80N2X2S-P1 |
| | 900 MHz | 10-30V dc | 4 ** | 4 PNP | 2 Universal * | Two 0–20mA | — | DX80N9X6S-P2 | | | |
| | | | | | | | | 2.4 GHz | DX80N9X6S-P2C | | |
| | | | | | | | | 2.4 GHz | DX80N2X6S-P2 | | |
| | 900 MHz | FlexPower | 2 ** | 1 NMOS | 4 Thermocouple | — | — | DX80N9X2S-P3 | | | |
| | | | | | | | | 2.4 GHz | DX80N9X2S-P3C | | |
| | | | | | | | | | 2.4 GHz | DX80N9X1S-P3E | |
| | | | | | | | | 2.4 GHz | DX80N2X2S-P3 | | |
| | | | | | | | | | 2.4 GHz | DX80N2X2S-P3C | |
| 2.4 GHz | | | | | | | | DX80N2X2S-P3E | | | |

* Universal analog inputs can be configured in the field to be either 0–20 mA or 0–10V.
 ** Discrete inputs can be selected to be either PNP and NPN
 "C" models have IP20 housings and are meant to be installed into a suitable enclosure. "E" models have IP54 housings and are meant for outdoor installations.

More on next page

SureCross Performance Nodes (cont'd)

| | Freq | Power | Discrete | | Analog | | Other | Model Number | | | | | | | |
|--|---|-----------|--------------------|--------------------|--------|---------|-------|---------------|-----------|--------------------|---------------------|---|---|---|---------------|
| | | | Inputs | Outputs | Inputs | Outputs | | | | | | | | | |
|  IP67 Housing | 900 MHz | FlexPower | — | — | 4 RTD | — | — | DX80N9X2S-P4 | | | | | | | |
| | 2.4 GHz | | | | | | | DX80N9X2S-P4C | | | | | | | |
| | | | | | | | | DX80N9X1S-P4E | | | | | | | |
| |  IP20 "C" Housing | | | | | | | 900 MHz | FlexPower | 6 NPN [†] | 6 NMOS [†] | — | — | — | DX80N9X2S-P7 |
| | | | | | | | | 2.4 GHz | | | | | | | DX80N9X2S-P7C |
| | | | | | | | | | | | | | | | DX80N2X2S-P7 |
|  IP54 "E" Housing with Integrated Battery | 900 MHz | 10-30V dc | 6 PNP [†] | 6 PNP [†] | — | — | — | DX80N9X2S-P8 | | | | | | | |
| | 2.4 GHz | | | | | | | DX80N9X2S-P8C | | | | | | | |
| | | | | | | | | DX80N2X2S-P8 | | | | | | | |
| | | | | | | | | DX80N2X2S-P8C | | | | | | | |

* Universal analog inputs can be configured in the field to be either 0–20 mA or 0–10V.
 ** Discrete inputs can be selected to be either PNP and NPN
 † 6 IN/6 OUT is factory default. I/O can be configured up to 12 points.
 "C" models have IP20 housings and are meant to be installed into a suitable enclosure. "E" models ...

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless**
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- WIRELESS**
- Performance
- DX80**
- DX99
- MultiHop
- Ethernet Radio
- DX70

| SureCross™ Performance Specifications | |
|---------------------------------------|---|
| Range | 900 MHz: Up to 9.6 kilometers (6 miles) 2.4 GHz: Up to 3.2 kilometers (2 miles) |
| Transmit Power | 900 MHz: 1 Watt (30 dBm conducted) 2.4 GHz: 65 mW (18 dBm Conducted) |
| Network Size | 1 Gateway and up to 47 remotely located Nodes |
| I/O | Discrete, Analog, Temperature, Humidity |
| Gateway Communications | Modbus RTU; Modbus TCP, Ethernet/IP available using GatewayPro or DX83 Ethernet Bridge |
| Power | + 10 to 30V dc (For European applications: + 10 to 24V dc ± 10%) FlexPower: + 10 to 30V dc or 3.6 to 5.5V low power option (For European applications: + 10 to 24V dc, ± 10% or 3.6 to 5.5V dc low power option) Integrated Battery models: 3.6V dc low power option for an internal battery |
| Power Consumption | 900 MHz: Maximum current draw is <100 mA and typical current draw is <50 mA at 24V dc. (2.4 GHz consumption is less.) |
| Environmental rating | DX80 Rating: IEC IP67; NEMA 6; DX80...C Rating: IEC IP20; NEMA 1; DX80...E Rating: IEC IP54; NEMA 4 |

See Bannerengineering.com for more detailed specifications.

SureCross™ DX80

Wireless I/O Network

- An industrial wireless I/O network that can operate in extreme environments while eliminating the need for costly wiring runs
- A basic network consists of a Gateway system controller and one or more Nodes that monitor and/or control I/O in remote locations
- Nodes are easily deployed throughout a facility for gathering data to be concentrated at the Gateway
- Bi-directional communication between the Gateway and Node(s), including fully acknowledged data transmission
- Frequency Hopping Spread Spectrum (FHSS) technology and Time Division Multiple Access (TDMA) control architecture combine to ensure reliable data delivery within the unlicensed Industrial, Scientific and Medical (ISM) bands
- FlexPower™ options allow for +10-30V dc, solar and battery power sources
- 900 MHz and 2.4 GHz models accommodate worldwide communication standards
- Rugged IP67/NEMA 6 design enabling simple plug-and-play installation
- Installation is fast and easy with flexible mounting and power options



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Gateways

- Gateways are the master of Banner's SureCross Wireless Network
- Modbus RTU over RS-485 communication capability is integrated into every Gateway
- Gateway models are available with discrete, analog and a mix of both I/O types
- IP20 housing option is certified for Class I Div 2 areas

Nodes

- Nodes collect the data and wirelessly transmit it to the Gateway
- Nodes may be powered by either 10 to 30V dc, battery or solar power options
- Models are available in a variety of input/output options
- IP20 housing option is certified for Class I Div 2 areas

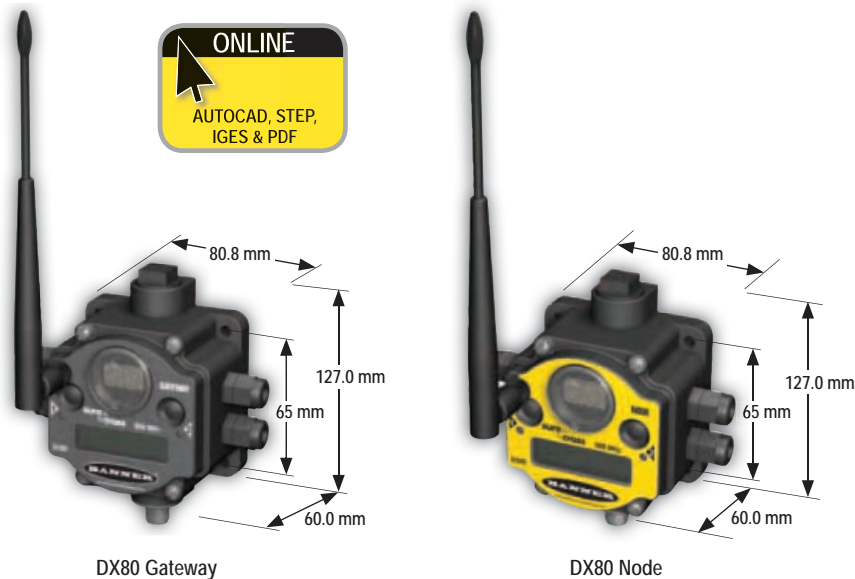
User Configuration Tool

RS-485 to USB Adapter Cable

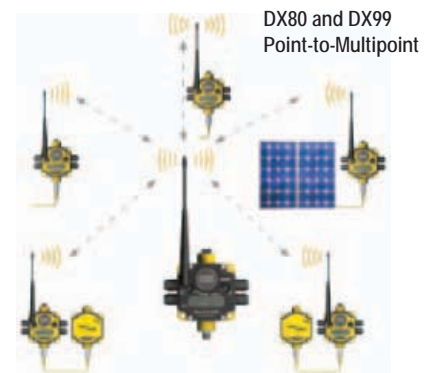
BWA-UCT-900 RS-485 to USB adapter cable is used to connect the DX80 Gateway to a computer. Download your free configuration software at bannerengineering.com/wireless





Gateways and Node



DX85 Modbus RTU Remote I/O
Used to expand I/O capacity when connected to a Data Radio or Gateway (see page 402)



Modbus RTU Gateways, 10–30V dc

| | Freq | Base | Discrete | | Analog | | Models |
|---|---------|------|----------|--------------|--------------|-------------------|-------------------|
| | | | Inputs | Outputs | Inputs | Outputs | |
|  <p>DX80 IP67</p>  <p>DX80..C IP20 External Terminal Strips</p> | 900 MHz | IP67 | 6 ** | 6 PNP | — | — | DX80G9M6S6P6 |
| | | IP20 | | | | | DX80G9M6S6P6C |
| | 2.4 GHz | IP67 | | | | | DX80G2M6S6P6 |
| | | IP20 | | | | | DX80G2M6S6P6C |
| | 900 MHz | IP67 | 6 ** | 6 NPN | — | — | DX80G9M6S6N6 |
| | | IP20 | | | | | DX80G9M6S6N6C |
| | 2.4 GHz | IP67 | | | | | DX80G2M6S6N6 |
| | | IP20 | | | | | DX80G2M6S6N6C |
| | 900 MHz | IP67 | 4 ** | 4 PNP | Two 0–20 mA | Two 0–20 mA | DX80G9M6S4P4M2M2 |
| | | IP20 | | | | | DX80G9M6S4P4M2M2C |
| | 2.4 GHz | IP67 | | | | | DX80G2M6S4P4M2M2 |
| | | IP20 | | | | | DX80G2M6S4P4M2M2C |
| | 900 MHz | IP67 | 4 ** | 4 PNP | Two 0–10V | Two 0–10V | DX80G9M6S4P4V2V2 |
| | | IP20 | | | | | DX80G9M6S4P4V2V2C |
| | 2.4 GHz | IP67 | | | | | DX80G2M6S4P4V2V2 |
| | | IP20 | | | | | DX80G2M6S4P4V2V2C |
| | 900 MHz | IP67 | 8 ** | 4 PNP | — | — | DX80G9M6S8P4 |
| | | IP20 | | | | | DX80G9M6S8P4C |
| | 2.4 GHz | IP67 | | | | | DX80G2M6S8P4 |
| | | IP20 | | | | | DX80G2M6S8P4C |
| 900 MHz | IP67 | 4 ** | 8 PNP | — | — | DX80G9M6S4P8 | |
| | IP20 | | | | | DX80G9M6S4P8C | |
| 2.4 GHz | IP67 | | | | | DX80G2M6S4P8 | |
| | IP20 | | | | | DX80G2M6S4P8C | |
| 900 MHz | IP67 | — | — | Four 0-20 mA | Four 0-20 mA | DX80G9M6S0P0M4M4 | |
| | IP20 | | | | | DX80G9M6S0P0M4M4C | |
| 2.4 GHz | IP67 | | | | | DX80G2M6S0P0M4M4 | |
| | IP20 | | | | | DX80G2M6S0P0M4M4C | |
| 900 MHz | IP67 | — | — | Four 0-10V | Four 0-10V | DX80G9M6S0P0V4V4 | |
| | IP20 | | | | | DX80G9M6S0P0V4V4C | |
| 2.4 GHz | IP67 | | | | | DX80G2M6S0P0V4V4 | |
| | IP20 | | | | | DX80G2M6S0P0V4V4C | |


** Discrete inputs can be selected to be either PNP and NPN
 C Models have IP20 housings and are meant to be installed into a suitable enclosure

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless**
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

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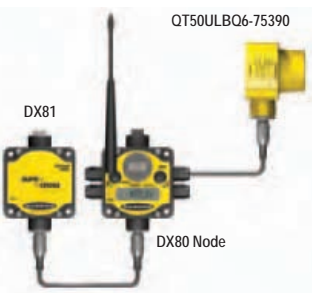
- WIRELESS**
- Performance
- DX80**
- DX99
- MultiHop
- Ethernet Radio
- DX70

Nodes, 10-30V dc—Analog and Discrete

| | Freq | Base | Discrete | | Analog | | Models |
|---|---------|------|----------|---------|-------------|-------------|-------------------|
| | | | Inputs | Outputs | Inputs | Outputs | |
|  <p>DX80 Node IP67</p> <p>DX80.C IP20 External Terminal Strips</p> | 900 MHz | IP67 | 4 | 4 PNP | Two 0–20 mA | Two 0–20 mA | DX80N9X6S4P4M2M2 |
| | | IP20 | | | | | DX80N9X6S4P4M2M2C |
| | 2.4 GHz | IP67 | | | | | DX80N2X6S4P4M2M2 |
| | | IP20 | | | | | DX80N2X6S4P4M2M2C |
| | 900 MHz | IP67 | 4 | 4 PNP | Two 0–10V | Two 0–10V | DX80N9X6S4P4V2V2 |
| | | IP20 | | | | | DX80N9X6S4P4V2V2C |
| | 2.4 GHz | IP67 | | | | | DX80N2X6S4P4V2V2 |
| | | IP20 | | | | | DX80N2X6S4P4V2V2C |


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Nodes, FlexPower—Analog and Discrete

| | Freq | Base | Discrete | | Analog | Other | Models | | | | |
|---|---------|------|----------|---------|-------------|--------------------------------|-----------------|-----------------|--------------|--------------|-----------------|
| | | | Inputs | Outputs | Inputs | | | | | | |
|  <p>DX81</p> <p>DX80 Node</p> <p>QT50ULBQ6-75390</p> | 900 MHz | IP67 | 2 | 2 NMOS | Two 0–20 mA | 10 or 15V Switch Power Outputs | DX80N9X2S2N2M2 | | | | |
| | | IP20 | | | | | DX80N9X2S2N2M2C | | | | |
| | 2.4 GHz | IP67 | | | | | DX80N2X2S2N2M2 | | | | |
| | | IP20 | | | | | DX80N2X2S2N2M2C | | | | |
| | 900 MHz | IP67 | 2 | 2 NMOS | Two 0–10V | | Two 0–10V | DX80N9X2S2N2V2 | | | |
| | | IP20 | | | | | | DX80N9X2S2N2V2C | | | |
| | 2.4 GHz | IP67 | | | | | | DX80N2X2S2N2V2 | | | |
| | | IP20 | | | | | | DX80N2X2S2N2V2C | | | |
| | 900 MHz | IP67 | | | | 2 | | 2 NMOS | Four 0–20 mA | Four 0–20 mA | DX80N9X2S2N2M4 |
| | | IP20 | | | | | | | | | DX80N9X2S2N2M4C |
| | 2.4 GHz | IP67 | | | | | | | | | DX80N2X2S2N2M4 |
| | | IP20 | | | | | | | | | DX80N2X2S2N2M4C |
| | 900 MHz | IP67 | 2 | 2 NMOS | Four 0–10V | | Four 0–10V | | | | DX80N9X2S2N2V4 |
| | | IP20 | | | | | | | | | DX80N9X2S2N2V4C |
| | 2.4 GHz | IP67 | | | | | | | | | DX80N2X2S2N2V4 |
| | | IP20 | | | | | | | | | DX80N2X2S2N2V4C |

C Models have IP20 housings and are meant to be installed into a suitable enclosure

FlexPower™ Node with Integrated Battery and Switched Power Outputs



| | Freq | Base | Discrete | | Analog | Other | Models |
|---|---------|------|----------|---------|---------|--------------------------------------|----------------|
| | | | Inputs | Outputs | Inputs | | |
|  | 900 MHz | IP67 | 2 | 1 NMOS | 0–20 mA | 10 or 15V Switch Power Outputs | DX80N9X1S2N1M1 |
| | 2.4 GHz | | | | | | DX80N2X1S2N1M1 |
| | 900 MHz | | 2 | 1 NMOS | 0–10V | | DX80N9X1S2N1V1 |
| | 2.4 GHz | | | | | | DX80N2X1S2N1V1 |

Models with batteries integrated into the housing are so noted. All other FlexPower Nodes can be powered using 10–30V dc, battery or solar power options. Power supplies are sold separately (see page 411).

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless**
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



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Nodes, 10-30V dc—Discrete



| | Freq | Base | Discrete | | Models |
|---|---------|------|----------|---------|---------------|
| | | | Inputs | Outputs | |
|  | 900 MHz | IP67 | 6 | 6 PNP | DX80N9X6S6P6 |
| | | IP20 | | | DX80N9X6S6P6C |
| | 2.4 GHz | IP67 | | | DX80N2X6S6P6 |
| | | IP20 | | | DX80N2X6S6P6C |
| | 900 MHz | IP67 | 6 | 6 NPN | DX80N9X6S6N6 |
| | | IP20 | | | DX80N9X6S6N6C |
| | 2.4 GHz | IP67 | | | DX80N2X6S6N6 |
| | | IP20 | | | DX80N2X6S6N6C |
|  | 900 MHz | IP67 | 8 | 4 PNP | DX80N9X6S8P4 |
| | | IP20 | | | DX80N9X6S8P4C |
| | 2.4 GHz | IP67 | | | DX80N2X6S8P4 |
| | | IP20 | | | DX80N2X6S8P4C |
| | 900 MHz | IP67 | 4 | 8 PNP | DX80N9X6S4P8 |
| | | IP20 | | | DX80N9X6S4P8C |
| | 2.4 GHz | IP67 | | | DX80N2X6S4P8 |
| | | IP20 | | | DX80N2X6S4P8C |

- WIRELESS
- Performance
- DX80**
- DX99
- MultiHop
- Ethernet Radio
- DX70

Nodes, 10-30V dc—Analog

| | Freq | Base | Analog | | Models |
|--|---------|------|--------------|--------------|-------------------|
| | | | Inputs | Outputs | |
|  <p>DX80 Node IP67</p> | 900 MHz | IP67 | Four 0–20 mA | Four 0–20 mA | DX80N9X6S0P0M4M4 |
| | | IP20 | | | DX80N9X6S0P0M4M4C |
| | 2.4 GHz | IP67 | | | DX80N2X6S0P0M4M4 |
| | | IP20 | | | DX80N2X6S0P0M4M4C |
|  <p>DX80..C IP20 External Terminal Strips</p> | 900 MHz | IP67 | Four 0–10V | Four 0–10V | DX80N9X6S0P0V4V4 |
| | | IP20 | | | DX80N9X6S0P0V4V4C |
| | 2.4 GHz | IP67 | | | DX80N2X6S0P0V4V4 |
| | | IP20 | | | DX80N2X6S0P0V4V4C |


Counter Nodes, FlexPower

| | Freq | Base | Power | Discrete Inputs | Discrete Outputs | Counter Input | Models |
|---|---------|------|------------------|-----------------|------------------|-------------------------|---------------|
|  <p>DX80 Node IP67</p> | 900 MHz | IP67 | FlexPower | 2 * | Two NMOS | 2 Event or Rate Counter | DX80N9X2S4A2 |
| | | IP20 | | | | | DX80N9X2S4A2C |
| | 2.4 GHz | IP67 | | | | | DX80N2X2S4A2 |
| | | IP20 | | | | | DX80N2X2S4A2C |
|  <p>Integrated battery counter Node IP67</p> | 900 MHz | IP67 | Internal Battery | 1 * | One NMOS | 1 Event or Rate Counter | DX80N9X1S2A1 |
| | 2.4 GHz | IP67 | | | | | DX80N2X1S2A1 |

* Discrete inputs can be selected to be either PNP and NPN

Models with batteries integrated into the housing are so noted. All other FlexPower models may be powered using 10–30V dc, battery or solar power options. Power supplies are sold separately. (see page 411).

Temperature Nodes, FlexPower


| | Freq | Base | Discrete | | Temperature | Models |
|--|---------|------|----------|---------|----------------|----------------|
| | | | Inputs | Outputs | Inputs | |
|  <p>DX80N2X2S2N2T</p> | 900 MHz | IP67 | 2 | 2 NMOS | 3 Thermocouple | DX80N9X2S2N2T |
| | | IP20 | | | | DX80N9X2S2N2TC |
| | 2.4 GHz | IP67 | | | | DX80N2X2S2N2T |
| | | IP20 | | | | DX80N2X2S2N2TC |
| | 900 MHz | IP67 | — | — | 4 RTD | DX80N9X2S0P0R |
| | | IP20 | | | | DX80N9X2S0P0RC |
| | 2.4 GHz | IP67 | | | | DX80N2X2S0P0R |
| | | IP20 | | | | DX80N2X2S0P0RC |

C Models have IP20 housings and are meant to be installed into a suitable enclosure.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless**
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

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Temperature and Relative Humidity Nodes


| | Freq | Base | Inputs | Models* |
|---|---------|------|--|--------------|
|  | 900 MHz | IP67 | 2 Temperature/Relative Humidity Inputs | DX80N9X2S2S |
| | | IP20 | | DX80N9X2S2SC |
| | 2.4 GHz | IP67 | | DX80N2X2S2S |
| | | IP20 | | DX80N2X2S2SC |
| | 900 MHz | IP67 | 1 Temperature/Relative Humidity Input Battery integrated into the housing | DX80N9X1S1S |
| | 2.4 GHz | | | DX80N2X1S1S |

* Models with batteries integrated into the housing are so noted. All other FlexPower Nodes may be powered using 10–30V dc, battery or solar power options. Power supplies are sold separately. (see page 411).

Temperature & Relative Humidity FlexSensors


M12FTH1Q
Temperature and relative humidity sensor ±2%

M12FTH2Q
Temperature and relative humidity sensor ±3.5% (Both offer NIST traceability)



- WIRELESS
- Performance
- DX80**
- DX99
- MultiHop
- Ethernet Radio
- DX70



M-GAGE™ Nodes

| | Freq | Base | Description | Models† |
|---|---------|------|--|----------------|
|  DX80N2X1W0P0ZR | 900 MHz | IP67 | M-GAGE sensor with an internal antenna and a battery integrated into an easy-to-embed Node housing | DX80N9X1W0P0ZR |
| | 2.4 GHz | | | DX80N2X1W0P0ZR |

† The M-GAGE Nodes are powered by a 3.6V lithium D cell integrated into the housing.




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DX85 Modbus RTU Remote I/O

| | Base | Power | Discrete | | Analog | | Models |
|---|------|-----------|--|--------------|--------------|---------------|---------------|
| | | | Inputs | Outputs | Inputs | Outputs | |
|  DX85  DX85.C | IP67 | 10–30V dc | 4 * | 4 PNP | Two 0–20 mA | Two 0–20 mA | DX85M4P4M2M2 |
| | IP20 | | | | | | DX85M4P4M2M2C |
| | IP67 | | 6 * | 6 PNP | — | — | DX85M6P6 |
| | IP20 | | | | | | DX85M6P6C |
| | IP67 | | 8 * | 4 PNP | — | — | DX85M8P4 |
| | IP20 | | | | | | DX85M8P4C |
| | IP67 | 4 * | 8 PNP | — | — | DX85M4P8 | |
| | IP20 | | | | | DX85M4P8C | |
| | IP67 | — | — | Four 0–20 mA | Four 0–20 mA | DX85M0P0M4M4 | |
| | IP20 | | | | | DX85M0P0M4M4C | |
| | IP67 | FlexPower | Up to 12 NPN inputs or 12 NMOS outputs, or a combination thereof | — | — | DX85M-P7 | |
| | IP20 | | | | | DX85M-P7C | |
| | IP67 | 10–30V dc | Up to 12 PNP inputs or 12 PNP outputs, or a combination thereof | — | — | DX85M-P8 | |
| | IP20 | | | | | DX85M-P8C | |

* Discrete inputs can be selected to be either PNP and NPN

SureCross™ Specifications

| | |
|------------------------------------|--|
| Range* | 900 MHz: Up to 4.8 kilometers (3 miles) 2.4 GHz: Up to 3.2 kilometers (2 miles) |
| Transmit Power | 900 MHz: 150 mW (21 dBm Conducted) 2.4 GHz: 65 mW (18 dBm Conducted) |
| Network Size | One Gateway and up to 47 remotely located Nodes |
| I/O | Discrete, Analog, Temperature, Humidity, Counter |
| Gateway Communications | Modbus RTU; Modbus TCP, Ethernet/IP available using GatewayPro or DX83 Ethernet Bridge |
| Power | + 10 to 30V dc (For European applications: + 10 to 24V dc ± 10%) <i>FlexPower</i> : + 10 to 30V dc or 3.6 to 5.5V low power option (For European applications: + 10 to 24V dc, ± 10% or 3.6 to 5.5V dc low power option) Integrated Battery models: 3.6V dc low power option for an internal battery |
| Power Consumption | Less than 1.4 W (60 mA) at 24V dc |
| Environmental rating | DX80 Rating: IEC IP67; NEMA 6 DX80...C Rating: IEC IP20; NEMA 1 |
| Certification ("C" models only) | <p>Class I, Division 2, Groups A, B, C, D. Certificate: 1921239 Ex/AEx nA II</p> <p>LCIE/ATEX Zone 2 (Group IIC). Certificate: LCIE: LCIE 10 ATEX 1012 X II 3G Ex nA IIC T4</p> <p> </p> <p></p> |

* With the standard 2 dB antenna. High-gain antennas are available, but the range depends on the environment and line of sight. To determine the range of your wireless network, perform a Site Survey. See Bannerengineering.com for more detailed specifications.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless**
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

WIRELESS

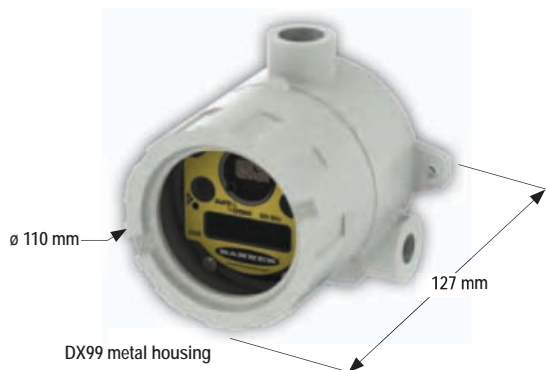
- Performance
- DX80**
- DX99
- MultiHop
- Ethernet Radio
- DX70

SureCross™ DX99 Intrinsically Safe FlexPower™ Nodes

- Networks formed using DX80 Gateways installed beyond the hazardous area and one or more Nodes operating in the same frequency band
- The DX99 is a state-of-the-art combination of wireless communication, battery technology and intrinsically safe electronics
- All models are certified for operation in Class I, Division 1 and ATEX Zone 0 locations
- Discrete, analog and temperature input types are available
- Battery power supply provides power for third-party 4–20 mA and NAMUR process sensors
- DX99 Nodes are designed to work with DX80 Gateways installed beyond the hazardous area
- DX99 FlexPower Nodes are available in two different housing materials: metal and polycarbonate
- Banner is working on expanding the I/O options for our DX99 product line; visit bannerengineering.com for the latest model information



Banner offers a variety of mounting brackets and antenna feed throughs that meet IS ratings. Visit www.bannerengineering.com for ordering information.





DX99 Nodes, FlexPower™—Class I, Div 1 and Zone 0 (Metal Housing)

| | Freq | Boost Power | Certifications | I/O | Metal Housing Models* |
|--|---------|-------------|--|---|-----------------------|
| | 900MHz | 18V | Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1 Ex ia IIC T4 AEx ia IIC T4 LCIE/ATEX Zone 0 (Group IIC) and Zone 20 (Group II) II 1 GD Ex ia IIC T4 Ex iaD 20 IP68 T82°C | Discrete: 2 selectable inputs Analog: 2 inputs (0-20 mA) | DX99N9X1S2N0M2X0D2 |
| | 2.4GHz | | | | DX99N2X1S2N0M2X0D2 |
| | 900MHz | 10V | | | DX99N9X1S2N0M2X0D1 |
| | 2.4GHz | | | | DX99N2X1S2N0M2X0D1 |
| | 900MHz | 18V | | Discrete: 2 selectable inputs Analog: 2 inputs (0-10V dc) | DX99N9X1S2N0V2X0D2 |
| | 2.4GHz | | | DX99N2X1S2N0V2X0D2 | |
| | 900MHz | 10V | | Discrete: 2 selectable inputs Thermocouple: 3 inputs, one thermistor CJC input | DX99N9X1S2N0V2X0D1 |
| | 2.4GHz | | | DX99N2X1S2N0V2X0D1 | |
| | 900MHz | N/A | | Discrete: 2 selectable inputs Thermocouple: 3 inputs, one thermistor CJC input | DX99N9X1S2N0T4X0D0 |
| | 2.4GHz | | | DX99N2X1S2N0T4X0D0 | |
| | 900MHz | N/A | | RTD: 4 three-wire inputs | DX99N9X1S0N0R4X0D0 |
| | 2.4GHz | | | DX99N2X1S0N0R4X0D0 | |
| | 900 MHz | N/A | | 2 Bridge inputs 2 Discrete Sinking inputs | DX99N9X1S2N0B2X0D0 |
| | 2.4 GHz | | | DX99N2X1S2N0B2X0D0 | |

Metal housing models are only available with external antennas and are powered by a 3.6V D cell lithium battery integrated into the housing. Mounting and intrinsically safe antenna installation accessories are available for the metal housing models.

SureCross™ DX99 Specifications

| | | |
|------------------------|--|--|
| Range | 900 MHz: Up to 4.8 kilometers (3 miles) 2.4 GHz: Up to 3.2 kilometers (2 miles) | |
| Transmit Power | 900 MHz: 150 mW (21 dBm Conducted) 2.4 GHz: 65 mW (18 dBm Conducted) | |
| Network Size | One Gateway and up to 47 remotely located Nodes (SureCross Performance or SureCross DX80 Gateway required) | |
| I/O | Discrete, Analog, Temperature, Bridge | |
| Gateway Communications | SureCross Performance or SureCross DX80 Gateway required | |
| Power | 3.6V low power option from an internal battery | |
| Power Consumption | Application Dependent | |
| Environmental rating | IEC IP68 | |
| Certifications | DX99, Intrinsically Safe, Metal Housing Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1 Ex ia IIC T4 AEx ia IIC T4 |  Certificate 2008243(LR 41887) |
| | LCIE/ATEX Zone 0 (Group IIC) and Zone 20 (Group II) II 1 GD Ex ia IIC T4 Ex iaD 20 IP68 T82°C |  Certificate LCIE 08 ATEX 6098X |

See Bannerengineering.com for more detailed specifications.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless**
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- WIRELESS**
- Performance
- DX80
- DX99**
- MultiHop
- Ethernet Radio
- DX70

SureCross™ MultiHop Wireless Network

- Networks formed using one master MultiHop radio and up to 50 MultiHop repeater or slave radios operating in the same frequency band
- Selectable power levels up to 1 watt transmit power; license-free operation up to 4 watt EIRP, with a high-gain antenna, in the U.S. and Canada for 900 MHz
- FlexPower power input options allow for +10 to 30V dc, solar or battery power
- Multiple hops allow for an extended range
- Message routing improves link performance
- SureCross architecture creates self-forming and self-healing wireless network
- DIP switches select operational modes: master, repeater or slave
- Built-in site survey mode enables rapid assessment of a location's RF transmission properties
- FHSS radios operate and synchronize automatically; selectable network IDs reduce interference from collocated networks
- Banner is constantly working on new models with I/O variations, contact factory for the latest model information



ACCESSORIES
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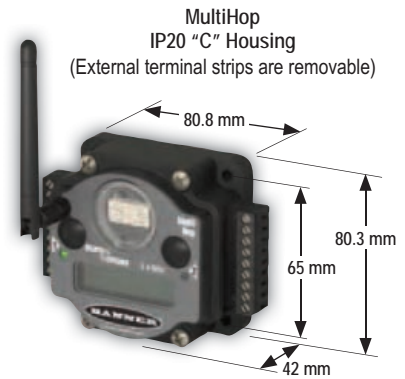
DX85 Modbus RTU Remote I/O
Used to expand I/O capacity when connected to a Data Radio or Gateway (see page 402)



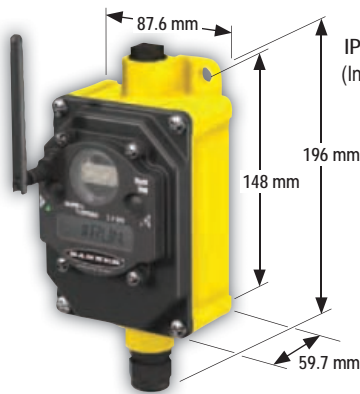
MultiHop Data Radio IP67



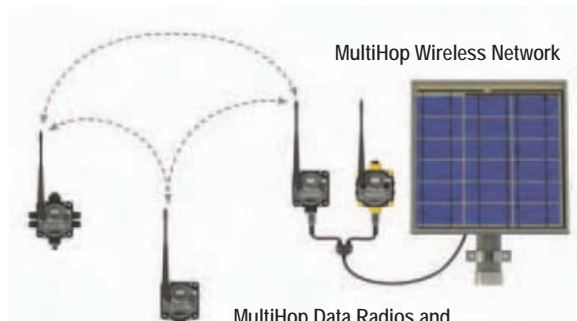
MultiHop Radio with I/O IP67



MultiHop IP20 "C" Housing (External terminal strips are removable)



MultiHop IP54 "E" Housing (Integrated Battery)



MultiHop Wireless Network

MultiHop Data Radios and MultiHop Radios with I/O can be combined to form a single network.

MultiHop Data Radios, FlexPower

| Description | Freq | Transmit Power | Models* |
|----------------|---------|------------------------------------|------------|
| MultiHop Radio | 900 MHz | DIP switch selectable up to 1 Watt | DX80DR9M-H |
| | 2.4 GHz | 100 mW EIRP | DX80DR2M-H |

* Serial communication style (RS-485 or RS-232) is user selectable

MultiHop Radios with I/O

| Freq | Power | Discrete | | Analog | | Transmit Power | Model Number | | | |
|---------|------------------|---------------|--------------------------|---|-------------|------------------|---------------|--|-------|-------------|
| | | Inputs | Outputs | Inputs | Outputs | | | | | |
| 900 MHz | FlexPower | 4 NPN | 2 NMOS 2 Switch Power | Two 0–20 mA 1 Thermistor 1 Counter | | 250 mW or 1 Watt | DX80DR9M-H1 | | | |
| | Internal battery | | | | | | DX80DR9M-H1C | | | |
| | DX80DR9M-H1E | | | | | | | | | |
| 2.4 GHz | FlexPower | | | | | | | | | 65 mW |
| | Internal battery | DX80DR2M-H1C | | | | | | | | |
| | | DX80DR2M-H1E | | | | | | | | |
| 900 MHz | 10–30V dc | 4 | 4 PNP | Two 0–20 mA | Two 0–20 mA | 250 mW or 1 Watt | DX80DR9M-H2 | | | |
| | | | | | | | DX80DR9M-H2C | | | |
| 2.4 GHz | | | | | | | | | 65 mW | DX80DR2M-H2 |
| | | | | | | DX80DR2M-H2C | | | | |
| 900 MHz | FlexPower | 2 | 2 NMOS | Four Thermocouple 1 Thermistor (CJC) | | 250 mW or 1 Watt | DX80DR9M-H3 | | | |
| | Internal battery | | | | | | DX80DR9M-H3C | | | |
| | DX80DR9M-H3E | | | | | | | | | |
| 2.4 GHz | FlexPower | | | | | | | | | 65 mW |
| | Internal battery | DX80DR2M-H3C | | | | | | | | |
| | | DX80DR2M-H3E | | | | | | | | |
| 900 MHz | FlexPower | | | Four 3-wire Pt100 RTD | | 250 mW or 1 Watt | DX80DR9M-H4 | | | |
| | Internal battery | | | | | | DX80DR9M-H4C | | | |
| | DX80DR9M-H4E | | | | | | | | | |
| 2.4 GHz | FlexPower | | | | | | | | | 65 mW |
| | Internal battery | DX80DR2M-H4C | | | | | | | | |
| | | DX80DR2M-H4E | | | | | | | | |
| 900 MHz | FlexPower | 2 | 2 NMOS 2 Switch Power | Two 0–20 mA 1 Thermistor 1 SDI-12 or Counter | | 250 mW or 1 Watt | DX80DR9M-H12 | | | |
| | Internal battery | | | | | | DX80DR9M-H12C | | | |
| | DX80DR9M-H12E | | | | | | | | | |
| 2.4 GHz | FlexPower | | | | | | | | | 65 mW |
| | Internal battery | DX80DR2M-H12C | | | | | | | | |
| | | DX80DR2M-H12E | | | | | | | | |

C Models have IP20 housings and are meant to be installed into a suitable enclosure

- Photoelectrics Sensors
- Fiber Optic Sensors
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- Wireless**
- Lighting & Indicators
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- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- WIRELESS**
- Performance
- DX80
- DX99
- MultiHop**
- Ethernet Radio
- DX70

| MultiHop Data Radio Specifications | |
|------------------------------------|---|
| Range | 900 MHz: Up to 9.6 kilometers (6 miles) per hop; 2.4 GHz: Up to 3.2 kilometers (2 miles) per hop |
| Transmit Power | 900 MHz: 1 Watt (30 dBm conducted); 2.4 GHz 65 mW (18 dBm Conducted) |
| Network Size | One Master radio and up to 50 repeater and/or slave radios per network |
| I/O | Discrete, Analog, Temperature, Humidity, RS-485 Serial interface |
| Radio Communications | Each radio is able to communicate through RS-485 serial interface, Modbus RTU or Transparent Mode |
| Power | + 10 to 30V dc (For European applications: + 10 to 24V dc ± 10%) FlexPower: + 10 to 30V dc or 3.6 to 5.5V low power option (For European applications: + 10 to 24V dc, ± 10% or 3.6 to 5.5V dc low power option) Integrated Battery models: 3.6V dc low power option for an internal battery |
| Power Consumption | 900 MHz: Maximum current draw is <100 mA and typical current draw is <30 mA at 24V dc. (2.4 GHz consumption is less.) |
| Environmental rating | DX80 Rating: IEC IP67; NEMA 6; DX80...C Rating: IEC IP20; NEMA 1; DX80...E Rating: IEC IP54; NEMA 4 |
| Certification | |

See Bannerengineering.com for more detailed specifications

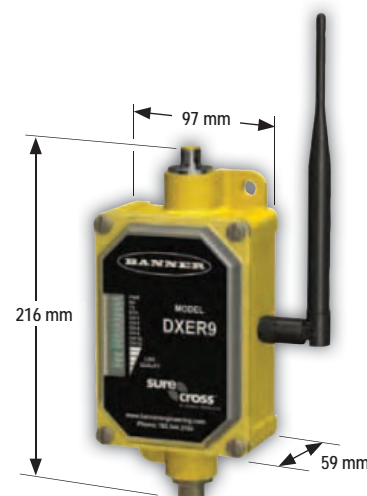
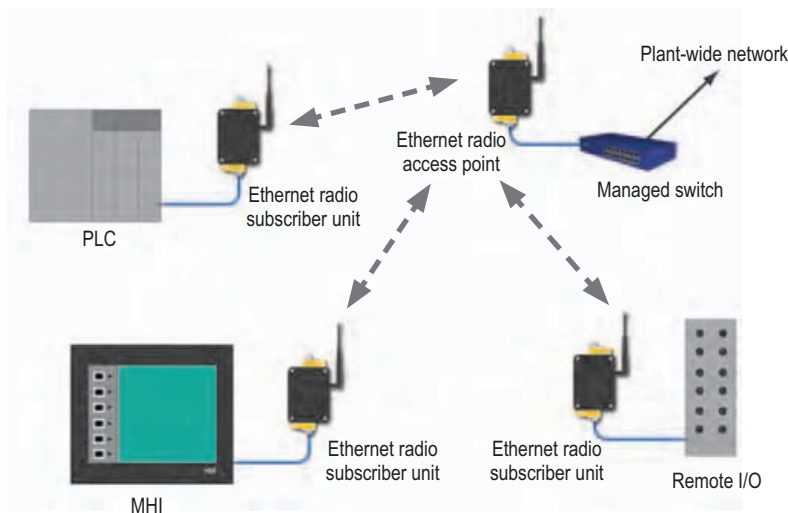
SureCross™ Ethernet Radio Wireless Network

- Industrial grade, long-range, 900 MHz radio used to create point-to-multipoint configurations of wireless Ethernet networks
- RF transmission rate of 1.536 Mb/s and a throughput of 935 Kb/s
- 128 bit AES encryption for Ethernet data packets
- Sub-block error detection and retransmission
- Automatic scan or manual override for the best of the 12 communication channels
- Indicator LEDs for channel selection and signal strength
- Point-to-multipoint configurations with up to 16 subscriber units
- User configuration via internal web page
- Built-in spectrum analyzer and firmware upgrading



ACCESSORIES
page
411

Ethernet Data Radio Network



SureCross™ Ethernet Radio, 10-30V dc

| Description | Freq | Transmit Power | Models* |
|----------------|---------|----------------|---------|
| Ethernet Radio | 900 MHz | 125 mW | DXER9 |

* Banner is constantly working on new models with I/O variations. Contact factory for the latest model information.

Ethernet Radio Specifications

Visit bannerengineering.com for more information.



SureCross™ DX70 Point-to-Point I/O Wireless Pairs

- DX70 models deliver an economical, dedicated wireless industrial I/O solution
- A network includes a Gateway and one Node that operate in the same radio frequency band
- Each Gateway and Node pair provides direct I/O mapping and plug-n-play installation
- Frequency Hopping Spread Spectrum (FHSS) technology and Time Division Multiple Access (TDMA) control architecture combine to ensure reliable data delivery within the unlicensed Industrial, Scientific and Medical (ISM) bands
- Open design supports inputs from sensors and devices made by Banner and other manufacturers
- The unique radio binding technology enables multiple DX70 pairs to be located within range of each other
- Models include discrete and analog I/O in a single device
- 900 MHz and 2.4 GHz models accommodate worldwide communication standards
- Rugged IP67/NEMA 6 design enabling simple installation

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless**
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 411

- WIRELESS**
- Performance
- DX80
- DX99
- MultiHop
- Ethernet Radio
- DX70**



Wireless Control to Eliminate Coil



Wireless Monitoring of Rotary Table



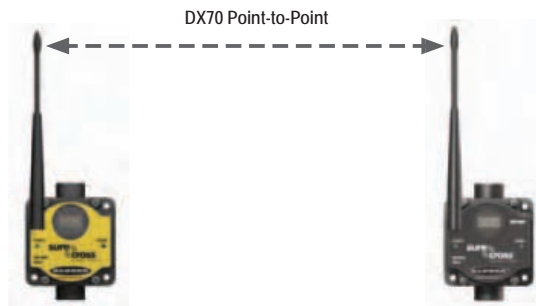
Wireless Control of HVAC System





Node



Gateway



DX70 Point-to-Point, 10-30V dc

| | Freq | Discrete | | Analog | | Kit Models |
|--|---------|-----------------------|-----------------------|-------------|-------------|-------------|
| | | Inputs* | Outputs | Inputs | Outputs | |
|  Node | 900 MHz | 4 | 4 PNP | Two 0-20 mA | Two 0-20 mA | DX70K9M6EM1 |
| | 2.4 GHz | | | | | DX70K2M6EM1 |
|  Gateway | 900 MHz | Gateway: 4 Node: 8 | Gateway: 8 Node: 4 | — | — | DX70K9M6ED1 |
| | 2.4 GHz | | | | | DX70K2M6ED1 |

* Discrete inputs can be selected to be either PNP and NPN

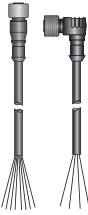
SureCross™ DX70 Specifications

| | |
|----------------------|--|
| Range | 900 MHz: Up to 4.8 kilometers (3 miles) 2.4 GHz: Up to 3.2 kilometers (2 miles) |
| Transmit Power | 900 MHz: 150 mW (21 dBm Conducted) 2.4 GHz: 65 mW (18 dBm Conducted) |
| Network Size | 1 Gateway and 1 Node, pre-mapped from factory |
| I/O | Discrete, Analog |
| Power | 10 to 30V dc (For European applications: 10 to 24V dc, +/- 10%) |
| Power Consumption | Less than 1.4 W (60 mA) at 24V dc |
| Environmental rating | IEC IP67; NEMA 6 |
| Certification | CE |

See Bannerengineering.com for more detailed specifications.



Cordsets

| Euro QD | | |
|----------------|-------------|-------------|
| See page 699 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 0.50 m | MQDC1-501.5 | — |
| 1.83 m | MQDC1-506 | MQDC1-506RA |
| 5.57 m | MQDC1-515 | MQDC1-515RA |
| 9.14 m | MQDC1-530 | MQDC1-530RA |







Additional cordset information available. See page 693.

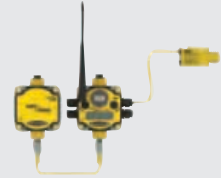

Brackets

| DX80 |
|--|
|  <p>pg. 653</p> <p>SMBDX80DIN</p> |
|  <p>Additional bracket information available. See page 632.</p> |


FlexPower Accessories

| Description | Model |
|---|---------------|
|  <p>FlexPower Battery 6-pack delivers and manages dc voltage from six 3.6V lithium D cell batteries.</p> | DX81P6 |
|  <p>FlexPower Battery Supply Module delivers and manages dc voltage from one 3.6V lithium D cell battery. Replacement battery: BWA-BATT-001</p> | DX81 |
|  <p>FlexPower Battery Supply Module delivers and manages dc voltage from one 3.6V lithium D cell battery and used to power the polycarbonate housed Intrinsically Safe DX99 devices. Replacement battery: BWA-BATT-001</p> | DX81H |
|  <p>FlexPower Solar Supply includes solar panel, controller, and rechargeable battery pack. Replacement battery pack: BWA-BATT-003</p> | BWA-SOLAR-001 |

Sensors Optimized for FlexPower Devices

| Description | Model |
|--|--|
|  <p>The low-power MINI-BEAM is designed to work with the FlexPower Nodes.</p> | <p>Retro: SM312LPQD-78447</p> <p>Diffuse: SM312DQD-78419</p> |
|  <p>A long-range ultrasonic sensor designed to work with the FlexPower Nodes.</p> | QT50ULBQ6-75390 |

K50 Optimized for FlexPower Devices



| Description | Model |
|--|-------------|
|  <p>K50 EZ-LIGHT, 3 color, with push button</p> | K50FGYRPB1Q |

DC Power Supplies, 24V dc

| Description | Model |
|--|------------|
| 500 mA, Demo kit power supply | PS24W |
| 700 mA, 5-pin Euro-style QD, Hardwired AC power connection | EZAC-E-QE5 |
| 200 mA, DX80 low-profile housing | PS24DX |

Relay Box

| Description | Model |
|---|-------|
| Interface Relay Box, 18-26V dc inputs, isolated relay outputs | IB6RP |


| FlexSensor Models* | |
|--|--|
| <p>QS30WEQ (emitter) QS30WRQ (receiver) Photoelectric pair up to 100' range</p>  | |
| <p>M12FTH1Q Temperature and relative humidity sensor $\pm 2\%$</p>  | <p>M12FTH2Q Temperature and relative humidity sensor $\pm 3.5\%$ (Both offer NIST traceability)</p> |

* FlexSensors are used with the DX80 Temp and Relative Humidity Node



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless**
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- WIRELESS**
- Performance
- DX80
- DX99
- MultiHop
- Ethernet Radio
- DX70**

Antenna Feed Throughs

| Description | | Model |
|---|------------------------------------|------------|
|  | Antenna Feed through, SS, 1/2" NPT | BWA-HW-016 |
| | Antenna Feed through, SS, 3/4" NPT | BWA-HW-017 |

Surge Protection

| Description | | Model |
|---|---|---------------|
|  | 900 MHz/2.4 GHz surge suppressor with bulkhead and RP-SMA | BWC-LMRSFRPB |
|  | Surge suppressor, bulkhead, N-Type and dc Blocking | BWC-LFNBMN-DC |



**User Configuration Tool
RS-485 to USB
Adapter Cable***




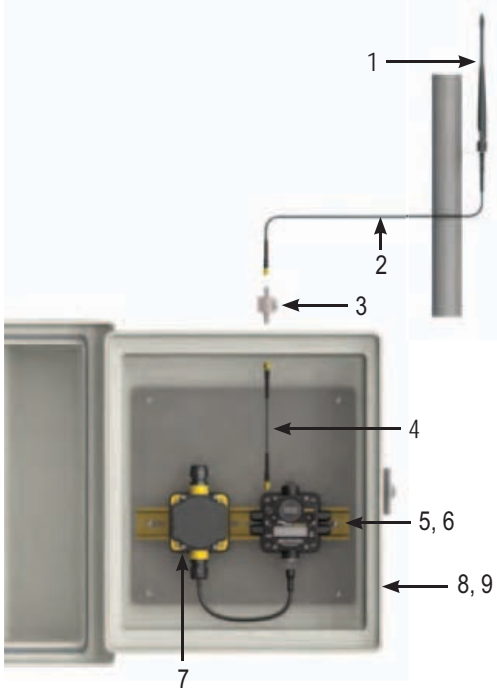
BWA-UCT-900

BWA-UCT-900 RS-485 to USB adapter cable is used to connect the DX80 Gateway to a computer. Download your free configuration software at bannerengineering.com/wireless

* MQDMC-401 adapter cable needed for connecting BWA-UCT-900 to DX80...C housing models

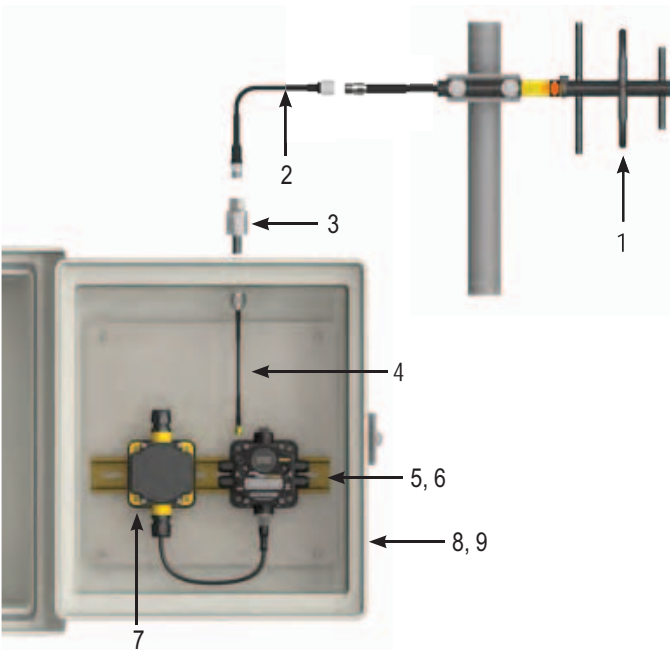
Enclosures

| Description | | Model |
|---|--|-------------|
|  | Enclosure Fiberglass Hinged 14" x 12" x 8" | BWA-EF14128 |
| | Enclosure Fiberglass Hinged 10" x 8" x 6" | BWA-EF1086 |
| | Enclosure Fiberglass Hinged 8" x 6" x 6" | BWA-EF866 |
| | Panel, 14" x 12" | BWA-PA1412 |
| | Panel, 10" x 8" | BWA-PA108 |
| | Panel, 8" x 6" | BWA-PA86 |
| | Pole Mount, 12" | BWA-PM12 |
| | Pole Mount, 8" | BWA-PM8 |
| | Pole Mount, 6" | BWA-PM6 |



SMA Antenna Options

| Description | | Model |
|-------------|---|----------------|
| 1 | Antenna, Omni, 902-928 MHz, 2 dBd, Rubber Swivel, RP-SMA MALE | BWA-902-C |
| | Antenna, Omni, 902-928 MHz, 5 dBd, Rubber Swivel, RP-SMA MALE | BWA-905-C |
| | Antenna, Omni, 2.4 GHz, 2 dBd, Rubber Swivel, RP-SMA MALE | BWA-202-C |
| | Antenna, Omni, 2.4 GHz, 5 dBd, Rubber Swivel, RP-SMA MALE | BWA-205-C |
| | Antenna, Omni, 2.4 GHz, 7 dBd, Rubber Swivel, RP-SMA MALE | BWA-207-C |
| 2 | RG58 Cable, RP-SMA to RP-SMA Female Bulkhead, 0.2 m | BWC-1MRSFRSB02 |
| | RG58 Cable, RP-SMA to RP-SMA Female Bulkhead, 1 m | BWC-1MRSFRSB1 |
| | RG58 Cable, RP-SMA to RP-SMA Female Bulkhead, 2 m | BWC-1MRSFRSB2 |
| | RG58 Cable, RP-SMA to RP-SMA Female Bulkhead, 4 m | BWC-1MRSFRSB4 |
| 3 | Surge Suppressor, Bulkhead, RP-SMA Type, 900 MHz/2.4 GHz | BWC-LMRSFRPB |
| 4 | RG58 Cable, RP-SMA TO RP-SMA Female Bulkhead, 0.2 m | BWC-1MRSFRSB02 |
| | RG58 Cable, RP-SMA TO RP-SMA Female Bulkhead, 1 m | BWC-1MRSFRSB1 |
| | RG58 Cable, RP-SMA TO RP-SMA Female Bulkhead, 2 m | BWC-1MRSFRSB2 |
| | RG58 Cable, RP-SMA TO RP-SMA Female Bulkhead, 4 m | BWC-1MRSFRSB4 |



N-Type Antenna Options

| Description | | Model |
|-------------|--|---------------|
| 1 | Antenna, Yagi, 900 MHz, 6.5 dBd, N Female | BWA-9Y6-A |
| | Antenna, Yagi, 900 MHz, 10 dBd, N Female | BWA-9Y10-A |
| | Antenna, Omni, 900 MHz, 6 dBd, Fiberglass, N Female | BWA-9O6-A |
| | Antenna, Omni, 900 MHz, 5 dBd/7.2 dBi, With ground plane, N Female | BWA-9O5-B |
| | Antenna, Omni, 2.4 GHz, 8.5 dBi, N Female, Fiberglass 24" | BWA-2O8-A |
| | Antenna, Omni, 2.4 GHz, 6 dBi, N Female, Fiberglass 16" | BWA-2O6-A |
| 2 | LMR400 Cable, N-Male to N-Female, 3 Meters | BWC-4MNFN3 |
| | LMR400 Cable, N-Male to N-Female, 6 Meters | BWC-4MNFN6 |
| | LMR400 Cable, N-Male to N-Female, 15 Meters | BWC-4MNFN15 |
| | LMR400 Cable, N-Male to N-Female, 30 Meters | BWC-4MNFN30 |
| 3 | Surge Suppressor, Bulkhead, N-Type, 900 MHz/2.4 GHz, dc Blocking | BWC-LFNBMN-DC |
| 4 | LMR200 Cable, RP-SMA to N-Male, 0.5 Meters | BWC-1MRSMN05 |
| | LMR200 Cable, RP-SMA to N-Male, 2 Meters | BWC-1MRSMN2 |

Power Supplies and Enclosure

| Description | | Model |
|-------------|--|-------------|
| 5 | DIN Rail Section, 35mm x 105mm Long | DIN-35-105 |
| 6 | DIN Rail Bracket Assembly for DX70 and DX80 models | SMBDX80DIN |
| 7 | DX81 FlexPower Battery Supply Module | DX81 |
| | DX81P6 FlexPower Battery Supply 6-Pack | DX81P6 |
| | Power Supply, 24V dc, 200 mA | PS24DX |
| | Power Supply, 24V dc, 200 mA, Solid State Relay | PS24DXSR |
| 8 | Internal panel, 14" x 12" | BWA-PA1412 |
| 9 | Fiberglass enclosure, 14" x 12" x 8" | BWA-EF14128 |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless**
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- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- WIRELESS**
- Performance
- DX80
- DX99
- MultiHop
- Ethernet Radio
- DX70

Can I rely on wireless I/O to improve efficiency?

SURE

Can I monitor operator and equipment performance remotely?
Can I get the timely data I need for lean manufacturing?
Can I eliminate costly wiring and minimize battery replacement?

sure  **cross**TM
wireless network

On the factory floor, you need reliable results, consistent uptime
and real ROI. Be sure. With the Banner SureCross Wireless I/O Network.
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BANNER[®]



Task Lights

page 416

- Extremely bright LEDs for enclosure, area and machine lighting, including control cabinets and panels
- Energy-efficient LEDs use less than one third the energy of fluorescent lighting
- Same efficacy (lumens per watt) as fluorescents, but are more efficient in directing light to the work area
- A choice of sizes and housing materials available to fit in any size area and environment
- Rugged housings for use in wet and dirty environments



Vision Lights

page 427

- A complete selection of lighting, including IP68-rated lights
- Rugged, maintenance-free LED lighting in red, green, blue, white and infrared
- High-intensity lighting with built-in universal strobe control and power regulation; no external controller or power supply required
- Complete selection of polarizing filter kits, colored filters and lighting diffusers available for improved lighting quality



Indicators

page 441

- Provides real-time operational status indication for workers and supervisors
- Installs directly on machine quickly and easily with prewired or quick-disconnect options; no assembly required
- Features a completely self-contained design—no controller needed
- Displays up to 5 colors, depending on model
- Available in over thirteen styles/housings, including tower and column lights, segmented displays, daylight visible for outdoor applications, call lights, and dome, T-style and barrel housings
- Rated to IP67/IP69K for any manufacturing environment, depending on model
- Includes models with steady and flashing colors, and audible alerts



Actuators

page 464

- K50 and K80 single-point, pick-to-light sensors and push buttons for error-proofing bin-picking, order fulfillment and operator guidance operations
- PVD one-piece light array for part assembly, part pick and error-proofing
- PVA two-component light array for part-pick verification
- VTB verification touch buttons with illuminated base for indicating bin-picking sequence
- OTB/LTB optical touch buttons for zero-force ergonomic replacement of mechanical push buttons
- STB self-checking touch buttons for use with safety controls

TASK LIGHTS



Strip Lights page 417

- 28 mm wide industrial strip lighting for enclosures and area lighting
- LED array in 145 to 1130 mm lighted lengths



Area Lights page 420

- Solid-state LED light for area and machine lighting
- Available in four sizes



Work Lights page 422

- 50 mm light of flat or 30 mm base mounting in wet or dirty environments
- Standard or push-button models available



Spot Lights page 424

- 50 mm diameter with flat profile and 30 mm mounting base
- Highly concentrated, focused light available in four colors



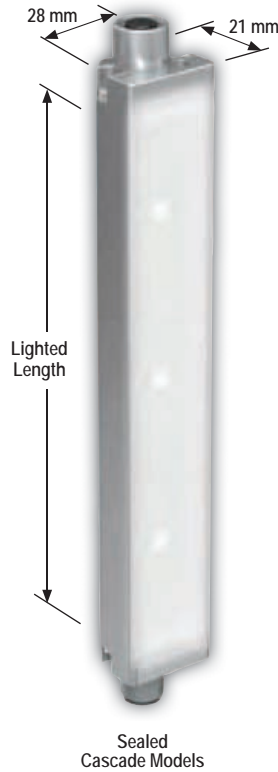
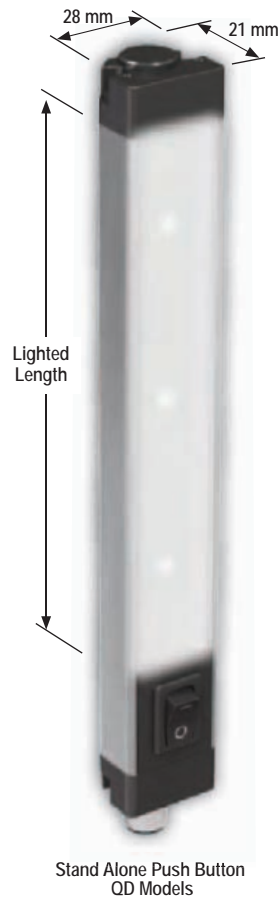
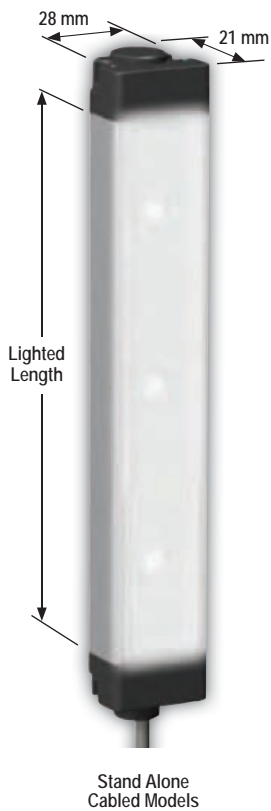
Work Light Strips WLS28

- Low-profile, 28 mm wide housing for use inside or under any industrial control cabinet, or in a work station
- High-power LEDs for superior illumination with an even pattern of light
- LED lights available in six colors ranging from 145 to 1130 mm lighted lengths
- Extremely long-lasting LED technology for greater than 50,000 hours of continuous working life
- Low power consumption less than 9 watts per foot
- Cascade models for connecting multiple lights end-to-end, minimizing wiring
- Rugged aluminum housing rated for IP50 (New models are available in waterproof housing rated IEC IP68)
- Swivel mounting brackets included
- Cabled or quick-disconnect models for installation flexibility and convenient cascading of lights
- ON/OFF switch and non-switch models available

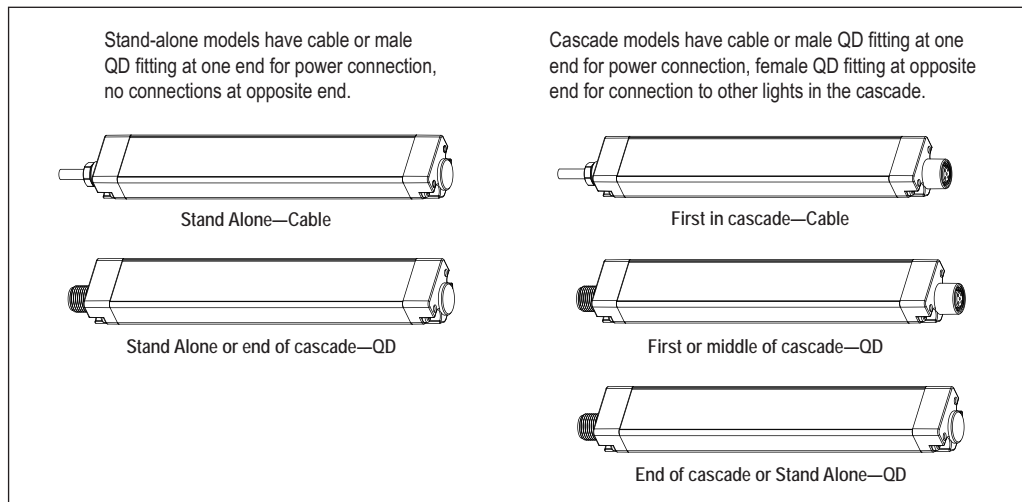
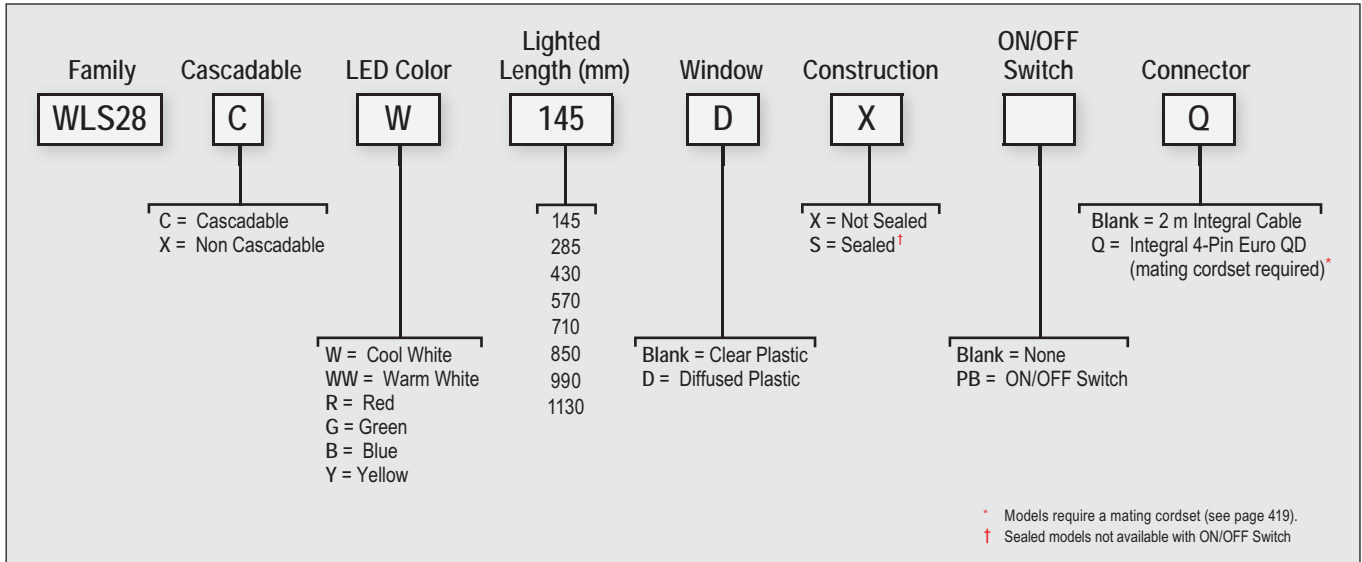
- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 419

- TASK LIGHTS
- WLS28**
- WLA
- WL50
- WL50S
- VISION LIGHTS
- INDICATORS
- ACTUATORS







Work Light WLS28 Model Key



| WLS28 Specifications | | | | | | | | | | | |
|----------------------------|---|--------|---------|--------|-------|---------------------------|------------|-------|-----|--------|------|
| Supply Voltage and Current | 12 to 30V dc (10% max. ripple) | | | | | | | | | | |
| | Max. current per length: | | | | | | | | | | |
| | | | | | | Lumens* (Typical @ 25° C) | | | | | |
| | Light Length | 12V dc | 24V dc | 30V dc | Watts | Cool White | Warm White | Green | Red | Yellow | Blue |
| | 145 mm | 0.5 A | 0.25 A | 0.2 A | 6 | 225 | 180 | 126 | 60 | 114 | 36 |
| | 285 mm | 0.75 A | 0.375 A | 0.3 A | 9 | 450 | 360 | 252 | 120 | 228 | 72 |
| | 430 mm | 1.25 A | 0.625 A | 0.5 A | 15 | 675 | 540 | 378 | 180 | 342 | 108 |
| | 570 mm | 1.5 A | 0.75 A | 0.6 A | 18 | 900 | 720 | 504 | 240 | 456 | 144 |
| | 710 mm | 2.0 A | 1.0 A | 0.8 A | 24 | 1125 | 900 | 630 | 300 | 570 | 180 |
| | 850 mm | 2.25 A | 1.125 A | 0.9 A | 27 | 1350 | 1080 | 756 | 360 | 684 | 216 |
| | 990 mm | 2.75 A | 1.375 A | 1.1 A | 33 | 1575 | 1260 | 882 | 420 | 798 | 252 |
| | 1130 mm | 3.0 A | 1.5 A | 1.2 A | 36 | 1800 | 1440 | 1008 | 480 | 912 | 288 |
| Light Characteristics | Color Temperature (CCT): Cool White: 5,000–8,300 K, Warm White: 2600 - 4300 K, Green: 520 - 535 nm, Red: 620 - 630 nm, Yellow: 585 - 595 nm, Blue: 460 - 475 nm | | | | | | | | | | |
| Useful Life | When operating within specifications, output will decrease less than 30% after 50,000 hours. | | | | | | | | | | |
| Construction | Clear anodized aluminum housing; painted zinc end caps; clear acrylic window; zinc plated steel brackets | | | | | | | | | | |

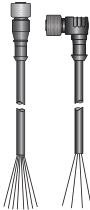



| WLS28 Specifications (cont'd) | |
|-------------------------------|---|
| Mounting | (2) swivel brackets and (4) screws included |
| Environmental Rating | IP50, IP67/IP69K |
| Connections | Integral 4-pin Euro style QD or 2 m integral cable, depending on model. QD cordsets are ordered separately. See page 419. |
| Operating Conditions | Temperature: -20° to +50° C Relative Humidity: 90% (non-condensing) Storage Temperature: -40° to +85° C |
| Certifications | IP50:   LISTED IP67/IP69K:   LISTED |
| Application Notes | When connecting cascadable lights in series it is important not to exceed maximum current limitations: Maximum length of light at 12V dc = 1.5 m Maximum length of light at 24V dc = 3.0 m Maximum length of light at 30V dc = 3.1 m |
| Hookup Diagrams | LI25 (p. 789) |

| |
|----------------------------------|
| Photoelectrics Sensors |
| Fiber Optic Sensors |
| Special Purpose Sensors |
| Measurement & Inspection Sensors |
| Vision |
| Wireless |
| Lighting & Indicators |
| Safety Light Screens |
| Safety Laser Scanners |
| Safety Controllers & Modules |
| Safety Two-Hand Control Modules |
| Safety Interlock Switches |
| Emergency Stop & Stop Control |

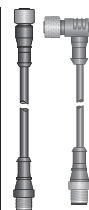
Cordsets

| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |




 Additional cordset information available. See page 693.

| Euro QD-Double-Ended | | |
|----------------------|-------------------|----------------------|
| See page 698 | | |
| Threaded 4-Pin | | |
| Length | Straight/Straight | Straight/Right-Angle |
| 0.30 m | MQDEC-401SS | MQDEC-401RS |
| 0.91 m | MQDEC-403SS | MQDEC-403RS |
| 1.83 m | MQDEC-406SS | MQDEC-406RS |
| 3.66 m | MQDEC-412SS | MQDEC-412RS |
| 6.10 m | MQDEC-420SS | MQDEC-420RS |
| 9.14 m | MQDEC-430SS | MQDEC-430RS |
| 15.2 m | MQDEC-450SS | MQDEC-450RS |



| Euro QD-Splitter | | |
|------------------|--------|-----------------|
| See page 698 | | |
| Length | | Threaded 4-Pin |
| Branches | Trunk | |
| 0 m | 0 m | CSB-M1240M1240 |
| 0.30 m | 0 m | CSB-M1240M1241 |
| 0.30 m | 0.30 m | CSB-M1241M1241 |
| 0.30 m | 2.50 m | CSB-M1248M1241 |
| 0.30 m | 4.60 m | CSB-M12415M1241 |
| 0.03 m | 7.60 m | CSB-M12425M1241 |
| 0.03 m | 7.60 m | CSB-UNT425M1241 |





| |
|--------------------|
| TASK LIGHTS |
| WLS28 |
| WLA |
| WL50 |
| WL50S |
| VISION LIGHTS |
| INDICATORS |
| ACTUATORS |

Brackets

| WLS28 | |
|---|--|
|  pg. 690 SMBWLS28RA |  pg. 690 SMBWLS28SM |

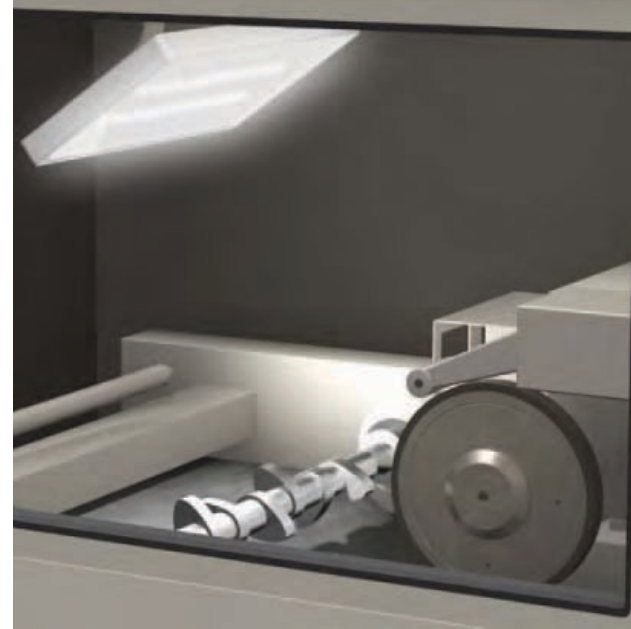
 Additional bracket information available. See page 632.

Magnetic Brackets

| WLS28 | | |
|---|------------|---|
| Two magnets, two m5 phillips head screws, and two m5 nuts with lock rings | SMBWLSMAG |  |
| Two rubber covers for use with SMBWLSMAG to prevent scratching | SMBWLSMAGR |  |

Area Work Light WLA

- High-power, solid-state LED array with cool white, warm white, red, green, blue or yellow light
- Available in four sizes
- Illuminates a large area with an even pattern of light and no shadows
- Extremely long-lasting LED technology for greater than 50,000 hours of continuous working life
- Rugged thermoplastic housing rated to IP69K
- Lensed models provide a concentrated, more intense beam pattern



ACCESSORIES
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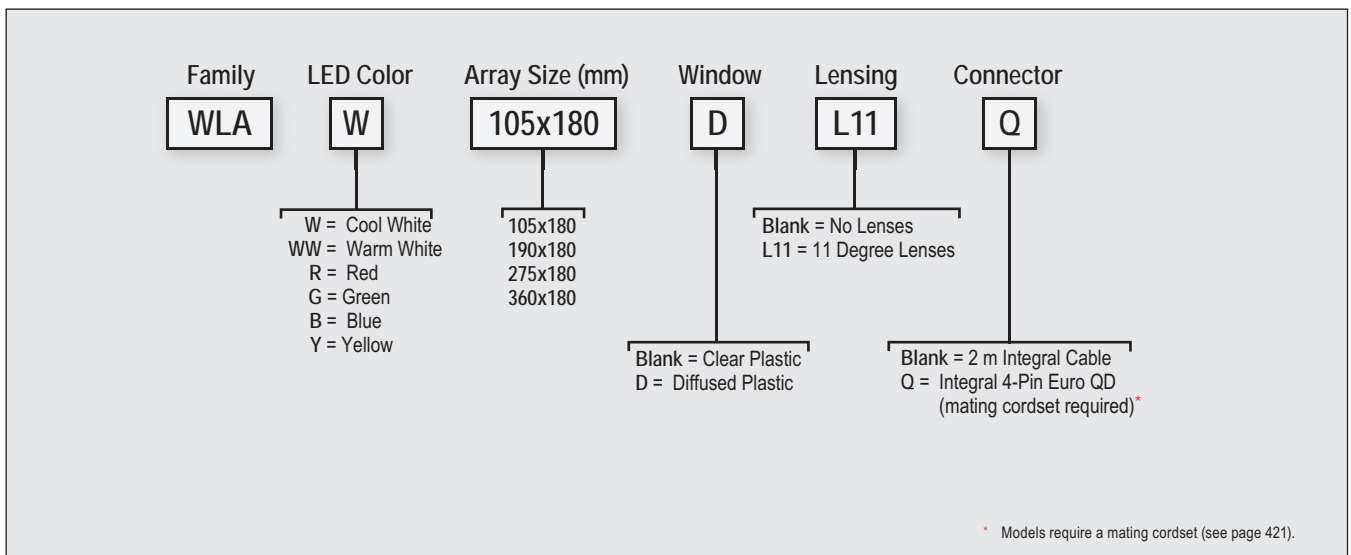


Non-Lensed
Models



Lensed
Models

Area Work Light WLA Model Key

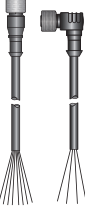


| WLA Specifications | | | | | | | | | | | |
|----------------------------|---|---------------------------|--------|--------|-------|------------|------------|-------|------|--------|------|
| Supply Voltage and Current | 12 to 30V dc (10% max. ripple) Max. current per length: | | | | | | | | | | |
| | | Lumens* (Typical @ 25° C) | | | | | | | | | |
| | Size | 12V dc | 24V dc | 30V dc | Watts | Cool White | Warm White | Green | Red | Yellow | Blue |
| | WLAW150X180 | 1.0A | 0.5A | 0.4A | 12 | 650 | 515 | 385 | 145 | 325 | 110 |
| | WLAW190X180 | 2.0A | 1.0A | 0.8A | 24 | 1300 | 1030 | 770 | 290 | 650 | 220 |
| WLAW275X180 | 3.0A | 1.5A | 1.2A | 36 | 1950 | 1545 | 1155 | 435 | 975 | 330 | |
| WLAW360X180 | 4.0A | 2.0A | 1.6A | 48 | 2600 | 2060 | 1540 | 580 | 1300 | 440 | |
| Light Characteristics | Color Temperature (CCT): Cool White: 5,000-8,300K, Warm White: 2,600-4,300K, Green: 520-535nm, Red: 620-630, Yellow: 585-595 , Blue: 460-475 nm | | | | | | | | | | |
| Useful Life | When operating within specifications, output will decrease less than 30% after 50,000 hours. | | | | | | | | | | |
| Construction | PBT housing; acrylic window, nickel-plated brass connector | | | | | | | | | | |
| Environmental Rating | IP69K, IP67 | | | | | | | | | | |
| Operating Conditions | Temperature: -20° to +50° C Relative Humidity: 95% (non-condensing) Storage Temperature: -40° to +70° C | | | | | | | | | | |
| Certifications | CE | | | | | | | | | | |
| Wiring Diagrams | LI25 (p. 789) | | | | | | | | | | |

- Photoelectrics
- Sensors
- Fiber Optic
- Sensors
- Special Purpose
- Sensors
- Measurement &
- Inspection Sensors
- Vision
- Wireless
- Lighting &**
- Indicators**
- Safety
- Light Screens
- Safety
- Laser Scanners
- Safety Controllers
- & Modules
- Safety Two-Hand
- Control Modules
- Safety Interlock
- Switches
- Emergency Stop
- & Stop Control

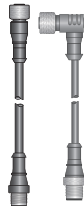
Cordsets

| Euro QD | | |
|--------------|----------------|-------------|
| See page 696 | | |
| | Threaded 4-Pin | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |




Additional cordset information available. See page 693.

| Euro QD-Double-Ended | | |
|----------------------|-------------------|----------------------|
| See page 698 | | |
| | Threaded 4-Pin | |
| Length | Straight/Straight | Straight/Right-Angle |
| 0.30 m | MQDEC-401SS | MQDEC-401RS |
| 0.91 m | MQDEC-403SS | MQDEC-403RS |
| 1.83 m | MQDEC-406SS | MQDEC-406RS |
| 3.66 m | MQDEC-412SS | MQDEC-412RS |
| 6.10 m | MQDEC-420SS | MQDEC-420RS |
| 9.14 m | MQDEC-430SS | MQDEC-430RS |
| 15.2 m | MQDEC-450SS | MQDEC-450RS |




| Euro QD-Splitter | | |
|------------------|----------------|-----------------|
| See page 698 | | |
| | Threaded 4-Pin | |
| Length | Threaded 4-Pin | |
| Branches | Trunk | Threaded 4-Pin |
| 0 m | 0 m | CSB-M1240M1240 |
| 0.30 m | 0 m | CSB-M1240M1241 |
| 0.30 m | 0.30 m | CSB-M1241M1241 |
| 0.30 m | 2.50 m | CSB-M1248M1241 |
| 0.30 m | 4.60 m | CSB-M12415M1241 |
| 0.03 m | 7.60 m | CSB-M12425M1241 |
| 0.03 m | 7.60 m | CSB-UNT425M1241 |





- TASK LIGHTS
- WLS28
- WLA
- WL50
- WL50S
- VISION LIGHTS
- INDICATORS
- ACTUATORS

Brackets

| WLA | |
|--|---|
|  |  |
| pg. 666 | |
| SMBBSSM | SMBBSRA |

Additional bracket information available. See page 632.

Magnetic Brackets

| WLA | | |
|---|------------|---|
| Four magnets, four m5 phillips head screws | SMBWLAMAG |  |
| Four rubber covers for use with SMBWLAMAG to prevent scratching | SMBWLAMAGR |  |

Work Lights WL50

- Compact industrial lighting for bright, even illumination where space is limited
- 50 mm white light for flat or 30 mm base mounting
- Standard or push-button models
- Robust IP69K (standard) or IP67 (push-button models) for use in wet and dirty environments
- Extremely long-lasting LED technology for greater than 50,000 hours of continuous working life
- Low power consumption; less than 2 watts
- Cabled or quick-disconnect models available
- Several mounting options available with low-profile, flat-pack design
- Ideal for lighting in wash-down and other rigorous industrial areas



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423



WL50F

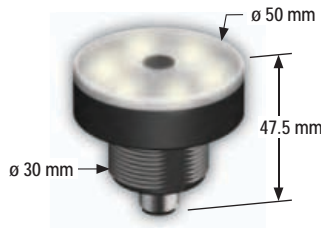


WL50F with Push Button

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AUTOCAD, STEP,
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WL50



WL50 with Push Button


Illuminators–WL50 Work Lights, 12 to 30V dc

| Description | | LED Color | Connection | Standard Models | Push-Button Models |
|---|-------------|-----------|---------------|-----------------|--------------------|
|  | Flat mount† | White | 2 m | WL50F | WL50FPB |
| | | | 4-pin Euro QD | WL50FQ | WL50FPBQ |
|  | 30 mm mount | | 2 m | WL50 | WL50PB |
| | | | 4-pin Euro QD | WL50Q | WL50PBQ |

Connection options: A model with a QD requires a mating cordset (see page 406).

For 9 m cable, add suffix W/30 to 2 m model number (example, WL50F W/30).
QD models: For a 4-pin 150 mm Euro-style pigtail QD, add suffix QP to 2 m model number (example, WL50FQP).

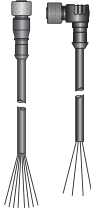
† Flat-mount models include a 48 mm circular velcro mounting kit and circular magnet for easy mounting with no additional hardware.


| WL50 Specifications | |
|------------------------|--|
| Supply Voltage | 12 to 30V dc (10% max. ripple) Max. current: 105 mA @ 12V dc; 55 mA @ 30V dc Max. input power: 1.7 watts |
| Light Characteristics | Color temperature (CCT): 5,000 to 10,000 K Color: Cool white Intensity (typical): 70 lumens; 50 lux @ 1 meter |
| Power-up Response Time | Light ON: 1 millisecond max. (models without push button) |
| Construction | Polycarbonate housing; Nickel-plated QD connector or PVC-jacketed cable |
| Environmental Rating | Standard models: IP69K per DIN 40050 Push-button models: IEC IP67 |
| Connections | Integral 4-pin Euro-style QD, 150 mm PVC pigtail with QD or 2 m integral cable, depending on model. QD cordsets are ordered separately. See page 423. |
| Operating Conditions | Temperature: -20° to +50° C Relative Humidity: 95% (non-condensing) Storage Temperature: -40° to +70° C |
| Application Note | Push-button models: When power is initially applied to the device, push the push button to turn the light on. If power to the device is interrupted the light will turn off and will remain off when power is restored. To turn light back on, push the push button. |
| Certification |  |
| Hookup Diagrams | L125 (p. 789) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control




Cordsets


| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |



 Additional cordset information available. See page 693.

Brackets

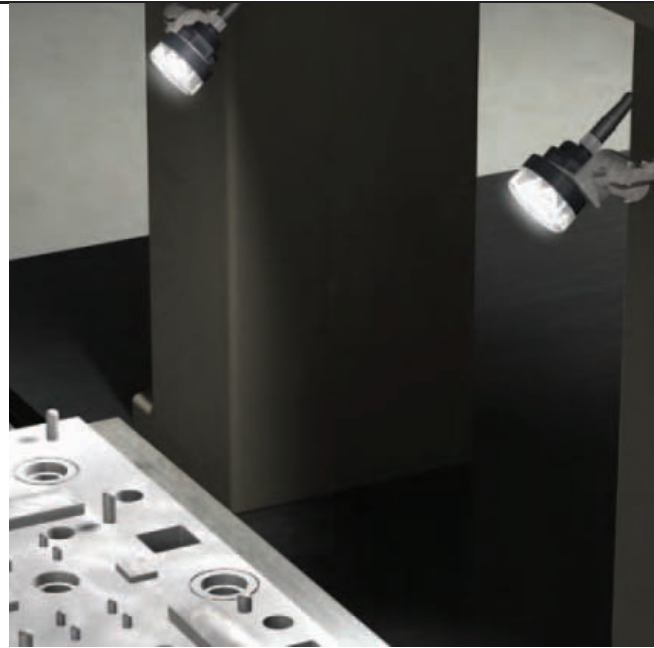
| WL50 | | |
|--|---|---|
|  pg. 653 SMB30A |  pg. 640 SMB30MM |  pg. 654 SMB30SC |

 Additional brackets and information available. See page 620.

- TASK LIGHTS
- WLS28
- WLA
- WL50**
- WL50S
- VISION LIGHTS
- INDICATORS
- ACTUATORS

Spot Work Lights WL50S

- Highly concentrated, focused light available in three colors
- Three high-intensity LED lights create impeccable illumination
- Lenses come in three angles to cover area of concentration
- Rugged sealed housing rated to IP69K
- Cabled and quick-disconnect models available
- 50 mm diameter with threaded profile and 30 mm mounting base

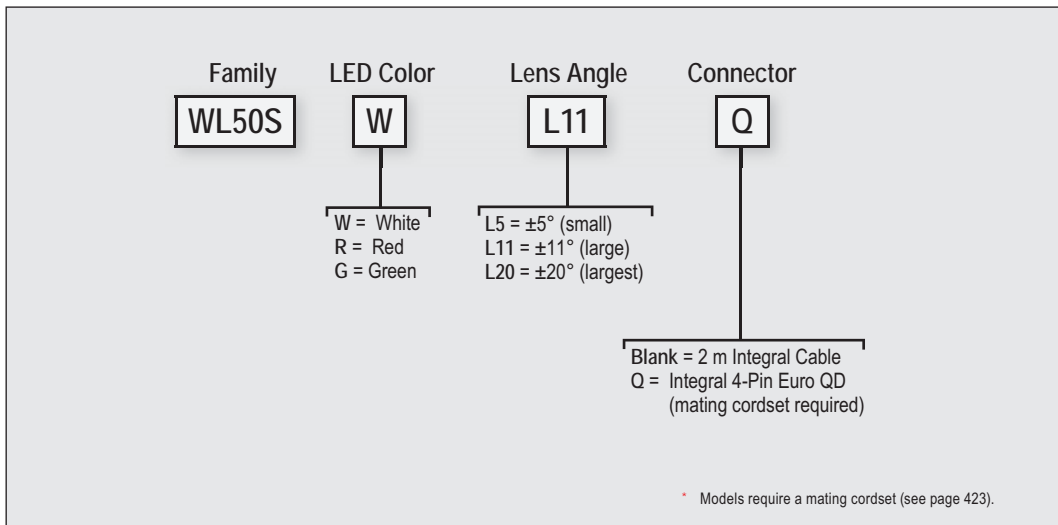


ACCESSORIES
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ONLINE
AUTOCAD, STEP,
IGES & PDF



Spot Work Light WL50S Model Key



WL50S Specifications

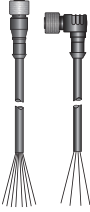
| | | | | |
|---|--|------------|-----------|---------------------------|
| Supply Voltage and Current | 12 to 30V dc, 400 mA max. | | | |
| Light Characteristics | Lens Angle | Model | LED Color | Lumens* (Typical @ 25° C) |
| | ±5° (smaller, more focused spot) | WL50SWL5Q | White | 295 |
| | | WL50SRL5Q | Red | 110 |
| | | WL50SGL5Q | Green | 210 |
| | ±11° (larger spot) | WL50SWL11Q | White | 285 |
| | | WL50SRL11Q | Red | 105 |
| | | WL50SGL11Q | Green | 200 |
| | ±20° (largest spot) | WL50SWL20Q | White | 270 |
| | | WL50SRL20Q | Red | 100 |
| | | WL50SGL20Q | Green | 190 |
| Color Temperature (CCT): White: 5,000-8,300 K, Red: 620-630 nm, Green: 520-535 nm | | | | |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages | | | |
| Construction | Black anodized aluminum housing; polycarbonate window; nickel-plated QD connector or PVC-jacketed cable; black zinc-plated steel mounting nut | | | |
| Useful Life | When operating within specifications, output will decrease less than 30% after 50,000 hours | | | |
| Connections | Integral 5-pin M12/Euro style QD or 2 m (6.5') integral cable, depending on model; 4-pin connecting cordset required for QD models; only 2 wires used | | | |
| Operating Conditions | Temperature: -20° to +50° C Relative Humidity: 95% (non-condensing) Storage Temperature: -40° to +70° C | | | |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration, half sine wave. | | | |
| Certification |  | | | |
| Hookup Diagrams | LI25 (p. 789) | | | |


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
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- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- TASK LIGHTS**
- WL528
- WLA
- WL50
- WL50S**
- VISION LIGHTS
- INDICATORS
- ACTUATORS





Cordsets


| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |



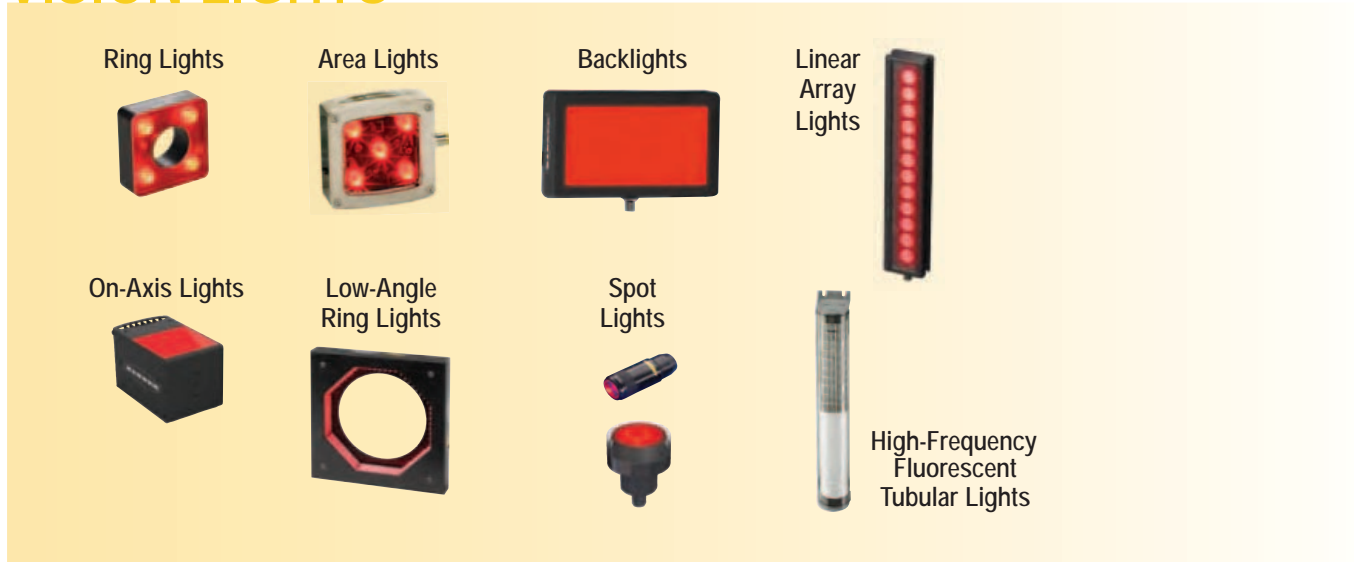
 Additional cordset information available. See page 693.

Brackets

| WL50S | | | |
|---|---|---|---|
|  |  |  |  |
| pg. 653 | pg. 640 | pg. 654 | pg. 661 |
| SMB30A | SMB30FA | SMB30SC | SMBAMS30P |

 Additional brackets and information available. See page "Banner Bracket Selection Chart" on page 632.

VISION LIGHTS



Vision Lighting

- Hundreds of lighting solutions and accessories—the most by any single source
- Robust solutions rated to IP68/NEMA 4X
- LEDs for up to 50,000+ hours of maintenance-free illumination
- Internal self-regulation for consistent illumination
- Built-in universal strobe control

page 427

- A comprehensive selection of lighting accessories
- A complete offering of sizes and colors, including:
 - Ring Lights
 - Area Lights
 - Backlights
 - Linear Array Lights
 - On-Axis Lights
 - Low-Angle Ring Lights
 - Spot Lights
 - Tubular Fluorescent Lights
 - Structured Lights

Vision Lighting

Critical Role in Successful Vision Sensing

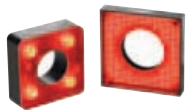
No matter how powerful or robust a sensor is, successfully solving a challenging vision applications depends on the fit between the particular vision application and the appropriate lighting. A properly chosen light can guarantee constant, consistent light conditions and can be used to maximize the contrast in an image. The correct light will highlight the features under inspection, disregard background objects and overpower any ambient light in the mix.

Banner offers a wide selection of high-intensity LED lights with built-in current and strobe control. A variety of specialty lights are available, including fluorescent lights. A complete selection of polarizing filter kits, colored filters and lighting diffusers are offered to improve lighting quality.

As the innovative leader with more than 40 years of sensor development, Banner understands the challenges of the factory floor. Banner has over 3,000 factory and field representatives worldwide, as well as the largest force of application engineers in the industry. Banner's engineers solve thousands of the most challenging applications every year. Banner offers one of the industry's most extensive selections of vision lighting solutions and continues its commitment to provide quality solutions for a variety of sensing needs.



- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



Ring Lights page 430
Mounts directly to the sensor for easy setup and illuminates any object directly in front of the sensor



Area Lights page 432
Provides even illumination in a concentrated area



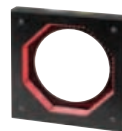
Backlights page 434
Installs behind the target, directly facing the sensor; has a highly diffused surface and uniform brightness



Linear Array Lights page 435
Provides high-intensity illumination of large areas, at long distances



On-Axis Lights page 436
Provides collimated illumination along the same optical path as camera



Low-Angle Ring Lights page 436
Illuminates nearly perpendicular to the direction of an inspection



Spot Lights page 437
Provides even illumination in a small concentrated spot



Tubular Fluorescent Lights page 438
Features flicker-free high-intensity illumination of large areas



Structured Lights page 438
Uses Class 2 laser line for 3-dimensional sensing

- TASK LIGHTS
- VISION LIGHTS**
- Ring Lights
- Area Lights
- Backlights
- Linear Array Lights
- On-Axis Lights
- Low-Angle Ring Lights
- Spot Lights
- Tubular Fluorescent Lights
- Structured Lights
- INDICATORS
- ACTUATORS

| | | 62 x 62 & 80 x 80 mm LED Ring Lights | 70 mm High-Intensity LED Ring Lights | 62 x 62 & 80 x 80 mm LED Area Lights | 70 mm High-Intensity LED Area Lights | 70 x 70 & 85 x 220 mm LED Backlights | | |
|---|--------------------------------|--------------------------------------|--|--|--|--|---|--|
| Page | | 430 | 430 | 432 | 432 | 434 | | |
| Color (wavelength) | Red | 630 nm | 620-630 nm | 62 x 62 mm: 630 nm 80 x 80 mm: 660 nm | 620-630 nm | 660 nm | | |
| | White | 5500 K | 5000-8300 K | 5500 K | 5000-8300 K | — | | |
| | Blue | 464 - 475 nm | 465-485 nm | 62 x 62 mm: 464-475 nm 80 x 80 mm: 470 nm | 465-485 nm | — | | |
| | Green | 520 - 540 nm | 520-535 nm | 62 x 62 mm: 520-540 nm 80 x 80 mm: 525 nm | 520-535 nm | — | | |
| | Infrared | 940 nm | 850 nm | 62 x 62 mm: 940 nm 80 x 80 mm: 850 nm | 850 nm | 940 nm | | |
| | Ultraviolet | — | 395 nm | — | 365 nm 395 nm | — | | |
| Supply Voltage & Current | Operating Voltage | 24V dc ± 10% | 24V dc ± 10% | 24V dc ± 10% | 24V dc ± 10% | 24V dc ± 10% | | |
| | Strobe Voltage | 5-24V dc (Active Low) | 5-24V dc (Active High or Low) | 5-24V dc (Active Low) | 5-24V dc (Active High or Low) | 5-24V dc (Active Low) | | |
| | Current draw at Full Intensity | Infrared | 62 x 62 mm: @ 100 mA max 80 x 80 mm: @ 180 mA max | 350 mA max | 62 x 62 mm: @ 150 mA max 80 x 80 mm: @ 250 mA max | 350 mA max | 70 x 70 mm: @ 250 mA max 85 x 220 mm: @ 500 mA max | |
| | | All others | 62 x 62 mm: @ 130 mA max 80 x 80 mm: @ 250 mA max | | 62 x 62 mm: @ 200 mA max 80 x 80 mm: @ 250 mA max | | | |
| Construction | Housing | Steel with black zinc plating | Black anodized aluminum | Steel with black zinc plating | Black Anodized Aluminum Nickel-plated aluminum or 316 Stainless Steel | Steel with black zinc plating | | |
| | Window | Clear Acrylic | Clear Diffused Acrylic | Clear Acrylic | Clear Diffused Acrylic Clear Acrylic, Clear Glass or Clear Diffused Acrylic | White Acrylic | | |
| | Rating | IP20; NEMA 1 | IP50; NEMA 2 | IP40; NEMA 1 | IP50; NEMA 2 IP68; NEMA 4X | IP40; NEMA 1 | | |
| Connection | Model number suffix | M* | 0.3 m 3-pin pigtail Pico QD | 0.3 m 3-pin pigtail Pico QD | 2 m 3-pin pigtail Pico QD | 2 m 3-pin pigtail Pico QD — | 2 m 3-pin pigtail Pico QD | |
| | | W or Q* | 2 m or 9 m 3-conductor attached cable with flying leads | 5-pin 0.15 m pigtail Euro QD | 2 m or 9 m 3-conductor attached cable with flying leads | 0.15 m 5-pin pigtail Euro QD 5-pin Integral Euro QD | 2 m or 9 m 3-conductor attached cable with flying leads | |
| Useful Life (LED ON time) Hours (Strobing will increase life) | | 20,000 | Visible, IR: 50,000 UV: 20,000 | 20,000 | Visible, IR: 50,000 UV: 20,000 | 20,000 | | |
| Operating Temperature | | 0° to +50° C | 0° to +50° C | 0° to +50° C | 0° to +50° C | 0° to +50° C | | |
| Effective Range (at Full Intensity) | Minimum (Clear) | — | — | — | 10" | — | | |
| | Maximum (Clear) | — | — | — | 10' | — | | |
| | Minimum (Clear Diffuse) | 3" | 6" | 3" | 5" | — | | |
| | Maximum (Clear Diffuse) | 62 mm: 12" 80 mm: 20" | 4' | 62 mm: 12" 80 mm: 20" | 4' | — | | |

* Suffix M, W or Q added to model number denotes connection type.

** Clear window model light patterns are slightly more intense and smaller than diffuse models.

† IP68-rated models are only available in lengths of 290, 435 and 580 mm.

| 75x150, 150x150, 225x150 & 300x150 mm LED Backlights | 145, 290, 435, 580, 870 & 1160 mm LED Linear Array Lights† | 50 & 100 mm LED On-Axis Lights | 150 mm LED Low-Angle Ring Lights | LED Spot Lights | High-Frequency Fluorescent Tubular Lights |
|---|---|--|---|--|---|
| 434 | 435 | 436 | 436 | 437 | 438 |
| 633 nm | 620-630 nm | 630 nm | 640 nm | 620-630 nm | — |
| 6500 K | 5000-8300 K | 5500 K | — | 5000-8300 K | 4100 K†† |
| 469 nm | 465-485 nm | 470 nm | — | 465-485 nm | — |
| 525 nm | 520-535 nm | 530 nm | — | 520-535 nm | — |
| 850 nm | 850 nm | 880 nm | 880 nm | High: 850 | — |
| — | 365 nm 395 nm | — | — | High: 395 | — |
| 24V dc ± 10% | IP50: 24V dc ± 10% IP68: 24V dc ± 10% | 24V dc ± 10% | 24V dc ± 10% | Normal: 10-30V dc High: 12-30V dc | 24V dc, 110V ac, 220V ac or 120/277V ac |
| 5-24V dc (Active High or Low) | 5-24V dc (Active High or Low) | 5-24V dc (Active Low) | 5-24V dc (Active Low) | Normal: 5-24V dc (Low) High: 5-30V dc(High or low) | — |
| 75 x 150 mm: @ 550 mA 150 x 150 mm: @ 1.1 A 225 x 150 mm: @ 1.65 A 300 x 150 mm: @ 2.2 A | 145 mm: @ 0.5 A max 290 mm: @ 1 A max 485 mm: @ 1.5 A max 580 mm: @ 2 A max 870 mm: @ 3 A max 1160 mm: @ 4 A max | 500 mA max. | 350 mA max 500 mA max | Normal: 360 mA max High: 400 mA max | 120V ac @ 0.15-0.26 A or 277V ac @ 0.07-0.11 A (Depending on bulb size/wattage) |
| Black Valox Plastic | Black Anodized Aluminum Nickel-plated aluminum or 316 Stainless Steel | Black anodized aluminum | Black anodized aluminum | Black anodized aluminum | Acrylic |
| White Acrylic | Clear Acrylic, Clear Glass or Clear Diffused Acrylic | Optical Glass with anti-reflective coating | — | Normal: Glass Lens High: Clear acrylic | Clear Acrylic Tube |
| IP67, NEMA 6 | IP50; NEMA 2 IP68; NEMA 4X | IP40; NEMA 1 | IP0; NEMA 0 | Normal: IP68; NEMA 4X High: IP67; IP69K | IP68; NEMA 4X |
| — | — | 0.6 m 3-pin pigtail Pico QD | 2 m 3-pin pigtail Pico QD | Normal: 2 m 3-pin pigtail Pico QD | — |
| 5-pin integral Euro QD | 5-pin Integral Euro QD | — | 2 m or 9 m 3-conductor attached cable with flying leads | Normal: 2 or 9 m 3-conductor cable with flying leads High: 5-pin Integral Euro QD | 2.5 m attached cable (unterminated or wall plug) |
| Green, White, Blue: 90,000 Red, Infrared: 100,000 | Visible, IR: 50,000 UV: 20,000 | 20,000 | 20,000 | Visible, IR: 50,000 UV: 20,000 | — |
| 0° to +50° C | 0° to +50° C | 0° to +50° C | 0° to +50° C | Normal: -40° to +50° C High: -20° to +50° C | -18 ° to +40 ° C |
| — | 9" | — | — | 0" | — |
| — | 20' ** | — | — | Normal: 18" | — |
| — | 6" | — | — | — | — |
| — | 7' ** | — | — | — | — |

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Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

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VISION LIGHTS

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On-Axis Lights
Low-Angle Ring Lights
Spot Lights
Tubular Fluorescent Lights
Structured Lights

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ACTUATORS

†† Color wavelength for ultraviolet(UVA) models is 350-400 nm.

Ring Lights

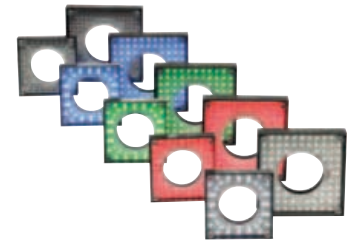
A ring light provides direct illumination over a small area. With the lens axis through the center opening of the ring light assembly, the ring light illuminates the area directly in front of the camera.

- Connects directly to *PresencePLUS* vision sensors or an external power supply
- Brightly illuminates small objects
- Mounts directly to the camera and centers the light on the image
- Includes models to withstand washdown environments (IP68 rated)



LED Ring Lights (IP20), 24V dc

| | Pro Models [†] | | Pro Mini Camera [†] | P4 Models [†] | |
|------------|-------------------------|-------------|------------------------------|---------------------------------------|-------------|
| | 80 x 80 mm | 62 x 62 mm | 62 x 62 mm | 80 x 80 mm | 62 x 62 mm |
| Connection | 2 m | | | 0.3 m Threaded 3-pin Pico Pigtail QD* | |
| Red | LEDRR80X80W | LEDRR62X62W | LEDRRM62X62W | LEDRR80X80M | LEDRR62X62M |
| White | LEDWR80X80W | LEDWR62X62W | LEDWRM62X62W | LEDWR80X80M | LEDWR62X62M |
| Blue | LEDBR80X80W | LEDBR62X62W | LEDBRM62X62W | LEDBR80X80M | LEDBR62X62M |
| Green | LEDGR80X80W | LEDGR62X62W | LEDGRM62X62W | LEDGR80X80M | LEDGR62X62M |
| Infrared | LEDIR80X80W | LEDIR62X62W | LEDIRM62X62W | LEDIR80X80M | LEDIR62X62M |



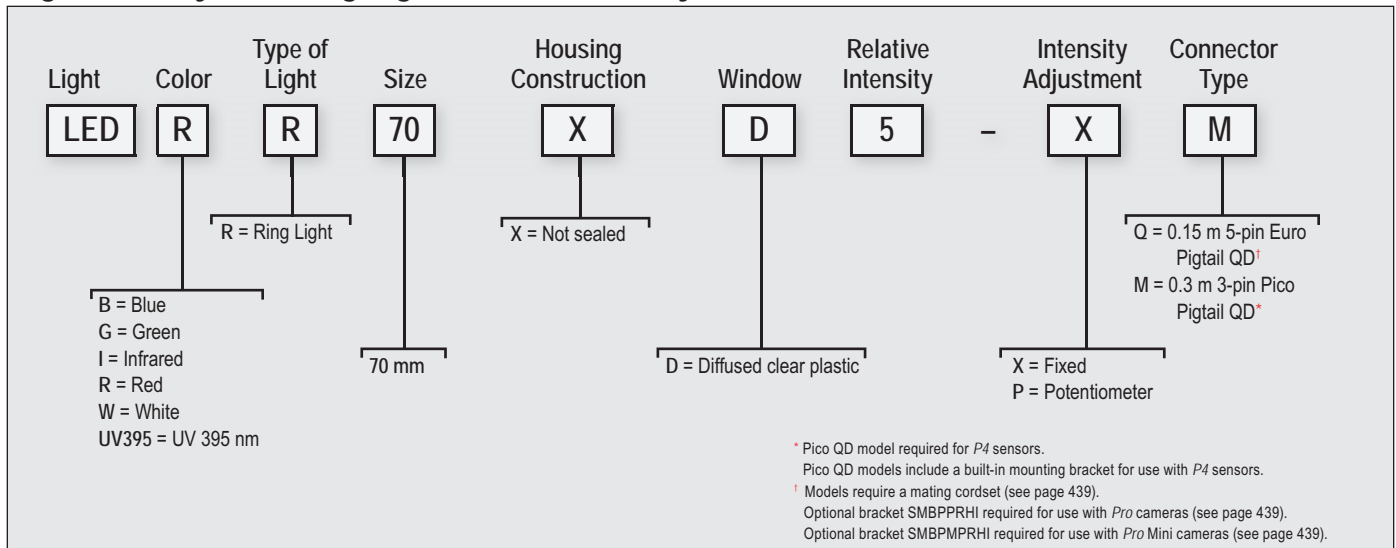
Connection options:

For 9 m cable, add suffix W/30 to the 2 m model number (example, LEDRR80X80W W/30).
 * Splitter cordsets available for powering two lights (see page 439).

[†] For replacement windows and diffusers (see page 439).



High-Intensity LED Ring Light (IP50) Model Key, 24V dc





Sealed Pro LED Ring Lights (IP68), 24V dc



| Color | Housing | Connection | 90 mm Diameter Models† | |
|----------|------------------------|---------------|------------------------|----------------|
| | | | Glass Window | Plastic Window |
| Red | Nickel-plated Aluminum | 3-pin Pico QD | LEDRR90S-G | LEDRR90S-P |
| | Stainless Steel | | LEDRR90SS-G | LEDRR90SS-P |
| White | Nickel-plated Aluminum | | LEDWR90S-G | LEDWR90S-P |
| | Stainless Steel | | LEDWR90SS-G | LEDWR90SS-P |
| Blue | Nickel-plated Aluminum | | LEDBR90S-G | LEDBR90S-P |
| | Stainless Steel | | LEDBR90SS-G | LEDBR90SS-P |
| Green | Nickel-plated Aluminum | | LEDGR90S-G | LEDGR90S-P |
| | Stainless Steel | | LEDGR90SS-G | LEDGR90SS-P |
| Infrared | Nickel-plated Aluminum | | LEDIR90S-G | LEDIR90S-P |
| | Stainless Steel | | LEDIR90SS-G | LEDIR90SS-P |

Connection options: Models requires a mating cordset (see page 439).

† Windows are factory replaceable, contact factory at 1-888-373-6767.

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Linear Array Lights

On-Axis Lights

Low-Angle Ring Lights

Spot Lights

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Structured Lights

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Area Lights

An area light provides even illumination in a concentrated area. When properly placed area lights can create shadows and glare, allowing the vision sensor to detect the presence or absence of a feature.

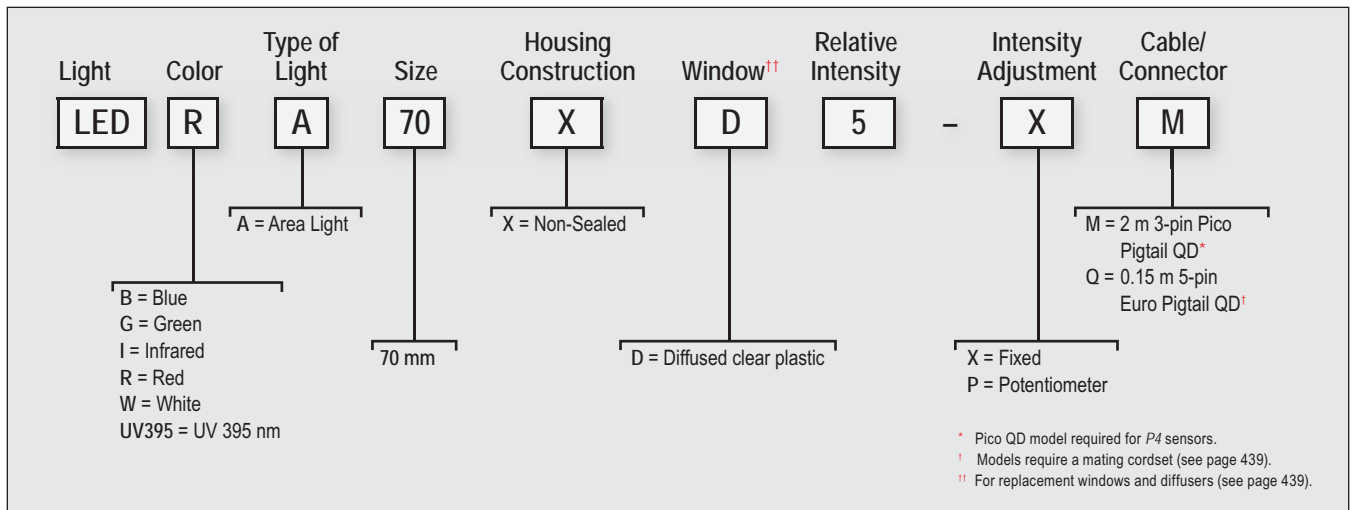
- Creates shadows to detect changes in depth, depending on mounting
- High-intensity lighting for distances greater than 12 inches



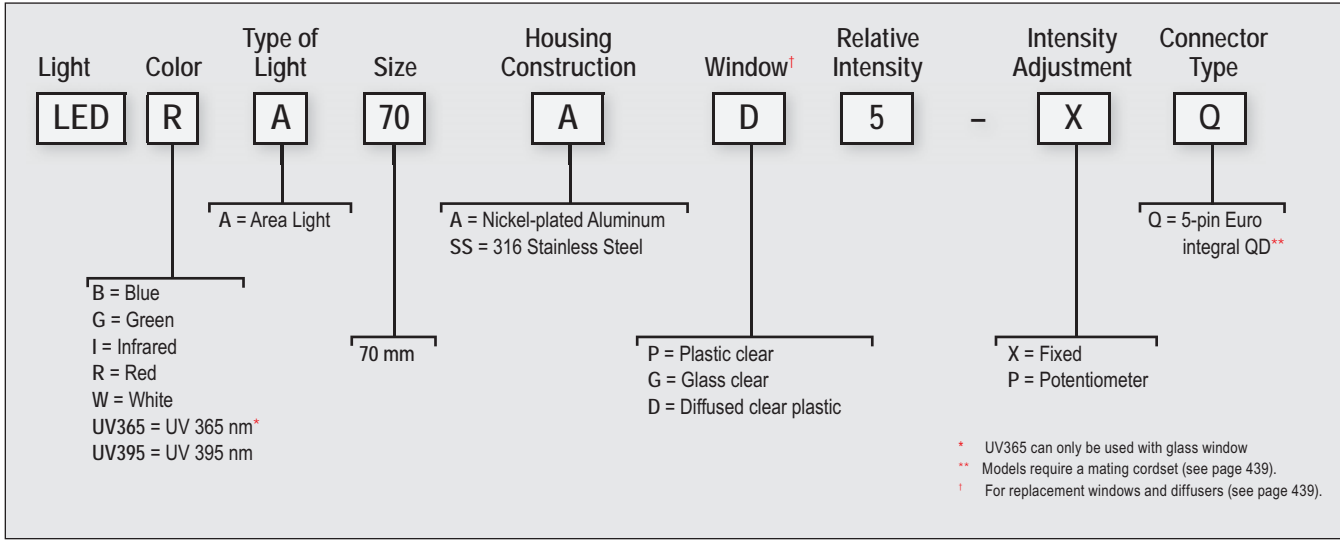
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High-Intensity LED Area Light (IP50) Model Key, 24V dc



Sealed High-Intensity LED Area Light (IP68) Model Key, 24V dc



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LED Area Lights (IP40), 24V dc

| Color | Connection | Models ^{††} | |
|----------|------------------------------------|----------------------|-------------|
| | | 80 x 80 mm | 62 x 62 mm |
| Red | 2 m | LEDRA80X80W | LEDRA62X62W |
| | 2 m Threaded 3-pin Pico Pigtail QD | LEDRA80X80M | LEDRA62X62M |
| White | 2 m | LEDWA80X80W | LEDWA62X62W |
| | 2 m Threaded 3-pin Pico Pigtail QD | LEDWA80X80M | LEDWA62X62M |
| Blue | 2 m | LEDBA80X80W | LEDBA62X62W |
| | 2 m Threaded 3-pin Pico Pigtail QD | LEDBA80X80M | LEDBA62X62M |
| Green | 2 m | LEDGA80X80W | LEDGA62X62W |
| | 2 m Threaded 3-pin Pico Pigtail QD | LEDGA80X80M | LEDGA62X62M |
| Infrared | 2 m | LEDIA80X80W | LEDIA62X62W |
| | 2 m Threaded 3-pin Pico Pigtail QD | LEDIA80X80M | LEDIA62X62M |



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Connection options:

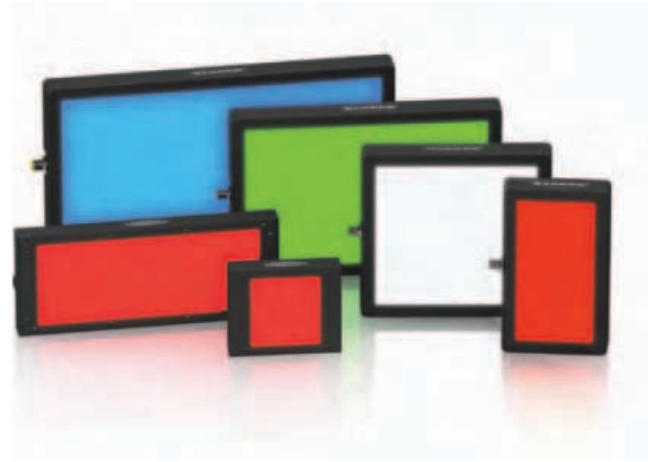
For 9 m cable, add suffix W/30 to the 2 m model number (example, LEDRA80X80W W/30).
 QD models can be connected directly to P4 sensors; splitter cordset available for powering two lights (see page 439).

†† For replacement windows and diffusers (see page 439).

Backlights

A backlight provides even bright lighting by placing the backlight behind the target and aiming it directly towards the camera. The resulting silhouette can be inspected for proper size and shape.

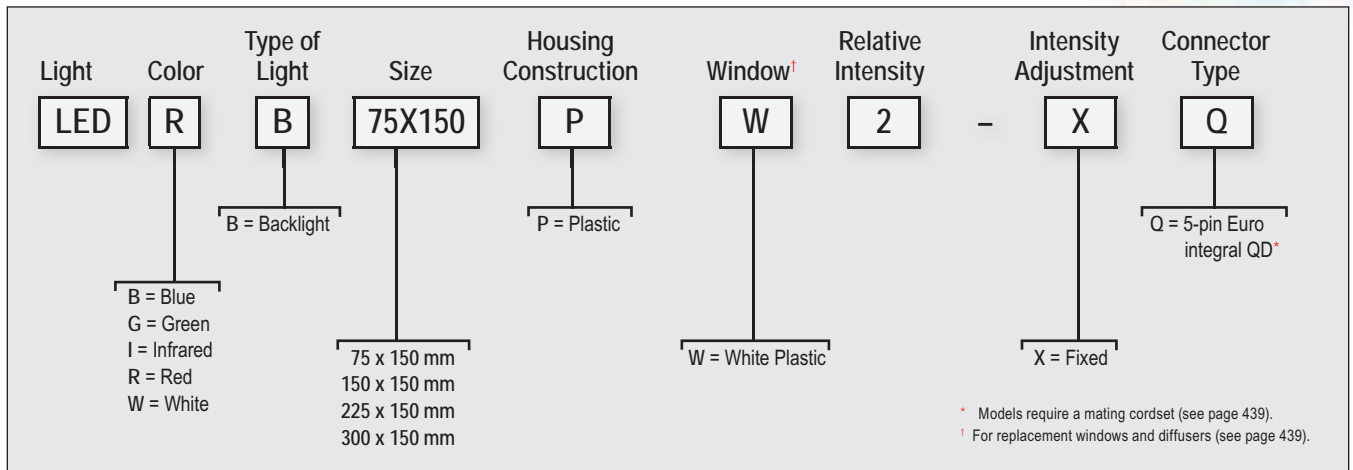
- Determines the shape and size of target objects
- Offers a highly diffused surface and uniform brightness, with lower intensity than other lights
- Provides the most robust lighting for measuring and gauging
- Highlights through-holes in target objects



Sealed LED Backlights (IP67) Model Key, 24V dc



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LED Backlights (IP40), 24V dc



| Color | Connection | Models [†] | |
|----------|------------------------------------|---------------------|-------------|
| | | 70 x 70 mm | 85 x 220 mm |
| Red | 2 m | LED70X70W | LED85X220W |
| | 2 m Threaded 3-pin Pico Pigtail QD | LED70X70M | LED85X220M |
| Infrared | 2 m | LED70X70W | LED85X220W |
| | 2 m Threaded 3-pin Pico Pigtail QD | LED70X70M | LED85X220M |

Connection options:

For 9 m cable, add suffix W/30 to the 2 m model number (example, LED70X70W W/30).
QD models can be connected directly to P4 sensors; splitter cordsets available for powering two lights (see page 439).

[†] For replacement windows and diffusers (see page 439).



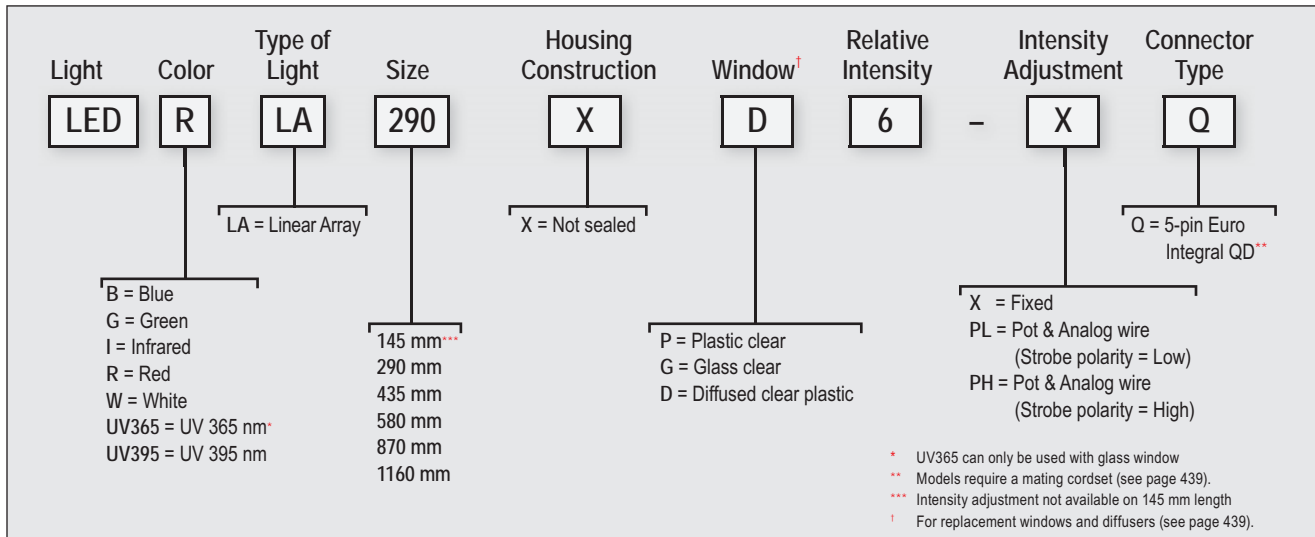
Linear Array Lights

Linear array lights provide high-intensity illumination of large areas, and for long distances. Available in 3 housings including: nickel-plated aluminum (IP68), stainless steel (IP68) and black anodized aluminum (IP50).

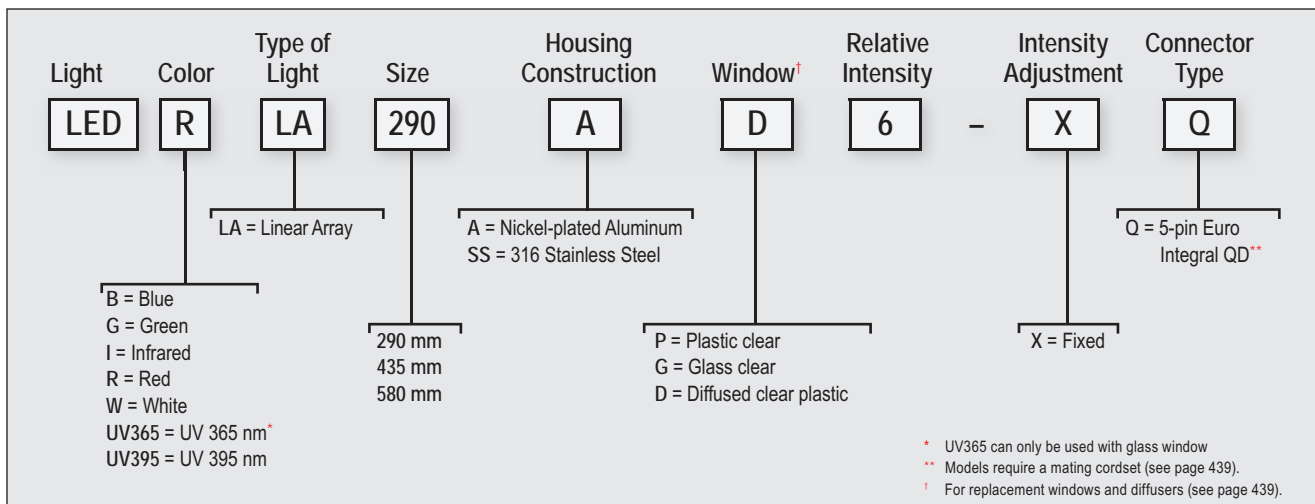
- Provides maintenance-free LED illumination of large objects from far away
- Provides superior high-intensity illumination of large areas
- Available in sealed (IP68) nickel-plated and non-sealed (IP50) housings
- Provides optically isolated strobe signal



High-Intensity LED Linear Array (IP50) Model Key, 24V dc



High-Intensity LED Linear Array (IP68) Model Key, 24V dc

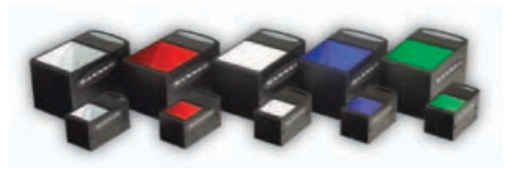


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On-Axis Lights

On-axis lighting provides even, diffused illumination. A beam splitter directs the light rays along the same axis as the camera lens. Reflective surfaces perpendicular to the camera appear bright. Surfaces at an angle to the camera and non-reflective surfaces appear dark.



- Provides more uniform illumination than a ring light
- Delivers collimated illumination in the same optical path as camera
- Evenly illuminates flat reflective surfaces
- Provides minimum useful life of 10,000 to 60,000 hours, depending on model

LED On-Axis (IP40) Lights, 24V dc

| Color | Connection | Models [†] | |
|----------|--------------------------------------|---------------------|------------|
| | | 100 x 100 mm | 50 x 50 mm |
| Red | 0.6 m Threaded 3-pin Pico Pigtail QD | LEDRO100M | LEDRO50M |
| White | | LEDWO100M | LEDWO50M |
| Blue | | LEDBO100M | LEDBO50M |
| Green | | LEDGO100M | LEDGO50M |
| Infrared | | LEDIO100M | LEDIO50M |

Connection options:

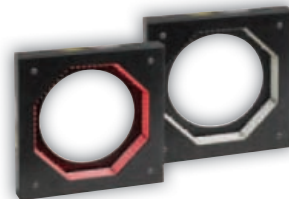
QD cordsets with flying leads are available for connecting to models other than P4 (see page 439).

† For models with dust cover, add suffix -D to model number (example, LEDRO100M-D).

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Low-Angle Ring Lights

Low-angle lighting enhances the contrast of surface features. The low-angle light is aimed nearly perpendicular to the imaged surface of the target object so that it can highlight changes in elevation.



- Highlights surface irregularities
- Highlights slight height differences such as etching, solder balls and embossing
- Illuminates from an angle nearly perpendicular to object
- Provides minimum useful life of 10,000 to 60,000 hours, depending on model

LED Low-Angle Ring Lights, 24V dc

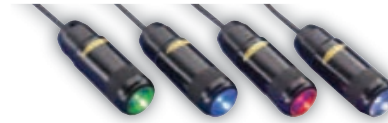
| Color | Connection | Size | Model |
|----------|------------------------------------|-------------|-------------|
| Red | 2 m | 150 mm dia. | LEDRI150-3W |
| | 2 m Threaded 3-pin Pico Pigtail QD | | LEDRI150-3M |
| Infrared | 2 m | 150 mm dia. | LEDII150-3W |
| | 2 m Threaded 3-pin Pico Pigtail QD | | LEDII150-3M |

Connection options:

For 9 m cable, add suffix W/30 to the 2 m model number (example, LEDRI150-3W W/30). QD models can be connected directly to P4 sensors.

Spot Lights

A spot light provides even light with high-powered LEDs. When properly placed, spotlights can create shadows and glare, allowing the vision sensor to detect the presence or absence of a feature.



- Provides off-axis illumination of small areas
- Provides extremely bright, even light with high-power LEDs
- Withstands washdown
- Delivers constant, even light intensity, even if voltage fluctuates

Sealed LED Spot Lights (IP68), 10 to 30V dc

| Color | Connection | Models |
|-------|------------------------------------|--------|
| | | 30 mm |
| Red | 2 m | LEDRSW |
| | 2 m Threaded 3-pin Pico Pigtail QD | LEDRSM |
| White | 2 m | LEDWSW |
| | 2 m Threaded 3-pin Pico Pigtail QD | LEDWSM |
| Blue | 2 m | LEDBSW |
| | 2 m Threaded 3-pin Pico Pigtail QD | LEDBSM |
| Green | 2 m | LEDGSW |
| | 2 m Threaded 3-pin Pico Pigtail QD | LEDGSM |

Connection options:

For 9 m cable, add suffix W/30 to the 2 m model number (example, LEDRSW W/30).
QD models can be connected directly to P4 sensors; splitter cordsets available for powering two lights (see page 439).

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Sealed High Intensity LED Spot Lights (IP69K), 12 to 30V dc



| Lens Angle | Color | Lumens | Lux | | Connection | Models |
|--------------------------------------|-------|--------|--------|-------------------|---|-------------------|
| | | | 0.5 m | 1 m | | |
| ± 5° (smaller, more focused spot) | Red | 110 | 8,000 | 2,000 | 5-pin Euro integral QD connector (use with a 5-wire mating cordset) | LEDRS50L5-XQ |
| | White | 295 | 13,780 | 3,445 | | LEDWS50L5-XQ |
| | Blue | 85 | 4,880 | 1,220 | | LEDBS50L5-XQ |
| | Green | 210 | 13,000 | 3,250 | | LEDGS50L5-XQ |
| | IR | 760* | 4.40** | 1.10** | | LEDIS50L5-XQ |
| | UV | 480* | 2.10** | 0.52** | | LEDUV395S50L5-XQ |
| ± 11° (larger spot) | Red | 105 | 2,500 | 625 | | LEDRS50L11-XQ |
| | White | 285 | 5,460 | 1,365 | | LEDWS50L11-XQ |
| | Blue | 80 | 1,540 | 385 | | LEDBS50L11-XQ |
| | Green | 200 | 3,900 | 975 | | LEDGS50L11-XQ |
| ± 14° (larger spot) | UV | 420* | 0.78** | 0.19** | | LEDGS50L11-XQ |
| ± 20° (largest spot) | IR | 665* | 1.16** | 0.29** | | LEDUV395S50L11-XQ |
| | Red | 100 | 1,040 | 260 | | LEDRS50L20-XQ |
| | White | 270 | 2,000 | 500 | | LEDWS50L20-XQ |
| | Blue | 75 | 700 | 175 | | LEDBS50L20-XQ |
| | Green | 190 | 1,700 | 425 | | LEDGS50L20-XQ |
| UV | 390* | 0.42** | 0.10** | LEDUV395S50L11-XQ | | |

Connection options: A model with a QD requires a mating cordset (see page 439).

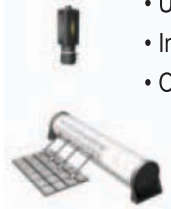
For 2 m cable, omit suffix XQ from model number (example, LEDRS50L5).

* Values listed in milliWatts
** Values listed in mW/cm²

High-Frequency Fluorescent Tubular Lights

Tubular fluorescent lights provide easy, affordable, flicker-free illumination of large objects.

- Illuminates large objects with flicker-free white fluorescent light
- Uses waterproof housing for wash-down environment – rated IP67; NEMA 4X
- Includes built-in mounting brackets in end caps
- Offers minimum useful life of 10,000 to 20,000 hours, depending on model



Sealed Fluorescent Tubular Lights (IP67)



| Length | Voltage | Ballast | Models | | |
|--------|----------------|-----------|----------------|-----------------------|-----------|
| | | | White (4100 K) | Black UV (350-400 nm) | |
| 8" | 24V dc | Integral | HFFW8DC | HFFB8DC | |
| 8" | 110V ac | | HFFW8AC110 | HFFB8AC110 | |
| 8" | 230V ac | | HFFW8AC230 | HFFB8AC230 | |
| 12" | 24V dc | | HFFW12DC | HFFB12DC | |
| 12" | 120 to 277V ac | | HFFW12AC | HFFB12AC | |
| 14" | 24V dc | | HFFW14DC | — | |
| 15" | 110V ac | | HFFW15AC110 | — | |
| 15" | 230V ac | | HFFW15AC230 | — | |
| 24" | 120 to 277V ac | | HFFW24AC | — | |
| 36" | 120 to 277V ac | | HFFW36AC | — | |
| 48" | 120 to 277V ac | | HFFW48AC | — | |
| 8" | 120 to 277V ac | | Remote | HFFW8ACR | HFFB8ACR |
| 12" | 120 to 277V ac | | | HFFW12ACR | HFFB12ACR |
| 15" | 120 to 277V ac | | | HFFW15ACR | — |
| 24" | 120 to 277V ac | HFFW24ACR | | — | |
| 36" | 120 to 277V ac | HFFW36ACR | | — | |
| 48" | 120 to 277V ac | HFFW48ACR | | — | |

NOTE: Replacement bulbs available, contact factory for information. All models have louvers and integral mounting flange; optional brackets are available for heavy-duty mounting (two brackets required for each light, see page 439).

Laser Emitters for Structured Illumination

- Provides high-contrast illumination
- Senses surface height differences
- Provides 3D inspection with a 2D camera



QS18 Laser Emitters, 10 to 30V dc

| Description | Connection | Model |
|--|------------|------------|
| Extra Bright Horizontal Line (Class 2) | 2 m | QS186LE212 |

Connection options:

For 9 m cable, add suffix W/30 to the 2 m model number (example, QS186LE212 W/30).

For more options including vertical and circle see page 91.

Cordsets

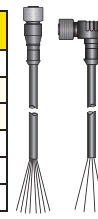
| Euro QD | | |
|----------------|-------------------|---------------------|
| See page 700 | | |
| Threaded 5-Pin | | |
| Length | Nickel-plated Nut | Stainless Steel Nut |
| 1.83 m | MQDC20-506 | MQDC20SS-506 |
| 4.57 m | MQDC20-515 | MQDC20SS-515 |
| 9.14 m | MQDC20-530 | MQDC20SS-530 |



| Pico QD | | |
|----------------|-------------------|---------------------|
| See page 693 | | |
| Threaded 3-Pin | | |
| Length | Nickel-plated Nut | Stainless Steel Nut |
| 4.00 m | — | PKG3M-4 |
| 5.00 m | PKG3M-5 | — |
| 7.00 m | PKG3M-7 | PKG3M-7 |
| 10.0 m | PKG3M-10 | PKG3M-10 |



| Euro QD | | |
|----------------|----------|-------------|
| See page 700 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-506 | MQDC-506RA |
| 4.57 m | MQDC-515 | MQDC-515RA |
| 9.14 m | MQDC-530 | MQDC-530RA |



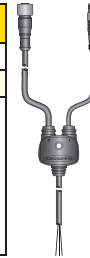
| Pico QD Splitter † | | |
|--------------------|----------------|--------------|
| See page 694 | | |
| Length | Threaded 3-Pin | |
| Branches | Trunk | Model |
| 0.20 m | 0.20 m | CSB-M831M831 |



Additional cordset information available. See page 693.

† Powers 2 lights from one P4 Sensor

| Pico QD Splitter †† | | |
|---------------------|--|---------------------|
| See page 694 | | |
| Length | Model | |
| Branches | Branch 1: 3-Pin Pico QD (0.3 m) Branch 2: 4-Pin Euro QD (0.3 m) | CSB-UNT213M831F1241 |
| Trunk | 4 m Flying Leads | |











†† Enables strobe signal from P4 while obtaining power from an external source

| Pico QD—Double-Ended | | |
|----------------------|----------------|--|
| See page 693 | | |
| Length | Threaded 3-Pin | |
| 0.35 m | PKG3M-35-PSG3M | |
| 2.00 m | PKG3M-2-PSG3M | |



Brackets

| Area Lights & Backlights | | | Linear Array | Ring Lights | On-Axis | | Tubular Lights |
|---|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |
| pg. 666 | pg. 660 | pg. 673 | pg. 668 | pg. 675 | pg. 674 | pg. 676 | pg. 690 |
| SMBBSSM | SMBACM | SMBP42ASM | SMBLASRA | SMBPMPRHI | SMBP4OAL... | SMBPPOAL... | SMBWFTLS |

Additional brackets and information available. See page 632.

Color Filters

| Description | Models |
|--|--------------|
| Polarizing filter kit for 62 x 62 Ring Lights | LEDRPFKS |
| Polarizing filter kit for 80 x 80 Area Lights and 70 x 70 Backlights | LEDAPFK |
| Polarizing filter kit for 62 x 62 Area Lights | LEDAPFKS |
| Polarizing filter kit for Sealed Ring Lights | LEDRPFK90 |
| Kit with a variety of filters, diffusers and window replacements | LEDFLTK |
| Polarizing filter kit for 290 mm Linear Array Lights (IP68) | LEDLAPFK290S |
| Polarizing filter kit for 580 mm Linear Array Lights (IP68) | LEDLAPFK580S |
| Polarizing filter kit for 145 mm Linear Array Lights (IP50) | LEDLAPFK145 |
| Polarizing filter kit for 290 mm Linear Array Lights (IP50) | LEDLAPFK290 |
| Polarizing filter kit for 435 mm Linear Array Lights (IP50) | LEDLAPFK435 |
| Polarizing filter kit for 580 mm Linear Array Lights (IP50) | LEDLAPFK580 |
| Polarizing filter kit for 870 mm Linear Array Lights (IP50) | LEDLAPFK870 |
| Polarizing filter kit for 1160 mm Linear Array Lights (IP50) | LEDLAPFK1160 |
| Polarizing filter kit for 70 mm High-Intensity Area Lights | LEDAPFK70 |
| Polarizing filter kit for 70 mm High-Intensity Ring Lights | LEDRPFK70 |
| Polarizing filter kit for 70 mm IP68 High-Intensity Area Lights | LEDAPFK70S |

Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors

Vision

Wireless

Lighting &
Indicators

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers
& Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop
& Stop Control

TASK LIGHTS

VISION LIGHTS

Ring Lights

Area Lights

Backlights

Linear Array Lights

On-Axis Lights

Low-Angle Ring Lights

Spot Lights

Tubular
Fluorescent Lights

Structured Lights

INDICATORS

ACTUATORS

Window Replacements and Lighting Diffusers

| Use With | Models |
|--|-----------------|
| Clear Plastic | |
| 62 x 62 mm Ring Lights | LEDRCS |
| 80 x 80 mm Ring Lights | LEDRCW |
| 62 x 62 mm Area Lights | LEDAWS |
| 80 x 80 mm Area Lights | LEDAW |
| 70 mm Sealed High-Intensity Area Lights | LEDA70SW-P |
| 145 mm IP50 Linear Array Lights | LEDLA145XW-P |
| 290 mm IP50 Linear Array Lights | LEDLA290XW-P |
| 290 mm Sealed IP68 Linear Array Lights | LEDLA290SW-P |
| 435 mm IP50 Linear Array Lights | LEDLA435XW-P |
| 435 mm Sealed IP68 Linear Array Lights | LEDLA435SW-P |
| 580 mm IP50 Linear Array Lights | LEDLA580XW-P |
| 580 mm Sealed IP68 Linear Array Lights | LEDLA580SW-P |
| 870 mm Sealed IP50 Linear Array Lights | LEDLA870XW-P |
| 1160 mm IP50 Linear Array Lights | LEDLA1160XW-P |
| Clear Plastic Diffuse | |
| 80 x 80 mm Ring Lights | LEDRCDW |
| 62 x 62 mm Right Lights | LEDRCDWS |
| 70 mm High-Intensity Ring Lights | LEDR70CDW |
| 70 mm High-Intensity Area Lights | LEDA70CDW |
| 70 mm Sealed IP68 High-Intensity Area Lights | LEDA70SCDW-P |
| 145 mm IP50 Linear Array Lights | LEDLA145XCDW-P |
| 290 mm IP50 Linear Array Lights | LEDLA290XCDW-P |
| 290 mm Sealed IP68 Linear Array Lights | LEDLA290SCDW-P |
| 435 mm IP50 Linear Array Lights | LEDLA435XCDW-P |
| 435 mm Sealed IP68 Linear Array Lights | LEDLA435SCDW-P |
| 580 mm IP50 Linear Array Lights | LEDLA580XCDW-P |
| 580 mm Sealed IP68 Linear Array Lights | LEDLA580SCDW-P |
| 870 mm IP50 Linear Array Lights | LEDLA870XCDW-P |
| 1160 mm IP50 Linear Array Lights | LEDLA1160XCDW-P |
| Clear Glass | |
| 70 mm Sealed IP68 High-Intensity Area Lights | LEDA70SW-G |
| 145 mm IP50 Linear Array Lights | LEDLA145XW-G |
| 290 mm IP50 Linear Array Lights | LEDLA290XW-G |
| 290 mm Sealed IP68 Linear Array Lights | LEDLA290SW-G |
| 435 mm IP50 Linear Array Lights | LEDLA435XW-G |
| 435 mm Sealed IP68 Linear Array Lights | LEDLA435SW-G |
| 580 mm IP50 Linear Array Lights | LEDLA580XW-G |
| 580 mm Sealed IP68 Linear Array Lights | LEDLA580SW-G |
| 870 mm IP50 Linear Array Lights | LEDLA870XW-G |
| 1160 mm IP50 Linear Array Lights | LEDLA1160XW-G |

| Use With | Models |
|---|-----------------|
| White Plastic | |
| 70 x 70 mm Red Backlights | LEDBW |
| 70 x 70 mm Infrared Backlights | LEDBIW |
| 85 x 220 mm Red Backlights | LEDBWL |
| 85 x 220 mm Infrared Backlights | LEDBIWL |
| White Plastic Diffuse | |
| 62 x 62 mm Ring Lights | LEDRDWS |
| 80 x 80 mm Ring Lights | LEDRDW |
| 62 x 62 mm Area Lights | LEDADWS |
| 80 x 80 mm Area Lights | LEDADW |
| 70 mm Sealed High-Intensity Area Lights | LEDA70SWDW-P |
| 145 mm IP50 Linear Array Lights | LEDLA145XWDW-P |
| 290 mm IP50 Linear Array Lights | LEDLA290XWDW-P |
| 290 mm Sealed IP68 Linear Array Lights | LEDLA290SWDW-P |
| 435 mm IP50 Linear Array Lights | LEDLA435XWDW-P |
| 435 mm Sealed IP68 Linear Array Lights | LEDLA435SWDW-P |
| 580 mm IP50 Linear Array Lights | LEDLA580XWDW-P |
| 580 mm Sealed IP68 Linear Array Lights | LEDLA580SWDW-P |
| 870 mm IP50 Linear Array Lights | LEDLA870XWDW-P |
| 1160 mm IP50 Linear Array Lights | LEDLA1160XWDW-P |

INDICATORS

- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Light Screens
- Safety
- Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

Tower and Column Lights



Small Indicators



Medium Indicators



Large Indicators



Tower Lights page 442

- Preassembled and preconfigured multi-segment indicators
- Up to five colors in one tower light
- Models for 30 mm base or flat surface mounting
- IP67-rated housing available
- Available in models with adjustable audible intensity
- Black or gray housing
- Audible only models



Small Indicators page 451

- 8 and 18 mm housings for small spaces
- Multiple colors and preconfigured glowing, flashing or sequenced flashing cycles in one housing
- Green and yellow remote indication of sensor status



Medium Indicators page 454

- 30 & 50 mm T-style or dome housings
- Multiple colors and preconfigured glowing, flashing or sequenced flashing cycles in one housing
- Green and yellow remote indication of sensor status (sensor emulator)
- Audible models with two decibel levels



Large Indicators page 459

- Selection of housings styles
- Multiple colors and preconfigured glowing, flashing or sequenced flashing cycles in one housing
- Green and yellow remote indication of sensor status
- Audible models with two decibel levels
- Up to four color segments in one housing

- TASK LIGHTS
- VISION LIGHTS
- INDICATORS**
- Tower Lights
- Small Indicators
- Medium Indicators
- Large Indicators
- ACTUATORS

Tower Lights

EZ-LIGHT® Indicators

- Delivers highly visible operational status indication for workers and supervisors
- Preassembled and preconfigured multi-segment indicators; no assembly required
- Uses LED technology for low-power consumption (2W) and long life (100,000 hours typical)
- Offers choice of models for 30 mm base or flat surface mounting
- Features models with IP67-rated, water- and oil-tight industrial housings for direct machine mounting
- Displays up to five lights in a single tower, multiple lights can be on simultaneously
- Includes models with audible alert; intensity adjustable
- Installs directly on machine quickly and easily with prewired or quick-disconnect options
- Provides excellent yet non-aggressive light brilliance and visibility at long distances
- Eliminates false indication from ambient light; indicators appear gray when off
- Offers an extensive line of elevated mounting accessories, legend plates and brackets for almost any installation requirement

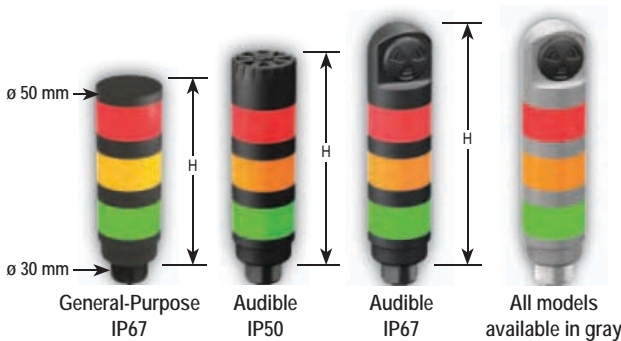


ACCESSORIES
page
449



EZ-LIGHT® TL50 Tower Lights

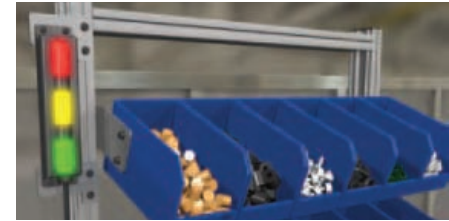
- Up to five colors in a single tower; choice of green, yellow, red, blue or white LED colors
- Optional audible function with variable intensity control
- 30 mm threaded base for direct cabinet and panel mounting with a single drilled hole
- Black or gray housing with standard or high-brightness LEDs
- IP67-rated housings
- Standoff pipe and adapters for elevated mounting



TL50

| Color Count | Tower Height (H) | | |
|-------------|----------------------|--------------|--------------|
| | General-Purpose IP67 | Audible IP50 | Audible IP67 |
| 0 | — | 92.0 mm | 74.4 mm |
| 1 | 61.2 mm | 92.0 mm | 115.1 mm |
| 2 | 101.9 mm | 132.7 mm | 155.8 mm |
| 3 | 142.6 mm | 173.4 mm | 196.5 mm |
| 4 | 183.3 mm | 214.1 mm | 237.2 mm |
| 5 | 224.0 mm | — | — |

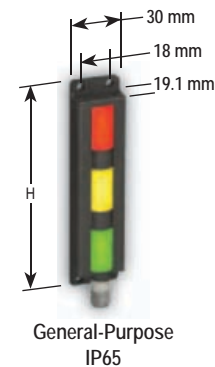
† Tower height (H) with top unscrewed approximately 3.5 mm to allow sound to escape.



EZ-LIGHT® TL30F Tower Lights

- Models with five or three lights in a single tower
- Rugged, flat metal housing for mounting to horizontal or vertical surfaces
- IP65-rated housing
- Extensive line of brackets for any installation requirement, including direct mounting to 28 mm pipe

ONLINE
AUTOCAD, STEP,
IGES & PDF



TL30F

| Color Count | Tower Height (H) |
|-------------|------------------|
| 3 | 128.1 mm |
| 5 | 204.3 mm |

SureCross™ Wireless I/O and EZ-LIGHT® Indicators

Machine monitoring enables an entirely new category of applications and machine diagnostics free from wired limitation. See page 449.





EZ-LIGHT® TL50 Tower Lights Model Key, 18-30V dc or 24V ac

| Family | Brightness | LED Color Position | | | | | Audible Alarm | (Audible models only**) | Housing Color | Connection |
|---|------------|---|---|----|--|--|-----------------------------|---------------------------|---|---------------------------|
| 1 | 2 | 3 | 4 | 5† | | | | | | |
| TL50 | H | G | Y | R | | | A | | Q | |
| Blank = Standard H = High Brightness | | R = Red G = Green Y = Yellow B = Blue W = White T = Turquoise* O = Orange* V = Violet* S = Sky Blue* M = Magenta* Blank: None | | | | | Blank = None A = Audible | Blank = IP50 LS = IP67 | Blank = 2 m Integral Cable Q = Integral QD*** QP = Euro Pigtail QD*** | Blank = Black C = Gray |

* Colors only available in standard brightness
 ** Leave blank for non audible models (Non audible models rated IP67)
 *** Models require a mating cordset (see page 449).
 † 5-color models are not available with audible indication

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

EZ-LIGHT® TL30F Tower Lights, 18-30V dc or 24V ac

| LED Function* | Environmental Rating | Connection | Input | Model |
|--|----------------------|---------------|--------------------|-------------|
|  3 Color: Green, Yellow, Red | IP65 | 4-Pin Euro QD | BiModal NPN/PNP | TL30FGYRQ |
|  5 Color: White, Blue, Green, Yellow, Red | | 8-Pin Euro QD | | TL30FWBGYRQ |




- TASK LIGHTS
- VISION LIGHTS
- INDICATORS
- Tower Lights**
- Small Indicators
- Medium Indicators
- Large Indicators
- ACTUATORS

Connection options: A model with a QD requires a mating cordset (see page 449).

Integral QD models are listed. For 150 mm PVC pigtail with QD, replace Q with QP in model number (example, TL30FGYRQP). For 2 m cable, omit suffix Q from model number (example, TL30FGYR). Contact factory for other connector and cable options.

* The first color listed is the bottom color, going up in successive order.

EZ-LIGHT® Tower Light Specifications

| | |
|---------------------------------|---|
| Supply Voltage and Current | <p>TL50: 18 to 30V dc (10% max. ripple); or 21 to 27V ac</p> <p>Standard Brightness:</p> <p>Indicators: 45 mA max. current per LED color</p> <p>Standard Audible Alarm (IP50): @ 25 mA max. current</p> <p>Sealed Audible Alarm (IP67): 35 mA max. current</p> <p>High Brightness: max. current per LED color:</p> <p>Indicators: 18V dc—100 mA; 30V dc—60 mA; 21V ac—80 mA; 27V ac—70 mA</p> <p>Standard Audible (IP50): 25 mA max. current</p> <p>Sealed Audible Alarm (IP67): 35 mA max. current</p> <p>Audible only: @ 45mA max.</p> <p>TL30F: 18 to 30V dc (10% max. ripple); or 21 to 27V ac @ 15 mA max per LED color</p> |
| Indicators | <p>TL50: LEDs are independently selected— Green, Red, Yellow, Blue or White; 1-5 colors depending on model</p> <p>TL30F: LEDs are independently selected— Green, Red, Yellow, Blue or White; 3 or 5 colors depending on model</p> |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Input Response Time | Indicators ON/OFF: 10 milliseconds (max.) |
| Audible Alarm (TL50 Only) | <p>Audible measurements are made in the direction sound exits the device. For standard audible models, this is the top of the unit (when mounted vertically, sound is directed toward the ceiling). For sealed audible models (IP67), sound exits the vented openings in the side of the unit, which should be oriented so that the sound is directed toward the machine operator(s). In environments with high ambient noise levels or high ceilings that absorb sound, the sealed version is recommended.</p> <p>Standard Audible Alarm: 2.7 KHz ± 500 Hz oscillation frequency; max. intensity 92 db @ 1 meter (typical)</p> <p>Sealed Audible Alarm: 29 KHz to 250 Hz oscillation frequency; max. intensity 94 db @ 1 meter (typical)</p> |
| Audible Adjustments (TL50 Only) | <p>Standard Audible Alarm: Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it.</p> <p>Sealed Audible Alarm: Rotate the front cover until the desired intensity is reached.</p> |
| Construction | <p>TL50: Bases and Covers— ABS Light Segment— Polycarbonate</p> <p>TL30F: Black painted aluminum housing; thermoplastic polyester end caps; acrylic light bar</p> |
| Environmental Rating | TL50: General-Purpose— IEC IP67 Audible— IEC IP50 or IEC IP67, depending on model TL30F— IEC IP65 |
| Connections | Integral 4-pin, 5-pin or 8-pin Euro-style QD, 150 mm PVC pigtail with QD, or 2 m integral cable, depending on model |
| Operating Conditions | <p>General-Purpose: -40° to +50° C</p> <p>Audible: -20° to +50° C</p> <p>Relative Humidity: 95% @ 50° C (non-condensing)</p> <p>Storage Temperature: -40° to +70° C</p> |
| Certifications | <p>TL50:   TL30F: </p> |
| Hookup Diagrams | 4-pin models: LI09 (p. 785) 5-pin: models: LI10 (p. 785) 8-pin models: LI11 (p. 785) |



Column Lights EZ-LIGHT® Indicators

- Rugged, cost-effective and easy-to-install multi-color indicators
- Illumination provides easy-to-see operator guidance and equipment status indication
- 1-, 2-, or 3-color models available
- Available in black or light gray housing
- Audible models available with standard or sealed audible element
- Compact devices are completely self-contained — no controller needed
- Immune to EMI and RFI interference

Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors

Vision

Wireless

**Lighting &
Indicators**

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers
& Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop
& Stop Control

ACCESSORIES

page
449

TASK LIGHTS

VISION LIGHTS

INDICATORS

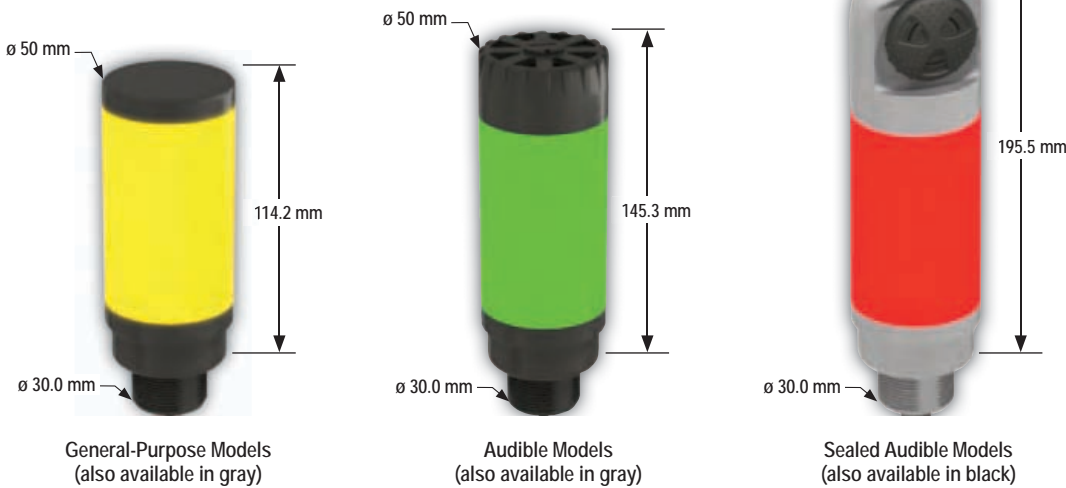
Tower Lights

Small Indicators

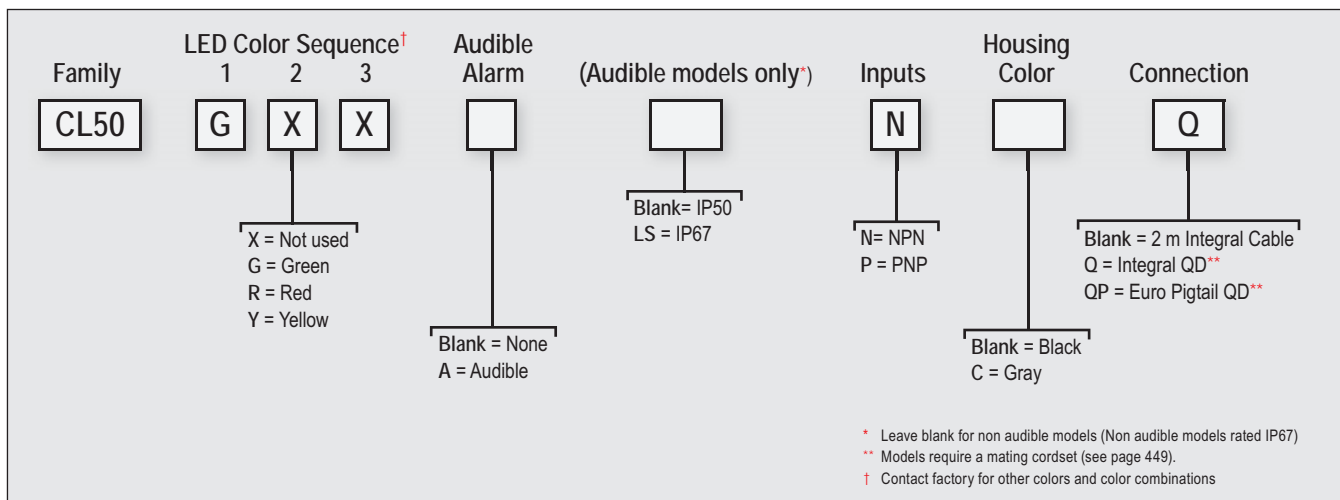
Medium Indicators

Large Indicators


ACTUATORS



EZ-LIGHT® CL50 Column Lights Model Key, 18-30V dc



EZ-LIGHT® Column Light Specifications

| | |
|--------------------------------|--|
| Supply Voltage and Current | 18 to 30V dc (10% max. ripple) 100 mA max. current @ 18V dc; 70 mA max. current @ 30V dc Standard Audible Alarm: 25 mA max. current Sealed Audible Alarm: 35 mA max. current |
| Indicators | Green, Red, Yellow; 1-3 colors, depending on model LEDs or audible alarm are independently selected |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltage |
| Input Response Time | 10 ms (max.) |
| Audible Alarm | Standard Audible Alarm: 2.7 KHz \pm 500 Hz oscillation frequency; max. intensity 92 db @ 1 meter (typical) Sealed Audible Alarm: 2.9 KHz \pm 250 Hz oscillation frequency; max. intensity 94 db @ 1 meter (typical) |
| Audible Adjustments | Standard Audible Alarm: Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it. Sealed Audible Alarm: Rotate the front cover until the desired intensity is reached. |
| Construction | Bases and Covers: ABS Light Segment: Polycarbonate |
| Environmental Rating | Standard Audible: IEC IP50 General-Purpose and Sealed Audible: IEC IP67 |
| Connections | Integral 4-pin or 5-pin M12/Euro-style QD, 150 mm PVC pigtail with QD, or 2 m (6.5') integral cable, depending on model |
| Operating Conditions | Temperature: Standard and Sealed Audible: -20° to +50° C General-Purpose: -40° to +50° C Relative humidity: 95% @ 50° C (non-condensing) Storage Temperature: -40° to +70° C |
| Vibration and Mechanical Shock | All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration, half sine wave. |
| Certifications |  |
| Hookup Diagrams | L115 (p. 786) |



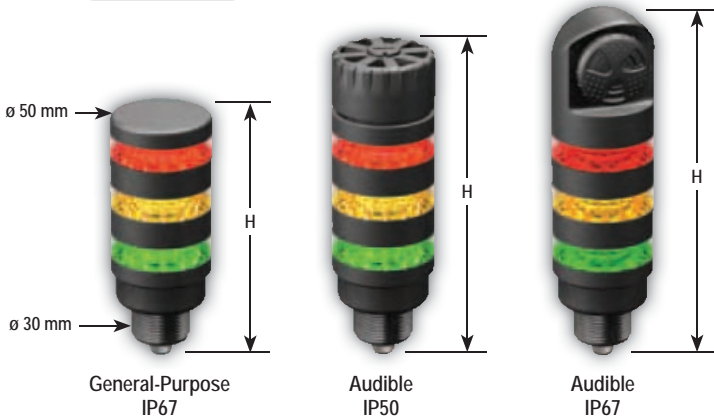
Beacon Tower Lights EZ-LIGHT® Indicators

- Rugged, cost-effective, and easy-to-install multi-segment indicators
- Extremely intense and can even be used in outdoor applications
- Illuminated segments provide easy-to-see operator guidance and indication of equipment status
- Displays up to 4 colors
- Available in black or light gray housing
- Optional audible function with variable intensity
- Audible models available with standard or sealed audible element
- Immune to ambient light, EMI, and RFI interference
- No assembly required
- Consult model key about flashing and rotating options

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Wireless
**Lighting &
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TASK LIGHTS
VISION LIGHTS
INDICATORS
Tower Lights
Small Indicators
Medium Indicators
Large Indicators
ACTUATORS

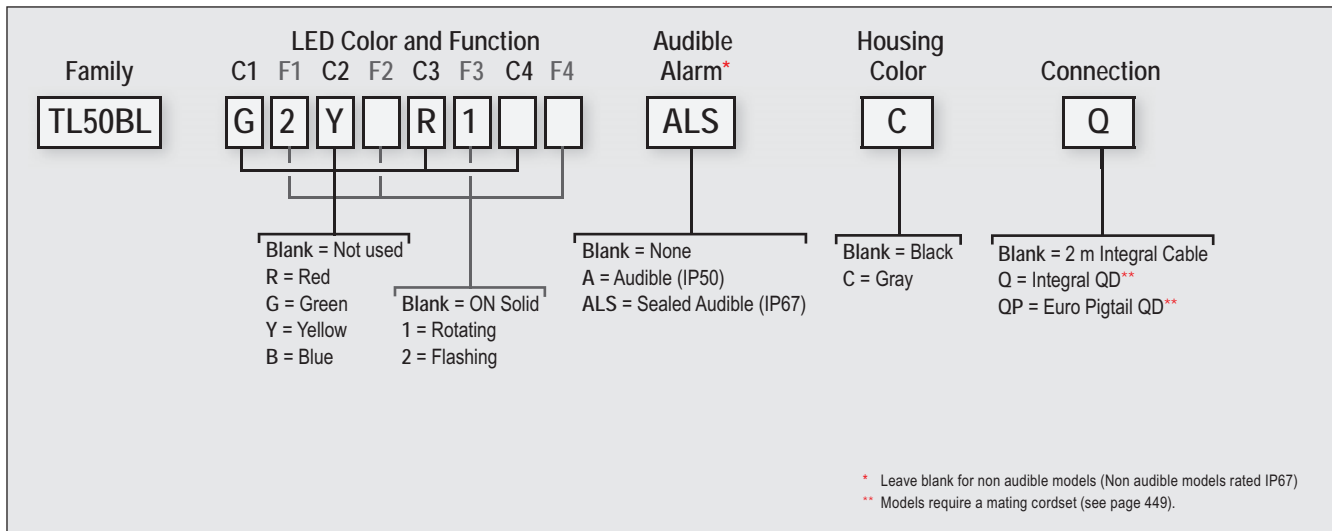


TL50BL



| Color Count | Tower Height (H) | | |
|-------------|----------------------|---------------|--------------|
| | General-Purpose IP67 | Audible† IP50 | Audible IP67 |
| 1 | 46.2 | 77.1 | 100.2 |
| 2 | 72.0 | 102.9 | 126.0 |
| 3 | 97.8 | 128.7 | 151.8 |
| 4 | 123.6 | 154.5 | 177.6 |

† Tower height (H) with top unscrewed approximately 3.5 mm to allow sound to escape.

EZ-LIGHT® TL50BL Tower Lights Model Key, 12-30V dc or 24V ac

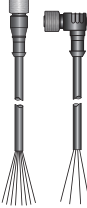



Beacon Tower Light Specifications

| | |
|-----------------------------|---|
| Supply Voltage and Current | 12 to 30V dc (10% max. ripple); or 21 to 27V ac Indicators — max. current per LED color: @ 12V dc: 125 mA @ 30V dc: 60 mA @ 21V ac: 80 mA @ 27V ac: 70 mA Standard Audible Alarm: 25 mA max. current Sealed Audible Alarm: 35 mA max. current |
| Indicators | 1-4 colors depending on model; Green, Red, Yellow, Blue LEDs are independently selected |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Input Response Time | 1 ms (max.) |
| Audible Alarm | Audible measurements are made in the direction sound exits the device. For standard audible models, this is the top of the unit (when mounted vertically, sound is directed toward the ceiling). For sealed audible models, sound exits the vented openings in the side of the unit, which should be oriented so that the sound is directed toward the machine operator(s). In environments with high ambient noise levels or high ceilings that absorb sound, the sealed version is recommended. Standard Audible Alarm: 2.7 KHz \pm 500 Hz oscillation frequency; max. intensity 92 db @ 1 meter (typical) Sealed Audible Alarm: 2.9 KHz \pm 250 Hz oscillation frequency; max. intensity 94 db @ 1 meter (typical) |
| Audible Adjustments | Standard Audible Alarm: Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it. Sealed Audible Alarm: Rotate the front cover until the desired intensity is reached. |
| Construction | Bases and Covers: ABS Light Segment: Polycarbonate |
| Environmental Rating | General-Purpose: -40° to +50° C Standard and Sealed Audible: -20° to +50° C Max. Rel. Humidity: 95% @ 50° C (non-condensing) |
| Connections | Integral 4-pin, 5-pin or 8-pin M12/Euro-style QD, 150 mm PVC pigtail with QD, or 2 m (6.5') integral cable, depending on model. See page 449. |
| Operating Conditions | Temperature: General-Purpose: -40° to +50° C Standard and Sealed Audible: -20° to +50° C Max. Rel. Humidity: 95% @ 50° C (non-condensing) Storage Temperature: -40° to +70° C |
| Certifications |   |
| Hookup Diagrams | 4-pin models: LI09 (p. 785) 5-pin: models: LI10 (p. 785) 8-pin models: LI11 (p. 785) |







Cordsets


| Euro QD | | | |
|--------------|----------------|-------------|----------------|
| See page 696 | | | |
| Length | Threaded 4-Pin | | Threaded 8-Pin |
| | Straight | Right-Angle | Straight |
| 1.83 m | MQDC-406 | MQDC-406RA | MQDC2S-806 |
| 4.57 m | MQDC-415 | MQDC-415RA | MQDC2S-815 |
| 9.14 m | MQDC-430 | MQDC-430RA | MQDC2S-830 |
| Length | Threaded 5-Pin | | |
| | Straight | Right-Angle | |
| 1.83 m | MQDC1-506 | MQDC1-506RA | |
| 4.57 m | MQDC1-515 | MQDC1-515RA | |
| 9.14 m | MQDC1-530 | MQDC1-530RA | |




 Additional cordset information available. See page 693.

Brackets

| TL50, CL50, TL50BL | | | | TL30F | |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
| pg. 653 | pg. 653 | pg. 654 | pg. 661 | pg. 678 | pg. 678 |
| SMB30A | SMB30FA.. | SMB30SC | SMBAMS30P | SMBPVA1 | SMBPVA2 |


 Additional brackets and information available. See page 632.

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Vision

Wireless

**Lighting &
Indicators**

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Control Modules

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& Stop Control

TASK LIGHTS

VISION LIGHTS

INDICATORS

Tower Lights





Small Indicators

Medium Indicators


Large Indicators

ACTUATORS







Elevated Mount System

| Features | Model | | | Components | |
|---|------------------------------------|-----------------------------------|------------------------------------|---|---|
| <ul style="list-style-type: none"> Streamlined acetal stand-off pipe adapter/cover Connects between 30 mm light base and ½" NPSM/DN15 pipe Mounting hardware included | SA-M30TE12 (black acetal) | | |  |  |
| | SA-M30TE12C (white UHMW) | | | | |
| <ul style="list-style-type: none"> Elevated-use stand-off pipe (½" NPSM/ DN15) Polished 304 stainless steel or black anodized aluminum surface ½ NPT thread at both ends Compatible with most industrial environments | Polished 304 Stainless Steel | Black Anodized Aluminum | Clear Anodized Aluminum |  | |
| | SOP-E12-150SS 150 mm (6") long | SOP-E12-150A 150 mm (6") long | SOP-E12-150AC 150 mm (6") long | | |
| | SOP-E12-300SS 300 mm (12") long | SOP-E12-300A 300 mm (12") long | SOP-E12-300AC 300 mm (12") long | | |
| | SOP-E12-900SS 900 mm (36") long | SOP-E12-900A 900 mm (36") long | SOP-E12-900AC 900 mm (36") long | | |
| <ul style="list-style-type: none"> Streamlined acetal mounting base adapter/cover Connects between ½" NPSM/DN15 pipe and 30 mm (1-3/16") drilled hole Mounting hardware included | SA-E12M30 (black acetal) | | |  | |
| | SA-E12M30C (white UHMW) | | | | |

EZ-LIGHT® Controllers

| Description | Function | Model | |
|---------------------------|--------------|-------|---|
| 5 toggle switches | ON-OFF-FLASH | LC80T |  pg. 754 |
| 12 position rotary switch | | LC80R | |

EZ-LIGHT® Sealed Right-Angle Brackets

| Description | Model | | |
|--|-----------|---|---|
| Bracket kit with base, ½-14 pipe adapter, set screw, fasteners, o-rings and gaskets. For use with stand-off pipe (listed and sold separately). | LMBE12RA |  |  |
| | LMBE12RAC |  | |
| Bracket kit with base, 30 mm adapter, set screw, fasteners, o-rings and gaskets | LMB30RA |  |  |
| | LMB30RAC |  | |



Small Indicators EZ-LIGHT® Indicators

- 8 and 18 mm housings for small spaces
- Multiple colors and preconfigured glowing, flashing or sequenced flashing cycles in one housing
- Green and yellow remote indication of sensor status (sensor emulator models)

Photoelectrics
Sensors
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Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors

Vision

Wireless

**Lighting &
Indicators**

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers
& Modules

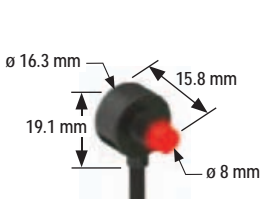
Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop
& Stop Control

ACCESSORIES

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T8L Models





T18 Models



M18 Models



EZ-LIGHT® Indicators

| Construction | LED Function* | Connection | Supply Voltage | Inputs | Model |
|--|--|--------------------------|----------------|-----------|-----------|
|  <p>8 mm mount ABS blend/ polycarbonate</p> | 2 Color: Green, Red | 4-pin Euro Pigtail QD | 10 to 30V dc | PNP | T8LGRXPQP |
| | 2 Color: Green, Yellow | | | NPN | T8LGRXNQP |
| | 2 Color: Red, Yellow | | | PNP | T8LGXYPQP |
| | Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON. | | | NPN | T8LGXYNQP |
| | | | | PNP | T8LXRYQPQ |
| | | | | NPN | T8LXRYNQP |
| PNP | | T8LGYX7PQP | | | |
|  <p>18 mm mount thermoplastic polyester</p> | 3 Color: Green, Red, Yellow | 4-pin Euro QD | 10 to 30V dc | PNP | T18GRYPQ |
| | 2 Color: Green, Red | | | NPN | T18GRYNQ |
| | 2 Color: Green, Yellow | | | PNP | T18GRXPQ |
| | | | | NPN | T18GRXNQP |
| | 2 Color: Red, Yellow | | | PNP | T18GXYPQ |
| | | | | NPN | T18GXYNQP |
| | PNP | | | T18XRYQPQ | |
| | NPN | | | T18XRYNQP | |



More
on next
page


Connection Option: A model with a QD requires a mating cordset (see page 463).

T8L models: 150 mm PVC Pigtail QD models are listed. For 2 m cable, omit suffix QP from model number (example, T8LGRXP).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

EZ-LIGHT® Indicators (cont'd)

| Construction | | LED Function* | Connection | Supply Voltage | Inputs | Model |
|---|--|--|-----------------------|----------------|-------------|------------|
|  | 18 mm mount thermoplastic polyester | Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON. | 4-pin Euro QD | 10 to 30V dc | PNP | T18GYX7PQ |
| | | | | | NPN | T18GYX7NQ |
| | | 2 Color: Red/Green indication follows OSSD output of the EZ-SCREEN receiver | M12/ 8-pin Euro QD | 24V dc | PNP | T18RGX8PQ8 |
|  | 18 mm mount nickel-plated brass | Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON. | 4-pin Euro QD | 10 to 30V dc | PNP | M18GRYPQ |
| | | | | | NPN | M18GRYNQ |
| | | | | | PNP | M18GRXPQ |
| | | | | | NPN | M18GRXNQ |
| | | | | | PNP | M18GXYPQ |
| | | | | | NPN | M18GXYNQ |
| | | | | | PNP | M18XRYPQ |
| | | | | | NPN | M18XRYNQ |
| | 18 mm mount nickel-plated brass | 3 Color: Choose Green, Red or Yellow ON, flashing or alternating | 5-pin Euro QD† | 10 to 30V dc | PNP | M18GRY2PQ |
| | | | | | NPN | M18GRY2NQ |
| 18 mm mount nickel-plated brass | Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON. | 4-pin Euro QD | 10 to 30V dc | PNP | M18GYX7PQ | |
| | | | | NPN | M18GYX7NQ | |
| 18 mm mount nickel-plated brass | 2 Color: Red/Green indication follows OSSD output of the EZ-SCREEN receiver | M12/ 8-pin Euro QD | 24V dc | PNP | M18RGX8PQ8* | |

 Connection Option: A model with a QD requires a mating cordset (see page 463).

Integral QD models are listed. For 150 mm PVC pigtail with QD, replace Q with QP in model number (example, T18GYX7PQP).
For 2 m cable, omit suffix Q from model number (example, T18GYX7P).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

† Connects to Banner 4-pin Euro QD cordset. If cordset other than a Banner 4-pin Euro QD is used, a 5-pin cordset may be required.

EZ-LIGHT® Small Indicator Specifications

See page 462

K50L Series

Audible, Easy-to-See Indicator Lights



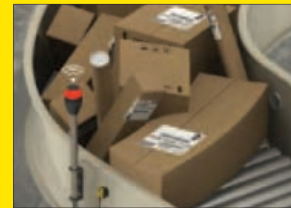
Bright lights for operator guidance and equipment status



Tank Level Monitoring Status Indication
K50L audible lights visibly and audibly alert operators when tank is filled to a certain point to prevent overflow.



Product Line Status Indication
Bright domed lights indicate the status of the workstations by alerting operators when products are complete.



Manufacturing Line Blockage Indication
A red, audible domed light alerts operators of congestion due to a box pile up.

Rugged, self-contained bright lights with steady or pulsed audible alarms

K50L EZ-LIGHT® audible job lights are the perfect solution for operator guidance and equipment status indication by providing steady or pulsed audible alarms with bright, intense LEDs. Banner's EZ-LIGHT Indicators are easy-to-install, easy-to-use and cost-effective. Indicators are available in one-, two- or three- color versions.

- ▶ Real-time operational status indication for workers and supervisors
- ▶ Easy-to-see bright, high intensity LEDs with audible alarm
- ▶ Completely self-contained device, no external controller needed
- ▶ Indicators are available in one-, two- and three-color versions with standard green, yellow, and red; contact factory for additional color options
- ▶ IP67 models come with an intensity adjustment
- ▶ IP69K models with fixed low audible intensity are great for food and beverage applications because there are no sound ports to collect liquids and debris
- ▶ Cabled and quick-disconnect models available
- ▶ Immune to EMI and RFI interference

40-plus years of sensor design experience, quality control, sales support and cost-effective solutions:

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- Safety Interlock Switches
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- TASK LIGHTS
- VISION LIGHTS
- INDICATORS
- Tower Lights
- Small Indicators
- Medium Indicators
- Large Indicators
- ACTUATORS

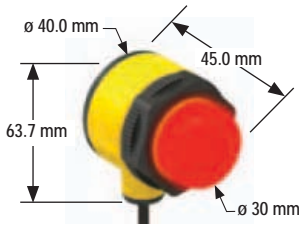
Medium Indicators

EZ-LIGHT® Indicators

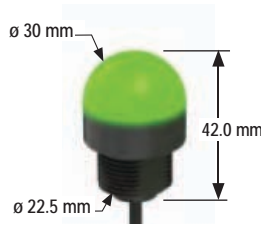
- 30 and 50 mm housings
- Multiple colors and preconfigured glowing, flashing or sequenced flashing cycles in one housing
- Green and yellow remote indication of sensor status
- Audible models with two decibel levels



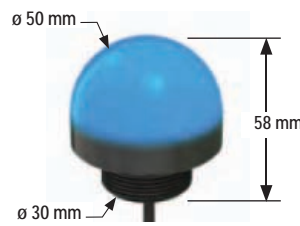
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T30 Models



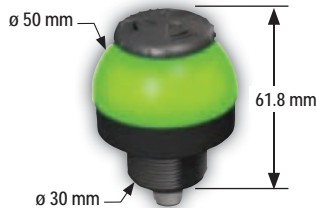
K30L Models



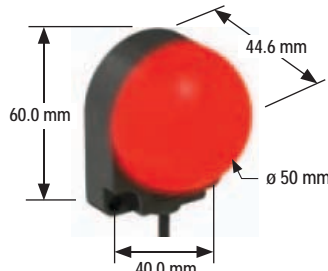
K50L Models



K50L Audible Models



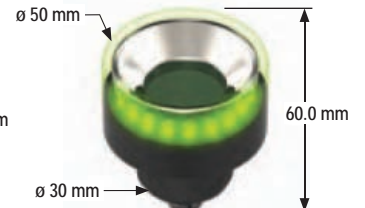
K50L Sealed Audible Models



K50FL Models




K50L Daylight Models



K50BLD Beacon Models

EZ-LIGHT® Indicators

| Construction | | LED Function* | Connection | Supply Voltage | Inputs | Model |
|---|-------------------------------------|--------------------------------|------------------|----------------|---------------------------|----------|
|  | 30 mm mount thermoplastic polyester | 3 Color: Green, Red, Yellow | 4-pin Euro QD | 10 to 30V dc | PNP | T30GRYPQ |
| | | 2 Color: Green, Red | | | NPN | T30GRYNQ |
| | | | | | 2 Color: Green, Yellow | PNP |
| | | NPN | | | | T30GRXNQ |
| | | PNP | | | | T30GXYPQ |
| NPN | T30GXYNQ | | | | | |


More on next page

Connection Option: A model with a QD requires a mating cordset (see page 463).

Integral QD models are listed. For 150 mm PVC pigtail with QD, replace Q with QP in model number (example, T30GRYPQP). For 2 m cable, omit suffix Q from model number (example, T30GRYP).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

EZ-LIGHT® Indicators (cont'd)

| Construction | | LED Function* | Connection | Supply Voltage | Inputs | Model |
|--|--------------------------------------|--|----------------|----------------|---------------|--------------|
|  | 30 mm mount thermoplastic polyester | 2 Color: Red, Yellow | 4-pin Euro QD | 10 to 30V dc | PNP | T30XRYPQ |
| | | | | | NPN | T30XRYNQ |
| | | 3 Color: Choose Green, Red or Yellow ON, flashing or alternating | 5-pin Euro QD | | PNP | T30GRY2PQ |
| | | | | | NPN | T30GRY2NQ |
| | | Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON. | 4-pin Euro QD | PNP | T30GYX7PQ | |
| | | | | NPN | T30GYX7NQ | |
|  | 30 mm dome/22 mm mount polycarbonate | 3 Color: Green, Red, Yellow | 4-pin Euro QD | 10 to 30V dc | PNP | K30LGRYPQ |
| | | | | | NPN | K30LGRYNQ |
| | | 2 Color: Green, Red | | | PNP | K30LGRXPQ |
| | | | | | NPN | K30LGRXNQ |
| | | 2 Color: Green, Yellow | PNP | K30LGXYPQ | | |
| | | | NPN | K30LGXYNQ | | |
| 2 Color: Red, Yellow | PNP | K30LXRYPQ | | | | |
| | NPN | K30LXRYNQ | | | | |
| Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON. | | PNP | K30LGX7PQ | | | |
| | | NPN | K30LGX7NQ | | | |
| 2 Color: Red/Green indication follows OSSD output of the EZ-SCREEN receiver | M12/8-pin Euro QD | 24V dc | PNP | K30LRGX8PQ8 | | |
| 2 Color: Red/Green indication follows OSSD output of the EZ-SCREEN receiver | M12/8-pin Euro QD | 24V dc | PNP | K30LRGX8PQ8 | | |
|  | 50 mm dome/30 mm mount polycarbonate | 3 Color: Green, Red, Yellow | 5-pin Micro QD | 85 to 130V ac | 85 to 130V ac | K50LGRYA120Q |
| | | | 4-pin Euro QD | 18 to 30V dc | PNP | K50LGRYPQ |
| | | 2 Color: Green, Red | 4-pin Euro QD | 18 to 30V dc | NPN | K50LGRYNQ |
| | | | | | PNP | K50LGRXPQ |
| | | | | | NPN | K50LGRXNQ |
| | | | | | PNP | K50LGXPQ |
| | | 2 Color: Green, Yellow | 4-pin Euro QD | 18 to 30V dc | NPN | K50LGXYNQ |
| | | | | | PNP | K50LXRYPQ |
| | | 2 Color: Red, Yellow | 4-pin Euro QD | 18 to 30V dc | NPN | K50LXRYNQ |
| | | | | | PNP | K50LXRYPQ |
| 5 Color: Green, Red, Yellow, Blue or White ON, flashing or alternating | 8-pin Euro QD | 18 to 30V dc | PNP | K50LGRYBWPQ8 | | |
| | | | NPN | K50LGRYBWNQ8 | | |
| 4 Color: Green, Red, Yellow or Blue ON, flashing or alternating | 5-pin Euro QD | 18 to 30V dc | PNP | K50LGRYB4PQ | | |
| | | | NPN | K50LGRYB4NQ | | |

- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
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- Emergency Stop & Stop Control

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Connection Option: A model with a QD requires a mating cordset (see page 463).

Integral QD models are listed. For 150 mm PVC pigtail with QD, replace Q with QP in model number (example, T30XRYQPQ). For 2 m cable, omit suffix Q from model number (example, T30XRYP).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

EZ-LIGHT® Indicators (cont'd)

| Construction | | LED Function* | Connection | Supply Voltage | Inputs | Model | |
|---|--|---|--------------------------|----------------|------------|---------------|--------------|
|  | 50 mm dome/ 30 mm mount polycarbonate | 3 Color: Choose Green, Red or Yellow ON, flashing or alternating | 5-pin Euro QD† | 18 to 30V dc | PNP | K50LGRY2PQ | |
| | | Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON. | 4-pin Euro QD | | PNP | K50LGYX7PQ | |
| | | | NPN | | K50LGYX7NQ | | |
| | | 2 Color: Red/Green indication follows OSSD output of the EZ-SCEEN receiver | M12/ 8-pin Euro QD | | 24V dc | PNP | K50LRGX8PQ8 |
| 4 Color: Green, Red, Yellow, Blue for DUO-TOUCH SG Run Bars | 2 m | K50LGRYB11P | | | | | |
|  | 50 mm dome/ 30 mm mount polycarbonate | 3 Color: Green, Red Yellow Steady (75 dB) | 5-pin Euro QD | 18 to 30V dc | PNP | K50LGRA1YPQ | |
| | | 3 Color: Green, Red Yellow Pulsed (75 dB) | | | NPN | K50LGRA1YNQ | |
| | | 3 Color: Green, Red Yellow Loud Steady (95 dB) | | | PNP | K50LGRA2YPQ | |
|  | 50 mm dome/ 30 mm mount polycarbonate (IP69K) | 1 Color: Green Steady (65 dB) | 5-pin Euro QD | 12 to 30V dc | PNP | K50LGRAL1YPQ | |
| | | 2 Color: Green, Red Steady (65 dB) | | | | NPN | K50LGRAL1YNQ |
| | | 3 Color: Green, Red Yellow Steady (65 dB) | | | | | |
|  | 50 mm dome/ 30 mm mount polycarbonate (IP67) | 1 Color: Green Steady (94 dB) | 5-pin Euro QD | 12 to 30V dc | PNP | K50LGXASXPQ | |
| | | 2 Color: Green, Red Steady (94 dB) | | | | K50LGRASXPQ | |
| | | 3 Color: Green, Red Yellow Steady (94 dB) | | | | K50LGRASYPQ | |
|  | 50 mm dome/ Flat mount ABS/ polycarbonate | 3 Color: Green, Red, Yellow | 4-pin Euro QD | 18 to 30V dc | PNP | K50FLGRYPQ | |
| | | 2 Color: Green, Red | | | NPN | K50FLGRYNQ | |
| | | | | | PNP | K50FLGRXPQ | |
| | | NPN | | | K50FLGRXNQ | | |
| | | 2 Color: Green, Yellow | PNP | | K50FLGXYPQ | | |
| | | 2 Color: Red, Yellow | NPN | | K50FLGXYNQ | | |
| | | | PNP | | K50FLXRYPQ | | |
| | | 5 Color: Green, Red, Yellow, Blue or White ON, flashing or alternating | 8-pin Euro QD | | PNP | K50FLGRYBWPQ8 | |
| NPN | K50FLGRYBWNQ8 | | | | | | |
| 4 Color: Green, Red, Yellow or Blue ON, flashing or alternating | 5-pin Euro QD | PNP | K50FLGRYB4PQ | | | | |
| | | NPN | K50FLGRYB4NQ | | | | |

Connection Option: A model with a QD requires a mating cordset (see page 463).

Integral QD models are listed. For 150 mm PVC pigtail with QD, replace Q with QP in model number (example, K50LGRY2PQP).
For 2 m cable, omit suffix Q from model number (example, K50LGRY2P).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.
† Connects to Banner 4-pin Euro QD cordset. If cordset other than Banner 4-pin Euro QD is used, a 5-pin cordset may be required.



EZ-LIGHT® Indicators (cont'd)

| Construction | | LED Function* | Connection | Supply Voltage | Inputs | Model | |
|--|--|--|--------------------------|--------------------------------------|-----------------------------------|---------------|-------------|
|  | 50 mm dome/ Flat mount ABS/ polycarbonate | 3 Color: Green, Red or Yellow ON, flashing or alternating | 5-pin Euro QD† | 18 to 30V dc | PNP | K50FLGRY2PQ | |
| | | | | | NPN | K50FLGRY2NQ | |
| | | Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON. | 4-pin Euro QD | PNP | K50FLGYX7PQ | | |
| | | 2 Color: Red/Green indication follows OSSD output of the EZ-SCEEN receiver | M12/ 8-pin Euro QD | 24V dc | NPN | K50FLGYX7NQ | |
|  | 30 mm mount polycarbonate | 3 Color: Green, Red, Yellow (6 LEDs per color) | 4-Pin Euro QD | 15 to 30V dc | PNP | K50LDGRYPQ | |
| | | | | | NPN | K50LDGRYNQ | |
| | | 3 Color: Green, Red, Blue (18 LEDs) | | | PNP | K50LDGRBPQ | |
| | | | | | NPN | K50LDGRBNQ | |
| | | 1 Color: Green (18 LEDs) | 3-Pin Micro QD | 85 to 130V ac | 85-130V ac | PNP/NPN | K50LDXGXQPQ |
| | | 1 Color: Red (18 LEDs) | 4-Pin Euro QD | 15 to 30V dc | PNP/NPN | K50LDXRXPQ | |
| | | | 3-Pin Micro QD | 85 to 130V ac | 85-130V ac | K50LDRA120Q | |
| | | 1 Color: Yellow (18 LEDs) | 4-Pin Euro QD | 15 to 30V dc | PNP/NPN | K50LDXYXPQ | |
| | | | 3-Pin Micro QD | 85 to 130V ac | 85-130V ac | K50LDYA120Q | |
| | | 1 Color: White (18 LEDs) | 4-Pin Euro QD | 15 to 30V dc | PNP/NPN | K50LDXWXPQ | |
| | 3-Pin Micro QD | 85 to 130V ac | 85-130V ac | K50LDWA120Q | | | |
| 1 Color: Blue (18 LEDs) | 4-Pin Euro QD | 15 to 30V dc | PNP/NPN | K50LDBXBPQ | | | |
| | 3-Pin Micro QD | 85 to 130V ac | 85-130V ac | K50LDBA120Q | | | |
|  | 30 mm mount polycarbonate | 1 Color: Green (18 LEDs) | 4-Pin Euro QD | 12 to 30V dc | PNP | K50BLXGXQPQ | |
| | | 1 Color: Red (18 LEDs) | | | | K50BLXRXPQ | |
| | | 1 Color: Yellow (18 LEDs) | | | | K50BLXYXPQ | |
| | | 1 Color: Blue (18 LEDs) | | | | K50BLXBPQ | |
| | | 2 Color: Green/Red (18 LEDs) | | | | K50BLGRXPQ | |
| | | 1 Color: Green (18 LEDs) | 3-Pin Micro QD | 85 to 130V ac or 75 to 120V dc | 85-130V ac or 75 to 120V dc | K50BLGA120Q | |
| | | 1 Color: Red (18 LEDs) | | | | K50BLRA120Q | |
| | | 1 Color: Yellow (18 LEDs) | | | | K50BLYA120Q | |
| | | 1 Color: White (18 LEDs) | | | | K50BLWA120Q | |
| | | 1 Color: Blue (18 LEDs) | | | | K50BLBA120Q | |
| | | 1 Color Rotating: Green (18 LEDs) | 5-Pin Euro QD | 12 to 30V dc | PNP | K50BLR1XGXQPQ | |
| | | 1 Color Rotating: Red (18 LEDs) | | | | K50BLR1XRXPQ | |
| | | 1 Color Rotating: Yellow (18 LEDs) | | | | K50BLR1XYXPQ | |
| | | 1 Color Rotating: Blue (18 LEDs) | | | | K50BLR1XBPQ | |

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- Lighting &**
- Indicators**
- Safety
- Light Screens
- Safety
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- Safety Controllers
- & Modules
- Safety Two-Hand
- Control Modules
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- Medium Indicators
- Large Indicators
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Connection Option: A model with a QD requires a mating cordset (see page 463).

Integral QD models are listed. For 150 mm PVC pigtail with QD, replace Q with QP in model number (example, K50LDGRYPQP). For 2 m cable, omit suffix Q from model number (example, K50LDGRYP).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

EZ-LIGHT® Indicators (cont'd)

| Construction | | LED Function* | Connection | Supply Voltage | Inputs | Model |
|---|---------------------------|--|----------------|----------------|--------|-----------------------------------|
|  | 30 mm mount polycarbonate | 1 Color: Green (24 LEDs) Perimeter and top view | 4-Pin Euro QD | 12-30V dc | PNP | K50BCLXGXQ |
| | | 1 Color: Red (24 LEDs) Perimeter and top view | | | | K50BCLRXQ |
| | | 1 Color: Yellow (24 LEDs) Perimeter and top view | | | | K50BCLXYXQ |
| | | 1 Color: Blue (24 LEDs) Perimeter and top view | | | | K50BCLBXXQ |
| | | 2 Color: Green/Red (24 LEDs) Perimeter and top view | | | | K50BCLGRXQ |
| | | 1 Color Strobing: Green (24 LEDs) Perimeter and top view | 5-Pin Euro QD | | | K50BCLS1XGXQ |
| | | 1 Color Strobing: Red (24 LEDs) Perimeter and top view | | | | K50BCLS1RXQ |
| | | 1 Color Strobing: Yellow (24 LEDs) Perimeter and top view | | | | K50BCLS1XYXQ |
| | | 1 Color Strobing: Blue (24 LEDs) Perimeter and top view | | | | K50BCLS1BXXQ |
| | | 1 Color: Green (24 LEDs) Perimeter and top view | 3-Pin Micro QD | | | 85-130V ac or 75 to 120V dc |
| | | 1 Color: Red (24 LEDs) Perimeter and top view | | K50BCLRA120Q | | |
| | | 1 Color: Yellow (24 LEDs) Perimeter and top view | | K50BCLYA120Q | | |
| | | 1 Color: Blue (24 LEDs) Perimeter and top view | | K50BCLBA120Q | | |

 Connection Option: A model with a QD requires a mating cordset (see page 463).

Integral QD models are listed. For 150 mm PVC pigtail with QD, replace Q with QP in model number (example, K50BCLXGXQP).
For 2 m cable, omit suffix Q from model number (example, K50BCLXGX).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

EZ-LIGHT® Medium Indicator Specifications

See page 462



Large Indicators EZ-LIGHT® Indicators

- Selection of housings with 50 mm diameter light
- Multiple colors and preconfigured glowing, flashing or sequenced flashing cycles in one housing
- Green and yellow remote indication of sensor status
- Audible models with two decibel levels
- Up to 4 color segments in one housing

Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors

Vision

Wireless

**Lighting &
Indicators**

Safety
Light Screens

Safety
Laser Scanners
Safety Controllers
& Modules

Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop
& Stop Control

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TASK LIGHTS

VISION LIGHTS

INDICATORS

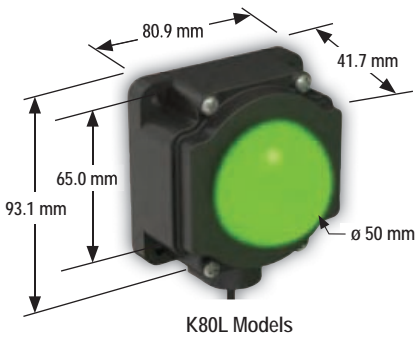
Tower Lights

Small Indicators

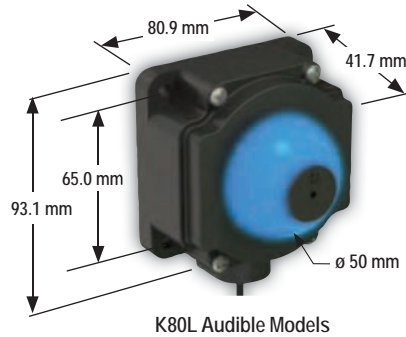
Medium Indicators

Large Indicators

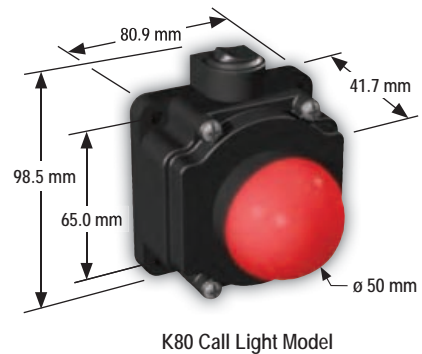
ACTUATORS



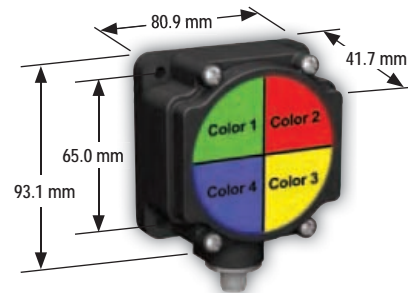
K80L Models



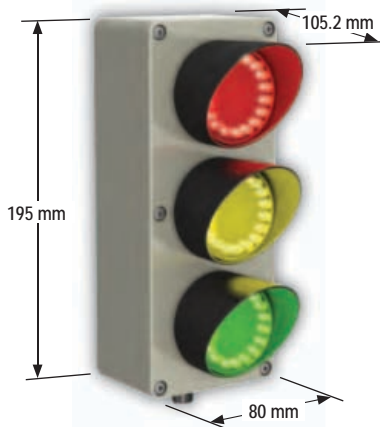
K80L Audible Models



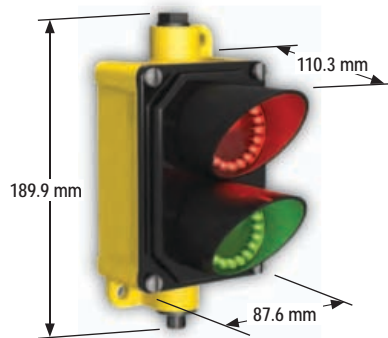
K80 Call Light Model



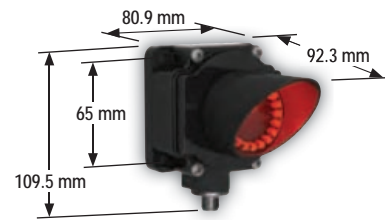
K80L Segmented Models



SP350 Models



SP250 Models



SP150 Models

EZ-LIGHT® Indicators

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| Construction | | LED Function* | Connection | Supply Voltage | Inputs | Model |
|---|---|--|------------------|--|--|--------------|
|  | 50 mm dome/ Flat or DIN-mount polycarbonate | 3 Color: Green, Red, Yellow | 5-pin Micro QD | 85 to 130V ac | 85-130V ac | K80LGRYA120Q |
| | | | 4-pin Euro QD | 18 to 30V dc | PNP | K80LGRYPQ |
| | | 2 Color: Green, Red | 4-pin Euro QD | 18 to 30V dc | PNP | K80LGRXPQ |
| | | | | | | NPN |
| | | 2 Color: Green, Yellow | | PNP | K80LGRXPQ | |
| | | | | | NPN | K80LGRYNQ |
| | | 2 Color: Red, Yellow | | PNP | K80LGRXPQ | |
| | | | | | NPN | K80LGRYNQ |
| | | 5 Color: Green, Red, Yellow, Blue or White ON, flashing or alternating | 8-pin Euro QD | 18 to 30V dc | PNP | K80LGRYBWPQ8 |
| | | | NPN | K80LGRYBWNQ8 | | |
| | | 4 Color: Green, Red, Yellow or Blue ON, flashing or alternating | 5-pin Euro QD | PNP | K80LGRYB4PQ | |
| NPN | K80LGRYB4NQ | | | | | |
| 3 Color: Green, Red or Yellow ON, flashing or alternating | 5-pin Euro QD† | PNP | K80LGRY2PQ | | | |
| | | NPN | K80LGRY2NQ | | | |
| Use with discrete output of photoelectric and proximity sensors to duplicate the sensor's Green and Yellow indicator function. When the sensor is powered, the Green LED is ON. When the sensor's output is energized, the Yellow LED is ON. | 4-pin Euro QD | PNP | K80LGYX7PQ | | | |
| | | NPN | K80LGYX7NQ | | | |
| 2 Color: Red/Green indication follows OSSD output of the EZ-SCEEN receiver | M12/ 8-pin Euro QD | 24V dc | PNP | K80LRGX8PQ8 | | |
|  | 50 mm dome/ Flat or DIN-mount polycarbonate | 3 Color: Green, Red Yellow Steady (75 dB) | 5-pin Euro QD | 18 to 30V dc | PNP | K80LGRA1YPQ |
| | | | | | NPN | K80LGRA1YNQ |
| | | | | | 3 Color: Green, Red Yellow Pulsed (75 dB) | PNP |
| NPN | K80LGRA2YNQ | | | | | |
| 3 Color: Green, Red Yellow Loud Steady (95 dB) | PNP | K80LGRAL1YPQ | | | | |
| | NPN | K80LGRAL1YNQ | | | | |
|  | Flat or DIN-mount polycarbonate | Red 1 second flash | ON/OFF Switch | 18V—two 9V batteries (batteries included) | ON/OFF Switch | K80CLR |

More
on next
page

QD models: A model with a QD requires a mating cordset (see page 463).

Integral QD models are listed. For 150 mm PVC pigtail with QD, replace Q with QP in model number (example, K80LGRYA120).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

† Connects to Banner 4-pin Euro QD cordset. If cordset other than Banner 4-pin Euro QD is used, a 5-pin cordset may be required.

EZ-LIGHT® Indicators (cont'd)

| Construction | | LED Function* | Connection | Supply Voltage | Inputs | Model | |
|--------------|---------------------------------|---|---------------|----------------|--------------------|--|--------------------------|
| | Flat or DIN-mount polycarbonate | Color 1: Green Color 2: Red Color 3: Yellow Color 4: Blue | 5-pin Euro QD | 18 to 30V dc | PNP | K80L4GRYB1PQ | |
| | | | | | NPN | K80L4GRYB1NQ | |
| | Flat or DIN-mount polycarbonate | Color 1: Green Color 2: Red Color 3: Yellow | 5-pin Euro QD | 18 to 30V dc | PNP | K80L3THGRYX1PQ | |
| | | | | | NPN | K80L3THGRYX1NQ | |
| | Flat or DIN-mount polycarbonate | Color 1: Green Color 2: Red | 5-pin Euro QD | 18 to 30V dc | PNP | K80L2HGRXX1PQ | |
| | | | | | NPN | K80L2HGRXX1NQ | |
| | | | | | PNP | K80L1WXXX1PQ | |
| | | | | | | K80L1YXXX1PQ | |
| | | | | | | K80L1RXXX1PQ | |
| K80L1GXXX1PQ | | | | | | | |
| | Flat or DIN-mount polycarbonate | Color 1: White Color 1: Yellow Color 1: Red Color 1: Green Color 1: Blue | 4-Pin Euro QD | 15 to 30V dc | PNP/NPN selectable | K80L1BXXX1PQ | |
| | | | | | | 3 Color: Green, Red, Yellow (6 LEDs per color) | SP150GRYPQ |
| | | | | | | 1 Color: Green (18 LEDs) | SP150GRYNQ |
| | | | | | | 1 Color: Red (18 LEDs) | SP150GPQ |
| | | | | | | 1 Color: Green (18 LEDs) | SP150RPQ |
| | Flat or DIN-mount polycarbonate | 1 Color: Red (18 LEDs) | Field-wired | 85 to 130V ac | 85 to 130V ac | SP150GA120 | |
| | | | | | | 1 Color: Red (18 LEDs) | SP150RA120 |
| | Flat mount polycarbonate | Top Indicator: Red (18 LEDs) Bottom Indicator: Green (18 LEDs) | 4-Pin Euro QD | 15 to 30V dc | PNP | SP250GRPQ | |
| | | | | | NPN | SP250GRNQ | |
| | Flat mount polycarbonate | Top Indicator: Red (18 LEDs) Bottom Indicator: Green (18 LEDs) | Field-wired | 85 to 130V ac | 85 to 130V ac | SP250GRA120 | |
| | | | | | | | Flat mount polycarbonate |
| NPN | SP350GYRNQ | | | | | | |
| | Flat mount polycarbonate | Top Indicator: Red (18 LEDs) Middle Indicator: Yellow (18 LEDs) Bottom Indicator: Green (18 LEDs) | Field-wired | 85 to 130V ac | 85 to 130V ac | SP350GYRA120 | |

QD models: A model with a QD requires a mating cordset (see page 463).

Integral QD models are listed. For 150 mm PVC pigtail with QD, replace Q with QP in model number (example, K80L4GRYB1PQP).

* Single-color models are available. Colors are independently selectable. Contact factory for other colors and color combinations.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



ACCESSORIES
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- TASK LIGHTS
- VISION LIGHTS
- INDICATORS
- Tower Lights
- Small Indicators
- Medium Indicators
- Large Indicators
- ACTUATORS

EZ-LIGHT® Indicator Specifications

| | |
|--------------------------------------|---|
| Supply Voltage and Current | <p>DC models:</p> <p>T8L models: 10 to 30V dc @ 20 mA max. per LED color K30L, M18 and T18 General-Purpose models: 10 to 30V dc @ 25 mA max. per LED color K30L, M18 and T18 Emulators: 10 to 30V dc @ 30 mA max. M18 models Multi-Function: 10 to 30V dc @ 40 mA max. T30 models: 10 to 30V dc General-Purpose: @ 40 mA max. per LED color Multi-Function: @ 50 mA max. Emulators: @ 45 mA max. K50L, K50FL and K80L models: 18 to 30V dc Multi-Function: @ 50 mA max. Emulators: @ 45 mA max. All others: @ 40 mA max. per LED color (alarm) CL50 models: 18 to 30V dc (10% max. ripple) Indicators: @ 100 mA max. current at 18V dc; 70 mA max. current at 30V dc; Audible Alarm (IP50): @ 25 max. current Sealed Audible Alarm (IP67): @ 35 mA max current Segmented displays: 18 to 30V dc K80L4: @ 35 mA max. per LED color, @ 90 mA max. with all LEDs ON; K80L3 @ 50 mA max. with color 1 ON, @ 35 mA max. with colors 2 or 3 ON, @ 90 mA max. with all LEDs ON; K80L2: @ 50 mA max. with colors 1 or 2 ON, @ 90 mA max. with all LEDs ON; K80L1: @ 90 mA max Daylight Visible Models: 15 to 30V dc 1-Color: @ 120 mA max. per LED; 3-Color: @ 40 mA max. per LED color SP150/SP250/SP350 Models: 15 to 30V dc 1-Color: @ 120 mA max. per LED color; 3-Color: @ 40 mA max. per LED color</p> <p>AC models: K50L & K80L Models: 85 to 130V ac @ 15 mA max. Daylight Visible & SP150/250/350 Models: 85 to 130V ac or 75 to 120V dc @ 16 mA max. per LED color</p> <p>Indicators for use with Safety Devices: K30L, M18 and T18 Models: +24V dc @ 30 mA max. T30, K50L, K50FL and K80L Models: +24V dc @ 45 mA max.</p> <p>Call Lights: 18V (two 9V batteries); batteries included Type: 9V alkaline (2) Life expectancy: approximately 100 hours continuous operation with high-quality alkaline batteries</p> |
| Indicators | <p>Multi-Color, General-Purpose: Entire translucent diffuser or dome provides indication. LEDs are independently selected: Green, Red, Yellow; 1, 2 or 3 colors, depending on model.</p> <p>Multi-Color, Multi-Function: Entire translucent diffuser or dome provides indication. LEDs are independently selected: Green, Red, Yellow, Blue or White, ON steady or flashing; up to 5 colors, depending on model.</p> <p>2-Color for Sensor Emulation: Entire translucent diffuser or dome provides indications. Green and Yellow, when connected to discrete output of 3-wire or 4-wire sensor.</p> <p>Audible: LEDs or audible independently selected: Green, Red, Yellow.</p> <p>Segmented and Daylight Visible: LEDs are independently selected: colors and operation, depending on model.</p> <p>SP150/SP250/SP350: LED colors are independently selected, depending on model.</p> <p>Indicators for use with EZ-SCREEN: Entire translucent dome provides indication. Red/Green indication follows EZ-SCREEN OFF/ON OSSD#1 output.</p> <p>Call Light: Red LED</p> |
| Input Response Time | <p>Multi-Color, Multi-Function models: Indicator ON: 250 milliseconds max.; Indicator OFF: 10 milliseconds max. CL50, Daylight Visible (dc models), SP150/SP250/SP350 and Audible models: 10 milliseconds max. Indicator ON/OFF Daylight Visible (ac models): 500 microseconds max.</p> <p>Segmented models: Indicator ON: Initial light—250 milliseconds max. Additional lights—10 milliseconds max. Indicator OFF: 10 milliseconds max.</p> |
| Indicator Flash Rate | <p>Multi-Color Multi-Function models only: Single color: 1 second flash rate (500 milliseconds ON); 3-color: 1.5 second rotation rate (500 milliseconds per color); 4-Color: 2 second rotation rate (500 milliseconds per color)</p> <p>Call Light (Flash timing): Turn on response: 1 second Flash duration: 35 milliseconds Flash rate: 1 second</p> |
| Oscillation Frequency (Audible only) | <p>K50L and K80L models: A1 models—3 KHz ± 500 Hz A2 models—3 KHz ± 500 Hz; pulse rate 3 Hz ± 20% AL1 models—2.7 KHz ± 500 Hz CL50 models (IP50): 2.7 KHz ± 500 Hz oscillation frequency; Max Intensity (Typical): IP50—92 dB @ 1 m CL50 models (IP67): 2.9 KHz ± 250 Hz oscillation frequency; Max Intensity (Typical): IP67—94 dB @ 1 m</p> |
| Audible Adjustments (Audible only) | <p>Standard CL50 models (IP50): Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it. Sealed CL50 models (IP67): Audible Alarm rotate the front cover until the desired intensity is reached.</p> |
| Environmental Rating | <p>Audible Models: Standard: IEC IP50 Sealed: IEC IP67</p> <p>T8L Models: IEC IP67 (not encapsulated) K80L models: IEC IP67 (encapsulated electronics only) K50L and K50FL QD Models: Fully encapsulated, meet IP69K per DIN 40050-9. Cabled models meet IP69K if the cable and cable entrance are protected from high-pressure spray. SP150/SP250/SP350 Models: Fully encapsulated; Electronics: IP66 Enclosure: SP150—IEC IP67; SP250 & SP350: IEC IP65</p> <p>Call Light: IP50 All others: Fully encapsulated, IEC IP67</p> |

EZ-LIGHT® Indicator Specifications (cont'd)



| | |
|-----------------------|---|
| Connections | <p>QD cordsets are ordered separately. See page 463.</p> <p>DC models: Multi-Color, General Purpose, Sensor Emulators and Daylight Visible: K80L Models: 4-pin Euro-style integral QD. Terminal-wired models available for use with bulk cable; compression fitting is optional. Contact factory for cable information. T8L Models: 2 m attached cable or 150 mm PVC pigtail with 4-pin Euro-style QD, depending on model. Other Models: 2 m attached cable, 4-pin Euro-style integral QD, or 150 mm PVC pigtail with 4-pin Euro-style QD, depending on model.</p> <p>Multi-Color, Multi-Function: K80L Models: 5-pin (3- or 4-color) or 8-pin (5-color) Euro-style integral QD. Terminal-wired models available for use with bulk cable; compression fitting is optional. Contact Factory for cable information. Other Models: 2 m attached cable, 5-pin (3- or 4-color), or 8-pin (5-color) Euro-style integral QD or 150 mm PVC pigtail Euro-style QD.</p> <p>K50L and CL50 Audible Models: 2 m attached cable, or 5-pin Euro-style integral QD or 150 mm PVC pigtail with 5-pin Euro-style QD. K80L Segmented and Audible Models: 5-pin Euro-style integral QD or 150 mm PVC pigtail with 5-pin Euro-style QD. Terminal-wired models available for use with bulk cable; compression fitting is optional. Contact factory for cable information. SP150/SP250/SP350 Models: 4-pin Euro-style integral QD or 150 mm PVC pigtail with Euro-style QD. Terminal-wired models available for use with bulk cable (wire nuts included); ½-14 NPSM cord grip or conduit adapter are optional.</p> <p>AC Models: K50L and K80L: 2 m attached cable, 5-pin Micro-style integral QD or 150 mm PVC pigtail with 5-pin Micro-style QD, depending on model. Daylight Visible Models: 3-pin Micro-style integral QD or 2 m integral cable, depending on model SP150/SP250/SP350 Models: Terminal-wired models available for use with bulk cable. Indicators for use with EZ-SCREEN: 8-pin Euro-style integral QD.</p> |
| Operating Temperature | <p>Audible and Call Light models: -20° to +50°C All others: -40° to +50° C</p> |
| Certifications | <p>K50L & K80L:  K50L & K30L:  LISTED</p> |
| Hookups | <p>General-purpose: DC: LI12 (p. 785) AC: LI13 (p. 786) Audible: K50L & K80L: LI15 (p. 786) CL50: LI15 (p. 786) Multi-Function: 3- or 4-color: LI16 (p. 786) 5-color: LI17 (p. 787) Segmented: LI20 (p. 787) Sensor Emulators: LI18 (p. 787) Daylight Visible: 1-color models (dc): LI21 (p. 788) 3-color models (dc): LI22 (p. 788) AC models: LI23 (p. 788) DC Traffic Lights: SP150 models: LI24 (p. 785) SP250 models: LI24 (p. 788) SP350 models: see data sheet AC Traffic Lights: see data sheet</p> |


- Photoelectrics
- Sensors
- Fiber Optic
- Sensors
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- Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety
- Light Screens
- Safety
- Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- TASK LIGHTS
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- Tower Lights
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Cordsets

| Micro QD | | | | |
|--------------|----------------|-------------|------------------------------|--------------|
| See page 712 | | | | |
| Length | Threaded 3-Pin | | Threaded 5-Pin (With Shield) | |
| | Straight | Right-Angle | Straight | Right-Angle |
| 1.83 m | MQDC-306 | MQDC-306RA | MQVR3S-506 | MQVR3S-506RA |
| 4.57 m | MQDC-315 | MQDC-315RA | MQVR3S-515 | MQVR3S-515RA |
| 9.14 m | MQDC-330 | MQDC-330RA | MQVR3S-530 | MQVR3S-530RA |



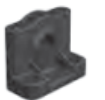
 Additional cordset information available. See page 693.





| Euro QD | | | |
|--------------|----------------|-------------|----------------|
| See page 696 | | | |
| Length | Threaded 4-Pin | | Threaded 8-Pin |
| | Straight | Right-Angle | Straight |
| 1.83 m | MQDC-406 | MQDC-406RA | MQDC2S-806 |
| 4.57 m | MQDC-415 | MQDC-415RA | MQDC2S-815 |
| 9.14 m | MQDC-430 | MQDC-430RA | MQDC2S-830 |


 

| Threaded 5-Pin | | |
|----------------|-----------|-------------|
| Length | Straight | Right-Angle |
| | 1.83 m | MQDC1-506 |
| 4.57 m | MQDC1-515 | MQDC1-515RA |
| 9.14 m | MQDC1-530 | MQDC1-530RA |


Brackets

| T8L | | T18/M18 | |
|--|---|---|--|
|  |  |  | |
| pg. 659 | pg. 650 | pg. 650 | |
| SMB8MM | SMB18A | SMB1815SF | |

| T30/K50L/CL50 | | K30L | K80L |
|---|---|---|---|
|  |  |  |  |
| pg. 653 | pg. 654 | pg. 652 | pg. 666 |
| SMB30A | SMB30SC | SMB22A | SMBDX80DIN |

 Additional brackets and information available. See page 632.

EZ-LIGHT Controllers

| | Description | Function | Model |
|---|---------------------------|--------------|-------|
|  | 5 toggle switches | ON-OFF-Flash | LC80T |
| | 12 position rotary switch | | LC80R |

pg. 754



Elevated mounting accessories see page 738.

ACTUATORS



K30, K50 and K80 page 465

- Highly visible 30 & 50 mm dome light is available in two housing styles
- Single-point sensor features a large integrated pick light
- Fixed-field background suppression, long-range retroreflective or push-button models are available
- Models are available for 30 mm, Flat or DIN-rail mounting



PVD page 470

- Large highly visible job lights indicate the action to perform and signal errors
- One-piece self-contained sensor requires no controller to operate
- Sensor automatically operates in either diffuse or retroreflective mode, depending on the application
- Two lengths fit existing bin sizes and configurations



PVA page 472

- Highly visible LEDs on the emitter and receiver show the part-assembly sequence
- Four lengths are available to fit common bin sizes
- Range is up to 2 m
- Array can also be used for detecting parts at least 35 mm in diameter



VTB page 475

- Illuminated button base provides a bright, easy-to-see job light to guide assembly sequence
- VTB buttons provide a cost-effective and easy-to-install solution for areas that cannot accommodate a light screen
- Ergonomic design requires no physical pressure to operate, reducing hand, wrist and arm stress



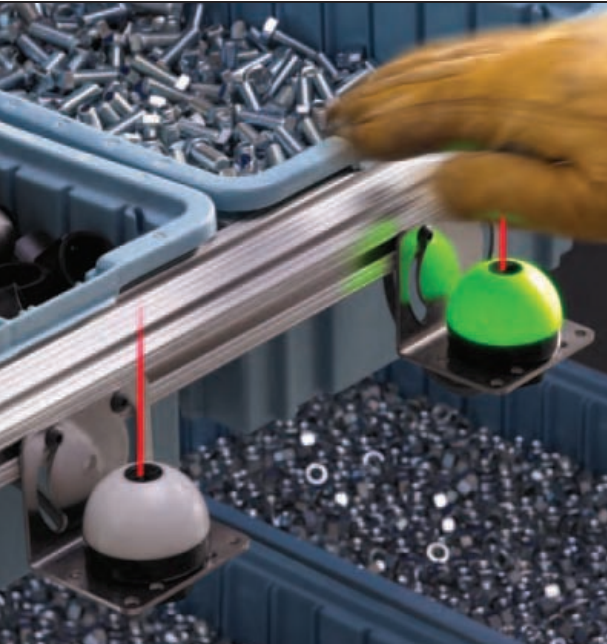
OTB/LTB page 477

- Replaces mechanical push buttons
- Features ergonomic design to prevent repetitive motion stress
- Senses light, not pressure
- Provides a choice of momentary-action or alternate-action touch buttons



STB page 481

- Self-checking for use with safety controls
- LED power, output and fault indicators
- 10 to 30V dc or 20 to 30V ac/dc
- Housing sealed to IP66
- Optional field cover colors



Single-Point Actuators K30, K50 and K80

- Requires no external controller to operate; completely self-contained
- Indicates job pick status with 30 & 50 mm translucent dome containing one, two or three colored lights
- Shows correct order for selecting parts using a green job light in all models
- Models available with a red light to indicate detection of operator action or misspick
- Features models with background suppression to avoid sensing background objects in field-of-view, reliable retroreflective (break beam) mode or pressure activated push buttons
- Models available with 30 mm, Flat or DIN-rail mounting
- Ideal for use in abusive environments—fully encapsulated IP67 construction; rated to IP69K depending on installation
- Offers AS-i module compatibility, depending on model
- Available without sensor for use as an indicator light (EZ-LIGHT® K30, K50L & K80L, see pages 454 & 459)

Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors

Vision

Wireless

Lighting &
Indicators

Safety
Light Screens

Safety
Laser Scanners

Safety Controllers
& Modules

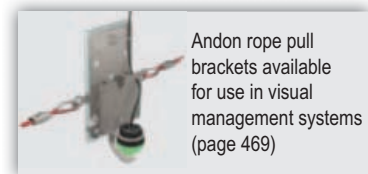
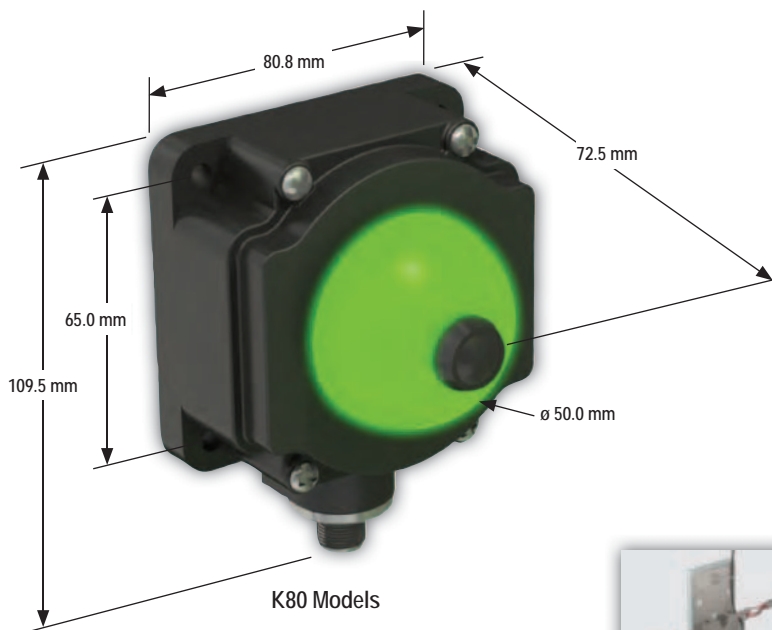
Safety Two-Hand
Control Modules

Safety Interlock
Switches

Emergency Stop
& Stop Control

ACCESSORIES

page
469



TASK LIGHTS

VISION LIGHTS

INDICATORS

ACTUATORS

K30, K50 & K80

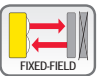
PVD

PVA

VTB

OTB/LTB

STB


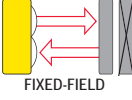
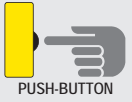



ACCESSORIES
page
469

K30, K50 and K80 Standard–Single Color, 12-30V dc

- Job light is ON at all times while job input is active.
- Presence of hand initiates output change of state.

➔ Visible Red LED ➔ Infrared LED

| Sensing Mode/LED | Housing | Range | Connection | Output | Job Light | PNP Models | NPN Models |
|---|---|------------------|---------------|--------|-----------|----------------|----------------|
|  POLAR RETRO | 50 mm dome/ 30 mm mount polycarbonate | 2 m | 2 m | NO | Green | K50APLPGXD | K50ANLPGXD |
| | | | 4-pin Euro QD | | | K50APLPGXDQ | K50ANLPGXDQ |
| | | | 2 m | NC | | K50RPLPGXD | K50RNLPGX |
| | | | 4-pin Euro QD | | | K50RPLPGXDQ | K50RNLPGXQD |
|  FIXED-FIELD | 50 mm dome/ 30 mm mount polycarbonate | 50 mm Cutoff | 2 m | NO | Green | K50APFF50GXD | K50ANFF50GXD |
| | | | 4-pin Euro QD | | | K50APFF50GXDQ | K50ANFF50GXDQ |
| | | | 2 m | NC | | K50RPF50GXD | K50RNFF50GXD |
| | | | 4-pin Euro QD | | | K50RPF50GXDQ | K50RNFF50GXDQ |
| | | 100 mm Cutoff | 2 m | NO | | K50APFF100GXD | K50ANFF100GXD |
| | | | 4-pin Euro QD | | | K50APFF100GXDQ | K50ANFF100GXDQ |
| | | | 2 m | NC | | K50RPF100GXD | K50RNFF100GXD |
| | | | 4-pin Euro QD | | | K50RPF100GXDQ | K50RNFF100GXDQ |
|  PUSH-BUTTON | 30 mm dome/ 22 mm mount polycarbonate | - | 2 m | NO | Green | K30APBPGXD | K30ANBPGXD |
| | | | 4-pin Euro QD | | | K30APBPGXDQ | K30ANBPGXDQ |
|  PUSH-BUTTON | 50 mm dome/ 30 mm mount polycarbonate | - | 2 m | NO | Green | K50APBPGXD | K50ANBPGXD |
| | | | 4-pin Euro QD | | | K50APBPGXDQ | K50ANBPGXDQ |
| | | | 2 m | NC | | K50RPPBPGXD | K50RNPPBPGXD |
| | | | 4-pin Euro QD | | | K50RPPBPGXDQ | K50RNPPBPGXDQ |
| | 50 mm dome/ Flat or DIN-mount polycarbonate | - | 2 m | NO | | K80APBPGXD | K80ANBPGXD |
| | | | 4-pin Euro QD | | | K80APBPGXDQ | K80ANBPGXDQ |
| | | | 2 m | NC | | K80RPPBPGXD | K80RNPPBPGXD |
| | | | 4-pin Euro QD | | | K80RPPBPGXDQ | K80RNPPBPGXDQ |

Connection options: A model with a QD requires a mating cordset (see page 469).


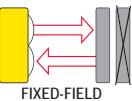
QD models: For 150 mm 4-pin Euro-style PVC pigtail, add suffix QP to 2 m model number (example, K50APLPGXDQP).
For 9 m cable, add suffix W/30 to the 2 m model number (example, K50APLPGXD W/30).

NO = Normally Open, NC = Normally Closed

K50 and K80 Specialty C-Series–Two Color, 12-30V dc

- Job light is Green while job input is active (unless hand is present.)
- Presence of hand (or pressing push button) initiates output change of state and turns light Red for visual verification that action was sensed.
- Aids in alignment of retroreflective models by providing Red signal when retroreflective target is not aligned or present.

➔ Visible Red LED ➔ Infrared LED

| Sensing Mode/LED | Housing | Range | Connection | Output | Job Light | PNP Models | NPN Models |
|--|---|------------------|---------------|--------|----------------|----------------|----------------|
|  POLAR RETRO | 50 mm dome/ 30 mm mount polycarbonate | 2 m | 4-pin Euro QD | NO | Green (Red) | K50APLPGRCQ | K50ANLPGRCQ |
| | | | | NC | | K50RPLPGRCQ | K50RNLPGRQC |
|  FIXED-FIELD | 50 mm dome/ 30 mm mount polycarbonate | 50 mm Cutoff | 4-pin Euro QD | NO | Green (Red) | K50APFF50GRCQ | K50ANFF50GRCQ |
| | | | | NC | | K50RPF50GRCQ | K50RNFF50GRCQ |
| | | 100 mm Cutoff | 4-pin Euro QD | NO | | K50APFF100GRCQ | K50ANFF100GRCQ |
| | | | | NC | | K50RPF100GRCQ | K50RNFF100GRCQ |

Connection options: A model with a QD requires a mating cordset (see page 469).

QD models: For 150 mm 4-pin Euro-style PVC pigtail, replace suffix Q with QP (example, K50APLPGRCQP).
For 2 m cable, remove Q from model number (example, K50APLPGRC) or 9 m cable, add suffix W/30 to the 2 m model number (example, K50APLPGRC W/30).



NO = Normally Open, NC = Normally Closed

† For other color combinations, contact factory at 1-888-373-6767.

More on next page

K50 and K80 Specialty C-Series–Two Color, 12-30V dc (cont'd)

- Job light is Green while job input is active (unless hand is present.)
- Presence of hand (or pressing push button) initiates output change of state and turns light Red for visual verification that action was sensed.
- Aids in alignment of retroreflective models by providing Red signal when retroreflective target is not aligned or present.

| Sensing Mode/LED | Housing | Range | Connection | Output | Job† Light | PNP Models | NPN Models |
|--|---|-------|---------------|--------|----------------|----------------|-------------|
|  PUSH-BUTTON | 30 mm dome/ 22 mm mount polycarbonate | – | 4-pin Euro QD | NO | Green (Red) | K30APPBGRQC | K30ANPBGRQC |
|  PUSH-BUTTON | 50 mm dome/ 30 mm mount polycarbonate | – | 4-pin Euro QD | NO | | Green (Red) | K50APPBGRQC |
| | | | | NC | K50RPPBGRQC | | K50RNPBGRQC |
| | 50 mm dome/ Flat or DIN-mount polycarbonate | – | 4-pin Euro QD | NO | K80APPBGRQC | | K80ANPBGRQC |
| | | | | NC | K80RPPBGRQC | | K80RNPBGRQC |

Connection options: A model with a QD requires a mating cordset (see page 469).

QD models: For 150 mm 4-pin Euro-style PVC pigtail, replace suffix Q with QP (example, K50APLPGRQP).
For 2 m cable, remove Q from model number (example, K50APLPGR) or 9 m cable, add suffix W/30 to the 2 m model number (example, K50APLPGR W/30).


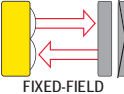

- NO = Normally Open, NC = Normally Closed
† For other color combinations, contact factory at 1-888-373-6767.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

K50 and K80 Specialty C-Series–Three Color, 12-30V dc

- Job light is ON at all times while job input is active (unless hand is present).
- Presence of hand (or pressing button) activates output and turns job light Yellow for visual verification that action was sensed.
- Presence of hand (or pressing button) while job input is not active turns light Red signaling mispick.

➔ Visible Red LED ➔ Infrared LED

| Sensing Mode/LED | Housing | Range | Connection | Output† | Output Type | Job Light | Models |
|--|---|------------------|------------------------------|---------|-------------|--------------------------|---------------------|
|  POLAR RETRO | 50 mm dome/ 30 mm mount polycarbonate | 2 m | 5-pin Euro PUR Pigtail QD | NC | PNP | Green/ Yellow/ Red | K50RPLPGRYC3QPMA |
|  FIXED-FIELD | 50 mm dome/ 30 mm mount polycarbonate | 50 mm Cutoff | 5-pin Euro PUR Pigtail QD | NO | PNP | Green/ Yellow/ Red | K50APFF50GRYC3QPMA |
| | | 100 mm Cutoff | | | | | K50APFF100GRYC3QPMA |
|  PUSH-BUTTON | 50 mm dome/ 30 mm mount polycarbonate | – | 5-pin Euro PUR Pigtail QD | NO | PNP | Green/ Yellow/ Red | K50APPBGRYC3QPMA |
| | 50 mm dome/ Flat or DIN-mount polycarbonate | | | | | | K80APPBGRYC3QPMA |

Connection options: A model with a QD requires a mating cordset (see page 469).

5-pin 150 mm Euro-style PUR pigtail QD models are listed. Other cable and connector options are available, contact factory at 1-888-373-6767.


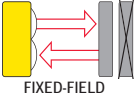


- NO = Normally Open, NC = Normally Closed
† PNP models are listed. For other output types, contact factory at 1-888-373-6767.

- TASK LIGHTS
- VISION LIGHTS
- INDICATORS
- ACTUATORS**
- K30, K50 & K80
- PVD
- PVA
- VTB
- OTB/LTB
- STB

K30, K50 and K80 Specialty E-Series–Two Color, 12-30V dc

- Job light is Green at all times while job input is active.
- Presence of hand (or pressing button) initiates output change of state.
- Presence of hand (or pressing button) while job input is inactive turns light Red, giving operator visual verification that sensor is functioning properly.

➔ Visible Red LED ➔ Infrared LED

| Sensing Mode/LED | Housing | Range | Connection | Output | Job Light | PNP Models | NPN Models |
|--|---|------------------|---------------|----------------|----------------|----------------|----------------|
|  POLAR RETRO | 50 mm dome/ 30 mm mount polycarbonate | 2 m | 4-pin Euro QD | NO | Green (Red) | K50APLPGREQ | K50ANLPGREQ |
| | | | | NC | | K50RPLPGREQ | K50RNLPGREQ |
|  FIXED-FIELD | 50 mm dome/ 30 mm mount polycarbonate | 50 mm Cutoff | 4-pin Euro QD | NO | Green (Red) | K50APFF50GREQ | K50ANFF50GREQ |
| | | 100 mm Cutoff | 4-pin Euro QD | NC | | K50RPF50GREQ | K50RNFF50GREQ |
| | | | | NO | | K50APFF100GREQ | K50ANFF100GREQ |
| | | NC | K50RPF100GREQ | K50RNFF100GREQ | | | |
|  PUSH-BUTTON | 30 mm dome/ 22 mm mount polycarbonate | – | 4-pin Euro QD | NO | Green (Red) | K30APPBGREQ | K30ANPBGREQ |
|  PUSH-BUTTON | 50 mm dome/ 30 mm mount polycarbonate | – | 4-pin Euro QD | NO | Green (Red) | K50APPBGREQ | K50ANPBGREQ |
| | | | | NC | | K50RPPBGREQ | K50RNPBGREQ |
| | 50 mm dome/ Flat or DIN-mount polycarbonate | | | NO | | K80APPBGREQ | K80ANPBGREQ |
| | | | | NC | | K80RPPBGREQ | K80RNPBGREQ |

Connection options: A model with a QD requires a mating cordset (see page 469).

QD models: For 150 mm 4-pin Euro-style PVC pigtail, replace Q with QP (example, K50APLPGREQP).
For 2 m cable, remove Q from model number (example, K50APLPGRE) or 9 m cable, add suffix W/30 to the 2 m model number (example, K50APLPGRE W/30).



NO = Normally Open, NC = Normally Closed

† For other color combinations, contact factory at 1-888-373-6767.

K50 and K80 Specifications

| | |
|-----------------------------|--|
| Supply Voltage and Current | 12 to 30V dc, (10% max. ripple) C3 models: less than 90 mA max. current @ 12V dc (exclusive of load) less than 60 mA max. current @ 30V dc (exclusive of load) All others: less than 60 mA max. current @ 12V dc (exclusive of load) less than 40 mA max. current @ 30V dc (exclusive of load) AS-i Compatible |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages (fast transient and over-voltage) and reverse polarity |
| Output Configuration | PNP or NPN (depending on model) |
| Output Rating | 150 mA max. C3 models: ON-state saturation voltage: PNP models: Less than 2V @ 10 mA dc; less than 2.5V @ 150 mA dc NPN models: Less than 1.5V @ 10 mA dc; less than 2V @ 150 mA dc OFF-state leakage current: Less than 10 μA @ 30V dc All others: OFF-state leakage current: Less than 10 μA @ 30V dc ON-state voltage: less than 2V @ 10 mA dc; less than 2.5V @ 150 mA dc |
| Output Protection Circuitry | Protected against false pulse on power-up and continuous overload or short circuit of output |
| Output Response Time | C3 models: 5 milliseconds ON/OFF All others: 3 milliseconds ON/OFF |

More
on next
page

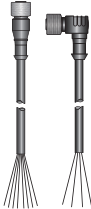
| K50 and K80 Specifications (cont'd) | |
|-------------------------------------|--|
| Indicators | C3 models: Entire translucent dome provides indicator light. Job ("Pick") indicator–Green Pick Sensed indicator–Yellow Mispick indicator–Red All others: Entire translucent dome provides indicator light; either Job or Pick Sensed indicator inhibits the other light, depending on model. Job ("Pick") indicator–Green Pick Sensed indicator–Red or OFF, depending on model |
| Job Light Enable Input | Input impedance: 8000Ω Sinking–Input low less than 1.5V Sourcing–Input high greater than 7V |
| Construction | Base and translucent dome: polycarbonate Lens: polycarbonate or acrylic Push Button: thermoplastic |
| Environmental Rating | Fully encapsulated; IEC IP67 Integral QD models: IP69K when using IP69K-rated cordsets Pigtail and cable models: IP69K when mounted with conduit |
| Connections | C3 models: 5-pin 150 mm PUR pigtail Euro-style QD (QPMA). QD cordsets are ordered separately. See page 447. All others: 2 m or 9 m 4-wire attached cable, 4-pin integral Euro-style QD (Q) or 4-pin 150 mm PVC pigtail Euro-style QD (QP), depending on model. QD cordsets are ordered separately. See page 469. |
| Ambient Light Immunity | Up to 5,000 lux |
| EMI/RFI Immunity | Immunity to EMI and RFI noise sources per IEC 947-5-2 |
| Operating Conditions | Temperature: -40° to +50° C Relative Humidity: 90% at 50° C (non-condensing) |
| Certifications | K30, K50 & K80:  K50:  |
| Hookup Diagrams | 1- & 2-color models: LI01 (p. 783) 3-color models: LI02 (p. 783) |


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- TASK LIGHTS
- VISION LIGHTS
- INDICATORS
- ACTUATORS**
- K30, K50 & K80
- PVD
- PVA
- VTB
- OTB/LTB
- STB





Cordsets


| Euro QD | | | | |
|--------------|----------------|-------------|----------------|-------------|
| See page 696 | | | | |
| Length | Threaded 4-Pin | | Threaded 5-Pin | |
| | Straight | Right-Angle | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA | MQDC1-506 | MQDC1-506RA |
| 4.57 m | MQDC-415 | MQDC-415RA | MQDC1-515 | MQDC1-515RA |
| 9.14 m | MQDC-430 | MQDC-430RA | MQDC1-530 | MQDC1-530RA |




 Additional cordset information available. See page 693.

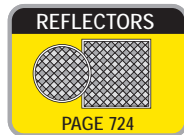
Brackets

| K50/K80 | | | K30 |
|---|---|---|---|
|  |  |  |  |
| pg. 653 SMB30A | pg. 654 SMB30SC | pg. 653 SMB30FA.. | pg. 652 SMB22A |

 Additional brackets and information available. See page 632.

Andon Solutions

| K50 | |
|--|------------------------|
|  | SMBARPL30 (Left Side) |
| | SMBARPR30 (Right Side) |
| | SMBARPB30 (Both Sides) |

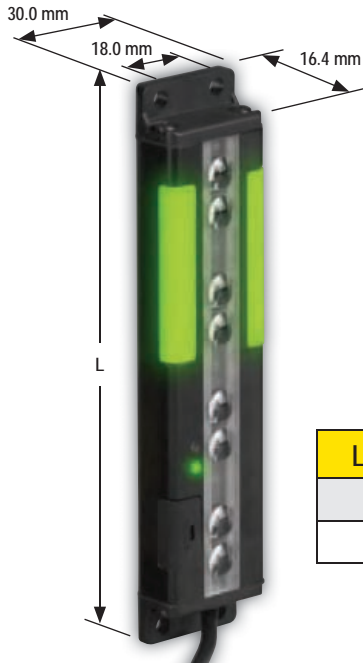
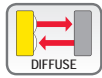
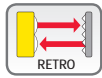


One-Piece Pick-to-Light Sensor PVD

- Large green job light indicates action to perform, and red job light indicates an error
- Two lengths are available to fit existing bins and configurations: 100 and 225 mm
- Easy-to-use sensor suits many part assembly, pick-to-light and error-proofing applications
- One-piece self-contained sensor requires no external controller
- Sensor automatically operates in either diffuse or retroreflective mode, depending on the application
- Automated setup and adjustment with a wide beam pattern makes alignment easy
- Protective mounting brackets are available

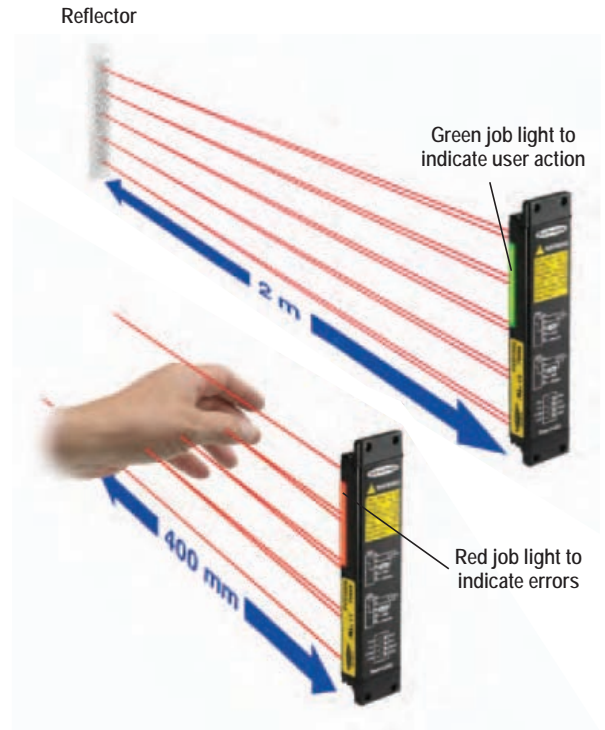


ACCESSORIES
page 471



ONLINE
AUTOCAD, STEP, IGES & PDF

| Length (L) | Models |
|------------|--------|
| 137.8 mm | PVD100 |
| 266.4 mm | PVD225 |




PVD, 12-30V dc

→ Visible Red LED

| Sensing Mode/LED | Range | Array | Connection | Output | Models |
|------------------|------------------------------------|---------------------|-----------------------|---------|---------|
| | Retroreflective Mode: up to 2 m | 100 mm (4 Beams) | 2 m | NPN/PNP | PVD100 |
| | | | 5-pin Euro Pigtail QD | | PVD100Q |
| | Diffuse Mode: up to 400 mm | 225 mm (8 Beams) | 2 m | | PVD225 |
| | | | 5-pin Euro Pigtail QD | | PVD225Q |

Connection options: A model with a QD requires a mating cordset (see page 471).

For 9 m cable, add W/30 to the 2 m model number (example, PVD100 W/30).

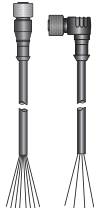
| PVD Specifications | |
|-----------------------------|---|
| Sensing Range | Retroreflective applications: 2 m, using 25 mm wide retroreflective tape Diffuse applications: 400 mm, with 18% reflectivity gray card target |
| Sensing Beam | 630 nm, Visible red |
| Beam Spacing | 28.6 mm |
| Sensing Height | 4-channel models: 111 mm 8-channel models: 240 mm |
| Supply Voltage and Current | Input Voltage: 12 to 30V dc (10% max. ripple @ 10% duty cycle) Input Current: less than 40 mA @ 24V dc and less than 70 mA @ 12V dc (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient over-voltage |
| Sensing Resolution | Retroreflective: 51 mm at 406 mm range, 100 mm at 2 m Diffuse: 55 mm dia. at 400 mm range |
| Output Configuration | User-selectable via DIP switch: 1 open-collector PNP (current sourcing) or 1 open-collector NPN (current sinking) |
| Output Rating | 150 mA max. OFF-state leakage current: less than 10 µA ON-state saturation voltage: NPN: less than 1.0V dc at 150 mA PNP: less than 2.0V dc at 150 mA |
| Output Protection Circuitry | Protected against false pulse at power-up and short circuit of outputs |
| Output Response Time | 400 milliseconds (Includes standard 100 milliseconds ON-delay and 100 milliseconds OFF-delay) |
| Delay at Power-Up | Less than 1.0 second |
| Indicators | Green: LED to indicate power ON/OFF Yellow: LED to indicate output ON/OFF Job Light: (Diffused Green LED) Turned ON and OFF by applying an external signal to the Job input (white wire). The job lights will be active high or active low, depending on user selection of DIP switch 4. Error Light: (Diffused Red LED) Turned ON and OFF by detection of an output event when job light is not ON. |
| Adjustments | 4 DIP switches, located behind access panel (' denotes default setting): 1. PNP / NPN output 2. Normally Open operation / Normally Closed 3. Job light ON solid / Job light flashing 4. Job light input high / Job light input low |
| Construction | Black painted aluminum housing; acrylic lenses; thermoplastic polyester end caps; thermoplastic elastomer programming switch cover; stainless steel mounting brackets and hardware |
| Environmental Rating | NEMA 2; IEC IP62 |
| Connections | 5-conductor PVC-jacketed 2 m cable which is either unterminated or terminated with a 5-pin Euro-style quick-disconnect connector, depending on model. Cable diameter is 3.3 mm. QD cordsets are ordered separately. See page 471. |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% relative humidity @ 50° C (non-condensing) |
| Certifications |  |
| Hookup Diagrams | LI03 (p. 783) |


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- TASK LIGHTS
- VISION LIGHTS
- INDICATORS
- ACTUATORS
- K30, K50 & K80
- PVD**
- PVA
- VTB
- OTB/LTB
- STB




Cordsets


| Euro QD | | |
|----------------|-----------|-------------|
| See page 699 | | |
| Threaded 5-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC1-506 | MQDC1-506RA |
| 4.57 m | MQDC1-515 | MQDC1-515RA |
| 9.14 m | MQDC1-530 | MQDC1-530RA |



 Additional cordset information available. See page 693.

Brackets

| PVD | | |
|---|---|---|
|  |  |  |
| pg. 681 | pg. 679 | pg. 679 |
| SMBPVD... | SMBPVA..C | SMBPVA6 |

 Additional brackets and information available. See page 632.

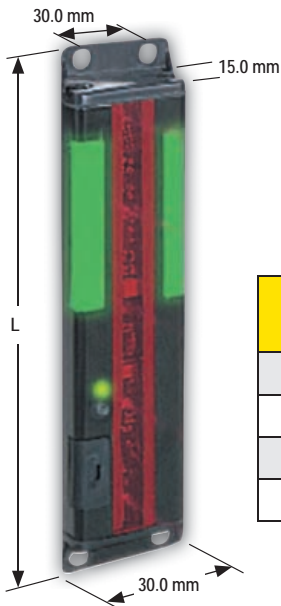
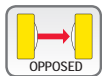


Pick-to-Light Parts Verification Array PVA

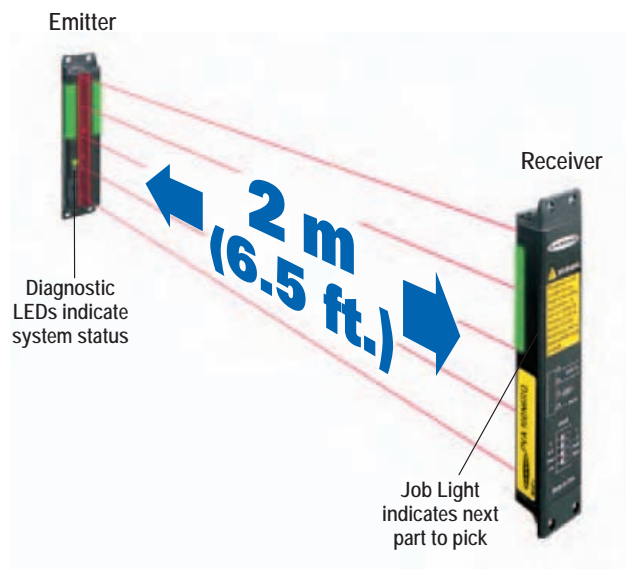
- Highly visible job lights on each emitter and receiver provide a reliable error-proofing system for assembly operations
- Reducing the chance of missed and misassembled parts increases quality and decreases production costs
- Asynchronous emitter and receiver requires no external controller
- Sensor can detect objects larger than 35 mm in diameter
- Emitter and receiver interface easily with the existing process controller for simple installation, minimal maintenance and reduced wiring costs
- Diagnostic LEDs indicate setup and system errors at a glance, and the wide field of view makes alignment easy
- Operating range is up to 2 m
- Four lengths are available: 100, 225, 300 and 375 mm
- Protective brackets are available



ACCESSORIES
page
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| Models | No. of Beams | Length (L) |
|--------|--------------|------------|
| PVA100 | 5 | 137.8 mm |
| PVA225 | 10 | 266.4 mm |
| PVA300 | 13 | 341.4 mm |
| PVA375 | 16 | 416.6 mm |



PVA, 12-30V dc

⇨ Infrared LED

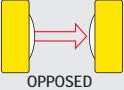
| Sensing Mode/LED | Description | Range | Array Length & Response Time | Connection | Job Light Input | NPN Models | PNP Models |
|------------------|-----------------------|-------|------------------------------|------------------------------|---|------------|------------|
| | Emitter/Receiver Pair | 2 m | 100 mm (5 Beams) 20 ms | 2 m | NPN: 0V dc PNP: +5 to 30V dc | PVA100N6 | PVA100P6 |
| | Emitter | | | | | PVA100N6E | PVA100P6E |
| | Receiver | | | | | PVA100N6R | PVA100P6R |
| | Emitter/Receiver Pair | | | 2 m 4-pin Euro Pigtail QD | | PVA100N6Q | PVA100P6Q |
| | Emitter | | | | | PVA100N6EQ | PVA100P6EQ |
| | Receiver | | | | | PVA100N6RQ | PVA100P6RQ |

More on next page

Connection options: A model with a QD requires a mating cordset (see page 474).

PVA, 12-30V dc (cont'd)

⇒ Infrared LED

| Sensing Mode/LED | Description | Range | Array Length & Response Time | Connection | Job Light Input | NPN Models | PNP Models | | | |
|--|-----------------------|-------|------------------------------|------------|-----------------|------------|---------------------------------|----------------------|------------|------------|
|  | Emitter/Receiver Pair | 2 m | 225 mm (10 Beams) | 2 m | NPN: 0V dc | PVA225N6 | PVA225P6 | | | |
| | Emitter | | | | | PVA225N6E | PVA225P6E | | | |
| | Receiver | | | | | PVA225N6R | PVA225P6R | | | |
| | Emitter/Receiver Pair | | | | | 40 ms | 2 m 4-pin Euro Pigtail QD | PNP: +5 to 30V dc | PVA225N6Q | PVA225P6Q |
| | Emitter | | | | | | | | PVA225N6EQ | PVA225P6EQ |
| | Receiver | | | | | | | | PVA225N6RQ | PVA225P6RQ |
| | Emitter/Receiver Pair | | 300 mm (13 Beams) | 2 m | NPN: 0V dc | | | | PVA300N6 | PVA300P6 |
| | Emitter | | | | | | | | PVA300N6E | PVA300P6E |
| | Receiver | | | | | | | | PVA300N6R | PVA300P6R |
| | Emitter/Receiver Pair | | | | | 52 ms | 2 m 4-pin Euro Pigtail QD | PNP: +5 to 30V dc | PVA300N6Q | PVA300P6Q |
| | Emitter | | | | | | | | PVA300N6EQ | PVA300P6EQ |
| | Receiver | | | | | | | | PVA300N6RQ | PVA300P6RQ |
| | Emitter/Receiver Pair | | 375 mm (16 Beams) | 2 m | NPN: 0V dc | | | | PVA375N6 | PVA375P6 |
| | Emitter | | | | | | | | PVA375N6E | PVA375P6E |
| | Receiver | | | | | | | | PVA375N6R | PVA375P6R |
| | Emitter/Receiver Pair | | | | | 64 ms | 2 m 4-pin Euro Pigtail QD | PNP: +5 to 30V dc | PVA375N6Q | PVA375P6Q |
| | Emitter | | | | | | | | PVA375N6EQ | PVA375P6EQ |
| | Receiver | | | | | | | | PVA375N6RQ | PVA375P6RQ |

Connection options: A model with a QD requires a mating cordset (see page 474).



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 470

- TASK LIGHTS
- VISION LIGHTS
- INDICATORS
- ACTUATORS
- K30, K50 & K80
- PVD
- PVA**
- VTB
- OTB/LTB
- STB

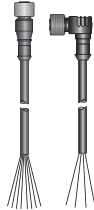
| PVA Specifications | | | | | | | | | | | | | | | | |
|-----------------------------|---|------------------------------------|----------|------------------------------------|--------|-----------------|----------------------|--------|-----------------|----------------------|--------|-----------------|----------------------|--------|-----------------|----------------------|
| Beam Spacing | 25.0 mm | | | | | | | | | | | | | | | |
| Sensing Height | 100, 225, 300 or 375 mm, depending on emitter and receiver models | | | | | | | | | | | | | | | |
| Supply Voltage and Current | 12 to 30V dc (10% max. ripple) at less than 62 mA for the emitter and 50 mA for the receiver (exclusive of load) | | | | | | | | | | | | | | | |
| Supply Protection Circuitry | Protected against reverse polarity | | | | | | | | | | | | | | | |
| Output Configuration | Receivers have one solid-state dc output, programmable for Light or Dark Operate: Models PVA...N6R have current sinking (NPN) open-collector transistor Models PVA...P6R have current sourcing (PNP) open-collector transistor | | | | | | | | | | | | | | | |
| Output Rating | 150 mA max. OFF-state leakage current: less than 2 µA ON-state saturation voltage: less than 1V dc at 10 mA and less than 1.5V dc at 100 mA | | | | | | | | | | | | | | | |
| Output Response Time | <table border="1"> <thead> <tr> <th>Sensor Size</th> <th>Standard</th> <th>With Crosstalk from Adjacent Units</th> </tr> </thead> <tbody> <tr> <td>100 mm</td> <td>20 milliseconds</td> <td>30 milliseconds max.</td> </tr> <tr> <td>225 mm</td> <td>40 milliseconds</td> <td>60 milliseconds max.</td> </tr> <tr> <td>300 mm</td> <td>52 milliseconds</td> <td>78 milliseconds max.</td> </tr> <tr> <td>375 mm</td> <td>64 milliseconds</td> <td>96 milliseconds max.</td> </tr> </tbody> </table> | Sensor Size | Standard | With Crosstalk from Adjacent Units | 100 mm | 20 milliseconds | 30 milliseconds max. | 225 mm | 40 milliseconds | 60 milliseconds max. | 300 mm | 52 milliseconds | 78 milliseconds max. | 375 mm | 64 milliseconds | 96 milliseconds max. |
| Sensor Size | Standard | With Crosstalk from Adjacent Units | | | | | | | | | | | | | | |
| 100 mm | 20 milliseconds | 30 milliseconds max. | | | | | | | | | | | | | | |
| 225 mm | 40 milliseconds | 60 milliseconds max. | | | | | | | | | | | | | | |
| 300 mm | 52 milliseconds | 78 milliseconds max. | | | | | | | | | | | | | | |
| 375 mm | 64 milliseconds | 96 milliseconds max. | | | | | | | | | | | | | | |
| Output Protection Circuitry | Protected against false pulse at power-up and continuous overload or short circuit of outputs | | | | | | | | | | | | | | | |
| Sensing Resolution | 35 mm min. diameter | | | | | | | | | | | | | | | |


More on next page

| PVA Specifications (cont'd) | |
|-----------------------------|---|
| Status Indicators | <p>Emitter: One Green LED to indicate power ON/OFF One Red LED to indicate frequency selected</p> <p>Receiver: One Green LED to indicate power ON/OFF One Yellow LED to indicate output state</p> <p>Emitter & Receiver: Both have two highly visible "job lights" which are turned ON/OFF by applying an external signal to the white wire. The job lights may be programmed for steady or flashing green.</p> |
| Construction | Black painted aluminum housing; acrylic lenses; PBT polyester end caps; thermoplastic elastomer programming switch cover; stainless steel mounting brackets and hardware |
| Environmental Rating | IEC IP62; NEMA 2 |
| Connections | <p>Emitter: 3-conductor PVC-jacketed 2 m cable which is either unterminated or terminated with a 4-pin Euro-style quick-disconnect connector, depending on model. Cable diameter is 3.3 mm.</p> <p>Receiver: 4-conductor PVC-jacketed 2 m cable which is either unterminated or terminated with a 4-pin Euro-style quick-disconnect connector, depending on model. Cable diameter is 3.3 mm.</p> |
| Operating Temperature | 0° to +50° C |
| Certifications |   |
| Hookup Diagrams | Emitters: LI05 (p. 784) All others: LI04 (p. 783) |




Cordsets


| Euro QD | | |
|----------------|----------|-------------|
| See page 696 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA |
| 4.57 m | MQDC-415 | MQDC-415RA |
| 9.14 m | MQDC-430 | MQDC-430RA |




 Additional cordset information available. See page 693.

Brackets

| PVA | | |
|---|---|--|
|  pg. 679 SMBPVA... |  pg. 679 SMBPVA..C |  pg. 678 SMBPVA2 |


 Additional brackets and information available. See page 632.



Verification Optical Touch Buttons VTB

- Replaces capacitive touch switches and mechanical push buttons
- Features illuminated base (to provide a bright, easy-to-see job light); solid, flashing or multiple color models available
- Models available with red, green or blue job light
- Requires no physical pressure to operate, eliminating hand, wrist and arm stresses associated with repeated switch operation
- Offers a cost-effective and easy-to-install pick-to-light solution for areas that cannot accommodate a light screen
- Cuts through heavy airborne contamination to function in almost any environment
- Withstands exposure to a variety of chemicals, depending on model

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 476




- TASK LIGHTS
- VISION LIGHTS
- INDICATORS
- ACTUATORS
- K30, K50 & K80
- PVD
- PVA
- VTB**
- OTB/LTB
- STB

VTB, 12-30V dc

| Job Light(s) Color | Connection | Upper Housing | Job Light Input | NPN Models | PNP Models |
|--------------------|---------------|---------------|---|------------|------------|
| Green | 2 m | Polysulfone | NPN: 0V dc PNP: +5 to 30V dc | VTBN6 | VTBP6 |
| | 4-Pin Euro QD | | | VTBN6Q | VTBP6Q |
| Red | 2 m | | | VTBN6R | VTBP6R |
| | 4-Pin Euro QD | | | VTBN6RQ | VTBP6RQ |
| Blue | 2 m | | | VTBN6B | VTBP6B |
| | 4-Pin Euro QD | | | VTBN6BQ | VTBP6BQ |
| Green & Red | 2 m | Polycarbonate | | VTBN6GR | VTBP6GR |
| | 5-Pin Euro QD | | | VTBN6GRQ | VTBP6GRQ |
| Green | 2 m | | | VTBN6L | VTBP6L |
| | 4-Pin Euro QD | | | VTBN6LQ | VTBP6LQ |
| Red | 2 m | | | VTBN6RL | VTBP6RL |
| | 4-Pin Euro QD | | | VTBN6RLQ | VTBP6RLQ |
| Blue | 2 m | | VTBN6BL | VTBP6BL | |
| | 4-Pin Euro QD | | VTBN6BLQ | VTBP6BLQ | |
| Green & Red | 2 m | | VTBN6GRL | VTBP6GRL | |
| | 5-Pin Euro QD | | VTBN6GRLQ | VTBP6GRLQ | |


Connection options: A model with a QD requires a mating cordset (see page 476).

For 9 m cable, add W/30 to the 2 m model number (example, VTBN6 W/30).

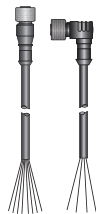
| VTB Specifications | |
|-----------------------------|--|
| Supply Voltage and Current | 12 to 30V dc (10% max. ripple) Single-color models: Less than 120 mA max. current @ 12V dc (exclusive of load) Less than 70 mA max. current @ 30V dc (exclusive of load) Two-color models: Less than 67 mA max. current @ 12V dc (exclusive of load) Less than 40 mA max. current @ 24V dc (exclusive of load) Less than 35 mA max. current @ 30V dc (exclusive of load) |
| Supply Protection Circuitry | Protected against transient voltages (fast-transient and over-voltage) and reverse polarity |
| Output Configuration | Choose 1 current sinking (NPN) open collector transistor or 1 current sourcing (PNP) open collector transistor, depending on model |
| Output Rating | Max. load: 150 mA ON-state saturation voltage: less than 1.5V @ 150 mA OFF-state leakage current: less than 10 µA |
| Output Protection | All models protected against false pulse on power-up (outputs held OFF for 1 second at power-up). Models with solid-state outputs have overload and short-circuit protection. |
| Response Time | 100 milliseconds ON/OFF |
| Indicators | 2 Red LED indicators: Power ON and Output Conducting Base: Lights green, red, blue, or green and red as a job light when input line is enabled. One-color models may be wired for flashing rather than solid color operation. |
| Construction | Totally encapsulated, non-metallic enclosure. Black polysulfone or red polycarbonate upper housing (see Application Note below); translucent white polycarbonate base. Electronics fully epoxy-encapsulated. |
| Environmental Rating | IEC IP66 ; NEMA 1, 3, 4, 4X, 12 and 13 |
| Connections | 2 m or 9 m attached cable, or 4-pin (single color) or 5-pin (two color) Euro-style QD fitting. QD cordsets are ordered separately. See pages 476. |
| Ambient Light Immunity | Up to 120,000 lux (direct sunlight) |
| EMI/RFI Immunity | Immune to EMI and RFI noise sources, per IEC 947-5-2. |
| Operating Conditions | Temperature: -20° to +50° C Relative humidity: 90% @ +50° C (non-condensing) |
| Application Notes | Environmental considerations for models with polysulfone upper housings: The polysulfone upper housing will become brittle with prolonged exposure to outdoor sunlight. Avoid contact with strong alkalis. Clean periodically using mild soap solution and a soft cloth. Environmental considerations for models with polycarbonate upper housings: Avoid prolonged exposure to hot water and moist, high-temperature environments above 66° C. Avoid contact with aromatic hydrocarbons (such as xylene and toluene), halogenated hydrocarbons and strong alkalis. Clean periodically using mild soap solution and a soft cloth. |
| Certifications |  |
| Hookup Diagrams | NPN Single-Color Models: LI06 (p. 784) PNP Single-Color Models: LI07 (p. 784) Two-Color Models: LI22 (p. 788) |

Cordsets




| Euro QD | | | | |
|--------------|----------------|-------------|----------------|-------------|
| See page 696 | | | | |
| | Threaded 4-Pin | | Threaded 5-Pin | |
| Length | Straight | Right-Angle | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA | MQDC1-506 | MQDC1-506RA |
| 4.57 m | MQDC-415 | MQDC-415RA | MQDC1-515 | MQDC1-515RA |
| 9.14 m | MQDC-430 | MQDC-430RA | MQDC1-530 | MQDC1-530RA |




Additional cordset information available. See page 693.



Brackets


| VTB | | |
|---|--|---|
|  |  |  |
| pg. 653 SMB30A | pg. 654 SMB30SC | pg. 653 SMB30FA.. |



Additional brackets and information available. See page 632.

Field Covers

| VTB | |
|--------|----------|
| Models | |
| Black | OTC-1-BK |
| Green | OTC-1-GN |
| Red | OTC-1-RD |
| Yellow | OTC-1-YW |





Optical Touch Buttons

OTB/LTB OPTO-TOUCH®

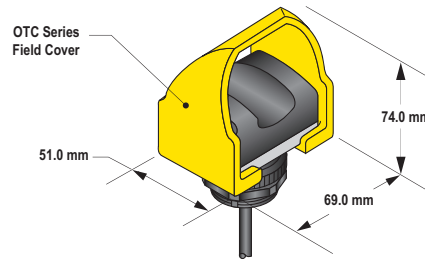
- Ergonomically designed touch buttons eliminate hand, wrist and arm stress
- Zero-force touch buttons provide an alternative to capacitive touch switches and mechanical push buttons
- OTB models are momentary-action touch buttons with electromechanical relay or solid-state outputs
- LTB models are alternate-action touch buttons with electromechanical relay outputs

OTB Models [page 477](#)

LTB Models [479](#)



OTB and LTB Models



OTB and LTB Models with cover



- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 480

- TASK LIGHTS
- VISION LIGHTS
- INDICATORS
- ACTUATORS
- K30, K50 & K80
- PVD
- PVA
- VTB
- OTB/LTB**
- STB

OTB Momentary Action, 10-30V dc

| Upper Housing | Connection | Models NPN | Models PNP |
|---------------|---------------|------------|------------|
| Polysulfone | 2 m | OTBVN6 | OTBVP6 |
| | 4-Pin Mini QD | OTBVN6QD | OTBVP6QD |
| Polycarbonate | 2 m | OTBVN6L | OTBVP6L |
| | 4-Pin Mini QD | OTBVN6LQD | OTBVP6LQD |

Connection options: A model with a QD requires a mating cordset (see page 480)

For 9 m cable, add suffix W/30 to the 2 m model number (example, OTBVN6 W/30).

OTB Momentary Action, 20-30V ac or dc

| Upper Housing | Connection | Output Type | Models |
|---------------|---------------|-------------------|------------|
| Polysulfone | 2 m | SPDT e/m Relay | OTBVR81 |
| | 5-Pin Mini QD | | OTBVR81QD |
| Polycarbonate | 2 m | SPDT e/m Relay | OTBVR81L |
| | 5-Pin Mini QD | | OTBVR81LQD |

OTB Momentary Action, 120V ac


| Upper Housing | Connection | Output Type | Models |
|---------------|---------------|-------------------|----------|
| Polysulfone | 2 m | SPDT e/m Relay | OTBA5 |
| | 5-Pin Mini QD | | OTBA5QD |
| Polycarbonate | 2 m | SPDT e/m Relay | OTBA5L |
| | 5-Pin Mini QD | | OTBA5LQD |

ACCESSORIES

page
480

OTB Momentary Action, 220/240V ac

| Connection | Upper Housing | Output Type | Models |
|---------------|---------------|-------------------|----------|
| Polysulfone | 2 m | SPDT e/m Relay | OTBB5 |
| | 5-Pin Mini QD | | OTBB5QD |
| Polycarbonate | 2 m | SPDT e/m Relay | OTBB5L |
| | 5-Pin Mini QD | | OTBB5LQD |

 Connection options: A model with a QD requires a mating cordset (see page 480)

For 9 m cable, add suffix W/30 to the 2 m model number (example, OTBVR81 W/30).

OTB Specifications

| | |
|-----------------------------|--|
| Supply Voltage and Current | OTBVR81 models: 20 to 30V ac/dc OTBA5 models: 105 to 130V ac, 50-60 Hz OTBB5 models: 210 to 250V ac, 50-60 Hz OTBVN6/VP6 models: 10 to 30V dc All models require less than 25 mA (exclusive of load) |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | OTBVR81, OTBA5, and OTBB5 models: SPDT electromechanical relay OTBVN6 models: Complementary NPN (sinking) open-collector transistor; 1 normally open (NO) and 1 normally closed (NC) OTBVP6 models: Complementary PNP (sourcing) open-collector transistors; 1 normally open (NO) and 1 normally closed (NC) |
| Output Rating | Electromechanical relay models: Max. switching current: 7 amps (resistive load), 1 HP max. Min. load: 0.05 watts (dc), 0.05 VA (ac) Mechanical life of relay: 50,000,000 operations (min.) Electrical life of relay: 100,000 operations (min.) at full resistive load Transient suppression is recommended when switching inductive loads Solid-state output models: 150 mA max. load (each output) ON-state saturation voltage: less than 1 volt at signal levels; less than 1.5 volts at full load OFF-state leakage current: less than 1 μ A |

 More
on next
page

| OTB Specifications (cont'd) | |
|-----------------------------|---|
| Response Time | 100 milliseconds ON/OFF |
| Output Protection | All models protected against false pulse on power-up Models with solid-state outputs have overload and short circuit protection |
| Indicators | Two Red indicator LEDs: one lights whenever power is applied; the other lights whenever the switch is activated making the normally-open (NO) output conduct |
| Construction | Totally encapsulated, non-metallic enclosure. Black polysulfone or red polycarbonate upper housing (see Application Notes below); fiber-reinforced thermoplastic polyester base. Electronics fully epoxy-encapsulated. Supplied with a field cover of polypropylene (TP). |
| Environmental Rating | Meets NEMA standards 1, 3, 4, 4X, 12 and 13; IEC IP66 |
| Connections | PVC-jacketed 2 m or 9 m cables, or Mini-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 480. |
| Ambient Light Immunity | 120,000 lux (direct sunlight) |
| EMI/RFI Immunity | Immune to both single and mixed EMI and RFI noise sources |
| Operating Conditions | Temperature: -20° to +50° C Relative humidity: 90% at 50° C (non-condensing) |
| Application Notes | <p>Environmental considerations for models with polysulfone upper housings: The polysulfone upper housing will become embrittled with prolonged exposure to outdoor sunlight. Window glass effectively filters longer wavelength ultraviolet light and provides excellent protection from sunlight.</p> <p>Environmental considerations for models with polycarbonate upper housings: Avoid prolonged exposure to hot water and moist high-temperature environments above 66° C. Avoid contact with aromatic hydrocarbons (such as xylene and toluene), halogenated hydrocarbons and strong alkalis. Clean periodically using mild soap solution and a soft cloth. Avoid strong alkaline materials.</p> |
| Certifications | |
| Hookup Diagrams | DC Models: DC03 (p. 758) AC/DC Models: OTBVR81 Models: UN01 (p. 767) AC Models: OTBA5 Models: AC08 (p. 765) OTBB5 Models: AC08 (p. 765) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators**
- Safety Light Screens
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- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- TASK LIGHTS
- VISION LIGHTS
- INDICATORS
- ACTUATORS**
- K30, K50 & K80
- PVD
- PVA
- VTB
- OTB/LTB**
- STB

LTB Alternate Action, 220/240V ac


| Upper Housing | Connection | Output Type | Models |
|---------------|---------------|-------------------|----------|
| Polysulfone | 2 m | SPDT e/m Relay | LTBB5 |
| | 5-Pin Mini QD | | LTBB5QD |
| Polycarbonate | 2 m | | LTBB5L |
| | 5-Pin Mini QD | | LTBB5LQD |

LTB Alternate Action, 120V ac

| Upper Housing | Connection | Output Type | Models |
|---------------|---------------|-------------------|----------|
| Polysulfone | 2 m | SPDT e/m Relay | LTBA5 |
| | 5-Pin Mini QD | | LTBA5QD |
| Polycarbonate | 2 m | | LTBA5L |
| | 5-Pin Mini QD | | LTBA5LQD |


Connection options: A model with a QD requires a mating cordset (see page 480)


For 9 m cable, add suffix W/30 to the 2 m model number (example, LTBA5 W/30).

| LTB Specifications | |
|-----------------------------|--|
| Supply Voltage and Current | LTBA5 models: 105 to 130V ac, 50-60 Hz LTBB5 models: 210 to 250V ac, 50-60 Hz |
| Supply Protection Circuitry | Protected against reverse polarity and transient voltages |
| Output Configuration | All models have SPDT electromechanical relay - complementary outputs: one normally open (NO) contact and one normally closed (NC) contact which "toggle" from open to closed when the button is activated |
| Output Rating | Max. voltage is 250V ac or 30V dc Max. current: 7 amps (resistive load), 1 HP max. Min. load: .05 watts (dc), 0.5VA (ac) Mechanical life of relay: 50,000,000 operations (min.) Electrical life of relay: 100,000 operations (min.) at full resistive load Transient suppression is recommended when switching inductive loads. |
| Output Protection | All models protected against false pulse on power-up |
| Indicators | Two Red indicator LEDs: one lights whenever power is applied; the other lights when the infrared sensing beam is interrupted |
| Construction | Totally encapsulated, non-metallic enclosure. Black polysulfone or red polycarbonate upper housing; fiber-reinforced thermoplastic polyester base. Electronics fully epoxy-encapsulated. Supplied with a field cover of polypropylene (TP). |
| Environmental Rating | Meets NEMA standards 1, 3, 4, 4X, 12 and 13; IEC IP66 |
| Connections | PVC-jacketed 2 m or 9 m cables, or Mini-style quick-disconnect (QD) fitting. QD cordsets are ordered separately. See page 480. |
| Ambient Light Immunity | 120,000 lux (direct sunlight) |
| EMI/RFI Immunity | Immune to both single and mixed EMI and RFI noise sources |
| Operating Conditions | Temperature: -20° to +50° C Relative humidity: 90% at 50° C (non-condensing) |
| Application Notes | Environmental considerations for models with polysulfone upper housings: The polysulfone upper housing will become embrittled with prolonged exposure to outdoor sunlight. Window glass effectively filters longer wavelength ultraviolet light and provides excellent protection from sunlight. Environmental considerations for models with polycarbonate upper housings: Avoid prolonged exposure to hot water and moist high-temperature environments above 66° C. Avoid contact with aromatic hydrocarbons (such as xylene and toluene), halogenated hydrocarbons and strong alkalis. Clean periodically using mild soap solution and a soft cloth. Avoid strong alkaline materials. |
| Certifications |  |
| Hookup Diagrams | AC08 (p. 765) |

Cordsets


| Mini QD | | |
|--------------|----------------|----------------|
| See page 714 | | |
| | Threaded 4-Pin | Threaded 5-Pin |
| Length | Straight | |
| 1.83 m | MBCC-406 | MBCC-506 |
| 3.66 m | MBCC-412 | MBCC-512 |
| 9.14 m | MBCC-430 | MBCC-530 |






 Additional cordset information available. See page 693.


Field Covers

| OTB/LTB | |
|---------|----------|
| Models | |
| Black | OTC-1-BK |
| Green | OTC-1-GN |
| Red | OTC-1-RD |
| Yellow | OTC-1-YW |



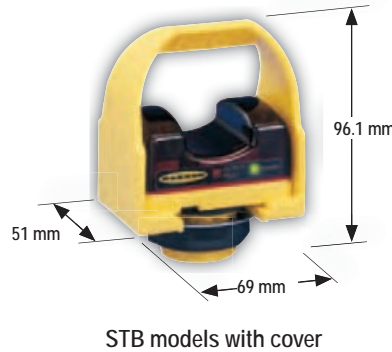
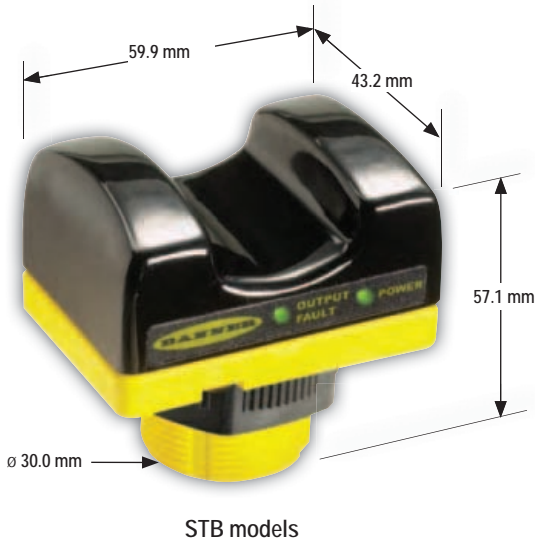
Brackets

| OTB/LTB Optical Touch Buttons | | |
|---|---|---|
|  |  |  |
| pg. 653 | pg. 653 | pg. 654 |
| SMB30A | SMB30MM | SMB30SC |

 Additional brackets and information available. See page 632.

Self-Checking Touch Buttons STB

- Provides highest level of safety for two-hand control input devices, per independent certification tests
- Provides redundant microprocessor and optical path
- Responds to a finger blocking light rather than to pressure
- Features ergonomic design to prevent repetitive motion stress
- Includes yellow field cover to prevent unintended switching
- Immune to ambient light and EMI and RFI interference
- Available with e/m relays rated for 1 amp switch capacity or solid-state outputs rated for 150 mA
- Polyetherimide housing withstands exposure to a variety of chemicals
- For safety applications, STB buttons must be used with DUO-TOUCH® SG Two-Hand control modules, a SC22-3—Safety Controller or comparable control Type IIIC Two-Hand system



STB Self-Checking, 10-30V dc

| Upper Housing | Connection | Output Type | Models |
|----------------|---------------|-------------------------------|----------|
| Polyetherimide | 2 m | Complementary PNP Solid-state | STBVP6 |
| | 4-Pin Mini QD | | STBVP6Q |
| | 4-Pin Euro QD | | STBVP6Q5 |

STB Self-Checking, 20-30V ac/dc

| Upper Housing | Connection | Output Type | Models |
|----------------|---------------|--|-----------|
| Polyetherimide | 2 m | Two Independent and Complementary e/m Relays | STBVR81 |
| | 5-Pin Mini QD | | STBVR81Q |
| | 5-Pin Euro QD | | STBVR81Q6 |

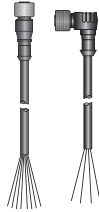
Connection options: A model with a QD requires a mating cordset (see page 482)
For 9 m cable, add suffix W/30 to the 2 m model number (example, STBVP6 W/30).

STB Specifications

See page 568.

Cordsets

| Euro QD | | | | |
|--------------|----------------|-------------|----------------|-------------|
| See page 696 | | | | |
| Length | Threaded 4-Pin | | Threaded 5-Pin | |
| | Straight | Right-Angle | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA | MQDC1-506 | MQDC1-506RA |
| 4.57 m | MQDC-415 | MQDC-415RA | MQDC1-515 | MQDC1-515RA |
| 9.17 m | MQDC-430 | MQDC-430RA | MQDC1-530 | MQDC1-530RA |






| Mini QD | | |
|--------------|----------------|----------------|
| See page 715 | | |
| Length | Threaded 4-Pin | Threaded 5-Pin |
| | Straight | |
| 1.83 m | MBCC-406 | MBCC-506 |
| 3.66 m | MBCC-412 | MBCC-512 |
| 9.14 m | MBCC-430 | MBCC-530 |



Additional cordset information available.
See page 693.

Brackets

| STB Optical Touch Buttons | | |
|---|---|---|
|  |  |  |
| pg. 653 | pg. 653 | pg. 654 |
| SMB30A | SMB30MM | SMB30SC |



Additional brackets and information available.
See page 632.

Field Covers

| STB | |
|--------|----------|
| Models | |
| Black | OTC-1-BK |
| Green | OTC-1-GN |
| Red | OTC-1-RD |
| Yellow | OTC-1-YW |





- Light Screens** page 489
- EZ-SCREEN TYPE 4 493
 - EZ-SCREEN TYPE 2 511



- Laser Scanner** page 525
- AG4 Laser Scanner 525



- Safety Controllers & Modules** page 529
- SC22-3 533
 - E-Stop & Guard 537
 - Universal Input 545
 - Safety Mat 547
 - Muting 550
 - Safe Speed 554
 - Extension Relay 556
 - Interface Relay 558



- Two-Hand Control Modules** page 560
- DUO-TOUCH SG 562
 - STB Buttons 567
 - DUO-TOUCH SG Run Bars 570



- Safety Interlock Switches** page 572
- Magnet Style 575
 - Hinge Style 578
 - Compact Plastic 584
 - Compact Metal 590
 - Locking Style 593

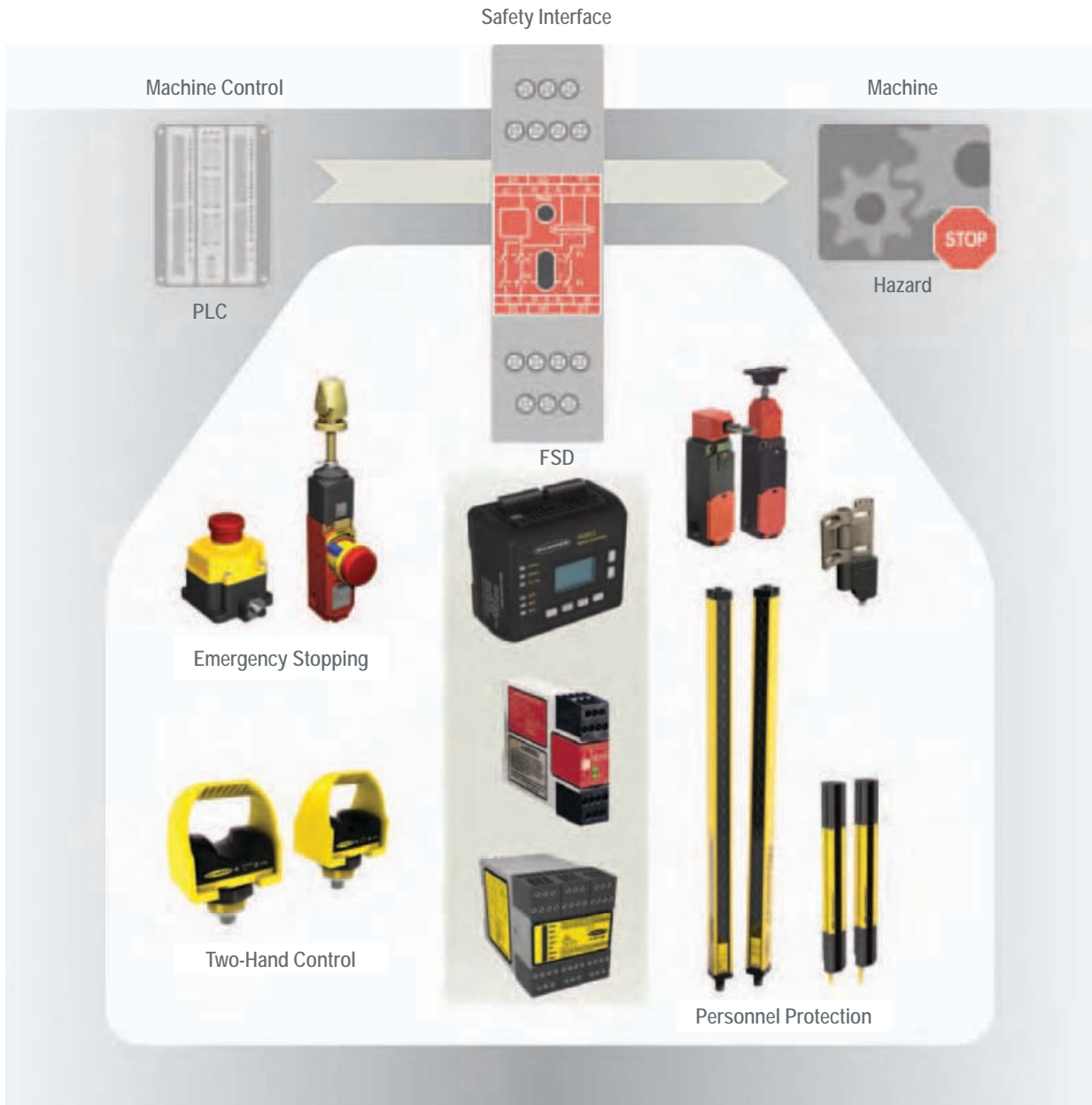


- Emergency Stop & Stop Control Devices** page 607
- E-Stop Buttons 613
 - Rope Pull Switches 617
 - Enabling Devices 627

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LIGHT SCREENS
- LASER SCANNER
- CONTROLLERS & MODULES
- TWO-HAND CONTROL MODULES
- INTERLOCK SWITCHES
- E-STOP & CONTROL DEVICES

Safeguarding Basics



Basics of Safeguarding

Machine and personnel safeguarding refers to the combination of requirements, methods and solutions used to protect people who come in contact with dangerous machines in the industrial environment.

Requirements

National and regional governmental bodies have regulations, mandates, standards and recommendations for implementing a safety method or a solution.

Key regulations regarding general machine guarding include the following:

- Machinery Directive - EU
- OSHA General Duty Clause – USA

(see page 466 for an abridged version list of industry safety standards)

Device Requirements

Safety devices must be able to consistently and reliably bring a machine hazard to an orderly stop.

To be considered a safety device, the following methods must be used to ensure reliable operation: fault exclusion, redundancy and self-checking.

Safety Circuit Requirements

A safety stop circuit typically comprises of 2 normally-open contact from mechanically-linked relays. The circuit is monitored to detect certain failures that could lead to the loss of the safety function.

Methods: Risk Assessment

The Risk Assessment Process in machine safeguarding is a process used to identify hazards through each phase of the machine's life cycle and to minimize dangers to personnel and equipment.

The basic steps in a Risk Assessment Process:

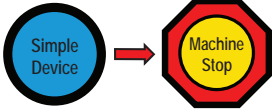



1. Identify hazards and where they occur.
2. Assess risk by severity of harm and probability of occurrence.
3. Reduce the risk through the use of protective measures.
4. Validate and document results.

Risk Assessment Standards

- OSHA 3071, Job Hazard Analysis
- MIL-STD-8820, US DOD System Safety Program
- ANSI/RIA R15.06, Safety Requirements for Industrial Robots and Robot Systems
- ANSI B11.0 General (Safety) Requirements and Risk Assessment
- ANSI B11.TR3, Risk Assessment and Risk Reduction
- ISO 12100, General Principles for Design, Risk Assessment and Risk Reduction
- SEMI S10, Risk Assessment, Semiconductor Manufacturing Equipment

Methods: Safety Circuits





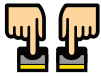

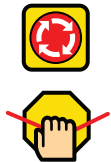
Depending on the level of risk associated with the machine or operations, an appropriate level of control circuitry performance must be incorporated into safety device design.

| | Basic | Single | Single with Monitoring | Dual with Monitoring |
|------------|--|--|---|---|
| Generic | Stop Command | Protective Command | Protective Command Monitoring Signal | Redundant (Safety) Stop Commands Monitoring Signal |
| |  |  |  |  |
| | <ul style="list-style-type: none"> • Non safety-rated components • Integrated in accordance with relevant standards • Reliability depends on robust components • Redundancy not required | <ul style="list-style-type: none"> • Safety-rated components • Integrated in accordance with safety principles and design • Redundancy not required | <ul style="list-style-type: none"> • Safety-rated components • Conducts periodic test of system • Normal operation allowed if no faults are found • If unsafe fault is found, system will default to safe state or indicate that unsafe system exists | <ul style="list-style-type: none"> • Safety-rated components • Greatest degree of fault tolerance • Redundancy and self-checking • Single failure cannot cause loss of safety function • Faults detected immediately or at next demand on system |
| Fault | Possible loss of safety function | Greater reliability, but possible loss of safety function | Fault detected at each test | Safety function is ensured with a single fault. An accumulation of faults is not possible or detected. |
| Risk | Very Low Minor bump or bruise with no lost time | Low Minor first aid, infrequent exposure or high likelihood of avoiding the hazard | Mid Range Injuries that are slight or normally reversible, requiring normal healing or only first aid | High or Very High Normally reserved for hand-fed applications where injuries could be severe to irreversible |
| ANSI / B11 | — | — | — | Control Reliable ANSI B11.19 (Clause 6.1 and Annex C) Category 3 or 4 and/or PL d pr PL e satisfy Control Reliability requirements |
| ANSI / RIA | Simple | Single Channel | Single Channel with Monitoring | Control Reliable ANSI/RIA R15.06 (Clause 4.5) Control reliability for robots typically exceeds a Cat 3 but is not necessarily intended to be a Cat 4 |
| ISO / EN | Category B ISO 13849-1/EN 954-1 | Category 1 ISO 13849-1/EN 954-1 | Category 2 ISO 13849-1/EN 954-1 | Category 3 & 4 ISO 13849-1/EN 954-1 |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- LIGHT SCREENS
- LASER SCANNER
- CONTROLLERS & MODULES
- TWO-HAND CONTROL MODULES
- INTERLOCK SWITCHES
- E-STOP & CONTROL DEVICES

Solutions: Comparing Guards and Devices*

| Type | Safety Function | Advantages | Limitations | Requirements | Standards |
|--|--|--|---|--|---|
| Guards: protective physical barrier used to prevent access. | | | | | |
| Fixed Guard  | Provides a fixed barrier to the hazard | <ul style="list-style-type: none"> • Low maintenance • Long life • Low cost for small areas • Protects all individuals • Can contain ejected materials | <ul style="list-style-type: none"> • Poor ergonomics • Limited visibility • Limited access • Costly for large areas • Maintenance may require removal of guard | <ul style="list-style-type: none"> • Protect from identified hazard • Prevent user from reaching over, under, around or through the barrier • Provide safe openings | <ul style="list-style-type: none"> • ANSI B11.19 • ISO 14120 • ISO 13857 |
| Interlocked Guard  | Interrupts power to machine when guard is opened | <ul style="list-style-type: none"> • Low initial investment • Can be placed close to hazard • Protects all individuals • Can contain ejected materials | <ul style="list-style-type: none"> • Costly for large areas • Increased maintenance | <ul style="list-style-type: none"> • Must be difficult to defeat • Guard may open only after machine has stopped—or must be installed at a safe distance | <ul style="list-style-type: none"> • ANSI B11.19 • NFPA 79 • ISO 14119 • 14120 • IEC 60204-1 |
| Safeguarding Devices: components, attachments or mechanisms designed to perform a specific safeguarding function. | | | | | |
| Safety Light Screen  | Arrests power to machine when sensing field is interrupted | <ul style="list-style-type: none"> • Excellent ergonomics • Allows frequent access • Protects all individuals • Cost effective for large areas • Allows for good visibility | <ul style="list-style-type: none"> • Limited to machines that can be stopped quickly • No protection from ejected parts • May require the use of additional guards • May create a pass-through hazard | <ul style="list-style-type: none"> • Initiate immediate stop when sensing field is interrupted • Appropriate resolution required to detect objects the size of a torso, ankle, hand or finger | <ul style="list-style-type: none"> • ANSI B11.19 • IEC 61496 • ISO 13855 |
| Multiple-Beam System: <ul style="list-style-type: none"> • Grids • Points  | Arrests power to machine when sensing field is interrupted | <ul style="list-style-type: none"> • Low initial investment • Allows frequent access • Allows for good visibility • Protects all individuals | <ul style="list-style-type: none"> • Limited to machines that can be stopped quickly • No protection from ejected parts • Large safety distance • May create a pass-through hazard | <ul style="list-style-type: none"> • Initiate immediate stop when sensing field is interrupted • Appropriate resolution required to detect objects the size of a torso | <ul style="list-style-type: none"> • ANSI B11.19 • IEC 61496 • ISO 13855 |
| Two-Hand Control  | Operator must use both hands to actuate machine motion hereby preventing operator access to hazardous area | <ul style="list-style-type: none"> • Operator's hands are away from hazardous area • Low initial investment • Low maintenance | <ul style="list-style-type: none"> • Potential ergonomic impact • Provides protection only for operator • No protection from ejected parts | <ul style="list-style-type: none"> • Concurrent actuation within 1/2 second • Release and reactivation required before machine motion may be reinitiated | <ul style="list-style-type: none"> • ANSI B11.19 • NFPA 79 • ISO 13851 • IEC 60204-1 |
| Safety Mat Monitor  | Interrupts power to machine when a minimum pressure is applied | <ul style="list-style-type: none"> • Excellent ergonomics • Protects all individuals • Allows for good visibility | <ul style="list-style-type: none"> • Costly for large areas • Maintenance intensive • Large safety distance | Minimum object sensitivity of 66 lbs on and 3-1/8" surface to detect a foot | <ul style="list-style-type: none"> • ANSI B11.19 • ISO 13855 • ISO 13856 |
| Complementary Safety Devices: used to supplement a primary safeguard. | | | | | |
| E-Stop <ul style="list-style-type: none"> • Button • Rope Pull  | Operator activates button in emergency situation to shut off power to machine | <ul style="list-style-type: none"> • Immediate response • Safe shutdown of machine process | <ul style="list-style-type: none"> • Not considered a safeguard • Requires conscious act of operator • Limits injury or machine damage but typically does not prevent it | <ul style="list-style-type: none"> • Overrides all other functions and operations • Reset of E-stop doesn't initiate machine motion • Button must be red with yellow background • Should be located at each operation station • Final removal of power done by electromechanical components | <ul style="list-style-type: none"> • ANSI B11.19 • NFPA 79 • ISO 12100 • IEC 60204-1 • ISO 13850 |

*This represents a partial list of available safeguards & devices.

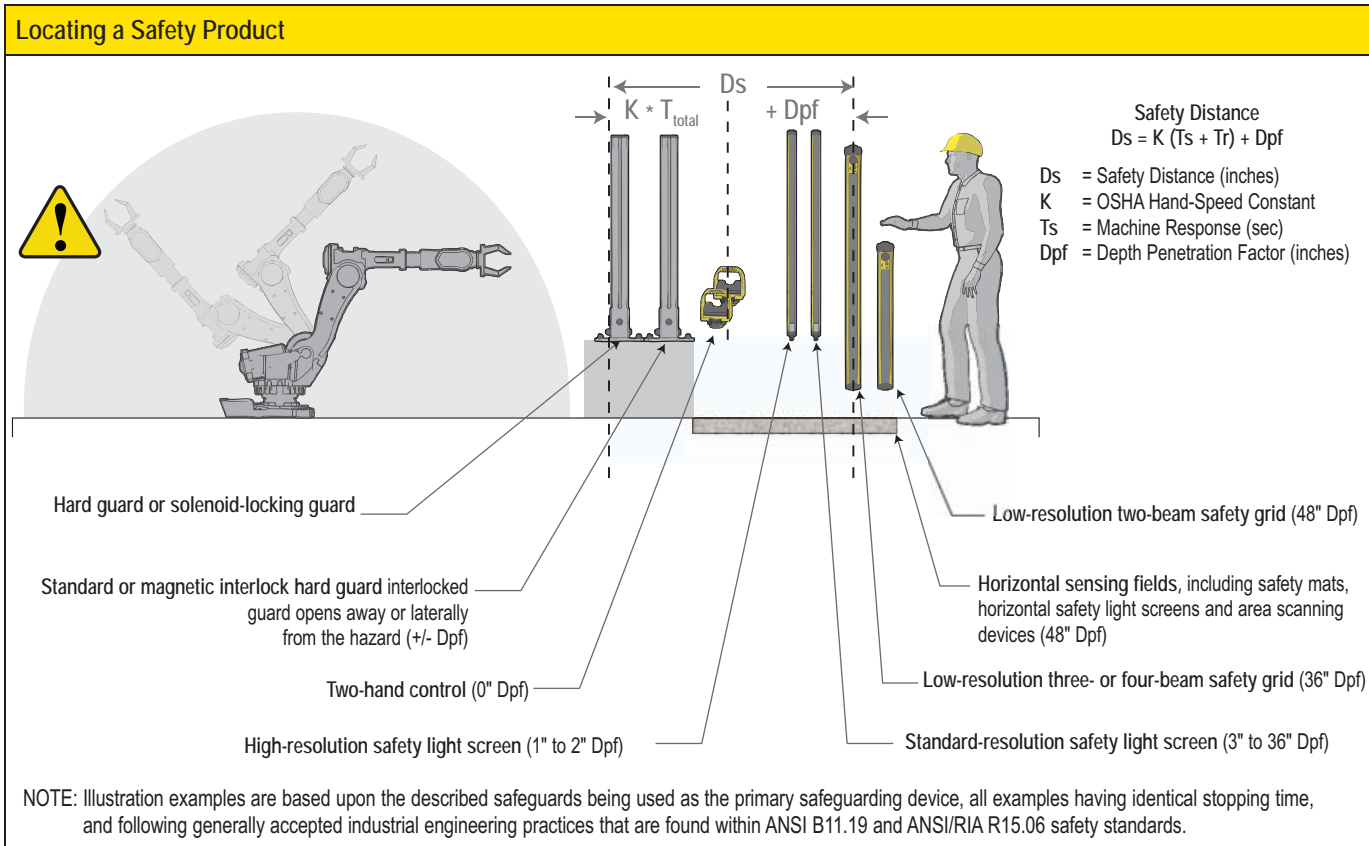
Solutions: Choosing and Locating a Safeguard

When choosing a safeguard, ask yourself the following questions:
 1) is it safe, 2) is it legal and 3) does it make sense for the application.

| Choosing a Safety Product | | | | | | | | | | | |
|---|---|----------------|-----------------|-------------------|------------------------|------------------------|-----------|------------|--------------------|---|---|
| □ Who will use it? □ How will they use it? □ What hazards are associated with which task? □ What are the types of hazards? □ Where will the safeguard be located? | ■ E = Excellent ■ A = Acceptable ■ P = Poor ■ X = Not Acceptable | Maintenance \$ | Frequent Access | Infrequent Access | Locate Close to Hazard | Long Machine Stop Time | Ergonomic | Visibility | Multiple Operators | Guards Against Ejected Material | Comments |
| | Guarding Solutions | | | | | | | | | | |
| | Fixed Hard Guard | P | P | E | E | E | P | P | E | E | <ul style="list-style-type: none"> Limited access Limited visibility to the machine Costly for large areas Costly to maintain and fix |
| | Locking Guard | P | P | E | E | E | P | P | E | E | |
| | Interlock Guard | P | P | A | E | A | P | P | E | E | |
| | Two-Hand Control | A | A | A | A | A | A | A | P | P | <ul style="list-style-type: none"> Only protects operator(s) |
| | High-Resolution SLS | E | E | P | E | P | E | E | E | X | <ul style="list-style-type: none"> Locate closer to hazard |
| | Low-Resolution SLS | E | E | P | E | P | E | E | E | X | <ul style="list-style-type: none"> Costs less than high resolution SLS |
| | 3- or 4-Beam Perimeter | E | A | A | P | A | E | E | E | X | <ul style="list-style-type: none"> Takes less space than 2-beam |
| | 2-Beam Perimeter | E | A | A | P | A | E | E | E | X | <ul style="list-style-type: none"> Costs less than 3- or 4-beam |
| Safety Mats | P | A | A | P | A | E | E | E | X | <ul style="list-style-type: none"> Maintenance-intensive | |

- Photoelectrics Sensors
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- E-STOP & CONTROL DEVICES



Requirements: Standards

Safeguarding standards are minimum requirements for product and machine design, manufacture, use and evaluation that guide the methods used to improve safety.

Go online for a more comprehensive and up-to-date list of standards.

General Requirements

U.S.

OSHA 29CFR1910.212

General Requirements for (Guarding of) All Machines

International/European

ISO 12100 Safety of Machinery General Principles for Design

ISO 14121 (EN 1050)

Safety of Machinery: Risk Assessment

Standards: Safeguarding Design

U.S.

ANSI/NFPA 79

Electrical Standard for Industrial Machinery

ANSI Z535

Safety Signs, Symbols and Color Codes

ANSI Z136.1

Safe Use of Lasers

ANSI Z244.1 Lockout/Tagout of Energy Sources

ANSI B11.21

Machine Tools Using Lasers – Safety

OSHA 29CFR1910.147

Control of Hazardous Energy

OSHA 29CFR1910.219

Mechanical Power Transmission Apparatus

ANSI B11.0 Safety of Machinery; General Requirements and Risk Assessment

ANSI B11.19

Performance Criteria for Safeguarding

ANSI B11.TR1

Ergonomic Guidelines

ANSI B11.TR3

Risk Assessment / Risk Reduction

OSHA 3071

Job Hazard Analysis

International/European

IEC 60204-1

Electrical Equipment of Machines

ISO 14118 (EN 1037)

Prevention of Unexpected Start Up

ISO 13849-1 (EN 954-1)

Safety Related Parts of Control Systems

ISO 14120 (EN 953)

Guards – General Requirements for the Design and Construction

Standards: Specific Machine Applications, Grouped by Type

Machine Tools

OSHA 29CFR1910.217

(Guarding of) Mechanical Power Press

ANSI B11.1

Mechanical Power Presses

EN 692

Mechanical Power Presses

More online....

Conveyors

ANSI/ASME B20.1

Conveyors and Related Equipment

ISO 4123

Belt Conveyors

ISO 9851

Overhead Electrical Monorail Conveyors

Industrial Robots

ANSI/RIA R15.06

Industrial Robots and Robot Systems

ISO 10218

Manipulating Industrial Robots – Safety

Injection Molding

ANSI B151.1

Horizontal Injection Molding Machines

ANSI B151.21

Injection Blow Molding Machines – Safety

ANSI B151.26

Dynamic Reaction – Injection Molding Machines

ANSI B151.27

Plastics Machinery – Robots Used With HIM Machines – Safety

Mills and Calenders

OSHA 29CFR1910.261

Pulp, Paper, and Paperboard Mills

OSHA 29CFR1910.216

Mills and Calenders in the Rubber and Plastics Industry

ANSI B28.1

Safety Code for Rubber Mills and Calenders

EN 1417

Rubber and Plastics Machines – Two-Roll Mills

Packaging

ANSI/PMMI B155.1

Packaging and Packaging-Related Converting Machinery – Safety

EN 415

Safety of Packaging Machines

Semiconductor

SEMI S1

Safety Guideline for Equipment Safety Labels

SEMI S2

Environmental, Health, and Safety Guideline for Semiconductor Manufacturing Equipment

SEMI S3

Safety Guidelines for Heated Chemical Baths

SEMI S7

Safety Guidelines for Environmental, Safety, and Health (ESH) Evaluation of Semiconductor Manufacturing Equipment

SEMI S8

Safety Guidelines for Ergonomics Engineering of Semiconductor Manufacturing Equipment

SEMI S9

Safety Guideline for Electrical Design Verification Tests for Semiconductor Manufacturing Equipment

SEMI S10

Safety Guideline for Risk Assessment

And More...

Cranes, Printing, Woodworking, Lumber and Logging

Safety Standards Acronyms

ANSI: American National Standards Institute

CE: Mark of European Conformity

CEN: European Committee for Standardization

CENELEC: European Committee for Electrotechnical Standardization

CSA: Canadian Standards Association

EN: European Norm

IEC: International Electrotechnical Commission

ISO: International Organization for Standardization

MIL-STD: USA Military Standard

OSHA: Occupation Safety and Health Administration

UL: Underwriters Laboratory

LIGHT SCREENS

EZ-SCREEN™ TYPE 4



14 or 30 mm Resolution

Low-Profile
14 or 25 mm Resolution

EZ-SCREEN® TYPE 2

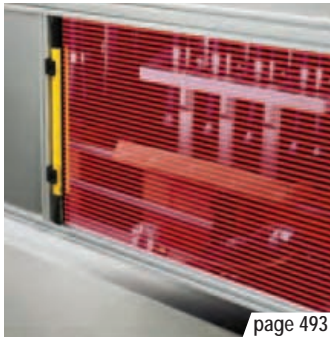


30 mm Resolution

EZ-SCREEN™ TYPE 4 Grids & Points



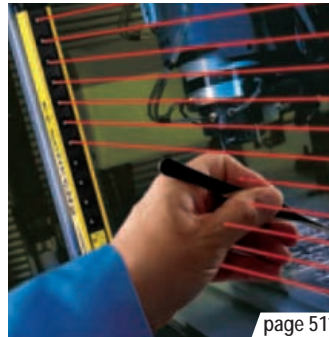
Grids & Points



page 493



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page 511



page 516

EZ-SCREEN® TYPE 4

- Provides point-of-operation, area, access and perimeter safeguarding
- Protects personnel from injury and equipment from damage
- Offered in a standard housing with 14 & 30 mm resolution, low-profile housing with 14 & 25 mm resolution, single-beam points or multi-beam grids
- Reduced resolution and fixed blanking
- External Device Monitoring (EDM) ensures that a controller or "third box" is not required
- Easily understood advanced diagnostics allow for quick troubleshooting
- Safety PLC input compatible (per OSSD specifications)
- Rated Type 4 per IEC 61496
- Available with optional ESD-safe housing, pigtail connectors and cascading on some models

EZ-SCREEN® Low-Profile

- Features space saving design to fit perfectly into machinery
- Operates in ranges up to 7 m
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps
- Offers optional cascading to create up to a four sensor system that issues a single stop command

EZ-SCREEN® TYPE 2


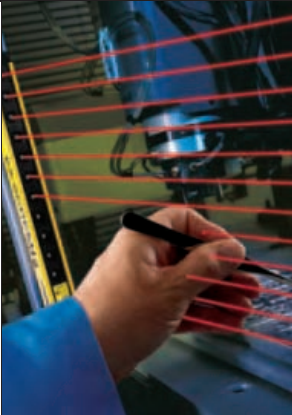
- Designed for lower-risk applications
- Provides economical, compact optical safeguarding
- Rated Type 2 per IEC 61496
- Offered with 30 mm resolution and 15 m range

Grids & Points

- Suited to a variety of access and long-range perimeter guarding applications
- Uses 1-, 2-, 3- or 4-beams to protect personnel and machinery
- Can be combined with other devices, such as mirrors and Points, for a custom configuration
- Offers optional lens shields and enclosures for added durability

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS

| | Model | Page | Safety Rating | Resolution | Supply Voltage | Maximum Range | |
|----------------------|-----------------------------|---|---|---------------------------------|----------------|---------------|--|
| EZ-SCREEN® Type 4 | Standard Systems |  | Type 4 Category 4 PLe SIL 3 Control Reliable | 14 & 30 mm | 24V dc | 6 m/18 m | |
| | Cascade Systems | | | 14 & 30 mm | | 6 m/18 m | |
| | Low-Profile Systems | | | 14 & 25 mm | | 7 m | |
| | Low-Profile Cascade Systems | | | 14 & 25 mm | | 7 m | |
| | Grid & Point Systems | | Type 4 Category 4 Control Reliable (call for PL & SIL ratings) | 300 to 584 mm (beam spacing) | | 20 m/70 m | |
| EZ-SCREEN® Type 2 | Type 2 Systems | 511 | Type 2 Category 2 | 30 mm | 24V dc | 15 m |  |

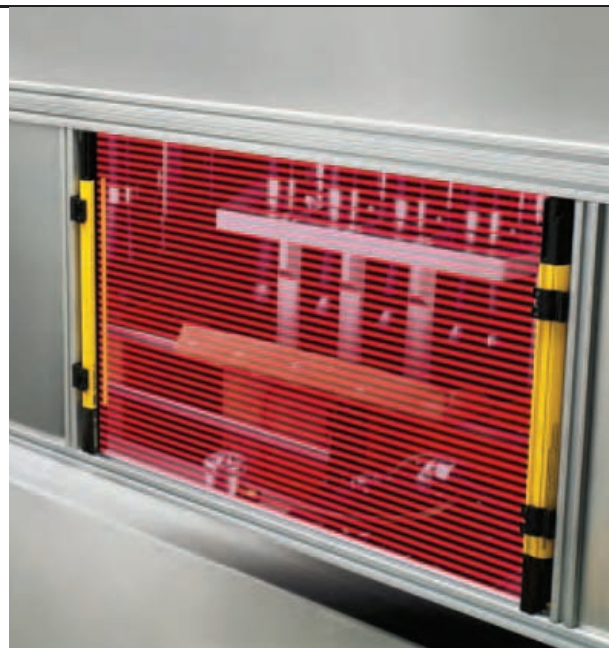
| | Safety Output | Auxiliary Output | Blanking | Output Response Time | Housing Material | Environmental Rating |
|--|-------------------------------------|--|-----------------------------------|----------------------|--|----------------------|
| | 2 PNP OSSD (Trip /Latch Selectable) | Yes PNP OSSD follow (when configured for 1-CH EDM) | 2-beam Reduced Resolution & Fixed | 9 to 56 ms | Aluminum housing with yellow polyester powder finish (other colors available) nickel-plated ESD, clear anodized aluminum or nickel-plated silver | IEC IP65 |
| | | | | 11 to 56 ms | | |
| | | | | 8 to 43.5 ms | Aluminum housing with yellow polyester powder finish, nickel-plated ESD, or clear anodized aluminum | |
| | | | | 9.5 to 43.5 ms | | |
| | | — | — | 24 ms | Aluminum housing with yellow polyester powder finish | |
| | 2 PNP OSSD (Trip or Latch) | — | — | 11 to 25 ms | Aluminum housing with yellow polyester powder finish | IEC IP65 |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

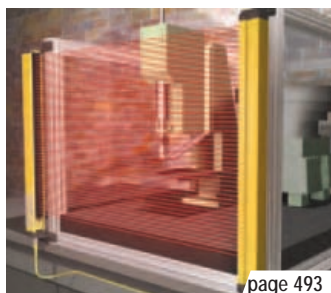
- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS

EZ-SCREEN® Safety Light Screens

- Simple, two-piece integrated system has no control box
- EZ-SCREEN point-of-operation systems provide finger, hand and ankle detection in a standard or low-profile housing to fit any machine
- Point and Grid systems allow one-, two-, three- or four-beam perimeter and access guarding
- Type 4 models are designed with redundant microprocessor-controlled, self-checking circuitry to exceed control reliability requirements and are certified for CE (Type 4/Category 4 PLe) and cULus/cTUVus applications (dependent on model)
- Type 2 systems are suited to lower-risk applications where the result of an accident is only a slight injury and meet all requirements for CE (Type 2/Category 2) and cULus applications
- Superior optical design makes system extremely easy to align
- Status indicators and diagnostics show when alignment is complete and if there are problems with the installation
- Cascading models allow up to four systems of any length and resolution to be wired together to form a single safety device
- Systems have ranges up to 70 m, with power and range for all types of applications including long-range perimeter guarding



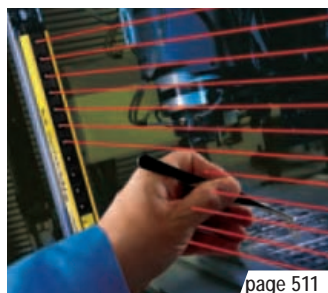
Interface multiple devices with the SC22-3 Safety Controller. See page 533.



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Type 4 Point-of-Operation and Area

- Provides choice of models for finger, hand and ankle detection
- Includes standard or low-profile models to fit any machine
- Meets Type 4 requirements
- Offers cascading models to allow up to four systems to be wired together to form a single safety device
- Includes ESD-safe solutions
- Provides remote (TEACH) Fixed Blanking options



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Type 2 Point-of-Operation and Area

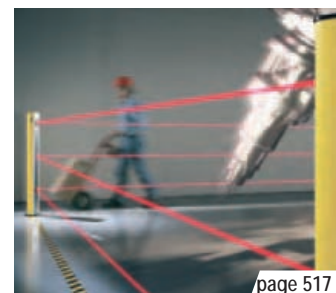
- Designed for lower-risk applications
- Meets Type 2 requirements
- Offered with 30 mm resolution and 15 m range



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Type 4 Single-Point Access

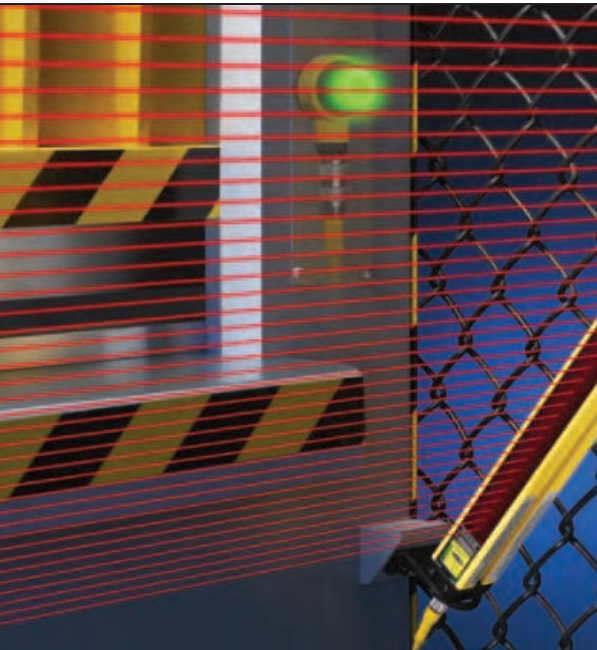
- Uses angled mirrors to simulate a two-beam system
- Allows for the use of multiple units to create custom beam patterns
- Meets Type 4 requirements



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Type 4 Perimeter and Access Guarding

- Uses one-, two-, three- or four- beams for perimeter and long-range single-sided protection
- Guards multiple sides of a dangerous area up to 70 m long
- Meets Type 4 requirements



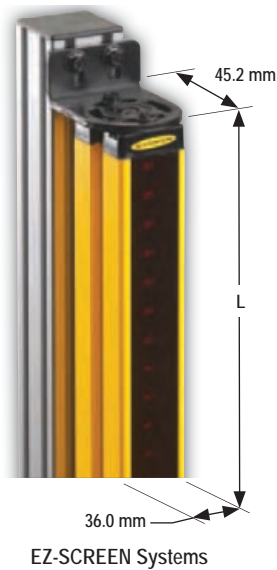
EZ-SCREEN®

Type 4 Point-of-Operation

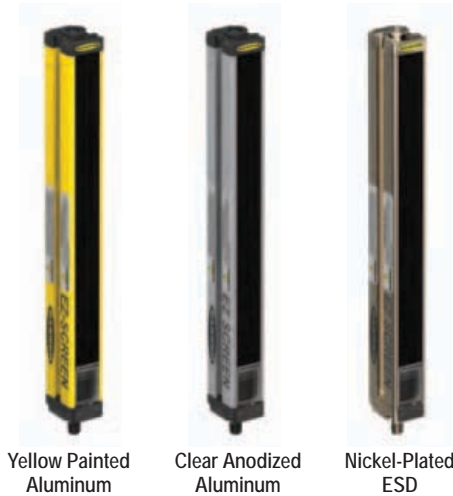
- Available in 14 mm resolution for finger, hand and ankle detection or 30 mm resolution for hand and ankle detection
- Operates in ranges from 0.1 to 6 m (14 mm models) and 0.1 to 18 m (30 mm models)
- Offers fixed or 2-beam reduced resolution (floating blanking) to ignore tooling or constant inflow of materials
- Displays operating status, configuration error codes, and blocked beams
- User-configurable trip or latch outputs, Scan Code 1 or 2 and Aux output
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cULus NIPF, and CE certified to Type 4, Cat 4 PLe, and SIL 3
- Provides external device monitoring (EDM)
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps
- Available with standard yellow, clear anodized aluminum housing or nickel-plated ESD-safe housing for protection against electrostatic discharges (other color options available)
- Offers optional cascading to create up to a four sensor system that issues a single stop command
- Offers optional lens shields and enclosures for added durability

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 500



Some of the Available Finishes



- EZ-SCREEN**
- TYPE 4 14 or 30 mm
- TYPE 4 LOW PROFILE 14 or 25 mm
- TYPE 2 30 mm
- GRIDS & POINTS

EZ-SCREEN® Systems, 14 mm Resolution–0.1 to 6 m Range, 24V dc

| Defined Area | M12/Euro Connection | Housing Length (L) | Response Time | # of Beams | Output | Models* | | |
|--------------|---------------------|--------------------|---------------|---------------|---|----------------|----------------|---------------|
| | | | | | | Emitter | Receiver | Pair† |
| 150 mm | 8-pin QD | 262 mm | 11 ms | 20 | 2 PNP OSSD (Trip/Latch selectable) | SLSE14-150Q8 | SLSR14-150Q8 | SLSP14-150Q88 |
| | 8-pin Pigtail QD | | | | | SLSE14-150P8 | SLSR14-150P8 | SLSP14-150P88 |
| 300 mm | 8-pin QD | 372 mm | 15 ms | SLSE14-300Q8 | | SLSR14-300Q8 | SLSP14-300Q88 | |
| | 8-pin Pigtail QD | | | SLSE14-300P8 | | SLSR14-300P8 | SLSP14-300P88 | |
| 450 mm | 8-pin QD | 522 mm | 19 ms | SLSE14-450Q8 | | SLSR14-450Q8 | SLSP14-450Q88 | |
| | 8-pin Pigtail QD | | | SLSE14-450P8 | | SLSR14-450P8 | SLSP14-450P88 | |
| 600 mm | 8-pin QD | 671 mm | 23 ms | SLSE14-600Q8 | | SLSR14-600Q8 | SLSP14-600Q88 | |
| | 8-pin Pigtail QD | | | SLSE14-600P8 | | SLSR14-600P8 | SLSP14-600P88 | |
| 750 mm | 8-pin QD | 821 mm | 27 ms | SLSE14-750Q8 | | SLSR14-750Q8 | SLSP14-750Q88 | |
| | 8-pin Pigtail QD | | | SLSE14-750P8 | | SLSR14-750P8 | SLSP14-750P88 | |
| 900 mm | 8-pin QD | 971 mm | 32 ms | SLSE14-900Q8 | | SLSR14-900Q8 | SLSP14-900Q88 | |
| | 8-pin Pigtail QD | | | SLSE14-900P8 | | SLSR14-900P8 | SLSP14-900P88 | |
| 1050 mm | 8-pin QD | 1120 mm | 36 ms | SLSE14-1050Q8 | | SLSR14-1050Q8 | SLSP14-1050Q88 | |
| | 8-pin Pigtail QD | | | SLSE14-1050P8 | | SLSR14-1050P8 | SLSP14-1050P88 | |
| 1200 mm | 8-pin QD | 1270 mm | 40 ms | SLSE14-1200Q8 | | SLSR14-1200Q8 | SLSP14-1200Q88 | |
| | 8-pin Pigtail QD | | | SLSE14-1200P8 | | SLSR14-1200P8 | SLSP14-1200P88 | |
| 1350 mm | 8-pin QD | 1420 mm | 43 ms | SLSE14-1350Q8 | | SLSR14-1350Q8 | SLSP14-1350Q88 | |
| | 8-pin Pigtail QD | | | SLSE14-1350P8 | | SLSR14-1350P8 | SLSP14-1350P88 | |
| 1500 mm | 8-pin QD | 1569 mm | 48 ms | SLSE14-1500Q8 | | SLSR14-1500Q8 | SLSP14-1500Q88 | |
| | 8-pin Pigtail QD | | | SLSE14-1500P8 | | SLSR14-1500P8 | SLSP14-1500P88 | |
| 1650 mm | 8-pin QD | 1719 mm | 52 ms | SLSE14-1650Q8 | SLSR14-1650Q8 | SLSP14-1650Q88 | | |
| | 8-pin Pigtail QD | | | SLSE14-1650P8 | SLSR14-1650P8 | SLSP14-1650P88 | | |
| 1800 mm | 8-pin QD | 1869 mm | 56 ms | SLSE14-1800Q8 | SLSR14-1800Q8 | SLSP14-1800Q88 | | |
| | 8-pin Pigtail QD | | | SLSE14-1800P8 | SLSR14-1800P8 | SLSP14-1800P88 | | |

EZ-SCREEN® Systems, 30 mm Resolution–0.1 to 18 m Range, 24V dc

| Defined Area | M12/Euro Connection | Housing Length (L) | Response Time | # of Beams | Output | Models* | | |
|--------------|---------------------|--------------------|---------------|--------------|---|--------------|---------------|---------------|
| | | | | | | Emitter | Receiver | Pair† |
| 150 mm | 8-pin QD | 262 mm | 9 ms | 10 | 2 PNP OSSD (Trip/Latch selectable) | SLSE30-150Q8 | SLSR30-150Q8 | SLSP30-150Q88 |
| | 8-pin Pigtail QD | | | | | SLSE30-150P8 | SLSR30-150P8 | SLSP30-150P88 |
| 300 mm | 8-pin QD | 372 mm | 11 ms | SLSE30-300Q8 | | SLSR30-300Q8 | SLSP30-300Q88 | |
| | 8-pin Pigtail QD | | | SLSE30-300P8 | | SLSR30-300P8 | SLSP30-300P88 | |
| 450 mm | 8-pin QD | 522 mm | 13 ms | SLSE30-450Q8 | | SLSR30-450Q8 | SLSP30-450Q88 | |
| | 8-pin Pigtail QD | | | SLSE30-450P8 | | SLSR30-450P8 | SLSP30-450P88 | |
| 600 mm | 8-pin QD | 671 mm | 15 ms | SLSE30-600Q8 | | SLSR30-600Q8 | SLSP30-600Q88 | |
| | 8-pin Pigtail QD | | | SLSE30-600P8 | | SLSR30-600P8 | SLSP30-600P88 | |
| 750 mm | 8-pin QD | 821 mm | 17 ms | SLSE30-750Q8 | | SLSR30-750Q8 | SLSP30-750Q88 | |
| | 8-pin Pigtail QD | | | SLSE30-750P8 | | SLSR30-750P8 | SLSP30-750P88 | |
| 900 mm | 8-pin QD | 971 mm | 19 ms | SLSE30-900Q8 | | SLSR30-900Q8 | SLSP30-900Q88 | |
| | 8-pin Pigtail QD | | | SLSE30-900P8 | | SLSR30-900P8 | SLSP30-900P88 | |

More
on next
page

QD models: A model with a QD requires a mating cordset (see page 500).

For an emitter with TEST function, replace Q8 with Q5 on emitter model numbers (example, SLSE14-150Q5) and Q88 with Q85 on pair model numbers (example, SLSP14-150Q85).
 For a 300 mm M12/Euro pigtail QD, replace Q with P in model numbers (example, SLSP14-150P88).
 For a 5-pin 300 mm M12/Euro pigtail QD with No EDM or TEST functions, replace Q8 with P5NT on emitter or receiver (example, SLSE14-150P5NT) and Q88 with P55NT on pair model numbers (example, SLSP14-150P55NT).
 For a 4-pin 300 mm M12/Euro pigtail QD with no EDM or TEST functions (GND/PE via mounting), replace Q8 with P4NT or Q88 with P44NT (example, SLSP14-150P44NT).

* ESD-safe models: Add N to the model number, prior to the QD option designation (example, SLSE14-150NQ8). ESD-safe models are not available with the pigtail QD option.

Optional housing finishes:

Prior to the QD designation in the model number, add A for a clear (brushed) anodized aluminum finish, black endcaps (example, SLSE14-150AQ8);

S for a nickel-plated (silver) finish, black endcaps (example, SLSE14-150SQ8), B for a black painted finish, black endcaps (example, SLSE14-150BQ8),

W for a white painted finish, black endcaps (example, SLSE14-150WQ8) or SO for a safety orange painted finish, black endcaps (example, SLSE14-150SOQ8).

† A pair includes an emitter and receiver (example, SLSP14-150Q88). Emitters (example, SLSE14-150Q8) and receivers (example, SLSR14-150Q8) are also sold separately.

EZ-SCREEN® Systems, 30 mm Resolution–0.1 to 18 m Range, 24V dc (cont'd)

| Defined Area | M12/Euro Connection | Housing Length (L) | Response Time | # of Beams | Output | Models* | | |
|--------------|---------------------|--------------------|---------------|------------|------------------------------------|---------------|---------------|----------------|
| | | | | | | Emitter | Receiver | Pair† |
| 1050 mm | 8-pin QD | 1120 mm | 21 ms | 70 | 2 PNP OSSD (Trip/Latch selectable) | SLSE30-1050Q8 | SLSR30-1050Q8 | SLSP30-1050Q88 |
| | 8-pin Pigtail QD | | | | | SLSE30-1050P8 | SLSR30-1050P8 | SLSP30-1050P88 |
| 1200 mm | 8-pin QD | 1270 mm | 23 ms | 80 | | SLSE30-1200Q8 | SLSR30-1200Q8 | SLSP30-1200Q88 |
| | 8-pin Pigtail QD | | | | | SLSE30-1200P8 | SLSR30-1200P8 | SLSP30-1200P88 |
| 1350 mm | 8-pin QD | 1420 mm | 25 ms | 90 | | SLSE30-1350Q8 | SLSR30-1350Q8 | SLSP30-1350Q88 |
| | 8-pin Pigtail QD | | | | | SLSE30-1350P8 | SLSR30-1350P8 | SLSP30-1350P88 |
| 1500 mm | 8-pin QD | 1569 mm | 27 ms | 100 | | SLSE30-1500Q8 | SLSR30-1500Q8 | SLSP30-1500Q88 |
| | 8-pin Pigtail QD | | | | | SLSE30-1500P8 | SLSR30-1500P8 | SLSP30-1500P88 |
| 1650 mm | 8-pin QD | 1719 mm | 30 ms | 110 | | SLSE30-1650Q8 | SLSR30-1650Q8 | SLSP30-1650Q88 |
| | 8-pin Pigtail QD | | | | | SLSE30-1650P8 | SLSR30-1650P8 | SLSP30-1650P88 |
| 1800 mm | 8-pin QD | 1869 mm | 32 ms | 120 | | SLSE30-1800Q8 | SLSR30-1800Q8 | SLSP30-1800Q88 |
| | 8-pin Pigtail QD | | | | | SLSE30-1800P8 | SLSR30-1800P8 | SLSP30-1800P88 |
| 1950 mm | 8-pin QD | 2018 mm | 34 ms | 130 | | SLSE30-1950Q8 | SLSR30-1950Q8 | SLSP30-1950Q88 |
| | 8-pin Pigtail QD | | | | | SLSE30-1950P8 | SLSR30-1950P8 | SLSP30-1950P88 |
| 2100 mm | 8-pin QD | 2168 mm | 36 ms | 140 | | SLSE30-2100Q8 | SLSR30-2100Q8 | SLSP30-2100Q88 |
| | 8-pin Pigtail QD | | | | | SLSE30-2100P8 | SLSR30-2100P8 | SLSP30-2100P88 |
| 2250 mm | 8-pin QD | 2318 mm | 38 ms | 150 | | SLSE30-2250Q8 | SLSR30-2250Q8 | SLSP30-2250Q88 |
| | 8-pin Pigtail QD | | | | | SLSE30-2250P8 | SLSR30-2250P8 | SLSP30-2250P88 |
| 2400 mm | 8-pin QD | 2468 mm | 40 ms | 160 | | SLSE30-2400Q8 | SLSR30-2400Q8 | SLSP30-2400Q88 |
| | 8-pin Pigtail QD | | | | | SLSE30-2400P8 | SLSR30-2400P8 | SLSP30-2400P88 |

Photoelectrics Sensors
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 Safety Two-Hand Control Modules
 Safety Interlock Switches
 Emergency Stop & Stop Control

ACCESSORIES
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EZ-SCREEN
 TYPE 4
 14 or 30 mm
 TYPE 4
 LOW PROFILE
 14 or 25 mm
 TYPE 2
 30 mm
 GRIDS & POINTS

EZ-SCREEN® Cascade Systems, 14 mm Resolution–0.1 to 6 m Range, 24V dc

| Defined Area | M12/Euro Connection | Housing Length (L) | Response Time** | # of Beams | Output | Models* | | |
|--------------|---------------------|--------------------|-----------------|------------|------------------------------------|----------------|----------------|-----------------|
| | | | | | | Emitter | Receiver | Pair† |
| 300 mm | 8-pin QD | 372 mm | 15 ms | 40 | 2 PNP OSSD (Trip/Latch selectable) | SLSCE14-300Q8 | SLSCR14-300Q8 | SLSCP14-300Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE14-300P8 | SLSCR14-300P8 | SLSCP14-300P88 |
| 450 mm | 8-pin QD | 522 mm | 19 ms | 60 | | SLSCE14-450Q8 | SLSCR14-450Q8 | SLSCP14-450Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE14-450P8 | SLSCR14-450P8 | SLSCP14-450P88 |
| 600 mm | 8-pin QD | 671 mm | 23 ms | 80 | | SLSCE14-600Q8 | SLSCR14-600Q8 | SLSCP14-600Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE14-600P8 | SLSCR14-600P8 | SLSCP14-600P88 |
| 750 mm | 8-pin QD | 821 mm | 27 ms | 100 | | SLSCE14-750Q8 | SLSCR14-750Q8 | SLSCP14-750Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE14-750P8 | SLSCR14-750P8 | SLSCP14-750P88 |
| 900 mm | 8-pin QD | 971 mm | 32 ms | 120 | | SLSCE14-900Q8 | SLSCR14-900Q8 | SLSCP14-900Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE14-900P8 | SLSCR14-900P8 | SLSCP14-900P88 |
| 1050 mm | 8-pin QD | 1120 mm | 36 ms | 140 | | SLSCE14-1050Q8 | SLSCR14-1050Q8 | SLSCP14-1050Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE14-1050P8 | SLSCR14-1050P8 | SLSCP14-1050P88 |
| 1200 mm | 8-pin QD | 1270 mm | 40 ms | 160 | | SLSCE14-1200Q8 | SLSCR14-1200Q8 | SLSCP14-1200Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE14-1200P8 | SLSCR14-1200P8 | SLSCP14-1200P88 |
| 1350 mm | 8-pin QD | 1420 mm | 43 ms | 180 | | SLSCE14-1350Q8 | SLSCR14-1350Q8 | SLSCP14-1350Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE14-1350P8 | SLSCR14-1350P8 | SLSCP14-1350P88 |

More on next page

QD models: A model with a QD requires a mating cordset (see page 500).

For an emitter with TEST function, replace Q8 with Q5 on emitter model numbers (example, SLSE30-1050Q5) and Q88 with Q85 on pair model numbers (example, SLSP30-1050Q85).
 For a 300 mm Euro pigtail QD, replace Q with P in model numbers (example, SLSP30-1050P88).
 For a 5-pin 300 mm Euro pigtail QD with No EDM or TEST, replace Q8 with P5NT on emitter or receiver (example, SLSE30-1050P5NT) and Q88 with P55NT on pair models (example, SLSP30-1050P55NT).
 For a 4-pin 300 mm M12/Euro pigtail QD with no EDM or TEST functions (GND/PE via mounting), replace Q8 with P4NT or Q88 with P44NT (example, SLSP30-1050P44NT).

* ESD-safe models: Add N to the model number, prior to the QD option designation (example, SLSE30-1050NQ8). ESD-safe models are not available with the pigtail QD option.

Optional housing finishes:

Prior to the QD designation in the model number, add A for a clear (brushed) anodized aluminum finish, black endcaps (example, SLSE30-1050AQ8);

S for a nickel-plated (silver) finish, black endcaps (example, SLSE30-1050SQ8), B for a black painted finish, black endcaps (example, SLSE30-1050BQ8),

W for a white painted finish, black endcaps (example, SLSE30-1050WQ8) or SO for a safety orange painted finish, black endcaps (example, SLSE30-1050SOQ8).

** Cascading system response time: To the response time of the slowest pair, add 2 ms for each additional pair.

Example: slowest pair's response time is 15 ms, and the system has three additional pairs (four pairs total), so the system maximum response time is 15 ms + 6 ms (3 pairs x 2 ms) = 21 ms.

† A pair includes an emitter and receiver (example, SLSP30-1050Q88). Emitters (example, SLSE30-1050Q8) and receivers (example, SLSR30-1050Q8) are also sold separately.

EZ-SCREEN® Cascade Systems, 14 mm Resolution–0.1 to 6 m Range, 24V dc (cont'd)

| Defined Area | M12/Euro Connection | Housing Length (L) | Response Time** | # of Beams | Output | Models* | | |
|--------------|---------------------|--------------------|-----------------|------------|------------------------------------|----------------|----------------|-----------------|
| | | | | | | Emitter | Receiver | Pair† |
| 1500 mm | 8-pin QD | 1569 mm | 48 ms | 200 | 2 PNP OSSD (Trip/Latch selectable) | SLSCE14-1500Q8 | SLSCR14-1500Q8 | SLSCP14-1500Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE14-1500P8 | SLSCR14-1500P8 | SLSCP14-1500P88 |
| 1650 mm | 8-pin QD | 1719 mm | 52 ms | 220 | | SLSCE14-1650Q8 | SLSCR14-1650Q8 | SLSCP14-1650Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE14-1650P8 | SLSCR14-1650P8 | SLSCP14-1650P88 |
| 1800 mm | 8-pin QD | 1869 mm | 56 ms | 240 | | SLSCE14-1800Q8 | SLSCR14-1800Q8 | SLSCP14-1800Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE14-1800P8 | SLSCR14-1800P8 | SLSCP14-1800P88 |

EZ-SCREEN® Cascade Systems, 30 mm Resolution–0.1 to 18 m Range, 24V dc

| Defined Area | M12/Euro Connection | Housing Length (L) | Response Time** | # of Beams | Output | Models* | | |
|--------------|---------------------|--------------------|-----------------|------------|------------------------------------|----------------|-----------------|-----------------|
| | | | | | | Emitter | Receiver | Pair† |
| 300 mm | 8-pin QD | 372 mm | 11 ms | 20 | 2 PNP OSSD (Trip/Latch selectable) | SLSCE30-300Q8 | SLSCR30-300Q8 | SLSCP30-300Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-300P8 | SLSCR30-300P8 | SLSCP30-300P88 |
| 450 mm | 8-pin QD | 522 mm | 13 ms | 30 | | SLSCE30-450Q8 | SLSCR30-450Q8 | SLSCP30-450Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-450P8 | SLSCR30-450P8 | SLSCP30-450P88 |
| 600 mm | 8-pin QD | 671 mm | 15 ms | 40 | | SLSCE30-600Q8 | SLSCR30-600Q8 | SLSCP30-600Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-600P8 | SLSCR30-600P8 | SLSCP30-600P88 |
| 750 mm | 8-pin QD | 821 mm | 17 ms | 50 | | SLSCE30-750Q8 | SLSCR30-750Q8 | SLSCP30-750Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-750P8 | SLSCR30-750P8 | SLSCP30-750P88 |
| 900 mm | 8-pin QD | 971 mm | 19 ms | 60 | | SLSCE30-900Q8 | SLSCR30-900Q8 | SLSCP30-900Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-900P8 | SLSCR30-900P8 | SLSCP30-900P88 |
| 1050 mm | 8-pin QD | 1120 mm | 21 ms | 70 | | SLSCE30-1050Q8 | SLSCR30-1050Q8 | SLSCP30-1050Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-1050P8 | SLSCR30-1050P8 | SLSCP30-1050P88 |
| 1200 mm | 8-pin QD | 1270 mm | 23 ms | 80 | | SLSCE30-1200Q8 | SLSCR30-1200Q8 | SLSCP30-1200Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-1200P8 | SLSCR30-1200P8 | SLSCP30-1200P88 |
| 1350 mm | 8-pin QD | 1420 mm | 25 ms | 90 | | SLSCE30-1350Q8 | SLSCR30-1350Q8 | SLSCP30-1350Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-1350P8 | SLSCR30-1350P8 | SLSCP30-1350P88 |
| 1500 mm | 8-pin QD | 1569 mm | 27 ms | 100 | | SLSCE30-1500Q8 | SLSCR30-1500Q8 | SLSCP30-1500Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-1500P8 | SLSCR30-1500P8 | SLSCP30-1500P88 |
| 1650 mm | 8-pin QD | 1719 mm | 30 ms | 110 | | SLSCE30-1650Q8 | SLSCR30-1650Q8 | SLSCP30-1650Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-1650P8 | SLSCR30-1650P8 | SLSCP30-1650P88 |
| 1800 mm | 8-pin QD | 1869 mm | 32 ms | 120 | | SLSCE30-1800Q8 | SLSCR30-1800Q8 | SLSCP30-1800Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-1800P8 | SLSCR30-1800P8 | SLSCP30-1800P88 |
| 1950 mm | 8-pin QD | 2018 mm | 34 ms | 130 | | SLSCE30-1950Q8 | SLSCR30-1950Q8 | SLSCP30-1950Q88 |
| | 8-pin Pigtail QD | | | | | SLSCE30-1950P8 | SLSCR30-1950P8 | SLSCP30-1950P88 |
| 2100 mm | 8-pin QD | 2168 mm | 36 ms | 140 | SLSCE30-2100Q8 | SLSCR30-2100Q8 | SLSCP30-2100Q88 | |
| | 8-pin Pigtail QD | | | | SLSCE30-2100P8 | SLSCR30-2100P8 | SLSCP30-2100P88 | |
| 2250 mm | 8-pin QD | 2318 mm | 38 ms | 150 | SLSCE30-2250Q8 | SLSCR30-2250Q8 | SLSCP30-2250Q88 | |
| | 8-pin Pigtail QD | | | | SLSCE30-2250P8 | SLSCR30-2250P8 | SLSCP30-2250P88 | |
| 2400 mm | 8-pin QD | 2468 mm | 40 ms | 160 | SLSCE30-2400Q8 | SLSCR30-2400Q8 | SLSCP30-2400Q88 | |
| | 8-pin Pigtail QD | | | | SLSCE30-2400P8 | SLSCR30-2400P8 | SLSCP30-2400P88 | |

QD models: A model with a QD requires a mating cordset (see page 500).

For an emitter with TEST function, replace Q8 with Q5 on emitter model numbers (example, SLSCE14-1500Q5) and Q88 with Q85 on pair model numbers (example, SLSCP14-1500Q85).

For a 300 mm Euro pigtail QD, replace Q with P in model numbers (example, SLSCP30-300P88).

For a 5-pin 300 mm M12/Euro pigtail QD with No EDM or TEST, replace Q8 with P5NT on emitter or receiver (example, SLSCE14-1050P5NT), and Q88 with P55NT on pair model number (example, SLSCP14-1050P55NT).

For a 4-pin 300 mm M12/Euro pigtail QD with no EDM or TEST functions (GND/PE via mounting), replace Q8 with P4NT or Q88 with P44NT (example, SLSP14-1050P44NT).

* ESD-safe models: Add N to the model number, prior to the QD option designation (example, SLSCE14-1500NQ8). ESD-safe models are not available with the pigtail QD option.

Optional housing finishes: Prior to the QD designation in the model number, add A for a clear (brushed) anodized aluminum finish, black endcaps (example, SLSCE14-1500AQ8);

S for a nickel-plated (silver) finish, black endcaps (example, SLSCE14-1500SQ8), B for a black painted finish, black endcaps (example, SLSCE14-1500BQ8),

W for a white painted finish, black endcaps (example, SLSCE14-1500WQ8) or SO for a safety orange painted finish, black endcaps (example, SLSCE14-1500SOQ8).

** Cascading system response time: To the response time of the slowest pair, add 2 ms for each additional pair. Example: slowest pair's response time is 15 ms, and the system has three additional pairs (four pairs total), so the system maximum response time is 15 ms + 6 ms (3 pairs x 2 ms) = 21 ms.

† A pair includes an emitter and receiver (example, SLSCP30-300Q88). Emitters (example, SLSCE30-300Q8) and receivers (example, SLSCR30-300Q8) are also sold separately.

EZ-SCREEN® 14 & 30 mm Resolution Kits



You can purchase a kit that contains an emitter and receiver of equal length and resolution; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

| | |
|-------------------------|----------|
| • Emitter and Receivers | Page 494 |
| • Interfacing Options | 523 |
| • Cordsets | 500 |
| • Brackets | 500 |

To Order:

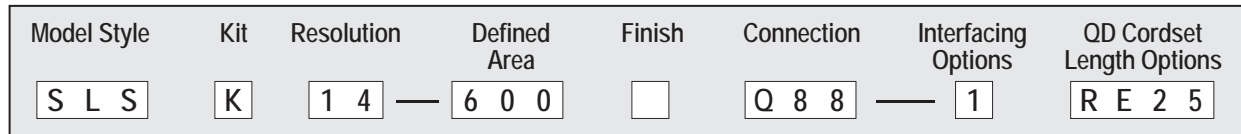
1. Choose model, resolution and defined area.
2. Yellow housing is standard. To choose an optional housing, add designation listed below prior to the connection.
3. Choose the connection: Integral M12/Euro-Style QD with or without TEST, or 300 mm M12/Euro-Style pigtail with or without TEST.
4. Choose an optional interfacing solution, such as an IM-T-9A or -11 interfacing model.
5. Choose one cordset for each sensor or two cordsets for a pair.
 - M12/Euro QD models (example, SLK30-150Q88) require mating M12/Euro QD cordsets, such as:
 - QDE cordset with flying leads
 - DEE2R double-ended cordset
 - CSB series splitter cordset

See www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories. 1-888-373-6767.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 500

Kit Model Key



Model Style

| |
|--------------------------------------|
| SLS = Safety Light Screen |
| SLSC = Cascading Safety Light Screen |

Kit

| |
|---------|
| K = Kit |
|---------|

SLS Resolution

| |
|------------|
| 14 = 14 mm |
| 30 = 30 mm |

Sensor Finish

| |
|-----------------------------|
| Blank = Yellow powder coat |
| N = Nickel plated ESD |
| A = Clear Anodized Aluminum |
| S = Nickel-plated (silver) |
| B = Black powder coat |
| W = White powder coat |

Defined Area

| |
|----------|
| 150 mm* |
| 300 mm |
| 450 mm |
| 600 mm |
| 750 mm |
| 900 mm |
| 1050 mm |
| 1200 mm |
| 1350 mm |
| 1500 mm |
| 1650 mm |
| 1800 mm |
| 1950 mm† |
| 2100 mm† |
| 2250 mm† |
| 2400 mm† |

Receiver & Emitter QD Options

| |
|---|
| Q85 = Receiver with integral 8-pin M12/Euro QD Emitter with integral 5-pin M12/Euro QD with Test |
| Q88 = Receiver with integral 8-pin M12/Euro QD Emitter with integral 8-pin M12/Euro QD |
| P88 = Receiver with 8-pin M12/Euro pigtail QD Emitter with 8-pin M12/Euro pigtail QD |
| P55NT = Receiver with 5-pin M12/Euro pigtail QD (No EDM) Emitter with 5-pin M12/Euro pigtail QD (No Test) |
| P44NT = Receiver with 4-pin M12/Euro pigtail QD (No EDM) Emitter with 4-pin M12/Euro pigtail QD (No Test) (GND/PE via mounting) |

QD Cordset Length Examples

| |
|--|
| RE15 = 4.5 m, 2 each |
| RE25 = 7.6 m, 2 each |
| R15E25 = 4.5 m (Receiver) & 7.6 m (Emitter) |
| R25E15 = 7.6 m (Receiver) & 4.5 m (Emitter) |
| DD1 = 0.3 DEE2R-81D, 2 each |
| C1D15 = CSB-M1281M1281 (Receiver) DEE2R-815D (8-pin Emitter) |
| C8D25 = CSB-M1288M1281 (SLS Receiver) DEE2R-825D (8-pin Emitter) |
| CU25D25 = CSB-UNT825M1281 (SLS Receiver) DEE2R-825D (8-pin Emitter) |

Interfacing Options

| |
|---|
| 1 = IM-T-9A Interface Module, 1 each (3 NO) |
| 2 = IM-T-11A Interface Module, 1 each (2 NO/ 1 NC) |
| 3 = 11-BG00-31-D-024 Contactors (10A), 2 each |
| 4 = BF1801L-024 Contactors (18A), 2 each |
| 5 = EZAC-R9-QE8 = AC Interface Box (3 NO), 1 each |
| 6 = EZAC-R11-QE8 = AC Interface Box (2 NO/1 NC), 1 each |

* 150 mm not available in cascade models
† Longer lengths not available in 14 mm resolution models.



EZ-SCREEN

- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS

NOTE: See notes under model number tables. Not all combinations are listed.
Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

EZ-SCREEN® 14 & 30 mm Resolution Specifications

| Supply Voltage at the Device | 24V dc $\pm 15\%$ (use a SELV-rated supply according to EN IEC60950) (The external voltage supply must be capable of buffering brief mains interruptions of 20 ms, as specified in EN/IEC 60204-1.) | | | | | | | | | | |
|--|---|--|--|--------------------|-----------------|--------------|---------------|--------------|--------------|--------------|--------------|
| Residual Ripple | $\pm 10\%$ maximum | | | | | | | | | | |
| Supply Current | Emitter: 100 mA max. Receiver: 275 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each) and AUX output load (up to 75 mA) | | | | | | | | | | |
| Response Time | 9 to 56 milliseconds (see model number tables) Cascade Safety Stop Interface (CSSI): 40 milliseconds max. | | | | | | | | | | |
| Remote Test Input (Optional – available only on model SLSE...Q5 emitters) | Test Mode is activated either by applying a low signal (less than 3V dc) to emitter TEST #1 terminal for a minimum of 50 milliseconds, or by opening a switch connected between TEST #1 and TEST #2 for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal at TEST #1 deactivates Test Mode. High signal: 10 to 30V dc Low signal: 0 to 3V dc Input current: 35 mA inrush, 10 mA max. | | | | | | | | | | |
| Wavelength of Emitter Elements | Infrared LEDs, 950 nm at peak emission | | | | | | | | | | |
| Recovery Time–Blocked to clear (OSSDs turn ON; varies with total number of sensing beams and whether Sync beam is blocked) | | <table border="1"> <thead> <tr> <th></th> <th>Beam 1 (Sync Beam)</th> <th>All Other Beams</th> </tr> </thead> <tbody> <tr> <td>14 mm Models</td> <td>109 to 800 ms</td> <td>33 to 220 ms</td> </tr> <tr> <td>30 mm Models</td> <td>81 to 495 ms</td> <td>25 to 152 ms</td> </tr> </tbody> </table> | | Beam 1 (Sync Beam) | All Other Beams | 14 mm Models | 109 to 800 ms | 33 to 220 ms | 30 mm Models | 81 to 495 ms | 25 to 152 ms |
| | Beam 1 (Sync Beam) | All Other Beams | | | | | | | | | |
| 14 mm Models | 109 to 800 ms | 33 to 220 ms | | | | | | | | | |
| 30 mm Models | 81 to 495 ms | 25 to 152 ms | | | | | | | | | |
| EDM Input | +24V dc signals from external device contacts can be monitored (one-channel, two-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver High signal: 10 to 30V dc at 30 mA typical Low signal: 0 to 3V dc | | | | | | | | | | |
| Reset Input | The Reset input must be high for 0.25 to 2 seconds and then low to reset the receiver High signal: 10 to 30V dc at 30 mA typical Low signal: 0 to 3V dc Closed switch time: 0.25 to 2 sec | | | | | | | | | | |
| Safety Outputs (OSSDs) | Two redundant solid-state 24V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Capable of the Banner "Safety Handshake" ON-State voltage: $\geq V_{in}-1.5V$ dc OFF-State voltage: 1.2V dc max. (0-1.2V dc) Max. load capacitance: 1.0 μ F Max. load inductance: 10 H Leakage current: 0.50 mA maximum Cable resistance: 10 Ω maximum OSSD test pulse width: 100 to 300 microseconds OSSD test pulse period: 10 to 27 milliseconds (varies with number of beams) Switching current: 0-0.5 A | | | | | | | | | | |
| Auxiliary (Aux.) Output Switching Capacity | Current-sourcing (PNP) solid-state output, 24V dc at 75mA max that follow the safety outputs (lockout function optional) | | | | | | | | | | |
| Controls and Adjustments | Emitter: Scan Code selection: 2-position switch (code 1 or 2). Factory default position is code 1. Receiver: Scan Code selection: 2-position switch (code 1 or 2). Factory default position is code 1. Trip/Latch Output selection: Redundant switches. Factory default position is T (Trip). EDM/MPCE monitor selection: 2-position switch selects between 1- or 2-channel monitoring. Factory default position is 2. Reduced Resolution (2-beam Floating Blanking): Redundant switches. Factory default is OFF. | | | | | | | | | | |
| Short Circuit Protection | All inputs and outputs are protected from short circuits to +24V dc or dc common | | | | | | | | | | |
| Electrical Safety Class (IEC 61140) | III | | | | | | | | | | |
| Operating Range | 14 mm models: 0.1 m to 6 m 30 mm models: 0.1 m to 18 m Range decreases with use of mirrors and/or lens shields: Lens shields – approximately 10% less range per shield Glass-surface mirrors – approximately 8% less range per mirror See Accessory section for more information on a specific mirror, page 740. | | | | | | | | | | |
| Ambient Light Immunity | > 10,000 lux at 5° angle of incidence | | | | | | | | | | |
| Strobe Light Immunity | Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe | | | | | | | | | | |
| Effective Aperture Angle (EAA) | Meets Type 4 requirements per IEC 61496-2, $\pm 2.5^\circ$ @ 3 m | | | | | | | | | | |
| Enclosure | Materials: Extruded aluminum housing with yellow polyester powder (optional black or white or nickel-plated silver finish) and well-sealed, rugged die-cast zinc end caps, acrylic lens cover, copolyester access cover. Endcaps on silver models are also nickel-plated. Rating: IP65 | | | | | | | | | | |

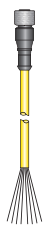
| EZ-SCREEN® 14 & 30 mm Resolution Specifications (cont'd) | |
|--|--|
| Operating Conditions | Temperature: 0° to +55° C Relative humidity: 95% (non-condensing) |
| Status Indicators | <p>Emitter: One Bi-color (Red/Green) Status Indicator – indicates operating mode, Lockout or power OFF condition 7-segment Diagnostic Indicator (1 digit) – indicates proper operation, scan code or error code</p> <p>Receiver: Yellow Reset Indicator – indicates whether system is ready for operation or requires a reset Bi-Color (Red/Green) Status Indicator – indicates general system and output status Bi-Color (Red/Green) Zone Status Indicators – indicates condition (clear or blocked beam) of a defined group of beams 7-Segment Diagnostic Indicator (3-digit) – indicates proper operation, scan code or error code, total number of blocked beams</p> |
| Mounting Hardware | Emitter and receiver each are supplied with a pair of swivel end-mounting brackets. Models longer than 900 mm also include a swivel center-mount bracket. Mounting brackets are 8-gauge cold-rolled steel, black zinc finish. |
| Shock and Vibration | EZ-SCREEN components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles). |
| Design Standards | Designed to comply with Type 4 per IEC 61496; Category 4 PLe per EN ISO 13849-1; SIL 3 per IEC 61508, SIL CL 3 per IEC 62061; Type 4 per UL 61496-1/2 |
| Certifications |   |
| Wiring Diagrams | WD001, WD003, WD004, WD005, WD006, WD007, WD013, WD014, WD015, WD016, WD017, WD018, WD019 (pp. 790-800) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS

Cordsets

| Euro QD | | |
|--------------|-----------|-----------|
| See page 699 | | |
| Length | 8-Pin | 5-Pin |
| 4.57 m | QDE-815D | QDE-515D |
| 7.62 m | QDE-825D | QDE-525D |
| 15.3 m | QDE-850D | QDE-550D |
| 22.9 m | QDE-875D | QDE-575D |
| 30.5 m | QDE-8100D | QDE-5100D |



| Euro QD–Double-Ended | | |
|----------------------|-------------|-------------|
| See page 701 | | |
| Length | 8-Pin* | 5-Pin |
| 0.31 m | DEE2R-81D | DEE2R-51D |
| 0.91 m | DEE2R-83D | DEE2R-53D |
| 2.44 m | DEE2R-88D | DEE2R-58D |
| 4.57 m | DEE2R-815D | DEE2R-515D |
| 7.62 m | DEE2R-825D | DEE2R-525D |
| 15.2 m | DEE2R-850D | DEE2R-550D |
| 22.9 m | DEE2R-875D | DEE2R-575D |
| 30.5 m | DEE2R-8100D | DEE2R-5100D |



| Euro QD Splitter | |
|------------------|-----------------|
| See page 707 | |
| Length | 8-Pin |
| 0 m | CSB-M1280M1280 |
| 0.30 m | CSB-M1281M1281 |
| 2.50 m | CSB-M1288M1281 |
| 4.60 m | CSB-M12815M1281 |
| 7.60 m | CSB-M12825M1281 |
| 7.60 m | CSB-UNT825M1281 |







Additional cordsets and information available. See page 693.

NOTE: See page 501 for interfacing solutions. Additional accessories are listed on page 619.

* For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC see page 701.

Brackets

| 14 & 30 mm | | 14 & 30mm Cascade | |
|---|---|---|---|
|  |  |  |  |
| pg. 642 | pg. 642 | pg. 642 | pg. 643 |
| EZA-MBK-12* | EZA-MBK-11* | EZA-MBK-20 | EZA-MBK-21 |

Additional brackets and information available. See page 632.

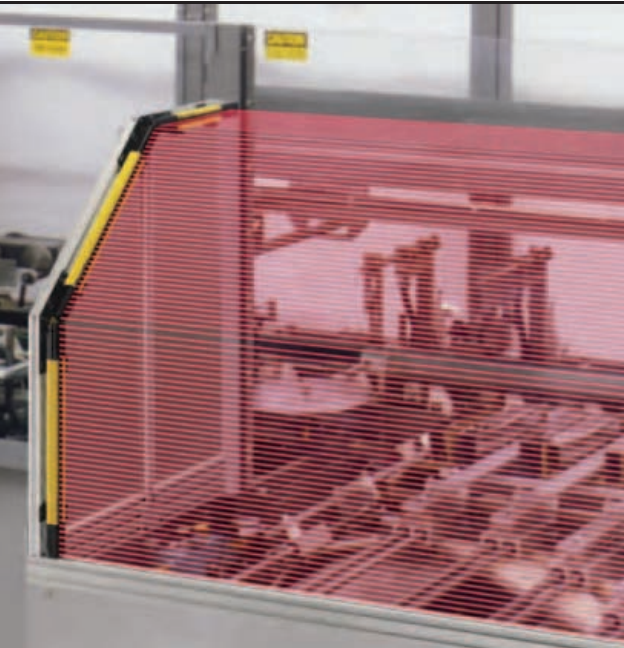
* Standard brackets included with emitter/receiver.



Replacement Parts

| Model | Description |
|------------|--|
| EZA-ADE-1 | Copolyester access cover with label for 14 or 30 mm resolution emitters |
| EZA-ADE-2 | Copolyester access cover with inverted label for 14 or 30 mm resolution emitters |
| EZA-ADR-1 | Copolyester access cover with label for 14 or 30 mm resolution receiver |
| EZA-ADR-2 | Copolyester access cover with inverted label for 14 or 30 mm resolution receiver |
| EZA-MBK-12 | Center bracket kit (includes 1 bracket and hardware to mount to MSA Series stands) for 14 or 30 mm resolution EZ-SCREEN |
| EZA-MBK-11 | Standard bracket kit with hardware (includes 2 end brackets and hardware to mount to MSA Series stands) for 14 or 30 mm resolution EZ-SCREEN |
| EZA-TP-1 | Access cover security plate (includes 2 screws, wrench) for 14 or 30 mm resolution EZ-SCREEN |
| EZA-RR-1 | External normally open reset switch with 8-pin/M12 Euro-style QD |
| MGA-K-1 | Replacement key for switch MGA-KS0-1 |
| MGA-KS0-1 | Panel-mount keyed normally open reset switch |
| EZA-HK-1 | Wrench, Security |
| EZA-RTP-1 | Terminator plug for cascade receiver |
| STP-13 | 14 mm test piece (14 mm resolution systems) |
| STP-14 | 30 mm test piece (14 mm resolution systems with 2-beam Reduced Resolution and for 30 mm resolution systems) |
| STP-15 | 60 mm test piece (30 mm resolution systems with 2-beam Reduced Resolution) |

Note: See Installation manual p/n 112852 for complete list of replacement parts and accessories.



EZ-SCREEN® Low-Profile (LP) Type 4 Point-of-Operation

- Available in 14 mm resolution for finger, hand and ankle detection or 25 mm resolution for hand and ankle detection
- Features space saving design to fit perfectly into machinery
- Operates in ranges up to 7 m
- Offers reduced resolution (2-beam floating blanking) and fixed blanking to ignore tooling or constant inflow of materials
- Features a 7-segment display for diagnostic information and number of blocked beams
- Identifies clear and blocked beam using zone indicators
- Features user-configurable trip or latch outputs, and Scan Code 1 or 2
- Provides External Device Monitoring (EDM), TEST function and Aux outputs
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cTUVus, and CE certified to Type 4, Cat 4 PLE, and SIL 3
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps
- Available with nickel-plated ESD-safe housing for protection against electrostatic discharges, clear anodized aluminum or with a "safety" yellow powder-coat housing
- Offers optional cascading to create up to a four sensor system that issues a single stop command
- Easily configured reduced resolution and fixed blanking, remote Teach of fixed blanking option available on cascade models

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

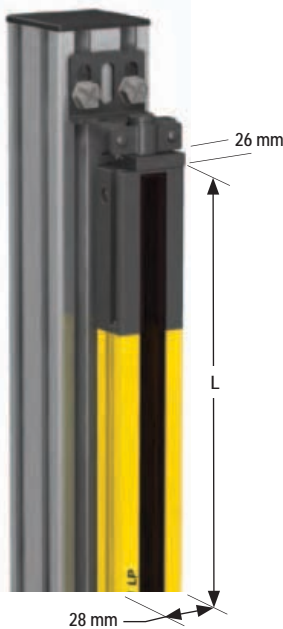
ACCESSORIES
page 510

- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS



Remote Fixed Blanking

- Simple procedure to allow for frequent configuration of a fixed blanked area, without using receiver DIP switches
 - Available in all low-profile cascade receivers when used as a standalone or as an end receiver
 - Requires optional EZA-RBK-1 key switch or SPDT (Form C) switch to perform remote programming
- See page 510.



EZ-SCREEN LP Systems

Available Finishes



Interface multiple devices with the SC22-3 Safety Controller. See page 533

EZ-SCREEN® Low-Profile Systems, 14 mm Resolution–0.1 to 7 m Range, 24V dc

| Defined Area | Connection | Housing Length (L) | Response Time | # of Beams | Output | Models* | | |
|--------------|----------------------------|--------------------|---------------|------------|---|---------------|----------------|----------------|
| | | | | | | Emitter | Receiver | Pair† |
| 270 mm | Pigtail QD, 8-pin M12/Euro | 270 mm | 10.5 ms | 27 | 2 PNP OSSD (Trip/Latch selectable) | SLPE14-270P8 | SLPR14-270P8 | SLPP14-270P88 |
| | Integral RD | | | | | SLPE14-270 | SLPR14-270 | SLPP14-270 |
| 410 mm | Pigtail QD, 8-pin M12/Euro | 410 mm | 13.5 ms | 41 | | SLPE14-410P8 | SLPR14-410P8 | SLPP14-410P88 |
| | Integral RD | | | | | SLPE14-410 | SLPR14-410 | SLPP14-410 |
| 550 mm | Pigtail QD, 8-pin M12/Euro | 549 mm | 16.5 ms | 55 | | SLPE14-550P8 | SLPR14-550P8 | SLPP14-550P88 |
| | Integral RD | | | | | SLPE14-550 | SLPR14-550 | SLPP14-550 |
| 690 mm | Pigtail QD, 8-pin M12/Euro | 689 mm | 19.5 ms | 69 | | SLPE14-690P8 | SLPR14-690P8 | SLPP14-690P88 |
| | Integral RD | | | | | SLPE14-690 | SLPR14-690 | SLPP14-690 |
| 830 mm | Pigtail QD, 8-pin M12/Euro | 829 mm | 22.5 ms | 83 | | SLPE14-830P8 | SLPR14-830P8 | SLPP14-830P88 |
| | Integral RD | | | | | SLPE14-830 | SLPR14-830 | SLPP14-830 |
| 970 mm | Pigtail QD, 8-pin M12/Euro | 969 mm | 25.5 ms | 97 | | SLPE14-970P8 | SLPR14-970P8 | SLPP14-970P88 |
| | Integral RD | | | | | SLPE14-970 | SLPR14-970 | SLPP14-970 |
| 1110 mm | Pigtail QD, 8-pin M12/Euro | 1108 mm | 28.5 ms | 111 | | SLPE14-1110P8 | SLPR14-1110P8 | SLPP14-1110P88 |
| | Integral RD | | | | | SLPE14-1110 | SLPR14-1110 | SLPP14-1110 |
| 1250 mm | Pigtail QD, 8-pin M12/Euro | 1248 mm | 31.5 ms | 125 | | SLPE14-1250P8 | SLPR14-1250P8 | SLPP14-1250P88 |
| | Integral RD | | | | | SLPE14-1250 | SLPR14-1250 | SLPP14-1250 |
| 1390 mm | Pigtail QD, 8-pin M12/Euro | 1388 mm | 34.5 ms | 139 | | SLPE14-1390P8 | SLPR14-1390P8 | SLPP14-1390P88 |
| | Integral RD | | | | | SLPE14-1390 | SLPR14-1390 | SLPP14-1390 |
| 1530 mm | Pigtail QD, 8-pin M12/Euro | 1528 mm | 37.5 ms | 153 | | SLPE14-1530P8 | SLPR14-1530P8 | SLPP14-1530P88 |
| | Integral RD | | | | | SLPE14-1530 | SLPR14-1530 | SLPP14-1530 |
| 1670 mm | Pigtail QD, 8-pin M12/Euro | 1667 mm | 40.5 ms | 167 | SLPE14-1670P8 | SLPR14-1670P8 | SLPP14-1670P88 | |
| | Integral RD | | | | SLPE14-1670 | SLPR14-1670 | SLPP14-1670 | |
| 1810 mm | Pigtail QD, 8-pin M12/Euro | 1807 mm | 43.5 ms | 181 | SLPE14-1810P8 | SLPR14-1810P8 | SLPP14-1810P88 | |
| | Integral RD | | | | SLPE14-1810 | SLPR14-1810 | SLPP14-1810 | |

EZ-SCREEN® Low-Profile Systems, 25 mm Resolution–0.1 to 7 m Range, 24V dc

| Defined Area | Connection | Housing Length (L) | Response Time | # of Beams | Output | Models* | | |
|--------------|----------------------------|--------------------|---------------|------------|---|--------------|--------------|---------------|
| | | | | | | Emitter | Receiver | Pair† |
| 270 mm | Pigtail QD, 8-pin M12/Euro | 270 mm | 8 ms | 14 | 2 PNP OSSD (Trip/Latch selectable) | SLPE25-270P8 | SLPR25-270P8 | SLPP25-270P88 |
| | Integral RD | | | | | SLPE25-270 | SLPR25-270 | SLPP25-270 |
| 410 mm | Pigtail QD, 8-pin M12/Euro | 410 mm | 9.5 ms | 21 | | SLPE25-410P8 | SLPR25-410P8 | SLPP25-410P88 |
| | Integral RD | | | | | SLPE25-410 | SLPR25-410 | SLPP25-410 |
| 550 mm | Pigtail QD, 8-pin M12/Euro | 549 mm | 11 ms | 28 | | SLPE25-550P8 | SLPR25-550P8 | SLPP25-550P88 |
| | Integral RD | | | | | SLPE25-550 | SLPR25-550 | SLPP25-550 |
| 690 mm | Pigtail QD, 8-pin M12/Euro | 689 mm | 12.5 ms | 35 | | SLPE25-690P8 | SLPR25-690P8 | SLPP25-690P88 |
| | Integral RD | | | | | SLPE25-690 | SLPR25-690 | SLPP25-690 |
| 830 mm | Pigtail QD, 8-pin M12/Euro | 829 mm | 14 ms | 42 | | SLPE25-830P8 | SLPR25-830P8 | SLPP25-830P88 |
| | Integral RD | | | | | SLPE25-830 | SLPR25-830 | SLPP25-830 |

More
on next
page
 Connection options:

QD models: Pigtail QD models require mating cordsets with an 8-pin M12/Euro-style connector (such as QDE-8..D, DEE2R-8..D or CSB-M128..M1281; see page 510).
Integral RD models require mating cordsets with a removable disconnect connector (such as RDLPE-8..D or DELPE-8..D; see page 510).

* Only standard yellow housing models are listed. 300 mm Pigtail QD models (example, SLPE14-270P8) have yellow PVC cable and black PVC QD overmold.

For other models:

Anodized aluminum housing: Prior to the connection designation (if any) in the model number, add A for a clear (brushed) anodized aluminum finish and black endcaps (example, SLPE14-270AP8).

Pigtail QD models (example, SLPE14-270AP8) have black PVC cable and QD overmold.

ESD-safe models: Prior to the connection designation (if any) in the model number, add N for a nickel-plated housing and endcaps (example, SLPE14-270NP8).

† A pair includes an emitter and receiver (example, SLPP25-270P88).

EZ-SCREEN® Low-Profile Systems, 25 mm Resolution–0.1 to 7 m Range, 24V dc (cont'd)

| Defined Area | Connection | Housing Length (L) | Response Time | # of Beams | Output | Models* | | |
|--------------|----------------------------|--------------------|---------------|------------|------------------------------------|---------------|---------------|-------------------|
| | | | | | | Emitter | Receiver | Pair [†] |
| 970 mm | Pigtail QD, 8-pin M12/Euro | 969 mm | 15.5 ms | 49 | 2 PNP OSSD (Trip/Latch selectable) | SLPE25-970P8 | SLPR25-970P8 | SLPP25-970P88 |
| | Integral RD | | | | | SLPE25-970 | SLPR25-970 | SLPP25-970 |
| 1110 mm | Pigtail QD, 8-pin M12/Euro | 1108 mm | 17 ms | 56 | | SLPE25-1110P8 | SLPR25-1110P8 | SLPP25-1110P88 |
| | Integral RD | | | | | SLPE25-1110 | SLPR25-1110 | SLPP25-1110 |
| 1250 mm | Pigtail QD, 8-pin M12/Euro | 1248 mm | 18.5 ms | 63 | | SLPE25-1250P8 | SLPR25-1250P8 | SLPP25-1250P88 |
| | Integral RD | | | | | SLPE25-1250 | SLPR25-1250 | SLPP25-1250 |
| 1390 mm | Pigtail QD, 8-pin M12/Euro | 1388 mm | 20 ms | 70 | | SLPE25-1390P8 | SLPR25-1390P8 | SLPP25-1390P88 |
| | Integral RD | | | | | SLPE25-1390 | SLPR25-1390 | SLPP25-1390 |
| 1530 mm | Pigtail QD, 8-pin M12/Euro | 1528 mm | 21 ms | 77 | | SLPE25-1530P8 | SLPR25-1530P8 | SLPP25-1530P88 |
| | Integral RD | | | | | SLPE25-1530 | SLPR25-1530 | SLPP25-1530 |
| 1670 mm | Pigtail QD, 8-pin M12/Euro | 1668 mm | 22.5 ms | 84 | | SLPE25-1670P8 | SLPR25-1670P8 | SLPP25-1670P88 |
| | Integral RD | | | | | SLPE25-1670 | SLPR25-1670 | SLPP25-1670 |
| 1810 mm | Pigtail QD, 8-pin M12/Euro | 1807 mm | 24 ms | 91 | | SLPE25-1810P8 | SLPR25-1810P8 | SLPP25-1810P88 |
| | Integral RD | | | | | SLPE25-1810 | SLPR25-1810 | SLPP25-1810 |

Photoelectrics Sensors
Fiber Optic Sensors
Special Purpose Sensors
Measurement & Inspection Sensors
Vision
Wireless
Lighting & Indicators
Safety Light Screens
Safety Laser Scanners
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

ACCESSORIES
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EZ-SCREEN® Low-Profile Cascade Systems, 14 mm Resolution–0.1 to 7 m Range, 24V dc

| Defined Area | Connection | Housing Length (L) | Response Time | # of Beams | Output | Models* | | |
|--------------|----------------------------|--------------------|---------------|------------|------------------------------------|----------------|-----------------|-------------------|
| | | | | | | Emitter | Receiver | Pair [†] |
| 410 mm | Pigtail QD, 8-pin M12/Euro | 410 mm | 13.5 ms | 41 | 2 PNP OSSD (Trip/Latch selectable) | SLPCE14-410P8 | SLPCR14-410P8 | SLPCP14-410P88 |
| | Integral RD | | | | | SLPCE14-410 | SLPCR14-410 | SLPCP14-410 |
| 550 mm | Pigtail QD, 8-pin M12/Euro | 549 mm | 16.5 ms | 55 | | SLPCE14-550P8 | SLPCR14-550P8 | SLPCP14-550P88 |
| | Integral RD | | | | | SLPCE14-550 | SLPCR14-550 | SLPCP14-550 |
| 690 mm | Pigtail QD, 8-pin M12/Euro | 689 mm | 19.5 ms | 69 | | SLPCE14-690P8 | SLPCR14-690P8 | SLPCP14-690P88 |
| | Integral RD | | | | | SLPCE14-690 | SLPCR14-690 | SLPCP14-690 |
| 830 mm | Pigtail QD, 8-pin M12/Euro | 829 mm | 22.5 ms | 83 | | SLPCE14-830P8 | SLPCR14-830P8 | SLPCP14-830P88 |
| | Integral RD | | | | | SLPCE14-830 | SLPCR14-830 | SLPCP14-830 |
| 970 mm | Pigtail QD, 8-pin M12/Euro | 969 mm | 25.5 ms | 97 | | SLPCE14-970P8 | SLPCR14-970P8 | SLPCP14-970P88 |
| | Integral RD | | | | | SLPCE14-970 | SLPCR14-970 | SLPCP14-970 |
| 1110 mm | Pigtail QD, 8-pin M12/Euro | 1108 mm | 28.5 ms | 111 | | SLPCE14-1110P8 | SLPCR14-1110P8 | SLPCP14-1110P88 |
| | Integral RD | | | | | SLPCE14-1110 | SLPCR14-1110 | SLPCP14-1110 |
| 1250 mm | Pigtail QD, 8-pin M12/Euro | 1248 mm | 31.5 ms | 125 | | SLPCE14-1250P8 | SLPCR14-1250P8 | SLPCP14-1250P88 |
| | Integral RD | | | | | SLPCE14-1250 | SLPCR14-1250 | SLPCP14-1250 |
| 1390 mm | Pigtail QD, 8-pin M12/Euro | 1388 mm | 34.5 ms | 139 | SLPCE14-1390P8 | SLPCR14-1390P8 | SLPCP14-1390P88 | |
| | Integral RD | | | | SLPCE14-1390 | SLPCR14-1390 | SLPCP14-1390 | |
| 1530 mm | Pigtail QD, 8-pin M12/Euro | 1528 mm | 37.5 ms | 153 | SLPCE14-1530P8 | SLPCR14-1530P8 | SLPCP14-1530P88 | |
| | Integral RD | | | | SLPCE14-1530 | SLPCR14-1530 | SLPCP14-1530 | |

EZ-SCREEN
TYPE 4
14 or 30 mm
TYPE 4
LOW PROFILE
14 or 25 mm
TYPE 2
30 mm
GRIDS & POINTS

More on next page

Connection options:

QD models: Pigtail QD models require mating cordsets with an 8-pin M12/Euro-style connector (such as QDE-8..D, DEE2R-8..D or CSB-M128..M1281; see page 510).
Integral RD models require mating cordsets with a removable disconnect connector (such as RDLP-8..D or DELPE-8..D; see page 510).

* Only standard yellow housing models are listed. Pigtail QD models (example, SLPE25-830P8) have yellow PVC cable and black PVC QD overmold.
For other models:
Anodized aluminum housing: Prior to the connection designation (if any) in the model number, add A for a clear (brushed) anodized aluminum finish and black endcaps (example, SLPE25-830AP8).
Pigtail QD models (example, SLPE25-830AP8) have black PVC cable and QD overmold.
ESD-safe models: Prior to the connection designation (if any) in the model number, add N for a nickel-plated housing and endcaps (example, SLPE25-380NP8).
† A pair includes an emitter and receiver (example, SLPP25-270P88).

EZ-SCREEN® Low-Profile Cascade Systems, 14 mm Resolution—0.1 to 7 m Range, 24V dc (cont'd)

| Defined Area | Connection | Housing Length (L) | Response Time | # of Beams | Output | Models* | | |
|--------------|----------------------------|--------------------|---------------|------------|---------------------------------------|----------------|----------------|-----------------|
| | | | | | | Emitter | Receiver | Pair† |
| 1670 mm | Pigtail QD, 8-pin M12/Euro | 1667 mm | 40.5 ms | 167 | 2 PNP OSSD (Trip/Latch selectable) | SLPCE14-1670P8 | SLPCR14-1670P8 | SLPCP14-1670P88 |
| | Integral RD | | | | | SLPCE14-1670 | SLPCR14-1670 | SLPCP14-1670 |
| 1810 mm | Pigtail QD, 8-pin M12/Euro | 1807 mm | 43.5 ms | 181 | | SLPCE14-1810P8 | SLPCR14-1810P8 | SLPCP14-1810P88 |
| | Integral RD | | | | | SLPCE14-1810 | SLPCR14-1810 | SLPCP14-1810 |

EZ-SCREEN® Low-Profile Cascade Systems, 25 mm Resolution—0.1 to 7 m Range, 24V dc

| Defined Area | Connection | Housing Length (L) | Response Time | # of Beams | Output | Models* | | |
|--------------|----------------------------|--------------------|---------------|------------|---------------------------------------|----------------|----------------|-----------------|
| | | | | | | Emitter | Receiver | Pair† |
| 410 mm | Pigtail QD, 8-pin M12/Euro | 410 mm | 9.5 ms | 21 | 2 PNP OSSD (Trip/Latch selectable) | SLPCE25-410P8 | SLPCR25-410P8 | SLPCP25-410P88 |
| | Integral RD | | | | | SLPCE25-410 | SLPCR25-410 | SLPCP25-410 |
| 550 mm | Pigtail QD, 8-pin M12/Euro | 549 mm | 11 ms | 28 | | SLPCE25-550P8 | SLPCR25-550P8 | SLPCP25-550P88 |
| | Integral RD | | | | | SLPCE25-550 | SLPCR25-550 | SLPCP25-550 |
| 690 mm | Pigtail QD, 8-pin M12/Euro | 689 mm | 12.5 ms | 35 | | SLPCE25-690P8 | SLPCR25-690P8 | SLPCP25-690P88 |
| | Integral RD | | | | | SLPCE25-690 | SLPCR25-690 | SLPCP25-690 |
| 830 mm | Pigtail QD, 8-pin M12/Euro | 829 mm | 14 ms | 42 | | SLPCE25-830P8 | SLPCR25-830P8 | SLPCP25-830P88 |
| | Integral RD | | | | | SLPCE25-830 | SLPCR25-830 | SLPCP25-830 |
| 970 mm | Pigtail QD, 8-pin M12/Euro | 969 mm | 15.5 ms | 49 | | SLPCE25-970P8 | SLPCR25-970P8 | SLPCP25-970P88 |
| | Integral RD | | | | | SLPCE25-970 | SLPCR25-970 | SLPCP25-970 |
| 1110 mm | Pigtail QD, 8-pin M12/Euro | 1108 mm | 17 ms | 56 | | SLPCE25-1110P8 | SLPCR25-1110P8 | SLPCP25-1110P88 |
| | Integral RD | | | | | SLPCE25-1110 | SLPCR25-1110 | SLPCP25-1110 |
| 1250 mm | Pigtail QD, 8-pin M12/Euro | 1248 mm | 18.5 ms | 63 | | SLPCE25-1250P8 | SLPCR25-1250P8 | SLPCP25-1250P88 |
| | Integral RD | | | | | SLPCE25-1250 | SLPCR25-1250 | SLPCP25-1250 |
| 1390 mm | Pigtail QD, 8-pin M12/Euro | 1388 mm | 20 ms | 70 | | SLPCE25-1390P8 | SLPCR25-1390P8 | SLPCP25-1390P88 |
| | Integral RD | | | | | SLPCE25-1390 | SLPCR25-1390 | SLPCP25-1390 |
| 1530 mm | Pigtail QD, 8-pin M12/Euro | 1528 mm | 21 ms | 77 | | SLPCE25-1530P8 | SLPCR25-1530P8 | SLPCP25-1530P88 |
| | Integral RD | | | | | SLPCE25-1530 | SLPCR25-1530 | SLPCP25-1530 |
| 1670 mm | Pigtail QD, 8-pin M12/Euro | 1668 mm | 22.5 ms | 84 | | SLPCE25-1670P8 | SLPCR25-1670P8 | SLPCP25-1670P88 |
| | Integral RD | | | | | SLPCE25-1670 | SLPCR25-1670 | SLPCP25-1670 |
| 1810 mm | Pigtail QD, 8-pin M12/Euro | 1807 mm | 24 ms | 91 | | SLPCE25-1810P8 | SLPCR25-1810P8 | SLPCP25-1810P88 |
| | Integral RD | | | | | SLPCE25-1810 | SLPCR25-1810 | SLPCP25-1810 |

Connection options:

QD models: Pigtail QD models require mating cordsets with an 8-pin M12/Euro-style connector (such as QDE-8..D, DEE2R-8..D or CSB-M128..M1281; see page 510).
Integral RD models require mating cordsets with a removable disconnect connector (such as RDL-8..D or DELPE-8..D; see page 510).

* Only standard yellow housing models are listed. Pigtail QD models (example, SLPCE25-1670P8) have yellow PVC cable and black PVC QD overmold.

For other models:

Anodized aluminum housing: Prior to the connection designation (if any) in the model number, add A for a clear (brushed) anodized aluminum finish and black endcaps (example, SLPCE25-1670AP8).

Pigtail QD models (example, SLPCE25-1670AP8) have black PVC cable and QD overmold.

ESD-safe models: Prior to the connection designation (if any) in the model number, add N for a nickel-plated housing and endcaps (example, SLPCE25-1670NP8).

Pigtail QD models (example, SLPCE25-410NP88) have black PVC cable and QD overmold.

† A pair includes an emitter and receiver (example, SLPCP25-410P88).

EZ-SCREEN® Low-Profile Systems with Integral Muting, 14 mm Resolution, 24V dc

| Defined Area | Connection | Housing Length (L) | Response Time | # of Beams | Output | Models | | |
|--------------|-----------------------------|--------------------|---------------|------------|------------------------------------|-----------------|------------------|------------------|
| | | | | | | Emitter | Receiver | Pair† |
| 410 mm | Pigtail QD, 12-pin M12/Euro | 410 mm | 13.5 ms | 41 | 2 PNP OSSD (Trip/Latch selectable) | SLPE14-410P8 | SLPMR14-410P12 | SLPMP14-410P128 |
| | Integral RD | | | | | SLPE14-410 | SLPMR14-410 | SLPMP14-410 |
| 550 mm | Pigtail QD, 12-pin M12/Euro | 549 mm | 16.5 ms | 55 | | SLPE14-550P8 | SLPMR14-550P12 | SLPMP14-550P128 |
| | Integral RD | | | | | SLPE14-550 | SLPMR14-550 | SLPMP14-550 |
| 690 mm | Pigtail QD, 12-pin M12/Euro | 689 mm | 19.5 ms | 69 | | SLPE14-690P8 | SLPMR14-690P12 | SLPMP14-690P128 |
| | Integral RD | | | | | SLPE14-690 | SLPMR14-690 | SLPMP14-690 |
| 830 mm | Pigtail QD, 12-pin M12/Euro | 829 mm | 22.5 ms | 83 | | SLPE14-830P8 | SLPMR14-830P12 | SLPMP14-830P128 |
| | Integral RD | | | | | SLPE14-830 | SLPMR14-830 | SLPMP14-830 |
| 970 mm | Pigtail QD, 12-pin M12/Euro | 969 mm | 25.5 ms | 97 | | SLPE14-970P8 | SLPMR14-970P12 | SLPMP14-970P128 |
| | Integral RD | | | | | SLPE14-970 | SLPMR14-970 | SLPMP14-970 |
| 1110 mm | Pigtail QD, 12-pin M12/Euro | 1108 mm | 28.5 ms | 111 | | SLPE14-1110P8 | SLPMR14-1110P12 | SLPMP14-1110P128 |
| | Integral RD | | | | | SLPE14-1110 | SLPMR14-1110 | SLPMP14-1110 |
| 1250 mm | Pigtail QD, 12-pin M12/Euro | 1248 mm | 31.5 ms | 125 | | SLPE14-1250P8 | SLPMR14-1250P12 | SLPMP14-1250P128 |
| | Integral RD | | | | | SLPE14-1250 | SLPMR14-1250 | SLPMP14-1250 |
| 1390 mm | Pigtail QD, 12-pin M12/Euro | 1388 mm | 34.5 ms | 139 | | SLPE14-1390P8 | SLPMR14-1390P12 | SLPMP14-1390P128 |
| | Integral RD | | | | | SLPE14-1390 | SLPMR14-1390 | SLPMP14-1390 |
| 1530 mm | Pigtail QD, 12-pin M12/Euro | 1528 mm | 37.5 ms | 153 | | SLPE14-1530P8 | SLPMR14-1530P12 | SLPMP14-1530P128 |
| | Integral RD | | | | | SLPE14-1530 | SLPMR14-1530 | SLPMP14-1530 |
| 1670 mm | Pigtail QD, 12-pin M12/Euro | 1667 mm | 40.5 ms | 167 | | SLPE14-1670P8 | SLPMR14-1670P12 | SLPMP14-1670P128 |
| | Integral RD | | | | | SLPE14-1670 | SLPMR14-1670 | SLPMP14-1670 |
| 1810 mm | Pigtail QD, 12-pin M12/Euro | 1807 mm | 43.5 ms | 181 | SLPE14-1810P8 | SLPMR14-1810P12 | SLPMP14-1810P128 | |
| | Integral RD | | | | SLPE14-1810 | SLPMR14-1810 | SLPMP25-1810 | |

- Photoelectrics Sensors
- Fiber Optic Sensors
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- Wireless
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- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm**
- TYPE 2
30 mm
- GRIDS & POINTS

EZ-SCREEN® Low-Profile Systems with Integral Muting, 25 mm Resolution, 24V dc

| Defined Area | Connection | Housing Length (L) | Response Time | # of Beams | Output | Models | | |
|--------------|-----------------------------|--------------------|---------------|------------|------------------------------------|--------------|----------------|-----------------|
| | | | | | | Emitter | Receiver | Pair† |
| 410 mm | Pigtail QD, 12-pin M12/Euro | 410 mm | 9.5 ms | 21 | 2 PNP OSSD (Trip/Latch selectable) | SLPE25-410P8 | SLPMR25-410P12 | SLPMP25-410P128 |
| | Integral RD | | | | | SLPE25-410 | SLPMR25-410 | SLPMP25-410 |
| 550 mm | Pigtail QD, 12-pin M12/Euro | 549 mm | 11 ms | 28 | | SLPE25-550P8 | SLPMR25-550P12 | SLPMP25-550P128 |
| | Integral RD | | | | | SLPE25-550 | SLPMR25-550 | SLPMP25-550 |
| 690 mm | Pigtail QD, 12-pin M12/Euro | 689 mm | 12.5 ms | 35 | | SLPE25-690P8 | SLPMR14-690P12 | SLPMP25-690P128 |
| | Integral RD | | | | | SLPE25-690 | SLPMR25-690 | SLPMP25-690 |
| 830 mm | Pigtail QD, 12-pin M12/Euro | 829 mm | 14 ms | 42 | | SLPE25-830P8 | SLPMR25-830P12 | SLPMP25-830P128 |
| | Integral RD | | | | | SLPE25-830 | SLPMR25-830 | SLPMP25-830 |

More on next page

Connection options:

QD models: Pigtail QD models require mating cordsets with an 12-pin M12/Euro-style connector (such as ODE-8..D, DEE2R-8..D or CSB-M128..M1281; see page 510).
Integral RD models require mating cordsets with a removable disconnect connector (such as RDL-8..D or DELPE-8..D; see page 510).

† A pair includes an emitter and receiver (example, SLPMP14-410P128).

EZ-SCREEN® Low-Profile Systems with Integral Muting, 25 mm Resolution, 24V dc (cont'd)

| Defined Area | Connection | Housing Length (L) | Response Time | # of Beams | Output | Models | | |
|--------------|-----------------------------|--------------------|---------------|------------|---|---------------|-----------------|------------------|
| | | | | | | Emitter | Receiver | Pair† |
| 970 mm | Pigtail QD, 12-pin M12/Euro | 969 mm | 49 | 15.5 ms | 2 PNP OSSD (Trip/Latch selectable) | SLPE25-970P8 | SLPMR25-970P12 | SLPMP25-970P128 |
| | Integral RD | | | | | SLPE25-970 | SLPMR25-970 | SLPMP25-970 |
| 1110 mm | Pigtail QD, 12-pin M12/Euro | 1108 mm | 56 | 17 ms | | SLPE25-1110P8 | SLPMR25-1110P12 | SLPMP25-1110P128 |
| | Integral RD | | | | | SLPE25-1110 | SLPMR25-1110 | SLPMP25-1110 |
| 1250 mm | Pigtail QD, 12-pin M12/Euro | 1248 mm | 63 | 18.5 ms | | SLPE25-1250P8 | SLPMR25-1250P12 | SLPMP25-1250P128 |
| | Integral RD | | | | | SLPE25-1250 | SLPMR25-1250 | SLPMP25-1250 |
| 1390 mm | Pigtail QD, 12-pin M12/Euro | 1388 mm | 70 | 20 ms | | SLPE25-1390P8 | SLPMR25-1390P12 | SLPMP25-1390P128 |
| | Integral RD | | | | | SLPE25-1390 | SLPMR25-1390 | SLPMP25-1390 |
| 1530 mm | Pigtail QD, 12-pin M12/Euro | 1528 mm | 77 | 21 ms | | SLPE25-1530P8 | SLPMR25-1530P12 | SLPMP25-1530P128 |
| | Integral RD | | | | | SLPE25-1530 | SLPMR25-1530 | SLPMP25-1530 |
| 1670 mm | Pigtail QD, 12-pin M12/Euro | 1667 mm | 84 | 22.5 ms | | SLPE25-1670P8 | SLPMR25-1670P12 | SLPMP25-1670P128 |
| | Integral RD | | | | | SLPE25-1670 | SLPMR25-1670 | SLPMP14-1670 |
| 1810 mm | Pigtail QD, 12-pin M12/Euro | 1807 mm | 91 | 24 ms | | SLPE25-1810P8 | SLPMR14-1810P12 | SLPMP25-1810P128 |
| | Integral RD | | | | | SLPE25-1810 | SLPMR25-1810 | SLPMR25-1810 |

 Connection options:

QD models: Pigtail QD models require mating cordsets with an 12-pin M12/Euro-style connector (such as QDE-8..D, DEE2R-8..D or CSB-M128..M1281; see page 510).
Integral RD models require mating cordsets with a removable disconnect connector (such as RDLP-8..D or DELPE-8..D; see page 510).

† A pair includes an emitter and receiver (example, SLPMP14-410P128).

EZ-SCREEN® Low-Profile 14 & 25 mm Resolution Kits



You can purchase a kit that contains an emitter and receiver of equal length and resolution; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

| | |
|-------------------------|----------|
| • Emitter and Receivers | Page 501 |
| • Interfacing Options | 523 |
| • Cordsets | 510 |
| • Brackets | 510 |

To Order:

1. Choose model, resolution and defined area.
2. Yellow housing is standard. To choose an optional housing, add an A or N prior to the connection designation:
A for anodized aluminum (clear) finish with black endcaps (example, SLPK25-270A). †
N for ESD-safe models with a nickel-plated housing and endcaps (example, SLPK25-270N). †
3. Choose the connection: 300 mm M12/Euro-Style Pigtail QD or integral Removable Disconnect (RD).
4. Choose an optional interfacing solution, such as an IM-T-9A or -11 interfacing model.

5. Choose one cordset for each sensor or two cordsets for a pair.

M12/Euro Pigtail QD models (example, SLPK25-270P88) require mating 8-pin M12/Euro QD cordsets, such as:

- QDE cordset with flying leads
- DEE2R double-ended cordset
- CSB series splitter cordset

Integral RD models (example, SLPK25-270) require mating cordsets, such as:

- RDLP cordset with flying leads
- DELPE double-ended cordset with M12/Euro QD (requires additional mating 8-pin M12/Euro QD cordsets)
- DELP cordset in cascade application for connection of 2nd, 3rd and 4th sensors

See www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

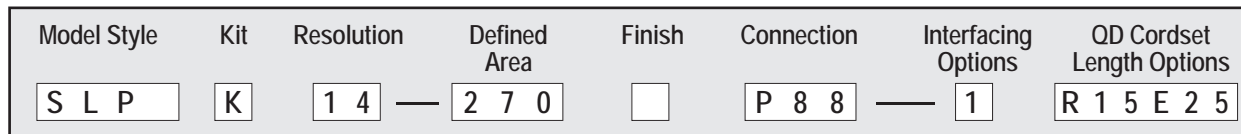
† Optional housings with Pigtail QD models have a black 300 mm PVC cable and QD overmold.

- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 510

- EZ-SCREEN
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS

Kit Model Key



Model Style

| |
|----------------|
| SLP = Standard |
| SLPC = Cascade |
| SLPM = Muting |

Kit

| |
|---------|
| K = Kit |
|---------|

SLS Resolution

| |
|------------|
| 14 = 14 mm |
| 25 = 25 mm |

Sensor Finish

| |
|-----------------------------|
| Blank = Yellow powder coat |
| A = Clear anodized Aluminum |
| N = Nickel plated (ESD) |

Defined Area

| |
|----------|
| 270 mm * |
| 410 mm |
| 550 mm |
| 690 mm |
| 830 mm |
| 970 mm |
| 1110 mm |
| 1250 mm |
| 1390 mm |
| 1530 mm |
| 1670 mm |
| 1810 mm |

Connection Options

| |
|---|
| P88 = Two 300 mm pigtail with 8-pin M12/Euro QD connector. Used with QDE-8xxD, DEE2R-8xxD or CSB-M1281M128xx. Cordsets ordered separately. |
| R88 = Two RDLP-8xxD Removable Disconnect cordsets with flying lead wires |
| D88 = Two DELPE-8xxD with 8-pin M12/Euro QD connector. Used with QDE-8xxD, DEE2R-8xxD or CSB-M1281M128xx. Cordsets ordered separately. |
| D1111 = Two DELP-11xxxE cordsets for 2 nd , 3 rd or 4 th SLPC cascade sensors. |

QD Cordset Length Examples

| |
|--|
| RE15 = 4.6 m, 2 each |
| RE25 = 8 m, 2 each |
| R15E25 = 4.6 m (Receiver) & 8 m (Emitter) |
| R25E15 = 8 m (Receiver) & 4.6 m (Emitter) |
| DD1 = 0.3 m, 2 each, DEE2R-8xxD, DELPE-8xxD or DELP-11xxxE, depending on QD option |
| C1D15 = CSB-M1281M1281 (Receiver) DEE2R-815D (Emitter) |
| C8D25 = CSB-M1288M1281 (Receiver) DEE2R-850D (Emitter) |
| CU25D25 = CSB-UNT825M1281 (Receiver) DEE2R-825D (Emitter) |

Interfacing Options

| |
|---|
| 1 = IM-T-9A Interface Module, 1 each (3 NO) |
| 2 = IM-T-11A Interface Module, 1 each (2 NO/1 NC) |
| 3 = 11-BG00-31-D-024 Contactors (10A), 2 each |
| 4 = BF1801L-024 Contactors (18A), 2 each |
| 5 = EZAC-R9-QE8 = AC Interface Box (3 NO), 1 each |
| 6 = EZAC-R11-QE8 = AC Interface Box (2 NO/1 NC), 1 each |




* 270 mm not available in cascade or muting models

NOTE: See notes under model number tables. Not all combinations are listed. Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

EZ-SCREEN® Low-Profile 14 & 25 mm Resolution Specifications

| | | |
|--|---|--|
| Supply Voltage at the Device | 24V dc $\pm 15\%$ (use a SELV-rated supply according to EN IEC 60950) (The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds, as specified in EN IEC 60204-1.) | |
| Residual Ripple | $\pm 10\%$ maximum | |
| Supply Current | Emitter: 60 mA max., exclusive of fault load Receiver: 150 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each) and Aux Output load (up to an additional 0.25A) | |
| Response Time | 8 to 43.5 milliseconds (see model number tables) Cascade safety stop interface (CSSI): 40 milliseconds max. (contacts must be open for 60 milliseconds min.) | |
| Remote Test Input | Test mode is activated either by applying a low signal (less than 3V dc) to emitter Test/Reset terminal for a minimum of 50 milliseconds, or by opening a switch connected between Test/Reset and 24V dc for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal at Test/Reset deactivates Test Mode. High Signal: 10 to 30V dc Low Signal: 0 to 3V dc Input Current: 35 mA inrush, 10 mA max. | |
| Wavelength of Emitter Elements | Infrared LEDs, 850 nm at peak emission | |
| Recovery Time—Blocked to clear (OSSDs turn ON; varies with total number of sensing beams and whether Sync beam is blocked) | | |
| | | |
| | | |
| EDM Input | +24V dc signals from external device contacts can be monitored (one-channel, two-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver High Signal: 10 to 30V dc at 30 mA typical Low Signal: 0 to 3V dc | |
| Reset Input | The Reset input must be high for 0.25 to 2 seconds and then low to reset the receiver High Signal: 10 to 30V dc at 30 mA typical Low Signal: 0 to 3V dc Closed Switch Time: 0.25 to 2 seconds | |
| Safety Outputs (OSSDs) | Two redundant solid-state 24V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Capable of the Banner "Safety Handshake" ON-State voltage: $\geq V_{in} - 1.5V$ dc OFF-State voltage: 1.2V dc max. (0-1.2V dc) Max. load capacitance: 1.0 μ F Max. load inductance: 10 H Leakage Current: 0.50 mA maximum Cable Resistance: 10 Ω maximum OSSD test pulse width: 100 to 300 microseconds OSSD test pulse period: 10 to 22 milliseconds (varies with number of beams) Switching Current: 0-0.5 A | |
| Auxiliary (Aux.)/Fault Output Switching Capacity | Current-sourcing (PNP) Solid-state output, 24V dc at 250 mA max. that follow safety outputs or lock out status (configurable) | |
| Controls and Adjustments | <p>Emitter:</p> <p>Scan Code selection: 2-position switch (code 1 or 2). Factory default position is code 1. Test/Reset: 2-position switch. Factory default position is Reset. Invert Display: 2-position switch. Factory default position is OFF (Standard display). Fault: 2-position switch. Factory default position is OFF.</p> <p>Receiver:</p> <p>Scan Code selection: 2-position switch (code 1 or 2). Factory default position is code 1. Trip/Latch Output selection: Redundant switches. Factory default position is T (trip). EDM/MPCE monitor selection: 2-position switch selects between 1- or 2-channel monitoring. Factory default position is 2-channel monitoring. Reduced Resolution: Redundant switches. Factory default position is OFF. Aux/Fault: 2-position switch. Factory default position is Aux. Invert Display: 2-position switch. Factory default position is OFF.</p> | |
| Short Circuit Protection | All inputs and outputs are protected from short circuits to +24V dc or dc common | |
| Electrical Safety Class (IEC 61140) | III | |

EZ-SCREEN® Low-Profile 14 & 25 mm Resolution Specifications (cont'd)

| | |
|---------------------------------------|---|
| Operating Range | 0.1 to 7 m Range decreases with use of mirrors and/or lens shields: Lens shields – approximately 10% less range per shield Glass-surface mirrors – approximately 8% less range per mirror See the Accessory section for more information on a specific mirror page 726, for further information. |
| Ambient Light Immunity | > 10,000 lux at 5° angle of incidence |
| Strobe Light immunity | Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe |
| Effective Aperture Angle (EAA) | Meets Type 4 requirements per IEC 61496-2, ± 2.5° @ 3 m |
| Enclosure | Materials: Extruded aluminum housing with yellow polyester powder finish standard (optional clear anodized aluminum or nickel-plated silver finish) and well-sealed, rugged die-cast zinc end caps, acrylic lens cover, copolyester access cover. End caps on silver models are also nickel-plated. ESD-safe models have static-dissipative acrylic lens cover. Rating: IP65 |
| Operating Conditions | Temperature: 0° to +55° C Max. Relative Humidity: 95% maximum relative humidity (non-condensing) |
| Status Indicators | Emitter: One Bi-color (Red/Green) status indicator – indicates operating mode, lockout or power OFF condition 7-segment Diagnostic Indicator (1 digit) – indicates proper operation, scan code or error code Receiver: Yellow Reset indicator – indicates whether system is ready for operation or requires a reset Bi-color (Red/Green) Status indicator – indicates general system and output status Bi-color (Red/Green) Zone Status indicators – indicate condition (clear or blocked beam) of a defined group of beams 7-Segment Diagnostic indicator (1 digit) – indicates proper operation, scan code, or error code, total number of blocked beams |
| Mounting Hardware | Emitter and receiver each are supplied with a pair of swivel end-mounting brackets and two swivel side-mounting brackets. Models longer than 690 mm also include one or more additional side-mount brackets for center support. |
| Shock and Vibration | EZ-SCREEN LP components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles). |
| Design Standards | Designed to comply with Type 4 per IEC 61496-1/-2; Category 4 PLe per EN ISO 13849-1; SIL 3 per IEC 61508, SIL CL3 per IEC 62061 |
| Certifications | <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 20px;">  </div> <div style="margin-right: 20px;">  </div> <div> <p>TUV Rheinland of North America, a Nationally Recognized Test Laboratory (NRTL) in the United States according to OSHA 29 CFR 1910.7, and accredited by the Standards Council of Canada to test and certify products to Canadian National Standards, has certified the EZ-SCREEN Low Profile to all applicable U.S. and Canadian National Standards. The cTUVus mark is recognized throughout the United States and Canada by OSHA and the SCC.</p> </div> </div> <div style="margin-top: 20px;">  <p>Actual certification mark on EZ-SCREEN Low Profile product labels. This simplified certification mark is used on the product labels due to limited space.</p> </div> |
| Wiring Diagrams | WD002, WD003, WD004, WD005, WD006, WD007, WD013, WD014, WD015, WD016, WD017, WD018, WD019 (pp. 790-800) |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS

Cordsets

For use with models with integral RD connections. All standard cordsets are yellow PVC with black overmold. For black PVC cable and overmold, add suffix B to model number (example, RDLP-815DB).

| RD | |
|--------------|------------|
| See page 709 | |
| Length | 8-Wire* |
| 4.57 m | RDLP-815D |
| 7.62 m | RDLP-825D |
| 15.2 m | RDLP-850D |
| 22.9 m | RDLP-875D |
| 30.5 m | RDLP-8100D |

| RD to Euro QD* | | | |
|----------------|-------------|--------------|--|
| See page 708 | | | |
| Length | 8-Pin Male | 8-Pin Female | |
| 0.31 m | DELPE-81D | DELPEF-81D | |
| 0.91 m | DELPE-83D | DELPEF-83D | |
| 2.44 m | DELPE-88D | DELPEF-88D | |
| 4.57 m | DELPE-815D | DELPEF-815D | |
| 7.62 m | DELPE-825D | — | |
| 15.2 m | DELPE-850D | — | |
| 22.9 m | DELPE-875D | — | |
| 30.5 m | DELPE-8100D | — | |

| RD to RD | |
|--------------|-------------|
| See page 709 | |
| Length | Cascade |
| 0.05 m | DELP-110E |
| 0.30 m | DELP-111E |
| 0.91 m | DELP-113E |
| 2.44 m | DELP-118E |
| 4.57 m | DELP-1115E |
| 7.62 m | DELP-1125E |
| 15.2 m | DELP-1150E |
| 22.9 m | DELP-1175E |
| 30.5 m | DELP-11100E |


For use with models with Pigtail QD and DELPE-8xxD connections.

| Euro QD—Double-Ended | |
|----------------------|-------------|
| See page 705 | |
| Length | 8-Pin* |
| 0.31 m | DEE2R-81D |
| 0.91 m | DEE2R-83D |
| 2.44 m | DEE2R-88D |
| 4.57 m | DEE2R-815D |
| 7.62 m | DEE2R-825D |
| 15.2 m | DEE2R-850D |
| 22.9 m | DEE2R-875D |
| 30.5 m | DEE2R-8100D |

| Euro QD | |
|--------------|-----------|
| See page 704 | |
| Length | 8-Pin |
| 4.57 m | QDE-815D |
| 7.62 m | QDE-825D |
| 15.3 m | QDE-850D |
| 22.9 m | QDE-875D |
| 30.5 m | QDE-8100D |

* For connection of E-Stop or other hard/relay contacts see page 695.

* For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC see page 706.





 Additional cordsets and information available. See page 693.






* Requires mating 8-pin M12/Euro cordset. 8-pin Male used for Machine Interface connection (indicator end of sensor). 8-pin Female used for cascade connection when using M12/Euro QDs.


NOTE: See page 523 for interfacing solutions. Additional accessories are listed on page 631.


| Euro QD Splitter | |
|------------------|-----------------|
| See page 707 | |
| Length | 8-Pin |
| 0 m | CSB-M1280M1280 |
| 0.30 m | CSB-M1281M1281 |
| 2.50 m | CSB-M1288M1281 |
| 4.60 m | CSB-M12815M1281 |
| 7.60 m | CSB-M12825M1281 |
| 7.60 m | CSB-UNT825M1281 |

Brackets

| Low-Profile 14 & 25 mm | | | |
|---|---|---|---|
|  |  |  |  |
| pg. 644 | pg. 644 | pg. 645 | pg. 646 |
| LPA-MBK-11* | LPA-MBK-12* | LPA-MBK-20 | LPA-MBK-22 |

| Low-Profile 14 & 25 mm—Cascade | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
| pg. 645 | pg. 646 | pg. 644 | pg. 645 | pg. 645 |
| LPA-MBK-21 | LPA-MBK-90 | LPA-MBK-120 | LPA-MBK-135 | LPA-MBK-180 |

| Remote Fixed Blanking Switch | |
|---|---|
|  | Allows frequent configuration of a fixed blanked area, without using the receiver DIP switches. |
| EZA-RBK-1 | |

 Additional brackets and information available. See page 632.

* Standard brackets included with emitter/receiver.

Replacement Parts

| Model | Description |
|------------|---|
| STP-13 | 14 mm test piece (for 14 mm resolution systems) |
| STP-17 | 34 mm test piece (for 14 mm resolution systems with 2-beam reduced resolution enabled) |
| STP-16 | 25 mm test piece (for 25 mm resolution systems) |
| STP-18 | 65 mm test piece (for 25 mm resolution systems with 2-beam reduced resolution enabled) |
| LPA-TP-1 | Terminator plug, for SLPC... emitter/receiver (included with sensor) |
| EZA-RR-1 | External normally open reset switch with 8-pin M12/Euro-style QD |
| MGA-KSO-1 | Panel-mount keyed normally open reset switch |
| MGA-K-1 | Replacement key for switch MGA-HSO-1 |
| DELPE-81D | Replacement for M12-terminated pigtail QD, as shipped with standard pigtail QD models; 8-conductor cable, 22 AWG; 0.3 m long |
| LPA-MBK-11 | End-cap bracket kit (includes 2 end brackets and hardware to mount one sensor to MSA series stands; 360° sensor rotation; 14 ga (1.9 mm) steel, black zinc plated; die-cast zinc end-cap plate) |
| LPA-MBK-12 | Side-mount bracket kit (includes 1 bracket and hardware to mount to MSA Series stands; +10°/-30° sensor rotation; 14 ga (1.9 mm) steel, black zinc plated; die-cast zinc clamp) |

Note: See installation manual p/n 112852 for complete list of replacement parts and accessories.

| STANDS | |
|---|----------|
|  | PAGE 736 |

| MIRRORS | |
|---|----------|
|  | PAGE 740 |

| LENS SHIELDS | |
|---|----------|
|  | PAGE 746 |

| INTERFACE | |
|---|----------|
|  | PAGE 523 |

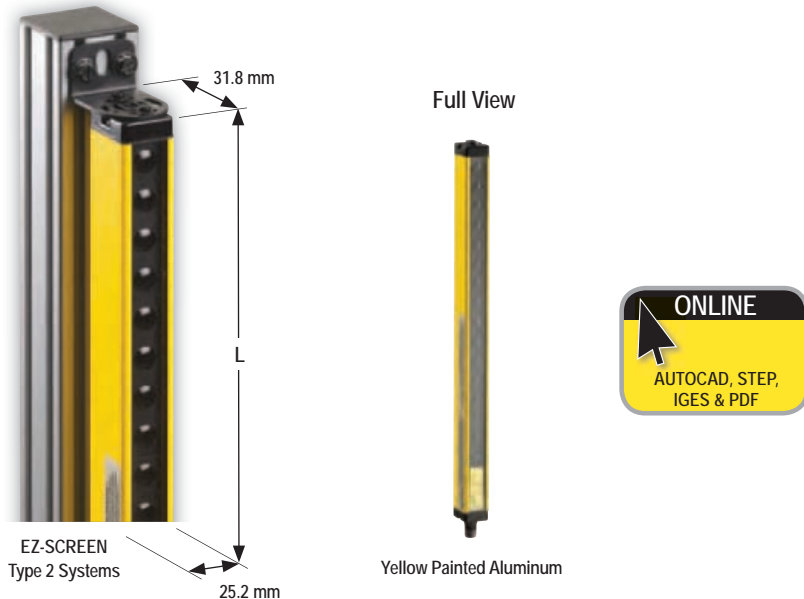


EZ-SCREEN® Type 2 Point-of-Operation

- A low-cost solution is suited to lower-risk applications where the result of an accident is only a slight injury such as a bump, bruise, knockdown or trapping (but not crushing), minor cuts and abrasions
- Simple two-piece system requires no control box
- 30 mm resolution detects narrow objects, such as a hand or ankle across long spans up to 15 m
- System meets all requirements for Type 2 devices per IEC 61496 (CE certified) and cULus NIPF
- System performs continual internal self-tests and provides Test function for external safety checks
- Dedicated models eliminate selectable functions, DIP switches and programming
- Trip output model automatically resets when the beam is cleared; Latch output model requires a manual reset
- Fast response times of 11 to 25 milliseconds shutdown machinery quickly

- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 515



- EZ-SCREEN**
- TYPE 4
- 14 or 30 mm
- TYPE 4
- LOW PROFILE
- 14 or 25 mm
- TYPE 2**
- 30 mm
- GRIDS & POINTS

EZ-SCREEN® Type 2 Systems, 30 mm Resolution–15 m Range, 24V dc

| Defined Area | Connection | Housing Length (L) | Response Time | # of Beams | Output | Models | | | |
|--------------|-------------------|--------------------|---------------|------------|------------|---------|--------------|---------------|----------------|
| | | | | | | Emitter | Receiver | Pair† | |
| 150 mm | 8-pin M12/Euro QD | 215 mm | 11 ms | 8 | 2 PNP OSSD | Trip | LS2E30-150Q8 | LS2TR30-150Q8 | LS2TP30-150Q88 |
| | | | | | | Latch | | LS2LR30-150Q8 | LS2LP30-150Q88 |
| 300 mm | | 365 mm | 13 ms | 16 | 2 PNP OSSD | Trip | LS2E30-300Q8 | LS2TR30-300Q8 | LS2TP30-300Q88 |
| | | | | | | Latch | | LS2LR30-300Q8 | LS2LP30-300Q88 |




† A model with a QD requires a mating cordset (see page 515).

† A pair includes an emitter and receiver (example, LS2TP30-150Q88).

EZ-SCREEN® Type 2 Systems, 30 mm Resolution–15 m Range, 24V dc (cont'd)

| Defined Area | Connection | Housing Length (L) | Response Time | # of Beams | Output | Models | | |
|--------------|----------------------|--------------------|---------------|------------|---------------|----------------|-----------------|-------------------|
| | | | | | | Emitter | Receiver | Pair [†] |
| 450 mm | 8-pin M12/Euro QD | 515 mm | 14 ms | 24 | Trip | LS2E30-450Q8 | LS2TR30-450Q8 | LS2TP30-450Q88 |
| | | | | | Latch | | LS2LR30-450Q8 | LS2LP30-450Q88 |
| 600 mm | | 665 mm | 16 ms | 32 | Trip | LS2E30-600Q8 | LS2TR30-600Q8 | LS2TP30-600Q88 |
| | | | | | Latch | | LS2LR30-600Q8 | LS2LP30-600Q88 |
| 750 mm | | 815 mm | 17 ms | 40 | Trip | LS2E30-750Q8 | LS2TR30-750Q8 | LS2TP30-750Q88 |
| | | | | | Latch | | LS2LR30-750Q8 | LS2LP30-750Q88 |
| 900 mm | | 964 mm | 19 ms | 48 | Trip | LS2E30-900Q8 | LS2TR30-900Q8 | LS2TP30-900Q88 |
| | | | | | Latch | | LS2LR30-900Q8 | LS2LP30-900Q88 |
| 1050 mm | | 1114 mm | 21 ms | 56 | Trip | LS2E30-1050Q8 | LS2TR30-1050Q8 | LS2TP30-1050Q88 |
| | | | | | Latch | | LS2LR30-1050Q8 | LS2LP30-1050Q88 |
| 1200 mm | | 1264 mm | 22 ms | 64 | Trip | LS2E30-1200Q8 | LS2TR30-1200Q8 | LS2TP30-1200Q88 |
| | | | | | Latch | | LS2LR30-1200Q8 | LS2LP30-1200Q88 |
| 1350 mm | 1414 mm | 24 ms | 72 | Trip | LS2E30-1350Q8 | LS2TR30-1350Q8 | LS2TP30-1350Q88 | |
| | | | | Latch | | LS2LR30-1350Q8 | LS2LP30-1350Q88 | |
| 1500 mm | 1563 mm | 25 ms | 80 | Trip | LS2E30-1500Q8 | LS2TR30-1500Q8 | LS2TP30-1500Q88 | |
| | | | | Latch | | LS2LR30-1500Q8 | LS2LP30-1500Q88 | |
| 1650 mm | 1713 mm | 27 ms | 88 | Trip | LS2E30-1650Q8 | LS2TR30-1650Q8 | LS2TP30-1650Q88 | |
| | | | | Latch | | LS2LR30-1650Q8 | LS2LP30-1650Q88 | |
| 1800 mm | 1863 mm | 29 ms | 96 | Trip | LS2E30-1800Q8 | LS2TR30-1800Q8 | LS2TP30-1800Q88 | |
| | | | | Latch | | LS2LR30-1800Q8 | LS2LP30-1800Q88 | |

 A model with a QD requires a mating cordset (see page 515).

[†] A pair includes an emitter and receiver (example, LS2TP30-450Q88).

EZ-SCREEN® Type 2 Kits



You can purchase a kit that contains an emitter and receiver of equal length; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

| | |
|-------------------------|----------|
| • Emitter and Receivers | Page 494 |
| • Interfacing Options | 523 |
| • Cordsets | 515 |
| • Brackets | 515 |

To Order:

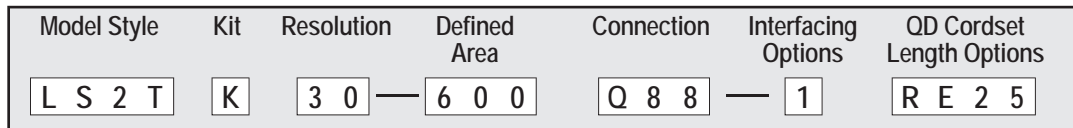
1. Choose model, output and defined area.
2. Choose an optional interfacing solution, such as an IM-T-9A or -11 interfacing model.
3. Choose one cordset for each sensor or two cordsets for a pair.
All models require mating 8-pin M12/Euro QD cordsets, such as:
 - QDE cordset with flying leads
 - DEE2R double-ended cordset
 - CSB series splitter cordset

See www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 515

Kit Model Key



Model Style

| |
|------------------------------------|
| LS2T = Type 2 Light Screen (Trip) |
| LS2L = Type 2 Light Screen (Latch) |

Kit

| |
|---------|
| K = Kit |
|---------|

Resolution

| |
|------------|
| 30 = 30 mm |
|------------|

Defined Area

| |
|---------|
| 150 mm |
| 300 mm |
| 450 mm |
| 600 mm |
| 750 mm |
| 900 mm |
| 1050 mm |
| 1200 mm |
| 1350 mm |
| 1500 mm |
| 1650 mm |
| 1800 mm |

Receiver & Emitter QD Options

| |
|--|
| Q88 = Receiver with integral 8-pin M12/Euro QD Emitter with integral 8-pin M12/Euro QD |
|--|

QD Cordset Length Examples

| |
|--|
| RE15 = 4.5 m, 2 each |
| RE25 = 7.6 m, 2 each |
| R15E25 = 4.5 m (Receiver) & 7.6 m (Emitter) |
| R25E15 = 8 m (Receiver) & 5 m (Emitter) |
| RE50 = 15.2 m, 2 each |
| R15E50 = 4.6 m (Receiver) & 15.2 m (Emitter) |
| R50E15 = 15.2 m (Receiver) & 4.6 m (Emitter) |
| R25E50 = 7.6 m (Receiver) & 15.2 m (Emitter) |
| R50E25 = 15.2 m (Receiver) & 7.6 m (Emitter) |
| RE75 = 22.8 m, 2 each |
| RE100 = 30.4 m, 2 each |

Interfacing Examples



| |
|---|
| 1 = IM-T-9A Interface Module, 1 each (3 NO) |
| 2 = IM-T-11A Interface Module, 1 each (2 NO/NC) |
| 3 = 11-BG00-31-D-024 Contactors (10A), 2 each |
| 4 = BF1801L-024 Contactors (18A), 2 each |
| 10 = UM-FA-9A, 1 each |
| 11 = UM-FA-11A, 1 each |

EZ-SCREEN

- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm**
- GRIDS & POINTS

NOTE: See notes under model number tables. Not all combinations are listed below. Contact Banner Engineering Corp. for additional information and/or verification of valid kit model number.

EZ-SCREEN® Type 2 Specifications

| | |
|-------------------------------------|---|
| Supply Voltage at the Device | 24V dc $\pm 20\%$ (PELV) (The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds as specified in EN/IEC 60204-1.) |
| Supply Current | Emitter: 50 mA max. Receiver: 90 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each) |
| Wavelength of Emitter Elements | Infrared LEDs, 950 nm at peak emission |
| Short Circuit Protection | All inputs and outputs are protected from short circuits to +24V dc or dc common |
| Electrical Safety Class (IEC 61140) | III |
| Operating Range | 0.2 m to 15 m Range decreases with use of mirrors and/or lens shields: Lens shields – approximately 10% less range per shield Glass-surface mirrors – approximately 8% less range per mirror See Accessory section for more information on a specific mirror, page 740 |
| Effective Aperture Angle (EAA) | Meets Type 2 requirements per IEC 61496-2; $\pm 5^\circ$ @ 3 m |
| Ambient Light Immunity | > 10,000 lux at 5° angle of incidence |
| Strobe Light Immunity | Immune as per IEC 61496-2 |
| Response Time | Dependent on number of beams; see Models table on page 755 |
| EDM Input | “Power Monitoring” accomplished via Reset/Remote Test input |
| Reset Input / Remote Test Input | Connect to +24V dc via a normally closed (NC) reset switch Auto Rest (Trip Output) Models: Test/Reset Manual Rest (Latch Output) Models: Test/Restart/Reset |
| Safety Outputs | Two redundant solid-state 24V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Not compatible with the Banner “Safety Handshake” ON-State voltage: > $V_{in} - 1.5V$ dc OFF-State voltage: 0.2V dc max. Max. load capacitance: 0.1 μF Min. load resistance: 48 Ω Open ground leakage current: 0.65 mA max. OSSD test pulse width: 0.2 - 0.25 milliseconds OSSD test pulse period: 260 milliseconds typical |
| Enclosure | Materials: Extruded aluminum housing with yellow polyester powder finish and well-sealed, rugged die-cast zinc end caps, acrylic lens cover Rating: IP65 |
| Operating Conditions | Temperature: 0° to $+55^\circ$ C Relative humidity: 95% maximum (non-condensing) |
| Shock and Vibration | EZ-SCREEN Type 2 components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles). |
| Design Standards | Designed to comply with Type 2 per IEC 61496-1, -2; Type 2 per UL 61496-1/-2; Category 2 per EN 954-1 |
| Certifications |   |
| Wiring Diagrams | Emitter: WD008 (p. 793) Receiver with 2 Solid-State OSSDs, 2 FSDs and Power Monitoring: WD009 (p. 794) Power Monitoring of IM-T-9A Interface Module: WD010 (p. 794) |

Cordsets

| Euro QD | |
|--------------|-----------|
| See page 704 | |
| Length | 8-Pin |
| 4.57 m | QDE-815D |
| 7.62 m | QDE-825D |
| 15.3 m | QDE-850D |
| 22.9 m | QDE-875D |
| 30.5 m | QDE-8100D |




| Euro QD-Double-Ended | |
|----------------------|-------------|
| See page 705 | |
| Length | 8-Pin |
| 0.31 m | DEE2R-81D |
| 0.91 m | DEE2R-83D |
| 2.44 m | DEE2R-88D |
| 4.57 m | DEE2R-815D |
| 7.62 m | DEE2R-825D |
| 15.2 m | DEE2R-850D |
| 22.9 m | DEE2R-875D |
| 30.5 m | DEE2R-8100D |








| Euro QD Splitter | |
|------------------|-----------------|
| See page 707 | |
| Length | 8-Pin |
| 0 m | CSB-M1280M1280 |
| 0.3 m | CSB-M1281M1281 |
| 2.50 m | CSB-M1288M1281 |
| 4.60 m | CSB-M12815M1281 |
| 7.60 m | CSB-M12825M1281 |
| 7.60 m | CSB-UNT825M1281 |



 Additional cordset information available. See page 693.

Brackets

| 30 mm-Type 2 | | | |
|---|---|---|---|
|  |  |  |  |
| pg. 692 | pg. 692 | pg. 692 | pg. 692 |
| USCMB-... | USMB-1 | USMB-6 | USMB-8 |

 Additional bracket information available. See page 632.

NOTE: See page 501 for interfacing solutions.

Replacement Parts

| Model | Description |
|-----------|---|
| MGA-K-1 | Replacement key for switch MGA-KS0-1 |
| MGA-KS0-1 | Panel-mount keyed normally open reset switch |
| STP-14 | 30 mm test piece |
| USMB-1 | Standard end brackets with hardware to mount to MSA series stands |
| USCMB-1 | Center bracket kit and standard end brackets with hardware to mount to MSA series stands (1 bracket, for 600 to 900 mm long sensors) |
| USCMB-2 | Center bracket kit and standard end brackets with hardware to mount to MSA series stands (2 brackets, for 1050 to 1500 mm long sensors) |

NOTE: See installation manual p/n 112852 for complete list of replacement parts and accessories.



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm**
- GRIDS & POINTS

EZ-SCREEN® Type 4 Grids and Points

- Suited to a variety of access and long-range perimeter guarding applications
- Uses 1-, 2-, 3- or 4-beams to protect personnel and machinery
- Operates in ranges from 0.8 to 20 m or 15 to 70 m, depending on model
- Displays operating status, configuration and error codes
- Includes blocked beam zone indicators
- Features user-configurable trip or latch outputs, and Scan Code 1 or 2
- Can be combined with other devices, such as mirrors and Points, for a custom configuration
- Resists impact, twisting and abusive environments with a durable aluminum housing and metal endcaps
- Exceeds OSHA/ANSI Control Reliability requirements and is certified to cULus NIPF, and complies with Type 4(IEC 61496) and Category 4 (EN 954)
- Offers optional lens shields and enclosures for added durability
- Easy to hook up and flexible machine interface options



ACCESSORIES
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Interface multiple devices with the SC22-3 Safety Controller. See page 533



EZ-SCREEN Grid Systems




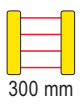
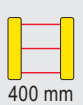
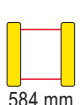
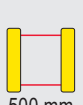
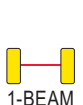
EZ-SCREEN Point Systems



EZ-SCREEN Grid

EZ-SCREEN Point

EZ-SCREEN® Grid & Point Systems, 24V dc

| Protected Height | Beam Spacing | Range | Connection | Housing Length (L) | Output | Models | | |
|------------------|---|------------|---------------|--------------------|---------------------------------------|---------------|-------------|-------------------|
| | | | | | | Emitter | Receiver | Pair [†] |
| 1066 mm |  533 mm | 0.8 - 20 m | 8-pin Euro QD | 1251 mm | 2 PNP OSSD (Trip/Latch selectable) | SGE3-533Q8E | SGR3-533Q8E | SGP3-533Q88E |
| | | 15 - 70 m | | | | SGXLE3-533Q8E | | SGXLP3-533Q88E |
| 900 mm |  300 mm | 0.8 - 20 m | | 1084 mm | | SGE4-300Q8E | SGR4-300Q8E | SGP4-300Q88E |
| | | 15 - 70 m | | | | SGXLE4-300Q8E | | SGXLP4-300Q88E |
| 800 mm |  400 mm | 0.8 - 20 m | | 984 mm | | SGE3-400Q8E | SGR3-400Q8E | SGP3-400Q88E |
| | | 15 - 70 m | | | | SGXLE3-400Q8E | | SGXLP3-400Q88E |
| 584 mm |  584 mm | 0.8 - 20 m | | 768 mm | | SGE2-584Q8E | SGR2-584Q8E | SGP2-584Q88E |
| | | 15 - 70 m | | | | SGXLE2-584Q8E | | SGXLP2-584Q88E |
| 500 mm |  500 mm | 0.8 - 20 m | | 684 mm | | SGE2-500Q8E | SGR2-500Q8E | SGP2-500Q88E |
| | | 15 - 70 m | | | | SGXLE2-500Q8E | | SGXLP2-500Q88E |
| N/A |  1-BEAM | 0.8 - 20 m | | 149 mm | | SPE1Q8E | SPR1Q8E | SPP1Q88E |
| | | 15 - 70 m | | | | SPXLE1Q8E | | SPXLP1Q88E |

 A model with a QD requires a mating cordset (see page 517).

For emitters and receivers with a wiring terminal chamber, remove the Q8E or Q88E from the model number (example, SGE4-300). For an emitter with a 5-pin Mini QD and TEST function, replace Q8E with Q5 on emitter model numbers (example, SGE4-300Q5) and Q88E with Q85 on pair model numbers (example, SGP4-300Q85).
For emitters with a 3-pin Mini QD, replace Q8E with Q3 (example, SGE4-300Q3); and for receivers with an 8-pin Mini QD, replace Q8E with Q8 on model numbers (example, SGR4-300Q8); or for a pair replace Q88E with Q83 (example, SGP4-300Q83).

† A pair includes an emitter and receiver (example, SGP4-300Q88E). Emitters (example, SGE4-300Q8E) and receivers (example, SGR4-300Q8E) are also sold separately.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 517

- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS**

EZ-SCREEN® Grid Kits



You can purchase a kit that contains an emitter and receiver of equal length and beam spacing; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.

| | |
|-------------------------|----------|
| • Emitter and Receivers | Page 517 |
| • Interfacing Options | 523 |
| • Cordsets | 522 |
| • Brackets | 522 |

To Order:

1. Choose model range, number of beams and beam spacing.
2. Choose the connection: Integral M12/Euro-Style QD or intergal Mini-Style QD
3. Choose an optional interfacing solution, such as an IM-T-9A or -11 interfacing model.
4. Choose one cordset for each sensor or two cordsets for a pair.

M12/Euro QD models (example, SGK4-300Q88E) require mating 8-pin M12/Euro QD cordsets, such as:

- QDE cordset with flying leads
- DEE2R double-ended cordset
- CSB series splitter cordset

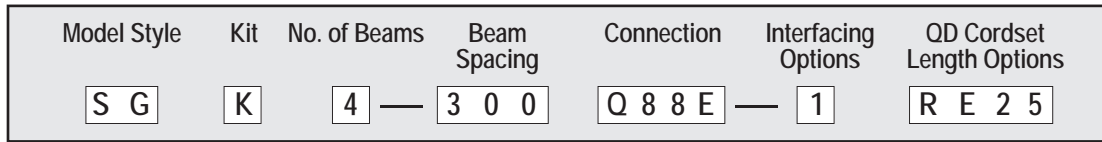
Mini QD models (example, SGK4-300Q83) require mating cordsets, such as:

- QDS cordset with flying leads

See www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

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Kit Model Key



Model Style

| |
|-------------------------------|
| SG = Safety Grid |
| SGXL = Safety Grid Long Range |

Kit

| |
|---------|
| K = Kit |
|---------|

No. of Beams

| |
|-----------------|
| 2 = two beams |
| 3 = three beams |
| 4 = four beams |

Beam Spacing

| |
|--------|
| 300 mm |
| 400 mm |
| 500 mm |
| 533 mm |
| 584 mm |

Receiver & Emitter QD Options

| |
|--|
| Blank = Receiver and emitter with wiring terminal chamber |
| Q85 = Receiver with integral 8-pin Mini-style QD Emitter with integral 5-pin Mini-style QD with Test |
| Q83 = Receiver with integral 8-pin Mini-style QD Emitter with integral 3-pin Mini-style QD |
| Q88E = Receiver and emitter with integral 8-pin M12/Euro QD |

QD Cordset Length Examples

| |
|---|
| RE15 = 4.6 m, 2 each |
| RE25 = 7.6 m, 2 each |
| R15E25 = 4.6 m (Receiver) & 7.6 m (Emitter) |
| R25E15 = 7.6 m (Receiver) & 4.6 m (Emitter) |
| DD1 = 0.3 DEE2R-81D, 2 each |
| C1D15 = CSB-M1281M1281 (Receiver) DEE2R-815D (8-pin Emitter) |
| C8D25 = CSB-M1288M1281 (Receiver) DEE2R-825D (8-pin Emitter) |
| CU25D25 = CSB-UNT825M1281 (Receiver) DEE2R-825D (8-pin Emitter) |

Interfacing Examples

| |
|---|
| 1 = IM-T-9A Interface Module, 1 each (3 NO) |
| 2 = IM-T-11A Interface Module, 1 each (2 NO/1 NC) |
| 3 = 11-BG00-31-D-024 Contactors (10A), 2 each |
| 4 = BF1801L-024 Contactors (18A), 2 each |
| 5 = EZAC-R9-QE8 = AC Interface Box (3 NO), 1 each |
| 6 = EZAC-R11-QE8 = AC Interface Box (2 NO/1 NC), 1 each |

NOTE: See notes under model number table. Not all combinations are listed below. Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

EZ-SCREEN® Point Kits

You can purchase a kit that contains an emitter and receiver of equal length; brackets; and optional interfacing solution and quick-disconnect cordsets. Detailed information about individual kit components is as follows.



| | |
|-------------------------|----------|
| • Emitter and Receivers | Page 517 |
| • Interfacing Options | 523 |
| • Cordsets | 522 |
| • Brackets | 522 |

To Order:

1. Choose model and range.
2. Choose the connection: Integral M12/Euro-Style QD or intergal Mini-Style QD
3. Choose an optional interfacing solution, such as an IM-T-9A or -11 interfacing model.

See www.bannerengineering.com for complete information and a current listing of accessories and options for kitting components. Call factory with questions regarding accessories.

4. Choose one cordset for each sensor or two cordsets for a pair.

M12/Euro QD models (example, SPK1-Q88E) require mating 8-pin M12/Euro QD cordsets, such as:

- QDE cordset with flying leads
- DEE2R double-ended cordset
- CSB series splitter cordset

Mini QD models (example, SPK1-Q83) require mating cordsets, such as:

- QDS cordset with flying leads

- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
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Kit Model Key

| Model Style | Kit | No. of Beams | Connector | Interfacing Options | QD Cordset Length Options |
|-------------|-----|--------------|-----------|---------------------|---------------------------|
| SP | K | 1 | Q 8 8 E | 1 | R E 2 5 |

Model Style

| |
|--------------------------------|
| SP = Safety Point |
| SPXL = Safety Point Long Range |

Kit

| |
|---------|
| K = Kit |
|---------|

No. of Beams

| |
|--------------|
| 1 = one beam |
|--------------|

Receiver & Emitter QD Options

| |
|--|
| Blank = Receiver and emitter with wiring terminal chamber |
| Q85 = Receiver with integral 8-pin Mini-style QD Emitter with integral 5-pin Mini-style QD with Test |
| Q83 = Receiver with integral 8-pin Mini-style QD Emitter with integral 3-pin Mini-style QD |
| Q88E = Receiver and emitter with integral 8-pin M12/Euro QD |

QD Cordset Length Examples

| |
|---|
| RE15 = 4.6 m, 2 each |
| RE25 = 7.6 m, 2 each |
| R15E25 = 4.6 m (Receiver) & 7.6 m (Emitter) |
| R25E15 = 7.6 m (Receiver) & 4.6 m (Emitter) |
| DD1 = 0.3 DEE2R-81D, 2 each |
| C1D15 = CSB-M1281M1281 (Receiver) DEE2R-815D (8-pin Emitter) |
| C8D25 = CSB-M1288M1281 (Receiver) DEE2R-825D (8-pin Emitter) |
| CU25D25 = CSB-UNT825M1281 (Receiver) DEE2R-825D (8-pin Emitter) |

Interfacing Examples

| |
|---|
| 1 = IM-T-9A Interface Module, 1 each (3 NO) |
| 2 = IM-T-11A Interface Module, 1 each (2 NO/NC) |
| 3 = 11-BG00-31-D-024 Contactors (10A), 2 each |
| 4 = BF1801L-024 Contactors (18A), 2 each |
| 5 = EZAC-R9-QE8 = AC Interface Box (3 NO), 1 each |
| 6 = EZAC-R11-QE8 = AC Interface Box (2 NO/1 NC), 1 each |

NOTE: See notes under model table. Not all combinations are listed below. Contact Banner Engineering Corp. for additional information and/or verification of valid kit model numbers.

- EZ-SCREEN
- TYPE 4
- 14 or 30 mm
- TYPE 4
- LOW PROFILE
- 14 or 25 mm
- TYPE 2
- 30 mm
- GRIDS & POINTS


EZ-SCREEN® Grid & Point Specifications

| | | |
|--|---|---|
| Supply Voltage (V in) | 24V dc \pm 15%, 10% max. ripple | |
| Supply Current | Emitter: 150 mA max. Receiver: 500 mA max., exclusive of OSSD1 and OSSD2 loads (up to an additional 0.5A each) | |
| Short Circuit Protection | All inputs and outputs are protected from short circuits to +24V dc or dc common (except Emitter AUX power connections) | |
| Response Time | 24 milliseconds or less from interruption of light grid beam to safety outputs going to OFF-state | |
| EDM Input | +24V dc signals from external device contacts can be monitored (single-channel, dual-channel or no monitoring) via EDM1 and EDM2 terminals in the receiver. Monitored devices must respond within 200 milliseconds of an output change. | |
| Reset Input | The Reset input must be high (10 to 30V dc at 30 mA) for 0.25 to 2 seconds and then low (less than 3V dc) to reset the receiver. | |
| Remote Test Input (optional- available only on certain models) | Test mode is activated either by applying a low signal (less than 3V dc) to emitter TEST1 terminal for a minimum of 50 milliseconds, or by opening a switch connected between TEST1 and TEST2 terminals for a minimum of 50 milliseconds. Beam scanning stops to simulate a blocked condition. A high signal (10 to 30V dc, 35 mA inrush, 10 mA max.) at TEST1 terminal deactivates Test mode and allows the emitter to operate normally. TEST1 and TEST2 are factory jumpered on models with wiring chamber. | |
| Safety Outputs | Two diverse-redundant solid-state 24V dc, 0.5 A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Capable of the Banner "Safety Handshake." ON-State voltage: \geq Vin-1.5V dc OFF-State voltage: 1.2V dc max. Max. load resistance: 1000 Ω Max. load capacitance: 0.1 μ F OSSD test pulse width: 250 microseconds OSSD test pulse period: 6 milliseconds | |
| Controls and Adjustments | Emitter: Scan code selection: 2-position switch (code 1 or 2). Factory default position is 1. Receiver: Scan code selection: 2-position switch (code 1 or 2). Factory default position is 1. Trip/latch output selection: redundant switches. Factory default position is L (latch) EDM/MPCe monitor selection: redundant switches select between 1- or 2-channel monitoring. Factory default position is 2. | |
| Emitter/Receiver Operating Range | Short-range models: 0.8 m to 20 m | Long-range models: 15 m to 70 m Range decreases with use of mirrors and/or lens shields. |
| Beam Spacing | Model SG...4-300: 300 mm Model SG...2-500: 500 mm Model SG...2-584: 584.2 mm | Model SG...3-400: 400 mm Model SG...3-533: 533.4 mm |
| Beam Diameter | 25 mm | |
| Ambient Light Immunity | > 10,000 lux at 5° angle of incidence | |
| Strobe Light Immunity | Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe | |
| Emitter Elements | Infrared LEDs, 880 nm at peak emission | |
| Effective Aperture Angle (EAA) | Meets Type 4 requirements per IEC 61496-2 Short-range models: \pm 2.5° @ 3 m Long-range models: \pm 2.5° @ 15 m | |
| Enclosure | Materials: Extruded aluminum housings with yellow polyester powder finish and well-sealed, rugged molded PBT end caps, acrylic lens cover Rating: NEMA 4, 13; IP65 | |
| Operating Conditions | Temperature: 0° to +50° C | Relative humidity: 95% (non-condensing) |
| Shock and Vibration | EZ-SCREEN systems have passed vibration and shock tests according to IEC 61496-1/-2. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles). | |



More on next page

EZ-SCREEN® Grid & Point Specifications (cont'd)

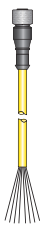
| | |
|------------------------|--|
| Status Indicators | <p>7-Segment Diagnostic Indicators, Both Emitter and Receiver</p> <p>Dash (-) = System is OK</p> <p>Error Codes = See product manuals (p/n 68410 or 68413) for code definitions and recommended action</p> <p>Scan code setting = Appears during power-up or after scan code is changed. (C1 or C2) (Temporary indication; normal display resumes within a few seconds.)</p> <p>Emitter: One bi-color (red/green) Status indicator</p> <p>Green steady = RUN mode</p> <p>Green single flashing = TEST mode</p> <p>Red single flashing = Lockout</p> <p>OFF = No power to sensor</p> <p>Receiver: Two System Status indicators, plus one bi-color (red/green) Beam Status indicator for each beam</p> <p>Yellow Reset Indicator</p> <p>ON steady = RUN mode</p> <p>Double flashing = Waiting for manual reset after power-up</p> <p>Single flashing = Waiting for manual latch reset</p> <p>OFF = No power to sensor or system is not ready for operation</p> <p>Bi-Color (Red/Green) Status Indicator</p> <p>Green steady = Outputs ON</p> <p>Red steady = RUN mode, outputs OFF</p> <p>Red single flashing = Lockout</p> <p>OFF = No power to sensor or system is not ready for operation</p> <p>Bi-Color (Red/Green) Beam Status Indicators</p> <p>Green steady = Clear beam, strong signal</p> <p>Green flickering = Clear beam, weak signal</p> <p>Red steady = Beam blocked</p> <p>OFF = No power to sensor or no scanning</p> |
| Mounting Hardware | <p>Emitter and receiver each are supplied with a pair of swivel end mounting brackets. Mounting brackets are 8-gauge cold-rolled steel, black zinc finish.</p> |
| Cables and Connections | <p>Cables are user-supplied. Wiring terminals accommodate one 22 to 16 ga. wire or two wires up to 18 ga.; Pg 13.5 wiring chamber access port capacity varies, depending on cable gland or strain relief fitting used. Supplied cable gland is for a cable diameter of 6 to 12 mm.</p> |
| Design Standards | <p>Designed to comply with Type 4 per IEC 61496-1, -2; Type 4 per UL 61496-1/-2; Category 4 per ISO 13849-1 (EN 954-1)</p> |
| Certifications | <div style="display: flex; align-items: center;"> <div style="flex: 1;">  </div> <div style="flex: 2; padding-left: 10px;"> <p>Important Notice: European Community Machinery Directive 2006/42/EC EZ Screen grids and points comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, the EZ Screen grids and points can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.</p> </div> </div> |
| Wiring Diagrams | <p>WD011, WD012, WD013, WD014, WD015, WD016, WD017, WD018, WD019 (pp. 795-800)</p> |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens**
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- EZ-SCREEN**
- TYPE 4
14 or 30 mm
- TYPE 4
LOW PROFILE
14 or 25 mm
- TYPE 2
30 mm
- GRIDS & POINTS**

Cordsets

| Euro QD | |
|--------------|-----------|
| See page 709 | |
| Length | 8-Pin |
| 4.57 m | QDE-815D |
| 7.62 m | QDE-825D |
| 15.3 m | QDE-850D |
| 22.9 m | QDE-875D |
| 30.5 m | QDE-8100D |



| Euro QD Splitter | |
|------------------|-----------------|
| See page 707 | |
| Length | 8-Pin |
| 0 m | CSB-M1280M1280 |
| 0.30 m | CSB-M1281M1281 |
| 2.50 m | CSB-M1288M1281 |
| 4.60 m | CSB-M12815M1281 |
| 7.60 m | CSB-M12825M1281 |
| 7.60 m | CSB-UNT825M1281 |



| Euro QD-Double-Ended | |
|----------------------|-------------|
| See page 705 | |
| Length | 8-Pin |
| 0.31 m | DEE2R-81D |
| 0.91 m | DEE2R-83D |
| 2.44 m | DEE2R-88D |
| 4.57 m | DEE2R-815D |
| 7.62 m | DEE2R-825D |
| 15.2 m | DEE2R-850D |
| 22.9 m | DEE2R-875D |
| 30.5 m | DEE2R-8100D |









| Mini QD | | | |
|--------------|-----------|----------|----------|
| See page 714 | | | |
| Length | 3-Pin | 5-Pin | 8-Pin |
| 4.75 m | QDS-315C | QDS-515C | QDS-815C |
| 7.62 m | QDS-325C | QDS-525C | QDS-825C |
| 15.2 m | QDS-350C | QDS-550C | QDS-850C |
| 22.9 m | QDS-375C | - | QDS-875C |
| 30.5 m | QDS-3100C | - | - |



Additional cordset information available. See page 693.

* For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC see page 706.

Brackets

| Grids & Points-Type 4 | | | | Points-Type 4 | |
|---|---|---|---|---|--|
|  |  |  |  |  |  |
| pg. 641 | pg. 643 | pg. 644 | pg. 642 | pg. 643 | pg. 643 |
| EZA-MBK-1* | EZA-MBK-3 | EZA-MBK-9 | EZA-MBK-2** | EZA-MBK-4 | EZA-MBK-5 |

Additional bracket information available. See page 632.

* Standard brackets included with emitter/receiver.

** One EZA-MBK-2 adapter bracket kit required per sensor when mounting to MSA series stands.

NOTE: See page 523 for interfacing solutions.

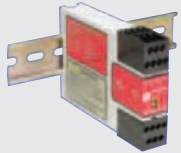





Replacement Parts

| Model | Description |
|-----------|---|
| EZA-AP-1 | Access port plug with o-ring |
| EZA-CP-13 | Pg13.5 plug with o-ring |
| EZA-ECE-1 | Emitter wiring chamber end cap (with gasket, captive screws, 3 plugs with o-rings, terminal block) |
| EZA-ECR-1 | Receiver wiring chamber end cap (with gasket, captive screws, 3 plugs with o-rings, terminal block) |
| EZA-SW-1 | Spanner wrench for Grid and Point |
| EZA-TBE-1 | Emitter terminal block |
| EZA-TBR-1 | Receiver terminal block |
| MGA-K-1 | Replacement key for switch MGA-KS0-1 |
| MGA-KS0-1 | Panel-mount keyed normally open reset switch |
| STP-3 | Specified test piece, 45 mm dia. |

Note: See installation manual p/n 112852 for complete list of replacement parts and accessories.



EZ-SCREEN® Interfacing Products

| | | Description | Models | Product Information | | |
|-----------------------------------|---|---|--|---------------------|------------------|----------|
| Interface Modules and Controllers |  | <ul style="list-style-type: none"> Interface modules provide two or three normally open force-guided relay outputs rated at 6 A (-9A) or 7A (-11A) EZ-SCREEN monitors these interface modules when they are connected to the EZ-SCREEN External Device Monitoring (EDM) inputs Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included | IM-T-9A (3 NO) IM-T-11A (2 NO/1 NC) | Page 529 | | |
| |  | <ul style="list-style-type: none"> One controller provides configurable monitoring of multiple safety devices 22 input terminals can monitor both contact-based and PNP solid-state input devices 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions All SC22-3 modules use 24V dc 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models) | SC22-3-S... SC22-3-C... SC22-3E-S... SC22-3E-C... | Page 533 | | |
| Muting Modules |  | <ul style="list-style-type: none"> The Muting Module temporarily inhibits a safety light screen so materials can safely pass through the screen without stopping the machinery The module uses redundant microcontroller-based logic MMD Modules can be used as dual controllers when muting function is not used | MMD-TA-12B MMD-TA-11B | Page 550 | | |
| Receiver AC Interface Boxes |  | <ul style="list-style-type: none"> Versatile power supplies allow EZ-SCREEN systems to connect to AC power sources Models are available to accommodate receivers only, emitters only or both Receiver models include 8 amp safety relay output | EZAC-R9-QE8 EZAC-R11-QE8 EZAC-R15A-QE8-QS83 EZAC-R8N-QE8-QS53 EZAC-R10N-QE8-QS53 | Page 755 | | |
| Emitter AC Interface Boxes |  | | EZAC-E-QE8 EZAC-E-QE5 EZAC-E-QE8-QS3 EZAC-E-QE5-QS5 | | | |
| Contactors |  | | Mechanically Linked Contactors | | 11-BG00-31-D-024 | Page 756 |
| | | | | | BF1801L-024 | |
| | | | Aux. Contacts | | 11-BGX10-40 | |
| | | | | | 11-G484-30 | |
| | | | Suppressors | | 11-BGX77-048 | |
| | | | | | 11-G318-48 | |
| | | | | | | |

NC = Normally closed, NO = Normally open

- Photoelectrics
- Sensors
- Fiber Optic
- Sensors
- Special Purpose
- Sensors
- Measurement &
- Inspection Sensors
- Vision
- Wireless
- Lighting &
- Indicators
- Safety**
- Light Screens**
- Safety
- Laser Scanners
- Safety Controllers
- & Modules
- Safety Two-Hand
- Control Modules
- Safety Interlock
- Switches
- Emergency Stop
- & Stop Control

- LIGHT SCREENS
- LASER SCANNER
- CONTROLLERS &
- MODULES
- TWO-HAND
- CONTROL MODULES
- INTERLOCK
- SWITCHES
- E-STOP &
- CONTROL DEVICES

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more sensors, more solutions

Introducing the Banner AG4



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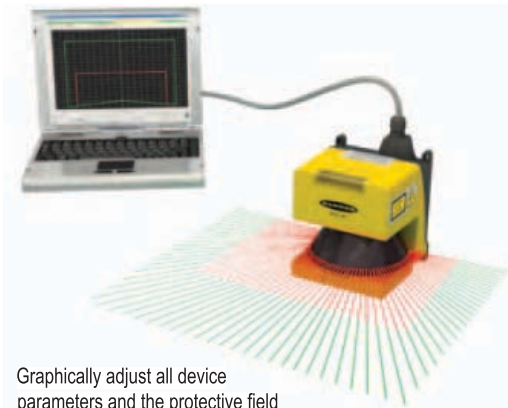
bannerengineering.com



AG4 Safety Laser Scanners

- Two-dimensional laser scanners effectively protect personnel, as well as stationary and mobile systems within a user designated area
- Persons or objects entering the protection field will be detected and a protective (safety) stop signal will be generated
- Eight protective and warning field pairs are individually defined using a PC
- Protective field can be set from 200 mm to 6.25 m with a resolution of 30 to 150 mm
- Available with 4 or 6.25 m maximum protective field range
- The warning field range can be set for up to 15 m with a resolution of 150 mm
- Scanner has a 0.36° lateral resolution and detects objects in a 190° working zone
- Two solid-state OSSD safety outputs (250 mA) and two solid-state auxiliary outputs (100 mA)
- The highly flexible protective and warning fields can be set to match the shape of the work area
- Exceeds OSHA/ANSI Control Reliability requirements, certified to cTUVus, and CE certified to Type 3, Cat 3 PLd, and SIL 2
- Response time is 80 milliseconds (default), adjustable to 640 milliseconds
- Compact design, simple installation and easy-to-use software provide efficient integration into work areas
- Rugged, die-cast aluminum housing withstands the rigor of factory floors
- 5-LED display presents system status and diagnostics of devices without the need for a PC connection

Configuration and diagnostic software



Graphically adjust all device parameters and the protective field contours to both local conditions and required safety distances.



Configuration parameters are permanently stored in the configuration plug, providing easier storage and device replacement without a PC.



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners**
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 528

LASER SCANNER

AG4 Safety Laser Scanner, 24V dc

| Range | | Safety Output | Aux. Outputs | Scanning Angle | Response Time | Model* |
|---|--------------------------|---------------|--------------|----------------|---|--------|
| Protective Fields | Warning Fields | | | | | |
| 30 mm Resolution = 1.6 m 40 mm Resolution = 2.2 m 50 mm Resolution = 2.8 m 70 mm Resolution = 4.0 m 150 mm Resolution = 4.0 m | 150 mm Resolution = 15 m | 2 PNP OSSD | 2 PNP | 190° | 80 ms (Default) adjustable to 640 ms | AG4-4E |
| 30 mm Resolution = 1.6 m 40 mm Resolution = 2.2 m 50 mm Resolution = 2.8 m 70 mm Resolution = 6.25 m 150 mm Resolution = 6.25 m | | | | | | AG4-6E |

* Model includes scanner, plugs and CD with diagnostic and configuration software. Cordset ordered separately (see page 528).

ACCESSORIES
page
528

AG4-TB1 Test Box

With the test box it's possible to test the following Scanner functions without hooking it up to the machine interface:

- Switch over between the different field pairs
- Indication of the Safety OSSD outputs (when entering protective field)
- Indication of the Alarm outputs (when entering warning field)
- Can be used as a "cloning" device to load the same configuration into multiple scanners
- Machine Interface-to-Test Box cordset included
- Power supply not included



AG4 Safety Laser Scanner Kits



You can purchase a kit that contains a laser scanner, optional interfacing solutions and cordsets.

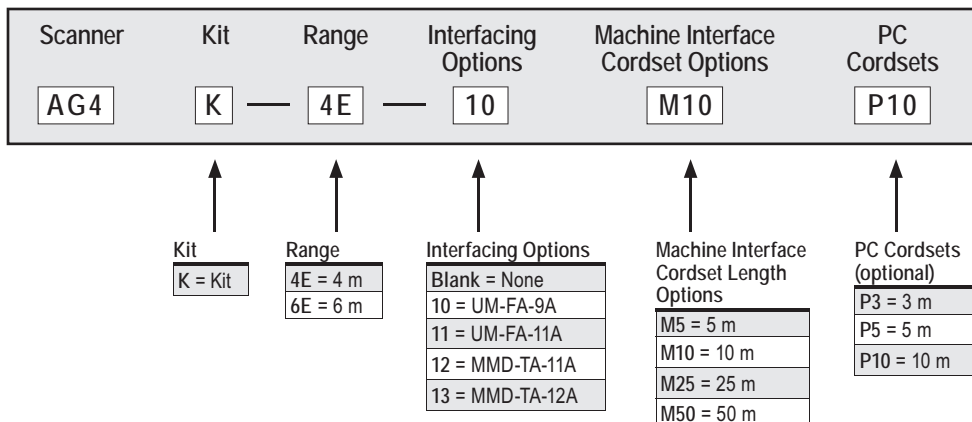
- *Scanner* page 525
- *Interfacing Options* 528
- *Cordsets* 528

To Order:



1. Choose an optional interfacing solution, such as an UM-FA-9A or -11A universal input safety module.
2. Choose a DB15 machine interface cordset, such as AG4-CPD15...
3. Choose a PC communication cordset, such as AG4-PCD9...

See www.bannerengineering.com for complete documentation and a current listing of accessories.

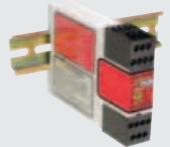


Kit Model Key



AG4 Laser Scanner Specifications (cont'd)

| | | |
|------------------|---|--|
| Design Standards | IEC 61496-1/-3 (Type 3), ISO 13849-1 (Category 3, PLd), IEC 61508-1 to -7 (SIL2) and IEC 62061 SIL CL2 | |
| Certifications |   | TUV Rheinland of North America, a Nationally Recognized Test Laboratory (NRTL) in the United States according to OSHA 29 CFR 1910.7, and accredited by the Standards Council of Canada to test and certify products to Canadian National Standards, has certified the AG4 Laser Scanner to all applicable U.S. and Canadian National Standards. The cTUVus mark is recognized throughout the United States and Canada by OSHA and the SCC. |
| Wiring Diagrams | WD20, WD21, WD22 (pp. 800-801) | |

AG4 Interfacing Products

| | | Description | Models | Product Information |
|-----------------------------------|---|---|--|---------------------|
| Interface Modules and Controllers |  | <ul style="list-style-type: none"> Universal input safety modules monitors both contact-based and PNP solid-state input devices Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing | UM-FA-9A (3 NO) UM-FA-11A (2 NO/1NC) | Page 558 |
| |  | <ul style="list-style-type: none"> One controller provides configurable monitoring of multiple safety devices 22 input terminals can monitor both contact-based and PNP solid-state input devices 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions All SC22-3 modules use 24V dc 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models) | SC22-3-S... SC22-3-C... SC22-3E-S... SC22-3E-C... | Page 533 |
| Muting Modules |  | <ul style="list-style-type: none"> The Muting Module temporarily inhibits a safety laser scanner so materials can safely pass through the screen without stopping the machinery The module uses redundant microcontroller-based logic | MMD-TA-12B MMD-TA-11B | Page 550 |

NC = Normally closed, NO = Normally open

Cordsets

| DB15 Machine Interface | |
|------------------------|--------------|
| See page 718 | |
| Length | Model |
| 5.00 m | AG4-CPD15-5 |
| 10.0 m | AG4-CPD15-10 |
| 25.0 m | AG4-CPD15-25 |
| 50.0 m | AG4-CPD15-50 |



| DB9 PC Communication* | |
|-----------------------|-------------|
| See page 718 | |
| Length | Model |
| 3.00 m | AG4-PCD9-3 |
| 5.00 m | AG4-PCD9-5 |
| 10.0 m | AG4-PCD9-10 |




| DB9 to USB† | |
|--------------|---------------|
| See page 718 | |
| Length | Model |
| 1.00 m | AG4-PCD9USB-1 |




† Not recommended for use with AG4-PCD9-10

* RS-232 Serial protocol


 Additional cordset information available. See page 693.

Bracket

| Swivel |
|---|
|  |
| pg. 641 |
| AG4-MBK1 |

 Additional bracket information available. See page 632.

Test Box

| Configuration & Test Box |
|---|
|  |
| AG4-TB1 |

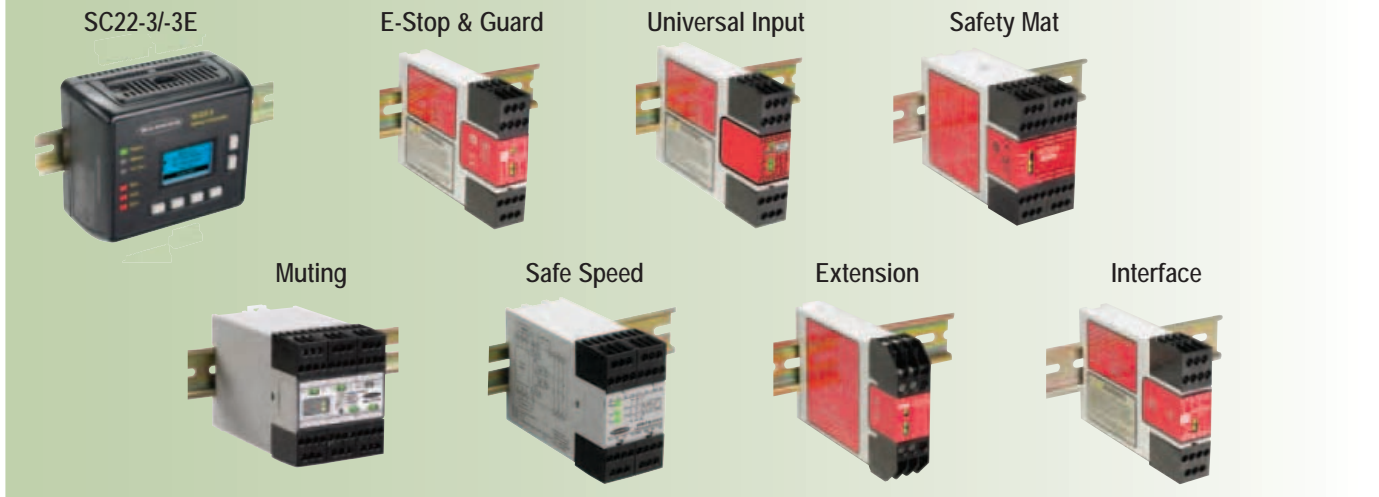
Misc. Replacement Parts

| Description | Model |
|--|-----------|
| Replacement window | AG4-WIN1 |
| Replacement configuration plug, straight | AG4-CPD15 |
| Replacement PC plug, straight | AG4-PCD9 |

| Description | Model |
|------------------------------|----------|
| Cleaning set (150 ml fluid) | AG4-CLN1 |
| Cleaning set (1000 ml fluid) | AG4-CLN2 |

SAFETY CONTROLLERS & MODULES

- Photoelectrics
- Sensors
- Fiber Optic
- Sensors
- Special Purpose
- Sensors
- Measurement &
- Inspection Sensors
- Vision
- Wireless
- Lighting &
- Indicators
- Safety
- Light Screens
- Safety
- Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand
- Control Modules
- Safety Interlock
- Switches
- Emergency Stop
- & Stop Control



SC22-3I-3E Safety Controller page 533

- 22 input terminals for monitoring of both contact-based or solid-state outputs from Banner devices or any other manufacturer
- Three pairs of independent solid-state safety outputs
- Configurable auxiliary outputs for tracking inputs, outputs, lockout, I/O status and other functions
- Reduces the complexity of interfacing multiple safety functions and devices



E-Stop & Interlocked Guard page 537

- Monitors contact failure or wiring fault
- Self-monitors to eliminate risk if module fails
- Installs easily



Universal Input page 545

- Monitors contact failure or wiring fault
- Used with one or two solid-state PNP or hand/relay contact safety or non-safety devices



Safety Mat Monitoring page 547

- Monitors a single mat or a series of connected mats
- Used with any standard 4-wire safety mat or edge triggered by a short in a contact plate or strip



Muting page 550

- Suspends safeguarding during hazard-free times in the machine's cycle
- Allows material to move into or from the process, without tripping the primary safeguard
- Monitors two or four hard-relay contact safety devices



Safe Speed Monitoring page 554

- Monitors two sensors with PNP outputs for rotation and linear movements
- Allows safety switches to release and safety gates to be opened when the speed drops below the dangerous level



Extension Relay page 556

- Provides additional safety outputs for a primary safety device with relay outputs
- Offers two hookup options, depending on model: one channel, or one or two channel
- Models with stop category 1 (OFF Delay)



Interface Relay page 558

- Increases the switching current capacity of low voltage primary safety devices to 6 amps
- Serves as a relay for primary safety devices with solid-state or hard contact outputs and external device monitoring

| | | Catalog Page | Model | Safety Category | Functional Stop Category | Input Device | Supply Voltage | |
|---|---|--------------|-------------------------|-------------------|--------------------------|-----------------------------------|---------------------|-----------|
| Safety Controller |  | 533 | SC22-3-... | 2, 3 or 4 | 0 & 1 | Electromechanical & Solid State | 24V dc | |
| | | | SC22-3E-... | | | | | |
| E-Stop & Interlocked Guard Safety Modules |  | 537 | GM-FA-10J | 2 or 4 | 0 | Magnetic & Electromechanical | 24V ac/dc | |
| | | | 537 | ES-FA-9AA | 2 or 4 | 0 | Electromechanical | 24V ac/dc |
| | | ES-FA-11AA | | | | | | |
| | | 537 | ES-UA-5A | 2 or 4 | 0 | Electromechanical | 115V ac & 12-24V dc | |
| | | | ES-VA-5A | | | | 230V ac & 12-24V dc | |
| | | 537 | ES-TN-1H1 to ES-TN-1H12 | 2 or 4 | 0 & 1 | Electromechanical | 24V dc | |
| 537 | ES-TN-14H5 | 2 or 4 | 0 & 1 | Electromechanical | 24V dc | | | |
| | ES-TN-14H6 | | | | | | | |
| 537 | ES-FA-6G | 2 | 0 | Electromechanical | 24V ac/dc | | | |
| UM Modules |  | 545 | UM-FA-9A | 2, 3 or 4 | 0 | Electromechanical & Solid State | 24V ac/dc | |
| | | | UM-FA-11A | | | | | |
| Safety Mat Modules |  | 547 | SM-GA-5A | 3 (with mat) | 0 | Safety Mat & Safety Edge (4-wire) | 115V ac & 12-24V dc | |
| | | | SM-HA-5A | | | | 230V ac & 12-24V dc | |
| Muting Modules |  | 550 | MMD-TA-12B | 2, 3 or 4 | 0 | Electromechanical & Solid State | 24V dc | |
| | | | MMD-TA-11B | | | | | |
| Safe Speed Modules |  | 554 | SSM-FM-11A10 | 3 | 0 | Solid State | 24V ac/dc | |
| | | | SSM-FM-11A20 | | | | | |
| Extension Modules |  | 556 | EM-T-7A | 2, 3 or 4 | 0 | Safety Output | 24V dc | |
| | | | EM-F-7G | | 1 | | 24V ac/dc | |
| | | | EM-FD-7G2 | | | | | |
| | | | EM-FD-7G3 | | | | | |
| | | | EM-FD-7G4 | | | | | |
| Interface Modules |  | 558 | IM-T-9A | 2, 3 or 4 | 0 | Safety Output | 24V dc | |
| | | | IM-T-11A | | | | | |

NC = Normally Closed Relay, NO = Normally Open Relay

| | Inputs | Safety Outputs | Output Rating | Auxiliary Outputs | Output Response Time | Delay | Housing Width |
|--|---|---------------------|---------------|--|----------------------|---|---------------|
| | 22 Safety & Non-Safety | 6 PNP (3 pair) | 0.75 amps ea. | 10 Discrete Status Outputs | 10 ms | ON-delay: 5 min max OFF-delay: 5 min max | 131 mm |
| | | | 0.5 amps ea. | 10 Discrete Status Outputs, Ethernet/IP & Modbus TCP | | | |
| | 1 NC & 1 NO (single or dual) | 2 NO | 6 amps | — | 35 ms | — | 22.5 mm |
| | 1 NC (single) or 2 NC (dual) | 3 NO | 6 amps | — | 25 ms | — | 22.5 mm |
| | | 2 NO | 7 amps | 1 NC | | | |
| | 1 NC (single) or 2 NC (dual) | 4 NO | 6 amps | 1 NC & 2 PNP | 25 ms | — | 45 mm |
| | 1 NC (single) or 2 NC (dual) | 2 NO & 2 NO w/delay | 4 amps | 1 NC (immediate) & 1 NC (delayed) | 50 ms | OFF-delay 0 - 200 sec., depending on model | 45 mm |
| | 1 NC (single) or 2 NC (dual) | 4 NO & 4 NO w/delay | 4 amps | 1 NC (immediate) & 1 NC (delayed) | 50 ms | OFF-delay 0 - 20 sec. | 67.5 mm |
| | | | | | | OFF-delay 0-200 sec. | |
| | 1 NC (single) | 3 NO | 6 amps | 1 NC | 35 ms | — | 22.5 mm |
| | 1 NC (single) or 2 NC (dual) | 3 NO | 6 amps | — | 25 ms | — | 22.5 mm |
| | | 2 NO | | 1 NC | | | |
| | 1 (or multiple in series) 4-wire Safety Mat | 4 NO | 6 amps | 1 NC & 2 PNP | 50 ms | — | 45 mm |
| | 2 NC Muteable (dual) & 2 NC SSI (dual) | 2 PNP OSSD | 0.5 amps | 1 PNP | 10 ms | — | 67.5 mm |
| | | 2 NO | 6 amps | 1 NC | 20 ms | | |
| | 2 PNP | 2 NO | 4 amps | 1 NC | 700 ms | — | 45 mm |
| | | | | | 350 ms | | |
| | 1 NC (single) or 2 NC (dual) | 4 NO | 6 amps | — | 20 ms | — | 22.5 mm |
| | 1 NC (single) | 4 NO w/delay | | | 35 ms | | |
| | | | | | 30 ms | | |
| | | | | | | OFF-delay 1.0 sec. | |
| | | | | | | OFF-delay 2.0 sec. | |
| | 1 NC (dual) | 3 NO | 6 amps | — | 20 ms | — | 22.5 mm |
| | | 2 NO | | 1 NC | | | |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

SAFETY CONTROLLERS
SAFETY MODULES



Safety

is easier than you think.



Banner SC22-3 Safety Controller is Less Costly and Less Complex than Multiple Safety Modules or Safety PLCs.

The flexible, easy-to-configure safety module solution from Banner

- Configurable monitoring of multiple safety devices including E-stop buttons, interlocking switches, safety light screens, two-hand controls, muting, safety mats and rope pull switches
- 3 pairs of independent solid-state safety outputs
- Configurable auxiliary outputs for tracking inputs, outputs, lockout, I/O status and other functions
- Reduces the complexity of interfacing multiple safety functions and devices
- Front panel control for configuration and real-time system status without a PC
- Configure offline using PC; replicate configuration to memory card, email or export as PDF or DXF files
- Meets Safety Integrity Level (SIL) 3 per IEC 62061 and IEC 61508, and Category 4 Performance Level (PL e) per ISO 13849-1

Intuitive free software for point-and-click configuration

Create or edit configurations in minutes:

1. Select the type of safety input device
 2. Map functions and properties from a pull down list
 3. Wiring and ladder logic diagrams autopopulate along with configuration summary
- View and track status using front panel display or PC "Live Display"
 - Includes fault history with time/date stamp
 - Use INFO button to link to software and manual for quick reference to devices and safety category 2, 3 or 4 hookup



FREE DEMO and PCI Software Download at

www.bannerengineering.com/SC22

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SC22-3/-3E Safety Controller

- Totally configurable and flexible safety controller that can easily replace multiple dedicated safety modules
- Controller monitors up to 22 inputs for proper operation
- Each input can be configured for Control Reliability for Category 2, 3 or 4 safety circuit performance per OSHA/ANSI or ISO 13849-1, or for a non-safety input
- Input terminals can monitor both contact-based or PNP solid-state outputs
- 3 pairs of solid-state safety outputs with ON-Delay, OFF-Delay and cancel OFF-Delay
- 10 configurable auxiliary status outputs track inputs, outputs, lockout, I/O status and other functions
- SC22-3E models provide diagnostic information using EtherNet/IP, Modbus TCP and PCCC
- Configuration is extremely intuitive with the built-in front panel LCD display or using a PC Interface (download free at www.bannerengineering.com/sc22)
- Controller can be configured offline using a PC; replicate configuration to memory card, email or export as PDF or DXF files
- Controller is designed to meet stringent standards including Safety Integrity Level (SIL) 3 per IEC 61508, SIL CL 3 per IEC 62061 and Category 4 Performance Level (PL e) per EN ISO 13849-1

- Photoelectrics Sensors
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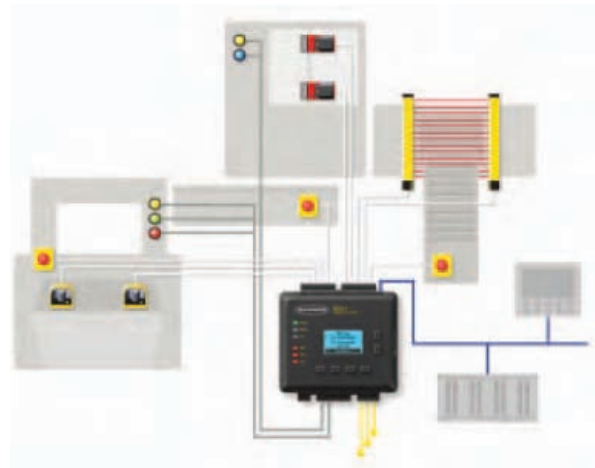
ACCESSORIES
page 536

Intuitive free software for point-and-click configuration



1. Select the type of safety input device
2. Map functions and properties from a pull down list
3. Wiring and ladder logic diagrams autopopulate along with configuration summary
 - View and track status using front panel display or PC "Live Display"
 - Includes fault history with time/date stamp
 - Use INFO button to link to software and manual for quick reference to devices and safety category 2, 3 or 4 hookup

22 input terminals for monitoring safety and non-safety devices



Versatile input circuitry accommodates a wide range of inputs from Banner devices or any other manufacturer, including:

- E-stop Buttons
- Two-Hand Controls
- Safety Light Screens
- Rope Pulls
- Safety Mats and Edges
- Enabling Devices
- Muting Sensors
- Bypass Switches
- Interlocking Switches
- Laser Scanners
- Value monitoring

- SAFETY CONTROLLERS**
- SC22-3/-3E
- PICO-GUARD
- SAFETY MODULES



SC22-3/-3E Safety Controller, 24V dc


ACCESSORIES
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| Terminal Type | Safety Outputs | USB Cable | Output Rating | Aux. Outputs | XM Card | XM Programming Tool | Communication Protocol | Model | | |
|---------------|--------------------|-----------|--------------------------|--|---------|--|------------------------|------------|-----------------------------|-------------|
| Screw | 6 PNP (3 pairs) | 1.8 m | 0.75 amps each output | 10 status (I/O, mute, lockout, fault and reset) | Yes | Yes | — | SC22-3-SU1 | | |
| Clamp | | | | | | | | SC22-3-CU1 | | |
| Screw | | — | — | | | — | SC22-3-S | | | |
| Clamp | | | | | | | SC22-3-C | | | |
| Screw | | 1.8 m | 0.5 amps each output | | | 10 status (I/O, mute, lockout, fault and reset) plus 32 virtual status | Yes | Yes | EtherNet/IP & Modbus TCP | SC22-3E-SU1 |
| Clamp | | | | | | | | | | SC22-3E-CU1 |
| Screw | | — | — | | | — | — | — | EtherNet/IP & Modbus TCP | SC22-3E-S |
| Clamp | | | | | | | | | | SC22-3E-C |

SC22-3/-3E Safety Controller Specifications

| | |
|--|--|
| Power | <p>24V dc, $\pm 20\%$</p> <p>SC22-3 models: 0.4 A (controller only), 5.9 A (all outputs ON @ full rated load)</p> <p>SC22-3E models: 0.4 A (controller only), 4.9 A (all outputs ON @ full rated load)</p> <p>The Controller should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply</p> |
| Safety and Non-Safety Inputs (22 terminals) | <p>Input ON threshold: > 15V dc (guaranteed on), 30V dc max.</p> <p>Input OFF threshold: < 5V dc (guaranteed off with any 1 fault), -3V dc min.</p> <p>Input ON current: 8 mA typical @ 24V dc, > 2 mA (guaranteed with 1 fault)</p> <p>50 mA peak contact cleaning current @ 24V dc</p> <p>Sourcing current: 30 mA minimum continuous (3V dc max. drop)</p> <p>Input lead resistance: 300 Ω max. (150 Ω per lead)</p> <p>Input requirements for a 4-wire safety mat:</p> <ul style="list-style-type: none"> Max. capacity between plates: 0.5 μF Max. capacity between bottom plate and ground: 0.5 μF Max. resistance between the 2 input terminals of one plate: 20 |
| Safety Outputs (6 terminals, 3 redundant outputs) | <p>Rated output current: SC22-3 models: 0.75 A max. each output (1.0V dc max drop)</p> <p>SC22-3E models: 0.5 A max. each output (1.0V dc max drop)</p> <p>Output OFF threshold: 0.6V dc typical (1.2V dc max. guaranteed with 1 fault)</p> <p>Output leakage current: 50 μA max. with open 0V</p> <p>Load: 0.1 μF max., 1 H max., 10 Ω max. per lead</p> |

More
on next
page

| SC22-3/-3E Safety Controller Specifications (cont'd) | | | | | |
|---|--|---|--|---|-----------------------------------|
| Status Outputs (10 terminals) | <p>Rated output current: 0.5A @ 24V dc (individual), 1.0 A @ 24V dc (total of all outputs)</p> <p>O1 to O8 (General Purpose) — Output OFF voltage: < 0.5V dc (no load), 22 KΩ pull down to 0V</p> <p>O9 and O10 (General Purpose or Monitored Mute Lamp) — Output OFF voltage: Internal 94 KΩ pull up to 24V dc supply Output ON/OFF threshold: 15V dc +/-4V dc @ 24V dc supply</p> <p>NOTE: For O9 and O10 (if configured as monitored mute lamp output only), if a short circuit or other fault condition causes the output to drop below this threshold while the output is ON, a lockout will occur. If an open circuit or other fault condition causes the output to rise above this threshold while the output is OFF, a lockout will occur.</p> | | | | |
| Network Interface (SC22-3E only) | <p>Ethernet 10/100 Base-T/TX, RJ45 modular connector</p> <p>Selectable auto negotiate or manual rate and duplex</p> <p>Auto MDI/MDIX (Auto cross)</p> <p>Protocols: EtherNet/IP (with PCCC), Modbus TCP</p> <p>Data: 32 configurable virtual status outputs; fault diagnostic codes and messages; access to fault log</p> | | | | |
| Response and Recovery Times | <p>Response time (ON to OFF): 10 milliseconds max. (with standard 6 milliseconds debounce; this can increase if debounce time increases. Refer to the configuration summary for actual response time.)</p> <p>Recovery time (OFF to ON): 400 milliseconds max. (with manual reset option)</p> <p>Recovery time (OFF to ON): 400 milliseconds max. plus input debounce time (auto reset)</p> | | | | |
| Onboard LCD Information Display— Password Requirements | <table border="0"> <tr> <td> <p>Password is not required: Run mode (I/O status) Fault (I/O fault detection and remedial steps) Review configuration parameters (I/O properties and terminals)</p> </td> <td> <p>Password is required: Configuration mode (create/modify/confirm/download configurations)</p> </td> </tr> </table> | <p>Password is not required: Run mode (I/O status) Fault (I/O fault detection and remedial steps) Review configuration parameters (I/O properties and terminals)</p> | <p>Password is required: Configuration mode (create/modify/confirm/download configurations)</p> | | |
| <p>Password is not required: Run mode (I/O status) Fault (I/O fault detection and remedial steps) Review configuration parameters (I/O properties and terminals)</p> | <p>Password is required: Configuration mode (create/modify/confirm/download configurations)</p> | | | | |
| Environmental Rating | NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC IP54) or better enclosure | | | | |
| Operating Conditions | Temperature range: 0° to +55° C | | | | |
| Mechanical Stress | <p>Shock: 15g for 11 milliseconds, half sine, 18 shocks total (per IEC 61131-2)</p> <p>Bump: 10g for 16 milliseconds, 6000 cycles total (per IEC 61496-1)</p> <p>Vibration: 3.5 mm occasional / 1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: (per IEC 61131-2) and 0.35 mm single amplitude / 0.70 mm peak-to-peak @ 10 to 55Hz (per IEC 61496-1), all @ 10 sweep cycles per axis</p> | | | | |
| EMC | Meets or exceeds all EMC requirements in IEC 61131-2, IEC 61496-1 (Type 4), and IEC 62061 Annex E, Table E.1 (increased immunity levels) | | | | |
| Removable Terminals | <table border="0"> <tr> <td> <p>Screw terminals</p> <p>Wire sizes: 16, 18, 20, 22 or 24 AWG (0.20 – 1.31 mm²)</p> <p>Tightening torque: 0.23 Nm (2 in. lbs) nominal</p> </td> <td> <p>Wire strip length: 5.00 mm</p> <p>Tightening torque: 0.34 Nm (3.0 in. lbs) maximum</p> </td> </tr> <tr> <td> <p>Clamp terminals</p> <p>Wire size: 16, 18, 20, 22, or 24 AWG (0.20 – 1.31 mm²)</p> </td> <td> <p>Wire strip length: 9.00 mm</p> </td> </tr> </table> <p>Important: Clamp terminals are designed for 1 wire only. If more than 1 wire is connected to a terminal, a wire could loosen or become completely disconnected from the terminal, causing a short.</p> | <p>Screw terminals</p> <p>Wire sizes: 16, 18, 20, 22 or 24 AWG (0.20 – 1.31 mm²)</p> <p>Tightening torque: 0.23 Nm (2 in. lbs) nominal</p> | <p>Wire strip length: 5.00 mm</p> <p>Tightening torque: 0.34 Nm (3.0 in. lbs) maximum</p> | <p>Clamp terminals</p> <p>Wire size: 16, 18, 20, 22, or 24 AWG (0.20 – 1.31 mm²)</p> | <p>Wire strip length: 9.00 mm</p> |
| <p>Screw terminals</p> <p>Wire sizes: 16, 18, 20, 22 or 24 AWG (0.20 – 1.31 mm²)</p> <p>Tightening torque: 0.23 Nm (2 in. lbs) nominal</p> | <p>Wire strip length: 5.00 mm</p> <p>Tightening torque: 0.34 Nm (3.0 in. lbs) maximum</p> | | | | |
| <p>Clamp terminals</p> <p>Wire size: 16, 18, 20, 22, or 24 AWG (0.20 – 1.31 mm²)</p> | <p>Wire strip length: 9.00 mm</p> | | | | |
| Design Standards | <ul style="list-style-type: none"> • SIL CL 3 per IEC 62061 Safety of Machinery – Functional Safety of Safety-Related Electrical, Electronic and Programmable Electronic Control Systems • SIL 3 per IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems • Category 4 per ISO 13849-1 (1999) • Category 4 Performance Level (PL) e per ISO 13849-1 (2006) • Complies with Machinery Directive 2006/42/EC • IEC 61131-2 Programmable Controllers, Part 2: Equipment Requirements and Tests • UL 508 Industrial Control Equipment • UL 1998 Software in Programmable Components • ANSI NFPA 79 Electrical Standards for Industrial Machinery • IEC 60204-1 Electrical Equipment of Machines: General Requirements • ISO 13851 (EN574) Safety of Machinery – Two-Hand Control Devices – Functional Aspects and Design Principles • ISO 13850 (EN418) Emergency Stop Devices | | | | |
| Certifications |  | | | | |
| Wiring Diagrams | WD023, WD024, WD025, WD026 (pp. 802-804). | | | | |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



- SAFETY CONTROLLERS**
- SC22-3/-3E
- PICO-GUARD
- SAFETY MODULES

SC22-3/-3E Interface Modules

| Description | Supply Voltage | Inputs (Safety Controller Outputs) | Safety Outputs | Output Rating | EDM Contacts | Model |
|---|------------------------------|------------------------------------|------------------------------|---------------|----------------------|---------|
| For use with 1-dual channel SC22-3 safety output | 24V dc (Controller supplied) | 2 (SO1) | 3 NO | 10 amps | 1 NC pair per output | SC-IM9A |
| For use with 2-dual channel SC22-3 safety outputs | | 4 (SO1 and SO2) | Total of 6 (3 NO per output) | | | SC-IM9B |
| For use with 3-dual channel SC22-3 safety outputs | | 6 (SO1, SO2 and SO3) | Total of 9 (3 NO per output) | | | SC-IM9C |

NOTE: External device monitoring (EDM) is required to be wired separately to the NC contacts to comply with ISO 13849-1 categories and ANSI/OSHA control reliability.

Additional Interfacing Products

| Description | | Models | Product Information |
|--------------------------------|---|----------------------|---------------------|
| Interface Modules |  <ul style="list-style-type: none"> Interface modules provide two or three normally open force-guided relay outputs rated at 6 A Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included | IM-T-9A (3 NO) | Page 558 |
| | | IM-T-11A (2 NO/1 NC) | |
| Mechanically Linked Contactors |  <ul style="list-style-type: none"> Contactors add 10 or 18 amp current carrying capability to any safety system Suppressors extend the life of an actuating device that uses a contactor Modular design simplifies assembly and installation | 11-BG00-31-D-024 | Page 756 |
| | | BF1801L-024 | |

NC = Normally closed, NO = Normally open


NOTE: External device monitoring (EDM) is required to be wired separately to the NC contacts to comply with ISO 13849-1 categories and ANSI/OSHA control reliability.

Miscellaneous

| Description | Model |
|---|------------|
| SC22-3 replacement controller (without terminals) | SC-SC22-3 |
| SC22-3E replacement controller (without terminals), Ethernet compatible | SC-SC22-3E |
| External memory card (XM card) | SC-XM1 |
| Bulk pack of 5 XM Cards | SC-XM1-5 |
| Screw terminal replacement set | SC-TS1 |
| Clamp terminal replacement set | SC-TC1 |
| USB A/B cable, 1.8 m | SC-USB1 |
| XM card USB programming tool | SC-XMP |


Cordsets


| Ethernet Communication | | |
|------------------------|----------|--------------------|
| See page 719 | | |
| Length | Shielded | Shielded Crossover |
| 2.13 m | STP07 | STPX07 |
| 7.62 m | STP25 | STPX25 |
| 15.2 m | STP50 | STPX50 |
| 22.9 m | STP75 | STPX75 |


 Additional cordset information available. See page 693.



Brackets

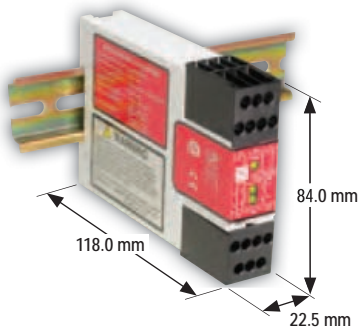
| SC22-3 |
|--|
|  |
| pg. 641 |
| DIN-35.. |


 Additional bracket information available. See page 632.

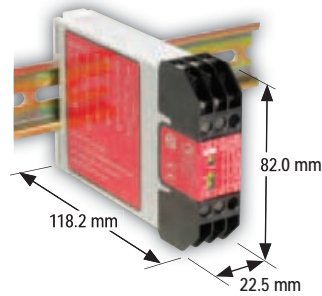
E-Stop & Interlocked Guard Safety Modules

- Modules monitor external devices for proper operation, contact failure or wiring faults
- Module goes into lockout mode if fault is detected
- Available voltages include 24V ac/dc; 24V dc; 115V ac or 12-24V dc; or 230V ac or 12-24V dc
- Modules serve to monitor positive-opening E-stop and interlocking switches
- Non-safety outputs are available on most modules
- Modules are available with an adjustable output delay of 0-20 or 0-200 seconds
- Modules offer reset options: Automatic, manual and monitored manual (depending on model)
- Ratings are NEMA 1 and at least IEC IP20
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



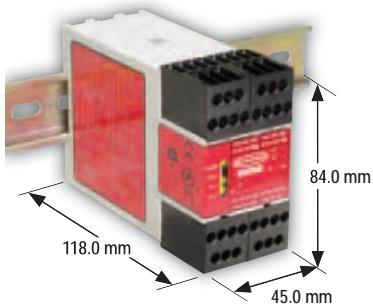
ES-FA...AA & GM-FA-10J Models



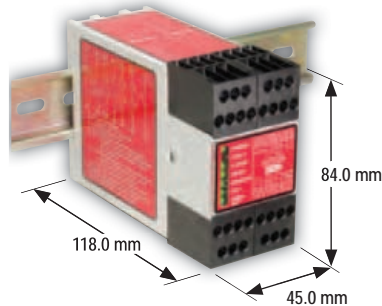
ES-FA-6G Models



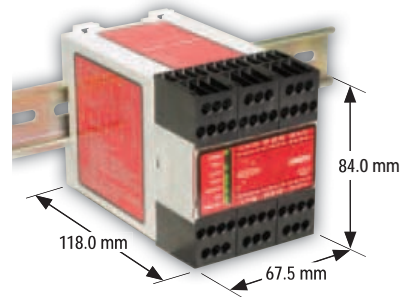
- SAFETY CONTROLLERS
- SAFETY MODULES**
- E-STOP & GUARD
- UNIVERSAL SAFETY MAT
- MUTING
- SAFE SPEED EXTENSION
- INTERFACE



ES...A-5A Models



ES-TN-1H.. Models



ES-TN-14H.. Models

E-Stop & Guard Safety Modules

| Functional Stop Category | Supply Voltage | Inputs | Safety Outputs | Aux. Outputs | Output Rating | Output Response Time | Delay | Model |
|--------------------------|---------------------|------------------------------|-----------------------------------|-----------------------------------|---------------|----------------------|--------------|------------|
| 0 | 24V ac/dc | 1 NC & 1 NO (single or dual) | 2 NO | — | 6 amps | 35 ms | — | GM-FA-10J |
| 0 | 24V ac/dc | 1 NC (single) or 2 NC (dual) | 3 NO | — | 6 amps | 25 ms | — | ES-FA-9AA |
| | | | 2 NO | 1 NC | 7 amps | | | ES-FA-11AA |
| 0 | 115V ac & 12-24V dc | 1 NC (single) or 2 NC (dual) | 4 NO | 1 NC & 2 PNP | 6 amps | 25 ms | — | ES-UA-5A |
| | 230V ac & 12-24V dc | | | | | | | ES-VA-5A |
| 0 & 1 | 24V dc | 1 NC (single) or 2 NC (dual) | 2 NO (immediate) & 2 NO (delayed) | 1 NC (immediate) & 1 NC (delayed) | 4 amps | 50 ms | 0 - 20 sec. | ES-TN-1H5 |
| | | | | | | | 0 - 200 sec. | ES-TN-1H6 |
| | | | | | | | 0.25 sec. | ES-TN-1H1 |
| | | | | | | | 0.5 sec. | ES-TN-1H2 |
| | | | | | | | 1.0 sec. | ES-TN-1H3 |
| | | | | | | | 2.0 sec. | ES-TN-1H4 |
| | | | | | | | 4.0 sec. | ES-TN-1H7 |
| | | | | | | | 6.0 sec. | ES-TN-1H8 |
| | | | | | | | 8.0 sec. | ES-TN-1H9 |
| | | | | | | | 10.0 sec. | ES-TN-1H10 |
| | | | | | | | 15.0 sec. | ES-TN-1H11 |
| | | | | | | | 20.0 sec. | ES-TN-1H12 |
| 0 & 1 | 24V dc | 1 NC (single) or 2 NC (dual) | 4 NO immediate & 4 NO (delayed) | 1 NC (immediate) & 1 NC (delayed) | 4 amps | 50 ms | 0 - 20 sec. | ES-TN-14H5 |
| | | | | | | | 0 - 200 sec. | ES-TN-14H6 |
| 0 | 24V ac/dc | 1 NC (single) | 3 NO | 1 NC | 6 amps | 35 ms | — | ES-FA-6G |

NC = Normally Closed Relay, NO = Normally Open Relay

GM-FA-10J Guard Monitoring Module Specifications




| | | | | | | | | | | | | | |
|--|--|--|---------------------|--------------------------|----------------------|-------------------------|------------------------|--|--|---|--|--|--|
| Supply Voltage and Current | 24V dc $\pm 15\%$ @ 150 mA (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24V ac $\pm 15\%$ @ 150 mA, 50-60 Hz $\pm 5\%$ (NEC Class 2-rated transformer) Power consumption: approx. 3 VA / 3 W To comply with UL and CSA standards, the isolated secondary power supply circuit in the installation must incorporate a method to limit the overvoltage to 0.8 kV | | | | | | | | | | | | |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity | | | | | | | | | | | | |
| Overvoltage Category | Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.) | | | | | | | | | | | | |
| Pollution Degree | 2 | | | | | | | | | | | | |
| Output Configuration | <p>Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2</p> <p>Contacts: AgNi, 5 μm gold-plated</p> <p>Low Current Rating: The 5 μm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching") To preserve the gold plating on the contacts, do not exceed the following max. values at any time:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Min. voltage: 1V ac/dc</td> <td style="width: 50%;">Max. voltage: 60V</td> </tr> <tr> <td>Min. current: 5 mA ac/dc</td> <td>Max. current: 300 mA</td> </tr> <tr> <td>Min power: 5 mW (5 mVA)</td> <td>Max. power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; text-align: center;"></td> <td style="width: 40%;"> Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) </td> <td style="width: 40%;"> Maximum: 250V ac/24V dc, 6A resistive B300, R300 per UL508 </td> </tr> <tr> <td style="width: 20%; text-align: center;"></td> <td style="width: 40%;"> Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) </td> <td style="width: 40%;"> Maximum: 250V ac/24V dc, 6A resistive IEC 60947-5-1: AC15: 230V ac. 3 A; DC-13: 24V dc, 2A </td> </tr> </table> <p>Mechanical life: $\geq 50,000,000$ operations Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 900 VA; 1,000,000 cycles @ 250 VA; 2,000,000 cycles @ 150 VA; 5,000,000 cycles @ 100 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p> | Min. voltage: 1V ac/dc | Max. voltage: 60V | Min. current: 5 mA ac/dc | Max. current: 300 mA | Min power: 5 mW (5 mVA) | Max. power: 7 W (7 VA) | | Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) | Maximum: 250V ac/24V dc, 6A resistive B300, R300 per UL508 | | Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) | Maximum: 250V ac/24V dc, 6A resistive IEC 60947-5-1: AC15: 230V ac. 3 A; DC-13: 24V dc, 2A |
| Min. voltage: 1V ac/dc | Max. voltage: 60V | | | | | | | | | | | | |
| Min. current: 5 mA ac/dc | Max. current: 300 mA | | | | | | | | | | | | |
| Min power: 5 mW (5 mVA) | Max. power: 7 W (7 VA) | | | | | | | | | | | | |
| | Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) | Maximum: 250V ac/24V dc, 6A resistive B300, R300 per UL508 | | | | | | | | | | | |
| | Minimum: Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) | Maximum: 250V ac/24V dc, 6A resistive IEC 60947-5-1: AC15: 230V ac. 3 A; DC-13: 24V dc, 2A | | | | | | | | | | | |
| Output Response Time | 35 milliseconds max. | | | | | | | | | | | | |
| Input Requirements | Each switch or sensor must have a normally closed contact and a normally open contact capable of switching 20 to 50 mA @ 15 to 30V dc Reset switch: 20 mA @ 12V dc, hard contact only Max. external resistance between terminals S11/S12, S11/S13, S21/S22 and S21/S23: 270 ohms each. | | | | | | | | | | | | |
| Simultaneity Monitoring | 2-Channel operation: 3 seconds 1-Channel operation: infinite | | | | | | | | | | | | |
| Status Indicators | <table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">4 green LEDs: Power: power is supplied to Safety Module Channel 1: inputs satisfied (guard closed) Channel 2: inputs satisfied (guard closed) Output: K1 and K2 energized, safety outputs closed</td> <td style="width: 40%;">1 red LED: Fault</td> </tr> </table> | 4 green LEDs: Power: power is supplied to Safety Module Channel 1: inputs satisfied (guard closed) Channel 2: inputs satisfied (guard closed) Output: K1 and K2 energized, safety outputs closed | 1 red LED: Fault | | | | | | | | | | |
| 4 green LEDs: Power: power is supplied to Safety Module Channel 1: inputs satisfied (guard closed) Channel 2: inputs satisfied (guard closed) Output: K1 and K2 energized, safety outputs closed | 1 red LED: Fault | | | | | | | | | | | | |
| Construction | Polycarbonate housing | | | | | | | | | | | | |
| Environmental Rating | IEC IP20 | | | | | | | | | | | | |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better. | | | | | | | | | | | | |
| Vibration Resistance | 10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6 | | | | | | | | | | | | |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing) | | | | | | | | | | | | |
| Design Standards | : Cat. 4 PL e, per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061 | | | | | | | | | | | | |

- Photoelectrics
- Sensors
- Fiber Optic
- Sensors
- Special Purpose
- Sensors
- Measurement &
- Inspection Sensors
- Vision
- Wireless
- Lighting &
- Indicators
- Safety
- Light Screens
- Safety
- Laser Scanners
- Safety Controllers**
- & Modules**
- Safety Two-Hand
- Control Modules
- Safety Interlock
- Switches
- Emergency Stop
- & Stop Control

- SAFETY
- CONTROLLERS
- SAFETY
- MODULES
- E-STOP & GUARD
- UNIVERSAL
- SAFETY MAT
- MUTING
- SAFE SPEED
- EXTENSION
- INTERFACE



GM-FA-10J Guard Monitoring Module Specifications (cont'd)

| | |
|-----------------|---|
| Certifications |    |
| Wiring Diagrams | 1-Channel Coded Magnet Switches: WD027 (p. 805) 2-Channel Positive Opening Switches: WD028 (p. 805) 1-Channel (Multiple Guards): WD029 (p. 806) 2-Channel (Multiple Guards): WD030 (p. 806) Guarded Machine: WD031 (p. 807) |

ES-FA-..AA Safety Module Specifications

| | | | | | | | | | | | | | | | | | |
|---------------------------------|---|----------|----------|-------------------|--------------|---------------------|-----------------|---------------------|-------------------|----------|----------|--------------------|---------------------|----------------------|---|-------------------------|--|
| Supply Voltage and Current | 24V dc $\pm 10\%$ (SELV-rated supply according to EN IEC 60950, NEC Class 2) 24V ac $\pm 10\%$, 50/60Hz (NEC Class 2-rated transformer) Power consumption: approx. 2 W/2 VA | | | | | | | | | | | | | | | | |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity | | | | | | | | | | | | | | | | |
| Overvoltage Category | Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category III, if appropriate overvoltage reduction is provided, as described in data sheet | | | | | | | | | | | | | | | | |
| Pollution Degree | 2 | | | | | | | | | | | | | | | | |
| Output Configuration | ES-FA-9AA: 3 normally open (NO) output channels ES-FA-11AA: 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel of the ES-FA-11AA is a parallel connection of contacts from two forced-guided relays, K1-K2. Contacts: AgNi, 5 μ m gold-plated Low Current Rating: The 5 μ m gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching") To preserve the gold plating on the contacts, do not exceed the following max. values at any time: <table style="margin-left: 40px;"> <tr> <td>Minimum:</td> <td>Maximum:</td> </tr> <tr> <td>Voltage: 1V ac/dc</td> <td>Voltage: 60V</td> </tr> <tr> <td>Current: 5 mA ac/dc</td> <td>Current: 300 mA</td> </tr> <tr> <td>Power: 5 mW (5 mVA)</td> <td>Power: 7 W (7 VA)</td> </tr> </table> High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) change to: <table style="margin-left: 40px;"> <tr> <td>Minimum:</td> <td>Maximum:</td> </tr> <tr> <td>Voltage: 15V ac/dc</td> <td>Voltage: 250V ac/dc</td> </tr> <tr> <td>Current: 30 mA ac/dc</td> <td>Current: ES-FA-9AA: 6A ES-FA-11AA: 7 A</td> </tr> <tr> <td>Power: 0.45 W (0.45 VA)</td> <td>Power: ES-FA-9AA: 200 W (1,500 VA) ES-FA-11AA: 200 W (1,750 VA)</td> </tr> </table> Mechanical life: > 20,000,000 operations Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts. | Minimum: | Maximum: | Voltage: 1V ac/dc | Voltage: 60V | Current: 5 mA ac/dc | Current: 300 mA | Power: 5 mW (5 mVA) | Power: 7 W (7 VA) | Minimum: | Maximum: | Voltage: 15V ac/dc | Voltage: 250V ac/dc | Current: 30 mA ac/dc | Current: ES-FA-9AA: 6A ES-FA-11AA: 7 A | Power: 0.45 W (0.45 VA) | Power: ES-FA-9AA: 200 W (1,500 VA) ES-FA-11AA: 200 W (1,750 VA) |
| Minimum: | Maximum: | | | | | | | | | | | | | | | | |
| Voltage: 1V ac/dc | Voltage: 60V | | | | | | | | | | | | | | | | |
| Current: 5 mA ac/dc | Current: 300 mA | | | | | | | | | | | | | | | | |
| Power: 5 mW (5 mVA) | Power: 7 W (7 VA) | | | | | | | | | | | | | | | | |
| Minimum: | Maximum: | | | | | | | | | | | | | | | | |
| Voltage: 15V ac/dc | Voltage: 250V ac/dc | | | | | | | | | | | | | | | | |
| Current: 30 mA ac/dc | Current: ES-FA-9AA: 6A ES-FA-11AA: 7 A | | | | | | | | | | | | | | | | |
| Power: 0.45 W (0.45 VA) | Power: ES-FA-9AA: 200 W (1,500 VA) ES-FA-11AA: 200 W (1,750 VA) | | | | | | | | | | | | | | | | |
| Output Response Time | 25 milliseconds typical | | | | | | | | | | | | | | | | |
| Input Requirements | Safety input switch: Dual-Channel (contacts) hookup – 10 to 20 mA steady state @ 12V dc NOTE: Inputs are designed with a brief contact-cleaning current of 100 mA when initially closed. Single-Channel hookup – 40 to 100 mA @ 24V ac/dc +/- 10%; 50/60 Hz Reset switch: 20 mA @ 12V dc, hard contact only | | | | | | | | | | | | | | | | |
| Minimum OFF-State Recovery Time | 250 milliseconds | | | | | | | | | | | | | | | | |
| Status Indicators | 3 green LEDs: Power ON K1 energized K2 energized | | | | | | | | | | | | | | | | |
| Construction | Polycarbonate housing | | | | | | | | | | | | | | | | |
| Environmental Rating | Rated NEMA 1; IP40, Terminals IP20 | | | | | | | | | | | | | | | | |

ES-FA-..AA Safety Module Specifications (cont'd)

| | |
|-----------------------------|--|
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better. |
| Vibration Resistance | 10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6 |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing) |
| Design Standards | Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061 |
| Certifications | |
| Wiring Diagrams | 1-Channel: WD032 (p. 808) 2-Channel: WD039 (p. 809) |




Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors
Vision
Wireless
Lighting &
Indicators
Safety
Light Screens
Safety
Laser Scanners
**Safety Controllers
& Modules**
Safety Two-Hand
Control Modules
Safety Interlock
Switches
Emergency Stop
& Stop Control

ES-..A-5A Safety Module Specifications

| | | | | | | | | | | | | | | | |
|------------------------------------|---|--|----------|-------------------|--------------|---------------------|-----------------|---------------------|-------------------|------|---|--|--|---|--|
| Supply Voltage and Current | AI-A2: 115V ac (model ES-UA-5A) or 230V ac (model ES-VA-5A) ±15% , 50/60Hz BI-B2: 11V dc – 27.6V dc Power consumption: approx. 4W/7VA The Safety Module should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply. | | | | | | | | | | | | | | |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity | | | | | | | | | | | | | | |
| Overvoltage Category | Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category III, if appropriate overvoltage reduction is provided, as described in data sheet | | | | | | | | | | | | | | |
| Pollution Degree | 2 | | | | | | | | | | | | | | |
| Output Configuration | <p>4 normally open (NO) output channels; 1 normally closed (NC) and 2 solid-state auxiliary outputs</p> <p>Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel is a parallel connection of contacts from two forced-guided relays, K1-K2.</p> <p>Contacts: AgNi, 5 µm gold-plated</p> <p>Low Current Rating: The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., “dry switching”) To preserve the gold plating on the contacts, do not exceed the following max. values at any time:</p> <table style="margin-left: 40px; border: none;"> <tr> <td style="padding-right: 20px;">Minimum:</td> <td>Maximum:</td> </tr> <tr> <td>Voltage: 1V ac/dc</td> <td>Voltage: 60V</td> </tr> <tr> <td>Current: 5 mA ac/dc</td> <td>Current: 300 mA</td> </tr> <tr> <td>Power: 5 mW (5 mVA)</td> <td>Power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table border="1" style="margin-left: 40px; border-collapse: collapse; width: 80%;"> <tr> <td style="width: 30%; text-align: center;"> </td> <td style="width: 35%;"> Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) </td> <td style="width: 35%;"> Maximum: NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250V ac/ 24V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250V ac/ 24V dc, 5A resistive B300, Q300 (UL508) </td> </tr> <tr> <td style="text-align: center;"> </td> <td> Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) </td> <td> Maximum—IEC60947-5-1 NO Safety Contact: AC-1: 250V ac, 6A; DC-1: 24V dc, 6A AC-15: 230V ac, 3A; DC-13: 24V dc, 4A NC Auxiliary Contact: AC-1: 250V ac, 5A; DC-1: 24V dc, 5A AC-15: 230V ac, 2A; DC-13: 24V dc, 4A </td> </tr> </table> <p>Mechanical life: > 20,000,000 operations Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 1,500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p> <p>Solid-State Monitor Outputs:</p> <ul style="list-style-type: none"> - Two non-safety solid-state dc outputs - Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized - Output at Y35 conducts (output high) when in normal operation (no lockout) - Output circuits require application of +12-24V dc ±15% at terminal Y31; dc common at Y30 - Maximum switching current: 100 mA at 12-24V dc - Both outputs are protected against short circuits | Minimum: | Maximum: | Voltage: 1V ac/dc | Voltage: 60V | Current: 5 mA ac/dc | Current: 300 mA | Power: 5 mW (5 mVA) | Power: 7 W (7 VA) | | Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) | Maximum: NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250V ac/ 24V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250V ac/ 24V dc, 5A resistive B300, Q300 (UL508) | | Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) | Maximum—IEC60947-5-1 NO Safety Contact: AC-1: 250V ac, 6A; DC-1: 24V dc, 6A AC-15: 230V ac, 3A; DC-13: 24V dc, 4A NC Auxiliary Contact: AC-1: 250V ac, 5A; DC-1: 24V dc, 5A AC-15: 230V ac, 2A; DC-13: 24V dc, 4A |
| Minimum: | Maximum: | | | | | | | | | | | | | | |
| Voltage: 1V ac/dc | Voltage: 60V | | | | | | | | | | | | | | |
| Current: 5 mA ac/dc | Current: 300 mA | | | | | | | | | | | | | | |
| Power: 5 mW (5 mVA) | Power: 7 W (7 VA) | | | | | | | | | | | | | | |
| | Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) | Maximum: NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250V ac/ 24V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250V ac/ 24V dc, 5A resistive B300, Q300 (UL508) | | | | | | | | | | | | | |
| | Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) | Maximum—IEC60947-5-1 NO Safety Contact: AC-1: 250V ac, 6A; DC-1: 24V dc, 6A AC-15: 230V ac, 3A; DC-13: 24V dc, 4A NC Auxiliary Contact: AC-1: 250V ac, 5A; DC-1: 24V dc, 5A AC-15: 230V ac, 2A; DC-13: 24V dc, 4A | | | | | | | | | | | | | |

SAFETY
CONTROLLERS
**SAFETY
MODULES**
E-STOP & GUARD
UNIVERSAL
SAFETY MAT
MUTING
SAFE SPEED
EXTENSION
INTERFACE

More on next page

| ES-...A-5A Safety Module Specifications (cont'd) | |
|--|---|
| Output Response Time | 35 milliseconds max. (25 milliseconds typical) |
| Input Requirements | E-stop switch must have normally closed contacts each capable of switching 20 to 50 mA @ 12 to 30V dc; and must be open \geq 15 milliseconds for a valid stop command Maximum input resistance 250 ohms per channel @ 24V dc supply voltage Maximum input resistance 25 ohms per channel @ 12V dc supply voltage Reset switch must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30V ac/dc |
| OFF-State Recovery Time | 350 milliseconds |
| Status Indicators | 3 green LEDs: Power ON Channel 1 Channel 2 1 red LED: Fault Condition |
| Construction | Polycarbonate housing |
| Environmental Rating | Rated NEMA 1; IEC IP20 |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better. |
| Vibration Resistance | 10 to 60Hz @ 0.35 mm displacement per UL 991 60 to 150 Hz @ 5 g max. |
| Operating Conditions | Temperature: 0° to +50° C (surrounding air) Relative humidity: 90% @ +50° C (non-condensing) |
| Design Standards | Cat. 4 PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061 |
| Certifications |    |
| Wiring Diagrams | 1-Channel: WD034 (p. 810) 2-Channel: WD037 (p. 811) |

| ES-TN-1H.. Safety Module Specifications | |
|---|--|
| Supply Voltage and Current | 24V dc, \pm 20% Power consumption: approx. 5 W |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity |
| Output Configuration | Outputs K1& K2: Two redundant (total of four) safety relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed Outputs K3 &K4: Two redundant (total of four) delayed relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed Contact ratings (all normally open and normally closed output contacts): Max. voltage: 250V ac or 250V dc Max. current: 4 A ac or dc Min. current: 30 mA @ 24V dc Max. power: 1000 VA, 200 W Mechanical life: 50,000,000 operations Electrical life: 100,000 at full resistive load NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts. |
| Output Response Time | K1 &K2: 50 milliseconds typical K3 &K4 (ES-TN-1H1): 0.25 second K3 &K4 (ES-TN-1H2): 0.5 second K3 &K4 (ES-TN-1H3): 1.0 second K3 &K4 (ES-TN-1H4): 2.0 seconds K3 & K4 (ES-TN-1H5): 0, 0.5, 1, 2, 4, 6, 8, 10, 15, 20 seconds K3 & K4 (ES-TN-1H6): 0, 5, 10, 20, 30, 50, 70, 100, 150, 200 seconds K3 &K4 (ES-TN-1H7): 4.0 seconds K3 &K4 (ES-TN-1H8): 6.0 seconds K3 &K4 (ES-TN-1H9): 8.0 seconds K3 &K4 (ES-TN-1H10): 10.0 seconds K3 &K4 (ES-TN-1H11): 15.0 seconds K3 &K4 (ES-TN-1H12): 20.0 seconds Delayed Output Timing Tolerance: Set time \pm 100 milliseconds or \pm 2%, whichever is greater |



| ES-TN-1H.. Safety Module Specifications (cont'd) | | | | | | | |
|--|---|----------|---|--------|----------------------|-------|----------------------------|
| Input Requirements | Input switch must have a normally closed contact capable of switching 20 mA @ 24V dc Reset switch must have one normally open contact capable of switching 20 mA @ 24V dc NOTE: Inputs must be voltage-free, dry contacts | | | | | | |
| ON-Time Delay | ≥ 100 milliseconds; time from the E-stop contacts to close (Auto Reset) or the Reset button to open (Manual Reset) and the safety outputs to close | | | | | | |
| Status Indicators | 6 green LEDs: <table style="display: inline-table; vertical-align: top; margin-right: 20px;"> <tr><td>Power</td><td>Monitor</td></tr> <tr><td>E-Stop</td><td>Out (K1 & K2 ON/OFF)</td></tr> <tr><td>Reset</td><td>Timed-Out (K3 & K4 ON/OFF)</td></tr> </table> 1 red LED: Fault | Power | Monitor | E-Stop | Out (K1 & K2 ON/OFF) | Reset | Timed-Out (K3 & K4 ON/OFF) |
| Power | Monitor | | | | | | |
| E-Stop | Out (K1 & K2 ON/OFF) | | | | | | |
| Reset | Timed-Out (K3 & K4 ON/OFF) | | | | | | |
| Construction | Polycarbonate housing | | | | | | |
| Environmental Rating | Rated NEMA 1; IP40, Terminals IP20, max. terminal torque 0.8 Nm | | | | | | |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better. | | | | | | |
| Vibration Resistance | 10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6 | | | | | | |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing) | | | | | | |
| Certifications | <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> </td> <td style="width: 50%; vertical-align: top;"> Important Notice: European Community Machinery Directive 2006/42/EC ES-TN-1H5/ - 1H6 Safety Modules comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these modules can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767. </td> </tr> </table> | | Important Notice: European Community Machinery Directive 2006/42/EC ES-TN-1H5/ - 1H6 Safety Modules comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these modules can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767. | | | | |
| | Important Notice: European Community Machinery Directive 2006/42/EC ES-TN-1H5/ - 1H6 Safety Modules comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these modules can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767. | | | | | | |
| Wiring Diagrams | 2-Channel: WD036 (p. 812) | | | | | | |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

| ES-TN-14H.. Safety Module Specifications | | | | | | | |
|--|---|-------|---------|--------|----------------------|-------|----------------------------|
| Supply Voltage and Current | 24V dc, ±20% Power consumption: approx. 5 W | | | | | | |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity | | | | | | |
| Output Configuration | Outputs K1 & K2: four redundant (total of eight) safety relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed Outputs K3 & K4: four redundant (total of eight) delayed relay (forced-guided) contacts – AgNi, gold flashed one auxiliary normally closed contact – AgNi, gold flashed Contact ratings (all normally open and normally closed output contacts): Max. voltage: 250V ac or dc Max. current: 4 A ac or dc Min. current: 30 mA @ 24V dc Max. power: 1000 VA, 200 W Mechanical life: 50,000,000 operations Electrical life: 100,000 at full resistive load NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts. | | | | | | |
| Output Response Time | K1 & K2: 50 milliseconds typical K3 & K4 (ES-TN-14H5): 0, 0.5, 1, 2, 4, 6, 8, 10, 15, 20 seconds K3 & K4 (ES-TN-14H6): 0, 5, 10, 20, 30, 50, 70, 100, 150, 200 seconds Delayed Output Timing Tolerance: Set time ±100 milliseconds or ±2%, whichever is greater | | | | | | |
| Input Requirements | Input switch must have a normally closed contact capable of switching 20 mA @ 24V dc Reset switch must have one normally open contact capable of switching 20 mA @ 24V dc NOTE: Inputs must be voltage-free, dry contacts | | | | | | |
| ON-Time Delay | ≥ 100 milliseconds; Time from the E-stop contacts to close (Auto Reset) or the Reset button to open (Manual Reset) and the safety outputs to close | | | | | | |
| Status Indicators | 6 green LEDs: <table style="display: inline-table; vertical-align: top; margin-right: 20px;"> <tr><td>Power</td><td>Monitor</td></tr> <tr><td>E-Stop</td><td>Out (K1 & K2 ON/OFF)</td></tr> <tr><td>Reset</td><td>Timed-Out (K3 & K4 ON/OFF)</td></tr> </table> 1 red LED: Fault | Power | Monitor | E-Stop | Out (K1 & K2 ON/OFF) | Reset | Timed-Out (K3 & K4 ON/OFF) |
| Power | Monitor | | | | | | |
| E-Stop | Out (K1 & K2 ON/OFF) | | | | | | |
| Reset | Timed-Out (K3 & K4 ON/OFF) | | | | | | |




- SAFETY CONTROLLERS
- SAFETY MODULES**
- E-STOP & GUARD
- UNIVERSAL
- SAFETY MAT
- MUTING
- SAFE SPEED
- EXTENSION
- INTERFACE



ES-TN-14H.. Safety Module Specifications (cont'd)

| | |
|----------------------|---|
| Construction | Polycarbonate housing |
| Environmental Rating | Rated NEMA 1; IP40, Terminals IP20, max. terminal torque 0.8 Nm |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 or IP54, or better. |
| Vibration Resistance | 10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6 |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing) |
| Wiring Diagrams | 2-Channel: WD037 (p. 813) |

ES-FA-6G Safety Module Specifications

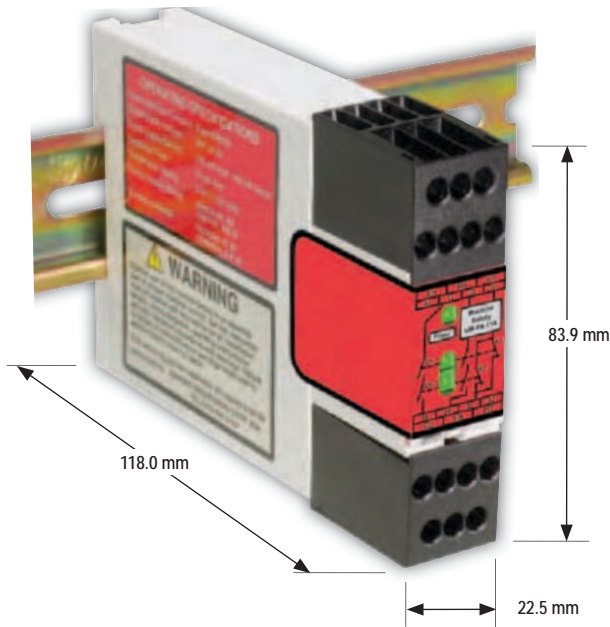
| | |
|-----------------------------|--|
| Supply Voltage and Current | 24V ac/dc, +/- 10%; 50/60Hz Power consumption: approx. 2 W/0.75 VA |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity |
| Output Configuration | Outputs (K1 & K2): three redundant (total of six) safety relay (forced-guided) contacts – AgSnO ₂ one auxiliary non-safety monitor output (open when both K1 and K2 are energized; closed when either K1 or K2 are de-energized) Contact ratings: Max. voltage: 250V ac or 250V dc Max. current: 6 A ac or dc Min. current: 30 mA @ 10V dc Max. power: 1500 VA, 150 W Mechanical life: 10,000,000 operations Electrical life: 100,000 at full resistive load NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts. |
| Output Response Time | 35 milliseconds typical |
| Input Requirements | Input switch must have a normally closed contact capable of switching 40 to 100 mA @ 13 to 27V ac/dc Reset switch must have one normally open contact capable of switching 20 to 30 mA @ 13 to 27V ac/dc |
| Status Indicators | 3 green LEDs: Power ON K1 energized K2 energized |
| Construction | Polycarbonate |
| Environmental Rating | Rated NEMA 1; IP40, Terminals IP20 |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better. |
| Vibration Resistance | 10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6 |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing) |
| Certifications |    <p>Important Notice: European Community Machinery Directive 2006/42/EC The ES-FA-6G Safety Module complies with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, this Safety Module can only be installed as replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.</p> |
| Wiring Diagrams | 1-Channel: WD038 (p. 814) |



Universal Input Safety Modules

- Modules monitor one or two solid-state PNP outputs or relay contact outputs from safety or non-safety devices, such as sensors, safety light screens, or one or two electromechanical contacts
- Category 2, 3 or 4 hookup of input devices is possible
- Module offers two reset options: Automatic and Monitored Manual
- Modules are an excellent choice for monitoring safety devices without external device monitoring (EDM) function
- Module goes into lockout mode if fault is detected
- Models are available with 3 normally open safety contacts, or 2 normally open safety and 1 normally closed auxiliary contact
- Output contacts are rated 6 or 7 amps, depending on model
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
- Modules are rated NEMA 1 and IP20
- Module can be configured to monitor single or dual channel input devices using DIP switches under removable terminals

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control



UM-FA-..A Models

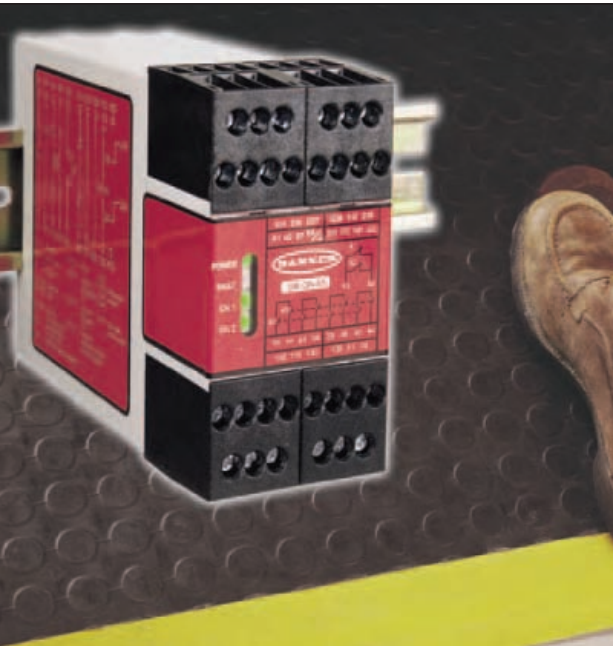


- SAFETY CONTROLLERS
- SAFETY MODULES**
- E-STOP & GUARD
- UNIVERSAL
- SAFETY MAT
- MUTING
- SAFE SPEED
- EXTENSION
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Universal Safety Input Modules

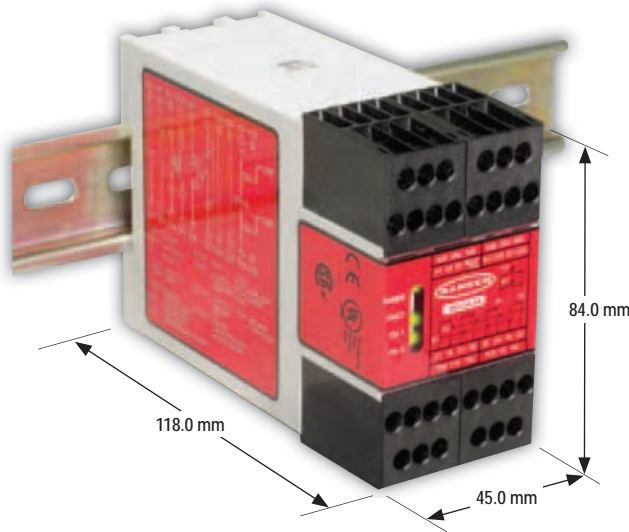
| Functional Stop Category | Supply Voltage | Inputs | Safety Outputs | Aux. Output | Output Rating | Output Response Time | Model |
|--------------------------|----------------|------------------------------|----------------|-------------|---------------|----------------------|-----------|
| 0 | 24V ac/dc | 1 NC (single) or 2 NC (dual) | 3 NO | - | 6 amps | 25 ms | UM-FA-9A |
| | | | 2 NO | 1 NC | 7 amps | | UM-FA-11A |

NC = Normally Closed Relay, NO = Normally Open Relay



Safety Mat Monitoring Modules

- Module monitors a single mat or a series of connected mats
- Module is for use with standard 4-wire safety mat or edge triggered by a short in a contact plate or strip
- Available voltages include 115V ac or 12-24V dc, and 230V ac or 12-24V dc
- Output contacts are rated 6 A
- Modules include non-safety auxiliary outputs
- Reset options are Automatic or Monitored Manual
- Housings are rugged polycarbonate and mount to standard 35 mm DIN rail
- Ratings are NEMA 1 and IP20
- LED indicators show power on, output and fault



SM...A-5A Models



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control










- SAFETY CONTROLLERS
- SAFETY MODULES**
- E-STOP & GUARD
- UNIVERSAL
- SAFETY MAT**
- MUTING
- SAFE SPEED
- EXTENSION
- INTERFACE

Safety Mat Monitoring Modules




| Supply Voltage | Inputs | Safety Outputs | Aux. Outputs | Output Rating | Output Response Time | Model |
|---------------------|---|----------------|--------------|---------------|----------------------|----------|
| 115V ac & 12-24V dc | 1 (or multiple in series) 4-wire Safety Mat | 4 NO | 1 NC & 2 PNP | 6 amps | 50 ms | SM-GA-5A |
| 230V ac & 12-24V dc | | | | | | SM-HA-5A |

NC = Normally Closed Relay, NO = Normally Open Relay

Safety Mat Monitoring Module Specifications

| | | | | | | | | | | | | | | | |
|---|--|--|-----------------|-------------------|--------------|---------------------|-----------------|---------------------|-------------------|---|---|--|---|---|--|
| Supply Voltage and Current | <p>AI-A2: 115V ac (model SM-GA-SA) or 230V ac (model SM-HA-5A) $\pm 15\%$, 50/60Hz BI-B2: 11V dc – 27.6V dc</p> <p>Power consumption: approx. 4W/7VA</p> <p>The Safety Module should be connected only to a SELV (safety extra-low voltage, for circuits without earth ground) or a PELV (protected extra-low voltage, for circuits with earth ground) power supply, according to EN IEC 60950, NEC Class 2</p> | | | | | | | | | | | | | | |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity | | | | | | | | | | | | | | |
| Overvoltage Category | <p>Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category III, if appropriate overvoltage reduction is provided, as described in data sheet</p> | | | | | | | | | | | | | | |
| Pollution Degree | 2 | | | | | | | | | | | | | | |
| Output Configuration | <p>4 normally open (NO) output channels; 1 normally closed (NC) and 2 solid-state auxiliary outputs</p> <p>Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed Aux. output channel is a parallel connection of contacts from two forced-guided relays, K1-K2.</p> <p>Contacts: AgNi, 5 μm gold-plated</p> <p>Low Current Rating: The 5 μm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). To preserve the gold plating on the contacts, the following max. values should not be exceeded at any time:</p> <table style="margin-left: 40px;"> <tr> <td style="padding-right: 20px;">Minimum:</td> <td>Maximum:</td> </tr> <tr> <td>Voltage: 1V ac/dc</td> <td>Voltage: 60V</td> </tr> <tr> <td>Current: 5 mA ac/dc</td> <td>Current: 300 mA</td> </tr> <tr> <td>Power: 5 mW (5 mVA)</td> <td>Power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) change to:</p> <table border="1" style="margin-left: 40px; width: 100%;"> <tr> <td style="width: 30%; text-align: center;">   </td> <td style="width: 35%;"> Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) </td> <td style="width: 35%;"> Maximum: NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250V ac/ 24V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250V ac/ 24V dc, 5A resistive B300, Q300 (UL508) </td> </tr> <tr> <td style="text-align: center;">  </td> <td> Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) </td> <td> Maximum—IEC60947-5-1 NO Safety Contact: AC-1: 250V ac, 6A; DC-1: 24V dc, 6A AC-15: 230V ac, 3A; DC-13: 24V dc, 4A NC Auxiliary Contact: AC-1: 250V ac, 5A; DC-1: 24V dc, 5A AC-15: 230V ac, 2A; DC-13: 24V dc, 4A </td> </tr> </table> <p>Mechanical life: >20,000,000 operations Electrical life: 150,000 cycles @ 1500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p> <p>Solid-State Monitor Outputs:</p> <ul style="list-style-type: none"> - Two non-safety solid-state dc outputs - Output at Y32 monitors state of outputs – conducts (output high) when both K1 and K2 are energized - Output at Y35 conducts (output high) when in normal operation (no lockout) - Output circuits require application of +12-24V dc $\pm 15\%$ at terminal Y31; dc common at Y30 - Maximum switching current: 100 mA at +12-24V dc - Both outputs are protected against short circuits | Minimum: | Maximum: | Voltage: 1V ac/dc | Voltage: 60V | Current: 5 mA ac/dc | Current: 300 mA | Power: 5 mW (5 mVA) | Power: 7 W (7 VA) |   | Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) | Maximum: NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250V ac/ 24V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250V ac/ 24V dc, 5A resistive B300, Q300 (UL508) |  | Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) | Maximum—IEC60947-5-1 NO Safety Contact: AC-1: 250V ac, 6A; DC-1: 24V dc, 6A AC-15: 230V ac, 3A; DC-13: 24V dc, 4A NC Auxiliary Contact: AC-1: 250V ac, 5A; DC-1: 24V dc, 5A AC-15: 230V ac, 2A; DC-13: 24V dc, 4A |
| Minimum: | Maximum: | | | | | | | | | | | | | | |
| Voltage: 1V ac/dc | Voltage: 60V | | | | | | | | | | | | | | |
| Current: 5 mA ac/dc | Current: 300 mA | | | | | | | | | | | | | | |
| Power: 5 mW (5 mVA) | Power: 7 W (7 VA) | | | | | | | | | | | | | | |
|   | Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) | Maximum: NO Safety Contacts (13-14, 23-24, 33-34, 43-44): 250V ac/ 24V dc, 6A resistive B300, Q300 (UL508) NC Auxiliary Contact (51-52): 250V ac/ 24V dc, 5A resistive B300, Q300 (UL508) | | | | | | | | | | | | | |
|  | Minimum: Voltage: 15V ac/dc Current: 250 mA ac/dc Power: 5 W (5 VA) | Maximum—IEC60947-5-1 NO Safety Contact: AC-1: 250V ac, 6A; DC-1: 24V dc, 6A AC-15: 230V ac, 3A; DC-13: 24V dc, 4A NC Auxiliary Contact: AC-1: 250V ac, 5A; DC-1: 24V dc, 5A AC-15: 230V ac, 2A; DC-13: 24V dc, 4A | | | | | | | | | | | | | |
| Output Response Time | 35 milliseconds max, 25 milliseconds typical | | | | | | | | | | | | | | |
| Input Requirements | <p>Safety mat normally open contact must be capable of switching 20 to 100 mA @ 12 to 30V dc; and must be closed ≥ 25 ms for a valid stop command</p> <p>115/230V ac or 24V dc: Maximum input resistance 250 ohms per lead; maximum contact resistance: 150 ohms 12V dc Supply: Maximum input resistance 25 ohms; maximum contact resistance: 10 ohms Reset switch: must have one normally open contact capable of switching 20 to 50 mA @ 12 to 30V dc</p> | | | | | | | | | | | | | | |
| OFF-State Recovery Time | 350 ms max. | | | | | | | | | | | | | | |

Safety Mat Monitoring Module Specifications (cont'd)

| | |
|----------------------|---|
| Status Indicators | 3 green LED indicators: Power ON, Channel 1 (high side), Channel 2 (low side) 1 red LED indicator: indicates a fault condition |
| Construction | Polycarbonate housing |
| Environmental Rating | Rated NEMA 1; IEC IP20 |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54) or better. |
| Vibration Resistance | 10 to 60 Hz @ 0.35 mm displacement per UL 991 60 to 150 Hz @ 5 g max. |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing) |
| Design Standards | Cat. 4, PL e per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061 |
| Certifications |    |
| Wiring Diagrams | 4-Wire Safety Mat: WD043 (p. 819) |

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- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- SAFETY CONTROLLERS
- SAFETY MODULES**
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Muting Modules and Dual Controllers

- Suspends safeguarding during non-hazardous times in the machine's cycle
- Allows material to move into or from the process, without tripping the muted safeguard
- Monitors hard-relay contact or PNP output safety devices
- Includes one non-safety auxiliary output
- Available in models for Type 4 (Category 4) applications
- Offers two reset options: Automatic and Monitored Manual
- Uses diverse redundancy and self-checking for control reliability
- Installs easily with DIN-rail mounting
- Connects to supplemental safeguarding devices or E-stops
- Can be used as a Dual Controller for safety devices, such as two Safety Light Screens, regardless of whether or not the muting function is used



MMD-TA-11B & MMD-TA-12B Muting Modules
(MMD-TA-12B shown)



Muting Modules

| Safety Category | Input Device | Supply Voltage | Inputs | Safety Outputs | Aux. Outputs | Output Rating | Output Response Time | Model |
|-----------------|--------------------------|----------------|--|----------------|--------------|---------------|----------------------|------------|
| 2, 3 or 4 | Mechanical & Solid State | 24V dc | 2 NC Muteable (dual) & 2 NC SSI (dual) | 2 PNP OSSD | 1 PNP | 0.5 amps | 10 ms | MMD-TA-12B |
| | | | | 2 NO | 1 NC | 6 amps | 20 ms | MMD-TA-11B |

NC = Normally Closed Relay, NO = Normally Open Relay

MMD-TA-12B & MMD-TA-11B Muting Modules Specifications

| | | | | | | | | | | | | | |
|-------------------------------------|--|------------------------|-------------------|--------------------------|----------------------|--------------------------|------------------------|-------------------------|--------------------------|---------------------------|-------------------|------------------------------|----------------------------|
| System Power Requirements | MMD-TA-11B: +24V dc $\pm 15\%$ @ 300 mA max (SELV/PELV) MMD-TA-12B: +24V dc $\pm 15\%$ @ 250 mA max (SELV/PELV) (not including draw of the MSSSI power, AUX, ML, M1-M4 and OSSD connections) The external voltage supply must be capable of buffering brief mains interruptions of 20 milliseconds, as specified in IEC/EN 60204-1 | | | | | | | | | | | | |
| Overvoltage Category | III (IEC 60664-1) | | | | | | | | | | | | |
| Pollution Degree | 2 | | | | | | | | | | | | |
| Supply Protection Circuitry | All inputs and outputs are protected from short circuit to +24V dc or dc common | | | | | | | | | | | | |
| Response Time (MSSI and SSI) | MMD-TA-12B: (solid-state output) 20 milliseconds max. MMD-TA-11B: (relay output) 10 milliseconds max. | | | | | | | | | | | | |
| Safety Outputs | <p>MMD-TA-11B: 2 normally open contact output channels and 1 normally closed auxiliary contact output channel: Each normally open output channel is a series connection of contacts from two forced-guided (positive-guided) relays, K1-K2. The normally closed AUX contact (non-safety) 31-32 is a parallel connection of contacts from K1-K2.</p> <p>Contacts: AgNi, 5 μm gold-plated</p> <p>Low Current Rating: Caution: The 5 μm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching "). To preserve the gold plating on the contacts and also guarantee reliable switching, the following values should be kept within the min. and max. ranges shown below.</p> <table style="margin-left: 40px; border: none;"> <tr> <td>Min. voltage: 1V ac/dc</td> <td>Max. voltage: 60V</td> </tr> <tr> <td>Min. current: 5 mA ac/dc</td> <td>Max. current: 300 mA</td> </tr> <tr> <td>Min. power: 5 mW (5 mVA)</td> <td>Max. power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table style="margin-left: 40px; border: none;"> <tr> <td>Min. voltage: 15V ac/dc</td> <td>Max. voltage: 120V ac/dc</td> </tr> <tr> <td>Min. current: 30 mA ac/dc</td> <td>Max. current: 6 A</td> </tr> <tr> <td>Min. power: 0.45 W (0.45 VA)</td> <td>Max. power: 160 W (720 VA)</td> </tr> </table> <p>Mechanical life: 50,000,000 operations Electrical life: 120,000 operations (typical at 144 W/[1380 VA] switched power, resistive load)</p> <p>NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts</p> <p>MMD-TA-12B: Two diverse-redundant solid-state safety outputs: 24V dc, 0.5 A sourcing OSSD (output signal switching device)</p> <ul style="list-style-type: none"> ON-State voltage: $\geq V$ in-1.5V dc OFF-State voltage: 1.2V dc max. (0-1 2V dc) Max. load capacitance: 0.1 μF Max. load inductance: 10 H Leakage current: 0.50 mA max. Cable resistance: 10 Ω max. OSSD test pulse width: < 100 microseconds OSSD test pulse period: > 100 milliseconds Switching current: 0-0.5 A | Min. voltage: 1V ac/dc | Max. voltage: 60V | Min. current: 5 mA ac/dc | Max. current: 300 mA | Min. power: 5 mW (5 mVA) | Max. power: 7 W (7 VA) | Min. voltage: 15V ac/dc | Max. voltage: 120V ac/dc | Min. current: 30 mA ac/dc | Max. current: 6 A | Min. power: 0.45 W (0.45 VA) | Max. power: 160 W (720 VA) |
| Min. voltage: 1V ac/dc | Max. voltage: 60V | | | | | | | | | | | | |
| Min. current: 5 mA ac/dc | Max. current: 300 mA | | | | | | | | | | | | |
| Min. power: 5 mW (5 mVA) | Max. power: 7 W (7 VA) | | | | | | | | | | | | |
| Min. voltage: 15V ac/dc | Max. voltage: 120V ac/dc | | | | | | | | | | | | |
| Min. current: 30 mA ac/dc | Max. current: 6 A | | | | | | | | | | | | |
| Min. power: 0.45 W (0.45 VA) | Max. power: 160 W (720 VA) | | | | | | | | | | | | |

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MMD-TA-12B & MMD-TA-11B Muting Modules Specifications (cont'd)

| | | | | | | | | | | | | | |
|----------------------------------|--|------------------------|-------------------------|--------------------------|----------------------------|--------------------------|------------------------|-------------------------|--------------------------|---------------------------|-------------------|------------------------------|--------------------------|
| Non-Safety Outputs | <p>Model MMD-TA-11B: Aux. output 31–32 is a parallel connection of two N.C. contacts from internal relays K1 and K2 Contact: AgNi, 5 µm gold-plated Low Current Rating: Caution: The 5 µm gold-plated contacts allow the switching of low current/low voltage. To preserve the gold plating on the contacts and also guarantee reliable switching, the following values should be kept within the min. and max. ranges shown below:</p> <table style="width: 100%; border: none;"> <tr> <td style="padding: 2px;">Min. Voltage: 1V ac/dc</td> <td style="padding: 2px;">Max. Voltage: 24V ac/dc</td> </tr> <tr> <td style="padding: 2px;">Min. Current: 5 mA ac/dc</td> <td style="padding: 2px;">Max. Current: 250 mA ac/dc</td> </tr> <tr> <td style="padding: 2px;">Min. Power: 5 mW (5 mVA)</td> <td style="padding: 2px;">Max. Power: 6 W (6 VA)</td> </tr> </table> <p>High Current Rating: For higher loads, the min. and max. values of the contact(s) changes to:</p> <table style="width: 100%; border: none;"> <tr> <td style="padding: 2px;">Min. Voltage: 15V ac/dc</td> <td style="padding: 2px;">Max. Voltage: 120V ac/dc</td> </tr> <tr> <td style="padding: 2px;">Min. Current: 30 mA ac/dc</td> <td style="padding: 2px;">Max. Current: 6 A</td> </tr> <tr> <td style="padding: 2px;">Min. Power: 0.45 W (0.45 VA)</td> <td style="padding: 2px;">Max. Power: 160 W/720 VA</td> </tr> </table> <p>Mechanical Life: 50,000,000 operations Electrical Life: >10 x 10⁶ cycles</p> <p>Model MMD-TA-12B: Z4–Z3 = Aux. 24V / 250 mA PNP output follows the two OSSD safety outputs</p> | Min. Voltage: 1V ac/dc | Max. Voltage: 24V ac/dc | Min. Current: 5 mA ac/dc | Max. Current: 250 mA ac/dc | Min. Power: 5 mW (5 mVA) | Max. Power: 6 W (6 VA) | Min. Voltage: 15V ac/dc | Max. Voltage: 120V ac/dc | Min. Current: 30 mA ac/dc | Max. Current: 6 A | Min. Power: 0.45 W (0.45 VA) | Max. Power: 160 W/720 VA |
| Min. Voltage: 1V ac/dc | Max. Voltage: 24V ac/dc | | | | | | | | | | | | |
| Min. Current: 5 mA ac/dc | Max. Current: 250 mA ac/dc | | | | | | | | | | | | |
| Min. Power: 5 mW (5 mVA) | Max. Power: 6 W (6 VA) | | | | | | | | | | | | |
| Min. Voltage: 15V ac/dc | Max. Voltage: 120V ac/dc | | | | | | | | | | | | |
| Min. Current: 30 mA ac/dc | Max. Current: 6 A | | | | | | | | | | | | |
| Min. Power: 0.45 W (0.45 VA) | Max. Power: 160 W/720 VA | | | | | | | | | | | | |
| Status Indicators | 3 Status LEDs (Red, Green and Yellow): indicate waiting for Reset, Lockout, Override, and OSSD status Yellow and Green LEDs adjacent to individual inputs/interfaces indicate status (ON = active/closed) | | | | | | | | | | | | |
| Diagnostic Code Display | Diagnostic Display is a two-digit numeric display that indicates the cause of lockout conditions and the amount of time remaining for the backdoor timer | | | | | | | | | | | | |
| Muting Lamp Output | A monitored or non-monitored (selectable) sinking output. If monitoring has been selected, the current draw must be 10 to 360 mA. Interconnect wire resistance < 30 Ω. Max. switching voltage: 30V dc Max. switching current: 360 mA Min. switching current: 10 mA Saturation voltage: ≤ 1.5V dc @ 10 mA; ≤ 5V dc @ 360 mA | | | | | | | | | | | | |
| Controls and Adjustments | All configured on two redundant banks of DIP switches: Manual/auto reset One-way/two-way muting Monitored/non-monitored mute lamp output One-channel/two-channel/no EDM Backdoor timer Mute on power-up enable | | | | | | | | | | | | |
| Inputs | The MSSI and the SSI can be interfaced with external safety devices that have either hard contact outputs or solid-state sourcing outputs When connecting the MSSI (S11-S12, S21-S22) or SSI (X5-X6, X7-X8) inputs to safety relay outputs or hard contacts, these contacts must be capable of switching 15 to 30 V dc at 10-50 mA Operating Range for MSSI and SSI Inputs OFF State: -3V to +5V, 0 to 2 mA ON State: 15-30V, 10-50 mA Muteable Safety Stop Interface (MSSI) This input consists of two channels (MSSI-A and MSSI-B), and can be muted when the requirements for a mute cycle have been met. When muted, the OSSDs remain ON, independent of the MSSI status. If not muted, when either or both channels open, the OSSD outputs will go OFF. <i>Maximum external resistance per channel must not exceed 400 Ω.</i> Safety Stop Interface (SSI) This input consists of two channels (SSI-A and SSI-B), and is always active. When one or both channels open, the OSSD Outputs will go OFF. <i>Maximum external resistance per channel must not exceed 400 Ω.</i> | | | | | | | | | | | | |
| External Device Monitoring (EDM) | Two pairs of terminals are provided to monitor the state of external devices controlled by the OSSD outputs. Each device must be capable of switching 15-30V dc at 10-50 mA. | | | | | | | | | | | | |
| Muting Device Inputs | The muting devices work in pairs (M1 and M2, M3 and M4) and are required to be “closed” within 3 seconds of each other (simultaneity requirement/synchronous actuation) to initiate a mute (assuming all other conditions are met). Each muting device must be capable of switching 15-30V dc at 10-50 mA. | | | | | | | | | | | | |
| Mute Enable Input | The mute enable input must have +24V dc applied in order to start a mute; opening this input after mute has begun has no effect. The switching device must be capable of switching 15-30V dc at 10-50 mA. | | | | | | | | | | | | |



More on next page

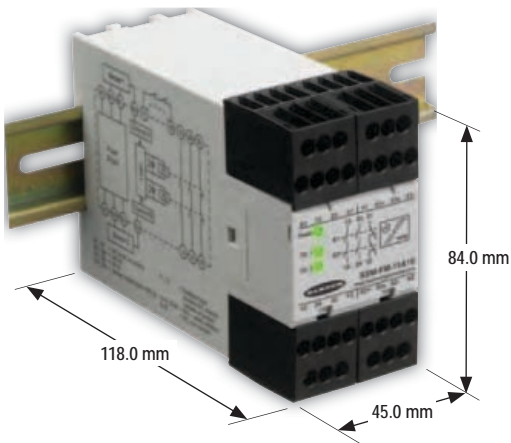
| MMD-TA-12B & MMD-TA-11B Muting Modules Specifications (cont'd) | |
|--|--|
| Override Inputs | The two-channel inputs must be closed within 3 seconds of each other (simultaneity/synchronous action requirement) and held closed during the 30-second Override. To initiate a subsequent Override, open both channels, wait 3 seconds, and then re-close both channels (within 3 seconds). The switching devices must be capable of switching 15-30V dc at 10-50 mA. |
| Reset Input | Terminals must be closed for a minimum of 0.25 seconds and not more than 2.0 seconds in order to guarantee a reset. The switching device must be capable of switching 15-30V dc at 10-50 mA. |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better. |
| Vibration Resistance | 10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6 |
| Construction | Polycarbonate housing |
| Connections | Removable terminal blocks |
| Environmental Rating | NEMA 1; IP20 |
| Operating Conditions | Temperature range: 0° to +50° C Relative humidity: 95% (non-condensing) |
| Design Standards | Designed to comply with Safety Category 4 per SIL 3 (IEC 61508); SIL CL3 (IEC 62061); Category 4, Performance Level (PL) e (ISO 13849-1) |
| Certifications |   |
| Wiring Diagrams | MMD-TA-12B: WD045, WD048, WD049 (pp. 820-824) MMD-TA-11B: WD047 (p. 822) |

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Safe Speed Monitoring Safety Modules

- Monitors redundant devices, such as two sensors with PNP outputs, for rotation and linear movements.
- Allows locked gates or guards to be opened when speed drops below the dangerous speed
- Provides two normally open safety contacts and one normally closed auxiliary contact, each rated at 4 amps
- Offers choice of two models with adjustable RPM ranges
- Rated NEMA 1 and at least IP20
- Constructed of rugged polycarbonate with removable terminal blocks
- Mounts to standard 35 mm DIN rail



SSM-FM-11A... Models



SSM Safe Speed Monitoring Modules

| Functional Stop Category | Supply Voltage | Inputs | Safety Outputs | Aux. Outputs | Ranges (lpm) | Output Rating | Model |
|--------------------------|----------------|--------|----------------|--------------|--|---------------|--------------|
| 0 | 24V ac/dc | 2 PNP | 2 NO | 1 NC | 5 - 40, 35 - 340, 300 - 2700, 1200 - 10500 | 4 amps | SSM-FM-11A10 |
| | | | | | 10 - 80, 80 - 650, 600 - 5300, 2400 - 20000 | | SSM-FM-11A20 |

NC = Normally Closed Relay, NO = Normally Open Relay

SSM Safe Speed Monitoring Module Specifications

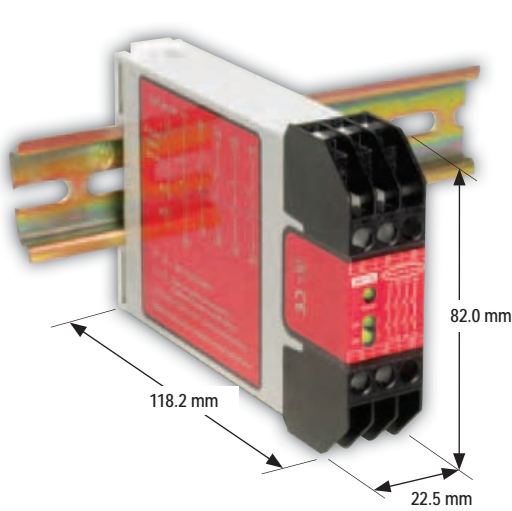
| | | | | | | | |
|---|--|-------------------------|--------------------------|---------------------------|-------------------|------------------------------|----------------------------|
| Supply Voltage and Current | <p>24V ac/dc, 50-60 Hz, no polarity</p> <p>AC: 24V +10% / -15% DC: 24V ±10%</p> <p>Power consumption: approx. 4 VA/2.5 W</p> | | | | | | |
| Start-up Reset Time | 1.5 second | | | | | | |
| Hysteresis | 6% typical | | | | | | |
| Input Requirements | <p>PNP-Input sensors: 24V dc (terminals S1s and S2s)</p> <p>Input current min.: 3 mA Input current max.: 25 mA</p> <p>Min. pulse time: 1 millisecond ON; 1 millisecond OFF</p> | | | | | | |
| Max. IPM at Inputs S1s and S2s | 30,000 | | | | | | |
| Adjustable Setting Ranges (Impulses per Minute) | <p>SSM-FM-11A10: 5...40 ipm, 35...340 ipm, 300...2,700 ipm or 1,200...10,500 ipm</p> <p>SSM-FM-11A20: 10...80 ipm, 80...650 ipm, 600...5,300 ipm or 2,400...20,000 ipm</p> | | | | | | |
| Output Response Time | <p>Standstill / Under-speed detection: (60 seconds/adjusted IPM value) + 2.5 seconds = tDS tDS = output ON-delay after detection of standstill</p> <p>Over-speed detection: SSM-FM-11A10: Range 5...10,500: tR = 700 milliseconds typical SSM-FM-11A20: Range 10...20,000: tR = 350 milliseconds typical</p> | | | | | | |
| Output Configuration | <p>Outputs K1 & K2: two redundant (total of four) safety relay NO (forced-guided) contacts—AgNi, gold flashed; one auxiliary NC contact—AgNi, gold flashed</p> <p>Contact ratings (all NO and NC output contacts): 2 normally open (NO) output channels and 1 normally closed (NC) auxiliary output</p> <p>Current Rating: Thermal Current Ith: 4 A Switching Capacity to AC 15: 3 A / 230V ac for NO contacts (per IEC/EN 60947-5-1) 2 A / 230V ac for NC contact (per IEC/EN 60947-5-1)</p> <table style="width: 100%; border: none;"> <tr> <td>Min. voltage: 15V ac/dc</td> <td>Max. voltage: 230V ac/dc</td> </tr> <tr> <td>Min. current: 30 mA ac/dc</td> <td>Max. current: 4 A</td> </tr> <tr> <td>Min. power: 0.45 W (0.45 VA)</td> <td>Max. power: 100 W (920 VA)</td> </tr> </table> <p>Mechanical Life: ≥50,000,000 operations Electrical life (switching cycles of the output contacts, resistive load): 350,000 cycles @ 920 VA; 1,000,000 cycles @ 440 VA; 2,000,000 cycles @ 250 VA; 5,000,000 cycles @ 125 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressor across load. Never install suppressor across output contacts.</p> | Min. voltage: 15V ac/dc | Max. voltage: 230V ac/dc | Min. current: 30 mA ac/dc | Max. current: 4 A | Min. power: 0.45 W (0.45 VA) | Max. power: 100 W (920 VA) |
| Min. voltage: 15V ac/dc | Max. voltage: 230V ac/dc | | | | | | |
| Min. current: 30 mA ac/dc | Max. current: 4 A | | | | | | |
| Min. power: 0.45 W (0.45 VA) | Max. power: 100 W (920 VA) | | | | | | |
| Indicators | 3 green LED indicators: Power On, Channel 1 active, and Channel 2 active | | | | | | |
| Construction | Polycarbonate housing | | | | | | |
| Environmental Rating | Rated NEMA 1; IEC IP20 (IEC/EN 60529) | | | | | | |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IEC IP54) or better. | | | | | | |
| Vibration Resistance | 10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6 | | | | | | |
| Operating Conditions | <p>Temperature: 0° to 50° C</p> <p>Max. Rel. Humidity: 90% @ +50° C (non-condensing)</p> | | | | | | |
| Design Standards | Cat. 3 PL e per DIN EN ISO 13849-1; SIL CL 3 per IEC 62061 | | | | | | |
| Certifications | <p>Approvals are pending</p> <p>This module was evaluated by UL to UL508 Industrial Control Equipment, which is not a certification relating to the safety performance of the module</p> | | | | | | |
| Wiring Diagrams | WD050 (p. 824) | | | | | | |

- Photoelectrics Sensors
- Fiber Optic Sensors
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- Measurement & Inspection Sensors
- Vision
- Wireless
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- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

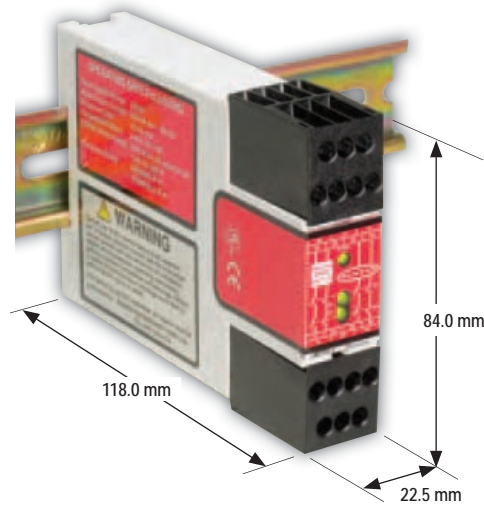
- SAFETY CONTROLLERS
- SAFETY MODULES**
- E-STOP & GUARD
- UNIVERSAL SAFETY MAT
- MUTING
- SAFE SPEED**
- EXTENSION INTERFACE

Extension Relay Modules

- Provides additional safety outputs for a primary safety device with relay outputs
- Offers four safety output channels
- Provides delayed or immediate outputs, depending on model
- Requires no adjustments
- If malfunctioning, signals primary safety device to react
- Responds in less than 35 milliseconds
- Mounts on DIN rail



EM-F.-7G Models




EM-T-7A Models



Extension Modules

| Supply Voltage | Inputs | Safety Outputs | Output Rating | Aux. Outputs | Output Response Time | Delay | Model |
|----------------|------------------------------|----------------|---------------|--------------|----------------------|-----------|-----------|
| 24V dc | 1 NC (single) or 2 NC (dual) | 4 NO | 6 amps | — | 20 ms | — | EM-T-7A |
| 24V ac/dc | 1 NC (single) | 4 NO | | | 35 ms | — | EM-F-7G |
| 24V ac/dc | 1 NC (single) | 4 NO w/delay | | | 30 ms | 0.5 sec. | EM-FD-7G2 |
| | | | | | | 1.0 sec. | EM-FD-7G3 |
| | | | | | 2.0 sec. | EM-FD-7G4 | |

NC = Normally Closed Relay, NO = Normally Open Relay

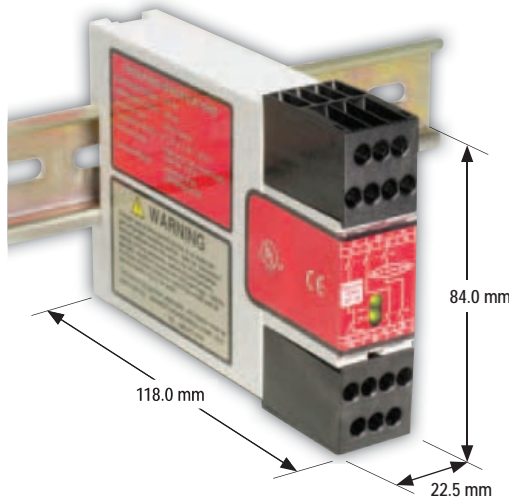
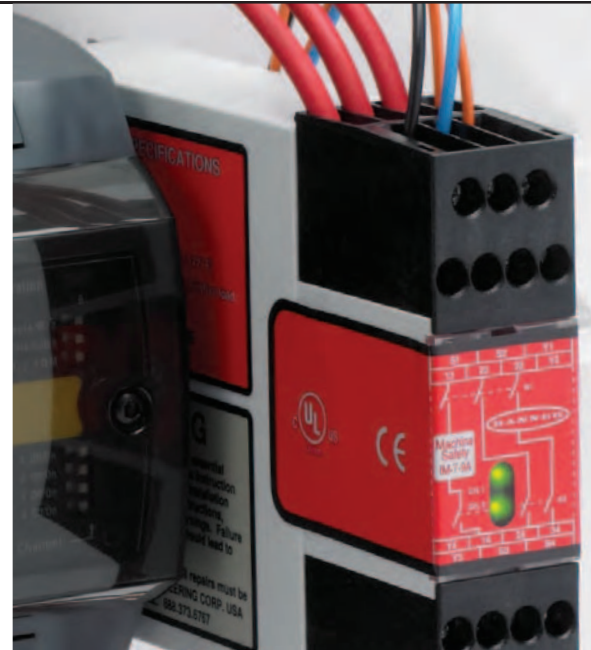
| Extension Module Specifications | |
|---------------------------------|---|
| Supply Voltage and Current | EM-T-7A model: A1-A2: 24V dc, +/-15%, 10% max. ripple EM-F/FD-7G.. models: A1-A2: 24V ac/dc, +/-10%, 10% max. ripple on dc |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity |
| Output Configuration | Four output channels: EM-T-7A: Each channel is a series connection of two forced-guided (positive-guided) relay contacts – AgNi, gold flashed EM-F/FD-7G..: Each channel is a series connection of two forced-guided (positive-guided) relay contacts – AgSnO ₂ Contact ratings: Max. voltage: 250V ac/dc Max. current: 6 A ac/dc Min. current: 30 mA @ 24V dc Max. power: 1500 VA, 200 W Mechanical life: EM-T-7A model: 50,000,000 operations EM-F/FD-7G.. models: 10,000,000 operations Electrical life: 100,000 at full resistive load Feedback contact rating (Y1-Y2): EM-T-7A: 24V dc @ 0.5A EM-F/FD-7G..: 250V ac/dc @ 3A NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts. |
| Output Response Time | EM-T-7A: 20 milliseconds max. (if channel u-k fails, maximum response time is 200 milliseconds) EM-F-7G: 35 milliseconds typical EM-FD-7G..: Delay OFF: 0.5 seconds ±30% for EM-FD-7G2, 1 seconds ±30% for EM-FD-7G3, 2 seconds ±30% for EM-FD-7G4, as measured from the time when the supply voltage to A1 is interrupted Delay ON: 30 milliseconds for all models |
| Input Requirements | EM-T-7A: Inputs from Primary Safety Device must each be capable of switching 30 to 250 mA @ 13 to 28V dc EM-F/FD-7G..: Input from Primary Safety Device must be capable of switching 40 to 100 mA @ 13 to 27V ac/dc |
| Status Indicators | 3 green LEDs: Power ON K1 energized K2 energized |
| Construction | Polycarbonate housing |
| Environmental Rating | Rated NEMA 1; IP20 |
| Mounting | Mounts to standard 35 mm DIN rail track. Extension Module must be installed inside an enclosure rated NEMA 3 (IP54), or better. |
| Vibration Resistance | 10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6 |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing) |
| Design standards | Designed to comply with EN 292-1, ISO 12100-1, EN 292-2, ISO 12100-2, EN 954-1, EN 20604-1, EN 60335-1 |
| Certifications |  EMERGENCY STOP DEVICE 29YL LISTED |
| Wiring Diagrams | EM-T-7A 1-Channel EDM: WD051 (p. 825) EM-F-7G: WD053 (p. 826) EM-T-7A 2-Channel EDM: WD052 (p. 825) EM-FD-7G: WD054 (p. 826) |

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- Vision
- Wireless
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- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- SAFETY CONTROLLERS
- SAFETY MODULES**
- E-STOP & GUARD
- UNIVERSAL
- SAFETY MAT
- MUTING
- SAFE SPEED
- EXTENSION
- INTERFACE

Interface Relay Modules

- Increases the switching current capacity of low-voltage primary safety devices to 6 amps
- Serves as a relay for primary safety devices with OSSD solid-state or hard contact outputs and external device monitoring, such as the EZ-SCREEN®
- Uses two green LEDs to indicate the output status of internal relays K1 and K2
- Responds in 20 milliseconds maximum
- Mounts on DIN rail



Interface Models



Interface Modules

| Supply Voltage | Inputs | Safety Outputs | Aux. Outputs | Output Rating | Output Response Time | Models |
|----------------|-------------|----------------|--------------|---------------|----------------------|----------|
| 24V dc | 2 NC (dual) | 3 NO | — | 6 amps | 20 ms | IM-T-9A |
| | | 2 NO | 1 NC | | | IM-T-11A |

NC = Normally Closed Relay, NO = Normally Open Relay

| Interface Modules Specifications | |
|----------------------------------|---|
| Input Voltage and Current | 24V dc, +/-15% no polarity, 10% max. ripple; 50 mA per input channel Power consumption: approx. 2.4 W |
| Supply Protection Circuitry | Protected against transient voltages |
| Overvoltage Category | Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category II (Category III, if appropriate overvoltage reduction is provided, as described in data sheet.) |

More on next page

Interface Modules Specifications (cont'd)

| | | | | | | | | | | | | | | | | | | | |
|------------------------------|---|------------------------|-------------------|--------------------------|----------------------|--------------------------|------------------------|-------------------------|--|---------------------------|-------------------------------------|------------------------------|--|------------------------|-------------------|--------------------------|----------------------|--------------------------|------------------------|
| Pollution Degree | 2 | | | | | | | | | | | | | | | | | | |
| Output Configuration | <p>IM-T-9A: 3 normally open output channels IM-T-11A: 2 normally open output channels and 1 normally closed auxiliary output channel Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2. The normally closed contact 31-32 is a parallel connection of contacts from K1-K2. Contacts: AgNi, 5 µm gold-plated</p> <p>Low Current Rating: The 5 µm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). To preserve the gold plating on the contacts, do not exceed the following max. values at any time:</p> <table style="width: 100%; border: none;"> <tr> <td style="padding-right: 20px;">Min. voltage: 1V ac/dc</td> <td>Max. voltage: 60V</td> </tr> <tr> <td>Min. current: 5 mA ac/dc</td> <td>Max. current: 300 mA</td> </tr> <tr> <td>Min. power: 5 mW (5 mVA)</td> <td>Max. power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table style="width: 100%; border: none;"> <tr> <td style="padding-right: 20px;">Min. voltage: 15V ac/dc</td> <td>Max. voltage: 250V ac/dc, 6A resistive</td> </tr> <tr> <td>Min. current: 30 mA ac/dc</td> <td><u>Max. power: 150 W (1,500 VA)</u></td> </tr> <tr> <td>Min. power: 0.45 W (0.45 VA)</td> <td>IEC 60947-5-1: AC-15: 230V ac, 3A; DC-13: 24V dc, 4 A</td> </tr> </table> <p>Mechanical life: 20,000,000 operations Electrical life: 150,000 cycles @ 1500 VA; 1,000,000 cycles @ 450 VA; 2,000,000 cycles @ 250 VA; 5,000,000 VA @ 125 VA</p> <p>Feedback contact rating (Y1-Y2, Y3-Y4):</p> <table style="width: 100%; border: none;"> <tr> <td style="padding-right: 20px;">Min. voltage: 1V ac/dc</td> <td>Max. voltage: 60V</td> </tr> <tr> <td>Min. current: 5 mA ac/dc</td> <td>Max. current: 300 mA</td> </tr> <tr> <td>Min. power: 5 mW (5 mVA)</td> <td>Max. power: 7 W (7 VA)</td> </tr> </table> <p>NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p> | Min. voltage: 1V ac/dc | Max. voltage: 60V | Min. current: 5 mA ac/dc | Max. current: 300 mA | Min. power: 5 mW (5 mVA) | Max. power: 7 W (7 VA) | Min. voltage: 15V ac/dc | Max. voltage: 250V ac/dc, 6A resistive | Min. current: 30 mA ac/dc | <u>Max. power: 150 W (1,500 VA)</u> | Min. power: 0.45 W (0.45 VA) | IEC 60947-5-1: AC-15: 230V ac, 3A; DC-13: 24V dc, 4 A | Min. voltage: 1V ac/dc | Max. voltage: 60V | Min. current: 5 mA ac/dc | Max. current: 300 mA | Min. power: 5 mW (5 mVA) | Max. power: 7 W (7 VA) |
| Min. voltage: 1V ac/dc | Max. voltage: 60V | | | | | | | | | | | | | | | | | | |
| Min. current: 5 mA ac/dc | Max. current: 300 mA | | | | | | | | | | | | | | | | | | |
| Min. power: 5 mW (5 mVA) | Max. power: 7 W (7 VA) | | | | | | | | | | | | | | | | | | |
| Min. voltage: 15V ac/dc | Max. voltage: 250V ac/dc, 6A resistive | | | | | | | | | | | | | | | | | | |
| Min. current: 30 mA ac/dc | <u>Max. power: 150 W (1,500 VA)</u> | | | | | | | | | | | | | | | | | | |
| Min. power: 0.45 W (0.45 VA) | IEC 60947-5-1: AC-15: 230V ac, 3A; DC-13: 24V dc, 4 A | | | | | | | | | | | | | | | | | | |
| Min. voltage: 1V ac/dc | Max. voltage: 60V | | | | | | | | | | | | | | | | | | |
| Min. current: 5 mA ac/dc | Max. current: 300 mA | | | | | | | | | | | | | | | | | | |
| Min. power: 5 mW (5 mVA) | Max. power: 7 W (7 VA) | | | | | | | | | | | | | | | | | | |
| Output Response Time | 20 milliseconds max. | | | | | | | | | | | | | | | | | | |
| Status Indicators | 2 green LED indicators: K1 energized K2 energized | | | | | | | | | | | | | | | | | | |
| Construction | Polycarbonate housing | | | | | | | | | | | | | | | | | | |
| Environmental Rating | Rated NEMA 1; IEC IP20 | | | | | | | | | | | | | | | | | | |
| Mounting | Mounts to standard 35 mm DIN rail track. Interface Module must be installed inside an enclosure rated NEMA 3 (IP54), or better. | | | | | | | | | | | | | | | | | | |
| Vibration Resistance | 10 to 55Hz @ 0.35 mm displacement per IEC 60068-2-6 | | | | | | | | | | | | | | | | | | |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ 50° C (non-condensing) | | | | | | | | | | | | | | | | | | |
| Design Standards | EN 60204-1, IEC 61810-1, EN 60255-1, EN 50205 | | | | | | | | | | | | | | | | | | |
| Application Notes | There are no adjustments or user-serviceable parts. | | | | | | | | | | | | | | | | | | |
| Certifications | | | | | | | | | | | | | | | | | | | |
| Wiring Diagrams | 2-Channel, 2 OSSDs, 2-Channel EDM: WD055 (p. 827) 2-Channel, 2 OSSDs, 1-Channel EDM: WD056 (p. 827) 2-Channel, 2 FSDs, 2-Channel EDM: WD057 (p. 828) 2-Channel, 2 OSSDs, 1-Channel EDM: WD057 (p. 828) 1-Channel, 1 Relay, 1 EDM: WD058 (p. 829) | | | | | | | | | | | | | | | | | | |

- Photoelectrics Sensors
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- Special Purpose Sensors
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- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules**
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

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- SAFETY MODULES**
- E-STOP & GUARD
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- MUTING
- SAFE SPEED
- EXTENSION
- INTERFACE

TWO-HAND CONTROL MODULES

DUO-TOUCH® SG Modules



STB Buttons



DUO-TOUCH® SG Run Bars



DUO-TOUCH® SG page 562

- Monitors STB buttons or other actuators
- Delivers highest level of safety for two-hand controls by meeting or exceeding OSHA/ANSI control reliability requirements
- Designed to meet Category 4 per ISO 13849-1 (EN 954-1) and Type IIIC two-hand control per ISO 13351 (EN 574)
- Offers choice of operating voltages, functions and outputs



STB Self-Checking Buttons page 567

- Delivers highest level of safety for two-hand controls
- Self-checks for internal problems
- Features ergonomic design to prevent repetitive motion stress



DUO-TOUCH® SG Run Bars page 570

- Provides convenient ergonomic means for two-hand control actuation
- Simplifies installment
- Includes two STB self-checking touch buttons (to be interfaced with DUO-TOUCH® SG modules or other Type IIIC two-hand control logic)

DUO-TOUCH® SG Selection Chart

| | Type | Supply Voltage | Inputs | Safety Outputs | Auxiliary Outputs | Output Rating | Housing Width | Model | Catalog Page |
|--|-----------------|--------------------|-----------------------|----------------|---------------------------|---------------|---------------|------------|--------------|
| | IIIC (cat 4) | 24V ac/dc | 2 STB* | 2 NO | — | 6 amps | 22.5 mm | AT-FM-10K | 562 |
| | | 115V ac/ 24V dc | 2 STB* | 4 NO | 1 NPN, 1 PNP & 1 NC | | 45 mm | AT-GM-13A | |
| | | 230V ac/ 24V dc | 2 STB* | 4 NO | 1 NPN, 1 PNP & 1 NC | | 45 mm | AT-HM-13A | |
| | | 115V ac/ 24V dc | 2 STB* & Muting | 2 NO | 1 NPN, 1 PNP & 1 NC | | 67.5 mm | AT-GM-11KM | |
| | | 230V ac/ 24V dc | 2 STB* & Muting | 2 NO | 1 NPN, 1 PNP & 1 NC | | 67.5 mm | AT-HM-11KM | |

NC = Normally Closed, NO = Normally Open

* May also use two mechanical push buttons, each with one normally open (NO) and one normally closed (NC) contact (Form C). See data sheets for details.

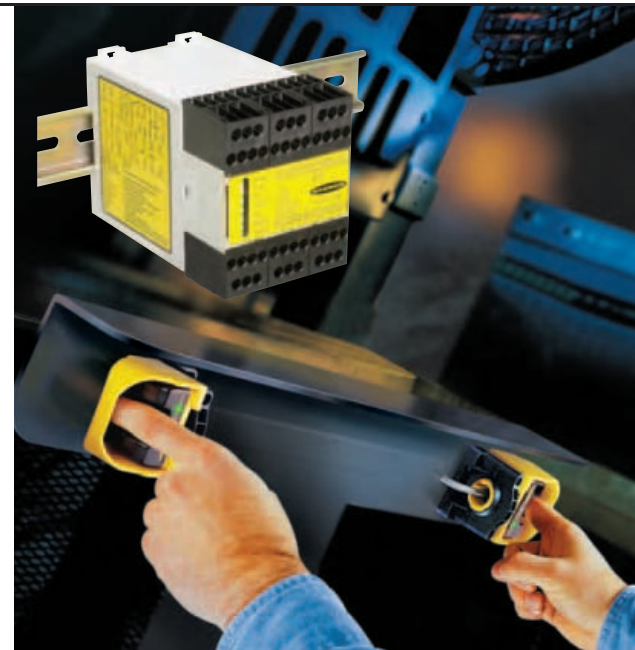
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules**
- Safety Interlock Switches
- Emergency Stop & Stop Control

- DUO-TOUCH SG**
- STB BUTTONS
- DUO-TOUCH RUN BARS

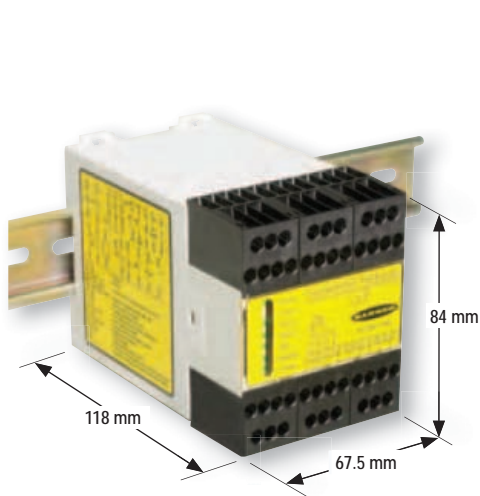
DUO-TOUCH® SG

Two-Hand Control Modules, STB Compatible

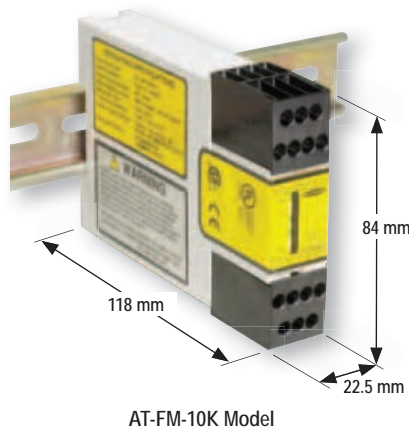
- Modules work with Banner STB self-checking touch buttons or can be retrofitted with existing mechanical palm buttons to create a complete, ergonomic two-hand control system (see page “STB” on page 567)
- To ensure OSHA/ANSI Control Reliability, modules have a diverse-redundant microcontroller circuit and multiple redundant, force-guided (mechanically linked) output contacts
- Anti-tiedown logic requires that both touch buttons are activated within one-half second or less of each other
- Designed to meet Category 4 per ISO 13849-1 (EN 954-1) and functional Type IIIC two-hand control per ISO 13851 (EN 574)
- Removable terminal blocks allow convenient wiring and exchanging of modules without rewiring
- Optional mute inputs allow release of actuating buttons during the non-hazardous portion of the machine cycle
- Modules easily interface with DUO-TOUCH® Run Bars with STBs for an economical, convenient means for actuation



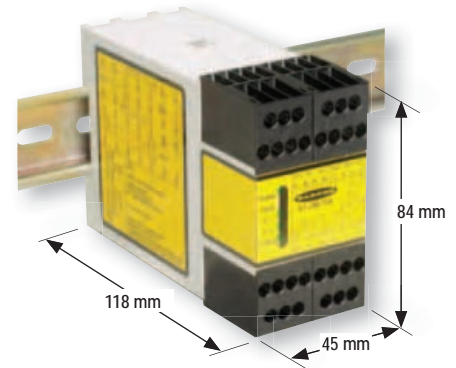
ACCESSORIES
page
569



AT-GM-11KM & AT-HM-11KM Models
(AT-GM-11KM shown)



AT-FM-10K Model



AT-GM-13A & AT-HM-13A Models
(AT-GM-13A shown)



STB Self-Checking Touch Buttons



Page 567

- Delivers highest level of safety for two-hand controls
- Self-checks for internal problems
- Features ergonomic design to prevent repetitive motion stress

DUO-TOUCH® SG Run Bar



Page 570

- Provides convenient economical means for two-hand control actuation
- Simplifies installment
- Includes two STB self-checking touch buttons

DUO-TOUCH® SG Two-Hand Control Modules

| Supply Voltage | Inputs | Safety Outputs | Output Rating | Auxiliary Outputs | Muting | Terminals | Model |
|----------------|-----------------------|----------------|---------------|---------------------------|--------|-----------|------------|
| 24V ac/dc | 2 STB* | 2 NO | 6 amps | — | — | Removable | AT-FM-10K |
| 115V ac/24V dc | 2 STB* | 4 NO | 6 amps | 1 NPN, 1 PNP & 1 NC | — | Removable | AT-GM-13A |
| 230V ac/24V dc | | | | | | | AT-HM-13A |
| 115V ac/24V dc | 2 STB* & Muting | 2 NO | 6 amps | 1 NPN, 1 PNP & 1 NC | Yes | Removable | AT-GM-11KM |
| 230V ac/24V dc | | | | | | | AT-HM-11KM |

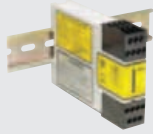
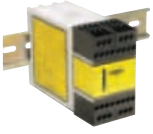
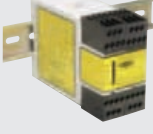


NC = Normally Closed, NO = Normally Open

* May also use two mechanical push buttons, each with one normally open (NO) and one normally closed (NC) contact (Form C). See data sheets for details.


NOTE: Kits are available which include one DUO-TOUCH SG Safety Module and two STB Touch Buttons. STB Touch Buttons are also available separately. See page 569.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules**
- Safety Interlock Switches
- Emergency Stop & Stop Control

DUO-TOUCH® SG Kits — Solid-State STB Touch Buttons (Meets Category IIIC)

| Kit | Kit Components† | | | | | | |
|--------------|---|-----------------------------|----------------|------------------------|-------------------|----------------------------------|-------|
| | Includes 2 STB Touch Buttons & a DUO-TOUCH® SG Safety Module | DUO-TOUCH® SG Safety Module | Supply Voltage | Safety Outputs | Auxiliary Outputs | STB Touch Buttons (see page 567) | |
| | | | | | | Connection | Model |
| ATK-VP6 |  AT-FM-10K | 24V ac/dc | 2 NO | — | 2 m | STBVP6 | |
| ATK-VP6Q | | | | | 4-Pin Mini QD | STBVP6Q | |
| ATK-VP6Q5 | | | | | 4-Pin Euro QD | STBVP6Q5 | |
| ATGMK-VP6 |  AT-GM-13A | 115V ac/24V dc | 4 NO | 1 NPN, 1 PNP & 1 NC | 2 m | STBVP6 | |
| ATGMK-VP6Q | | | | | 4-Pin Mini QD | STBVP6Q | |
| ATGMK-VP6Q5 | | | | | 4-Pin Euro QD | STBVP6Q5 | |
| ATHMK-VP6 |  AT-HM-13A | 230V ac/24V dc | 4 NO | 1 NPN, 1 PNP & 1 NC | 2 m | STBVP6 | |
| ATHMK-VP6Q | | | | | 4-Pin Mini QD | STBVP6Q | |
| ATHMK-VP6Q5 | | | | | 4-Pin Euro QD | STBVP6Q5 | |
| ATGMKM-VP6 |  AT-GM-11KM | 115V ac/24V dc | 2 NO | 1 NPN, 1 PNP & 1 NC | 2 m | STBVP6 | |
| ATGMKM-VP6Q | | | | | 4-Pin Mini QD | STBVP6Q | |
| ATGMKM-VP6Q5 | | | | | 4-Pin Euro QD | STBVP6Q5 | |
| ATHMKM-VP6 |  AT-HM-11KM | 230V ac/24V dc | 2 NO | 1 NPN, 1 PNP & 1 NC | 2 m | STBVP6 | |
| ATHMKM-VP6Q | | | | | 4-Pin Mini QD | STBVP6Q | |
| ATHMKM-VP6Q5 | | | | | 4-Pin Euro QD | STBVP6Q5 | |

NC = Normally Closed, NO = Normally Open

 Connection options: A model with a QD requires a mating cordset (see page 569).










For 9 m cable, add suffix W/30 to the 2 m model number (example, ATK-VP6 W/30).

† Contact factory for DUO-TOUCH SG kits with e/m relay STB Buttons.

ACCESSORIES
page
569

DUO-TOUCH SG
STB BUTTONS
DUO-TOUCH
RUN BARS

DUO-TOUCH® SG AT-FM-10K Modules Specifications

| | | | | | | | | | | | | | | |
|---|--|---|------------------------|-------------------|--------------------------|----------------------|--------------------------|------------------------|---|--|---|---|--|---|
| Supply Voltage and Current | 24V dc $\pm 15\%$ @ 150 mA (use a SELV-rated supply according to EN IEC 60950, NEC Class 2) 24V ac $\pm 15\%$ @ 150 mA, 50-60 Hz $\pm 5\%$ (use an NEC Class 2-rated transformer) To comply with UL and CSA standards, the installation's isolated secondary power supply circuit must incorporate a method to limit the overvoltage to 0.8 kV. | | | | | | | | | | | | | |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity | | | | | | | | | | | | | |
| Overvoltage Category | Output relay contact voltage of 1V to 150V ac/dc: Category III Output relay contact voltage of 151V to 250V ac/dc: Category II (Category III, if appropriate overvoltage reduction is provided, as described in datasheet.) | | | | | | | | | | | | | |
| Pollution Degree | 2 | | | | | | | | | | | | | |
| Safety Outputs | <p>Each normally open output channel is a series connection of contacts from two forced-guided (mechanically linked) relays, K1-K2.</p> <p>Contacts: AgNi, 5 μm gold-plated</p> <p>Low Current Rating: The 5 μm gold-plated contacts allow the switching of low current/low voltage. In these low-power applications, multiple contacts can also be switched in series (e.g., "dry switching"). To preserve the gold plating on the contacts, do not exceed the following max. values at any time</p> <table style="width: 100%; border: none;"> <tr> <td style="text-align: center;">Min. voltage: 1V ac/dc</td> <td style="text-align: center;">Max. voltage: 60V</td> </tr> <tr> <td style="text-align: center;">Min. current: 5 mA ac/dc</td> <td style="text-align: center;">Max. current: 300 mA</td> </tr> <tr> <td style="text-align: center;">Min. power: 5 mW (5 mVA)</td> <td style="text-align: center;">Max. power: 7 W (7 VA)</td> </tr> </table> <p>High Current Rating: If higher loads must be switched through one or more of the contacts, the minimum and maximum values of the contact(s) changes to:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; vertical-align: middle;">  </td> <td> Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) </td> <td> Maximum 250V ac/dc / 24V dc, 6 A resistive B300, R300 per UL508 </td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">  </td> <td> Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) </td> <td> Maximum 250V ac/dc / 24V dc, 6 A resistive IEC 60947-5-1 AC15 230V ac, 3A; DC-13: 24V dc, 2A </td> </tr> </table> <p>Mechanical life: 20,000,000 operations Electrical life (switching cycles of the output contacts, resistive load): 150,000 cycles @ 900 VA; 1,000,000 cycles @ 250 VA; 2,000,000 cycles @ 150 VA; 5,000,000 cycles @ 100 VA NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p> | | Min. voltage: 1V ac/dc | Max. voltage: 60V | Min. current: 5 mA ac/dc | Max. current: 300 mA | Min. power: 5 mW (5 mVA) | Max. power: 7 W (7 VA) |  | Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) | Maximum 250V ac/dc / 24V dc, 6 A resistive B300, R300 per UL508 |  | Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) | Maximum 250V ac/dc / 24V dc, 6 A resistive IEC 60947-5-1 AC15 230V ac, 3A; DC-13: 24V dc, 2A |
| Min. voltage: 1V ac/dc | Max. voltage: 60V | | | | | | | | | | | | | |
| Min. current: 5 mA ac/dc | Max. current: 300 mA | | | | | | | | | | | | | |
| Min. power: 5 mW (5 mVA) | Max. power: 7 W (7 VA) | | | | | | | | | | | | | |
|  | Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) | Maximum 250V ac/dc / 24V dc, 6 A resistive B300, R300 per UL508 | | | | | | | | | | | | |
|  | Minimum Voltage: 15V ac/dc Current: 30 mA ac/dc Power: 0.45 W (0.45 VA) | Maximum 250V ac/dc / 24V dc, 6 A resistive IEC 60947-5-1 AC15 230V ac, 3A; DC-13: 24V dc, 2A | | | | | | | | | | | | |
| Output Response Time | 35 milliseconds maximum | | | | | | | | | | | | | |
| Input Requirements | Outputs from actuating devices must each be capable of switching 25 mA @ 24V dc (nominal). | | | | | | | | | | | | | |
| Simultaneity Monitoring Period | ≤ 500 milliseconds | | | | | | | | | | | | | |
| Status Indicators | 4 green LEDs: Power ON Input 1 energized Input 2 energized Output | 1 red LED: Fault | | | | | | | | | | | | |
| Construction | Polycarbonate housing | | | | | | | | | | | | | |
| Environmental Rating | IEC IP20 | | | | | | | | | | | | | |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better. | | | | | | | | | | | | | |
| Vibration Resistance | 10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6 | | | | | | | | | | | | | |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing) | | | | | | | | | | | | | |
| Design Standards |  : Cat. 4 PL e, per EN ISO 13849-1; SIL 3 per IEC 61508 and IEC 62061; Type IIIC per ISO 13851 (EN574) (when used with STBs or hard contacts) | | | | | | | | | | | | | |
| Certifications |   PRESS CONTROL 8N35 | | | | | | | | | | | | | |
| Wiring Diagrams | WD059 (p. 829) | | | | | | | | | | | | | |

| DUO-TOUCH® SG AT-..M-13A Modules Specifications | | | | | | | | | | | |
|---|---|-------------------------|----------------------------------|---------------------|--|------------------------------|-----------------------------|--|--|---|--|
| Supply Voltage and Current | AT-GM-13A: 115V ac, ±15%; 50/60 Hz & 24V dc, ±15%, 10% max. ripple AT-HM-13A: 230V ac, ±15%; 50/60 Hz & 24V dc, ±15%, 10% max. ripple | | | | | | | | | | |
| Power Consumption | Approx. 4 W/7 VA | | | | | | | | | | |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity | | | | | | | | | | |
| Safety Outputs (including Auxiliary NC output 51/52) | <p>Outputs (K1 and K2): four redundant (total of eight) forced-guided safety relay contacts</p> <p>Contact ratings:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Min. voltage: 15V ac/dc</td> <td style="width: 50%;">Max. voltage: 250V ac or 250V dc</td> </tr> <tr> <td>Min. current: 30 mA</td> <td>Max. current: 6A ac or dc (resistive load)</td> </tr> <tr> <td>Min. power: 0.45 VA (0.45 W)</td> <td>Max. power: 1500 VA (200 W)</td> </tr> <tr> <td colspan="2">Mechanical life: 50,000,000 operations</td> </tr> <tr> <td colspan="2">Electrical life: 150,000 cycles (typically @ 1.5 kVA switching power)</td> </tr> </table> <p>NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p> | Min. voltage: 15V ac/dc | Max. voltage: 250V ac or 250V dc | Min. current: 30 mA | Max. current: 6A ac or dc (resistive load) | Min. power: 0.45 VA (0.45 W) | Max. power: 1500 VA (200 W) | Mechanical life: 50,000,000 operations | | Electrical life: 150,000 cycles (typically @ 1.5 kVA switching power) | |
| Min. voltage: 15V ac/dc | Max. voltage: 250V ac or 250V dc | | | | | | | | | | |
| Min. current: 30 mA | Max. current: 6A ac or dc (resistive load) | | | | | | | | | | |
| Min. power: 0.45 VA (0.45 W) | Max. power: 1500 VA (200 W) | | | | | | | | | | |
| Mechanical life: 50,000,000 operations | | | | | | | | | | | |
| Electrical life: 150,000 cycles (typically @ 1.5 kVA switching power) | | | | | | | | | | | |
| Auxiliary Supply Voltage (for Solid-State outputs) | 24V dc @ 1A (between Y30 & Y33) | | | | | | | | | | |
| Auxiliary Solid-State Output Current | 500 mA max., short circuit protected (Y32 or Y33) | | | | | | | | | | |
| Output Response Time | 35 milliseconds max. ON/OFF | | | | | | | | | | |
| Input Requirements | Outputs from actuating devices (1 NO and 1 NC) must each be capable of switching 20 mA @ 12V dc. | | | | | | | | | | |
| Simultaneity Monitoring Period | ≤ 500 milliseconds | | | | | | | | | | |
| Z1/Z2 Courtesy Voltage | 24V dc @ 150 mA (for STB button power) | | | | | | | | | | |
| External Device Monitoring (EDM) | One pair of terminals (Y1 and Y2) are provided to monitor the state of external devices controlled by the safety outputs. Each device must be capable of switching 15 to 30V dc at 10-50 mA. | | | | | | | | | | |
| Status Indicators | <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">4 green LEDs:</td> <td style="width: 50%;">1 red LED:</td> </tr> <tr> <td>Power ON</td> <td>Fault</td> </tr> <tr> <td>Input 1 energized</td> <td></td> </tr> <tr> <td>Input 2 energized</td> <td></td> </tr> <tr> <td>Output</td> <td></td> </tr> </table> | 4 green LEDs: | 1 red LED: | Power ON | Fault | Input 1 energized | | Input 2 energized | | Output | |
| 4 green LEDs: | 1 red LED: | | | | | | | | | | |
| Power ON | Fault | | | | | | | | | | |
| Input 1 energized | | | | | | | | | | | |
| Input 2 energized | | | | | | | | | | | |
| Output | | | | | | | | | | | |
| Environmental Rating | Polycarbonate. Rated NEMA 1; IP20 | | | | | | | | | | |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54), or better. | | | | | | | | | | |
| Vibration Resistance | 10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6 | | | | | | | | | | |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing) | | | | | | | | | | |
| Design Standards | Designed to comply with Category 4 per ISO 13849-1 (EN 954-1); Type IIIC per ISO 13851 (EN 574) | | | | | | | | | | |
| Certifications | <div style="display: flex; align-items: center;"> <div> <p>Important Notice: European Community Machinery Directive 2006/42/EC The DUO-TOUCH SG AT-..M-13A Two-Hand Control Modules comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these modules can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.</p> </div> </div> | | | | | | | | | | |
| Wiring Diagrams | AT-..M-13A models: WD054 (p. 826) AT-..M-13A to STB Buttons: WD056 (p. 827) | | | | | | | | | | |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules**
- Safety Interlock Switches
- Emergency Stop & Stop Control

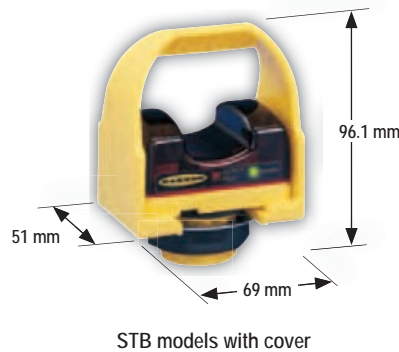
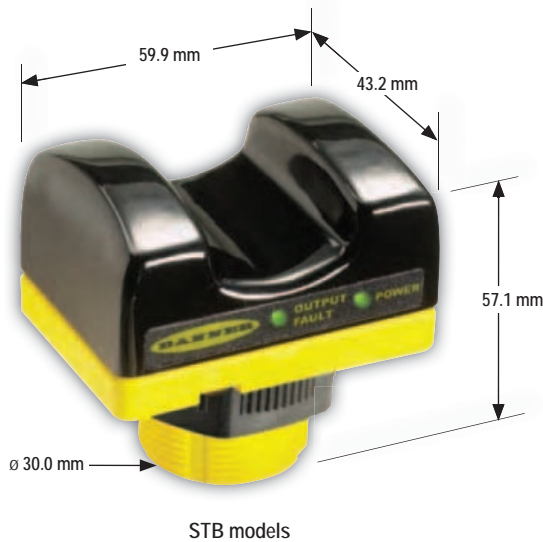
- DUO-TOUCH SG**
- STB BUTTONS
- DUO-TOUCH RUN BARS

DUO-TOUCH® SG AT-..M-11KM with Muting Specifications

| | | | |
|---|--|---|--|
| Supply Voltage and Current | AT-GM-11KM: 115V ac, ± 15%; 50/60Hz & 24V dc, +/- 15%, 10% max. ripple AT-HM-11KM: 230V ac, ± 15%; 50/60Hz & 24V dc, +/- 15%, 10% max. ripple | | |
| Power Consumption | Approx. 4 W / 7 VA | | |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity | | |
| Safety Outputs | Outputs (K1 and K2): two redundant (total of four) safety relay (forced-guided) contacts Contact ratings: <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Min voltage: 15V ac/dc</p> <p>Min. current: 30 mA</p> <p>Min. power: 0.45 W (0.45 VA)</p> <p>Mechanical life: 50,000,000 operations</p> <p>Electrical life: 150,000 cycles (typically @ 1.5 kVA switching power)</p> </div> <div style="width: 45%;"> <p>Max. voltage: 250V ac or 250V dc</p> <p>Max. current: 6A ac or dc (resistive load)</p> <p>Max. power: 1500 VA, 200 watts</p> </div> </div> <p>NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</p> | | |
| Auxiliary Supply Voltage (for solid-state outputs) | 24V dc @ 1A (applied between Y30 & Y31) | | |
| Auxiliary Solid-State Output Current | 500 mA max., short circuit protected, Y32 is a PNP output, Y33 is an NPN output | | |
| Output Response Time | 35 milliseconds max. ON/OFF | | |
| Input Requirements | Outputs from actuating devices must each be capable of switching up to 20 mA @ 12V dc. | | |
| Simultaneity Monitoring Period | ≤ 500 milliseconds | | |
| Z1/Z2 Courtesy Voltage | 24V dc @ 150 mA (for STB button power, separate from Auxiliary output, unregulated) | | |
| External Device Monitoring (EDM) | One pair of terminals (Y1 and Y2) are provided to monitor the state of external devices controlled by the safety outputs. Each device must be capable of switching 15 to 30V dc at 10-50 mA. | | |
| Muting Device Inputs (M1, M2) | The muting devices work as a pair (M1 and M2). The simultaneity requirement is that they be "closed" within 3 seconds of each other to initiate a mute condition or allow a mute cycle, assuming all other conditions are met. Each muting device must be capable of switching 15 to 30V dc at 10-50 mA. | | |
| Mute Enable Input (ME) | Mute Enable input must be closed in order to start a mute cycle. Opening this input after a mute cycle has begun has no effect. The switching device must be capable of switching 15 to 30V dc at 10-50 mA. | | |
| Safety Stop Interface (SSI) | This input consists of two concurrent channels (SSI-A and SSI-B) and is always active. Any time either or both channels open, the Safety Outputs will go OFF. When using the SSI, the external device must be capable of switching 15 to 30V dc at 10-50 mA. | | |
| Status Indicators | <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>6 green LED indicators</p> <ul style="list-style-type: none"> Power ON Input 1 energized Input 2 energized SSI inputs closed Muting activated Output </td> <td style="width: 50%; vertical-align: top;"> <p>1 red LED indicator</p> <ul style="list-style-type: none"> Fault </td> </tr> </table> | <p>6 green LED indicators</p> <ul style="list-style-type: none"> Power ON Input 1 energized Input 2 energized SSI inputs closed Muting activated Output | <p>1 red LED indicator</p> <ul style="list-style-type: none"> Fault |
| <p>6 green LED indicators</p> <ul style="list-style-type: none"> Power ON Input 1 energized Input 2 energized SSI inputs closed Muting activated Output | <p>1 red LED indicator</p> <ul style="list-style-type: none"> Fault | | |
| Environmental Rating | Polycarbonate. Rated NEMA 1; IP20 | | |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated NEMA 3 (IP54) or better. | | |
| Vibration Resistance | 10 to 55 Hz @ 0.35 mm displacement per IEC 60068-2-6 | | |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing) | | |
| Design Standards | Designed to comply with Category 4 per ISO 13849-1 (EN 954-1); Type IIIC per ISO (EN 574) | | |
| Certifications | Important Notice: European Community Machinery Directive 2006/42/EC The Duo-Touch SG AT-..M-11KM modules comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these modules can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767. | | |
| Wiring Diagrams | AT-..M-11KM: WD061 (p. 831) AT-..M-11KM to STB Buttons: WD062 (p. 831) | | |

STB Self-Checking Touch Buttons

- Provides highest level of safety for two-hand control input devices, per independent certification tests
- Provides redundant microprocessor and optical path
- Responds to a finger blocking light rather than to pressure
- Features ergonomic design to prevent repetitive motion stress
- Includes yellow field cover to prevent unintended switching
- Immune to ambient light, EMI and RFI interference
- Available with e/m relays rated for 1 amp switch capacity or solid-state outputs rated for 150 mA
- Withstands exposure to a variety of chemicals, depending on model
- For safety applications, STB buttons must be used with DUO-TOUCH® SG Two-Hand control modules, SC22-3.. Safety Controller or comparable control Type IIIC Two-Hand system



STB Self-Checking Buttons – Solid-State Outputs, 10-30V dc

| Connection | Upper Housing | Solid-State Outputs | Models |
|---------------|----------------|--------------------------------------|----------|
| 2 m | Polyetherimide | 2 Complementary PNP (1 ON, 1 OFF) | STBVP6 |
| 4-Pin Mini QD | | | STBVP6Q |
| 4-Pin Euro QD | | | STBVP6Q5 |

STB Self-Checking Buttons – e/m Relay Outputs, 20-30V ac/dc



| Connection | Upper Housing | e/m Relay Outputs | Models |
|---------------|----------------|--------------------------------------|-----------|
| 2 m | Polyetherimide | 2 Complementary SPST (1 NC, 1 NO) | STBVR81 |
| 5-Pin Mini QD | | | STBVR81Q |
| 5-Pin Euro QD | | | STBVR81Q6 |

NC = Normally Closed, NO = Normally Open


Connection options: A model with a QD requires a mating cordset (see page 569).

For 9 m cable, add suffix W/30 to the 2 m model number (example, STBVP6 W/30).

STB Self-Checking Buttons Specifications

| | |
|------------------------------|---|
| Supply Voltage and Current | STBVP6 Models: 10 to 30V dc @ 75 mA, typical STBVR81 Models: 20 to 30V ac/dc or 20V to 30V ac (peak-to-peak value), (50/60 Hz ± 5%) @ 75 mA |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity |
| Output Configuration | STBVP6 Models: Complementary PNP (sourcing) open-collector transistors STBVR81 Models: Complementary electromechanical relay |
| Output Rating | STBVP6 Models (solid-state outputs): Max. load: 150 mA ON-state saturation voltage: +V _(supply) -1.5V OFF-state leakage current: less than 1 µA STBVR81 Models (electromechanical relay): Max. switching voltage: 125V dc/150V ac Max. switching current: 1A @ 24V dc; 0.4A @ 125V ac (resistive loads) Max. resistive load power: 24 W dc; 50 VA ac Mechanical life of relay: 10 ⁹ cycles Electrical life of relay: 1.5 x 10 ⁵ cycles at 1 amp 24V resistive |
| Output Protection | All models protected against false pulse on power-up. Models with solid-state outputs have overload and short-circuit protection. |
| Output Response Time | 20 milliseconds ON/OFF |
| Indicators | 2 green LED indicators: Power: ON –power applied OFF –power off Output/fault: ON –button is activated OFF –button is deactivated Flashing –internal fault or blocked button on power-up detected |
| Construction | Totally encapsulated, non-metallic enclosure. Black Polyetherimide (PEI) upper housing; fiber-reinforced PBT polyester base. Electronics fully epoxy-encapsulated. Supplied with polypropylene (TP) field cover. |
| Environmental Rating | Meets NEMA standards 1, 3, 4, 4X, 12 and 13; IP66 |
| Connections | PVC-jacketed 2 m cables standard on integral-cable kits: QD fitting, depending on model. Accessory QD mating cordsets required for QD models. QD cordsets are ordered separately. See page 563. STBVP6: 4-wire (4-pin Mini-style QD, add suffix Q or 4-pin Euro-style QD, add suffix Q5) STBVR81: 5-wire (5-pin Mini-style QD, add suffix Q or 5-pin Euro-style QD, add suffix Q6) Integral 9 m cables are also available by adding suffix W/30 to the 2 m model number. |
| Ambient Light Immunity | Up to 100,000 lux |
| Applicable Agency Standards | (Used with an AT-FM-10K module or an SC22-3 Safety Controller) Analysis of measures for fault avoidance and fault control according to SIL3 (IEC 61508 and IEC 62061) and Category 4 (EN ISO 13849-1) passes EMI/RFI test levels as specified in IEC61496 and IEC62061. |
| Operating Conditions | Temperature: 0° to +50° C Relative humidity: 90% @ +50° C (non-condensing) |
| Application Notes | Environmental considerations for models with Polyetherimide (PEI) upper housings: The Polyetherimide upper housing will become brittle with prolonged exposure to outdoor sunlight. Window glass effectively filters ultraviolet light and provides excellent protection from sunlight. Avoid contact with strong alkalis, hydrocarbons and fuels. Clean periodically using mild soap solution and a soft cloth. |
| Two-Hand Control System Note | When the STBVP6 is used with Banner's SC22-3 Safety Controller in a two-hand control system, the power supply to the STBVP6 must be of the same voltage that is used to power the Safety Controller and they must have a common supply ground. |
| Certifications |   |
| Hookup Diagrams | STB Solid State (PNP): DC03 (p. 758) STB e/m Relay: UN01 (p. 767) |

STB Self-Checking Button Field Covers

| Description | Models | |
|--------------|----------|---|
| Black cover | OTC-1-BK |  |
| Green cover | OTC-1-GN | |
| Red cover | OTC-1-RD | |
| Yellow cover | OTC-1-YW | |

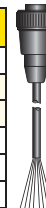
Field covers are designed to prevent inadvertent activation of buttons due to objects (loose clothing, debris, etc.) which might accidentally block their sensing beams. Field covers are constructed of rugged polypropylene and are highly resistant to abrasion and to damage by most chemicals. Standard model numbers are shipped with a yellow cover.


Cordsets

| Euro QD to Flying Leads | | | | |
|-------------------------|----------------|-------------|----------------|-------------|
| See page 696 | | | | |
| Length | Threaded 4-Pin | | Threaded 5-Pin | |
| | Straight | Right-Angle | Straight | Right-Angle |
| 1.83 m | MQDC-406 | MQDC-406RA | MQDC1-506 | MQDC1-506RA |
| 4.57 m | MQDC-415 | MQDC-415RA | MQDC1-515 | MQDC1-515RA |
| 9.17 m | MQDC-430 | MQDC-430RA | MQDC1-530 | MQDC1-530RA |
| 15.2 m | MQDC-450 | MQDC-450RA | - | - |









| Mini QD to Flying Leads | | |
|-------------------------|----------------|----------------|
| See page 714 | | |
| Length | Threaded 4-Pin | Threaded 5-Pin |
| | Straight | Straight |
| 1.83 m | MBCC-406 | MBCC-506 |
| 3.66 m | MBCC-412 | MBCC-512 |
| 9.14 m | MBCC-430 | MBCC-530 |



 Additional cordset information available. See page 693.

Brackets

| STB | | | | |
|--|---|---|---|--|
|  pg. 710 SMB30A |  pg. 653 SMB30MM |  pg. 654 SMB30SC |  pg. 661 SMBAMS30P |  pg. 662 SMBAMS30RA |

 Additional brackets and information available. See page 632.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Fiber Optic Safety Systems
- Safety Controllers & Modules
- Safety Two-Hand Control Modules**
- Safety Interlock Switches
- Emergency Stop & Stop Control

- DUO-TOUCH SG
- STB BUTTONS**
- DUO-TOUCH RUN BARS

Run Bar

DUO-TOUCH® SG Run Bar with STBs

- Minimizes risk of defeat and accidental machine actuation
- Provides a convenient and economical means for safeguarding when interfaced with DUO-TOUCH® SG Two-Hand Control Modules or comparable control systems
- Offers ergonomic design for reduced hand, wrist and arm stress
- Provides two diverse-redundant microcontroller-based photoelectric STB Touch Buttons with continuous internal self-checking
- Features bright LED power, output and fault indicators on STBs
- Constructed of robust, 13-gauge cold-rolled steel
- A choice of IP20- or IP65-rated models
- Provides immunity to ambient light, EMI and RFI interference
- Offers models with an emergency stop button
- Offers optional telescoping stands and brackets
- Provides knockouts for wiring flexibility and installation of accessory EZ-LIGHT™ indicators
- Meets ANSI B11.19 and ISO 13851 (EN 574) standards when monitored by Type IIIC Two-Hand Control logic device (e.g., AT series Two-Hand Control modules, see page 562)



ACCESSORIES
page
571



DUO-TOUCH® Run Bars with STB Self-Checking Touch Buttons

| Connection | STB Touch Buttons | | Environmental Rating | E-Stop Button | Models* |
|-----------------|-------------------|-------------------------------|----------------------|--|---------------|
| | Model | Output | | | |
| Terminal Strip | STBVP6 | Solid-State Complementary PNP | IP20 | Not included | STBVP6-RB1 |
| 8-pin Mini QD** | | | | Not included | STBVP6-RB1Q8 |
| Terminal Strip | | | | Model SSA-EBM-02L E-stop button (two NC safety contacts) | STBVP6-RB1E02 |
| Terminal Strip | | | IP65 | Not included | STBVP6-RB2 |
| 8-pin Mini QD** | | | | Not included | STBVP6-RB2Q8 |
| Terminal Strip | | | | Model SSA-EBM-02L E-stop button (two NC safety contacts) | STBVP6-RB2E02 |

* DUO-TOUCH Run Bar kits available with two-hand control module. Contact factory for combinations.

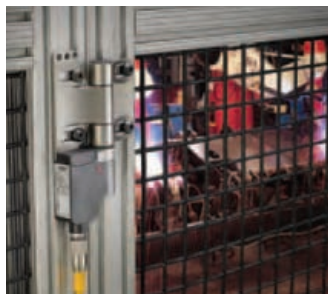
** Order QDS-8..C cordsets separately, see page 571.

INTERLOCKING SWITCHES



Magnet Style page 575

- Magnet switches for non-contact applications
- Compact, 3-piece non-contact system
- Sealed to resist water and dirt
- Designed to resist intentional defeat



Hinge Style page 578

- Load-bearing, lever and rotating hinge styles
- Adjustable range of operation
- One-piece switches



Compact Plastic page 584

- Designed to minimize tampering
- Five actuator types
- Actuator engagement from different locations




Compact Metal page 590

- Rigid and flexible in-line actuators
- Rotating actuator heads



Locking Style page 593

- Two options for locking mechanisms
- Two models for different voltages
- Rigid and flexible in-line actuators
- Rotating actuator heads

| Model | | Catalog Page | Type | Package Style | Housing Material | Actuator Contacts | Solenoid Contacts |
|-----------------|---|--------------|-------------------------------|---------------|------------------|---|----------------------|
| Magnet |  SI-MAG1.. | 575 | Magnetic | 2-Piece | Plastic | 1 NO & 1 NC | — |
| |  SI-MAG2.. | | | | Plastic | | |
| |  SI-MAG3.. | | | | Plastic | | |
| Hinge |  SI-HG63.. | 579 | Electromechanical Non-Locking | 1-Piece | Metal | 2 NC & 1 NO | — |
| |  SI-HG80.. | 580 | | | Metal | SPDT (Form C) | |
| |  SI-LS31H.. | 581 | | | Plastic | 1 NC & 1 NO, 2 NC | |
| |  SI-LS31R.. | 582 | | | Plastic | 1 NC & 1 NO, 2 NC | |
| Compact Plastic |  SI-LS83.. SI-LS100.. | 584 | Electromechanical Non-Locking | 2-Piece | Plastic | 2 NC & 1 NO, 1 NC & 1 NO, 2 NC | — |
| |  SI-QS75.. SI-QS90.. | 584 | | | Plastic | 1 NC, 1 NC & 1 NO, 2 NC, 2 NC & 1 NO | |
| Compact Metal |  SI-LM40.. | 590 | Electromechanical Non-Locking | 2-Piece | Metal | 1 NO & 1 NC, 2 NC, 2 NC & 1 NO | — |
| Locking |  SI-LS42.. | 593 | Electromechanical Locking | 2-Piece | Plastic | 1 NC & 1 NO, 2 NC, 2 NC & 1 NO, 3 NC | 1 NC & 1 NO, 1 NC |
| |  SI-QM100.. | 593 | | | Metal | 1 NC & 1 NO, 2 NC | 1 NC & 1 NO |

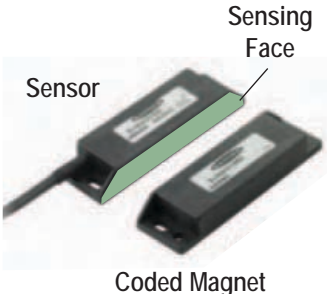
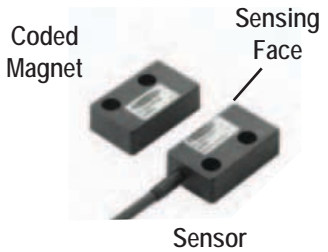
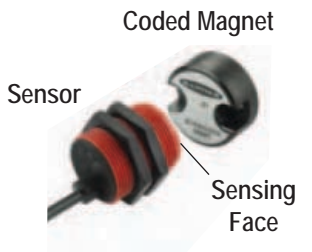
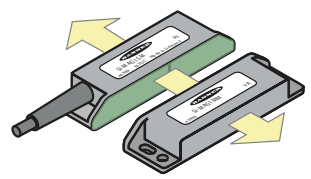
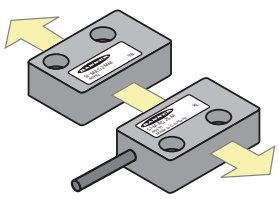
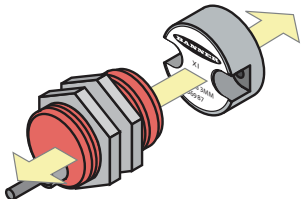
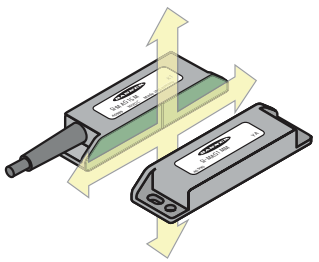
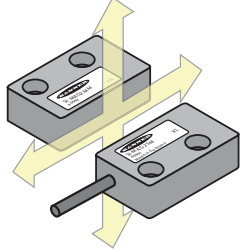
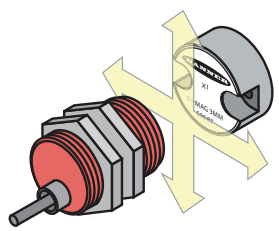
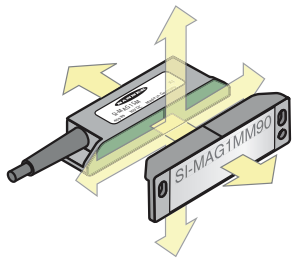
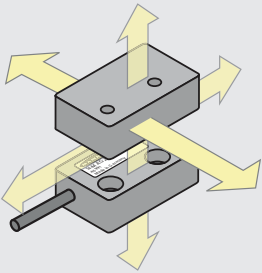
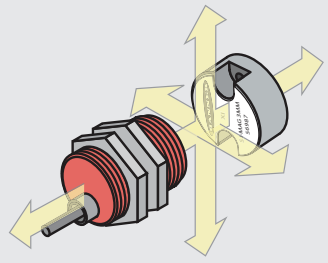
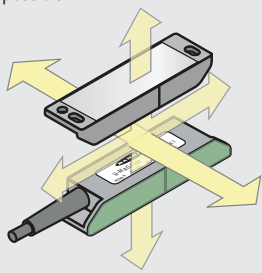
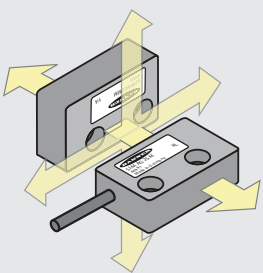
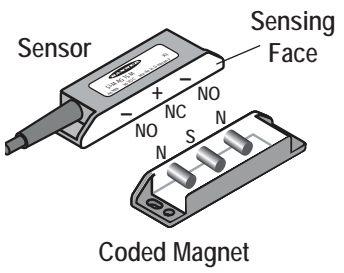
NC = Normally Closed, NO = Normally Open

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

ACCESSORIES
page 597

- INTERLOCK SWITCHES**
- MAGNET
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

Magnet-Style Interlocks: Direction of Approach for Sensor/Magnet Pairs

| Model SI-MAG1 | Model SI-MAG2 | Model SI-MAG3 |
|---|---|--|
|  |  |  |
| <p>Correct Movement is perpendicular to the sensing face.</p>  | <p>Correct Movement is perpendicular to the sensing face.</p>  | <p>Correct Movement is perpendicular to the sensing face.</p>  |
| <p>Correct Movement is parallel to the sensing face.</p>  | <p>Correct Movement is parallel to the sensing face.</p>  | <p>Correct Movement is parallel to the sensing face.</p>  |
| <p>Correct 90° approach of sensor and magnet is approved only for model SI-MAG1MM90.</p>  | <p>Incorrect Label to label approach of sensor and magnet is not possible.</p>  | <p>Incorrect Magnet orientation relative to magnet sensor cable is incorrect.</p>  |
| <p>Incorrect Label to label approach of sensor and magnet is not possible.</p>  | <p>Incorrect 90° approach of sensor and magnet is not possible.</p>  | <p>Detail of Interiors</p>  |

NOTE: With SI-MAG1C Controller, approach speed for all magnet-style switches must be greater than 0.2 ms.
With GM-FA-10J Controller, approach speed must be greater than 0.1 ms.



Magnet Style Non-Contact Safety Interlock Switches

- Sealed components resist water, dirt and are accommodating to misalignment
- Shifts in distance and alignment don't compromise sensing
- Coded magnets minimize the risk of intentional defeat
- Compact size makes it possible to conceal the switch
- Magnets with different polarizations add security
- Three housing styles are available for flat or 30 mm barrel mounting
- For safety applications, switch must be used with Gate Monitoring Module GM-FA-10J, SC22-3 Safety Controller or comparable control systems

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

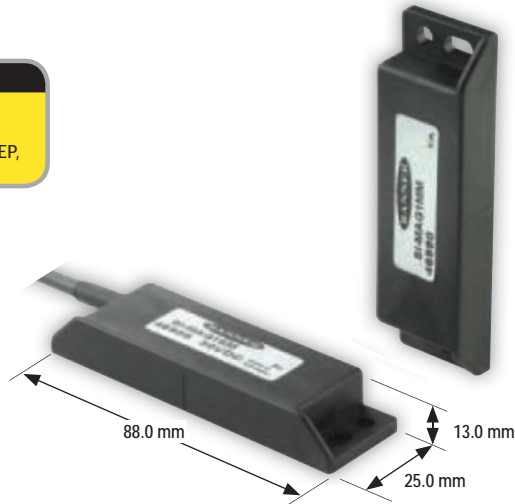
ACCESSORIES
page 577

- INTERLOCK SWITCHES
- MAGNET**
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

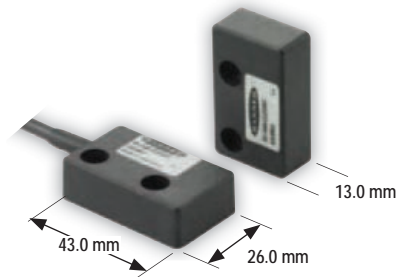
ONLINE
AUTOCAD, STEP, IGES & PDF



SI-MAG3SM and SI-MAG3MM Models



SI-MAG1SM.. and SI-MAG1MM.. Models



SI-MAG2SM and SI-MAG2MM Models

SI-MAG Magnet Style Safety Switches

| Description | | Contacts | Sensor Cable | Switching Distance | | Models |
|--------------|--|-------------|--------------|--------------------|----------|-------------|
| | | | | Min. ON | Max. OFF | |
| Sensor | | 1 NO & 1 NC | 3 m | — | — | SI-MAG1SM |
| Coded Magnet | | | | 0-3 mm | 3-14 mm | SI-MAG1MM |
| | | | | 0-8 mm | 8-16 mm | SI-MAG1MMHF |

More on next page

NC = Normally Closed Output, NO = Normally Open Output

Connection options:

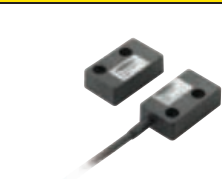

For 9 m cable, add suffix W/30 to the 3 m model number (example, SI-MAG1SM W/30).

* Difference is in direction of Approach. See page 574 for more information.

† Cable opposite

NOTE: The sensor and its magnet must be mounted at a minimum distance of 15 mm from any magnetized or ferrous material (example, steel) for proper operation. SFA-IMB1 or SFA-IMB2 can be used as spacers (see page 648). Depending on the installation, multiple brackets may be required.

SI-MAG Magnet Style Safety Switches (cont'd)

| Description | | Contacts | Sensor Cable | Switching Distance | | Models |
|--------------|---|-------------|--------------|--------------------|----------|-----------|
| | | | | Min. ON | Max. OFF | |
| Sensor |  | 1 NO & 1 NC | 3 m | — | — | SI-MAG2SM |
| Coded Magnet | | | | 0-4 mm | 4-8 mm | SI-MAG2MM |
| Sensor |  | 1 NO & 1 NC | 3 m | — | — | SI-MAG3SM |
| Coded Magnet | | | | 0-3 mm | 3-7 mm | SI-MAG3MM |

NC = Normally Closed Output, NO = Normally Open Output

 Connection options:

For 9 m cable, add suffix W/30 to the 3 m model number (example, SI-MAG2SM W/30).

NOTE: The sensor and its magnet must be mounted at a minimum distance of 15 mm from any magnetized or ferrous material (example, steel) for proper operation. SFA-IMB1 or SFA-IMB2 can be used as spacers (see page 648). Depending on the installation, multiple brackets may be required.

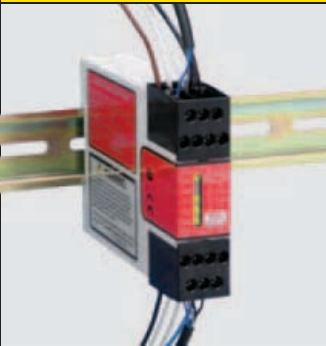

ACCESSORIES
page
577

SI-MAG Safety Switches Specifications

| | |
|---------------------------|---|
| Switching Elements | Three pole-stable reed switches |
| Repeat Switching Accuracy | ± 0.1 mm |
| Construction | Epoxy-encapsulated circuit in polyamide housing |
| Environmental Rating | NEMA 4X; IP67 |
| Switching Capacity | 30V dc max. @ 0.25 W |
| Operating Temperature | -5° to +70° C |
| Connections | Integral PVC-jacketed 3 m 4-wire cable. Cable O.D. is 5 mm. Wires are 24 AWG. (0.25 mm ²) |
| Wiring Diagrams | 1-Channel Coded Magnet Switches: WD033 (p. 805) 1-Channel (Multiple Guards): WD035 (p. 806) |

NOTE: See page 574 for direction of approach information.


Monitoring Control Module (required for a complete system)

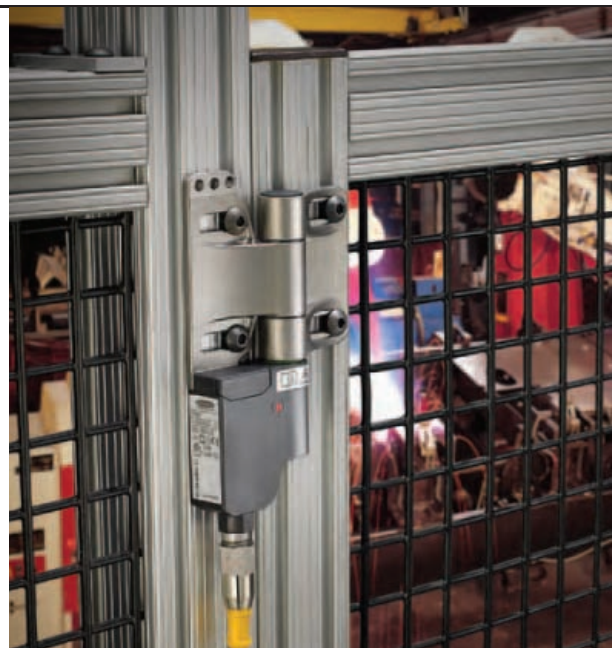
| | Description | Models | Product Information |
|--|---|--|---------------------|
|  | <ul style="list-style-type: none"> The gate module monitors up to 20 Banner coded magnets for contact failure or wiring fault. Two-channel operation monitors redundant switches on a single guard; one-channel operation monitors single switches on two guards. Two redundant output switching channels connect to control-reliable power interrupt circuits and are rated for up to 250V ac at up to 6 A. The reset input can be used for external device monitoring (EDM). The gate monitoring module uses 24V ac/dc at less than 150 mA. | GM-FA-10J | Page 537 |
|  | <ul style="list-style-type: none"> One controller provides configurable monitoring of multiple safety devices. 22 input terminals can monitor both contact-based and PNP solid-state input devices. 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring. Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions. All SC22-3 modules use 24V dc. 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models). | SC22-3-S... SC22-3-C... SC22-3E-S... SC22-3E-C... | Page 533 |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

- INTERLOCK SWITCHES**
- MAGNET
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

HINGE STYLE SWITCHES

- Three types are available—load-bearing hinge, hinged lever and rotating hinge
- One-piece switch eliminates need for alignment, engagement and risk of breakage of a separate actuator
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1) 



SI-HG63
Load Bearing Page 579

- Hinge operates to a full 270° range of motion with safety switching point adjustable over full operating range.
- Setpoint is $\pm 1.5^\circ$ adjustable after being set
- In-line and right-angle hinge models are available
- Hinge supports an axial and radial load of 1200 N
- Safety switching point is repositional
- Housing is constructed of corrosion-resistant stainless steel




SI-HG80
Load Bearing Page 580

- Hinge operates to a full 180° range of motion
- In-line and right-angle hinge models are available
- Hinge supports an axial load of 750 N and more than 1,000 N in radial direction
- Housing is constructed of corrosion-resistant zinc die-cast




SI-LS31H
Hinge Lever Style Page 581

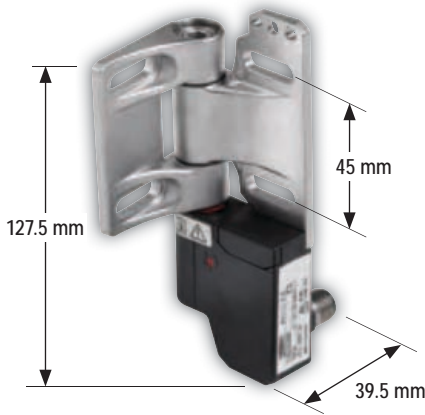
- Built-in hinge lever actuator attaches to doors or flaps which open 90° in one direction
- Actuator head rotates in 90° increments
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator
- All models are insulated devices (IEC 60947-5-1) 



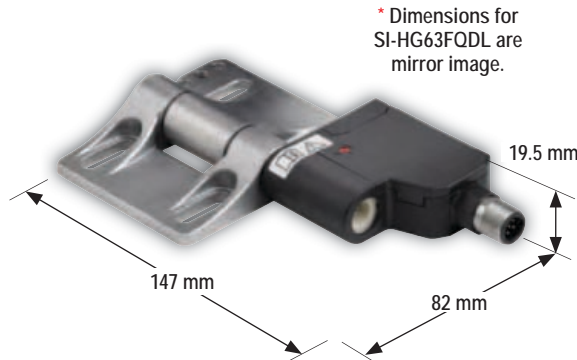
SI-LS31R
Rotary Hinge-Style Page 582

- Rotating actuator connects directly to door hinge
- Actuator head rotates in 90° increments
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator
- All models are insulated devices (IEC 60947-5-1) 

SI-HG63 Hinge Style Switches



SI-HG63FQDRR



SI-HG63FQDR*

* Dimensions for SI-HG63FQDL are mirror image.



- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

SI-HG63 Hinge Style Switches, 63 mm

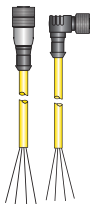
| Actuator Type | | Contact(s) | Connection | Models | Contact Config. & Switch Diagram |
|--------------------------------------|--|-------------|----------------|--------------|----------------------------------|
| In-line Integral load bearing | | 2 NC & 1 NO | 6-pin Micro QD | SI-HG63FQDR | SD001 (Page 598) |
| In-line Integral load bearing | | | | SI-HG63FQDL | |
| Right-angle Integral load bearing | | | | SI-HG63FQDRR | |
| Blank hinge | | — | — | SI-HG63A | |

Hinge 270° NC = Normally closed contact, NO = Normally open contact
 Connection options: A model with a QD requires a mating cordset (see page 579).

- INTERLOCK SWITCHES
- MAGNET
- HINGE**
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

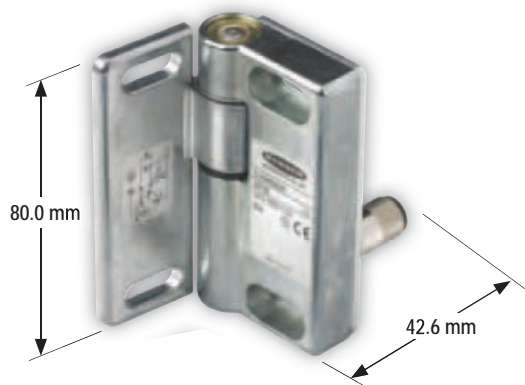
Cordsets

| Micro QD to Flying Leads | | |
|--------------------------|-----------|-------------|
| See page 713 | | |
| Threaded 6-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQEAC-606 | MQEAC-606RA |
| 4.57 m | MQEAC-615 | MQEAC-615RA |
| 9.14 m | MQEAC-630 | MQEAC-630RA |

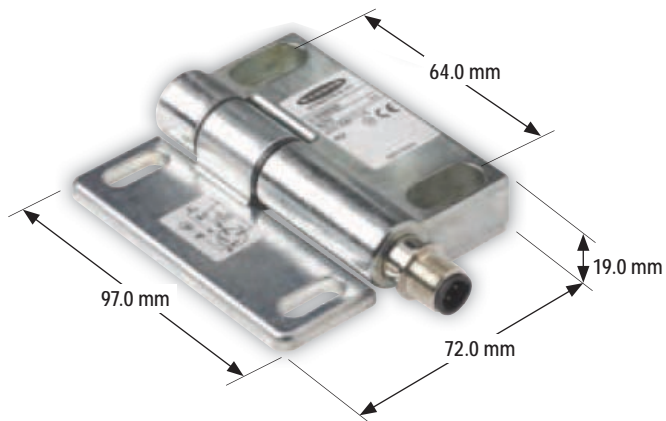


Additional cordset information available. See page 693.

SI-HG80 Hinge Style Switches









SI-HG80DQDR



SI-HG80DQD




SI-HG80 Hinge Style Switches, 80 mm

| Actuator Type | | Contact(s) | Connection | Models | Contact Config. & Switch Diagram |
|---|---|------------------|----------------|-------------|----------------------------------|
|  In-line Integral load bearing |  | SPDT (Form C) | 4-pin Micro QD | SI-HG80DQD | SD002 (Page 598) |
|  Right-angle Integral load bearing |  | | | SI-HG80DQDR | |
|  Blank hinge |  | — | — | SI-HG80A | |

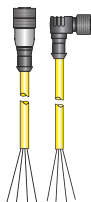
 Hinge 180°


SPDT = Single-Pole, Double-Throw Contacts

 Connection options: A model with a QD requires a mating cordset (see page 580).

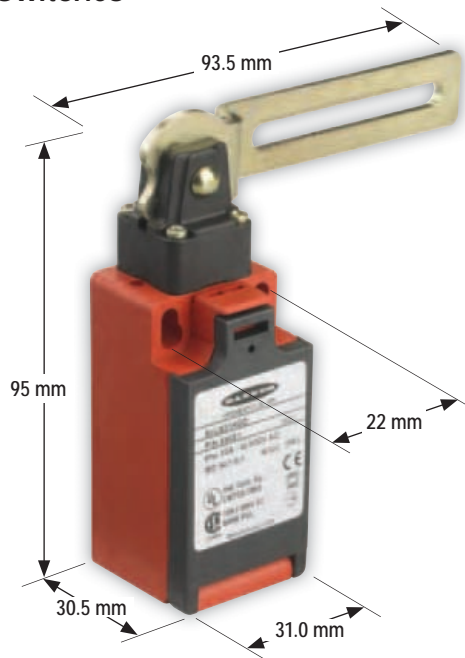
Cordsets

| Micro QD to Flying Leads | | |
|--------------------------|-----------|-------------|
| See page 712 | | |
| Threaded 4-Pin | | |
| Length | Straight | Right-Angle |
| 1.83 m | MQEAC-406 | MQEAC-406RA |
| 4.57 m | MQEAC-415 | MQEAC-415RA |
| 9.14 m | MQEAC-430 | MQEAC-430RA |


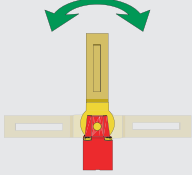

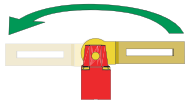

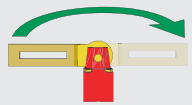





 Additional cordset information available. See page 693.

SI-LS31H Hinge Lever Style Switches



SI-LS31H Hinge Lever Style Switches, 31 mm

| Actuator Type | | Contact(s) | Models* | Contact Config. & Switch Diagram |
|--|---|-------------|-------------|----------------------------------|
|  Vertical Hinged Lever ± 90° |  | 1 NC & 1 NO | SI-LS31HGD | SD003 (Page 598) |
| | | 2 NC | SI-LS31HGE | SD004 (Page 598) |
|  Right-Hand Hinged Lever 180° |  | 1 NC & 1 NO | SI-LS31HGRD | SD005 (Page 598) |
| | | 2 NC | SI-LS31HGRE | SD006 (Page 598) |
|  Left-Hand Hinged Lever 180° |  | 1 NC & 1 NO | SI-LS31HGLD | SD007 (Page 599) |
| | | 2 NC | SI-LS31HGLE | SD008 (Page 599) |

 Hinge 90°
  One-Directional 180°
  One-Directional 180°
 NC = Normally Closed Contact, NO = Normally Open Contact

* Contact factory for integral quick-disconnect (QD) and pigtail QD options.


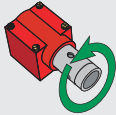
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

- INTERLOCK SWITCHES**
- MAGNET
- HINGE**
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

SI-LS31R Rotary Hinge Style Switches



SI-LS31R Rotary Hinge Style Switches, 31 mm

| Actuator Type | | Contact(s) | Models* | Contact Config. & Switch Diagram |
|---|---|-------------|------------|----------------------------------|
|  Rotary Shaft |  | 1 NC & 1 NO | SI-LS31RTD | SD009 (Page 599) |
| | | 2 NC | SI-LS31RTE | SD010 (Page 599) |









360° Rotary

NC = Normally Closed Contact, NO = Normally Open Contact

* Contact factory for integral quick-disconnect (QD) and pigtail QD options.




SI-HG63 Hinge Style Switches Specifications

| | | | |
|---|---|---------------------------------|----------------|
| Contact Rating | 3 A @ 230V ac max., 1.0 A @ 24V dc max. | 2.5 kV max. transient tolerance | NEMA A300 P300 |
| European Rating | Utilization categories: AC15 and DC13 (IEC 90497-5-1) $U_i = 250V$ ac, $I_{th} = 5A$ | | |
| Minimum Switching Speed | 5 operations per minute | | |
| Switching Angle | NC contact: $\pm 3^\circ$ NO contact: $\pm 9^\circ$ Tolerance for all angles: 1.5° | | |
| Mechanical Life | 1 million operations | | |
| Short Circuit Protection | 4 amp Slow Blow, 8 amp Fast Blow. Recommended external fusing or overload protection. | | |
| Force Exerted by Guard per Switch | Axial and radial: 1200 N (264 lbf) max. | | |
| Wire Connections | 6-pin Micro-style quick-disconnect (QD) fitting. Cordsets are ordered separately. See page 573. | | |
| Operating Range | 0° to 270° | | |
| Construction | Hinge: X22CrNi 17 Switch: PBT | | |
| Environmental Rating | NEMA 4; IP67 | | |
| Operating Conditions | Temperature: -25° to $+70^\circ$ C | | |
| Weight | 0.65 kg (1.43 lb) | | |
| Application Note | To avoid excessive radial stress in applications containing large doors, the hinge switch should be mounted either in pairs of two, or in conjunction with a blank hinge (see page 578). | | |
| Certifications |     | | |
| Contact configuration and Switching Diagram | SD001 (p. 598) | | |

| SI-HG80 Hinge Style Switches Specifications | | | |
|--|--|---------------------------------|----------------|
| Contact Rating | 3 A @ 250V ac max., 0.5 A @ 60V dc max. | 2.5 kV max. transient tolerance | NEMA A300 P300 |
| European Rating | Utilization categories: AC15 and DC13 (IEC 90497-5-1) $U_i = 250V$ ac, $I_{th} = 3A$ | | |
| Minimum Switching Speed | 20 operations per minute | | |
| Mechanical Life | 1 million operations | | |
| Short Circuit Protection | 6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection. | | |
| Force Exerted by Guard per Switch | Axial: 750 N max. Radial: 1000 N max. | | |
| Operating Range | 0° to 180° | | |
| Wire Connections | 4-pin Micro-style quick-disconnect (QD) fitting. Cordsets are ordered separately. See page 712. | | |
| Construction | Zinc Die-cast (GD-Zn) | | |
| Environmental Rating | NEMA 4; IP67 | | |
| Operating Conditions | Temperature: -25° to +70° C | | |
| Weight | 0.40 kg | | |
| Application Notes | To avoid excessive radial stress in applications containing large doors, the hinge switch should be mounted either in pairs of two, or in conjunction with a blank hinge (see page 578). | | |
| Certifications |   | | |
| Contact Configuration and Switching Diagrams | SD002 (p. 598) | | |

Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors
Vision
Wireless
Lighting &
Indicators
Safety
Light Screens
Safety
Laser Scanners
Safety Controllers
& Modules
Safety Two-Hand
Control Modules
**Safety Interlock
Switches**
Emergency Stop
& Stop Control

INTERLOCK
SWITCHES
MAGNET
HINGE
COMPACT PLASTIC
COMPACT METAL
LOCKING STYLE

| SI-LS31 Hinge Style Switches Specifications | | | | | | | | | | | | | | | | | | |
|--|---|--|----------------|--|--|--------|--------------------|--------------------|----|----|---|-----|----|---|-----|---|----|--|
| Contact Rating | 10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc | 2.5 kV max. transient tolerance | NEMA A300 P300 | | | | | | | | | | | | | | | |
| European Rating | Utilization categories: AC15 and DC13 $U_i = 500V$ ac $I_{th} = 10A$ | <table border="1"> <thead> <tr> <th colspan="3">40-60 Hz</th> </tr> <tr> <th>U V</th> <th>$I_{c}/AC-15$ A</th> <th>$I_{c}/DC-13$ A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>10</td> <td>6</td> </tr> <tr> <td>110</td> <td>10</td> <td>1</td> </tr> <tr> <td>230</td> <td>6</td> <td>.4</td> </tr> </tbody> </table> | 40-60 Hz | | | U V | $I_{c}/AC-15$ A | $I_{c}/DC-13$ A | 24 | 10 | 6 | 110 | 10 | 1 | 230 | 6 | .4 | |
| 40-60 Hz | | | | | | | | | | | | | | | | | | |
| U V | $I_{c}/AC-15$ A | $I_{c}/DC-13$ A | | | | | | | | | | | | | | | | |
| 24 | 10 | 6 | | | | | | | | | | | | | | | | |
| 110 | 10 | 1 | | | | | | | | | | | | | | | | |
| 230 | 6 | .4 | | | | | | | | | | | | | | | | |
| Contact Material | Silver-nickel alloy | | | | | | | | | | | | | | | | | |
| Maximum Switching Speed | 50 operations per minute | | | | | | | | | | | | | | | | | |
| Mechanical Life | 1 million operations | | | | | | | | | | | | | | | | | |
| Required Actuation Force | SI-LS31R models: 10 N cm | SI-LS31H models: 15 N cm | | | | | | | | | | | | | | | | |
| Short Circuit Protection | 6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection. | | | | | | | | | | | | | | | | | |
| Wire Connections | Screw terminals with pressure plates accept the following wire sizes – Stranded and solid: 20 AWG (0.5 mm ²) to 16 AWG (1.5 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires | | | | | | | | | | | | | | | | | |
| Cable Entry | M20 x 1.5 threaded entrance | Adapter supplied to convert from M20 x 1.5 to 1/2" - 14 NPT threaded entrance | | | | | | | | | | | | | | | | |
| Construction | Glass fiber-reinforced thermoplastic UL94-VO rating; plated steel actuator | | | | | | | | | | | | | | | | | |
| Environmental Rating | IP65 | | | | | | | | | | | | | | | | | |
| Operating Conditions | Temperature: -30° to +80° C | | | | | | | | | | | | | | | | | |
| Weight | 0.09 Kg | | | | | | | | | | | | | | | | | |
| Certifications |    | | | | | | | | | | | | | | | | | |
| Contact Configuration and Switching Diagrams | SI-LS31R models: SD009 and SD010 (p. 599) SI-LS31H models: SD003, SD004, SD005, SD006, SD007 and SD008 (pp. 598-599) | | | | | | | | | | | | | | | | | |

Compact Plastic Flat Pack and Limit Switch Styles

- Mechanically coded actuators use two independent operating elements to minimize intentional tampering or defeat
- Rotating head requires no tools
- Four standard actuators are available, as well as an optional high-extraction-force adaptor
- Housing is constructed of glass reinforced thermoplastic with plated steel actuator
- IP65 switch housing rating increases to IP67 with addition of a screw to the wiring chamber door
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1) ☞



ACCESSORIES
page 597



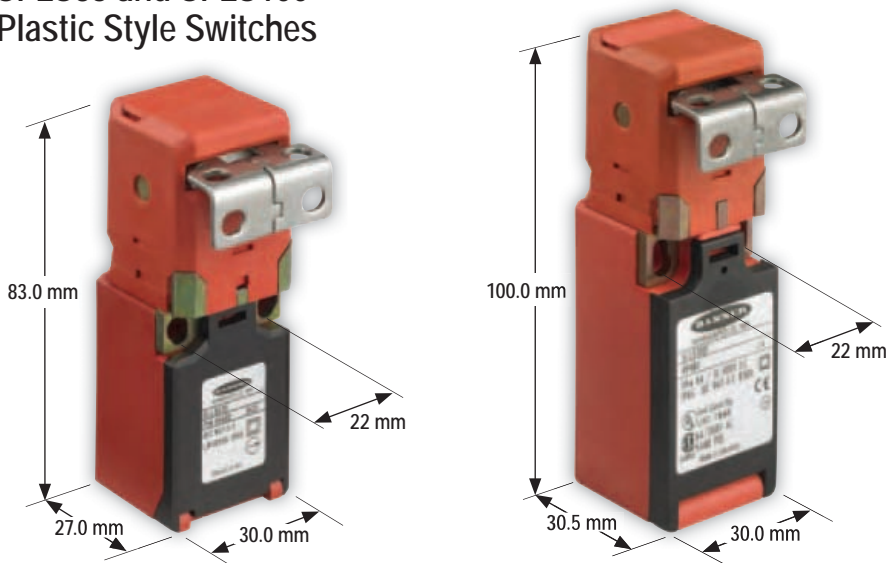
SI-LS83 and SI-LS100 Page 578

- Low profile for confined areas
- Limit switch design (EN 50047)
- In-line or right-angle actuator
- Actuator engagement from four side or four top positions
- Insulated device on all models (IEC 60947-5-1) ☐

SI-QS75 and SI-QS90 Page 580

- Flat-pack design for limited space requirements
- Actuator engagement from front, back, or either of two top positions
- Insulated device on all models (IEC 60947-5-1) ☐

SI-LS83 and SI-LS100 Plastic Style Switches



SI-LS83 Models

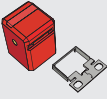
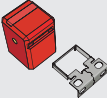

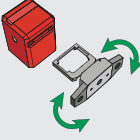
SI-LS100 Models

(both models shown with right-angle rigid in-line actuator)

ONLINE
AUTOCAD, STEP, IGES & PDF

Replacement actuators for safety interlock switches (page 597)

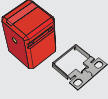
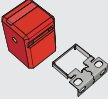

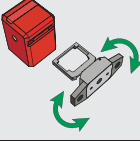
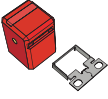
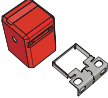

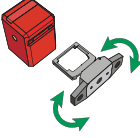
SI-LS100 Plastic Style Switches, 100 mm

| Kits | | | | Contact(s) | Contact Config. & Switch Diagram |
|---|-----------|--------------|--|-------------------|----------------------------------|
| Actuator Type | Interlock | Kit Model* | | | |
| SI-QS-SSA-2 Straight Rigid In-Line  | SI-LS100F | SI-LS100SF | | 2 NC & 1 NO | SD011 (Page 593) |
| SI-QS-SSA-3 Rigid In-Line  | SI-LS100F | SI-LS100SRAF | | | |
|  SI-QS-SSU Flexible In-Line  | SI-LS100F | SI-LS100MRFF | | | |


Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors
Vision
Wireless
Lighting &
Indicators
Safety
Light Screens
Safety
Laser Scanners
Safety Controllers
& Modules
Safety Two-Hand
Control Modules
**Safety Interlock
Switches**
Emergency Stop
& Stop Control

ACCESSORIES
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SI-LS83 Plastic Style Switches, 83 mm

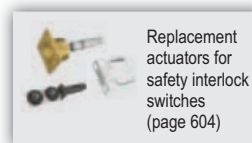
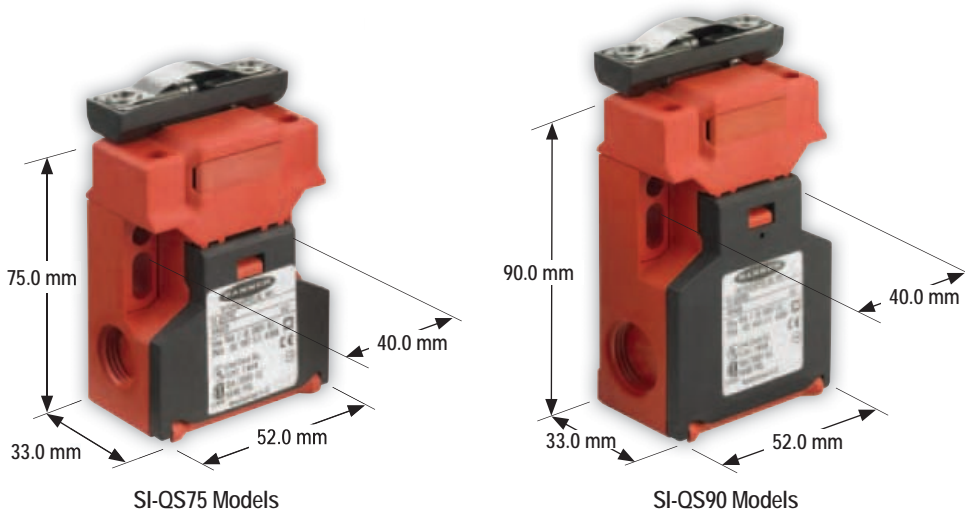
| Kits | | | | Contact(s) | Contact Config. & Switch Diagram |
|---|-----------|-------------|--|-------------------|----------------------------------|
| Actuator Type | Interlock | Kit Model* | | | |
| SI-QS-SSA-2 Straight Rigid In-Line  | SI-LS83D | SI-LS83SD | | 1 NC & 1 NO | SD012 (Page 593) |
| SI-QS-SSA-3 Rigid In-Line  | SI-LS83D | SI-LS83SRAD | | | |
|  SI-QS-SSU Flexible In-Line  | SI-LS83D | SI-LS83MRFD | | | |
| SI-QS-SSA-2 Straight Rigid In-Line  | SI-LS83E | SI-LS83SE | | 2 NC | SD013 (Page 594) |
| SI-QS-SSA-3 Rigid In-Line  | SI-LS83E | SI-LS83SRAE | | | |
|  SI-QS-SSU Flexible In-Line  | SI-LS83E | SI-LS83MRFE | | | |

INTERLOCK
SWITCHES
MAGNET
HINGE
COMPACT PLASTIC
COMPACT METAL
LOCKING STYLE

 Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QS75 and SI-QS90 Flat-Pack Style Switches



(both models shown with rigid in-line actuator)

ACCESSORIES
page
604

SI-QS75 Flat-Pack Style Switches, 75 mm

| Kits | | | | Contact | Contact Config. & Switch Diagram |
|--|-----------|------------|-------------------------------|---------|----------------------------------|
| Actuator Type | Interlock | Kit Model* | | | |
| SI-QS-SSA-4 Rigid In-Line | | SI-QS75C | SI-QS75MC | | |
| SI-QS-SSU Flexible In-Line | | SI-QS75C | SI-QS75MFC | 1 NC | SD014 (Page 600) |
| SI-QS-SSA Rigid In-Line & SI-QS-100 High-force Accessory | | SI-QS75C | SI-QS75MC-100 (High-Force) | | |



Multi-Directional

NC = Normally Closed Contact,

NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-QS90 Flat-Pack Style Switches, 90 mm

| Actuator Type | | Kits | | Contact(s) | Contact Config. & Switch Diagram |
|--|--|-----------|-------------------------------|-------------------|----------------------------------|
| | | Interlock | Kit Model* | | |
| SI-QS-SSA-4 Rigid In-Line | | SI-QS90D | SI-QS90MD | 1 NC & 1 NO | SD015 (Page 600) |
| SI-QS-SSU Flexible In-Line | | SI-QS90D | SI-QS90MFD | | |
| SI-QS-SSA Rigid In-Line & SI-QS-100 High-force Accessory | | SI-QS90D | SI-QS90MD-100 (High-Force) | | |
| SI-QS-SSA-4 Rigid In-Line | | SI-QS90E | SI-QS90ME | 2 NC | SD016 (Page 600) |
| SI-QS-SSU Flexible In-Line | | SI-QS90E | SI-QS90MFE | | |
| SI-QS-SSA Rigid In-Line & SI-QS-100 High-force Accessory | | SI-QS90E | SI-QS90ME-100 (High-Force) | | |
| SI-QS-SSA-4 Rigid In-Line | | SI-QS90F | SI-QS90MF | 2 NC & 1 NO | SD017 (Page 600) |
| SI-QS-SSU Flexible In-Line | | SI-QS90F | SI-QS90MFF | | |
| SI-QS-SSA Rigid In-Line & SI-QS-100 High-force Accessory | | SI-QS90F | SI-QS90MF-100 (High-Force) | | |

Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact




* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
Contact factory for integral quick-disconnect (QD) and pigtail QD options.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control




ACCESSORIES
page
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- INTERLOCK SWITCHES**
- MAGNET
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

SI-LS83 and SI-LS100 Plastic Style Switches Specifications

| Contact Rating | 10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300 | | | | | | | | | | | | | | | | |
|--|---|---|----------|--|--|------------|----------------------|----------------------|----|----|---|-----|----|---|-----|---|----|
| European Rating | Utilization categories: AC15 and DC13 (IEC 60947-5-1) Switches with 1 & 2 contact pairs: $U_i = 500V$ ac, $I_{th} = 10A$ Switches with 3 contact pairs: $U_i = 400V$ ac, $I_{th} = 5A$ | <table border="1"> <thead> <tr> <th colspan="3">40-60 Hz</th> </tr> <tr> <th>U_i V</th> <th>I_{th}/AC-15 A</th> <th>I_{th}/DC-13 A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>10</td> <td>6</td> </tr> <tr> <td>110</td> <td>10</td> <td>1</td> </tr> <tr> <td>230</td> <td>6</td> <td>.4</td> </tr> </tbody> </table> | 40-60 Hz | | | U_i V | I_{th} /AC-15 A | I_{th} /DC-13 A | 24 | 10 | 6 | 110 | 10 | 1 | 230 | 6 | .4 |
| 40-60 Hz | | | | | | | | | | | | | | | | | |
| U_i V | I_{th} /AC-15 A | I_{th} /DC-13 A | | | | | | | | | | | | | | | |
| 24 | 10 | 6 | | | | | | | | | | | | | | | |
| 110 | 10 | 1 | | | | | | | | | | | | | | | |
| 230 | 6 | .4 | | | | | | | | | | | | | | | |
| Contact Material | Silver-nickel alloy | | | | | | | | | | | | | | | | |
| Maximum Switching Speed | 30 operations per minute | | | | | | | | | | | | | | | | |
| Maximum Actuator Speed | 1 m/second | | | | | | | | | | | | | | | | |
| Mechanical Life | 1 million operations | | | | | | | | | | | | | | | | |
| Minimum Actuator Engagement Radius | In-line actuators: 150 mm Flexible actuators: 50 mm in all directions | | | | | | | | | | | | | | | | |
| Actuation Extraction Force | 12 N | | | | | | | | | | | | | | | | |
| Short Circuit Protection | 6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection. | | | | | | | | | | | | | | | | |
| Wire Connections | Stranded and solid: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires | | | | | | | | | | | | | | | | |
| Cable Entry | M20 x 1.5 for SI-LS100 and M16 x 1.5 for SI-LS83 threaded entrance. Adapter supplied to convert to 1/2" - 14 NPT threaded entrance. | | | | | | | | | | | | | | | | |
| Construction | Glass fiber-reinforced thermoplastic UL94-VO rating | | | | | | | | | | | | | | | | |
| Environmental Rating | IP65 Note: Addition of a No. 3 x 1/4" screw (max) to the wiring access door increases sealing to IP67; NEMA 4X | | | | | | | | | | | | | | | | |
| Operating Conditions | Temperature: -30° to +80° C | | | | | | | | | | | | | | | | |
| Weight | SI-LS83 models: 0.12 kg SI-LS100 models: 0.13 kg | | | | | | | | | | | | | | | | |
| Certifications |    | | | | | | | | | | | | | | | | |
| Contact Configuration and Switching Diagrams | SI-LS100 models: SD011 (p. 599) SI-LS83 models: SD012 and SD013 (pp. 599-600) | | | | | | | | | | | | | | | | |

SI-QS75 and SI-QS90 Flat-Pack Style Switches Specifications

| Contact Rating | 10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300 | | | | | | | | | | | | | | | | |
|--|---|---|----------|--|--|-------------------------|-------------------|-------------------|----|----|---|-----|----|---|-----|---|----|
| European Rating | Utilization categories: AC15 and DC13 (IEC 60947-5-1) Switches with 1 & 2 contact pairs: $U_i = 500V$ ac, $I_{th} = 10A$ Switches with 3 contact pairs: $U_i = 400V$ ac, $I_{th} = 5A$ | <table border="1"> <thead> <tr> <th colspan="3">40-60 Hz</th> </tr> <tr> <th>U_i V^r</th> <th>I_i/AC-15 A</th> <th>I_i/DC-13 A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>10</td> <td>6</td> </tr> <tr> <td>110</td> <td>10</td> <td>1</td> </tr> <tr> <td>230</td> <td>6</td> <td>.4</td> </tr> </tbody> </table> | 40-60 Hz | | | U_i V ^r | I_i /AC-15 A | I_i /DC-13 A | 24 | 10 | 6 | 110 | 10 | 1 | 230 | 6 | .4 |
| 40-60 Hz | | | | | | | | | | | | | | | | | |
| U_i V ^r | I_i /AC-15 A | I_i /DC-13 A | | | | | | | | | | | | | | | |
| 24 | 10 | 6 | | | | | | | | | | | | | | | |
| 110 | 10 | 1 | | | | | | | | | | | | | | | |
| 230 | 6 | .4 | | | | | | | | | | | | | | | |
| Contact Material | Silver-nickel alloy | | | | | | | | | | | | | | | | |
| Maximum Switching Speed | 30 operations per minute | | | | | | | | | | | | | | | | |
| Maximum Actuator Speed | 1 m/second | | | | | | | | | | | | | | | | |
| Mechanical Life | 1 million operations | | | | | | | | | | | | | | | | |
| Minimum Actuator Engagement Radius | In-line actuators: 150 mm Flexible actuators: 50 mm in all directions | | | | | | | | | | | | | | | | |
| Actuation Extraction Force | High-Force models: 100 N All others: 10 N | | | | | | | | | | | | | | | | |
| Short Circuit Protection | 6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection. | | | | | | | | | | | | | | | | |
| Wire Connections | Screw terminals with pressure plates accept the following wire sizes – For switches with one or two contacts: Stranded and solid: 20 AWG (0.5 mm ²) to 16 AWG (1.5 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires For switches with three contacts: Stranded and solid: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires | | | | | | | | | | | | | | | | |
| Cable Entry | M20 x 1.5 for SI-QS90 and M16 x 1.5 for SI-QS75 threaded entrance. Adapter supplied to convert to ½" - 14 NPT threaded entrance. | | | | | | | | | | | | | | | | |
| Construction | Glass fiber-reinforced thermoplastic UL94-VO rating | | | | | | | | | | | | | | | | |
| Environmental Rating | IP65 Note: Addition of a No. 3 x ¼" screw (max) to the wiring access door increases sealing to IEC IP67; NEMA 4X | | | | | | | | | | | | | | | | |
| Operating Conditions | Temperature: -30° to +80° C | | | | | | | | | | | | | | | | |
| Weight | SI-QS75 models: 0.11 kg SI-QS90 models: 0.13 kg | | | | | | | | | | | | | | | | |
| Application Notes | Models with one and two contacts have three cable entry locations (bottom and two sides); models with three contacts have two cable entry locations (two sides). All entry locations are sealed with knockouts. To remove knockouts, thread the supplied M16 x 1.5 or M20 x 1.5 to ½" - 14 NPT conduit adapter or optional M16 x 1.5 or M20 x 1.5 cable gland into one of the threaded entry locations. The knockout will break open just before the adapter or cable gland bottoms out. | | | | | | | | | | | | | | | | |
| Certifications |    | | | | | | | | | | | | | | | | |
| Contact Configuration and Switching Diagrams | SI-QS75 models: SD014 (p. 600) SI-QS90 models: SD015, SD016 and SD017 (p. 600) | | | | | | | | | | | | | | | | |

Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors
Vision
Wireless
Lighting &
Indicators
Safety
Light Screens
Safety
Laser Scanners
Safety Controllers
& Modules
Safety Two-Hand
Control Modules
**Safety Interlock
Switches**
Emergency Stop
& Stop Control

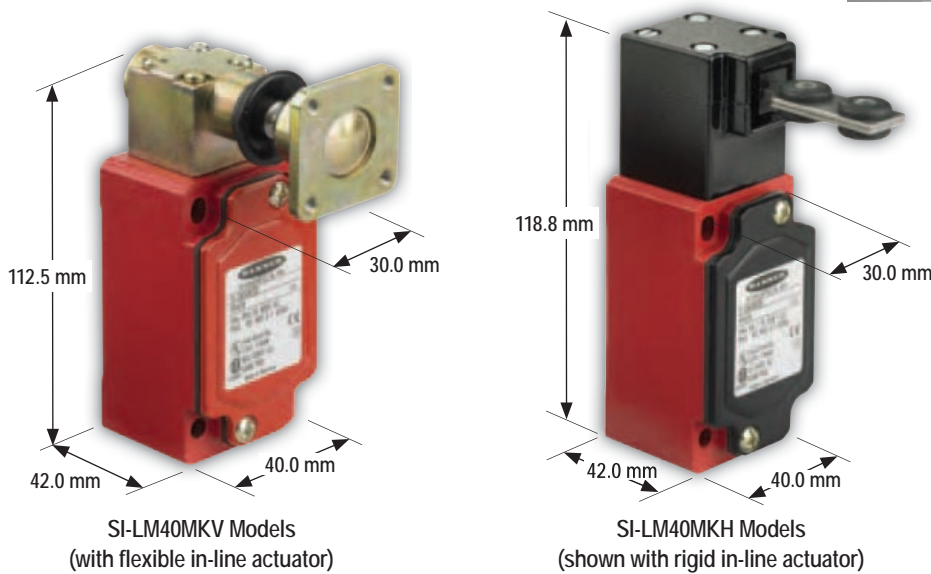
INTERLOCK
SWITCHES
MAGNET
HINGE
COMPACT PLASTIC
COMPACT METAL
LOCKING STYLE

Compact Metal Limit Switch Style with In-Line Actuator

- Rigid and flexible in-line actuators are available
- Actuator head rotates to four possible positions, in 90° increments
- Housing is constructed of die-cast aluminum with stainless steel actuator
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1)
- All models contain protective earth terminals (IEC 60947-1)



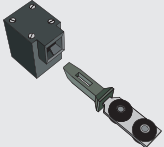

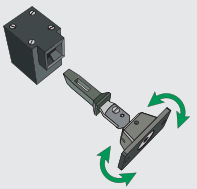
ACCESSORIES
page 604



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SI-LM40 Limit Switch Style, 40 mm

| Kits | | | | Contact(s) | Contact Config. & Switch Diagram |
|--|------------|--------------|-------------|------------------|----------------------------------|
| Actuator Type | Interlock | Kit Model* | | | |
| SI-QM-SSA Straight Rigid In-Line  | SI-LM40KHD | SI-LM40MKHD | 1 NO & 1 NC | SD018 (Page 600) | |
|  SI-QM-SMFA Flexible In-Line  | SI-LM40KHD | SI-LM40MKHFD | | | |

Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

More on next page

SI-LM40 Limit Switch Style, 40 mm (cont'd)

| Actuator Type | | Kits | | Contact(s) | Contact Config. & Switch Diagram |
|--|--|------------|--------------|-------------------|----------------------------------|
| | | Interlock | Kit Model* | | |
| SI-QM-SSA Straight Rigid In-Line | | SI-LM40KHE | SI-LM40MKHE | 2 NC | SD019 (Page 601) |
| SI-QM-SMFA Flexible In-Line | | SI-LM40KHE | SI-LM40MKHFE | | |
| SI-QM-SSA Straight Rigid In-Line | | SI-LM40KHF | SI-LM40MKHF | 2 NC & 1 NO | SD020 (Page 601) |
| SI-QM-SMFA Flexible In-Line | | SI-LM40KHF | SI-LM40MKHFF | | |
| SI-QM-90A Flexible In-Line | | SI-LM40KVD | SI-LM40MKVD | 1 NO & 1 NC | SD021 (Page 601) |
| | | SI-LM40KVE | SI-LM40MKVE | 2 NC | SD022 (Page 601) |

Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact




* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
Contact factory for integral quick-disconnect (QD) and pigtail QD options.

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

ACCESSORIES
page
604

INTERLOCK SWITCHES
MAGNET
HINGE
COMPACT PLASTIC
COMPACT METAL
LOCKING STYLE

SI-LM40 Limit Style Switches Specifications

| Contact Rating | 10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300 | | | | | | | | | | | | | | | | |
|--|---|---|----------|--|--|--------|----------------------|----------------------|----|----|---|-----|----|---|-----|---|----|
| European Rating | Utilization categories: AC15 and DC13 $U_i = 500V$ ac, $I_{th} = 10A$ | <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="3">40-60 Hz</th> </tr> <tr> <th>U V</th> <th>I_{th}/AC-15 A</th> <th>I_{th}/DC-13 A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>10</td> <td>6</td> </tr> <tr> <td>110</td> <td>10</td> <td>1</td> </tr> <tr> <td>230</td> <td>6</td> <td>.4</td> </tr> </tbody> </table> | 40-60 Hz | | | U V | I_{th} /AC-15 A | I_{th} /DC-13 A | 24 | 10 | 6 | 110 | 10 | 1 | 230 | 6 | .4 |
| 40-60 Hz | | | | | | | | | | | | | | | | | |
| U V | I_{th} /AC-15 A | I_{th} /DC-13 A | | | | | | | | | | | | | | | |
| 24 | 10 | 6 | | | | | | | | | | | | | | | |
| 110 | 10 | 1 | | | | | | | | | | | | | | | |
| 230 | 6 | .4 | | | | | | | | | | | | | | | |
| Contact Material | Silver-nickel alloy | | | | | | | | | | | | | | | | |
| Maximum Switching Speed | SI-LM40MKH models: 50 operations per minute SI-LM40MKV models: 10 operations per minute | | | | | | | | | | | | | | | | |
| Maximum Actuator Speed | SI-LM40MKH models: 1.5 m/second SI-LM40MKV models: 0.5 m/second | | | | | | | | | | | | | | | | |
| Mechanical Life | SI-LM40MKH models: 1 million operations SI-LM40MKV models: 25,000 operations | | | | | | | | | | | | | | | | |
| Minimum Actuator Engagement Radius | Rigid actuator: 400 mm Flexible actuator: 150 mm | | | | | | | | | | | | | | | | |
| Actuation Extraction Force | SI-LM40MKH models: 10 N SI-LM40MKV models: 20 N | | | | | | | | | | | | | | | | |
| Short Circuit Protection | 6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection. | | | | | | | | | | | | | | | | |
| Wire Connections | Screw terminals with pressure plates accept the following wire sizes – Stranded and solid: 20 AWG (0.5 mm ²) to 16 AWG (1.5 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires | | | | | | | | | | | | | | | | |
| Cable Entry | M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to ½" - 14 NPT threaded entrance | | | | | | | | | | | | | | | | |
| Construction | Aluminum alloy die cast | | | | | | | | | | | | | | | | |
| Environmental Rating | IP65 | | | | | | | | | | | | | | | | |
| Operating Conditions | Temperature: -30° to +80° C | | | | | | | | | | | | | | | | |
| Weight | SI-LM40MKH models: 0.34 kg SI-LM40MKV models: 0.31 kg | | | | | | | | | | | | | | | | |
| Certifications |    | | | | | | | | | | | | | | | | |
| Contact Configuration and Switching Diagrams | SI-LM40MKH..D models: SD018 (p. 600) SI-LM40MKH..E models: SD019 (p. 601) | SI-LM40MKH..F models: SD020 (p. 601) SI-LM40MKV.. models: SD021 and SD022 (p. 601) | | | | | | | | | | | | | | | |



Locking Style Spring or Solenoid Locking

- Two locking mechanisms are available: spring lock with energized solenoid release and energized solenoid lock with spring release
- Rigid and flexible in-line actuators are available
- Actuator head can be rotated in 90° increments to eight possible actuator positions: four vertical and four horizontal
- Two models are available, based on voltage
- Design meets positive opening requirements for safety interlocks (IEC 60947-5-1) →
- Insulated device on all models with plastic housing (IEC 60947-5-1) □
- Protective earth terminals on all metal models (IEC 60947-1) ⊕

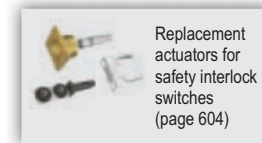
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- Sensors
- Fiber Optic
- Sensors
- Special Purpose
- Sensors
- Measurement &
- Inspection Sensors
- Vision
- Wireless
- Lighting &
- Indicators
- Safety
- Light Screens
- Safety
- Laser Scanners
- Safety Controllers
- & Modules
- Safety Two-Hand
- Control Modules
- Safety Interlock**
- Switches**
- Emergency Stop
- & Stop Control

ACCESSORIES
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SI-LS42 Locking Style Switches

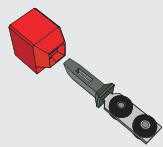
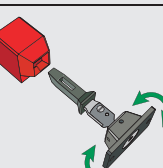


ONLINE
AUTOCAD, STEP,
IGES & PDF




- INTERLOCK
- SWITCHES
- MAGNET
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

SI-LS42 Safety Switches, 42 mm - Spring Lock and Solenoid Unlock

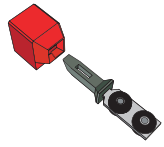
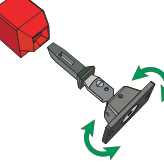
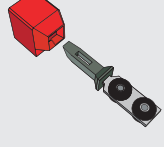
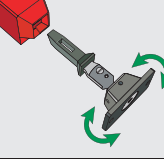
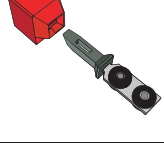
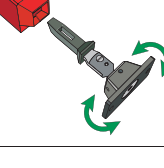
| Kits | | | Contact(s) | Solenoid Voltage | Contact Config. & Switch Diagram |
|--|------------|--------------|--|---------------------|----------------------------------|
| Actuator Type | Interlock | Kit Model * | | | |
| SI-QM-SSA Straight Rigid In-Line  | SI-LS42DSG | SI-LS42DMSG | Actuator Contacts: 1 NC & 1 NO | 24V ac/dc | SD023 (Page 601) |
| | SI-LS42WSG | SI-LS42WMSG | | 110V ac/ 230V ac | |
|  SI-QM-SMFA Flexible In-Line | SI-LS42DSG | SI-LS42DMSGF | Solenoid Monitor Contacts: 1 NC & 1 NO | 24V ac/dc | |
| | SI-LS42WSG | SI-LS42WMSGF | | 110V ac/ 230V ac | |


More on next page

 Multi-Directional
 NC = Normally Closed Contact,
 NO = Normally Open Contact
 * A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS42 Safety Switches, 42 mm - Spring Lock and Solenoid Unlock (cont'd)

ACCESSORIES
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| Actuator Type | | Kits | | Contact(s) | Solenoid Voltage | Contact Config. & Switch Diagram | |
|--|---|------------|--------------|--|---------------------|----------------------------------|---------------------|
| | | Interlock | Kit Model * | | | | |
| SI-QM-SSA Straight Rigid In-Line |  | SI-LS42DSH | SI-LS42DMSH | Actuator Contacts: 2 NC | 24V ac/dc | SD024 (Page 601) | |
| | | SI-LS42WSH | SI-LS42WMSH | | 110V ac/ 230V ac | | |
| SI-QM-SMFA Flexible In-Line |  | SI-LS42DSH | SI-LS42DMSHF | Solenoid Monitor Contacts: 1 NC & 1 NO | 24V ac/dc | | |
| | | SI-LS42WSH | SI-LS42WMSHF | | 110V ac/ 230V ac | | |
| SI-QM-SSA Straight Rigid In-Line |  | SI-LS42DSI | SI-LS42DMSI | Actuator Contacts: 2 NC & 1 NO | 24V ac/dc | | SD025 (Page 602) |
| | | SI-LS42WSI | SI-LS42WMSI | | 110V ac/ 230V ac | | |
| SI-QM-SMFA Flexible In-Line |  | SI-LS42DSI | SI-LS42DMSIF | Solenoid Monitor Contact: 1 NC | 24V ac/dc | | |
| | | SI-LS42WSI | SI-LS42WMSIF | | 110V ac/ 230V ac | | |
| SI-QM-SSA Straight Rigid In-Line |  | SI-LS42DSJ | SI-LS42DMSJ | Actuator Contacts: 3 NC | 24V ac/dc | SD026 (Page 602) | |
| SI-QM-SMFA Flexible In-Line |  | SI-LS42DSJ | SI-LS42DMSJF | Solenoid Monitor Contact: 1 NC | | | |

 Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only. Contact factory for integral quick-disconnect (QD) and pigtail QD options.

SI-LS42 Safety Switches, 42 mm - Solenoid Lock and Spring Unlock

| Actuator Type | | Kits | | Contact(s) | Solenoid Voltage | Contact Config. & Switch Diagram | |
|--|--|------------|--------------|--|---------------------|----------------------------------|---------------------|
| | | Interlock | Kit Model * | | | | |
| SI-QM-SSA Straight Rigid In-Line | | SI-LS42DMG | SI-LS42DMMG | Actuator Contacts: 1 NC & 1 NO | 24V ac/dc | SD023 (Page 601) | |
| | | SI-LS42WMG | SI-LS42WMMG | | 110V ac/ 230V ac | | |
| SI-QM-SMFA Flexible In-Line | | SI-LS42DMG | SI-LS42DMMGF | Solenoid Monitor Contacts: 1 NC & 1 NO | 24V ac/dc | | |
| | | SI-LS42WMG | SI-LS42WMMGF | | 110V ac/ 230V ac | | |
| SI-QM-SSA Straight Rigid In-Line | | SI-LS42DMH | SI-LS42DMMH | Actuator Contacts: 2 NC | 24V ac/dc | | SD024 (Page 601) |
| | | SI-LS42WMH | SI-LS42WMMH | | 110V ac/ 230V ac | | |
| SI-QM-SMFA Flexible In-Line | | SI-LS42DMH | SI-LS42DMMHF | Solenoid Monitor Contacts: 1 NC & 1 NO | 24V ac/dc | | |
| | | SI-LS42WMH | SI-LS42WMMHF | | 110V ac/ 230V ac | | |
| SI-QM-SSA Straight Rigid In-Line | | SI-LS42DMI | SI-LS42DMMI | Actuator Contacts: 2 NC & 1 NO | 24V ac/dc | SD025 (Page 602) | |
| | | SI-LS42WMI | SI-LS42WMMI | | 110V ac/ 230V ac | | |
| SI-QM-SMFA Flexible In-Line | | SI-LS42DMI | SI-LS42DMMIF | Solenoid Monitor Contact: 1 NC | 24V ac/dc | | |
| | | SI-LS42WMI | SI-LS42WMMIF | | 110V ac/ 230V ac | | |
| SI-QM-SSA Straight Rigid In-Line | | SI-LS42DMJ | SI-LS42DMMJ | Actuator Contacts: 3 NC | 24V ac/dc | | SD026 (Page 602) |
| SI-QM-SMFA Flexible In-Line | | SI-LS42DMJ | SI-LS42DMMJF | Solenoid Monitor Contact: 1 NC | | | |

Multi-Directional NC = Normally Closed Contact, NO = Normally Open Contact

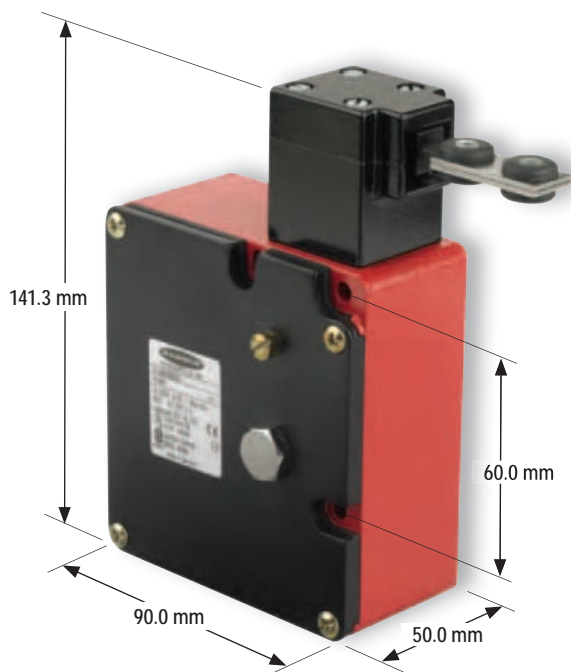
* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
Contact factory for integral quick-disconnect (QD) and pigtail QD options.

- Photoelectrics Sensors
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- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

ACCESSORIES
page 604

INTERLOCK SWITCHES
MAGNET
HINGE
COMPACT PLASTIC
COMPACT METAL
LOCKING STYLE

SI-QM100 Locking Style Switches

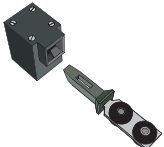


SI-QM100 Models
(shown with rigid in-line actuator)

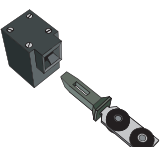



ACCESSORIES
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SI-QM100 Safety Switches, 100 mm - Spring Lock and Solenoid Unlock

| Kits | | | | Contact(s) | Solenoid Voltage | Contact Config. & Switch Diagram |
|--|-------------|--------------|---|--|---------------------|----------------------------------|
| Actuator Type | Interlock | Kit Model* | | | | |
| SI-QM-SSA Straight Rigid In-Line  | SI-QM100DSG | SI-QM100DMSG | Switching Contacts: 1 NC & 1 NO | 24V dc | SD027 (Page 602) | |
| | SI-QM100ASG | SI-QM100AMSG | Solenoid Monitor Contacts: 1 NC & 1 NO | 120V ac | | |
| | SI-QM100DSH | SI-QM100DMSH | Switching Contacts: 2 NC | Solenoid Monitor Contacts: 1 NC & 1 NO | 24V dc | SD028 (Page 602) |

SI-QM100 Safety Switches, 100 mm - Solenoid Lock and Spring Unlock

| Kits | | | | Contact(s) | Solenoid Voltage | Contact Config. & Switch Diagram |
|--|-------------|--------------|--|------------|---------------------|----------------------------------|
| Actuator Type | Interlock | Kit Model* | | | | |
| SI-QM-SSA Straight Rigid In-Line  | SI-QM100DMG | SI-QM100DMMG | Switching Contacts: 1 NC & 1 NO | 24V dc | SD027 (Page 602) | |
| | SI-QM100AMG | SI-QM100AMMG | Solenoid Monitor Contacts: 1 NC & 1 NO | 120V ac | | |

 Multi-Directional
 NC = Normally Closed Contact,
 NO = Normally Open Contact

* A kit contains an interlock and actuator. Individual interlocks (without actuator) are for replacement purposes only.
Contact factory for integral quick-disconnect (QD) and pigtail QD options.

Locking Style Switches Specifications

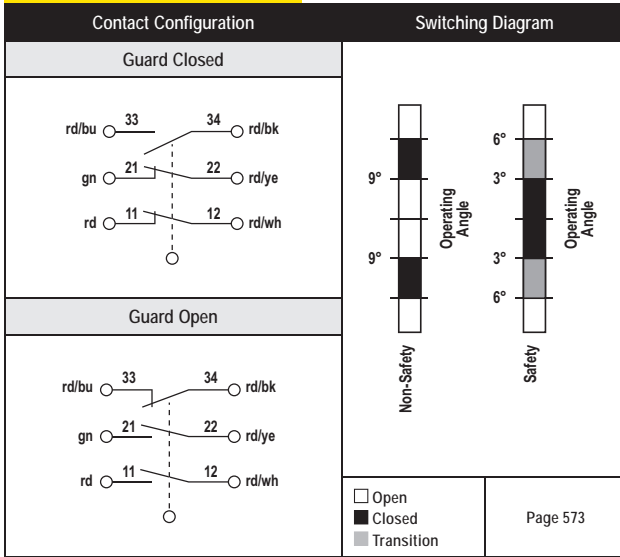
| Contact Rating | 4A @ 250V ac max. 2.5 kV max. transient tolerance NEMA A300 P300 | | | | | | | | | | | | | | | | |
|---|--|--|----------|--|--|--------|----------------------|----------------------|----|---|---|-----|---|-----|-----|---|-----|
| European Rating | Utilization categories: AC15 and DC13 (IEC 60947-5-1) Switches with 1 & 2 contact pairs: $U_f = 250V$ ac SI-LS42 models: $I_{th} = 2.5$ A SI-QM100 models: $I_{th} = 10$ A | <table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th colspan="3">40-60 Hz</th> </tr> <tr> <th>U V</th> <th>I_{th}/AC-15 A</th> <th>I_{th}/DC-13 A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>4</td> <td>3</td> </tr> <tr> <td>110</td> <td>4</td> <td>0.7</td> </tr> <tr> <td>230</td> <td>4</td> <td>0.3</td> </tr> </tbody> </table> | 40-60 Hz | | | U V | I_{th} /AC-15 A | I_{th} /DC-13 A | 24 | 4 | 3 | 110 | 4 | 0.7 | 230 | 4 | 0.3 |
| 40-60 Hz | | | | | | | | | | | | | | | | | |
| U V | I_{th} /AC-15 A | I_{th} /DC-13 A | | | | | | | | | | | | | | | |
| 24 | 4 | 3 | | | | | | | | | | | | | | | |
| 110 | 4 | 0.7 | | | | | | | | | | | | | | | |
| 230 | 4 | 0.3 | | | | | | | | | | | | | | | |
| Contact Material | Silver-nickel alloy | | | | | | | | | | | | | | | | |
| Solenoid Power Consumption | SI-LS42 models: 1.1 VA / Inrush 12 VA (0.2 sec) SI-QM100 models: 5.2 W | | | | | | | | | | | | | | | | |
| Maximum Actuator Speed | 1.5 m/second | | | | | | | | | | | | | | | | |
| Mechanical Life | 1 million operations | | | | | | | | | | | | | | | | |
| Minimum Actuator Engagement Radius | Rigid actuator: 400 mm Flexible actuator: 150 mm | | | | | | | | | | | | | | | | |
| Actuation Extraction Force | SI-LS42 models: 2000 N when locked SI-QM100 models: 1000 N when locked | | | | | | | | | | | | | | | | |
| Short Circuit Protection | 6 amp Slow Blow, 10 amp Fast Blow. Recommended external fusing or overload protection. | | | | | | | | | | | | | | | | |
| Wire Connections | SI-LS42 models: 10 cage clamp elements 1.5 mm stranded max. / 16 AWG SI-QM100 models: Screw terminals with pressure plates accept the following wire sizes – 16 AWG (1.5 mm ²) max. solid; 14 AWG (2.5 mm ²) max. stranded, 18 AWG (1 mm ²) when using all 11 terminals | | | | | | | | | | | | | | | | |
| Cable Entry | M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to 1/2" - 14 NPT threaded entrance | | | | | | | | | | | | | | | | |
| Construction | SI-LS42 models: Glass fiber-reinforced polyamide thermoplastic housing; UL 94-V0 rating SI-QM100 models: Aluminum die cast | | | | | | | | | | | | | | | | |
| Environmental Rating | IP67 | | | | | | | | | | | | | | | | |
| Operating Conditions | Temperature: SI-LS42 models: -30° to +70° C SI-QM100 models: -30° to +60° C | | | | | | | | | | | | | | | | |
| Weight | SI-LS42 models: 0.3 kg SI-QM100 models: 0.81 kg | | | | | | | | | | | | | | | | |
| Application Notes | When rotating the actuator head, the actuator MUST BE FULLY ENGAGED . When using a model with solenoid locking, the lock mechanism will disengage upon solenoid power failure. | | | | | | | | | | | | | | | | |
| Certifications | | | | | | | | | | | | | | | | | |
| Contact Configuration and Switching Diagrams | SI-LS42 models: SD023, SD024, SD025 & SD026 (pp. 601-602) SI-QM100 models: SD027 and SD028 (p. 602) | | | | | | | | | | | | | | | | |

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

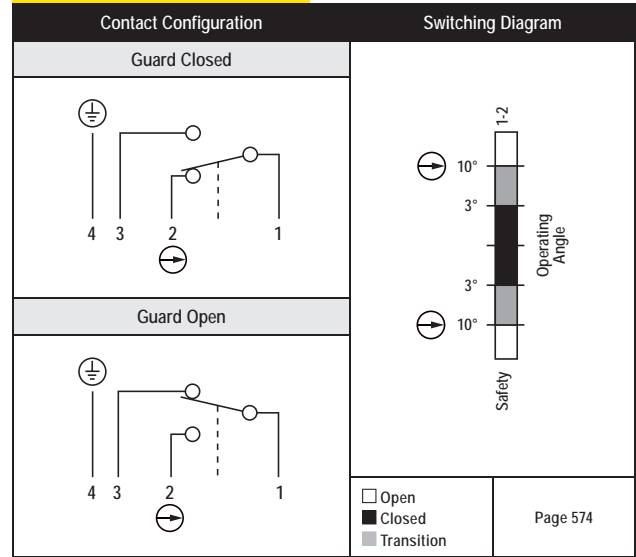
- INTERLOCK SWITCHES**
- MAGNET
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

Contact/Switching Diagrams

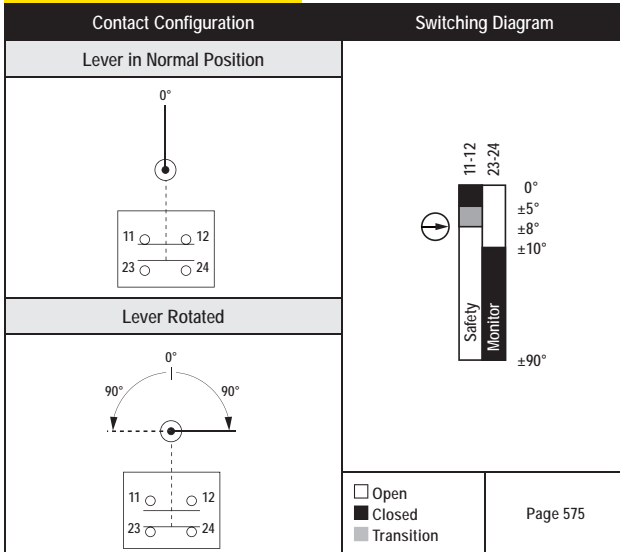
SD001 - SI-HG63 Series



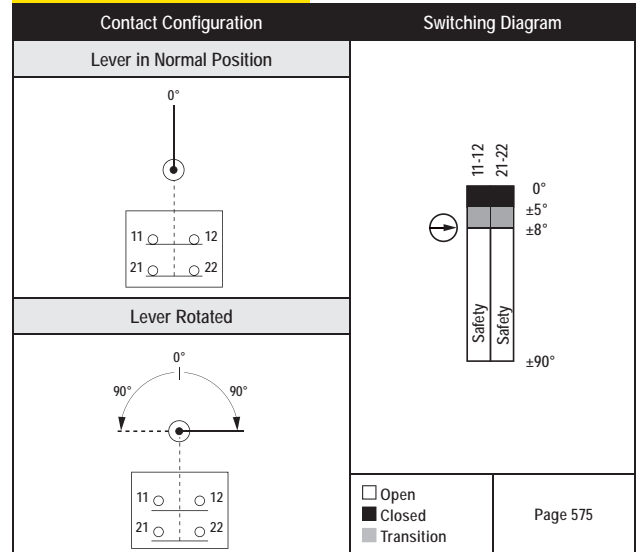
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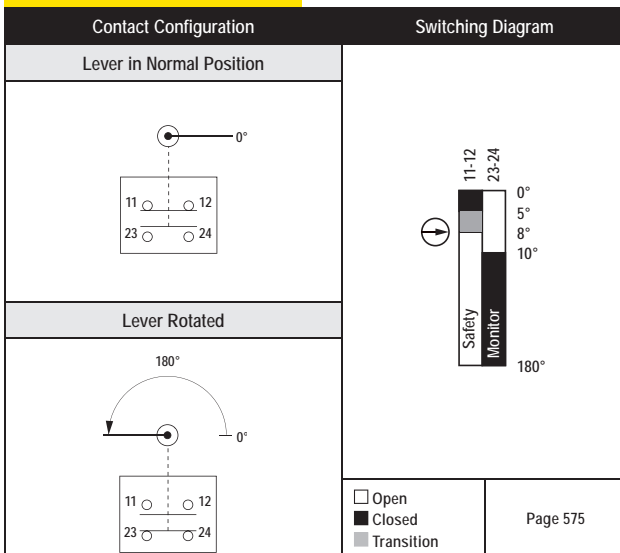
SD003 - SI-LS31HGD Series



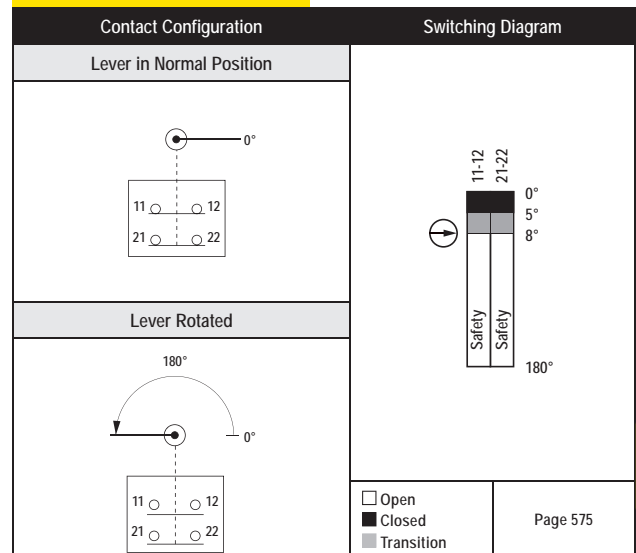
SD004 - SI-LS31HGE Series



SD005 - SI-LS31HGRD Series



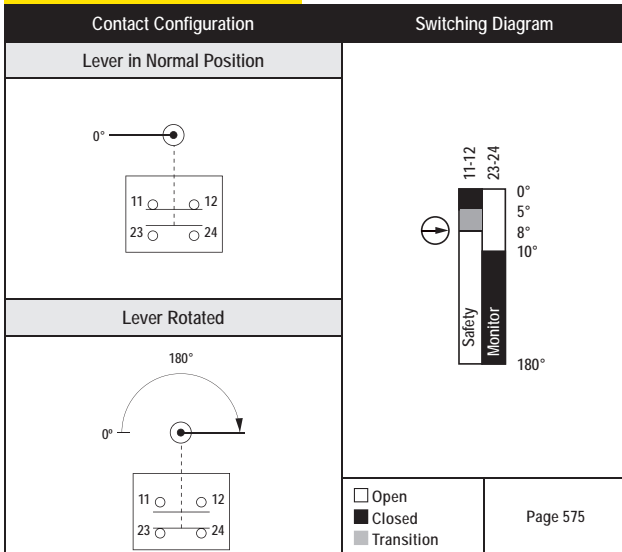
SD006 - SI-LS31HGRE Series



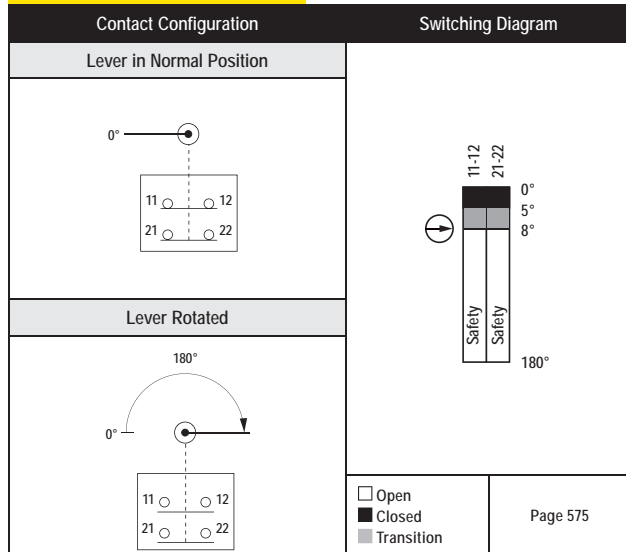
More on next page

Contact/Switching Diagrams

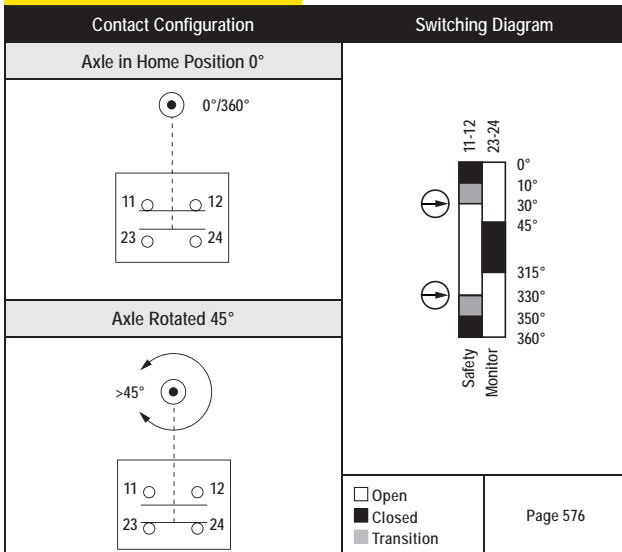
SD007 - SI-LS31HGLD Series



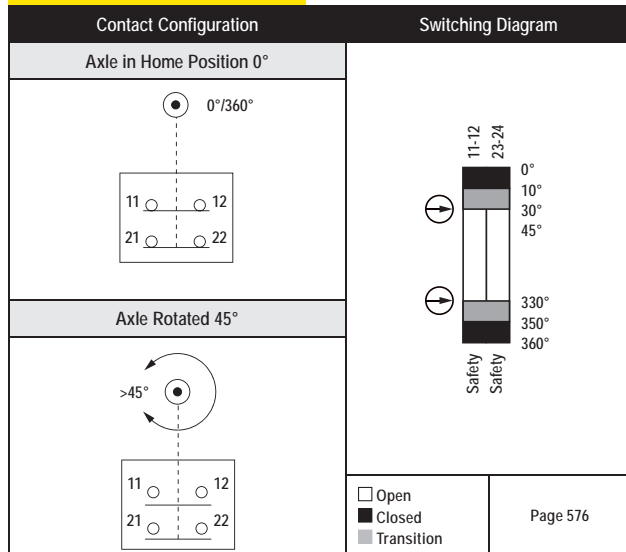
SD008 - SI-LS31HGLE Series



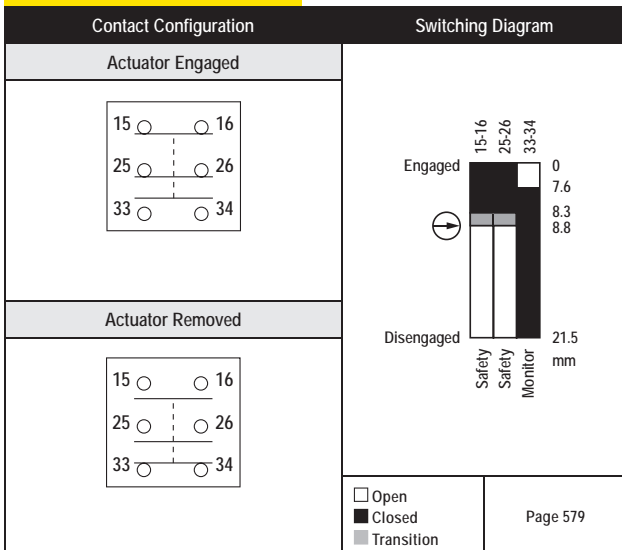
SD009 - SI-LS31RTD Series



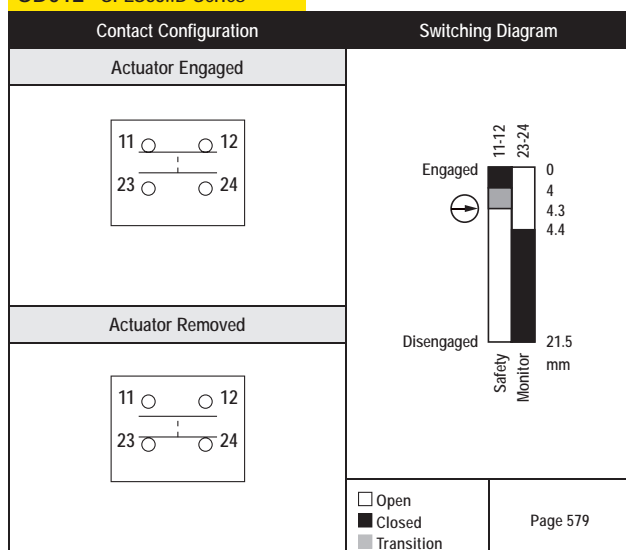
SD010 - SI-LS31RTE Series



SD011 - SI-LS100 Series



SD012 - SI-LS83..D Series

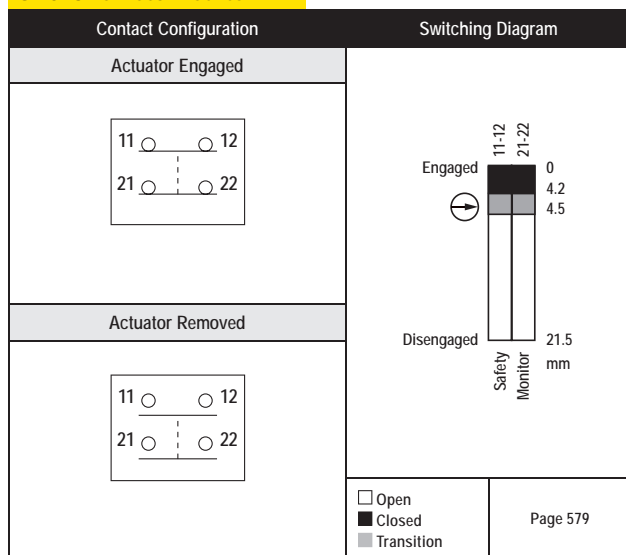


- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

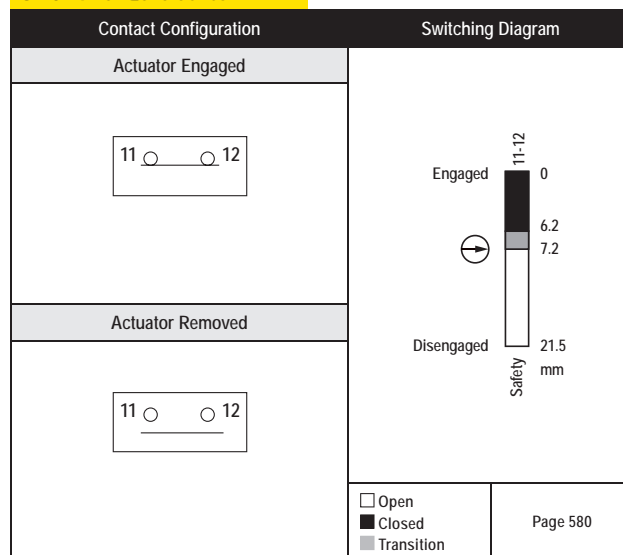
- INTERLOCK SWITCHES**
- MAGNET
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

Contact/Switching Diagrams

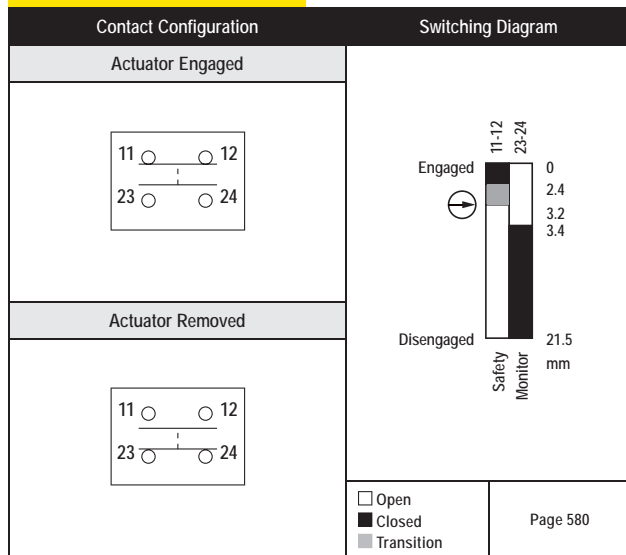
SD013 - SI-LS83..E Series



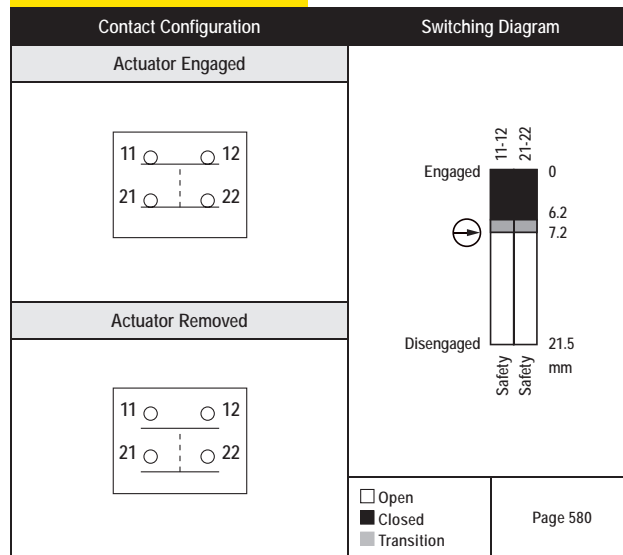
SD014 - SI-QS75 Series



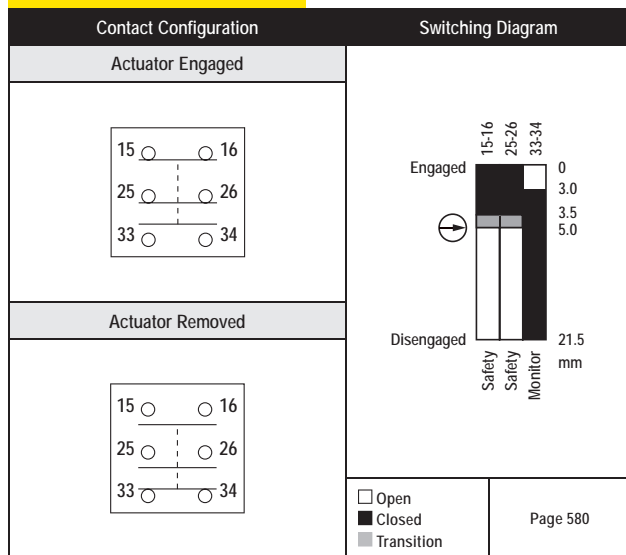
SD015 - SI-QS90MD Series



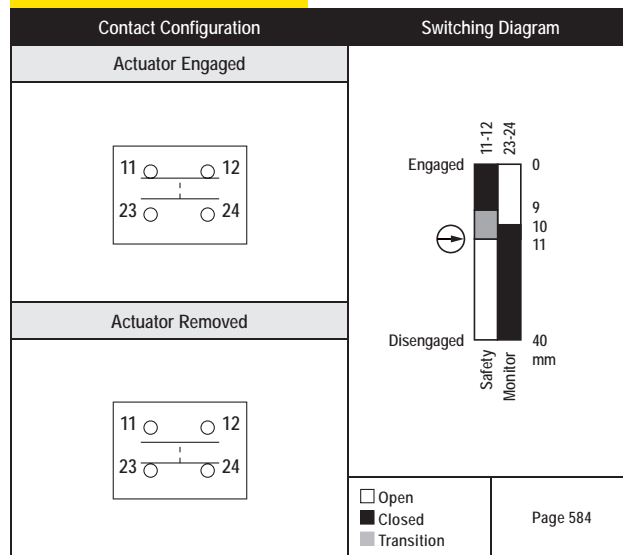
SD016 - SI-QS90ME Series



SD017 - SI-QS90MF Series

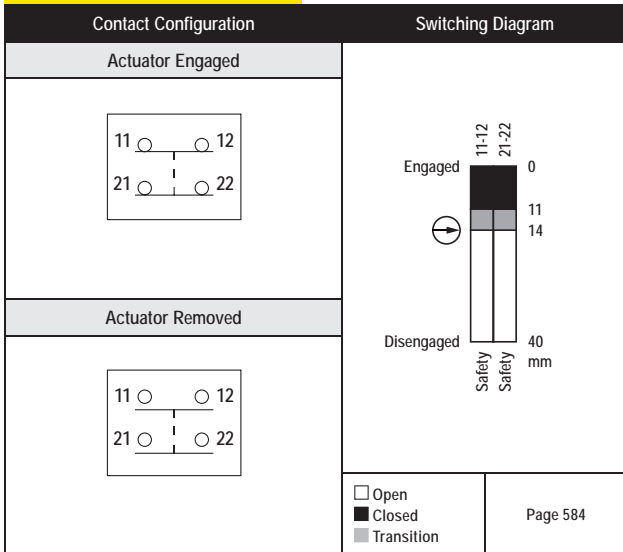


SD018 - SI-LM40MKHD Series

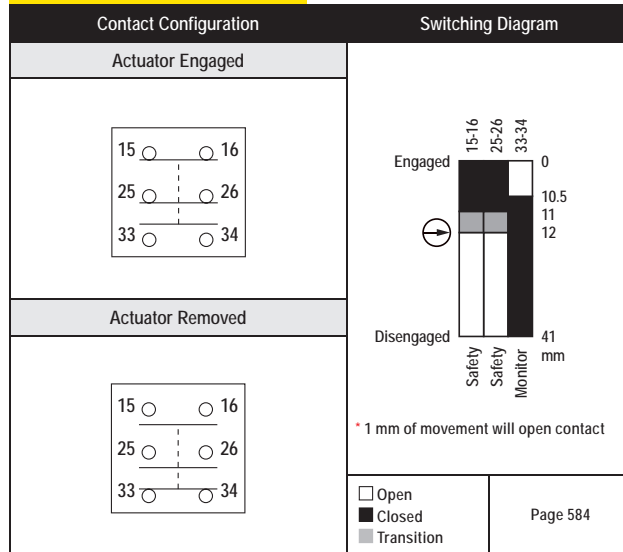


Contact/Switching Diagrams

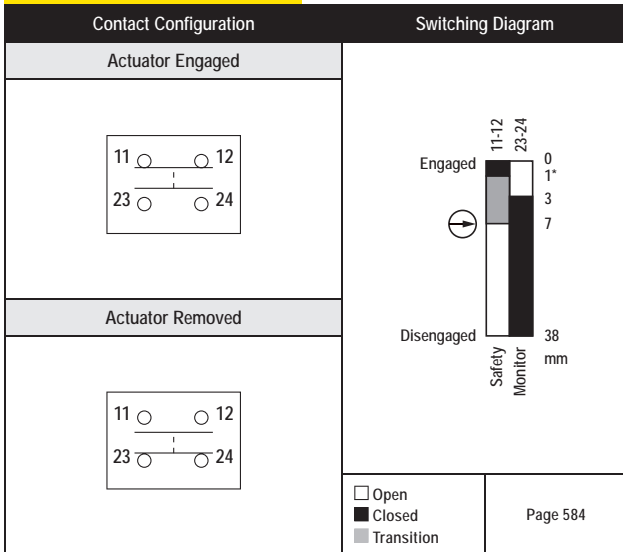
SD019 - SI-LM40MKHE Series



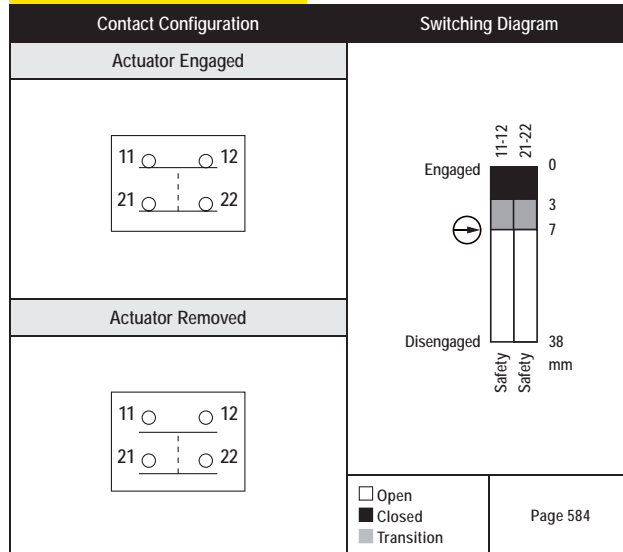
SD020 - SI-LM40MKHF Series



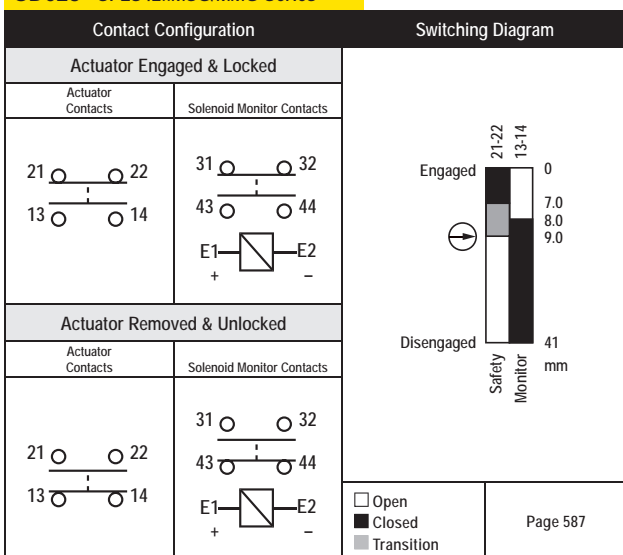
SD021 - SI-LM40MKVD Series



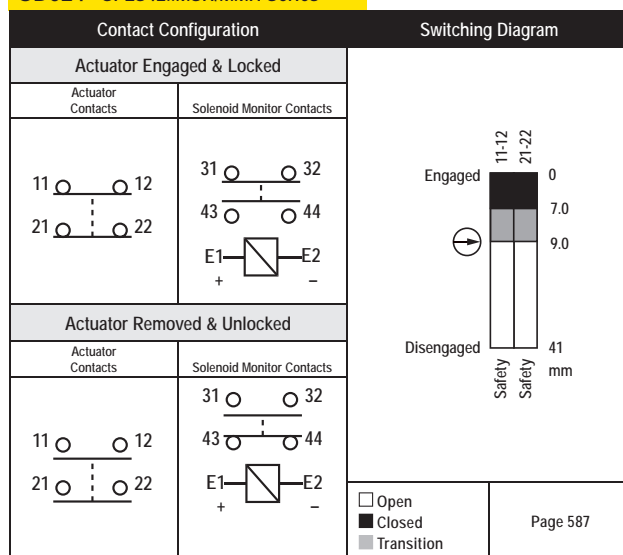
SD022 - SI-LM40MKVE Series



SD023 - SI-LS42..MSG/MMG Series



SD024 - SI-LS42..MSH/MMH Series



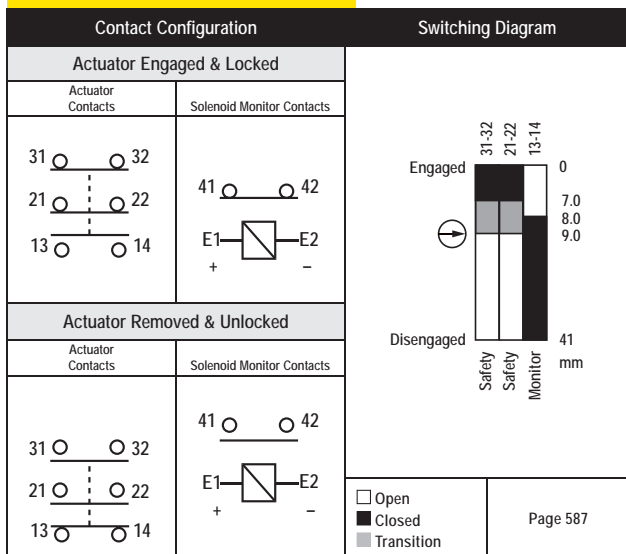
- Photoelectrics Sensors
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- Emergency Stop & Stop Control

- INTERLOCK SWITCHES**
- MAGNET
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

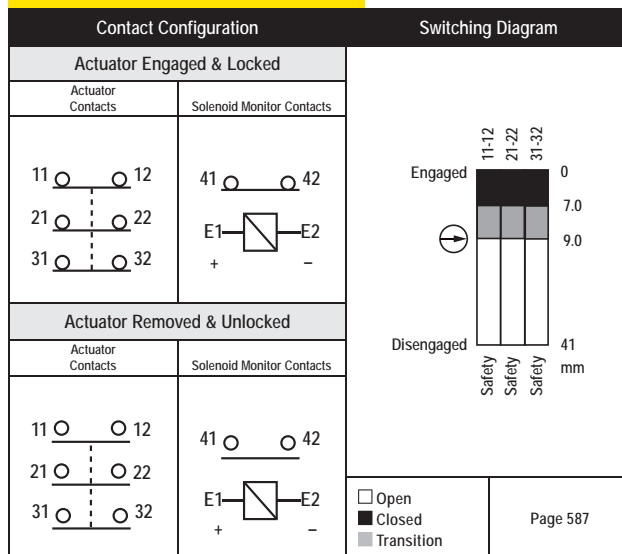


Contact/Switching Diagrams

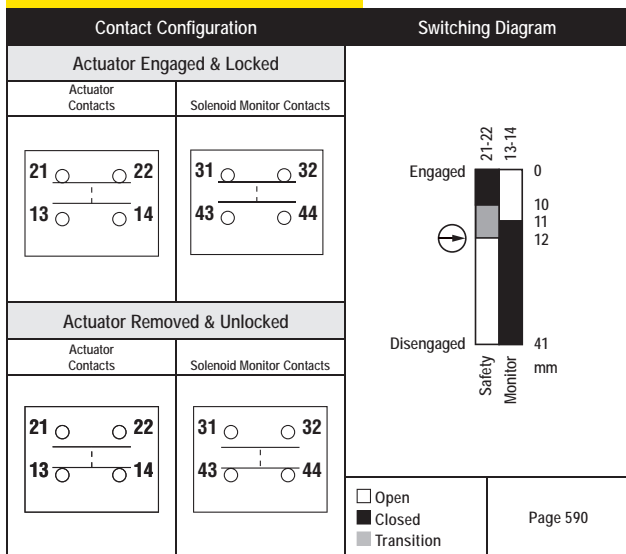
SD025 - SI-LS42..MSI/MMI Series



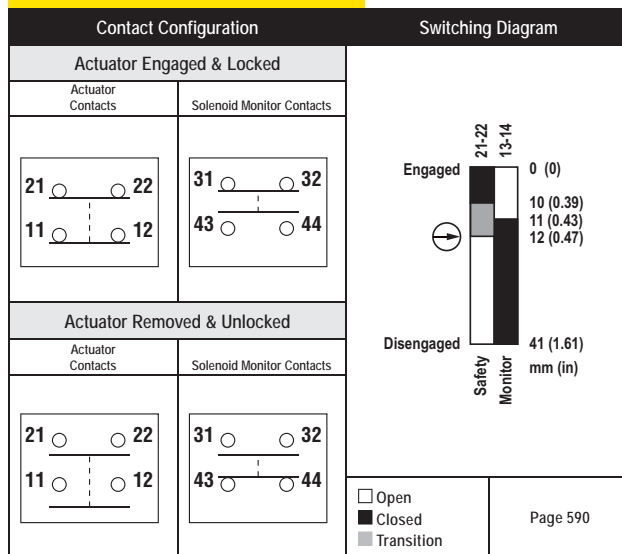
SD026 - SI-LS42..MSJ/MMJ Series



SD027 - SI-QM100..MSG/MMG Series



SD028 - SI-QM100..DMSH Series



Safety Interlock Switches Replacement Parts

| Used In | Description | Model* |
|--------------------|--|-------------|
| SI-LM40MKH..D kits | Individual Interlock (without actuator) | SI-LM40KHD |
| SI-LM40MKH..E kits | | SI-LM40KHE |
| SI-LM40MKH..F kits | | SI-LM40KHF |
| SI-LM40MKVD kit | | SI-LM40KVD |
| SI-LM40MKVE kit | | SI-LM40KVE |
| SI-LS42MSG.. kits | | SI-LS42DSG |
| SI-LS42WMSG.. kits | | SI-LS42WSG |
| SI-LS42DMSH.. kits | | SI-LS42DSH |
| SI-LS42WMSH.. kits | | SI-LS42WSH |
| SI-LS42DMSI.. kits | | SI-LS42DSI |
| SI-LS42WMSI.. kits | | SI-LS42WSI |
| SI-LS42DMSJ.. kits | | SI-LS42DSJ |
| SI-LS42DMMG.. kits | | SI-LS42DMG |
| SI-LS42WMMG.. kits | | SI-LS42WMG |
| SI-LS42DMMH.. kits | | SI-LS42DMH |
| SI-LS42WMMH.. kits | | SI-LS42WMH |
| SI-LS42DMMI.. kits | | SI-LS42DMI |
| SI-LS42WMMI.. kits | | SI-LS42WMI |
| SI-LS42DMMJ.. kits | | SI-LS42DMJ |
| SI-LS100..F kits | | SI-LS100F |
| SI-LS83..D kits | | SI-LS83D |
| SI-LS83..E kits | | SI-LS83E |
| SI-QM100DMSG kit | | SI-QM100DSG |
| SI-QM100AMSG kit | | SI-QM100ASG |
| SI-QM100DMMG kit | | SI-QM100DMG |
| SI-QM100AMMG kit | | SI-QM100AMG |
| SI-QS75..C kits | | SI-QS75C |
| SI-QS90..D kits | | SI-QS90D |
| SI-QS90..E kits | | SI-QS90E |
| SI-QS90..F kits | | SI-QS90F |

* Kits with one safety interlock switch and an actuator are available (see pp. 578-590).

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- Safety Two-Hand Control Modules
- Safety Interlock Switches**
- Emergency Stop & Stop Control

- INTERLOCK SWITCHES**
- MAGNET
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

Replacement Actuators Parts for Safety Interlock Switches

| Image | Description | Used With | Model |
|---|--|---|-------------------|
|  | <p>Flexible in-line, trumpet-style, metal actuator used for doors or covers where alignment is difficult to maintain. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm.</p> | <ul style="list-style-type: none"> • SI-LM40MKV | <p>SI-QM-90A</p> |
|  | <p>Rigid in-line metal actuator used for doors or covers. Slide-bolt design for use in heavy-duty applications where alignment is difficult to maintain.</p> | <ul style="list-style-type: none"> • SI-LM40MKH • SI-LS42 • SI-QM100 | <p>SI-QM-SB</p> |
|  | <p>Flexible in-line metal actuator used for doors or covers where alignment is difficult to maintain. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm.</p> | <ul style="list-style-type: none"> • SI-LM40MKH • SI-LS42 • SI-QM100 | <p>SI-QM-SMFA</p> |
|  | <p>Rigid in-line metal actuator used for doors or covers with accurate alignment, such as sliding doors. Minimum engagement radius for hinged closures is 400 mm.</p> | <ul style="list-style-type: none"> • SI-LM40MKH • SI-LS42 • SI-QM100 | <p>SI-QM-SSA</p> |
|  | <p>High-extraction-force adapter for particularly heavy or large doors. Adjustable from 50 to 100 Newtons (force). Used only for switches with in-line actuator SI-QS-SSA.</p> | <ul style="list-style-type: none"> • SI-QS75 • SI-QS90 | <p>SI-QS-100</p> |



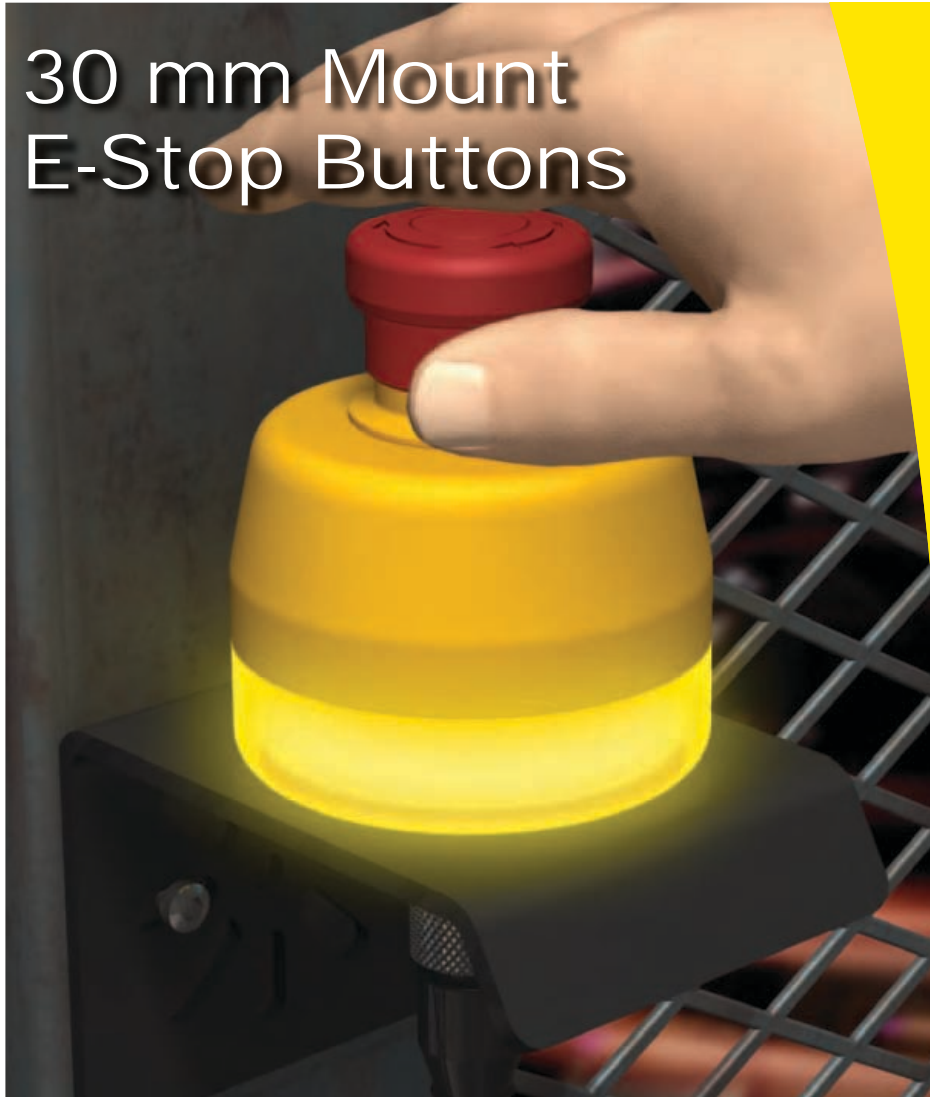
Replacement Actuators Parts for Safety Interlock Switches (cont'd)

| Description | | Used With | Model |
|---|---|---|------------------|
|  | Rigid in-line metal (die-cast steel) actuator for doors or covers with a radius of 150 mm or greater. | <ul style="list-style-type: none"> • SI-QS75 (high-force) • SI-QS90 (high-force) | SI-QS-SSA |
|  | Rigid in-line metal (stamped stainless steel) actuator used for doors or covers with accurate alignment, such as sliding doors. Minimum engagement radius for hinged closures is 150 mm. | <ul style="list-style-type: none"> • SI-LS83 • SI-LS100 | SI-QS-SSA-2 |
|  | Rigid in-line metal (stamped stainless steel) actuator used for doors or covers with accurate alignment, such as sliding doors. Right-angle mounting flange. Minimum engagement radius for hinged closures is 150 mm. | <ul style="list-style-type: none"> • SI-LS83 • SI-LS100 | SI-QS-SSA-3 |
|  | Rigid in-line metal (stamped stainless steel) actuator for doors or covers with a radius of 150 mm or greater. | <ul style="list-style-type: none"> • SI-QS75 • SI-QS90 | SI-QS-SSA-4 |
|  | Flexible in-line metal (die-cast steel) actuator for hinged doors with a radius of 50 mm or greater. Flexes in all directions. Minimum engagement radius for hinged closures is 150 mm. | <ul style="list-style-type: none"> • SI-LS83 • SI-LS100 • SI-QS75 • SI-QS90 | SI-QS-SSU |
| Replacement terminal cover | | • SI-LS42 | SI-LS42-COVER |
| Tamper Proof Screw (One way) | | • SI-LS42 | SI-LS42-SCREW OW |

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- Safety Interlock Switches**
- Emergency Stop & Stop Control

- INTERLOCK SWITCHES**
- MAGNET
- HINGE
- COMPACT PLASTIC
- COMPACT METAL
- LOCKING STYLE

30 mm Mount E-Stop Buttons



EZ-mount E-Stops

- ▶ Push-to-stop, twist-to-release or pull-to-release operation per IEC60947-5-5
- ▶ Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- ▶ Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- ▶ “Safe Break Action” ensures NC contacts will open if the contact block is damaged or separated from the actuator
- ▶ Rugged design; easy installation with no assembly or individual wiring required
- ▶ 4-, 5-, or 8-pin M12/Euro-style Quick Disconnect
- ▶ Models designed to interface with Safety BUS nodes/gateways
- ▶ Can be interfaced with CSS Series Hookup Cordsets
- ▶ Models with yellow and red indication of actuation (armed or depressed/latched button) and machine status (optional)
- ▶ Model with red LED indication of actuation (depressed/latched button)

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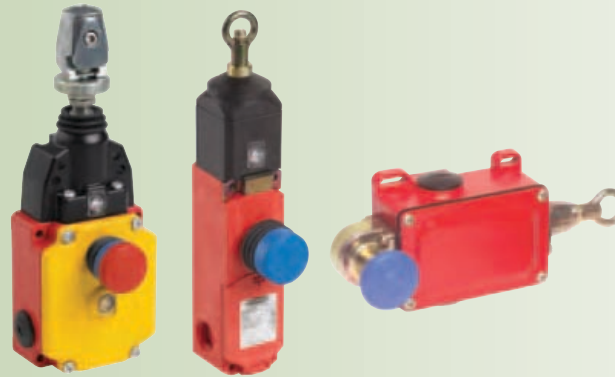


EMERGENCY STOP & STOP CONTROL DEVICES

E-Stop Push Buttons



Rope Pull Switches



Enabling Devices



E-Stop Buttons page 608

- Mechanical palm buttons push to stop and twist to release
- Panel mount and IP65 enclosures
- Panel mount modular design makes assembly and installation easy.
- Kits simplify selection and ordering
- EZ-Mount Emergency Stop enclosures for machine mount applications



Rope Pull Switches page 617

- Models that comply with cable break/slack detection with manual reset for Emergency Stop applications.
- Available spans range from 6 to 100 m.
- Trip and latch switch models are available.
- Minimum switch life is 1 million operations.
- Heavy-duty switch housings withstand harsh environments and outdoor use.



Enabling Devices page 627

- Handheld devices provide the three-position functionality required for manual control of a machine.
- When continuously actuated it permits the machine to run but does not start the cycle.
- Optional momentary push-button switch models can provide hold-to-run, reset or jogging/inching functions.

- Photoelectrics Sensors
- Fiber Optic Sensors
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- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control**

- E-STOP BUTTONS**
- ROPE PULLS**
- ENABLING DEVICES**

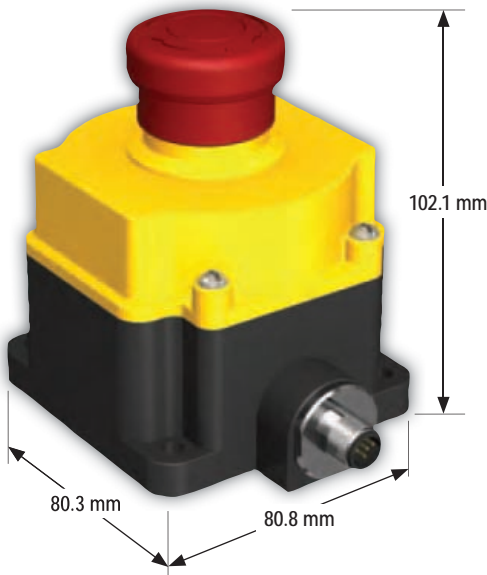
Flush Mount E-Stop Buttons

EZ-mount E-Stops

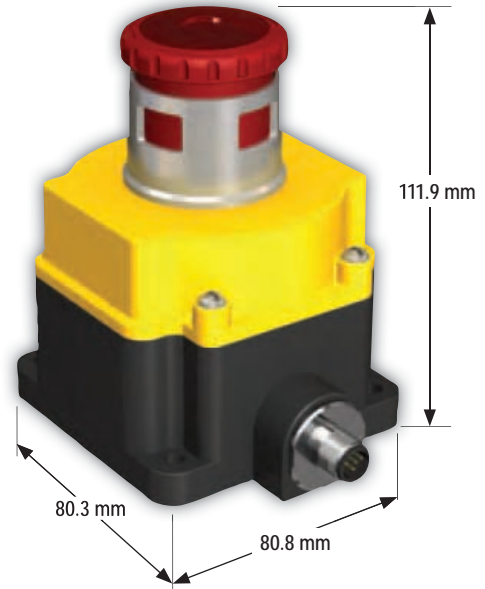
- Push-to-stop, twist-to-release operation per IEC 60947-5-5
- Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- “Safe Break Action” ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Rugged design; easy installation with no assembly or individual wiring required
- Models available with lockable emergency stop push buttons
- 4-, 5-, or 8-pin M12/Euro-style Quick Disconnect
- Models designed to interface with Safety BUS nodes/gateways
- Can be interfaced with CSS Series Hookup Cordsets (See page 612)



ACCESSORIES
page
612



Emergency Stop Push Button with Enclosure
(Standard button version shown)



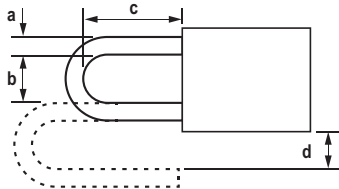

Emergency Stop Push Button with Enclosure
(Lockable button version shown)

Flush-mount E-Stop Push-Button

| Description | Illuminated | Standard Models | Lockable Models |
|--|-------------|--------------------|---------------------|
| 2NC E-Stop contacts | — | SSA-EB1P-02ED1Q4 | SSA-EB1MP-02ED1Q4 |
| 1NC/1NO E-Stop contacts | — | SSA-EB1P-11ED1Q4 | SSA-EB1MP-11ED1Q4 |
| 2NC E-Stop contacts, Safety BUS node compatible* | — | SSA-EB1P-02ED1Q5A | SSA-EB1MP-02ED1Q5A |
| 2NC E-Stop contacts, Safety BUS node compatible* | — | SSA-EB1P-02ED1Q5B | SSA-EB1MP-02ED1Q5B |
| 2NC/2NO E-Stop contacts | — | SSA-EB1P-22ED1Q8 | SSA-EB1MP-22ED1Q8 |
| 2NC/1NO E-Stop contacts, Illuminated—Push ON RED | Yes | SSA-EB1L2P-12ED1Q8 | SSA-EB1ML2P-12ED1Q8 |

* For pinout information see page 612.

E-Stop Push-Button Specifications

| Housing / Button Mounting | Polycarbonate / Polyamide #10 or M5 (M5 hardware included), Max. Tightening Torque: 0.56 N•m (5 in•lbf) | | | | | | | | | | | | | | | | | | | | |
|--|--|--|------------------------|-----|-------|------|---|---|---|----------|-----------|------------|-----------|--------------|------|--------|---------|---------|-------------------|-------------|------------|
| Operating Temperature | Non-illuminated: -25 to +60°C (no freezing) Illuminated: -25 to +55°C (no freezing) | | | | | | | | | | | | | | | | | | | | |
| Environmental rating | IP65 (IEC60529) | | | | | | | | | | | | | | | | | | | | |
| Operating Humidity | 45% to 85% RH (no condensation) | | | | | | | | | | | | | | | | | | | | |
| Insulation Resistance | 100MΩ minimum (500V DC megger) | | | | | | | | | | | | | | | | | | | | |
| Impulse Withstand Voltage | 2.5kV | | | | | | | | | | | | | | | | | | | | |
| Pollution Degree | 3 | | | | | | | | | | | | | | | | | | | | |
| Output Configuration | See "Installation and Maintenance" | | | | | | | | | | | | | | | | | | | | |
| Overvoltage Category | II | | | | | | | | | | | | | | | | | | | | |
| Contact material / bounce* | Gold plated silver / 20ms | | | | | | | | | | | | | | | | | | | | |
| Electrical Life | 100,000 operations minimum, 250,000 operations minimum at 24V AC/DC, 100mA | | | | | | | | | | | | | | | | | | | | |
| Mechanical Life | 250,000 operations, | | | | | | | | | | | | | | | | | | | | |
| Operating Force / Stroke / Freq | 80N minimum / 4mm (minimum for direct opening action) 4.5mm maximum / 900 operations/hr | | | | | | | | | | | | | | | | | | | | |
| Total Weight of Padlock and Hasp (SSA-EB1M..P... only) | <p>1500g (3.3 lb) maximum</p> <p>Since various form and sizes are available, ensure applicability of padlock and hasp before use. If total weight exceeds 1500g, the switch may malfunction or fail.</p> <p>Padlock size</p> <table border="1"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td>7 mm max</td> <td>19 mm min</td> <td>39 mm min.</td> <td>15 mm min</td> </tr> </tbody> </table> <p>Dimension d is 6 mm or more when attaching a padlock from the side of a switch.</p>  <p>Recommended Hasp</p> <table border="1"> <thead> <tr> <th>Manufacturer</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>Shinwa</td> <td>SHH0022</td> </tr> <tr> <td>Panduit</td> <td>PSL-HD3 PSL-1A</td> </tr> <tr> <td>Master Lock</td> <td>420 241</td> </tr> </tbody> </table> | | | | | a | b | c | d | 7 mm max | 19 mm min | 39 mm min. | 15 mm min | Manufacturer | Type | Shinwa | SHH0022 | Panduit | PSL-HD3 PSL-1A | Master Lock | 420 241 |
| a | b | c | d | | | | | | | | | | | | | | | | | | |
| 7 mm max | 19 mm min | 39 mm min. | 15 mm min | | | | | | | | | | | | | | | | | | |
| Manufacturer | Type | | | | | | | | | | | | | | | | | | | | |
| Shinwa | SHH0022 | | | | | | | | | | | | | | | | | | | | |
| Panduit | PSL-HD3 PSL-1A | | | | | | | | | | | | | | | | | | | | |
| Master Lock | 420 241 | | | | | | | | | | | | | | | | | | | | |
| Shock Resistance | Operating extremes: 150m/s ² (15G), Damage limits: 1000m/s ² (100G) | | | | | | | | | | | | | | | | | | | | |
| Vibration Resistance | Operating extremes: 10 to 500Hz, amplitude 0.35mm acceleration 50m/s ² Damage limits: 10 to 500Hz, amplitude 0.35mm acceleration 50m/s ² | | | | | | | | | | | | | | | | | | | | |
| LED Voltage/Current | 24V AC/DC ±10%, 15mA @ 24V AC/DC | | | | | | | | | | | | | | | | | | | | |
| Electrical Rating | SSA-EB1P...Q4 and SSA-EB1P...Q5... : 3A @ 250V maximum SSA-EB1P...Q8: 2A @ 60VAC/75VDC maximum | | | | | | | | | | | | | | | | | | | | |
| Rated Insulation Voltage (Ui) | 250V | | | | | | | | | | | | | | | | | | | | |
| Rated Current (Ith) | 3A | | | | | | | | | | | | | | | | | | | | |
| Rated Operating Voltage (Ue) | See Electrical Rating | | | 30V | 125V | 250V | | | | | | | | | | | | | | | |
| Rated Operating Current | Safety Contact (NC) | AC 50/60 Hz | Resistive Load (AC-12) | - | - | 3A | | | | | | | | | | | | | | | |
| | | | Inductive Load (AC-15) | - | 3A | 1.5A | | | | | | | | | | | | | | | |
| | | DC | Resistive Load (DC-12) | 2A | 0.4A | 0.2A | | | | | | | | | | | | | | | |
| | | | Inductive Load (DC-13) | 1A | 0.22A | 0.1A | | | | | | | | | | | | | | | |
| | Monitor Contacts (NO) | AC 50/60 Hz | Resistive Load (AC-12) | - | 1.2A | 0.6A | | | | | | | | | | | | | | | |
| | | | Inductive Load (AC-14) | - | 0.6A | 0.3A | | | | | | | | | | | | | | | |
| | | DC | Resistive Load (DC-12) | 2A | 0.4A | 0.2A | | | | | | | | | | | | | | | |
| | | | Inductive Load (DC-13) | 1A | 0.22A | 0.1A | | | | | | | | | | | | | | | |
| | <ul style="list-style-type: none"> • Minimum applicable load: 5V AC/DC, 1mA (reference value). • The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1. • See "Electrical Rating" above for maximum voltage/current rating per model. | | | | | | | | | | | | | | | | | | | | |
| | Design Standards | Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19, ANSI NFPA79, IEC 60204-1 | | | | | | | | | | | | | | | | | | | |
| Certifications |  | | | | | | | | | | | | | | | | | | | | |

Photoelectrics Sensors
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Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

E-STOP BUTTONS
ROPE PULLS
ENABLING DEVICES

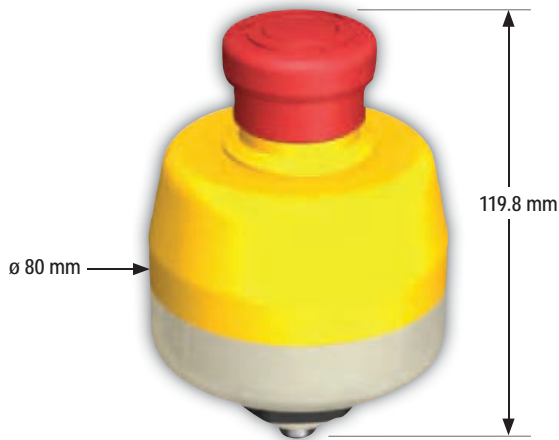
30 mm Mount E-Stop Buttons

EZ-mount E-Stops

- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
- Latching design complies with ISO 13850; direct (positive) opening operation per IEC 60947-5-1
- Compliant with ANSI B11.19, ANSI NFPA79, and IEC/EN 60204-1 Emergency Stop requirements
- “Safe Break Action” ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Rugged design; easy installation with no assembly or individual wiring required
- 4-, 5-, or 8-pin M12/Euro-style Quick Disconnect
- Models designed to interface with Safety BUS nodes/gateways
- Can be interfaced with CSS Series Hookup Cordsets (See page page 612)
- Models with yellow and red indication of actuation (armed or depressed/latched button) and machine status (optional)
- Model with red LED indication of actuation (depressed/latched button)



ACCESSORIES
page
612



Illuminated models



Non-Illuminated models



E-Stop Push-Button Components

| Description | Illuminated | Models |
|--|-----------------------------|--------------------|
| 2NC/1NO E-Stop contacts | YELLOW/RED (Flashing/Solid) | SSA-EB1PLYR-12ECQ8 |
| 2NC/1NO E-Stop contacts | RED (Flashing/Solid) | SSA-EB1PLXR-12ECQ8 |
| 2NC E-Stop contacts | — | SSA-EB1P-02ECQ4 |
| 1NC/1NO E-Stop contacts | — | SSA-EB1P-11ECQ4 |
| 2NC E-Stop contacts, Safety BUS node compatible* | — | SSA-EB1P-02ECQ5A |
| 2NC E-Stop contacts, Safety BUS node compatible* | — | SSA-EB1P-02ECQ5B |
| 2NC/2NO E-Stop contacts | — | SSA-EB1P-22ECQ8 |

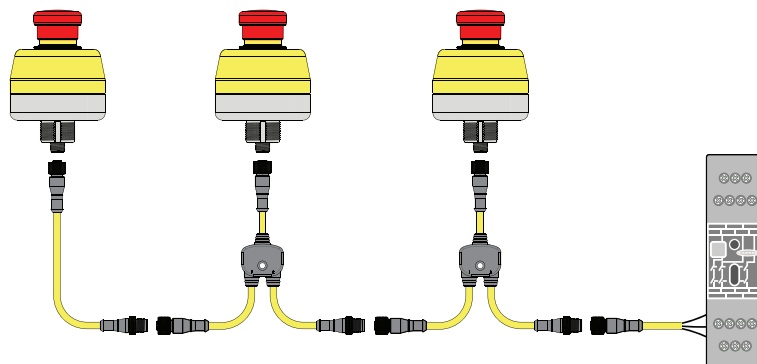
* For pinout information see page 612.

E-Stop Push-Button Specifications

| | | | | | | | |
|---------------------------------|--|---|------------------------|-------|-------------------------------|-------|------|
| Housing / Button Mounting | Polycarbonate / Polyamide Threaded base has M30 x 1.5 external threads.(M30 hardware included) Max. Tightening Torque: 0.56 N·m (5 in·lbf) | | | | | | |
| Environmental rating | IP65 (IEC60529) | | | | | | |
| Operating Humidity | 45% to 85% RH (no condensation) | | | | | | |
| Insulation Resistance | Insulation Resistance 100M minimum (500V DC megger) | | | | | | |
| Impulse Withstand Voltage | 2.5kV | | | | | | |
| Pollution Degree | 3 | | | | | | |
| Overvoltage Category | II | | | | | | |
| Contact material / bounce* | Gold plated silver / 20ms | | | | | | |
| Electrical Life | 100,000 operations minimum, 250,000 operations minimum at 24V AC/DC, 100mA | | | | | | |
| Mechanical Life | 250,000 operations | | | | | | |
| Operating Force / Stroke / Freq | 80N minimum / 4mm (minimum for direct opening action) 4.5mm maximum / 900 operations/hr | | | | | | |
| Shock Resistance | Operating extremes: 150m/s ² (15G), Damage limits: 1000m/s ² (100G) | | | | | | |
| Vibration Resistance | Operating extremes: 10 to 500Hz, amplitude 0.35mm acceleration 50m/s ² Damage limits: 10 to 500Hz, amplitude 0.35mm acceleration 50m/s ² | | | | | | |
| Electrical Rating | SSA-EB1P-..ECQ4 and SSA-EB1P-..ECQ5.. : 3A @ 250V maximum SSA-EB1P-22ECQ8 : 2A @ 60VAC/75VDC maximum | | | | | | |
| Rated Insulation Voltage (Ui) | 250V | | | | | | |
| Rated Current (Ith) | 3A | | | | | | |
| Rated Operating Current | See Electrical Rating | | | 30V | 60VAC/75VDC (SSA-EB1PL..) | 125V | 250V |
| | Safety Contact (NC) | AC 50/60 Hz | Resistive Load (AC-12) | — | 2A | — | 3A |
| | | | Resistive Load (AC-15) | — | 2A | 3A | 1.5A |
| | | DC | Resistive Load (DC-12) | 2A | 0.4A | 0.4A | 0.2A |
| | | | Resistive Load (DC-13) | 1A | 0.22A | 0.22A | 0.1A |
| | Monitor Contacts (NO) | AC 50/60 Hz | Resistive Load (AC-12) | — | — | 1.2A | 0.6A |
| | | | Resistive Load (AC-14) | — | — | 0.6A | 0.3A |
| | | DC | Resistive Load (DC-12) | 2A | — | 0.4A | 0.2A |
| | | | Resistive Load (DC-13) | 1A | — | 0.22A | 0.1A |
| | Auxiliary Output (NO) | 12-30V DC (from supply pin 2) | Resistive Load (DC-12) | 0.25A | — | — | — |
| | | | Resistive Load (DC-13) | 0.25A | — | — | — |
| | <ul style="list-style-type: none"> • Minimum applicable load: 5V AC/DC, 1mA (reference value). • The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1. • See "Electrical Rating" above for maximum voltage/current rating per model. • The "Auxiliary" Output is only available on SSA-EB1PL...-12ECQ8 | | | | | | |
| | Design Standards | Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1 | | | | | |
| | Certifications | E-stop button: CE (pending) cULus LISTED (pending) | | | | | |

Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors
Vision
Wireless
Lighting &
Indicators
Safety
Light Screens
Safety
Laser Scanners
Safety Controllers
& Modules
Safety Two-Hand
Control Modules
Safety Interlock
Switches
**Emergency Stop
& Stop Control**

E-STOP BUTTONS
ROPE PULLS
ENABLING
DEVICES



CSS Series Hookup Cordset Solution

This interconnection solution allows for quick hookup of a series string of emergency stop buttons.


| Situation | Indication* | Description |
|---------------------------------|-----------------|--|
| Button Armed Pin 3 open | YELLOW (STEADY) | Button is armed and machine is enabled to run or is running |
| Button Pushed Pin 3 open | RED (FLASH) | The button that is pushed (actuated) and the machine is in an Emergency Stop condition |
| Button Pushed Pin 3 = +24Vdc | RED (FLASH) | The button that is pushed (actuated). +24Vdc on Pin 3 has no effect on pushed button |
| Button Armed Pin 3 = +24Vdc | RED (STEADY) | The machine is in an Emergency Stop or STOP condition, but the individual button has not been pushed |

* Note: The Pin 3 gives the user the option to have the armed button(s) stay YELLOW (STEADY) or turn RED (STEADY) when a STOP condition exists. A pushed button (actuated) always flashes RED.

Cordsets

| Euro QD | |
|--------------|----------------|
| See page 696 | |
| | Threaded 4-Pin |
| Length | Straight |
| 1.83 m | MQDC-406 |
| 4.57 m | MQDC-415 |
| 9.14 m | MQDC-430 |



 Additional cordset information available. See page 693.

| Euro QD–Double-Ended | | |
|----------------------|-------------|-------------|
| See page 705 | | |
| Length | 5-Pin | 8-Pin |
| 0.31 m | DEE2R-51D | DEE2R-81D |
| 0.91 m | DEE2R-53D | DEE2R-83D |
| 2.44 m | DEE2R-58D | DEE2R-88D |
| 4.57 m | DEE2R-515D | DEE2R-815D |
| 7.62 m | DEE2R-525D | DEE2R-825D |
| 15.2 m | DEE2R-550D | DEE2R-850D |
| 22.9 m | DEE2R-575D | DEE2R-875D |
| 30.5 m | DEE2R-5100D | DEE2R-8100D |




| Euro QD (Open-Shield) | |
|-----------------------|----------------|
| See page 703 | |
| | Threaded 8-Pin |
| Length | Straight |
| 1.83 m | MQDC2S-806 |
| 4.57 m | MQDC2S-815 |
| 9.14 m | MQDC2S-830 |
| 15.2 m | MQDC2S-850 |



Brackets

| 30 mm Mount | | |
|---|---|---|
|  |  |  |
| SSA-MBK-EEC1 | SSA-MBK-EEC2 | SSA-MBK-EEC3 |

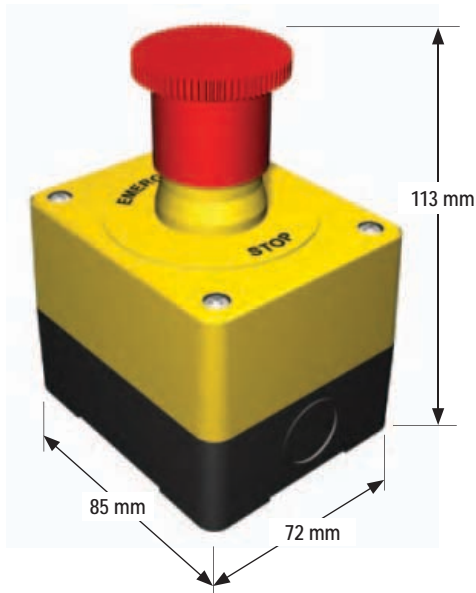
 Additional bracket information available. See page 632.



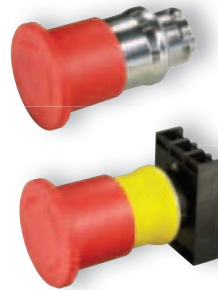
E-Stop Button Emergency Stop Push Buttons

- Electromechanical palm buttons push to stop and twist to release.
- Modular design makes assembly and installation easy.
- Kits simplify selection and ordering.
- Latching design complies with ANSI NFPA 79, IEC 60204-1 and ISO 13850 (EN 418); direct positive opening operation per EN/IEC 60947-5-1 ↻
- Options include station enclosures, contact elements and disc labels.

- Photoelectrics
- Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control**



Emergency Stop Push Button with Enclosure
(Plastic button version shown)





Metal (top) and Plastic (bottom) buttons



- E-STOP BUTTONS**
- ROPE PULLS
- ENABLING DEVICES






E-Stop Push-Button Components

| Product | Description | Models |
|---|--|---------------|
|  | 22.5 mm plastic button (mounting adapter included) | 8-LP2T-B6644* |
|  | 22.5 mm metal button (8-LM2T-AU120 mounting adapter sold separately) | 8-LM2T-B6644* |



* Twist to release, mechanical latching ISO 13850 (EN 418) compliant. Diameter 40 mm (without mounting adapter).




E-Stop Push-Button Components (cont'd)

| Product | Description | Models |
|---|--|---------------|
|  | Metal mounting adapter (for metal button) | 8-LM2T-AU120 |
|  | Normally closed (NC) positively driven contact element | 8-LM2T-C01** |
|  | Normally open (NO) auxiliary contact element | 8-LM2T-C10 |
|  | One-button enclosure—control stations have wire entry through the top or bottom; IP65 rating | 8-L2PP-1A5 |
|  | 60 mm diameter, non-adhesive plastic legend with "Emergency Stop" inscription | 8-LM2T-AU115† |

** Direct (positive) opening operation per IEC/EN 60947-5-1.

† Additional E-Stop background labels are available (see p/n 121976).

E-Stop Push-Button Kits

| E-Stop Button | Contacts | Legend | Enclosure | Models |
|---|-------------|--------|-----------|-------------|
|  | 2 NC | Yes | No | SSA-EBM-02L |
|  | 1 NC & 1 NO | | | SSA-EBM-11L |
|  | 2 NC & 1 NO | | | SSA-EBM-12L |

NC= Normally closed contact,

NO= Normally open contact

More
on next
page

E-Stop Push-Button Kits (cont'd)


| E-Stop Button | | Contacts | Legend | Enclosure | Models |
|---|---------|-------------|--------|-----------|-------------|
|  | Plastic | 2 NC | Yes | No | SSA-EBP-02L |
|  | | 1 NC & 1 NO | | | SSA-EBP-11L |
|  | | 2 NC & 1 NO | | | SSA-EBP-12L |
|  | Metal | 2 NC | Yes | Yes | SSA-EBM-02E |
|  | | 1 NC & 1 NO | | | SSA-EBM-11E |
|  | | 2 NC & 1 NO | | | SSA-EBM-12E |
|  | Plastic | 2 NC | Yes | Yes | SSA-EBP-02E |
|  | | 1 NC & 1 NO | | | SSA-EBP-11E |
|  | | 2 NC & 1 NO | | | SSA-EBP-12E |


NC = Normally Closed Contact,

NO = Normally Open Contact

Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors
Vision
Wireless
Lighting &
Indicators
Safety
Light Screens
Safety
Laser Scanners
Safety Controllers
& Modules
Safety Two-Hand
Control Modules
Safety Interlock
Switches
**Emergency Stop
& Stop Control**

E-STOP BUTTONS
ROPE PULLS
ENABLING
DEVICES

| E-Stop Push-Button Specifications | |
|-----------------------------------|--|
| Mechanical Life | 300,000 operations |
| Operating Force | 0.8 kg |
| Mounting Adapter | Plastic button: The adapter is fixed to the mounting surface by means of incorporated screws ($T_{max} = 0.6 \text{ Nm}$) Metal button: The adapter is fixed to the mounting surface by means of incorporated screws ($T_{max} = 0.8 \text{ Nm}$) |
| Construction | Plastic parts: Polyamide and polycarbonate Metal parts: Aluminum and zinc alloy |
| Environmental Rating | IP65; NEMA 4, 13 |
| Operating Temperature | -25° to +60° C |
| Certifications |  Compliant with EN/IEC 60947-1; -5-1 |

| Contact Specifications | |
|------------------------|---|
| European Rating | Utilization categories: AC15 and DC13 $U_i = 690\text{V ac}$ $I_{th} = 10\text{A}$ UL designation = A 600 Q600 |
| Mechanical Life | 1,000,000 operations |
| Connections | (1 or 2) 12 AWG (2.5 mm ²) maximum wire size |
| Construction | Polyamide and polycarbonate |
| Environmental Rating | IP20 |
| Operating Temperature | -25° to +60° C |
| Certifications |  Compliant with EN/IEC 60947-1; -5-1 |



Rope Pull Switches

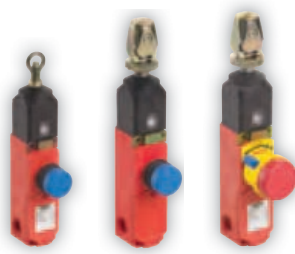
- Models that comply with cable break/slack detection with manual reset for Emergency Stop applications
- Available spans range from 6 to 100 m
- Trip and latch switch models are available
- Minimum switch life is 1-million operations
- Heavy-duty switch housings withstand harsh environments and outdoor use
- Switch activates if the rope is pulled, becomes loose or breaks
- Design meets positive opening requirements for rope pull switches (IEC 60947-5-1) ⊕
- RP-RM83 and RP-LS42 comply with ANSI NFPA 79, ANSI B11.19, IEC 60204-1, EN 13850 and EN ISO 60947-5-5 for Emergency Stop applications
- RP-QM72/QMT72, RP-LM40 and RP-QM90 comply with ANSI NFPA 79 and IEC 60204-1 for Stop Control applications

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control**



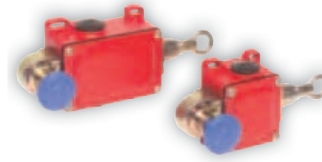
RP-RM83 page 618

- Cable break/slack detection with manual reset
- Manual reset (Latch) design
- Heavy-duty housing to withstand harsh environments and outdoor use; IP67 rated
- Rope span up to 75 meters
- E-stop button with manual reset
- Tension indicators
- Additional solid-state auxiliary output for remote tension monitoring
- Extra contacts for switch monitoring
- 90 mm wide at base
- Rugged metal housing with protective earth terminal (IEC 60947-1) ⊕



RP-LS42 page 619

- Cable break/slack detection with manual reset
- Manual reset (Latch) design
- Rope span up to 75 meters
- Model with E-stop button for manual reset
- Quick rope fixing and tensioning
- Tension indicator
- Extra contacts for switch monitoring
- 42 mm wide at base
- Insulated device (IEC 60947-5-1) ⊞



RP-QM72/QMT72 page 620

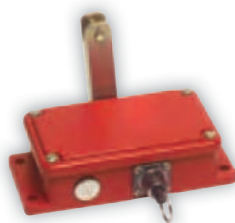
- Manual reset (Latch) design
- Rope span up to 6, 12 or 20 meters
- Tension Indicator
- Models with additional contacts for monitoring or dual channel hookup
- 82 mm wide at base
- Rugged metal housing with protective earth terminal (IEC 60947-1) ⊕
- Cable break/slack detection (note: does not comply with manual reset requirement per EN IEC 60947-5-5 for Emergency Stop applications.)

- E-STOP BUTTONS
- ROPE PULLS**
- ENABLING DEVICES



RP-LM40 page 621

- Manual reset (Latch) and Auto Reset (Trip) models
- Rope span up to 6 meters
- Tension Indicator
- Limit-switch style housing (EN 50041)
- 40 mm wide at base
- Rugged metal housing with protective earth terminal (IEC 60947-1) ⊕
- Cable break/slack detection (note: does not comply with manual reset requirement per EN IEC 60947-5-5 for Emergency Stop applications.)



RP-QM90 page 621

- Manual reset (Latch) design
- Rope span up to 100 meters, with switch in center
- Manual reset
- Extra contacts for switch monitoring
- 90 mm wide at base
- Rugged metal housing with protective earth terminal (IEC 60947-1) ⊕
- Cable break/slack detection (note: does not comply with manual reset requirement per EN IEC 60947-5-5 for Emergency Stop applications.)

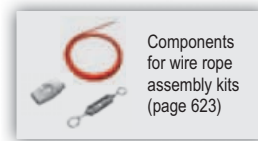
RP-RM83 Series



RP-RM83F-75LT.. and RP-RM83F-38LT.. Models



RP-RM83F-75LR.. and RP-RM83F-38LR.. Models



ACCESSORIES
page 622

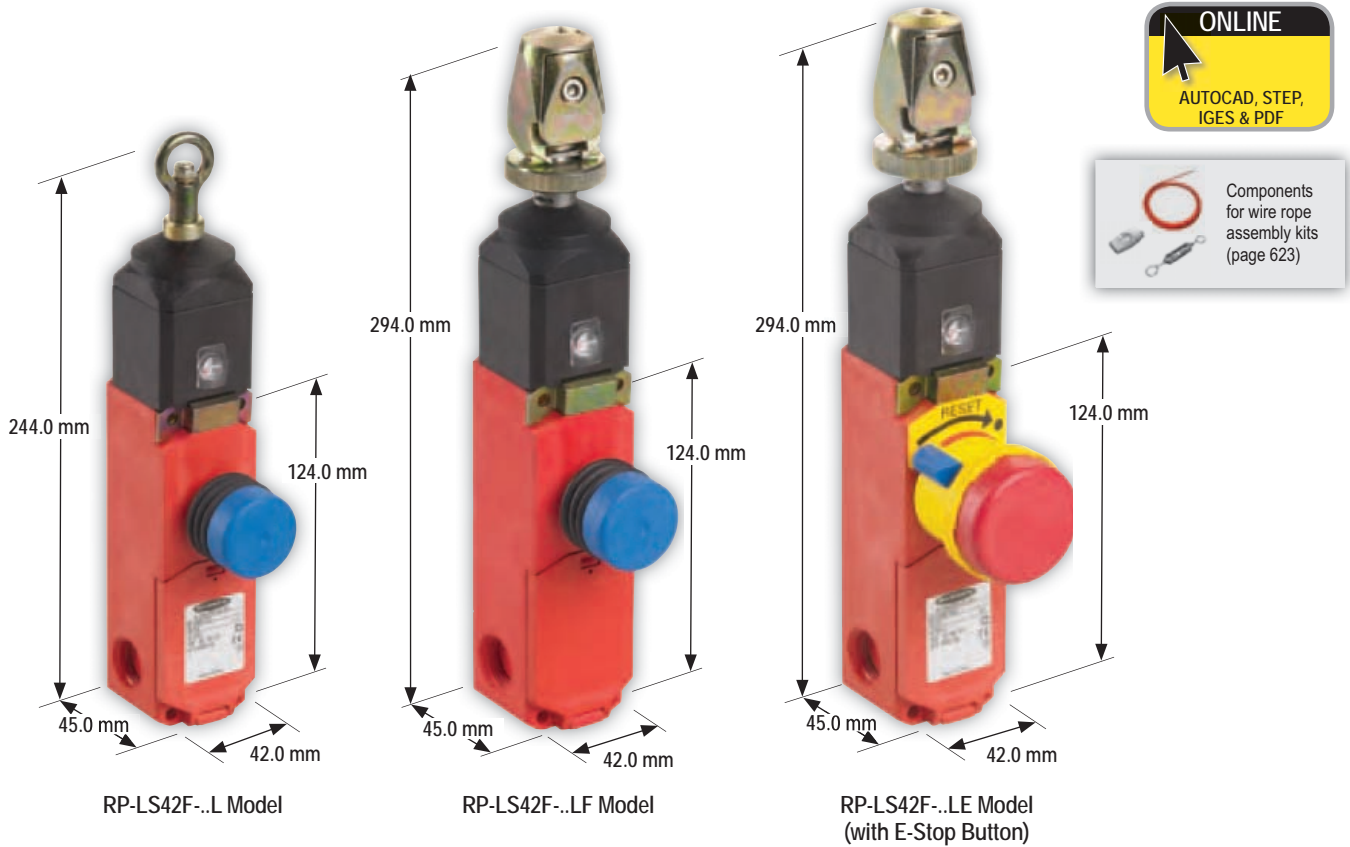
RP-RM83 Series E-Stop and Stop Control Device

| Actuation | Safety Contacts* | Auxiliary Contacts | Action/ Contact State* | Aux. Status Output | Model | | Contact Config. & Switch Diagram | | | | | | | | | | |
|---------------------|------------------|--------------------|---|--------------------|-----------------------|-----------------------|----------------------------------|--------|--|------|------|--------|--------|-----|----------------|----------------|----------------------|
| | | | | | Max. Rope Length 75 m | Max. Rope Length 38 m | | | | | | | | | | | |
| Latch (Rope Pulled) | 2 NC in | 2 NO in | <table border="0"> <tr> <td></td> <td>open</td> <td>open</td> <td>closed</td> <td>closed</td> </tr> <tr> <td></td> <td>open</td> <td>open</td> <td>closed</td> <td>closed</td> </tr> </table> | | open | open | closed | closed | | open | open | closed | closed | Yes | RP-RM83F-75LTE | RP-RM83F-38LTE | SD01 & SD02 (p. 624) |
| | | | | | open | open | closed | closed | | | | | | | | | |
| | | | | | open | open | closed | closed | | | | | | | | | |
| | | | | Yes | RP-RM83F-75LRE | RP-RM83F-38LRE | | | | | | | | | | | |
| — | RP-RM83F-75LT | RP-RM83F-38LT | SD03 & SD04 (p. 624) | | | | | | | | | | | | | | |
| — | RP-RM83F-75LR | RP-RM83F-38LR | | | | | | | | | | | | | | | |

Run Position Cable Pulled Cable Break NC = Normally Closed Contact, NO = Normally Open Contact

* RP-RM83 rope pulls comply with IEC 60947-5-1 Positive Opening requirements. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

RP-LS42 Series



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 622

RP-LS42 Series E-Stop and Stop Control Device

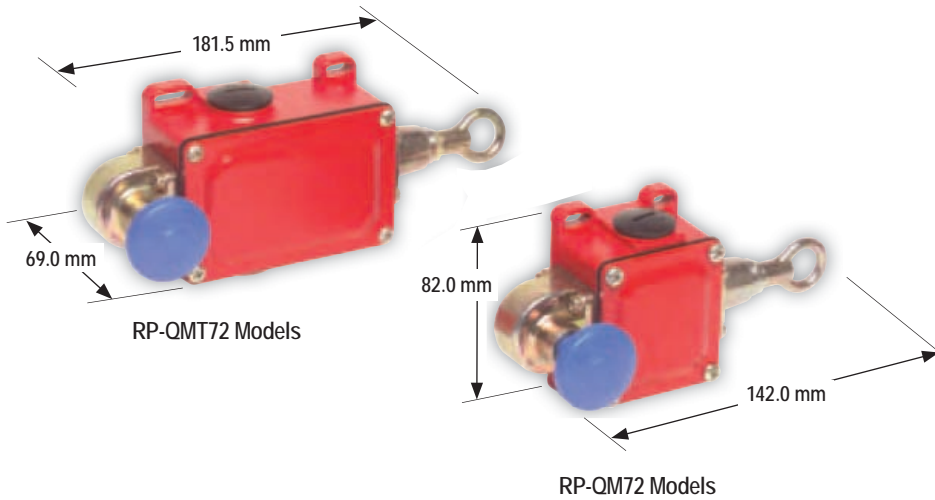
| Actuation | Max. Rope Length | Safety Contacts* | Auxiliary Contact | Action/ Contact State* | Model | Contact Config. & Switch Diagram |
|------------------------|------------------|------------------|-------------------|---------------------------|---------------|----------------------------------|
| Latch (Rope Pulled) | 25 m | 2 NC in | 2 NO in | Safety Auxiliary | RP-LS42F-25L | SD07 (p. 625) |
| | | | | open open closed closed | RP-LS42F-25LE | |
| | | | | open open closed closed | RP-LS42F-25LF | |
| | 37.5 m | 2 NC in | 2 NO in | Safety Auxiliary | RP-LS42F-38L | SD06 (p. 624) |
| | | | | open open closed closed | RP-LS42F-38LE | |
| | | | | open open closed closed | RP-LS42F-38LF | |
| | 75 m | 2 NC in | 2 NO in | Safety Auxiliary | RP-LS42F-75L | SD05 (p. 624) |
| | | | | open open closed closed | RP-LS42F-75LE | |
| | | | | open open closed closed | RP-LS42F-75LF | |

Run Position Cable Pulled Cable Break NC = Normally Closed Contact, NO = Normally Open Contact

* RP-LS42 rope pulls comply with IEC 60947-5-1 Positive Opening requirements. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

- E-STOP BUTTONS
- ROPE PULLS
- RP-RM83
- RP-LS42
- RP-QM72/QMT72
- RP-LM40
- RP-QM90
- ENABLING DEVICES

RP-QM72/QMT72 Series



ACCESSORIES
page
622

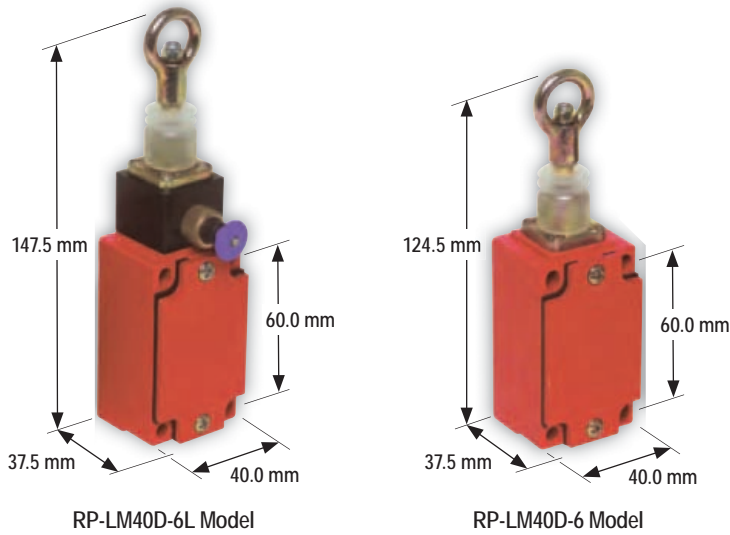
RP-QM72/QMT72 Series Stop Control Device

| Actuation | Max. Rope Length | Safety Contacts* | Auxiliary Contact | Action/Contact State* | Model | Contact Config. & Switch Diagram |
|------------------------|------------------|------------------|-------------------|--|---------------|----------------------------------|
| Latch (Rope Pulled) | 6 m | 2 NC in | — | Safety open closed closed open | RP-QM72D-6L | SD08 (p. 625) |
| | 12 m | | | | RP-QM72D-12L | SD09 (p. 625) |
| | 20 m | | | | RP-QMT72D-20L | SD10 (p. 625) |
| | 12 m | 4 NC in | — | Safety open open closed closed closed closed open open | RP-QMT72F-12L | SD11 (p. 625) |
| | 12 m | 2 NC in | 1 NO in | Safety Auxiliary open closed closed closed open open | RP-QMT72E-12L | SD12 (p. 625) |

Run Position Cable Pulled Cable Break NC = Normally Closed Contact

* RP-QM72/QMT72 rope pulls comply with IEC 60947-5-1 Positive Opening requirements. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

RP-LM40 Series



- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

RP-LM40 Series Stop Control Device

| Actuation | Max. Rope Length | Safety Contact* | Auxiliary Contact | Action/Contact State* | Model | Contact Config. & Switch Diagram |
|-----------|------------------|-----------------|-------------------|-----------------------|-------------|----------------------------------|
| Trip | 6 m | 2 NC in | — | open closed | RP-LM40D-6 | SD13 (p. 626) |
| Latch | | | | closed open | RP-LM40D-6L | SD14 (p. 626) |

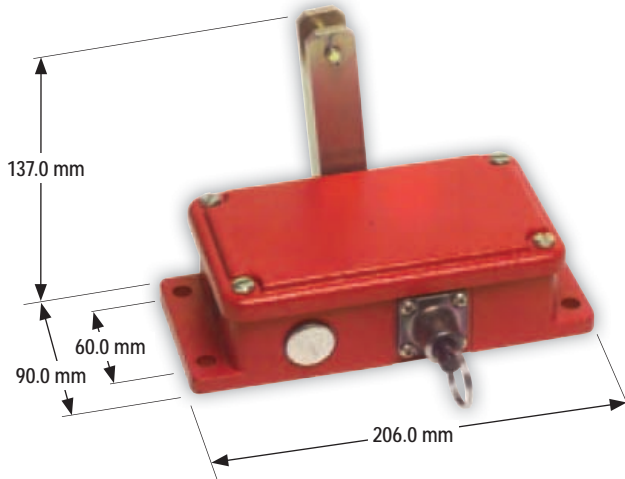
Run Position Cable Pulled Cable Break NC = Normally Closed Contact

* RP-LM40 rope pulls comply with IEC 60947-5-1 positive Opening requirements. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.

ACCESSORIES
page 622

- E-STOP BUTTONS
- ROPE PULLS
- RP-RM83
- RP-LS42
- RP-QM72/QMT72
- RP-LM40
- RP-QM90
- ENABLING DEVICES

RP-QM90 Series






RP-QM90 Series Stop Control Device

| Actuation | Max. Rope Length | Safety Contacts* | Auxiliary Contacts | Action/Contact State* | Model | Contact Config. & Switch Diagram | | | | | | | | | | | | |
|------------------------|---------------------------|------------------|--------------------|---|-------|----------------------------------|--|-----------|--|-----------|---------------|---------------|--|-----------|---------------|---------------|---------------|------------------|
| Latch (Rope Pulled) | 100 m (50 m each side) | 2 NC in | 2 NO in | <table border="0"> <tr> <td></td> <td>Safety</td> <td></td> <td>Auxiliary</td> </tr> <tr> <td></td> <td>open open</td> <td>closed closed</td> <td>closed closed</td> </tr> <tr> <td></td> <td>open open</td> <td>closed closed</td> <td>closed closed</td> </tr> </table> | | Safety | | Auxiliary | | open open | closed closed | closed closed | | open open | closed closed | closed closed | RP-QM90F-100L | SD15 (p. 626) |
| | Safety | | Auxiliary | | | | | | | | | | | | | | | |
| | open open | closed closed | closed closed | | | | | | | | | | | | | | | |
| | open open | closed closed | closed closed | | | | | | | | | | | | | | | |

Run Position Cable Pulled Cable Break NC = Normally Closed Contact, NO = Normally Open Contact

* RP-QM90 rope pulls comply with IEC 60947-5-1 Positive Opening requirements. See data sheet or Contact Configuration and Switching Diagrams for more information/clarification.











Rope Pull Switches Specifications

| Contact Rating | 10A @ 24V ac, 10A @ 110V ac, 6A @ 230V ac, 6A @ 24V dc 2.5 kV max. transient tolerance NEMA A300 P300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|--|---------------------------|--|--|----------|------------------|------------------|-----|---|------|-----|---|------|---|-----------------------|--|--|----------|------------------|------------------|----|----|---|-----|----|---|-----|---|-----|
| Monitoring Solid-State Output Rating | Rated operational voltage: $U_o = 10$ to 30V dc Rated operational current: $I_o = 50$ mA Utilization category: DC13 Protected against reverse polarity and short circuit. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| European Rating | Utilization categories: AC15 and DC13 $U = 500V$ ac, $I_{th} = 10A$ Rated Surge Capacity: 2.5 kV (RP-RM83 only) | <table border="1"> <thead> <tr> <th colspan="3">RP-RM83 models (40-60 Hz)</th> </tr> <tr> <th>U V</th> <th>$I_o/AC-15$ A</th> <th>$I_o/DC-13$ A</th> </tr> </thead> <tbody> <tr> <td>120</td> <td>6</td> <td>0.55</td> </tr> <tr> <td>240</td> <td>3</td> <td>0.27</td> </tr> </tbody> </table> | RP-RM83 models (40-60 Hz) | | | U V | $I_o/AC-15$ A | $I_o/DC-13$ A | 120 | 6 | 0.55 | 240 | 3 | 0.27 | <table border="1"> <thead> <tr> <th colspan="3">All others (40-60 Hz)</th> </tr> <tr> <th>U V</th> <th>$I_o/AC-15$ A</th> <th>$I_o/DC-13$ A</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>10</td> <td>6</td> </tr> <tr> <td>110</td> <td>10</td> <td>1</td> </tr> <tr> <td>230</td> <td>6</td> <td>0.4</td> </tr> </tbody> </table> | All others (40-60 Hz) | | | U V | $I_o/AC-15$ A | $I_o/DC-13$ A | 24 | 10 | 6 | 110 | 10 | 1 | 230 | 6 | 0.4 |
| RP-RM83 models (40-60 Hz) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U V | $I_o/AC-15$ A | $I_o/DC-13$ A | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 120 | 6 | 0.55 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 240 | 3 | 0.27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| All others (40-60 Hz) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U V | $I_o/AC-15$ A | $I_o/DC-13$ A | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | 10 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 110 | 10 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 230 | 6 | 0.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Contact Material | Silver-nickel alloy | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Switching Speed | RP-RM83 models: 20 operations per minute All others: 50 operations per minute | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recommended Rope Size | 40 mm models: 2 mm diameter steel rope 42 & 72 mm models: 3 mm diameter steel rope 83 mm models: 2-5 mm diameter steel rope (3 mm recommended) 90 mm models: 4 mm diameter steel rope | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Maximum Rope Pull Length | RP-LM40D-6/6L and RP-QM72D-6L: 6 m RP-LS42F-75L/75LE/75LF: 75 m RP-LS42F-38L/38LE/38LF: 37.5 m RP-LS42F-25L/25LE/25LF: 25 m RP-QM72D-12L: 12 m RP-QMT72D-20L: 20 m RP-QMT72E-12L and RP-QMT72F-12L: 12 m RP-RM83F-75LTE/LT/LRE/LR: 75 m RP-RM83F-38LTE/LT/LR/LRE: 38 m RP-QM90F-100L: 100 mm; equal lengths up to 50 m on either side of switch | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Short Circuit Protection | 10 amp Slow Blow, 15 amp Fast Blow. Recommended external fusing or overload protection. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mechanical Life | RP-RM83: 100,000 operations All others: 1 million operations | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Wire Connections | Screw terminals with pressure plates accept the following wire sizes – Stranded and solid: 20 AWG (0.5 mm ²) to 16 AWG (1.5 mm ²) for one wire Stranded: 20 AWG (0.5 mm ²) to 18 AWG (1.0 mm ²) for two wires | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cable Entry | M20 x 1.5 threaded entrance Adapter supplied to convert M20 x 1.5 to 1/2" - 14 NPT threaded entrance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Construction | RP-LS42F-..L/..LE/..LF: High-impact thermoplastic housing; zinc die-cast actuator All others: Aluminum alloy die cast | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Environmental Rating | RP-LS42F and RP-RM83F models: NEMA 4; IEC IP67 All other models: NEMA 4; IP65 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Temperature | RP-LS42F-..L/..LE/..LF: -25° to +70° C All other models: -30° to +80° C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Weight | RP-LM40D-6: 0.22 Kg RP-LM40D-6L: 0.26 Kg RP-LS42F-..L: 0.48 Kg RP-LS42F-..LE and RP-LS42F-..LF: 0.65 Kg RP-QM72D-6L: 0.49 Kg RP-QM72D-12L: 0.52 Kg RP-QMT72D-20L, RP-QMT72E-12L and RP-QMT72F-12L: 0.64 Kg RP-QM90F-100L: 3.8 Kg RP-RM83F-75LT and RP-RM83F-75LTE: 1 Kg RP-RM83F-75LR and RP-RM83F-75LRE: 0.77 Kg RP-RM83F-38LT and RP83FLT8: 1 Kg RP-RM83F-38LR and RP-RM83F-38LRE: 0.77 Kg | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Certifications |    (RP-RM83 and RP-LS42 only) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Contact Configurations and Switching Diagrams | RP-LM40 models: SD13 & SD14 (p. 626) RP-LS42 models: SD05, SD06 & SD07 (pp. 624-625) RP-QM72/QMT72 models: SD07, SD08, SD09, SD10 & SD11 (p. 625) RP-RM83 models: SD01, SD02, SD03 & SD04 (p. 624) RP-QM90 models: SD15 (p. 626) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Wire Rope Assembly Kits (Tensioning Springs ordered separately)

| Description | Rope Length 10 m | Rope Length 20 m | Rope Length 40 m | Rope Length 50 m | Rope Length 80 m | Used With |
|--|---------------------|---------------------|---------------------|---------------------|---------------------|--|
| 3 mm steel rope, eye bolts, clamps and thimbles | RPAK-CH2-10 | RPAK-CH2-20 | RPAK-CH2-40 | RPAK-CH2-50 | RPAK-CH2-80 | <ul style="list-style-type: none"> • RP-LS42 models • RP-QM72/QMT72 Models • RP-RM83 models |
| 3 mm steel rope, eye bolts, pulleys, clamps and thimbles | RPAK-CHP2-10 | RPAK-CHP2-20 | RPAK-CHP2-40 | RPAK-CHP2-50 | RPAK-CHP2-80 | |
| 3 mm steel rope, eye bolts, clamps, thimbles and turnbuckle | RPAK-CH2-10-TA | RPAK-CH2-20-TA | RPAK-CH2-40-TA | RPAK-CH2-50-TA | RPAK-CH2-80-TA | |
| 3 mm steel rope, eye bolts, pulleys, clamps, thimbles and turnbuckle | RPAK-CHP2-10-TA | RPAK-CHP2-20-TA | RPAK-CHP2-40-TA | RPAK-CHP2-50-TA | RPAK-CHP2-80-TA | |

Components for Wire Rope Assembly

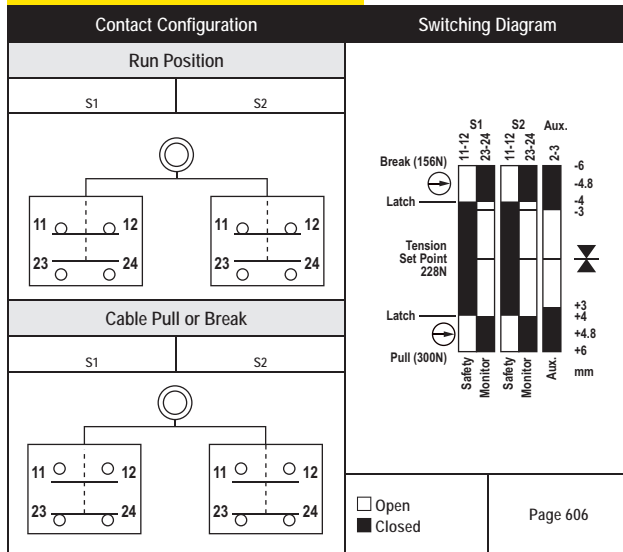
| Models | | Package Quantity | Description | | Used With | |
|---|---|--|----------------------------|---|--|--|
| Wire Ropes |  | RPA-C1-10 | 10 m | 2 mm steel wire rope with 0.5 mm red PVC jacket (unterminated) | • RP-LM40 models | |
| | | RPA-C1-20 | 20 m | | | |
| | | RPA-C1-100 | 100 m | | | |
| | | RPA-C2-10 | 10 m | 3 mm steel wire rope with 0.5 mm red PVC jacket (unterminated) | • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models | |
| | | RPA-C2-20 | 20 m | | | |
| | | RPA-C2-40 | 40 m | | | |
| | | RPA-C2-50 | 50 m | | | |
| | | RPA-C2-80 | 80 m | 4 mm steel wire rope with 0.5 mm red PVC jacket (unterminated) | • RP-QM90 models | |
| | | RPA-C3-20 | 20 m | | | |
| | | RPA-C3-100 | 100 m | | | |
| Thimbles |  | RPA-T1-4 | 4 pcs | Thimble for 2 mm wire rope | • RP-LM40 models | |
| | | RPA-T2-4 | 4 pcs | Thimble for 3 mm wire rope | • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models | |
| | | RPA-T3-4 | 4 pcs | Thimble for 4 mm wire rope | • RP-QM90 models | |
| Clamps |  | RPA-CC1-4 | 4 pcs | Clamp for 2 mm wire rope | • RP-LM40 models | |
| | | RPA-CC2-4 | 4 pcs | Clamp for 3 mm wire rope | • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models | |
| | | RPA-CC3-4 | 4 pcs | Clamp for 4 mm wire rope | • RP-QM90 models | |
| Turnbuckles |  | RPA-TA1-1 | 1 pc | #4 Turnbuckle | • RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models | |
| | | RPA-TA2-1 | 1 pc | #5 Turnbuckle | • RP-QM90 models | |
| Eye Bolts |  | RPA-EB1-1 | 1 pc | 1/4" - 20 Eye bolt (3" bolt shaft) | • RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models | |
| | | RPA-EB2-1 | 1 pc | 5/16" - 18 Eye bolt (3" bolt shaft) | • RP-QM90 models | |
| Pulleys |  RPA-P1-1 |  RPA-DP1-1 | 1 pc | RPA-P1-1 Pulley for in-line use | RPA-DP1-1 Pulley for corner turns (90-180°) | • RP-LM40 models • RP-LS42 models • RP-QM72/QMT72 models • RP-RM83 models • RP-QM90 models |
| | Tensioning Springs |  | RPA-S1-1 | 1 pc | Tensioning Spring #1 | • RP-QM90 models |
| RPA-S2-1 | | | 1 pc | Tensioning Spring #2 | • RP-QM90 models | |
| RPA-S3-1 | | | 1 pc | Tensioning Spring #3 | • RP-LS42 models (75 m) • RP-RM83 models (75 m) | |
| RPA-S5-1 | | | 1 pc | Tensioning Spring #5 | • RP-RM83 models (25 & 38 m) | |
|  | | RPA-S4-1 | 1 pc | Tensioning spring assembly with built-in eye bolt, cable thimble, clamp, tensioning and overload protection | • RP-LS42 models (75 m) • RP-RM83 models (75 m) | |
| | | RPA-S6-1 | 1 pc | | • RP-RM83 models (25 & 38 m) • RP-LS42 models (25 & 38 m) | |
| Terminal Cover | SI-LS42-COVER | | Replacement terminal cover | | • RP-LS42 models | |
| Indicator Lamps |  | SI-PL3T-R | 1 pc | Red with M20 x 1.5 (24V ac/dc) | • RP-LS42 • RP-QM72/QMT72 • RP-RM83 • RP-QM90 | |
| | | SI-PL3A-R | 1 pc | Red with M20 x 1.5 (120V ac) | | |
| | | SI-PL3T-G | 1 pc | Green with M20 x 1.5 (24V ac/dc) | | |
| | | SI-PL3A-G | 1 pc | Green with M20 x 1.5 (120V ac) | | |

Photoelectrics
Sensors
Fiber Optic
Sensors
Special Purpose
Sensors
Measurement &
Inspection Sensors
Vision
Wireless
Lighting &
Indicators
Safety
Light Screens
Safety
Laser Scanners
Safety Controllers
& Modules
Safety Two-Hand
Control Modules
Safety Interlock
Switches
**Emergency Stop
& Stop Control**

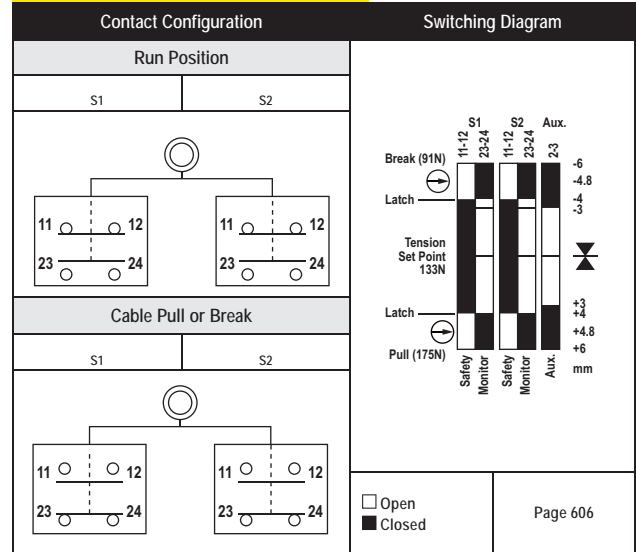
E-STOP BUTTONS
ROPE PULLS
ENABLING
DEVICES

Contact/Switching Diagrams

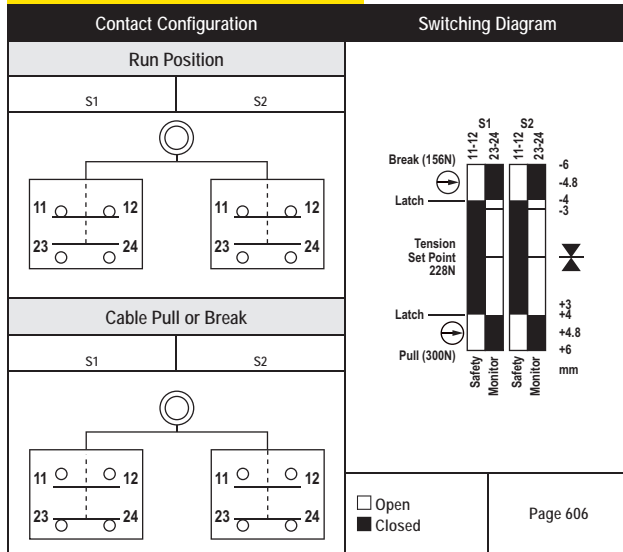
SD01 - RP-RM83F-75LTE/LRE Series



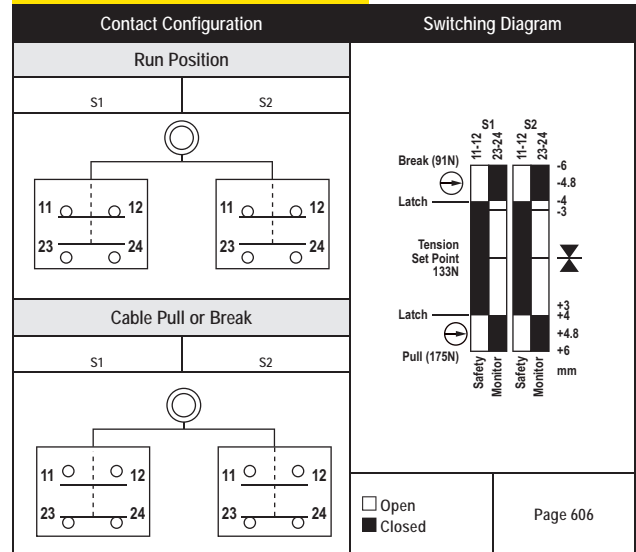
SD02 - RP-RM83F-38LTE/LRE Series



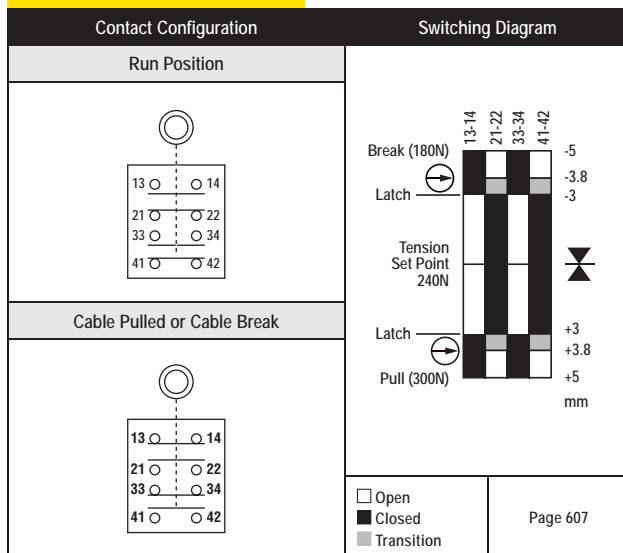
SD03 - RP-RM83-75LT/LR Series



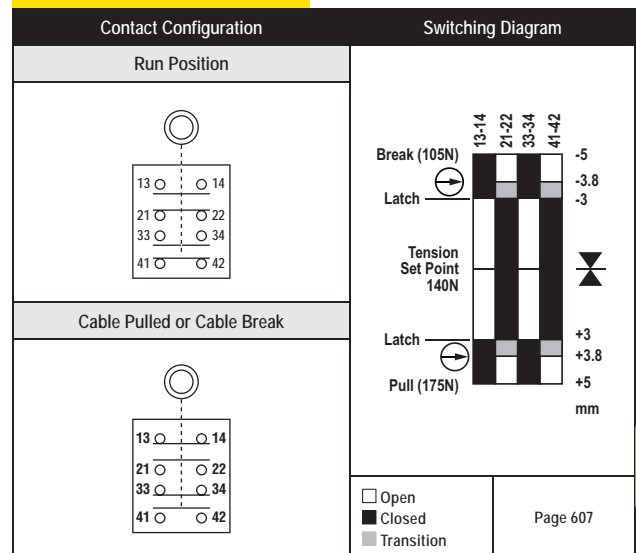
SD04 - RP-RM83-38LT/LR Series



SD05 - RP-LS42F-75L Series

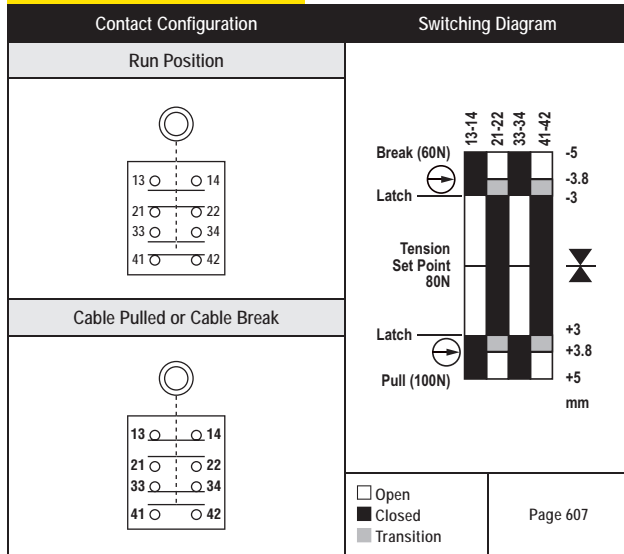


SD06 - RP-LS42F-38L Series

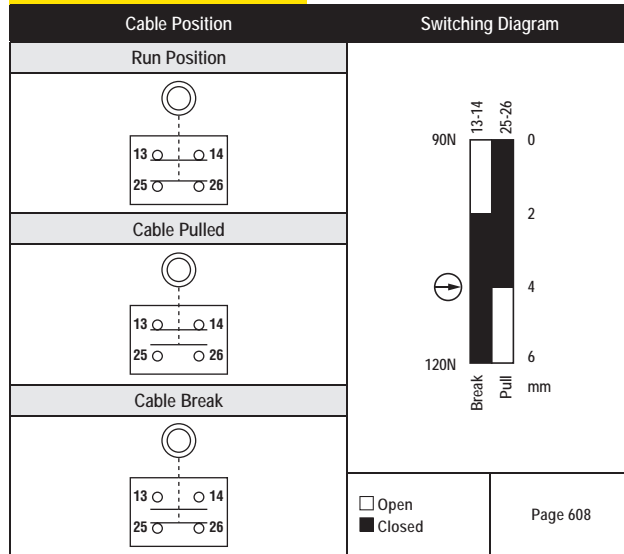


Contact/Switching Diagrams

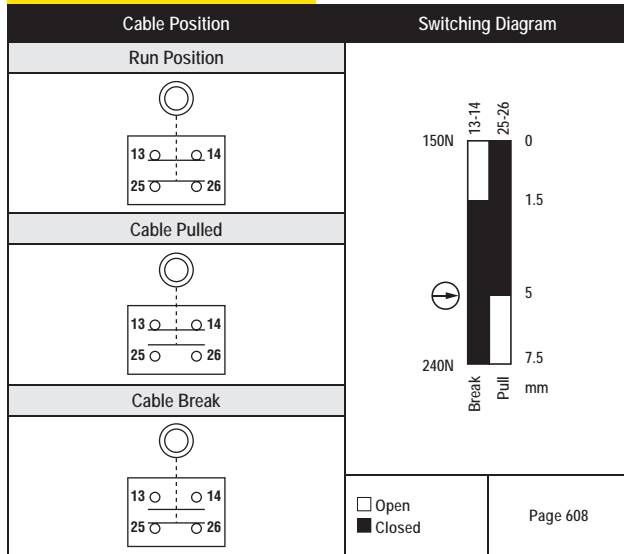
SD07 - RP-LS42F-25L Series



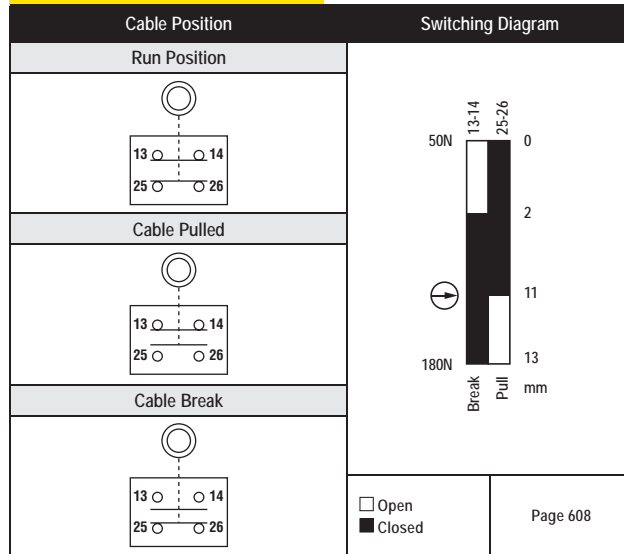
SD08 - RP-QM72D-6L Series



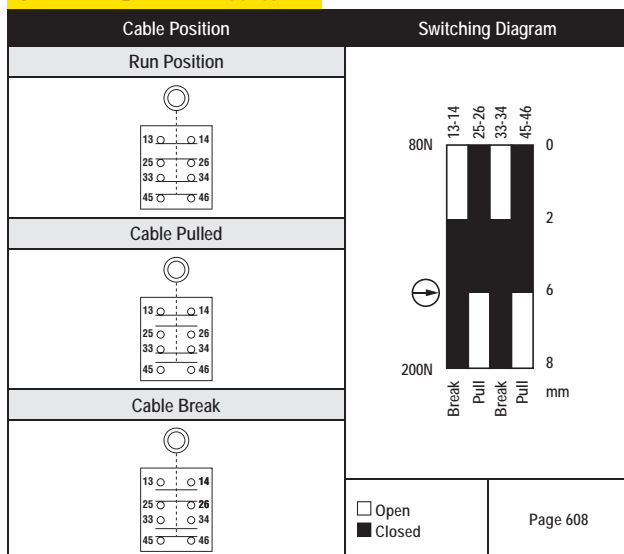
SD09 - RP-QM72D-12L Series



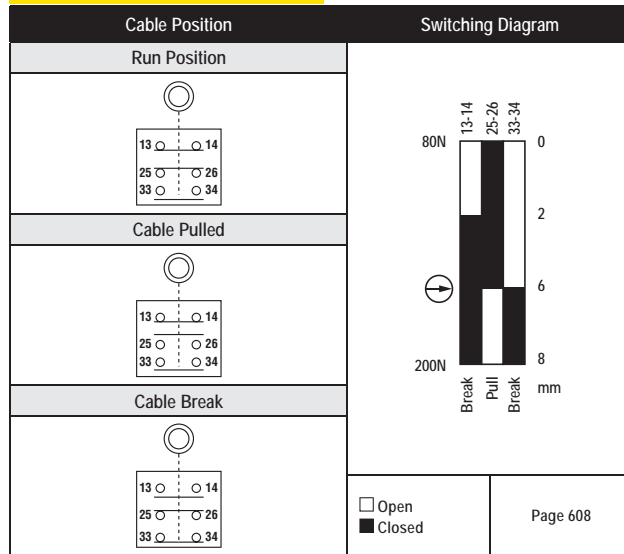
SD10 - RP-QMT72D-20L Series



SD11 - RP-QMT72F-12L Series



SD12 - RP-QMT72E-12L Series



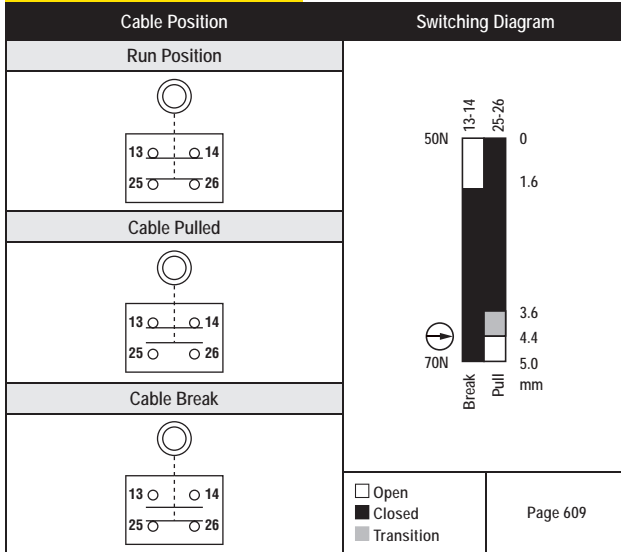
- Photoelectrics
- Sensors
- Fiber Optic
- Sensors
- Special Purpose
- Sensors
- Measurement &
- Inspection Sensors
- Vision
- Wireless
- Lighting &
- Indicators
- Safety
- Light Screens
- Safety
- Laser Scanners
- Safety Controllers
- & Modules
- Safety Two-Hand
- Control Modules
- Safety Interlock
- Switches
- Emergency Stop
- & Stop Control

- E-STOP BUTTONS
- ROPE PULLS
- ENABLING
- DEVICES

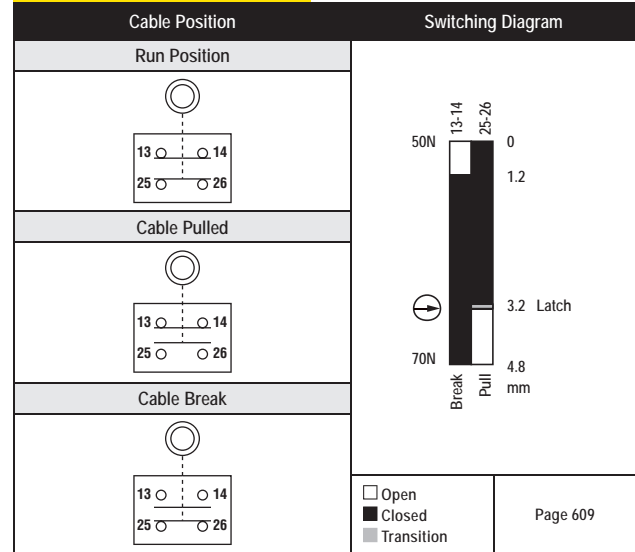


Contact/Switching Diagrams

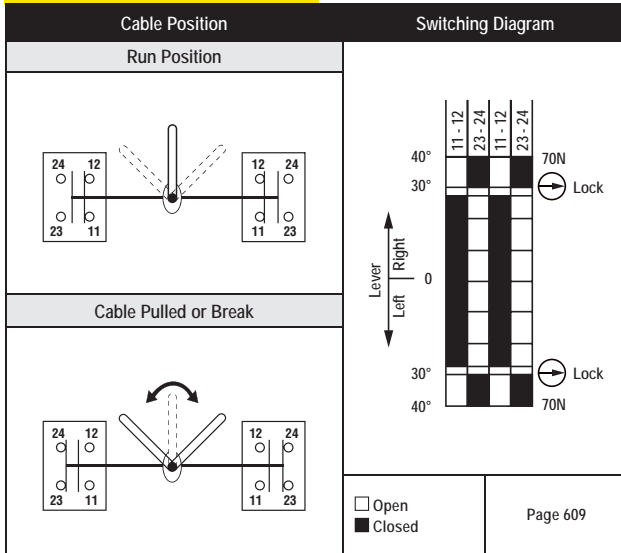
SD13 - RP-LM40D-6 Series



SD14 - RP-LM40D-6L Series



SD15 - RP-QM90F-100L Series





ED1G Enabling Devices

- Handheld grip-style switch typically used for manual control of machine functions, including visual observations, minor adjustments, troubleshooting, calibration, etc
- Enabling Switch provides the three-position functionality (OFF-ON-OFF) required for manual control of a machine, including enabling and hold-to-run applications.
- Safety function is provided when the user squeezes or releases the handlegrip enabling switch
- Ergonomic design has a detented enable position (position 2)
- Terminal 1-2 and 3-4 contacts will not re-close when released from fully squeezed (position 3)
- Suited for use as an enabling device for robotic cells
- Optional momentary push-button switch (depending on model) can provide hold-to-run, reset or jogging/inching functions
- All models are Insulated device (IEC 60947-5-1)
- Design meets or exceeds: ANSI RIA R15.06 and ISO 10218 Robot safety standard, ANSI B11.19 Performance Criteria for Safeguards, and ANSI NFPA 79 (2007) and IEC 60204-1 (2000) Electrical Requirements for Industrial Machines

- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

ACCESSORIES
page 628



ED1G-L21SM-1N Model



ED1G-L21SMB-1N Model



- E-STOP BUTTONS
- ROPE PULLS
- ENABLING DEVICES

ED1G Series Enabling Devices, Stop Control Devices

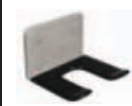
| Contact Configuration | Additional Push-Button Switch | Environmental Rating | Model | Contact Config. & Switch Diagram |
|--|-------------------------------|----------------------|----------------|----------------------------------|
| 2 NO & 1 NC Aux | — | IP66 | ED1G-L21SM-1N | SD01 (p. 624) |
| 1 NO & 1 NC Aux & 1 NO Momentary Push Button | Momentary Push Button | IP65 | ED1G-L21SMB-1N | SD02 (p. 624) |
| 2 NO & 2 NO Momentary Push Button | Momentary Push Button | IP65 | ED1G-L20MB-1N | SD03 (p. 624) |

ED1G Enabling Device Specifications

| Supply Voltage and Current | 250V ac/dc | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|-------|--|-------|---|--|--|--|--|------------------|--|-----|------|------|----|------------------------|---|-----|-------|------------------------|---|-------|-------|----|------------------------|-----|-------|---|------------------------|-------|-------|---|---|--|--|--|--|------------------|--|-----|------|------|----|------------------------|---|-----|-----|------------------------|---|-----|-------|----|------------------------|-----|-------|-------|------------------------|-----|--------|-------|--|--|--|--|--|------------------|--|-----|------|------|----|------------------------|---|-------|---|------------------------|---|-------|---|----|------------------------|-----|-------|---|------------------------|-------|-------|---|
| Impulse Withstand Voltage | Three Position Switch: 2.5 kV Momentary pushbutton: 1.5 kV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Output Contact Ratings | <p>Rated Insulation Voltage (UI): 3-position switch 250V; momentary push button 125V Rated Thermal Current (Ith): 2.5 A*</p> <p>*40°C operating temperature < 50° C: 2 A (4 contacts under load) *50°C operating temperature 60° C: 1.5 A (3 contacts under load)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="5">Rated Current (Ie) 3-Position Switch Terminals 1-2 and 3-4 (all models)</th> </tr> <tr> <th colspan="2">Rated Voltage Ue</th> <th>30V</th> <th>125V</th> <th>250V</th> </tr> </thead> <tbody> <tr> <td rowspan="2">AC</td> <td>Resistive load (AC-12)</td> <td>—</td> <td>1 A</td> <td>0.5 A</td> </tr> <tr> <td>Inductive load (AC-15)</td> <td>—</td> <td>0.7 A</td> <td>0.5 A</td> </tr> <tr> <td rowspan="2">DC</td> <td>Resistive load (DC-12)</td> <td>1 A</td> <td>0.2 A</td> <td>—</td> </tr> <tr> <td>Inductive load (DC-13)</td> <td>0.7 A</td> <td>0.1 A</td> <td>—</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="5">Rated Current (Ie) Monitor Switch Terminals 5-6 (models..-L21SM.. and..-L21SMB..)</th> </tr> <tr> <th colspan="2">Rated Voltage Ue</th> <th>30V</th> <th>125V</th> <th>250V</th> </tr> </thead> <tbody> <tr> <td rowspan="2">AC</td> <td>Resistive load (AC-12)</td> <td>—</td> <td>2 A</td> <td>1 A</td> </tr> <tr> <td>Inductive load (AC-15)</td> <td>—</td> <td>1 A</td> <td>0.5 A</td> </tr> <tr> <td rowspan="2">DC</td> <td>Resistive load (DC-12)</td> <td>2 A</td> <td>0.4 A</td> <td>0.2 A</td> </tr> <tr> <td>Inductive load (DC-13)</td> <td>1 A</td> <td>0.22 A</td> <td>0.1 A</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="5">Rated Current (Ie) Momentary Push Button Switch Terminals 7-8 (model ..-ED1G-L21SMB-1N..); 5-6 and 7-8 (model ED1G-L20MB-1N)</th> </tr> <tr> <th colspan="2">Rated Voltage Ue</th> <th>30V</th> <th>125V</th> <th>250V</th> </tr> </thead> <tbody> <tr> <td rowspan="2">AC</td> <td>Resistive load (AC-12)</td> <td>—</td> <td>0.5 A</td> <td>—</td> </tr> <tr> <td>Inductive load (DC-15)</td> <td>—</td> <td>0.3 A</td> <td>—</td> </tr> <tr> <td rowspan="2">DC</td> <td>Resistive load (AC-12)</td> <td>1 A</td> <td>0.2 A</td> <td>—</td> </tr> <tr> <td>Inductive load (DC-13)</td> <td>0.7 A</td> <td>0.1 A</td> <td>—</td> </tr> </tbody> </table> | | | | Rated Current (Ie) 3-Position Switch Terminals 1-2 and 3-4 (all models) | | | | | Rated Voltage Ue | | 30V | 125V | 250V | AC | Resistive load (AC-12) | — | 1 A | 0.5 A | Inductive load (AC-15) | — | 0.7 A | 0.5 A | DC | Resistive load (DC-12) | 1 A | 0.2 A | — | Inductive load (DC-13) | 0.7 A | 0.1 A | — | Rated Current (Ie) Monitor Switch Terminals 5-6 (models..-L21SM.. and..-L21SMB..) | | | | | Rated Voltage Ue | | 30V | 125V | 250V | AC | Resistive load (AC-12) | — | 2 A | 1 A | Inductive load (AC-15) | — | 1 A | 0.5 A | DC | Resistive load (DC-12) | 2 A | 0.4 A | 0.2 A | Inductive load (DC-13) | 1 A | 0.22 A | 0.1 A | Rated Current (Ie) Momentary Push Button Switch Terminals 7-8 (model ..-ED1G-L21SMB-1N..); 5-6 and 7-8 (model ED1G-L20MB-1N) | | | | | Rated Voltage Ue | | 30V | 125V | 250V | AC | Resistive load (AC-12) | — | 0.5 A | — | Inductive load (DC-15) | — | 0.3 A | — | DC | Resistive load (AC-12) | 1 A | 0.2 A | — | Inductive load (DC-13) | 0.7 A | 0.1 A | — |
| Rated Current (Ie) 3-Position Switch Terminals 1-2 and 3-4 (all models) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated Voltage Ue | | 30V | 125V | 250V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AC | Resistive load (AC-12) | — | 1 A | 0.5 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Inductive load (AC-15) | — | 0.7 A | 0.5 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DC | Resistive load (DC-12) | 1 A | 0.2 A | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Inductive load (DC-13) | 0.7 A | 0.1 A | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated Current (Ie) Monitor Switch Terminals 5-6 (models..-L21SM.. and..-L21SMB..) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated Voltage Ue | | 30V | 125V | 250V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AC | Resistive load (AC-12) | — | 2 A | 1 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Inductive load (AC-15) | — | 1 A | 0.5 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DC | Resistive load (DC-12) | 2 A | 0.4 A | 0.2 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Inductive load (DC-13) | 1 A | 0.22 A | 0.1 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated Current (Ie) Momentary Push Button Switch Terminals 7-8 (model ..-ED1G-L21SMB-1N..); 5-6 and 7-8 (model ED1G-L20MB-1N) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated Voltage Ue | | 30V | 125V | 250V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AC | Resistive load (AC-12) | — | 0.5 A | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Inductive load (DC-15) | — | 0.3 A | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DC | Resistive load (AC-12) | 1 A | 0.2 A | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Inductive load (DC-13) | 0.7 A | 0.1 A | — | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Contact Resistance | 100 mohm max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Insulation Resistance | Live to dead metal parts: 100 Mohm min. | | Positive to negative live parts: 100 Mohm min. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recommended Wire/Cable Size | Wire: 0.14 to 1.5 mm ² (25 AWG to 16 AWG) | | Cable: ø 7 to 13 mm M20 conduit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Short Circuit Protection | 250V / 10A fast blow fuse (IEC 60127-1) | | Conditional short circuit current: 50 A (250V) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vibration Resistance | Operating extremes: 5 to 55 Hz, half amplitude 0.5 mm minimum Damage limits: 16.7 Hz, half amplitude 1.5 mm minimum | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Shock Resistance | Operating extremes: 150 m/s ² (15 G) | | Damage limits: 1,000 m/s ² (100 G) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mechanical Life | Positions 1 & 2 only: 1,000,000 operations minimum Operating frequency: 1,200 operations per hour maximum | | Positions 1, 2 & 3: 100,000 operations minimum | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Electrical Life | 100,000 minimum at rated load | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pollution Degree | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Terminal Pulling Strength | 20 N minimum | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Terminal Screw Torque | 0.5 to 0.6 N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operating Conditions (indoor use only) | Temperature: -10° to +60° C (no freezing) Storage Temperature: -40° to +80° C (no freezing) | | Humidity: 45 to 85% RH max. (no condensation) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Construction | Polyamide housing and cable gland, NBR/PVC polyblend rubber grip switch boot; model ED1G-L21SM-1N meets IP66; other models meet IP65 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Design Standards | IEC 60947-5-1, EN 60947-5-1, JIS C8201-5-1, UL 508, CSA C22.2 No. 14, GS-ET-22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Certifications | Approvals are pending. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Contact Configurations and Switching Diagrams | SD01, SD02 and SD03 (p. 624) See wiring diagram WD067 (p. 834) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Brackets

ED1G



pg. 641

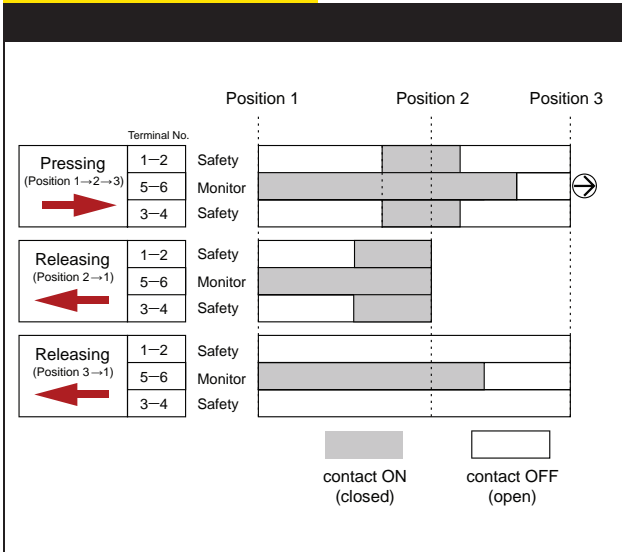
ED9Z-GH1



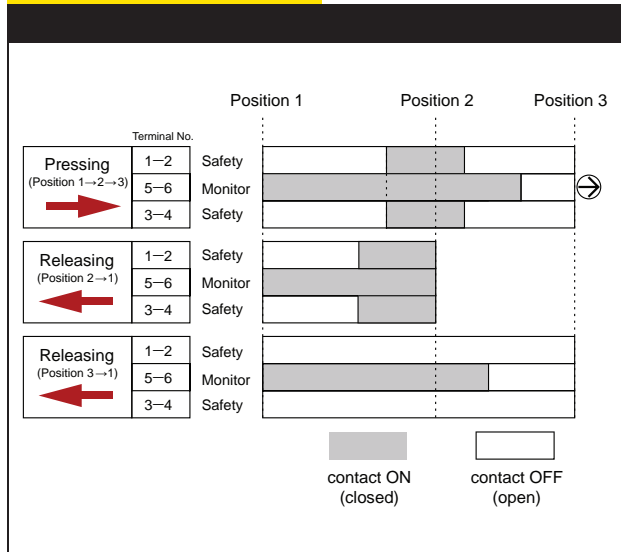
Additional bracket information available. See page 632.

Contact/Switching Diagrams

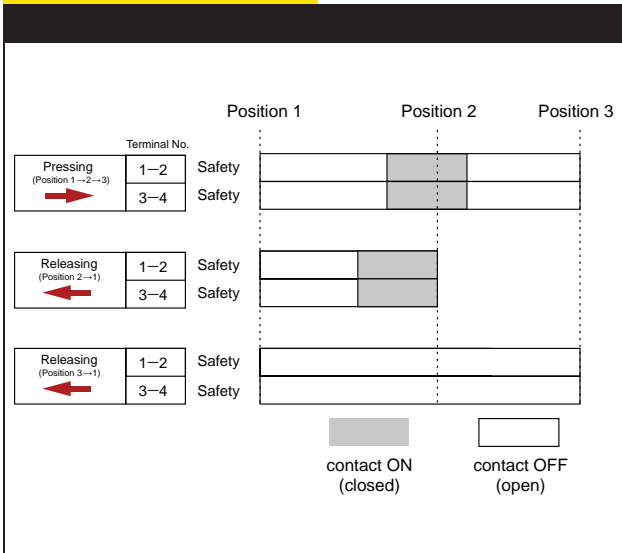
SD01 - ED1G-L21SM-1N Series



SD02 - ED1G-L21SMB-1N Series



SD03 - ED1G-L20MB-1N Series



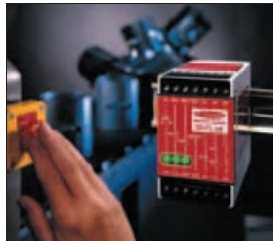
- Photoelectrics Sensors
- Fiber Optic Sensors
- Special Purpose Sensors
- Measurement & Inspection Sensors
- Vision
- Wireless
- Lighting & Indicators
- Safety Light Screens
- Safety Laser Scanners
- Safety Controllers & Modules
- Safety Two-Hand Control Modules
- Safety Interlock Switches
- Emergency Stop & Stop Control

- E-STOP BUTTONS
- ROPE PULLS
- ENABLING DEVICES

The following standard products are still available from Banner.
Please go online to bannerengineering.com for full descriptions and technical references.



MULTI-SCREEN®



ES-FL-2A Module



10- & 6-Input Modules



DUO-TOUCH® Modules



MINI-SCREEN® Safety Light Screens



PICO-GUARD™ Grids & Points



PICO-GUARD™ Interlock Switches



PICO-GUARD™ E-Stop

Accessories

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference

Brackets page 632

- A wide selection of bracket styles for easy installation and optimum performance
- Swivel brackets for greater range of motion and flexibility in mounting
- A choice of stainless steel, cold-rolled steel, black corrosion-resistant zinc or black ABS plastic brackets
- Custom brackets for unique applications



Quick-Disconnect (QD) Cordsets page 693

- A choice of cordset styles and length for each sensor or module
- M12/Euro-, M8/Pico-, Mini- and Micro-style QD connectors
- Straight or right-angle connectors, and a variety of lengths for installation flexibility
- Single or double-ended models and splitter cordsets for powering two devices with one cordset
- Cordsets for serial, Ethernet and video communication



Retroreflectors page 724


- A complete line of high-quality acrylic targets, high-temperature targets and adhesive-backed retroreflective tapes
- Numerous sizes, shapes and mounting options for most application requirements
- High-reflectivity models for increasing sensing ranges, with reflectivity factors up to 3x
- Temperature range ratings of -20° to 480° C



Miscellaneous page 736

| | |
|--|-----|
| Stands & Mounting Systems----- | 736 |
| Mirrors----- | 740 |
| Enclosures----- | 742 |
| Lens Shields----- | 746 |
| Alignment Tools----- | 749 |
| Apertures & Replacement Lenses----- | 750 |
| Power Supplies & Interfacing Products----- | 753 |
| Work Lights & Indicator Lights/Lamps----- | 757 |

Banner Bracket Selection Chart

| SENSORS | | | | | | | | |
|-----------------------------|---|-------------------------|------------------------|-----------------------|-----------------------|------------------------|------------------------|-----------------------|
| WORLD-BEAM® Q12 page 62 |  | SMBQ12A page 681 | SMBQ12T page 681 | | | | | |
| M12 page 66 |  | SMB12FA.. page 649 | SMB12MM page 649 | SMBQS12PD page 683 | | | | |
| T8 page 70 |  | SMB8MM page 659 | | | | | | |
| S12 page 73 |  | SMB12FA.. page 649 | SMB12MM page 649 | SMBQS12PD page 683 | | | | |
| VSM page 76 |  | N/A | | | | | | |
| VS1 page 80 |  | SMBVS1S page 688 | SMBVS1SC page 688 | SMBVS1T page 688 | SMBVS1TC page 688 | SMBVSM4 page 689 | | |
| VS2 page 83 |  | SMBVS2RA page 689 | | | | | | |
| VS3 page 86 |  | SMBVS3S page 689 | SMBVS3T page 689 | | | | | |
| WORLD-BEAM® QS18 page 90 |  | SMB18A page 650 | SMB18AFA.. page 651 | SMB18ATFA page 651 | SMB18FA.. page 651 | SMB18FM page 651 | SMB18Q page 651 | SMB18SF page 652 |
| | | SMB18UR page 652 | SMB3018SC page 652 | SMB30SK page 654 | SMB30SUS page 654 | SMB312PD page 655 | SMB312S page 655 | SMB4050YL page 656 |
| | | SMB46A page 657 | SMB46L page 657 | SMB46S page 657 | SMB46U page 658 | SMBAMS18P page 660 | SMBAMS18RA page 660 | SMBQS18A page 683 |
| | | SMBQS18AF page 684 | SMBQS18DIN page 684 | SMBQS18RA page 684 | SMBQS18Y page 684 | SMBQS18YL page 685 | SMH241F page 691 | |
| WORLD-BEAM® Q20 page 105 |  | SMBQ20H page 682 | SMBQ20L page 682 | SMBQ20LV page 682 | SMBQ20U page 682 | | | |
| WORLD-BEAM® Q26 page 110 |  | SMBLSTDLQ26 page 670 | SMBLSTQ26 page 671 | | | | | |
| MINI-BEAM® page 112 |  | SMB18A page 650 | SMB18FA.. page 651 | SMB18Q page 651 | SMB18SF page 652 | SMB18UR page 652 | SMB3018SC page 652 | SMB30SK page 654 |
| | | SMB30SUS page 654 | SMB312B page 655 | SMB312PD page 655 | SMB312S page 655 | SMB46L page 657 | SMB46S page 657 | SMB46U page 658 |
| | | SMBAMS18P page 660 | SMBAMS18RA page 660 | SMH241F page 691 | | | | |
| S18/M18 page 131 |  | SMB18A page 650 | SMB18FA.. page 651 | SMB18FM page 651 | SMB18Q page 651 | SMB18SF page 652 | SMB18UR page 652 | SMB3018SC page 652 |
| | | SMB30SK page 654 | SMB312PD page 655 | SMB46A page 657 | SMBAMS18P page 660 | SMBAMS18RA page 660 | | |


 More on next page

Banner Bracket Selection Chart

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference

| | | | | | | | |
|--|------------------------|------------------------|-------------------------|------------------------|------------------------|------------------------|-----------------------|
| T18 page 138  | SMB1815SF page 650 | SMB18A page 650 | SMB18AFA.. page 651 | SMB18FA.. page 651 | SMB18FM page 651 | SMB18Q page 651 | SMB18SF page 652 |
| | SMB18UR page 652 | SMB3018SC page 652 | SMB30SK page 654 | SMB312PD page 655 | SMBAMS18P page 660 | SMBAMS18RA page 660 | SMBT18Y page 667 |
| TM18 page 144  | SMB18A page 650 | SMB18AFA.. page 651 | SMB18ATFA.. page 651 | SMB18FA.. page 651 | SMB18Q page 651 | SMB18UR page 652 | SMB312PD page 655 |
| | SMBAMS18P page 630 | SMBAMS18RA page 660 | SMBT18Y page 687 | | | | |
| Q25 page 148  | SMB18A page 650 | SMB18FA.. page 651 | SMB18Q page 651 | SMB18SF page 652 | SMB18UR page 652 | SMB3018SC page 652 | SMB30SK page 654 |
| | SMB312PD page 655 | | | | | | |
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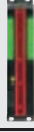











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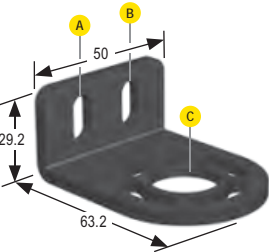
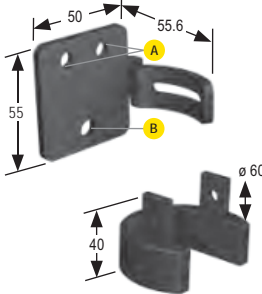
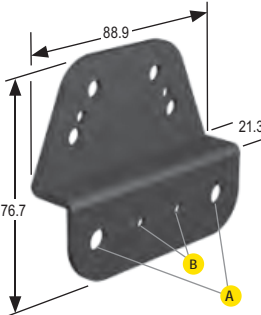
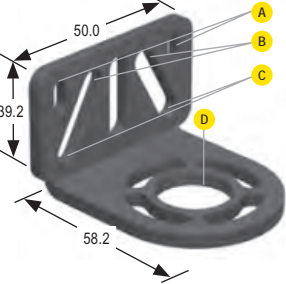




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|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> | | | | | | | | |
| <p>Hole center spacing: A = 63 Hole size: 9 x 20.4</p> | <table border="1"> <thead> <tr> <th>Model</th> <th>Length (L)</th> </tr> </thead> <tbody> <tr> <td>DIN-35-70</td> <td>70</td> </tr> <tr> <td>DIN-35-105</td> <td>105</td> </tr> <tr> <td>DIN-35-140</td> <td>140</td> </tr> </tbody> </table> | Model | Length (L) | DIN-35-70 | 70 | DIN-35-105 | 105 | DIN-35-140 | 140 | <p>Hole center spacing: A = 50 Hole size: A = \varnothing 5.3</p> | <p>Hole center spacing: A to B = 15.8, A to C = 31.5 Hole size: A, B, C = 15 x 7, D = \varnothing 32</p> |
| Model | Length (L) | | | | | | | | | | |
| DIN-35-70 | 70 | | | | | | | | | | |
| DIN-35-105 | 105 | | | | | | | | | | |
| DIN-35-140 | 140 | | | | | | | | | | |
| <ul style="list-style-type: none"> • Metal swivel bracket for mounting and aligning | <p>Hole center spacing: 35.1 Hole size: 25.4 x 5.3</p> <ul style="list-style-type: none"> • Available in 70, 105 & 140 mm lengths | <ul style="list-style-type: none"> • Right-angle bracket for mounting switch to upright surface • Stainless steel | <ul style="list-style-type: none"> • Two end-cap replacement brackets for one emitter/receiver • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware | | | | | | | | |
| Back Mount | Sensors | Side Mount | End Mount | | | | | | | | |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> | | | | | | | | |
| AG4 Laser Scanner | <p>DF-G1 D10 D12 R55F PICO-GUARD SFA-RD</p> <p>Controllers & Modules</p>  <p>Used with</p> <p>MINI-ARRAY High-Resolution MINI-ARRAY SC22-3 Controllers GM Modules ES Modules SM Modules MMD Modules IM Modules EM Modules SSM Modules UM Modules Two-Hand Control Modules</p> | ED1G Enabling Devices | EZ-SCREEN Point & Grid PICO-GUARD Grid | | | | | | | | |

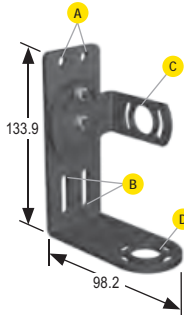
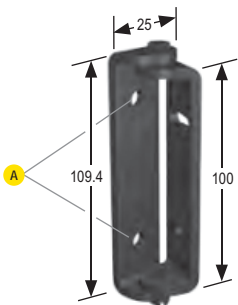
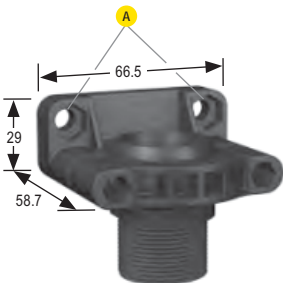
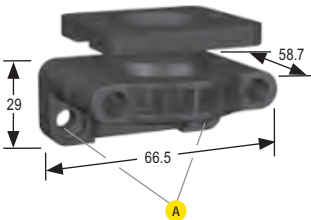




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- Cordsets
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- Miscellaneous
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| EZA-MBK-11 | EZA-MBK-12 | EZA-MBK-2 | EZA-MBK-20 |
|---|---|---|--|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A to B = 20 Hole size: A, B = 15 x 7, C = \varnothing 21.5</p> | <p>Hole center spacing: A = 20, A to B = 36 Hole size: A = \varnothing 7, B = \varnothing 8.3</p> | <p>Hole center spacing: A = 63.9, B = 19.9, A to B = 22 Hole size: A = \varnothing 8.3, B = \varnothing 4.8</p> | <p>Hole center spacing: A = 44.4, B = 20, C = 40 Hole size: A = 10.2 x 4.8, B, C = 25 x 7, D = \varnothing 21.5</p> |
| <ul style="list-style-type: none"> • Two end-cap replacement brackets for one emitter/receiver • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware | <ul style="list-style-type: none"> • Two-piece center bracket for one emitter/receiver • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware | <ul style="list-style-type: none"> • Bracket adapter (Qty 2) for attaching EZA-MBK-1 to any MSA series stand | <ul style="list-style-type: none"> • Two-bracket kit for one sensor • Adapter brackets for mounting to engineered/slotted aluminum framing such as 80/20™ and Unistrut™ • Order EZA-MBK-20U for bracket and M5 and M6 mounting hardware |
| <p>End Mount</p> | <p>Center Mount</p> | <p>Bracket-to-Bracket</p> | <p>End Mount</p> |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| <p>EZ-ARRAY EZ-SCREEN Standard 14 & 30 mm EZ-SCREEN Cascade 14 & 30 mm</p> | <p>EZ-ARRAY EZ-SCREEN Standard 14 & 30 mm EZ-SCREEN Cascade 14 & 30 mm</p> | <p>EZ-SCREEN Point & Grid PICO-GUARD Grid MSA Stands</p> | <p>EZ-ARRAY EZ-SCREEN Standard 14 & 30 mm</p> |

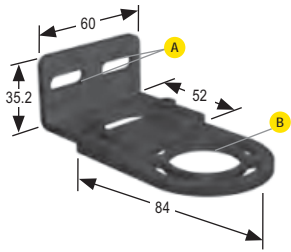
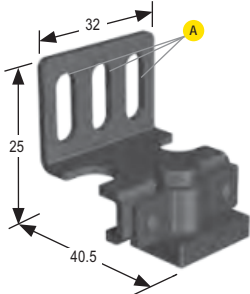
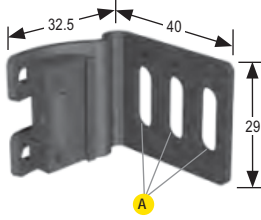
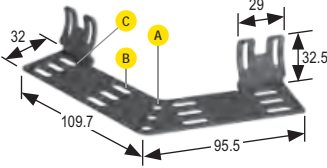
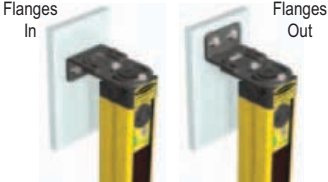



More on next page

| EZA-MBK-21 | EZA-MBK-3 | EZA-MBK-4 | EZA-MBK-5 |
|---|--|--|---|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 20, B = 20, A to B = 101.4 Hole size: A = \varnothing 7, B = 30 x 7.2, C, D = \varnothing 21.5</p> | <p>Hole center spacing: A = 65 Hole size: A = \varnothing 7</p> | <p>Hole center spacing: A = 50.8 Hole size: \varnothing 7</p> | <p>Hole center spacing: A = 50.8 Hole size: \varnothing 7</p> |
| <ul style="list-style-type: none"> • Mounting bracket system for L configuration of two cascaded EZ-SCREEN light screens • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware | <ul style="list-style-type: none"> • Two-piece side-swivel bracket kit • 180° range of motion • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish | <ul style="list-style-type: none"> • Top-mounting kit with SMB30SC swivel bracket and threaded adapter • 45° rotation in any direction • Black reinforced thermoplastic polyester | <ul style="list-style-type: none"> • Bottom-mounting kit with SMB30SC swivel bracket and threaded adapter plate • 45° rotation in any direction • Black reinforced thermoplastic polyester |
| <p>Cascading Mount</p> | <p>Side Mount</p> | <p>End Mount</p> | <p>End Mount</p> |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| <p>EZ-SCREEN Cascade 14 & 30 mm</p> | <p>EZ-SCREEN Point & Grid PICO-GUARD Grid</p> | <p>EZ-SCREEN Point</p> | <p>EZ-SCREEN Point</p> |

- Accessories
- Brackets
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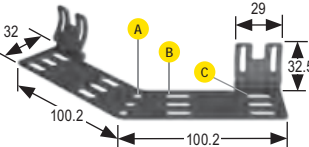
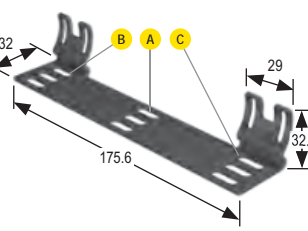
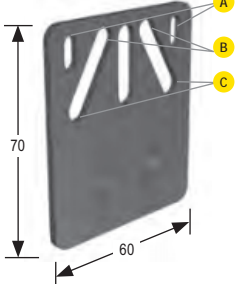
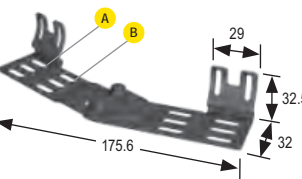






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| EZA-MBK-9 | LPA-MBK-11 | LPA-MBK-12 | LPA-MBK-120 |
|--|---|---|--|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  |
| <p>Hole center spacing: A = 30.8 Hole size: A = 21 x 7, B = ø 32</p> | <p>Hole center spacing: A = 10 Hole size: A = 5.5 x 15.5</p> | <p>Hole center spacing: A = 10 Hole size: A = 15.5 x 5.5</p> | <p>Hole center spacing: A, B, C = 10, B to C = 50 Hole size: A = ø 5.8, B, C = 15.5 x 5.5</p> |
| <ul style="list-style-type: none"> • Two-bracket kit with 30 mm range of motion for mounting sensor • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • M5 and M6 mounting hardware | <ul style="list-style-type: none"> • End-cap bracket kit • 360° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated; die-cast metal clamp • Includes 2 brackets and hardware | <ul style="list-style-type: none"> • Side-mount bracket kit • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated; die-cast zinc clamp • Includes 1 bracket and hardware | <ul style="list-style-type: none"> • Pair of angled L brackets for two cascaded emitter/receiver pairs • Fixed 120° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated |
| <p>End Mount</p> | <p>End Mount</p> | <p>Center Mount</p> | <p>Cascading Mount</p> |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| <p>EZ-SCREEN Grid PICO-GUARD Grid</p> | <p>EZ-SCREEN LP 14 & 25 mm</p> | <p>EZ-SCREEN LP 14 & 25 mm</p> | <p>EZ-SCREEN LP 14 & 25 mm</p> |

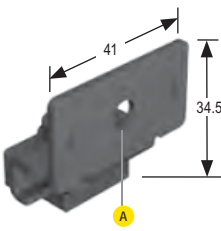
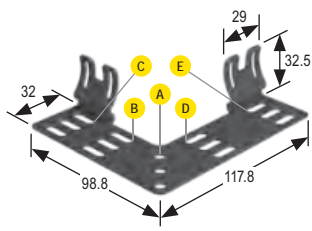
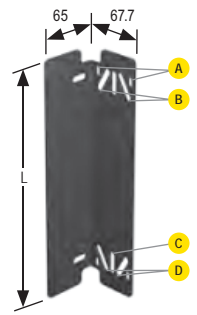
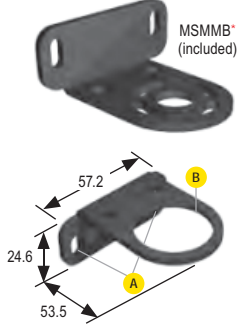






More on next page

| LPA-MBK-135 | LPA-MBK-180 | LPA-MBK-20 | LPA-MBK-21 |
|--|---|---|--|
|  |  <p style="text-align: center;">All measurements in mm</p> |  <p style="text-align: center;">All measurements in mm</p> |  <p style="text-align: center;">All measurements in mm</p> |
| <p>Hole center spacing: A, B, C = 10, B to C = 50 Hole size: A = \varnothing 5.8, B, C = 15.5 x 5.5</p> | <p>Hole center spacing: A, B, C = 10, A to B = 73.3, A to C = 73.3 Hole size: A, B, C = 15.5 x 5.5</p> | <p>Hole center spacing: A = 44.5, B = 20, C = 40 Hole size: A = 4.8 x 10.2, B, C = 7 x 26.8</p> | <p>Hole center spacing: A, B = 10, A to B = 30 Hole size: A, B = 15.5 x 5.5</p> |
| <ul style="list-style-type: none"> • Pair of angled L brackets for two cascaded emitter/receiver pairs • Fixed 135° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated | <ul style="list-style-type: none"> • Pair of inline (straight) brackets for two cascaded emitter/receiver pairs • Fixed 180° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated | <ul style="list-style-type: none"> • Universal adapter bracket for mounting to engineered/slotted aluminum framing (example, 80/20™, Bosch) • Use with LPA-MBK-11, -12 or -13 • 12-ga. (2.66 mm) steel; black zinc plated • Includes 1 bracket and hardware | <ul style="list-style-type: none"> • Pivoting "L" bracket system for two cascaded emitters/receivers; uses clamps from side-mount bracket LPA-MBK-12 • Adjustable 90° to 180° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated |
| Cascading Mount | Cascading Mount | Bracket-to-Bracket | Cascading Mount |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| EZ-SCREEN LP 14 & 25 mm | EZ-SCREEN LP 14 & 25 mm | EZ-SCREEN LP 14 & 25 mm | EZ-SCREEN LP 14 & 25 mm |

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| LPA-MBK-22 | LPA-MBK-90 | LPA-MBK-PXXX | MSMB-3 |
|---|---|---|--|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>MSMMB* (included)</p> <p>All measurements in mm</p> |
| <p>Hole size: A = \varnothing 6.6</p> | <p>Hole center spacing: A, B, C, D, E = 10, B to C = 30, D to E = 50 Hole size: A = \varnothing 5.8, B, C, D, E = 15.5 x 5.5</p> | <p>Hole center spacing: A = 44.5, B = 40, D = 18 Hole size: A = 4.8 x 10.2, B = 7 x 26.8, C = 7 x 25</p> | <p>Hole center spacing: A = 44.5 Hole size: A = 10.2 x 4.8, B = \varnothing 30.5</p> |
| <ul style="list-style-type: none"> • End-cap bracket for mounting inside Unistrut® metal framing • Fits Unistrut® P1000 size (1 5/8"), with M6 or 1/4" channel nuts • 14-ga. (1.9 mm) steel, black zinc, plated; die-cast zinc clamp • Used with LPA-MBK-11 • Includes 2 brackets and hardware (does not include Unistrut® channel nuts) | <ul style="list-style-type: none"> • Pair of angled L brackets for two cascaded emitter/receiver pairs • Fixed 90° orientation • +10°/-30° sensor rotation • 14-ga. (1.9 mm) steel, black zinc plated | <ul style="list-style-type: none"> • L-shaped protective bracket for one emitter/receiver • Sized to match emitter/receiver length; replace XXX in model number with emitter/receiver size (example, LPA-MBK-P270 for use with SLP.-270) • +10°/-30° sensor rotation • 12-ga. (2.66 mm) steel, black zinc plated or painted | <ul style="list-style-type: none"> • Two-bracket replacement kit for emitter/receiver • 11-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish <p>* Includes 1 bracket from model MSMMB (see page 634 for dimensions).</p> |
| Bracket-to-Bracket | Cascading Mount | Center Mount | End Mount |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| EZ-SCREEN LP 14 & 25 mm | EZ-SCREEN LP 14 & 25 mm | EZ-SCREEN LP 14 & 25 mm | High-Resolution MINI-ARRAY MINI-ARRAY |



| MSMB-MSM-45 | MSMMB | RMB100 | RMB50 |
|---|---|---|--|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: A to B = 50.8 Hole size: A = \varnothing 7, B = 87.7 x 7</p> | <p>Hole center spacing: A = 44.5 Hole size: A = 10.2 x 4.8, B = \varnothing 13.2</p> | <p>Hole center spacing: A, B, A to B = 92, C, D, C to D = 77, G = 56 Hole size: A, B, C, D = \varnothing 0.5, E = \varnothing 4.8, F = \varnothing 4.5, G = 21.5 x 4.5</p> | <p>Hole center spacing: A, B = 34, A to B = 52, E = 26 Hole size: A, B = \varnothing 0.5, C = \varnothing 6.3, D = \varnothing 4.5, E = 13.8 X 4.5</p> |
| <ul style="list-style-type: none"> • Bracket for 45° mounting of mirror • 11-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included | <ul style="list-style-type: none"> • Replacement (pair) for brackets that come with MSM mirrors • 11-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included | <ul style="list-style-type: none"> • Protective mounting bracket for retroreflective targets • 14-ga. 316 stainless steel • Stainless steel M3 x 0.5 hardware included | <ul style="list-style-type: none"> • Protective mounting bracket for retroreflective targets • 14-ga. 316 stainless steel • Stainless steel M3 x 0.5 hardware included |
| | End Mount | Round Targets | Round Targets |
| | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| Bracket-to-Bracket | | | |
| <p>Used with</p> | MSM Mirror | BRT-3 BRT-84 | BRT-50D BRT-50R |
| MSM4A Mirror | | Square Targets | Square Targets |
| | | <p>Used with</p> | <p>Used with</p> |
| | | BRT-77X77C BRT-92X92C BRT-92X92CB | BRT-2X2 BRT-51X51BM |
| | | | Rectangular Targets |
| | | | <p>Used with</p> |
| | | | BRT-60X40AF BRT-60X40C BRT-60X40IP69K |

NOTE: For a kit containing a bracket and MSM4A mirror, order model number MSA-MBM-K45



| RMB85 | SA-DIN-BRACKET* | SA-K50A18 | SFA-IMB1 |
|---|---|--|--|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: A, B, A to B = 77, E = 46 Hole size: A, B = \varnothing 0.5, C = \varnothing 4.8, D = \varnothing 4.5, E = 19 x 4.5</p> | <p>Hole center spacing: A = 16, B = 25.4, C = 15.2 Hole size: A = \varnothing 3.2, B = \varnothing 3.3, C = \varnothing 4.4</p> | <p>Hole center spacing: Hole size: A = \varnothing 30.5, A = \varnothing 20</p> | <p>Hole center spacing: A, B = 78, A to B = 10 Hole size: A = \varnothing 4.5, B = 8 x 4.5</p> |
| <ul style="list-style-type: none"> • Protective mounting bracket for retroreflective targets • 14-ga. 316 stainless steel • Stainless steel M3 x 0.5 hardware included | <ul style="list-style-type: none"> • Plastic bracket with mounting screws <p>* SA-DIN-BRACKET-10 (Kit of 10 brackets and mounting screws)</p> | <ul style="list-style-type: none"> • Protective mounting bracket for EZ-LIGHT K50 sensors • 12-ga. cold-rolled steel | <ul style="list-style-type: none"> • Retrofit bracket for replacing SI-MAG1 Magnetic Interlock switches with PICO-GUARD switches • Black reinforced thermoplastic polyester • Multiple brackets can be used as spacers for ferrous material standoff for SI-MAG.. |
| Round Targets | Side Mount | Base Mount | Flat Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| BRT-3 | DF-G1 D10 | K50 | PICO-GUARD Switches |
| Square Targets | | | |
| <p>Used with</p> | | | |
| BRT-77X77C | | | |

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| SFA-IMB2 | SMA-MBK-1 | SMB12FA.. | SMB12MM | | | | | | |
|--|---|---|--|-----------------|---------|---------------|------------|----------------|---|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | | | | | | |
| <p>Hole center spacing: A = 22 Hole size: A = \varnothing 4.5</p> | <p>Hole center spacing: A = 31.5, A to B = 15.8 Hole size: A, B = 15 X 7, C = \varnothing 32</p> | <table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB12FA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB12FAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table> <p>Hole size: B = \varnothing 12.1</p> | Model | Bolt Thread (A) | SMB12FA | 3/8 - 16 x 2" | SMB12FAM10 | M10 - 1.5 x 50 | <p>Hole center spacing: A to B = 26 Hole size: A = \varnothing 4.6, B = 12.8 x 4.6, C = \varnothing 12.3</p> |
| Model | Bolt Thread (A) | | | | | | | | |
| SMB12FA | 3/8 - 16 x 2" | | | | | | | | |
| SMB12FAM10 | M10 - 1.5 x 50 | | | | | | | | |
| <ul style="list-style-type: none"> • Retrofit bracket for replacing SI-MAG2 Magnetic Interlock switches with PICO-GUARD switches • Black reinforced thermoplastic polyester • Multiple brackets can be used as spacers for ferrous material standoff for SI-MAG.. | <ul style="list-style-type: none"> • Two-bracket replacement kit for brackets that come with SSM Mirrors • 8-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included | <ul style="list-style-type: none"> • Swivel bracket with tilt and pan movement for precision adjustment • Easy sensor mounting to extruded rail T-slots • Metric and inch size bolts available • 12 mm sensor mounting hole | <ul style="list-style-type: none"> • $\pm 10^\circ$ of lateral movement • 12-ga. stainless steel • Mounting holes for M4 (#6) hardware • 12 mm sensor mounting hole | | | | | | |
| Flat Mount | End Mount | Barrel Mount | Barrel Mount | | | | | | |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | | | | | | |
| PICO-GUARD Switches | SSM Mirror | M12 S12 | M12 S12 PICO-GUARD Switches PICO-GUARD Points | | | | | | |

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| SMB1812SF | SMB1815SF | SMB18A | SMB18AFA.. | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|-------|-----------------|----------|---------------|---|----------------|-------|-----------|-------------|-----|-------------|-----|------|-----|--------------|------|--------------|------|--|---|-----|------|------|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Hole center spacing: A = 36.1 Hole size: A = \varnothing 5, B = \varnothing 12</p> | <p>Hole center spacing: A = 36 Hole size: A = \varnothing 5, B = \varnothing 15</p> | <p>Hole center spacing: A to B = 24.2 Hole size: A = \varnothing 4.6, B = 17 x 4.6, C = \varnothing 18.5</p> | <table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB18AFA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB18AFAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table> <p>Hole size: B = \varnothing 18.1</p> | Model | Bolt Thread (A) | SMB18AFA | 3/8 - 16 x 2" | SMB18AFAM10 | M10 - 1.5 x 50 | | | | | | | | | | | | | | | | | |
| Model | Bolt Thread (A) | | | | | | | | | | | | | | | | | | | | | | | | | |
| SMB18AFA | 3/8 - 16 x 2" | | | | | | | | | | | | | | | | | | | | | | | | | |
| SMB18AFAM10 | M10 - 1.5 x 50 | | | | | | | | | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none"> Swivel bracket with 12 mm mounting hole Black reinforced thermoplastic polyester Stainless steel mounting and swivel locking hardware included | <ul style="list-style-type: none"> Swivel with set screws for mounting sensors by the cable hub Black reinforced thermoplastic polyester Stainless steel swivel locking hardware and hex wrench included | <ul style="list-style-type: none"> Right-angle mounting bracket with a curved slot for versatile orientation 12-ga. stainless steel, 18 mm sensor mounting hole Clearance for M4 (#8) hardware | <ul style="list-style-type: none"> Protective, swivel bracket with tilt and pan movement for precision adjustment Easy sensor mounting to extruded rail T-slots Metric and inch size bolts available Mounting hole for 18 mm sensors | | | | | | | | | | | | | | | | | | | | | | | |
| Barrel Mount | Base Mount | Barrel Mount | Barrel Mount | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | | | | | | | | | | | | | | | | | | | | | | | |
| PICO-GUARD Points | <table border="1"> <tr> <td>T18</td> <td>T30U</td> </tr> <tr> <td>T18U</td> <td>EZ-LIGHT T18</td> </tr> <tr> <td>T30</td> <td>EZ-LIGHT T30</td> </tr> </table> | T18 | T30U | T18U | EZ-LIGHT T18 | T30 | EZ-LIGHT T30 | <table border="1"> <tr> <td>QS18</td> <td>QS18U</td> </tr> <tr> <td>MINI-BEAM</td> <td>Q45UR M18C2</td> </tr> <tr> <td>M18</td> <td>Q45UR S18C2</td> </tr> <tr> <td>S18</td> <td>T18U</td> </tr> <tr> <td>T18</td> <td>EZ-LIGHT T18</td> </tr> <tr> <td>TM18</td> <td>EZ-LIGHT M18</td> </tr> <tr> <td>S18U</td> <td></td> </tr> </table> | QS18 | QS18U | MINI-BEAM | Q45UR M18C2 | M18 | Q45UR S18C2 | S18 | T18U | T18 | EZ-LIGHT T18 | TM18 | EZ-LIGHT M18 | S18U | | <table border="1"> <tr> <td>T18</td> </tr> <tr> <td>TM18</td> </tr> <tr> <td>QS18</td> </tr> </table> | T18 | TM18 | QS18 |
| T18 | T30U | | | | | | | | | | | | | | | | | | | | | | | | | |
| T18U | EZ-LIGHT T18 | | | | | | | | | | | | | | | | | | | | | | | | | |
| T30 | EZ-LIGHT T30 | | | | | | | | | | | | | | | | | | | | | | | | | |
| QS18 | QS18U | | | | | | | | | | | | | | | | | | | | | | | | | |
| MINI-BEAM | Q45UR M18C2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| M18 | Q45UR S18C2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| S18 | T18U | | | | | | | | | | | | | | | | | | | | | | | | | |
| T18 | EZ-LIGHT T18 | | | | | | | | | | | | | | | | | | | | | | | | | |
| TM18 | EZ-LIGHT M18 | | | | | | | | | | | | | | | | | | | | | | | | | |
| S18U | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T18 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TM18 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| QS18 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Base Mount | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <p>Used with</p> | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Q25 | | | | | | | | | | | | | | | | | | | | | | | | |

More on next page

| SMB18ATFA.. | | SMB18FA.. | | SMB18FM | | SMB18Q | | | | | | | | | | | | | |
|--|---|---|-----------------|---|--|---|----------------|--|----------------------|--|-----------------|--|---|------------|----------------|-----|--|---|--|
| <p>All measurements in mm</p> | | <p>All measurements in mm</p> | | <p>All measurements in mm</p> | | <p>All measurements in mm</p> | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB18ATFA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB18ATFAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table> | | Model | Bolt Thread (A) | SMB18ATFA | 3/8 - 16 x 2" | SMB18ATFAM10 | M10 - 1.5 x 50 | <table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB18FA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB18FAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table> | | Model | Bolt Thread (A) | SMB18FA | 3/8 - 16 x 2" | SMB18FAM10 | M10 - 1.5 x 50 | N/A | | Hole center spacing: A to B = 24.2 Hole size: A = \varnothing 4.6, B = 17 x 4.6, C = \varnothing 19 | |
| Model | Bolt Thread (A) | | | | | | | | | | | | | | | | | | |
| SMB18ATFA | 3/8 - 16 x 2" | | | | | | | | | | | | | | | | | | |
| SMB18ATFAM10 | M10 - 1.5 x 50 | | | | | | | | | | | | | | | | | | |
| Model | Bolt Thread (A) | | | | | | | | | | | | | | | | | | |
| SMB18FA | 3/8 - 16 x 2" | | | | | | | | | | | | | | | | | | |
| SMB18FAM10 | M10 - 1.5 x 50 | | | | | | | | | | | | | | | | | | |
| Hole size: B = \varnothing 18.1 | | Hole size: B = \varnothing 18.1 | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none"> • Protective, swivel bracket with tilt and pan movement for precision adjustment • Easy sensor mounting to extruded rail T-slots • Metric and inch size bolts available • Mounting hole for 18 mm sensors | | <ul style="list-style-type: none"> • Swivel bracket with tilt and pan movement for precision adjustment • Easy sensor mounting to extruded rail T-slots • Metric and inch size bolts available • 18 mm sensor mounting hole | | <ul style="list-style-type: none"> • Two-piece thermoplastic through-mount bracket • Mounting nut (M22 x 1.5) and outer flange (M22 x 1.5 external, M18 x 1 internal) | | <ul style="list-style-type: none"> • Right-angle flanged bracket • 18 mm sensor mounting hole • 12-ga. stainless steel | | | | | | | | | | | | | |
| Barrel Mount | | Barrel Mount | | Barrel Mount | | Barrel Mount | | | | | | | | | | | | | |
| <p>Used with</p> | | <p>Used with</p> | | <p>Used with</p> | | <p>Used with</p> | | | | | | | | | | | | | |
| QS18 (AC/DC models) TM18 | | <table border="1"> <tr> <td>QS18 MINI-BEAM S18/M18/T18 S18U TM18 QS18U</td> <td>Q45UR M18C2 Q45UR S18C2 T18U EZ-LIGHT M18 EZ-LIGHT T18</td> </tr> </table> | | QS18 MINI-BEAM S18/M18/T18 S18U TM18 QS18U | Q45UR M18C2 Q45UR S18C2 T18U EZ-LIGHT M18 EZ-LIGHT T18 | <table border="1"> <tr> <td>QS18 M18 S18</td> <td>T18 S18U QS18U</td> </tr> </table> | | QS18 M18 S18 | T18 S18U QS18U | <table border="1"> <tr> <td>QS18 MINI-BEAM S18 M18 T18 TM18 S18U</td> <td>QS18U Q45UR S18C2 Q45UR M18C2 T18U EZ-LIGHT T18 EZ-LIGHT M18</td> </tr> </table> | | QS18 MINI-BEAM S18 M18 T18 TM18 S18U | QS18U Q45UR S18C2 Q45UR M18C2 T18U EZ-LIGHT T18 EZ-LIGHT M18 | | | | | | |
| QS18 MINI-BEAM S18/M18/T18 S18U TM18 QS18U | Q45UR M18C2 Q45UR S18C2 T18U EZ-LIGHT M18 EZ-LIGHT T18 | | | | | | | | | | | | | | | | | | |
| QS18 M18 S18 | T18 S18U QS18U | | | | | | | | | | | | | | | | | | |
| QS18 MINI-BEAM S18 M18 T18 TM18 S18U | QS18U Q45UR S18C2 Q45UR M18C2 T18U EZ-LIGHT T18 EZ-LIGHT M18 | | | | | | | | | | | | | | | | | | |
| | | Bracket-to-Bracket | | | | Base Mount | | | | | | | | | | | | | |
| | | <p>Used with</p> | | | | <p>Used with</p> | | | | | | | | | | | | | |
| | | <table border="1"> <tr> <td>SMBQS18A SMBQS18Y</td> <td>SMBQS18YL SMB4050YL</td> </tr> </table> | | SMBQS18A SMBQS18Y | SMBQS18YL SMB4050YL | | | | | Q25 | | | | | | | | | |
| SMBQS18A SMBQS18Y | SMBQS18YL SMB4050YL | | | | | | | | | | | | | | | | | | |
| | | Base Mount | | | | | | | | | | | | | | | | | |
| | | <p>Used with</p> | | | | | | | | | | | | | | | | | |
| | | Q25 QS18 (AC/DC models) | | | | | | | | | | | | | | | | | |

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference



| SMB18SF | | SMB18UR | | SMB22A | | SMB3018SC | |
|--|---|--|--|--|--|---|-------------------------------------|
| | | | | | | | |
| All measurements in mm | | All measurements in mm | | All measurements in mm | | All measurements in mm | |
| Hole center spacing: A = 36 Hole size: A = \varnothing 5.3, B = \varnothing 18 | | Hole center spacing: A = 25.4, B = 46.7 Hole size: A , B = 6.9 x 32, C = \varnothing 18.3 | | Hole center spacing: A to B = 26 Hole size: A = \varnothing 4.6, B = 4.6 x 16.9, C = 22.2 | | Hole center spacing: A = 50.8 Hole size: A = \varnothing 7, B = \varnothing 18 | |
| <ul style="list-style-type: none"> • 18 mm swivel bracket with M18 x 1 internal thread • Black thermoplastic polyester • Stainless steel swivel locking hardware included | | <ul style="list-style-type: none"> • 2-piece universal swivel bracket • 300 series stainless steel • Stainless steel swivel locking hardware included • Mounting hole for 18 mm sensor | | <ul style="list-style-type: none"> • Right-angle bracket with curved slot for versatile orientation • 12-ga. stainless steel • Mounting hole for 22 mm sensor | | <ul style="list-style-type: none"> • 18 mm swivel side or barrel-mount bracket • Black reinforced thermoplastic polyester • Stainless steel swivel locking hardware included | |
| Barrel Mount | | Barrel Mount | | Base Mount | | Barrel Mount | |
| | | | | | | | |
| Used with | | Used with | | Used with | | Used with | |
| QS18 MINI-BEAM S18 M18 T18 S18U | QS18U Q45UR S18C2 Q45UR M18C2 T18U EZ-LIGHT T18 EZ-LIGHT M18 | QS18* MINI-BEAM S18 M18 T18 TM18 S18U | QS18U* Q45UR S18C2 Q45UR M18C2 T18U EZ-LIGHT T18 EZ-LIGHT M18 | K30L | | M18/S18/T18 S18U Q45UR S18C2 | Q45UR M18C2 T18U EZ-LIGHT T18 |
| Base Mount | | Base Mount | | | | Side Mount | |
| | | | | | | | |
| Used with | | Used with | | | | Used with | |
| Q25 | | Q25 | | | | QS18 MINI-BEAM | QM42/QMT42 QS18U |
| | | | | | | Base Mount | |
| | | | | | | | |
| | | | | | | Used with | |
| | | | | | | Q25 | |
| | | | | | | * Contact factory to verify compatibility with integral QD models. | |

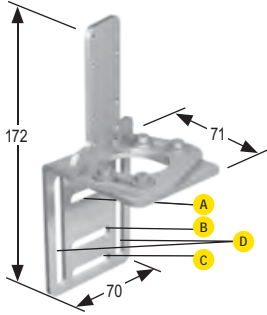
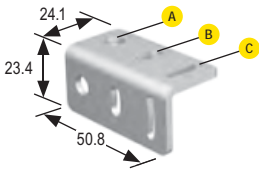
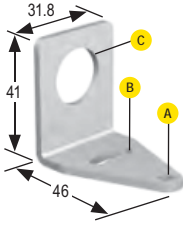
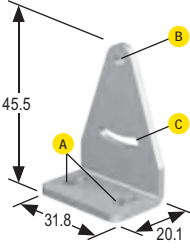

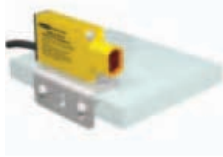
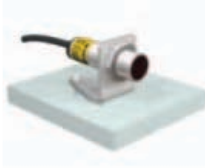
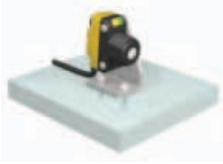

More on next page

| SMB30A | | SMB30FA.. | | SMB30MM | | SMB30Q | | | | | | | |
|--|---|---|---|---|--|---|--|------------|----------------|--|--|--|--|
| | | | | | | | | | | | | | |
| All measurements in mm | | All measurements in mm | | All measurements in mm | | All measurements in mm | | | | | | | |
| Hole center spacing: A to B = 40 Hole size: A = \varnothing 6.3, B = 27.1 x 6.3, C = \varnothing 30.5 | | <table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB30FA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB30FAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table> | | Model | Bolt Thread (A) | SMB30FA | 3/8 - 16 x 2" | SMB30FAM10 | M10 - 1.5 x 50 | Hole center spacing: A = 51, A to B = 25.4 Hole size: A = 42.6 x 7, B = \varnothing 6.4, C = \varnothing 30.1 | | Hole center spacing: A to B = 40 Hole size: A = \varnothing 6.3, B = 27.1 x 6.3, C = \varnothing 30.7 | |
| Model | Bolt Thread (A) | | | | | | | | | | | | |
| SMB30FA | 3/8 - 16 x 2" | | | | | | | | | | | | |
| SMB30FAM10 | M10 - 1.5 x 50 | | | | | | | | | | | | |
| <ul style="list-style-type: none"> Right-angle bracket with curved slot for versatile orientation Clearance for M6 (1/4") hardware Mounting hole for 30 mm sensor 12-ga. stainless steel | | <ul style="list-style-type: none"> Swivel bracket with tilt and pan movement for precision adjustment Mounting hole for 30 mm sensor Metric and inch size bolt available Easy sensor mounting to extruded rail T-slot | | <ul style="list-style-type: none"> 12-ga. stainless steel bracket with curved mounting slots for versatility and orientation Clearance for M6 (1/4") hardware Mounting hole for 30 mm sensor | | <ul style="list-style-type: none"> Right-angle flanged mounting bracket with curved slot for versatile orientation 12-ga. stainless steel Mounting hole for 30 mm sensor | | | | | | | |
| Barrel Mount | | Barrel Mount | | Barrel Mount | | Barrel Mount | | | | | | | |
| | | | | | | | | | | | | | |
| Used with | | Used with | | Used with | | Used with | | | | | | | |
| QS30 SM30/SMI30 S30 T30 | T30U EZ-LIGHT T30 PICO-GUARD Point | QS30 SM30/SMI30 S30 | T30 T30U EZ-LIGHT T30 | QS30 S30 SM30/SMI30 EZ-LIGHT T30 | T30 T30U PICO-GUARD Point | QS30 SM30/SMI30 S30 | T30 EZ-LIGHT T30 | | | | | | |
| Base Mount | | Base Mount | | Base Mount | | Base Mount | | | | | | | |
| | | | | | | | | | | | | | |
| Used with | | Used with | | Used with | | Used with | | | | | | | |
| Q40 Q45 OMNI-BEAM OTB/LTB VTB STB Q45U | Q45UR QT50U QT50R K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights | Q40 Q45 Q45U Q45UR QT50U OMNI-BEAM OTB/LTB | VTB STB K50 QT50R EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights | Q40 Q45 OMNI-BEAM OTB/LTB VTB QT50U | Q45U Q45UR QT50R K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights | Q40 Q45 OMNI-BEAM OTB/LTB VTB | STB Q45U Q45UR K50 EZ-LIGHT K50L WL50 Work Lights | | | | | | |

More on next page

| SMB30RAVK | | SMB30SC | | SMB30SK | | SMB30SUS | |
|--|--|---|--|---|---|---|--|
| | | | | | | | |
| All measurements in mm | | All measurements in mm | | All measurements in mm | | All measurements in mm | |
| Hole size: A = \varnothing 30.5 | | Hole center spacing: A = 50.8 Hole size: A = \varnothing 7, B = \varnothing 30 | | Hole center spacing: A = 50.8 Hole size: A = \varnothing 7, B = \varnothing 18 | | Hole center spacing: A = 50.8, B = 24.1 Hole size: A = \varnothing 7, B = \varnothing 7.6 | |
| <ul style="list-style-type: none"> V-clamp, right-angle bracket and fasteners for mounting sensors to pipe or extrusions Clamp accommodates 28 mm dia. tubing or 1" square extrusions 30 mm hole for mounting sensors | | <ul style="list-style-type: none"> Swivel bracket with 30 mm mounting hole for sensor Black reinforced thermoplastic polyester Stainless steel mounting and swivel locking hardware included | | <ul style="list-style-type: none"> Flat-mount swivel bracket with extended range of motion Black reinforced thermoplastic polyester and 316 stainless steel Stainless steel swivel locking hardware included | | <ul style="list-style-type: none"> Side-mount swivel bracket with extended range of motion Black reinforced thermoplastic polyester Stainless steel swivel locking hardware included | |
| Barrel Mount | | Barrel Mount | | Barrel Mount | | Side Mount | |
| | | | | | | | |
| Used with | | Used with | | Used with | | Used with | |
| QS30 SM30/SMI30 S30 | T30 T30U EZ-LIGHT T30 | QS30 SM30/SMI30 S30 T30 | T30U EZ-LIGHT T30 PICO-GUARD Point | QS18 MINI-BEAM S18/M18/T18 T18U S18U | QS18U Q45UR S18C2 Q45UR M18C2 EZ-LIGHT T18 EZ-LIGHT M18 | QS18 MINI-BEAM QM42/QMT42 QS18U | |
| Base Mount | | Base Mount | | Base Mount | | | |
| | | | | | | | |
| Used with | | Used with | | Used with | | | |
| Q40 Q45 Q45U Q45UR QT50U OMNI-BEAM OTB/LTB | VTB STB K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights | Q40 Q45 OMNI-BEAM OTB/LTB VTB STB QT50U | Q45U Q45UR QT50R K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights | Q25 | | | |
| | | | | Side Mount | | | |
| | | | | | | | |
| | | | | Used with | | | |
| | | | | QM42/QMT42 | | | |

More on next page

| SMB30UR | SMB312B | SMB312PD | SMB312S |
|---|---|---|--|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A to B = 31.8, B to C = 19, A to C = 50.8, D = 50.8 Hole size: A, B, C = 6.9 x 32, D = 73 x 6.9</p> | <p>Hole center spacing: A to B = 17.3, B to C = 17.7, A to C = 35 Hole size: A = ø 6.9, B = 4.3 x 10.5, C = 3.1 x 15.2</p> | <p>Hole center spacing: A to B = 24.2 Hole size: A = ø 4.6, B = 17 x 4.6, C = ø 18.5</p> | <p>Hole center spacing: A = 20.3, B to C = 5.1 Hole size: A = 4.3 x 7.5, B = ø 3, C = 3 x 15.3</p> |
| <ul style="list-style-type: none"> • 2-piece universal swivel bracket for limit-switch style sensors • 300 series stainless steel • Stainless steel swivel locking hardware included | <ul style="list-style-type: none"> • Right-angle • Stainless steel base mounting bracket • Includes mounting foot | <ul style="list-style-type: none"> • Right-angle mounting bracket with a curved slot for versatile orientation • 12-ga. stainless steel, 18 mm sensor mounting hole • Clearance for M4 (#8) hardware <p>NOTE: Not for use with plastic fiber optic sensors</p> | <ul style="list-style-type: none"> • Stainless steel 2-axis side-mounting bracket |
| Side Mount | Base Mount | Barrel Mount | Side Mount |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| <p>Q45 OMNI-BEAM Q45U Q45UR</p> | <p>MINI-BEAM</p> | <p>QS18 MINI-BEAM S18 M18 T18 TM18 S18U</p> | <p>QS18U Q45UR S18C2 Q45UR M18C2 T18U EZ-LIGHT T18 EZ-LIGHT M18</p> |
| | | <p>Base Mount</p> | |
| | |  <p>Used with</p> | |
| | | <p>Q25</p> | |



| SMB4050YL | SMB42F | SMB42L | SMB42T |
|---|--|--|---|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>● A = \varnothing 15.3</p> | <p>Hole center spacing: ● A = 10, ● B = 25.4 Hole size: ● A = \varnothing 3.4, ● B = \varnothing 2.5</p> | <p>Hole center spacing: ● A = 10, ● B = 25.4 Hole size: ● A = \varnothing 3.4, ● B = \varnothing 2.5</p> | <p>Hole center spacing: ● A = 20.3, ● B to ● C = 5.1 Hole size: ● A = 4.3 x 7.5, ● B = \varnothing 3, ● C = 3 x 15.3</p> |
| <ul style="list-style-type: none"> • Heavy-duty die-cast bracket for industrial protection • Replaceable window for use with some sensor models • M18 vertical mounting option • Nut and lock washer included | <ul style="list-style-type: none"> • 13-ga. stainless steel • Hardware included | <ul style="list-style-type: none"> • 13-ga. stainless steel • Hardware included | <ul style="list-style-type: none"> • Stainless steel 2-axis side-mounting bracket • Nut strap included for replacing two M3 mounting nuts |
| Base Mount | Side Mount | Side Mount | Side Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| QS18 DC Models (except AF) | QM42/QMT42 | QM42/QMT42 | QM42/QMT42 |



More on next page

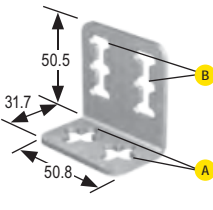
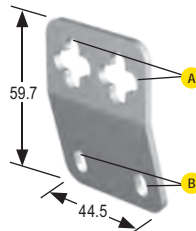
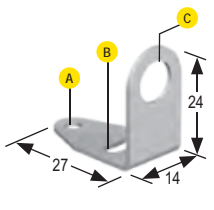
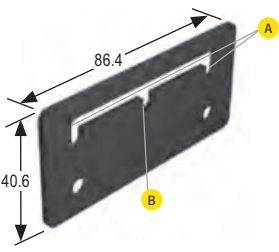


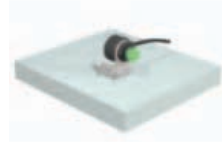

| SMB42U | SMB46A | SMB46L | SMB46S | | |
|---|---|--|--|---------------------------|--------------------------|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | | |
| <p>Hole center spacing: A = 30, B = 25.4 Hole size: A = \varnothing 3.4, B = \varnothing 2.5</p> | <p>Hole center spacing: A to B = 18.5, B = 30.5 Hole size: A = \varnothing 6.6, B = 7.1 x 20.3</p> | <p>Hole center spacing: A = 16 Hole size: A = 16.5 x 18.7</p> | <p>Hole center spacing: A = 16 Hole size: A = 16.5 x 18.7, B = 34 x 10</p> | | |
| <ul style="list-style-type: none"> • 13-ga. stainless steel • Hardware included | <ul style="list-style-type: none"> • 2-piece 12-ga. stainless steel bracket assembly with precision sensor alignment adjustment • 2 mm hex key included | <ul style="list-style-type: none"> • Right-angle • L bracket • 14-ga. 316 stainless steel | <ul style="list-style-type: none"> • Right-angle • S bracket • 14-ga. 316 stainless steel | | |
| Side Mount | Barrel Mount | Side Mount | Side Mount | | |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | | |
| QM42/QMT42 | QS18 Lasers S18 Laser Emitter QS18U | QS18 MINI-BEAM QS30 | PicoDot QM42/QMT42 QS18U | QS18 MINI-BEAM QS30 | PicoDot QM42 QS18U |
| | Side Mount | | | | |
| | <p>Used with</p> | | | | |
| | PicoDot | | | | |

- Accessories
- Brackets
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- Retroreflectors
- Miscellaneous
- Reference



| SMB46U | | SMB50RFA.. | | SMB55A | | SMB55F | | | | | | | |
|--|-----------------------|---|--|--|-----------------|--|---------------|-------------|----------------|--|--|--|--|
| <p>All measurements in mm</p> | | <p>All measurements in mm</p> | | <p>All measurements in mm</p> | | <p>All measurements in mm</p> | | | | | | | |
| <p>Hole center spacing: A = 16 Hole size: A = 16.5 x 18.7, B = 34 x 13</p> | | <table border="1"> <thead> <tr> <th>Model</th> <th>Bolt Thread (A)</th> </tr> </thead> <tbody> <tr> <td>SMB50RFA</td> <td>3/8 - 16 x 2"</td> </tr> <tr> <td>SMB50RFAM10</td> <td>M10 - 1.5 x 50</td> </tr> </tbody> </table> <p>Hole size: B = 5.4</p> | | Model | Bolt Thread (A) | SMB50RFA | 3/8 - 16 x 2" | SMB50RFAM10 | M10 - 1.5 x 50 | <p>Hole center spacing: A = 24.1, B = 27.9 Hole size: A = 12.7 x 11.4, B = 24.8 x 7.6</p> | | <p>Hole center spacing: A = 24.1, B = 27.9 Hole size: A = 12.7 x 11.4, B = 24.8 x 7.6</p> | |
| Model | Bolt Thread (A) | | | | | | | | | | | | |
| SMB50RFA | 3/8 - 16 x 2" | | | | | | | | | | | | |
| SMB50RFAM10 | M10 - 1.5 x 50 | | | | | | | | | | | | |
| <ul style="list-style-type: none"> • Right-angle • U bracket for sensor protection • 14-ga. 316 stainless steel | | <ul style="list-style-type: none"> • Swivel bracket with tilt and pan movement for precision adjustment • Easy sensor mounting to extruded rail T-slots • Metric and inch size bolt available • 50 mm diameter plate for mounting a reflector | | <ul style="list-style-type: none"> • 15° offset bracket • 12-ga. stainless steel | | <ul style="list-style-type: none"> • Flat-mount bracket • 12-ga. stainless steel | | | | | | | |
| Side Mount | | Base Mount | | Side Mount | | Side Mount | | | | | | | |
| <p>Used with</p> | | <p>Used with</p> | | <p>Used with</p> | | <p>Used with</p> | | | | | | | |
| <p>QS18 MINI-BEAM PicoDot</p> | <p>QM42 QS18U</p> | <p>BRT-35DM BRT-50D BRT-42D BRT-34T</p> | | <p>R58E/R58A QL56</p> | | <p>R58E/R58A QL56</p> | | | | | | | |

More on next page

| SMB55RA | SMB55S | SMB8MM | SMBABM |
|--|---|--|---|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 24.1, B = 27.9 Hole size: A = 12.7 x 11.4, B = 24.8 x 7.6</p> | <p>Hole center spacing: A = 30.5, B = 28 Hole size: A = 12.7 x 11.4, B = 5.2 x 8.9</p> | <p>Hole center spacing: A to B = 14 Hole size: A = \varnothing 3.5, B = 8.3 x 3.5, C = \varnothing 8.4</p> | <p>Hole center spacing: A = 61, A to B = 30.5 Hole size: A, B = 9.1 x 2.3</p> |
| <ul style="list-style-type: none"> • Right-angle bracket • 12-ga. stainless steel | <ul style="list-style-type: none"> • 15° offset bracket • 12-ga. stainless steel | <ul style="list-style-type: none"> • Right-angle bracket • 300 series stainless steel | <ul style="list-style-type: none"> • Surface-mount bracket for mounting light from front • Black corrosion-resistant zinc finish • Hardware included |
| Side Mount | Side Mount | Barrel Mount | Flat Mount |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| R58E/R58A QL56 | R58E/R58A QL56 | T8 IT23S (Glass Fiber) BT23S (Glass Fiber) EZ-LIGHT T8L | Area Lights (80 x 80 mm) Backlights (70 x 70 mm) |

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- Brackets
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- Retroreflectors
- Miscellaneous
- Reference



| SMBACM | SMBAMS18P | | SMBAMS18RA | | SMBAMS22P |
|---|--|---|---|---|--|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | | <p>All measurements in mm</p> | | <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 30, A to B = 15 Hole size: A = $\varnothing 5$ (M16), B = $\varnothing 5$ (1/4 - 20)</p> | <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = $\varnothing 6.5$, C = $\varnothing 19$</p> | | <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = $\varnothing 6.5$, C = $\varnothing 19$</p> | | <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = $\varnothing 6.5$, C = $\varnothing 22.5$</p> |
| <ul style="list-style-type: none"> • Column-mount bracket • Black corrosion-resistant zinc finish • Hardware included | <ul style="list-style-type: none"> • Flat SMBAMS series bracket with 18 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel | | <ul style="list-style-type: none"> • Right-angle SMBAMS series bracket with 18 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel | | <ul style="list-style-type: none"> • Flat SMBAMS series bracket with 22 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel |
| Back Mount | Barrel Mount | | Barrel Mount | | Base Mount |
| <p>Used with</p> | <p>Used with</p> | | <p>Used with</p> | | <p>Used with</p> |
| <p>Area Lights (80 x 80 mm) Backlights (70 x 70 mm)</p> | <p>QS18 MINI-BEAM S18 M18 T18 TM18 S18U</p> | <p>T18U Q45UR S18C2 Q45UR M18C2 QS18U EZ-LIGHT T18 EZ-LIGHT M18</p> | <p>QS18 MINI-BEAM S18 M18 T18 TM18 S18U</p> | <p>T18U QS18U Q45UR S18C2 Q45UR M18C2 EZ-LIGHT T18 EZ-LIGHT M18</p> | <p>K30L</p> |
| <p>NOTE: Shown with optional SMBPPK6 mounting kit (see page 724).</p> | | | | | |



| SMBAMS22RA | SMBAMS30P | SMBAMS30PL52 | SMBAMS30PL52R |
|---|--|--|--|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 22.5</p> | <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31</p> | <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31</p> | <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31</p> |
| <ul style="list-style-type: none"> • Right-angle SMBAMS series bracket with 22 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel | <ul style="list-style-type: none"> • Flat SMBAMS series bracket with 30 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel | <ul style="list-style-type: none"> • Flat SMBAMS series bracket with space for 70 x 40 mm label • 30 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel | <ul style="list-style-type: none"> • Flat SMBAMS series bracket with space for 60 x 58 mm label • 30 mm hole for mounting sensors • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel |
| Base Mount | Barrel Mount | Barrel Mount | Barrel Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| K30L | <p>QS30 S30 SM30/SMI30 T30</p> | <p>T30U EZ-LIGHT T30 PICO-GUARD Point</p> | EZ-LIGHT T30 |
| | Base Mount | Base Mount | Base Mount |
| | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| | <p>Q40 Q45 OMNI-BEAM OTB/LTB VTB STB QT50R QT50U</p> | <p>Q45U Q45UR K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights</p> | <p>VTB K50 EZ-LIGHT K50L</p> |

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- Cordsets
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- Reference



| SMBAMS30RA | | SMBAMS30RLJ | | SMBAMS30RLS | | SMBAMS70A | |
|---|---|--|--|--|--|--|--|
| | | | | | | | |
| All measurements in mm | | All measurements in mm | | All measurements in mm | | All measurements in mm | |
| Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31 | | Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31 | | Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 31 | | Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 7 | |
| <ul style="list-style-type: none"> Right-angle SMBAMS series bracket with 30 mm hole for mounting sensors Articulation slots for 90+° rotation 12-ga. (2.6 mm) cold-rolled steel | | <ul style="list-style-type: none"> Right-angle SMBAMS series bracket with 70 x 40 mm space for label 30 mm hole for mounting sensor Articulation slots for 90+° rotation 12-ga. (2.6 mm) cold-rolled steel | | <ul style="list-style-type: none"> Right-angle SMBAMS series bracket with 62 x 26 mm space for label 30 mm hole for mounting sensor Articulation slots for 90+° rotation 12-ga. (2.6 mm) cold-rolled steel | | <ul style="list-style-type: none"> Right-angle zinc-plated cold-rolled steel Articulated slots for 90+° rotation Two 1/4-20 screws included | |
| Barrel Mount | | Barrel Mount | | Barrel Mount | | Back Mount | |
| | | | | | | | |
| Used with | | Used with | | Used with | | Used with | |
| QS30 S30 SM30/SMI30 T30 | T30U EZ-LIGHT T30 PICO-GUARD Point | EZ-LIGHT T30 | | EZ-LIGHT T30L | | Area Light (70 mm) | |
| Base Mount | | Base Mount | | Base Mount | | | |
| | | | | | | | |
| Used with | | Used with | | Used with | | | |
| Q40 Q45 OMNI-BEAM OTB/LTB VTB STB Q45U | Q45UR QT50U QT50R K50 EZ-LIGHT K50L EZ-LIGHT TL50 EZ-LIGHT CL50 WL50 Work Lights | VTB K50 EZ-LIGHT K50L EZ-LIGHT CL50 | | VTB K50 EZ-LIGHT K50L EZ-LIGHT CL50 | | | |



More on next page

| SMBAMS70AS | SMBAMS80PL52 | SMBAMS80PL52R | SMBAMSBRA | |
|---|---|---|--|---|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | |
| <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5, C = ø 7</p> | <p>Hole center spacing: A = 26, A to B = 13, C = 65 Hole size: A = 26.8 x 7, B = ø 6.5, C = 4.2</p> | <p>Hole center spacing: A = 26, A to B = 13, C = 65 Hole size: A = 26.8 x 7, B = ø 6.5, C = 4.2</p> | <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = ø 6.5</p> | |
| <ul style="list-style-type: none"> Right-angle, 12-ga. 316 stainless steel Articulated slots for 90+° rotation Four 1/4-20 stainless steel screws included | <ul style="list-style-type: none"> Flat SMBAMS series bracket with 65 x 80 mm space for label Articulation slots for 90+° rotation 12-ga. (2.6 mm) cold-rolled steel | <ul style="list-style-type: none"> Flat SMBAMS series bracket with 65 x 80 mm space for label Articulation slots for 90+° rotation 12-ga. (2.6 mm) cold-rolled steel | <ul style="list-style-type: none"> Right-angle base piece for SMBAMS series of versatile mounting hardware Four point hole pattern to integrate with articulation slots in SMBAMS series brackets 12-ga. (2.6 mm) cold-rolled steel | |
| Side Mount | Back Mount | Back Mount | Bracket-to-Bracket | |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | |
| Sealed Area Light (70 mm) | EZ-LIGHT K80L EZ-LIGHT K80 DX80 DX70 DX99 DX85 | EZ-LIGHT K80L EZ-LIGHT K80 DX80 DX70 DX99 DX85 | SMBAMSBRA* SMBAMS18P SMBAMS18RA SMBAMS22P SMBAMS22RA SMBAMS30P SMBAMS30PL52 SMBAMS30PL52R SMBAMS30RLJ | SMBAMS30RLS SMBAMS30RA SMBAMS80PL52 SMBAMS80PL5R SMBAMSLT3iP SMBAMSLT3P SMBAMSQ60iP SMBAMSQ60P SMBAMSR85P |
| | | | <p>* Multiple SMBAMSBRA base brackets can be integrated together to allow for additional points of articulation</p> | |



| SMBAMSLT3IP | SMBAMSLT3P | SMBAMSQ60IP | SMBAMSQ60P |
|--|---|---|--|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = \varnothing 6.5</p> | <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = \varnothing 6.5</p> | <p>Hole center spacing: A = 26, A to B = 13 Hole size: A = 26.8 x 7, B = \varnothing 6.5</p> | <p>Hole center spacing: A = 26, B = 13 Hole size: A = 26.8 x 7, B = \varnothing 6.5</p> |
| <ul style="list-style-type: none"> • Industrial protection SMBAMS series bracket for LT3 with replaceable window • Articulation slots for 90+° rotation • 12-ga. 300 series stainless steel | <ul style="list-style-type: none"> • Flat SMBAMS series bracket for mounting LT3 • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) 300 series stainless steel | <ul style="list-style-type: none"> • Industrial protection SMBAMS series bracket for Q60 with replaceable window • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) 300 series stainless steel | <ul style="list-style-type: none"> • Flat SMBAMS series bracket for mounting Q60 • Articulation slots for 90+° rotation • 12-ga. 300 series stainless steel |
| Side Mount | Side Mount | Side Mount | Side Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| LT3 | LT3 | Q60 | Q60 |

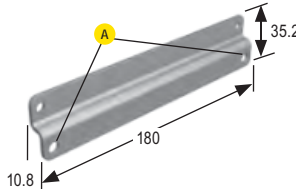
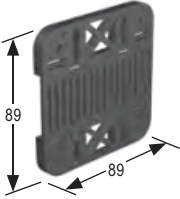
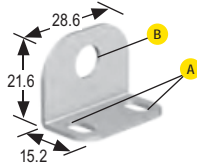
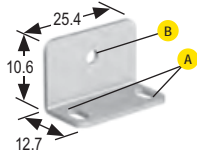


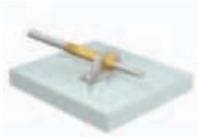
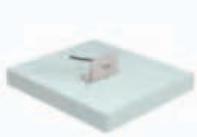
More on next page

| SMBAMSR85P | SMBAMSRAB | SMBARP..30 | SMBASCM | | | | | | | | |
|---|--|---|---|-----------|-----------|------|-----------|-------|-----------|------|--|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | | | | | | | | |
| <p>Hole center spacing: A = 26, B = 13, C = 77, E = 30 Hole size: A = 26.8 x 7, B = ø 6.5, C = 2.3, D = 3.2, E = 3.2</p> | <p>Hole center spacing: A to B = 12, B to C = 11, A to C = 23, A to D = 55, E to E = 50.8 Hole size: A, B, C, D = 6.9 x 32, E = 6.9 x 89.4</p> | <p>Hole center spacing: A = 69.9 Hole size: A = ø 12.8</p> | <p>Hole center spacing: A = 25.4, A to B = 12.7 Hole size: A = ø 5 (M16), B = ø 5 (1/4-20)</p> | | | | | | | | |
| <ul style="list-style-type: none"> • Flat SMBAMS series bracket for mounting reflectors • Articulation slots for 90+° rotation • 14-ga. 300 series stainless steel | <ul style="list-style-type: none"> • 10-ga. (3.4 mm) cold-rolled steel with zinc finish • Retrofit WORLD-BEAM QS30 in place of MULTI-BEAM, MAXI-BEAM, Q45, OMNI-BEAM and VALU-BEAM sensors | <table border="1"> <thead> <tr> <th>Model</th> <th>Rope Pull</th> </tr> </thead> <tbody> <tr> <td>SMBARPL30</td> <td>Left</td> </tr> <tr> <td>SMBARPR30</td> <td>Right</td> </tr> <tr> <td>SMBARPB30</td> <td>Both</td> </tr> </tbody> </table> | Model | Rope Pull | SMBARPL30 | Left | SMBARPR30 | Right | SMBARPB30 | Both | <ul style="list-style-type: none"> • Column-mount bracket • 316 stainless steel • Stainless steel hardware included |
| Model | Rope Pull | | | | | | | | | | |
| SMBARPL30 | Left | | | | | | | | | | |
| SMBARPR30 | Right | | | | | | | | | | |
| SMBARPB30 | Both | | | | | | | | | | |
| Round Targets | Barrel Mount | Base Mount | Back Mount | | | | | | | | |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | | | | | | | | |
| BRT-3 BRT-84 | QS30* | K50 | Sealed Area Light (70 mm) | | | | | | | | |
| Square Targets | * Requires a SMBAMS30RA bracket (sold separately) | | NOTE: Shown with optional SMBPPK6 mounting kit (see page 724). | | | | | | | | |
| <p>Used with</p> | | | | | | | | | | | |
| BRT-77X77C BRT-51X51BM | | | | | | | | | | | |

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| SMBBSSM | SMBDX80DIN | SMBF | SMBFP3 |
|--|--|--|--|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 167.8 Hole size: A = \varnothing 5.5</p> | N/A | <p>Hole center spacing: A = 19.1 Hole size: A = 8 x 4.6, B = \varnothing 8.3</p> | <p>Hole center spacing: A = 19.1 Hole size: A = 6.5 x 3.6, B = \varnothing 3.2</p> |
| <ul style="list-style-type: none"> • Surface-mount bracket • 316 stainless steel • Stainless steel hardware included • Set of two brackets | <ul style="list-style-type: none"> • Black reinforced thermoplastic • Bracket for mounting on 35 mm DIN rail | <ul style="list-style-type: none"> • Right-angle bracket for glass fiber optic with 5/16"-24 threaded tip • 18-ga. stainless steel | <ul style="list-style-type: none"> • Right-angle bracket for glass fiber optic with 3 mm threaded tip • 18-ga. stainless steel |
| Back Mount | Back Mount | Barrel Mount | Barrel Mount |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| Backlights (75 x 150 mm) Backlights (150 x 150 mm) Backlights (150 x 225 mm) Backlights (150 x 300 mm) WLA Work Lights | K80 EZ-LIGHT K80L EZ-LIGHT K80CLR EZ-LIGHT SP150 DX80 | DX70 DX85 DX81 DX90 DX91 | Glass fiber with 5/16" - 24 threaded tip Plastic fiber with M3 tip |

More on next page

| SMBFP4 | SMBFP4N | SMBFP6 | SMBIVUB |
|--|---|---|---|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 19.1 Hole size: A = 6.5 x 3.6, B = ø 4.2</p> | <p>Hole center spacing: A = 12 Hole size: A = 4.8 x 5, B = ø 4.2</p> | <p>Hole center spacing: A = 19.1 Hole size: A = 6.5 x 3.6, B = ø 6.2</p> | <p>Hole center spacing: A = 35, A to B = 18 Hole size: A, B = ø 4.4</p> |
| <ul style="list-style-type: none"> • Right-angle bracket for plastic fiber optic with 4 mm threaded tip • 18-ga. stainless steel | <ul style="list-style-type: none"> • Low-profile right-angle bracket for plastic fiber optics with 4 mm threaded tip • 18-ga. stainless steel | <ul style="list-style-type: none"> • Right-angle bracket for plastic fiber optics with 6 mm threaded tip • 18-ga. stainless steel | <ul style="list-style-type: none"> • Bottom mounting bracket • Black anodized aluminum • Hardware included |
| Barrel Mount | Barrel Mount | Barrel Mount | Bottom Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| Plastic fiber with M4 tip | Plastic fiber with M4 tip | Plastic fiber with M6 tip | iVu TG |
| | | | <p>NOTE: Shown with optional SMBPPK6 mounting kit (see page 724).</p> |

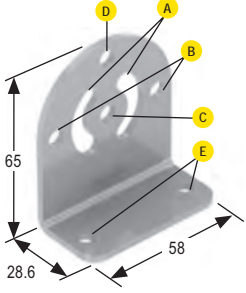
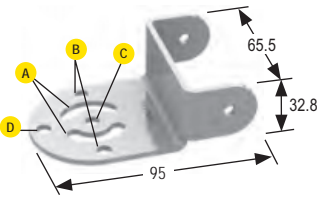
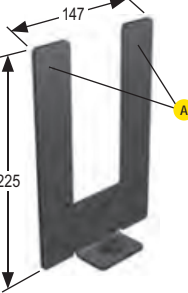
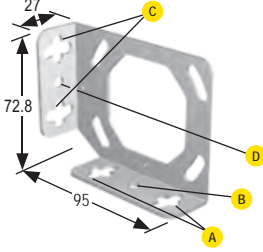



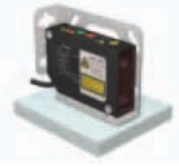
- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference



| SMBIVURAL | SMBIVURAR | SMBIVUU | SMBLASRA |
|--|---|--|---|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 36.4, B = 26 Hole size: A = 4.4 x 6.4, B = 7 x 26, C = 1/4-20</p> | <p>Hole center spacing: A = 36.4, B = 26 Hole size: A = 4.4 x 6.4, B = 7 x 26, C = 1/4-20</p> | <p>Hole center spacing: A = 26, C = 30, C to D = 42 Hole size: A = 6.5 x 3.6, B = ø 6.6, C, D = 5.4</p> | <p>Hole center spacing: A, B = 45, A to B = 22.5 Hole size: A = ø 6.6, B = 6.6 x 12.4</p> |
| <ul style="list-style-type: none"> • Right-angle bracket for mounting sensor from the left • 12-ga. stainless steel • Hardware included | <ul style="list-style-type: none"> • Right-angle bracket for mounting sensor from right • 12-ga. stainless steel • Hardware included | <ul style="list-style-type: none"> • U-shaped swivel bracket kit • 14-ga. stainless steel • Hardware included | <ul style="list-style-type: none"> • Right-angle metal bracket • May be used individually or two used in combination • 316 stainless steel bracket and hardware • Set of two brackets |
| Bottom Mount | Bottom Mount | Bottom Mount | Back Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| iVu iVu Plus | iVu iVu Plus | iVu iVu Plus | Sealed Linear Array Lights (IP68) |

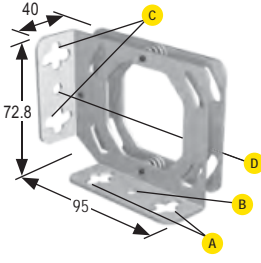
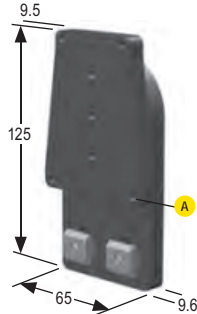

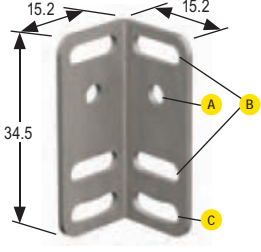
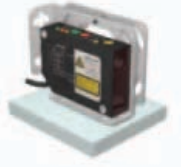


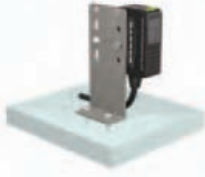


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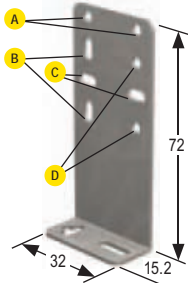
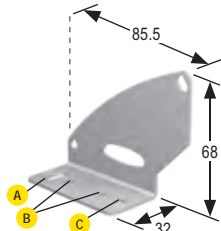
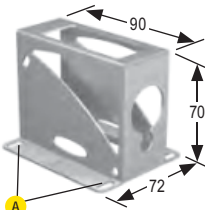
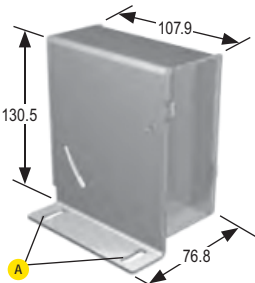

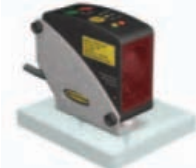
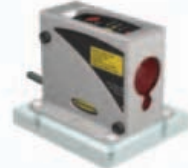
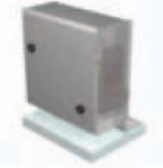
| SMBLAXRA | SMBLAXU | SMBLBCZB | SMBLG |
|---|--|--|---|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 26, B = 45, C to D & B to C = 22.5, E = 4.5 Hole size: A = 7 x 26, B, C, D = \varnothing 6.6, E = \varnothing 5.4</p> | <p>Hole center spacing: A = 25, B = 45, C to D & B to C = 22.5 Hole size: A = 7 x 26, B, C, D = \varnothing 6.6</p> | <p>Hole center spacing: A = 107 Hole size: A = \varnothing 5.2</p> | <p>Hole center spacing: A = 56, A to B = 20, C = 44.5, C to D = 14 Hole size: A = 19.1 x 14.2, B = \varnothing 6.3, C = 19.3 x 15.3, D = \varnothing 6.3</p> |
| <ul style="list-style-type: none"> • Right-angle metal bracket • May be used individually or with SMBLAXU to provide swivel adjustment • 316 stainless steel bracket and hardware • Set of two brackets | <ul style="list-style-type: none"> • U-shaped metal bracket • Used with SMBLAXRA to provide swivel adjustment • 316 stainless steel bracket and hardware • Set of two brackets | <ul style="list-style-type: none"> • U-shaped bracket for mounting EZ-ARRAY emitter/receiver 67 mm apart • 8-ga. (4 mm) cold-rolled steel, black zinc plated | <ul style="list-style-type: none"> • LG series sensor mounting bracket • 304 stainless steel |
| <p>Side Mount</p> | <p>Side Mount</p> | <p>Side Mount</p> | <p>Side Mount</p> |
|  |  |  |  |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| <p>Linear Array Lights (IP50)</p> | <p>Linear Array Lights (IP50)</p> | <p>EZ-ARRAY</p> | <p>LG5 LG10</p> |

- Accessories
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- Cordsets
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More on next page

| SMBLGA | SMBLH1 | SMBLH.. | SMBLSTDLO26 | | | | | | | | | | | | |
|---|---|---|---|------------|-----------|---------|-----|------|---------|-----|------|----------|-----|-------|--|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> | | | | | | | | | | | | |
| <p>Hole center spacing: A = 56, A to B = 20, C = 44.5, C to D = 14 Hole size: A = 19.1 x 14.2, B = \varnothing 6.3, C = 19.3 x 15.3, D = \varnothing 6.3</p> | <p>Hole size: A = M4</p> | <table border="1"> <thead> <tr> <th>Model</th> <th>Height (H)</th> <th>Used with</th> </tr> </thead> <tbody> <tr> <td>SMBLH30</td> <td>208</td> <td>LH30</td> </tr> <tr> <td>SMBLH80</td> <td>358</td> <td>LH80</td> </tr> <tr> <td>SMBLH150</td> <td>608</td> <td>LH150</td> </tr> </tbody> </table> | Model | Height (H) | Used with | SMBLH30 | 208 | LH30 | SMBLH80 | 358 | LH80 | SMBLH150 | 608 | LH150 | <p>Hole center spacing: B = 10 Hole size: A = \varnothing 3.5, B = 10.5 x 3.5, C = 10.5 x 3.5</p> |
| Model | Height (H) | Used with | | | | | | | | | | | | | |
| SMBLH30 | 208 | LH30 | | | | | | | | | | | | | |
| SMBLH80 | 358 | LH80 | | | | | | | | | | | | | |
| SMBLH150 | 608 | LH150 | | | | | | | | | | | | | |
| <ul style="list-style-type: none"> • LG series adjustable bracket assembly • Precision adjustment screws • 304 stainless steel | <ul style="list-style-type: none"> • Main mounting bracket for LH sensor • T-slot or "bolt-on" bracket for mounting one sensor • Anodized Aluminum | <p>Hole size: A = M4</p> <ul style="list-style-type: none"> • LH series adjustable bracket • Brackets for thickness and displacement measurement • Anodized Aluminum | <ul style="list-style-type: none"> • Adjustable right-angle metal bracket • 304 stainless steel | | | | | | | | | | | | |
| Side Mount | Side Mount | Side Mount | Side Mount | | | | | | | | | | | | |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> | | | | | | | | | | | | |
| <p>LG5 LG10</p> | <p>LH</p> | <p>LH</p> | <p>Q26</p> | | | | | | | | | | | | |

More on next page

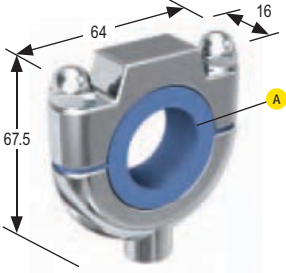
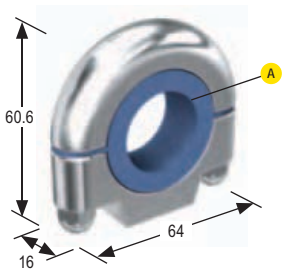
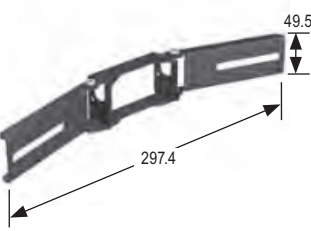





| SMBLSTQ26 | SMBLT31 | SMBLT32 | SMBLT3IP |
|--|---|--|--|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A, B, C, D = 20 Hole size: A, D = \varnothing 3.5, B, C = \varnothing 3.5</p> | <p>Hole center spacing: A to C = 47.5, B to B = 24.1 Hole size: A = 13.2 x 5, B = \varnothing 4, C = \varnothing 5</p> | <p>Hole center spacing: A = 80 Hole size: A = 5 x 12</p> | <p>Hole center spacing: A = 82.5 Hole size: A = 6 x 20.5</p> |
| <ul style="list-style-type: none"> • Right-angle bracket • 304 stainless steel | <ul style="list-style-type: none"> • Right-angle bracket • 300 stainless steel | <ul style="list-style-type: none"> • Full protection bracket • 300 stainless steel • Mounting hardware included | <ul style="list-style-type: none"> • Protective bracket with replaceable window • Stainless steel construction • Includes replacement windows |
| <p>Side Mount</p> | <p>Side Mount</p> | <p>Side Mount</p> | <p>Side Mount</p> |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| <p>Q26</p> | <p>LT3</p> | <p>LT3</p> | <p>LT3</p> |

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| SMBLT7 | SMBLT7F | SMBLX | SMBLXR |
|---|--|---|---|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A to C = 31.8 Hole size: A = \varnothing 3.1, B = 5 x 9, C = 5.2 x 28</p> | N/A | <p>Hole center spacing: A = 12.7 Hole size: A = \varnothing 4.3</p> | <p>Hole center spacing: A, B = 63.5, A to B = 10.2 Hole size: A, B = 5.2 x 11.6</p> |
| <ul style="list-style-type: none"> • Right-angle bracket • 300 stainless steel • Fine-adjust accessory available (model SMBLT7F) | <ul style="list-style-type: none"> • Fine-adjust accessory for bracket SMBLT7 • Mounting hardware included • SMBLT7 required (sold separately) • Cold-rolled steel | <ul style="list-style-type: none"> • End-cap brackets; set of 2 • Zinc-plated cold-rolled steel | <ul style="list-style-type: none"> • Back-mount bracket for secure one-end mounting • Zinc-plated cold-rolled steel |
| Side Mount | Bracket-to-Bracket | End Mount | Back Mount |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| LT7 | LT7* * Shown mounted on SMBLT7 (sold separately) | LX | LX |

More on next page

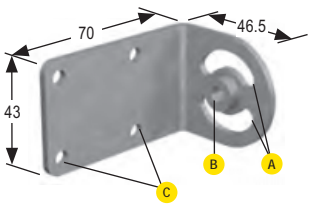
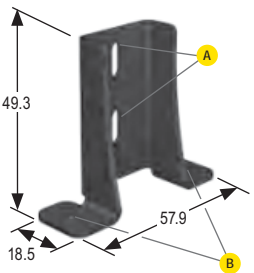
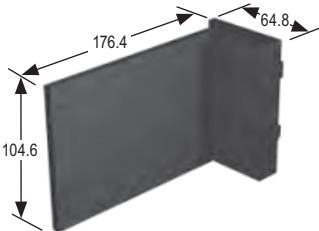
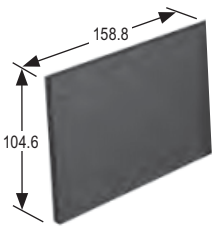


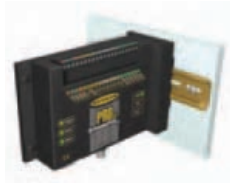

| SMBM25A | SMBM25B | SMBP42ASM | SMBP4ASM* |
|---|--|--|---|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| Hole size: A = \varnothing 25.4 | Hole size: A = \varnothing 25.4 | N/A | N/A |
| <ul style="list-style-type: none"> • Top mount swivel bracket • Stainless steel with rounded edges for cleanliness in demanding environments • Non-metallic FDA compliant bushing for acoustically isolating M25U sensors • M10 x 1.5 mount on opposite side of clamping nuts | <ul style="list-style-type: none"> • Bottom mount swivel bracket • Stainless steel with rounded edges for cleanliness in demanding environments • Non-metallic FDA compliant bushing for acoustically isolating M25U sensors • M10 x 1.5 mount on same side as clamping nuts | <ul style="list-style-type: none"> • For mounting two lights to P4 sensor housing • Black corrosion-resistant zinc finish • Hardware included | <ul style="list-style-type: none"> • For mounting light to P4 sensor housing • Black corrosion-resistant zinc finish • Hardware included |
| Barrel Mount | Barrel Mount | Light-to-Sensor | Light-to-Sensor |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| M25U | M25U | Area Light (80 x 80 mm)* Area Light (62 x 62 mm) Spot Light | Area Light (80 x 80 mm) Area Light (62 x 62 mm) Spot Light |
| | | * Requires one SMBACM bracket with each light (see page 646) | * Requires one SMBACM bracket with each light (see page 646) |

- Accessories
- Brackets
- Cordsets
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- Reference

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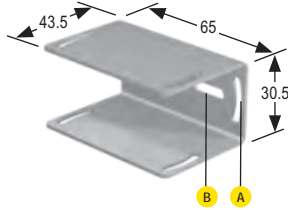
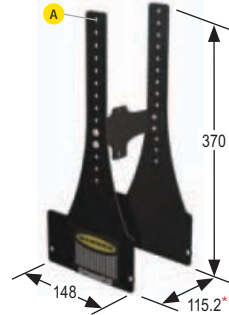
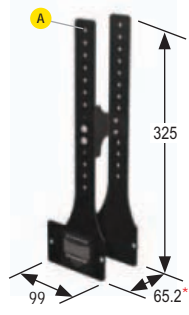




| SMBP4OAL100 | SMBP4OAL50 | SMBP4RAB | SMBP4RAS |
|---|---|--|--|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: $\text{A} = 15$ Hole size: $\text{A} = \text{ø} 5.3$</p> | <p>Hole center spacing: $\text{A} = 15$ Hole size: $\text{A} = \text{ø} 5.3$</p> | <p>Hole center spacing: $\text{A} = 47$ Hole size: $\text{A} = 3.3 \times 19.1$</p> | <p>Hole center spacing: $\text{A} = 43.5$ Hole size: $\text{A} = 6.8 \times 2.5$</p> |
| <ul style="list-style-type: none"> • For mounting On-Axis light to P4 housing • Centers lens on light opening • Black zinc-plated steel • Hardware included | <ul style="list-style-type: none"> • For mounting On-Axis light to P4 housing • Centers lens on light opening • Black zinc-plated steel • Hardware included | <ul style="list-style-type: none"> • Heavy-duty, black corrosion-resistant zinc finish • 8° of rotation on image-axis • Hardware included | <ul style="list-style-type: none"> • Right-angle swivel bracket • 70° rotation on image's x-axis and 20° on the y-axis • Black corrosion-resistant zinc finish • Hardware included |
| Light-to-Sensor | Light-to-Sensor | Side Mount | Side Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| On-Axis (100 mm) | On-Axis (50 mm) | P4 (right-angle) | P4 (right-angle) |
| * Dimensions include 100 mm light (sold separately) | * Dimensions include 50 mm light (sold separately) | | |

More on next page

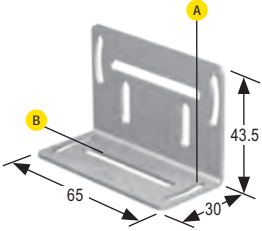
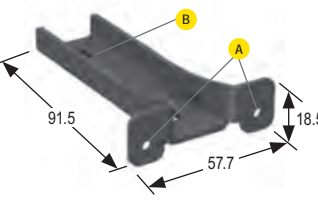
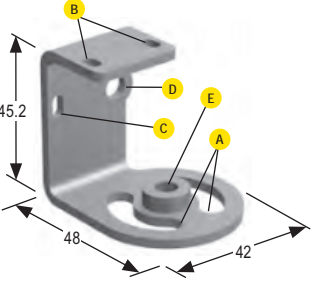
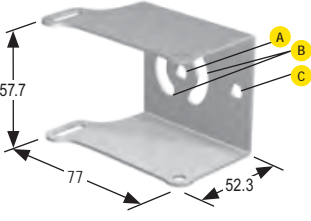




| SMBP4SRAF | SMBPMPRHI | SMBPPDE | SMBPPDH |
|---|--|---|--|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A to B = 12.5, C = 36 Hole size: A = 7 x 26, B = \varnothing 8 (1/4-20), C = \varnothing 5.5</p> | <p>Hole center spacing: A = 20.1, B = 44.8 Hole size: A = 3.5 x 9.9, B = 3.8</p> | N/A | N/A |
| <ul style="list-style-type: none"> • Right-angle, stainless steel bracket • Stainless steel hardware included | <ul style="list-style-type: none"> • Black zinc plated steel • For mounting light to <i>Pro Mini Camera</i> • Black zinc plated finish • Hardware included | <ul style="list-style-type: none"> • DIN-rail edge mounting bracket to save linear track space • Black ABS plastic • Hardware included | <ul style="list-style-type: none"> • DIN-rail flat mounting for easy viewing of LED's • Black ABS plastic • Hardware included |
| Front Mount | Light-to-Sensor | Back Mount | Back Mount |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| <i>P4 (sealed)</i> | Ring Light (70 mm) | <i>PresencePLUS Pro Controller</i> | <i>PresencePLUS Pro Controller</i> |

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| SMBPPLK | SMBPPLU | SMBPPOAL100 | SMBPPOAL50 |
|---|--|---|---|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| N/A | Hole center spacing: A = 58.5, B = 30 Hole Size: A = 18.7 x 3.4, B = 14.3 x 4.4 | Hole center spacing: A = 15 Hole size: A = \varnothing 5.3 | Hole center spacing: A = 15 Hole size: A = \varnothing 5.3 |
| <ul style="list-style-type: none"> • 2 inch pivoting assembly | <ul style="list-style-type: none"> • Highly stable U-Shaped bracket • Bright corrosion-resistant finish • Hardware included | <ul style="list-style-type: none"> • For mounting On-Axis light to <i>Pro</i> housing • Centers lens on light opening • Black zinc-plated steel • Hardware included | <ul style="list-style-type: none"> • For mounting On-Axis light to <i>Pro</i> housing • Centers lens on light opening • Black zinc-plated steel • Hardware included |
| Base Mount | Side Mount | Light-to-Sensor | Light-to-Sensor |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| Spot Lights | <i>PresencePLUS Pro</i> Camera | On-Axis (100 mm) | On-Axis (50 mm) |
| | | * Dimensions include 100 mm light (sold separately) | * Dimensions include 50 mm light (sold separately) |

More on next page

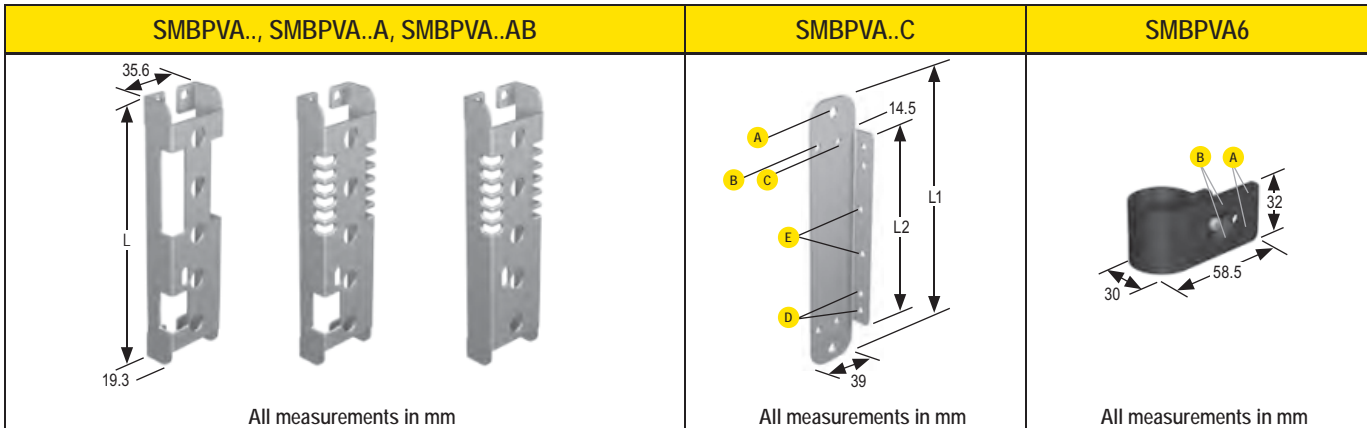
| SMBPPRA | SMBPPRHI | SMBPPROMRA | SMBPPSU |
|---|---|---|--|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 58.5 Hole Size: A = 18.7 x 3.4, B = 44.5 x 4.4</p> | <p>Hole center spacing: A = 44.5, B = 52.3 Hole size: A = \varnothing 3.8, B = 3.6 x 6.4</p> | <p>Hole center spacing: A = 26, B = 20, C to D = 20 Hole Size: A = 7 x 26, B = 3.6 x 5.6, C = 3.6 x 6.6, D = \varnothing 6.8, E = \varnothing 8 (1/4-20)</p> | <p>Hole center spacing: A to C = 31.8, B = 25 Hole size: A = \varnothing 6.5, B = 20.2 x 7, C = \varnothing 6.5</p> |
| <ul style="list-style-type: none"> • Right-angle bracket with single-side mounting for difficult-to-access sites • Bright corrosion-resistant finish • Hardware included | <ul style="list-style-type: none"> • Black anodized aluminum bracket • For mounting light to <i>Pro</i> camera • Hardware included | <ul style="list-style-type: none"> • Right-angle bracket • 316 stainless steel • Hardware included | <ul style="list-style-type: none"> • 316 stainless steel • 10° of rotation on image's y-axis • Hardware included |
| Side Mount | Light-to-Sensor | Side Mount | Side Mount |
|  |  |  |  |
| Used with <i>PresencePLUS Pro Camera</i> | Used with Ring Light (70 mm) | Used with <i>PresencePLUS Pro Mini Camera</i> | Used with Sealed <i>PresencePLUS Pro Camera</i> |

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference



| SMBPPU | SMBPVA1 | SMBPVA11 | SMBPVA2 |
|---|---|--|--|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: B = 25 Hole size: A = \varnothing 16, B = 3.3 x 25</p> | <p>Hole center spacing: A = 10.2, B to B = 18, B to C = 10.2 Hole size: A = 10 x 4.8, B, C = \varnothing 4.6</p> | <p>NA</p> | <p>Hole center spacing: A = 18.8 Hole size: A = \varnothing 4.4</p> |
| <ul style="list-style-type: none"> • U-Shaped swivel bracket for variable rotation • Bright corrosion-resistant finish • Hardware included | <ul style="list-style-type: none"> • Right-angle bracket • 303 stainless steel • Replacement brackets for brackets included with sensors | <ul style="list-style-type: none"> • Pair of two-piece swivel brackets for mounting sensor to 5/16" metal rack system • Articulation slot for $\pm 90^\circ$ rotation • May be used with SMBPVA..C bracket | <ul style="list-style-type: none"> • Set of 4 molded brackets • Snaps onto standard 28 mm diameter pipe • 2 required per sensor |
| Side Mount | Back Mount | Bracket Mount | Back Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| <p><i>PresencePLUS Pro Camera</i></p> | <p>PVA PVD EZ-LIGHT TL30F</p> | <p>PVD EZ-LIGHT TL30F</p> | <p>PVA PVD EZ-LIGHT TL30F</p> |
| | | Bracket-to-Bracket | Bracket-to-Bracket |
| | | <p>Used with</p> | <p>Used with</p> |
| | | <p>SMBPVD..A SMBPVD..AB</p> | <p>SMBPVA.. SMBPVA..A SMBPVA..AB</p> |
| | | | <p>SMBPVD..A SMBPVD..AB</p> |





All measurements in mm

All measurements in mm

All measurements in mm

| Models | DIP Switch Access | Light Protected | Length (L) | Used With |
|------------|-------------------|-----------------|------------|-----------|
| SMBPVA5 | Yes | No | 139.7 | PVA100 |
| SMBPVA5A | Yes | Yes | | |
| SMBPVA5AB | No | Yes | | |
| SMBPVA10 | Yes | No | 268.2 | PVA225 |
| SMBPVA10A | Yes | Yes | | |
| SMBPVA10AB | No | Yes | | |
| SMBPVA13 | Yes | No | 343.3 | PVA300 |
| SMBPVA13A | Yes | Yes | | |
| SMBPVA13AB | No | Yes | | |
| SMBPVA16 | Yes | No | 418.2 | PVA375 |
| SMBPVA16A | Yes | Yes | | |
| SMBPVA16AB | No | Yes | | |

| Models | L1 | L2 |
|-----------|-------|-------|
| SMBPVA5C | 188.7 | 139.5 |
| SMBPVA10C | 317.2 | 268.0 |

Hole center spacing: **A** to **C** = 20,
B to **C** = 18, **D** = 13, **E** = 32
 Hole size: **A** = \varnothing 7.3,
B, **C**, **D**, **E** = \varnothing 5.2

- Back-mounted bracket for mounting to SMBPVA7 or SMBPVA8 brackets
- Cold-rolled steel with zinc finish

Hole center spacing:
A, **B**, **A** to **B** = 18
 Hole size: **A** = \varnothing 3.2

- Set of 4 molded brackets
- Brackets clamp onto 28 mm pipe
- Request data sheet p/n 64900 for more information

- Pair of brackets protects sensor from impact; provides DIP-switch and/or indicator light exposure (depending on model)
- Heavy-duty cold-rolled steel-zinc finish
- May be used with SMBPVA..C for mounting to SMBPVA7 or SMBPVA8 brackets

| Back Mount | Back Mount |
|------------|------------------------------|
| | |
| Used with | Used with |
| PVA PVD | PVA PVD EZ-LIGHT TL30F |

| Back Mount | Bracket-to-Bracket | Bracket-to-Bracket |
|------------|--------------------|--------------------|
| | | |
| Used with | Used with | Used with |

| | | | | |
|-----------------|---|--|-------------------------------------|-------------------------|
| PVA (see chart) | SMBPVA7* SMBPVA8* SMBPVA... SMBPVA...A | SMBPVA...AB SMBPVD...A SMBPVD...AB | SMBPVA.. SMBPVA..A SMBPVA..AB | SMBPVD..A SMBPVD..AB |
|-----------------|---|--|-------------------------------------|-------------------------|

| | | |
|-------------------------|--|--|
| Used with | * Sensor must be mounted to a SMBPVA..C bracket. | |
| SMBPVA..2 SMBPVA..7* | SMBPVA..8* SMBPVA..C bracket | |

* Protective bracket must be mounted to a SMBPVA..C bracket.

More on next page

| SMBPVA7 | SMBPVA8 | SMBPVA9 | | |
|--|--|--|---------------------------------------|---------------------------|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | | |
| N/A | N/A | Hole center spacing: A = 18 Hole size: A = ø 5 | | |
| <ul style="list-style-type: none"> • One-piece bracket for mounting to 28 mm diameter pipe • Black-painted steel • Requires SMBPVA..C for mounting at an angle ±90° | <ul style="list-style-type: none"> • Heavy-duty 2-part bracket mounts to 28 mm diameter pipe • Cold-rolled steel with zinc finish • Requires SMBPVA..C for mounting | <ul style="list-style-type: none"> • Pair of 2-piece swivel brackets • Mount directly to sensor or to PVD/PVA protective brackets • Designed for mounting sensor to "look down" | | |
| Bracket-to-Bracket | Bracket-to-Bracket | Back Mount | | |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | | |
| PVA* PVD* SMBPVA5C SMBPVA10C | PVA* PVD* SMBPVA5C SMBPVA10C | PVA PVD EZ-LIGHT TL30F | | |
| * Sensor must be mounted to SMBPVA..C bracket. (sold separately) | * Sensor must be mounted to SMBPVA..C bracket. (sold separately) | Bracket-to-Bracket | | |
| | | <p>Used with</p> | | |
| | | <table border="1"> <tr> <td>SMBPVA... SMBPVA..A SMBPVA...AB</td> <td>SMBPVD...A SMBPVD...AB</td> </tr> </table> | SMBPVA... SMBPVA..A SMBPVA...AB | SMBPVD...A SMBPVD...AB |
| SMBPVA... SMBPVA..A SMBPVA...AB | SMBPVD...A SMBPVD...AB | | | |

More on next page

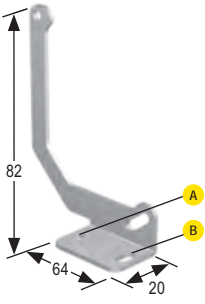
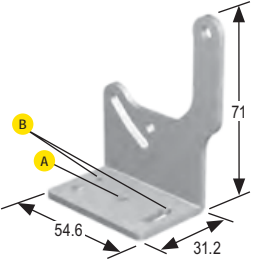
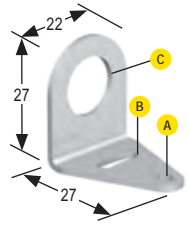
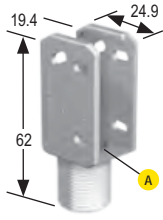


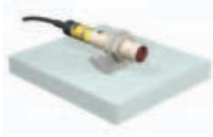
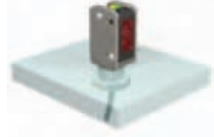
| SMBPVD..A & SMBPVD..AB | | | | SMBQ12A | SMBQ12T | | | | | | | | | | | | | | | | |
|--|-------------------|------------|-----------|---|--|------------|-----------|------------|-----|-----|--------|-------------|----|------------|-----|-----|--------|-------------|----|---|---|
| <p>All measurements in mm</p> | | | | <p>All measurements in mm</p> | <p>All measurements in mm</p> | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Models</th> <th>DIP Switch Access</th> <th>Length (L)</th> <th>Used With</th> </tr> </thead> <tbody> <tr> <td>SMBPVD100A</td> <td>Yes</td> <td rowspan="2">140</td> <td rowspan="2">PVD100</td> </tr> <tr> <td>SMBPVD100AB</td> <td>No</td> </tr> <tr> <td>SMBPVD225A</td> <td>Yes</td> <td rowspan="2">269</td> <td rowspan="2">PVD225</td> </tr> <tr> <td>SMBPVD225AB</td> <td>No</td> </tr> </tbody> </table> | | | | Models | DIP Switch Access | Length (L) | Used With | SMBPVD100A | Yes | 140 | PVD100 | SMBPVD100AB | No | SMBPVD225A | Yes | 269 | PVD225 | SMBPVD225AB | No | <p>Hole center spacing: A to B = 7.6 Hole size: A = 3.5 x 8.1, B = ø 3.2</p> | <p>Hole center spacing: A to B = 7.6 Hole size: A = 3.5 x 8.1, B = ø 3.2</p> |
| Models | DIP Switch Access | Length (L) | Used With | | | | | | | | | | | | | | | | | | |
| SMBPVD100A | Yes | 140 | PVD100 | | | | | | | | | | | | | | | | | | |
| SMBPVD100AB | No | | | | | | | | | | | | | | | | | | | | |
| SMBPVD225A | Yes | 269 | PVD225 | | | | | | | | | | | | | | | | | | |
| SMBPVD225AB | No | | | | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none"> • Heavy-duty protection brackets; DIP-switch access • Cold-rolled steel with zinc finish • May be used with SMBPVA..C for mounting to SMBPVA7 or SMBPVA8 brackets | | | | <ul style="list-style-type: none"> • Adjustable right-angle bracket • 20-ga. 300 series stainless steel | <ul style="list-style-type: none"> • Right-angle bracket • 20-ga. 300 series stainless steel | | | | | | | | | | | | | | | | |
| Back Mount | | | | Side Mount | Side Mount | | | | | | | | | | | | | | | | |
| <p>Used with</p> | | | | <p>Used with</p> | <p>Used with</p> | | | | | | | | | | | | | | | | |
| PVD (see chart) | | | | Q12 | Q12 | | | | | | | | | | | | | | | | |
| Bracket-to-Bracket | | | | | | | | | | | | | | | | | | | | | |
| <p>Used with</p> | | | | | | | | | | | | | | | | | | | | | |
| SMBPVA9 SMBPVA2 SMBPVA..C SMBPVA7* SMBPVA8* | | | | | | | | | | | | | | | | | | | | | |
| * Protective bracket must be mounted to a SMBPVA..C bracket. | | | | | | | | | | | | | | | | | | | | | |



More on next page

| SMBQ20H | SMBQ20L | SMBQ20LV | SMBQ20U |
|---|---|---|---|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: A to B = 20 Hole size: A = 2.8 x 9.3, B = 8.4 x 4.5</p> | <p>Hole center spacing: A to B = 20 Hole size: A = 2.8 x 9.3, B = 8.4 x 4.5</p> | <p>Hole center spacing: A = 12 Hole size: A = 3 x 9.4</p> | <p>Hole center spacing: A = 26.5 Hole size: A = 3 x 12.6</p> |
| <ul style="list-style-type: none"> • Sensor horizontal flange mount • ± 10° swivel • Stainless steel | <ul style="list-style-type: none"> • Right-angle bracket • ± 5° tip, ± 5° swivel • Stainless steel | <ul style="list-style-type: none"> • Right-angle bracket • ± 10° tip • Stainless steel | <ul style="list-style-type: none"> • Protective bracket • ± 22.5° swivel • Stainless steel |
| Side Mount | Side Mount | Side Mount | Side Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| Q20 | Q20 | Q20 | Q20 |

More on next page

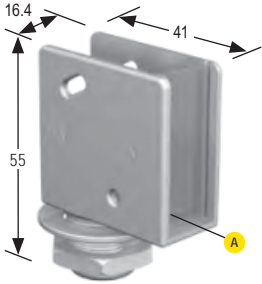
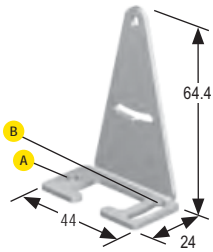
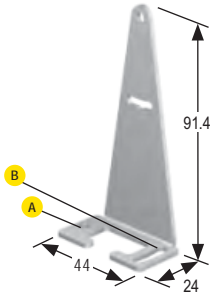
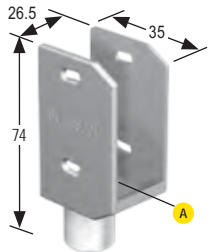
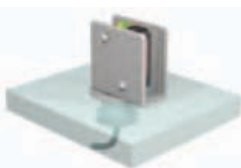
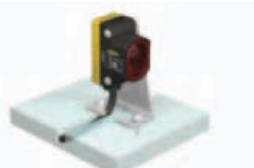
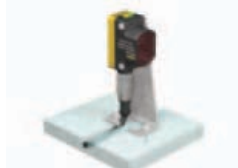
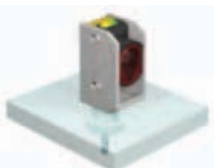
| SMBQ60 | SMBQC50 | SMBQS12PD | SMBQS18A |
|---|--|--|--|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A to B = 24.1 Hole size: A = \varnothing 4.5, B = 8.4 x 4.5</p> | <p>Hole center spacing: A to B = 18, B to B = 36 Hole size: A = \varnothing 4, B = 4 x 13.3</p> | <p>Hole center spacing: A to B = 14 Hole size: A = \varnothing 3.5, B = 3.5 x 10.6, C = \varnothing 13</p> | <p>Hole size: A = \varnothing 15.3</p> |
| <ul style="list-style-type: none"> • Right-angle bracket • 14-ga. 304 stainless steel | <ul style="list-style-type: none"> • Multi-directional stainless steel right-angle bracket • Variety of mounting options | <ul style="list-style-type: none"> • Right-angle, nose-mount bracket • 16-ga. 300 series stainless steel | <ul style="list-style-type: none"> • Wrap-around protection bracket • Die-cast bracket • Base fits 18 mm threaded hole • Metal hex nut, lock washer and grommet included • Mounting holes specially designed for QS18AF sensors |
| Side Mount | Side Mount | Barrel Mount | Side Mount |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| Q60 | QC50 QCX50 | M12 S12 | QS18 (DC only) QS18U QS18AF |

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference



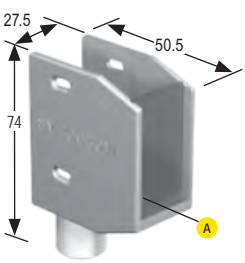
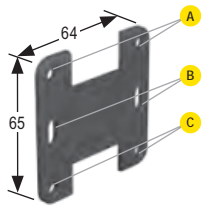
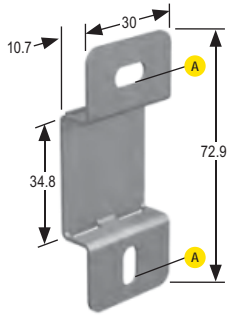
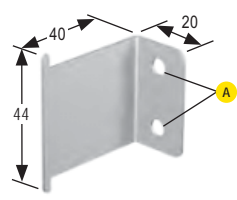
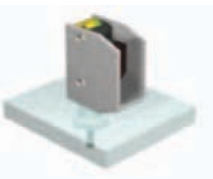



| SMBQS18AF | SMBQS18DIN | SMBQS18RA | SMBQS18Y |
|--|--|--|--|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: A to B = 20.3 Hole size: A = 4.3 x 9.4, B = ø 4.3</p> | N/A | <p>Hole center spacing: A to B = 20.3 Hole size: A = 4.3 x 9.4, B = ø 4.3</p> | <p>Hole size: A = ø 15.3</p> |
| <ul style="list-style-type: none"> • Right-angle mounting bracket • 14-ga. 304 stainless steel | <ul style="list-style-type: none"> • Right-angle bracket assembly for mounting on 35 mm DIN rail • 300 series stainless steel and glass filled nylon; zinc-plated screws | <ul style="list-style-type: none"> • Right-angle mounting bracket • 14-ga. 304 stainless steel | <ul style="list-style-type: none"> • Die-cast bracket for 18 mm holes • Includes metal hex nut and lock washer • Allows ± 8° for cabled sensors |
| Side Mount | Side Mount | Side Mount | Side Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| QS18AF (Only) | QS18 | QS18 (except QS18AF) QS18U | QS18 (DC only) QS18U |

More on next page

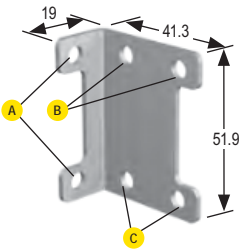
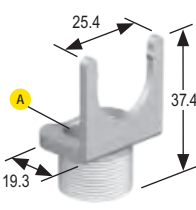
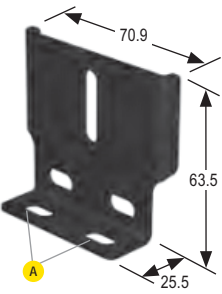
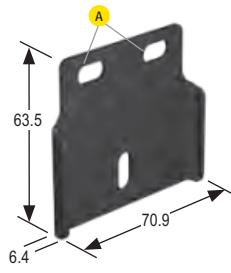
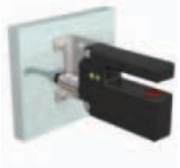
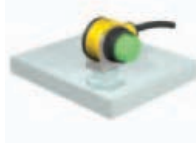
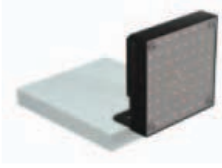

| SMBQS18YL | SMBQS30L | SMBQS30LT | SMBQS30Y |
|--|--|--|---|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| Hole size: A = \varnothing 15.3 | Hole center spacing: A to B = 35 Hole size: A = \varnothing 4.3, B = 4.25 x 16.3 | Hole center spacing: A to B = 35 Hole size: A = \varnothing 4.3, B = 4.25 x 16.3 | Hole size: A = \varnothing 15.3 |
| <ul style="list-style-type: none"> • Heavy-duty die-cast bracket for industrial protection • Replaceable window • M18 vertical mount-option • Nut and lock washer included | <ul style="list-style-type: none"> • Right-angle bracket for cable sensor models • Clearance for M4 (#8) hardware • $\pm 12^\circ$ tilt adjustment • 14-ga. stainless steel | <ul style="list-style-type: none"> • Tall right-angle bracket for QD models • $\pm 8^\circ$ tilt adjustment • 14-ga. stainless steel | <ul style="list-style-type: none"> • Heavy-duty die-cast bracket • M18 vertical mount option • $\pm 8^\circ$ tilt adjustment with cabled units • Includes nuts and lock washer |
| Side Mount | Side Mount | Side Mount | Side Mount |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| QS18AF (Class 2 Laser Only) | QS30 | QS30 with integral QDs | QS30 (DC only) |

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference

More on next page

| SMBQS30YL | SMBR55F01 | SMBR55F02 | SMBR55FRA |
|--|---|---|---|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| Hole size: A = \varnothing 15.3 | Hole center spacing: A, B, C = 50.8, A to B, B to C = 25.3 Hole size: A, C = \varnothing 5.6, B = 11 x 5 | Hole center spacing: A = 50.3 Hole size: A = 11.2 x 5.6 | Hole center spacing: A = 20 Hole size: A = \varnothing 5.4 |
| <ul style="list-style-type: none"> • Heavy-duty die-cast bracket designed for industrial protection • Replaceable window • M18 vertical mount option • Includes nuts and lock washer | <ul style="list-style-type: none"> • Flat-mounting bracket • Eliminates need for DIN rail • Molded PBT polyester • Black reinforced thermoplastic polyester | <ul style="list-style-type: none"> • Mounts to T-slotted or narrow flat surfaces • 19-ga. stainless steel | <ul style="list-style-type: none"> • Side-mounting bracket • Eliminates need for DIN rail • 19-ga. stainless steel |
| Side Mount | Back Mount | Back Mount | Side Mount |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| QS30 (DC only) | R55F DF-G1 D10 D12 PICO-GUARD SFA-RD | PICO-GUARD SFA-RD | R55F DF-G1 D10 D12 PICO-GUARD SFA-RD |



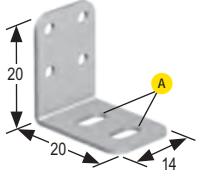
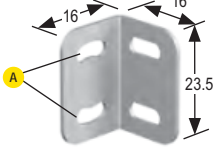
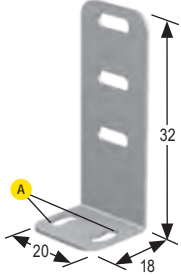
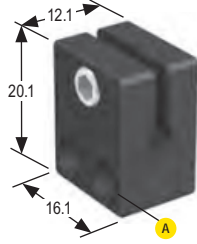
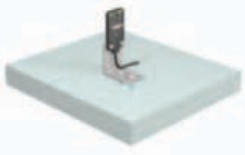

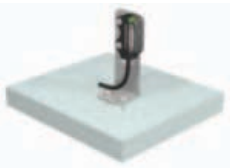

| SMBSL | SMBT18Y | SMBVLA62X62RA | SMBVLA62X62S |
|---|---|--|---|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 40, B, C = 21.6, B to C = 39.9 Hole size: A, B, C = \varnothing 5.5</p> | <p>Hole size: A = \varnothing 15.3</p> | <p>Hole center spacing: A = 36.4 Hole size: A = 13.1 x 6.6</p> | <p>Hole center spacing: A = 36.4 Hole size: A = 13.1 x 6.6</p> |
| <ul style="list-style-type: none"> • Right-angle bracket • 304 stainless steel • Hardware included | <ul style="list-style-type: none"> • Die-cast bracket for 18 mm holes • Includes metal hex nut • For use with Euro-style QD connectors and cabled versions | <ul style="list-style-type: none"> • For mounting a light at a right angle • 14-ga. steel, black zinc-plated | <ul style="list-style-type: none"> • Surface-mount bracket for mounting light from front • In-line bracket • 14-ga. steel, black zinc-plated |
| <p>Side Mount</p> | <p>Barrel Mount</p> | <p>Back Mount</p> | <p>Back Mount</p> |
|  |  |  |  |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| <p>SL10 SL30</p> | <p>T18 TM18 T18U EZ-LIGHT T18</p> | <p>Area Lights (62 x 62 mm)</p> | <p>Area Lights (62 x 62 mm)</p> |

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More on next page

| SMBVS1S | SMBVS1SC | SMBVS1T | SMBVS1TC |
|---|---|---|---|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 16.8 Hole size: A = 3.5 x 12.3</p> | <p>Hole center spacing: A = 10.0 Hole size: A = ø 2.8</p> | <p>Hole center spacing: A = 16.8 Hole size: A = 3.5 x 12.3</p> | <p>Hole center spacing: A = 5.5 Hole size: A = ø 2.8</p> |
| <ul style="list-style-type: none"> • Short right-angle bracket • 18-ga. stainless steel | <ul style="list-style-type: none"> • Short right-angle bracket • 18-ga. stainless steel | <ul style="list-style-type: none"> • Tall right-angle bracket • Stainless steel | <ul style="list-style-type: none"> • Tall right-angle compact bracket • 300 stainless steel |
| Side Mount | Side Mount | Side Mount | Side Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| VS1 | VS1 | VS1 | VS1 |

More on next page

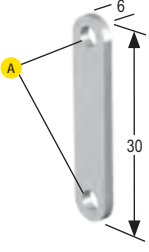
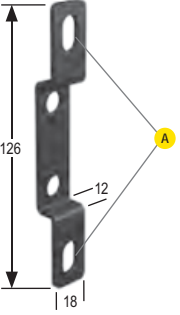
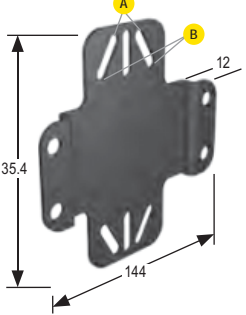





| SMBVS2RA | SMBVS3S | SMBVS3T | SMBVSM4 |
|---|---|--|--|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 80. Hole size: A = 3.2 x 6</p> | <p>Hole center spacing: A = 13.5 Hole size: A = 3.2 x 7.7</p> | <p>Hole center spacing: A = 13.5 Hole size: A = 3.2 x 7.7</p> | <p>Hole center spacing: A = 8 Hole size: A = ø 3.3</p> |
| <ul style="list-style-type: none"> • Right-angle bracket • Stainless steel | <ul style="list-style-type: none"> • Right-angle bracket • 300 stainless steel | <ul style="list-style-type: none"> • Tall right-angle bracket • 300 stainless steel | <ul style="list-style-type: none"> • Mounting clamp for 4 mm barrel-style sensors • Black impact-resistant plastic |
| Back Mount | Side Mount | Side Mount | Barrel Mount |
|  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |  <p>Used with</p> |
| VS2 | VS3 | VS3 | VSM4 |

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| SMBWFTLS | SMBWFTLR | SMBWLS28RA | SMBWLS28SM |
|---|---|--|--|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 27 Hole size: A = \varnothing 6.5</p> | <p>Hole center spacing: A = 27 Hole size: A = \varnothing 6.5</p> | <p>Hole center spacing: C = 8 Hole size: A = \varnothing 15.25, C = \varnothing 5</p> | <p>Hole center spacing: B = 24, C = 10 Hole size: A = \varnothing 15.25</p> |
| <ul style="list-style-type: none"> • In-line bracket • Mounts around light • Bright zinc-coated steel construction | <ul style="list-style-type: none"> • Right-angle bracket • Mounts around light • Bright zinc-coated steel construction | <ul style="list-style-type: none"> • Two replacement brackets for one light • 14-ga. zinc-plated steel • $\pm 45^\circ$ rotation from center | <ul style="list-style-type: none"> • Two replacement brackets for one light • 14-ga. zinc-plated steel • $\pm 30^\circ$ rotation from center |
| Base Mount | Base Mount | End Mount | End Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| Tubular Fluorescent Lights | Tubular Fluorescent Lights | WLS28 Work Lights | WLS28 Work Lights |

More on next page

| SMH241F | STBA-RB1-MB1 | STBA-RB1-MB2 | STBA-RB1-MB3 |
|---|---|---|---|
|  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |  <p>All measurements in mm</p> |
| <p>Hole center spacing: A = 24 Hole size: A = \varnothing 2.5</p> | <p>Hole center spacing: A = 106 Hole size: A = 9 x 15</p> | <p>Hole center spacing: A = 20, B = 40, A to B = 20 Hole size: A, B = 27 x 7</p> | <p>NA</p> |
| <ul style="list-style-type: none"> Nut strap replaces two M3 mounting nuts and washers 16-ga. stainless steel | <ul style="list-style-type: none"> Pair of wall-mount brackets; run bar "hangs" on vertical surface Slotted holes for vertical adjustment 12-ga. cold-rolled steel with black powdercoat paint | <ul style="list-style-type: none"> Universal-mount bracket; allows run bar to mount to vertical stand or surface Slotted holes for adjustment 12-ga. cold-rolled steel with black powdercoat paint | <ul style="list-style-type: none"> Swivel-mount bracket; mounts to telescoping stand Holes for radial adjustment, 0° to 30° in 10° increments 12-ga. cold-rolled steel with black powdercoat paint |
| <p>Side Mount</p> | <p>Wall Mount</p> | <p>Wall/Stand Mount</p> | <p>Stand Mount</p> |
|  |  |  |  |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| <p>QS18 MINI-BEAM QM42/QMT42 QS18U</p> | <p>DUO-TOUCH Run Bar</p> | <p>DUO-TOUCH Run Bar</p> | <p>DUO-TOUCH Run Bar</p> <p>NOTE: Included with telescoping stands STBA-RB1-S1 and STBA-RB1-S2</p> |

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- Cordsets
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- Miscellaneous
- Reference



| USCMB-.. | USMB-1 | USMB-6 | USMB-8 |
|---|---|---|--|
| <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> | <p>All measurements in mm</p> |
| <p>Hole center spacing: B = 19.9, A to B = 10 Hole size: A = 12.2 x 7.1, B = \varnothing 4.8</p> | <p>Hole center spacing: A = 20, A to B = 10 Hole size: A = \varnothing 4.8, B = 12.7 x 7, C = \varnothing 15.2</p> | <p>Hole center spacing: A = 52.1, A to B = 26, C = 30.6 Hole size: A, B = 25.4 x 7.1, C = 15.5 x 7, D = \varnothing 15.2</p> | <p>Hole center spacing: A = 22.7 Hole size: A = 15 x 3.5, B = \varnothing 14.8</p> |
| <ul style="list-style-type: none"> • Two-piece center mounting replacement kit for bracket that comes with emitter/receiver • 13-ga. cold-rolled steel with black power coat paint • Bracket hardware included | <ul style="list-style-type: none"> • Two-bracket replacement kit for brackets that come with emitter/receiver • 13-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included | <ul style="list-style-type: none"> • Two-bracket universal-mounting surface kit • 13-ga. cold-rolled steel with black corrosion-resistant zinc chromate finish • Bracket hardware included | <ul style="list-style-type: none"> • Two-bracket kit for one emitter/receiver • Mounting plate for 90° sensor direction • Black anodized aluminum |
| Center Bracket | End Mount | End Mount | End Mount |
| <p>Used with</p> | <p>Used with</p> | <p>Used with</p> | <p>Used with</p> |
| EZ-SCREEN Type 2 | EZ-SCREEN Type 2 | EZ-SCREEN Type 2 | EZ-SCREEN Type 2 |
| <p>NOTE: USCMB-1 fits emitters/receivers 600 to 900 mm long USCMB-2 fits emitters/receivers 1050 mm and longer</p> | | | |

3-Pin Threaded M8/Pico-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|----------|----------------|-----------------|---|---|
| Straight | 2.00 m | PKG3M-2 | 4.40 mm | | <p>Female</p> <p>1 = Brown 3 = Blue 4 = Black</p> | <ul style="list-style-type: none"> • Q12 • T8 • SB12 • VSM • VS1 • VS2 • VS3 • SLM • IP68 Sealed Ring Lights (nickel-plated) • On-Axis Lights |
| | 5.00 m | PKG3M-5 | | | | |
| | 7.00 m | PKG3M-7 | | | | |
| | 9.00 m | PKG3M-9 | | | | |
| | 10.0 m | PKG3M-10 | | | | |
| Right-Angle | 2.00 m | PKW3M-2 | 4.40 mm | | <p>Female</p> <p>1 = Brown 3 = Blue 4 = Black</p> | <ul style="list-style-type: none"> • IP68 Sealed Ring Lights (nickel-plated) • On-Axis Lights |
| | 5.00 m | PKW3M-5 | | | | |
| | 9.00 m | PKW3M-9 | | | | |

3-Pin Threaded M8/Pico-Style Cordsets

Cable: PVC jacket and connector body, stainless steel coupling nut
 Conductors: 24 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 4.0 A
 Temperature: -40° to +90° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|----------|----------------|-----------------|---|---|
| Straight | 4.00 m | PKG3M-4 | 4.40 mm | | <p>Female</p> <p>1 = Brown 3 = Blue 4 = Black</p> | <ul style="list-style-type: none"> • IP68 Sealed Ring Lights (stainless steel) |
| | 7.00 m | PKG3M-7 | | | | |
| | 10.0 m | PKG3M-10 | | | | |

3-Pin Threaded/Snap M8/Pico-Style Cordsets Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass (female) and nylon/nickel-plated brass (male) coupling nuts
 Conductors: 24 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|-----------------|----------------|-----------------|---------------|---|
| Straight | 0.35 m | PKG3M-.35-PSG3M | 4.40 mm | | <p>Female</p> | <ul style="list-style-type: none"> • IP68 Sealed P4 (connect IP68 Sealed Ring Light to P4) |
| | 2.00 m | PKG3M-2-PSG3M | | | | |

3-Pin Threaded M8/Pico-Style Splitter Cordset—Flat Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass (female) and nylon/nickel-plated brass (male) coupling nuts
 Conductors: 24 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cords

Connections

| Model | Branches | Trunk | Cable Diameter | Pinout | Used With |
|-----------------|------------------------------------|-------------|----------------|---|--|
| CSB-M831M831 | 3-Pin Pico QD 2 x 0.20 m Female | 0.20 m Male | 4.40 mm | <p>Female</p> <p>Male</p> <p>1 = Brown 3 = Blue 4 = Black</p> | <ul style="list-style-type: none"> • Connect P4 to two lights • Spot Lights • Area Lights • Backlights |
| Dimensions (mm) | | | | | |
| | | | | | |

3-Pin M8/Pico-Style and 4-Pin M12/Euro-Style to Flying Leads Splitter Cordset—Flat Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (3-pin) or 22 AWG (4-pin), gold-plated contacts
 Voltage/Current Rating: 250V ac/300V dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

Connections

| Model | Branches | Trunk | Cable Diameter | Pinout | Used With |
|---------------------|--|---------------------|---------------------------------------|--|--|
| CSB-UNT213M831F1241 | 3-Pin Pico QD 0.3 m Male 4-pin Euro QD 0.3 m Female | Flying Leads 4 m | 4.40 mm (branches) 5.50 mm (trunk) | <p>Female</p> <p>1=Brown 2=White 3=Blue 4=Black</p> <p>Male</p> <p>1 = NC 3 = Blue 4 = Black</p> | <ul style="list-style-type: none"> • P4 to High Intensity Area Lights (to strobe from P4) |
| Dimensions (mm) | | | | | |
| | | | | | |

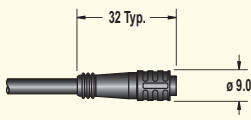

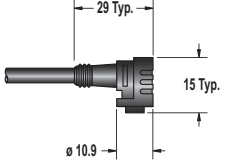
4-Pin Snap-on M8/Pico-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
 Conductors: 26 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 2.0 A
 Temperature: -40° to +90° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|---------|----------------|-----------------|---|---|
| Straight | 2.00 m | PKG4-2 | 3.20 mm | | <p>Female</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black</p> | <ul style="list-style-type: none"> • QS18 • Q20 • D12 • D10A • S12 |
| Right-Angle | 2.00 m | PKW4Z-2 | 3.20 mm | | <p>Female</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black</p> | |

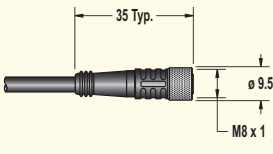

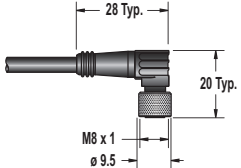
4-Pin Snap-On M8/Pico-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nylon or PUR coupling nut
 Conductors: 26 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 2.0 A
 Temperature: -40° to +90° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|----------|----------------|---|---|-----------|
| Straight | 2.00 m | PKG4S-2 | 4.40 mm |  | Female  | • QS18U |
| Right-Angle | 2.00 m | PKW4ZS-2 | 4.40 mm |  | 1 = Brown 2 = White 3 = Blue 4 = Black | |

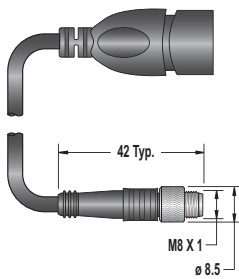

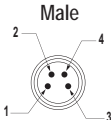
4-Pin Threaded M8/Pico-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) body, nickel-plated brass coupling nut
 Conductors: 26 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|---------|----------------|---|---|----------------|
| Straight | 2.00 m | PKG4M-2 | 3.80 mm |  | Female  | • Q12 • Q20 |
| | 5.00 m | PKG4M-5 | | | | |
| | 9.00 m | PKG4M-9 | | | | |
| Right-Angle | 2.00 m | PKW4M-2 | 4.30 mm |  | 1 = Brown 2 = White 3 = Blue 4 = Black | |
| | 5.00 m | PKW4M-5 | | | | |
| | 9.00 m | PKW4M-9 | | | | |

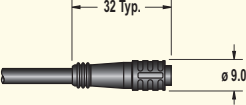
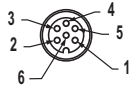
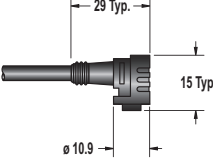
4-Pin Threaded M8/Pico-Style to USB Cordsets with Shield Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut on Pico QD end
 Conductors: 28 AWG and 24 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------------------|--------|-----------------|----------------|---|---|---|
| Straight Pico QD/USB | 0.15 m | PSG-4M-4005-USB | 4.80 mm |  | USB  | • iVu TG & BCR — Remote Touch Screen models • iVu Plus— Remote Touch Screen models |
| | 0.30 m | PSG-4M-401-USB | | | 1 = Red 3 = Green 2 = White 4 = Black | |
| | 0.91 m | PSG-4M-403-USB | | | Male  | |
| | 3.05 m | PSG-4M-410-USB | | | 1 = Red 3 = Black 2 = White 4 = Green | |
| | 4.88 m | PSG-4M-416-USB | | | | |

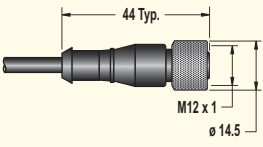
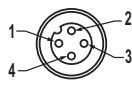
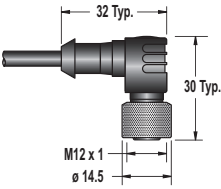
6-Pin Snap-On M8/Pico-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon or PUR coupling nut
 Conductors: 26 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 125V ac/dc, 2.0 A
 Temperature: -40° to +90° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|---------|----------------|---|---|-----------|
| Straight | 2.00 m | PKG6Z-2 | 4.70 mm |  | <p>Female</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray 6 = Pink</p> | • D10 |
| | 9.00 m | PKG6Z-9 | | | | |
| Right-Angle | 2.00 m | PKW6Z-2 | 4.70 mm |  | <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray 6 = Pink</p> | • D10 |
| | 9.00 m | PKW6Z-9 | | | | |

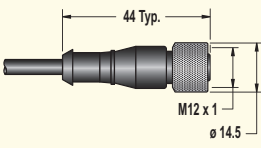
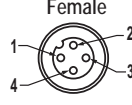
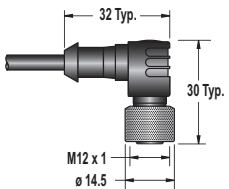
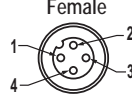
4-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67/IP69K

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|------------|----------------|--|---|---|
| Straight | 1.83 m | MQDC-406 | 5.20 mm |  | <p>Female</p>  <p>1 = Brown 2 = White 3 = Blue 4 = Black</p> | <ul style="list-style-type: none"> • Q12 • M12 • QS18 • Q20 • OMNI-BEAM (QDH suffix) • Q45 dc sensors (Q5 suffix) • MINI-BEAM dc SM312 sensors • S18, M18, T18, Q25, S30, T30, Q40 • TM18/TM18 <i>Expert</i> • QM42/QMT42 • QL50/QL51 • SLM • R58A • T18U • T30UX • TL50/TL30F • K50 • K80 • PVA • VTB • STB with solid-state relay • EZ-LIGHT • WL50 • WLS28 |
| | 4.57 m | MQDC-415 | | | | |
| | 9.14 m | MQDC-430 | | | | |
| | 15.2 m | MQDC-450 | | | | |
| Right-Angle | 1.83 m | MQDC-406RA | 5.20 mm |  | <p>1 = Brown 2 = White 3 = Blue 4 = Black</p> | <ul style="list-style-type: none"> • Q12 • M12 • QS18 • Q20 • OMNI-BEAM (QDH suffix) • Q45 dc sensors (Q5 suffix) • MINI-BEAM dc SM312 sensors • S18, M18, T18, Q25, S30, T30, Q40 • TM18/TM18 <i>Expert</i> • QM42/QMT42 • QL50/QL51 • SLM • R58A • T18U • T30UX • TL50/TL30F • K50 • K80 • PVA • VTB • STB with solid-state relay • EZ-LIGHT • WL50 • WLS28 |
| | 4.57 m | MQDC-415RA | | | | |
| | 9.14 m | MQDC-430RA | | | | |
| | 15.2 m | MQDC-450RA | | | | |

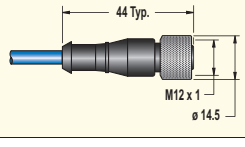
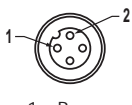
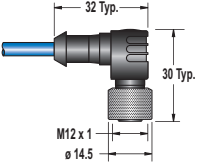
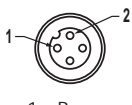
4-Pin Threaded M12/Euro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|--------------|----------------|---|--|-----------|
| Straight | 1.83 m | MQDEC2-406 | 5.20 mm |  |  <p>Female</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black</p> | • QS18U |
| | 4.57 m | MQDEC2-415 | | | | |
| | 9.14 m | MQDEC2-430 | | | | |
| Right-Angle | 1.83 m | MQDEC2-406RA | 5.20 mm |  |  <p>Female</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black</p> | • QS18U |
| | 4.57 m | MQDEC2-415RA | | | | |
| | 9.14 m | MQDEC2-430RA | | | | |

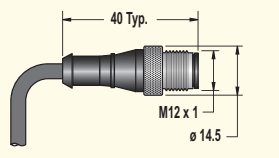
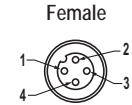
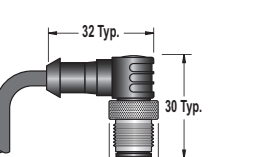
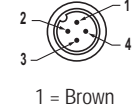
4-Pin Threaded M12/Euro-Style Cordsets (for use with NAMUR sensors)

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 20 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|------------|----------------|---|--|---------------------------------|
| Straight | 1.83 m | MQD9-406 | 5.20 mm |  |  <p>Female</p> <p>1 = Brown 2 = Blue</p> | • MINI-BEAM & Q45 NAMUR sensors |
| | 4.57 m | MQD9-415 | | | | |
| | 9.14 m | MQD9-430 | | | | |
| Right-Angle | 1.83 m | MQD9-406RA | 5.20 mm |  |  <p>Female</p> <p>1 = Brown 2 = Blue</p> | • MINI-BEAM & Q45 NAMUR sensors |
| | 4.57 m | MQD9-415RA | | | | |
| | 9.14 m | MQD9-430RA | | | | |

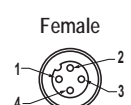
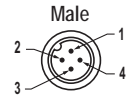
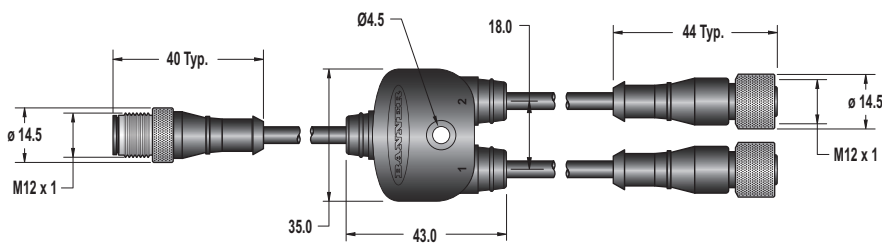
4-Pin Threaded M12/Euro-Style Cordsets Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|--------------------------------------|--------|-------------|----------------|--|---|---|
| Male Straight/ Female Straight | 0.31 m | MQDEC-401SS | 5.90 mm |  |  | <ul style="list-style-type: none"> • M12 • QS18 • Q20 • OMNI-BEAM (QDH suffix) • Q45 dc sensors (Q5 suffix) • MINI-BEAM dc SM312 sensors • S18, M18, T18, Q25, S30, T30, Q40 • QM42/QMT42 • SLM • R58A • T30UX • T18U • TL50 • TL30F • K50 • K80 • PVA • VTB and STB • EZ-LIGHT • WL50 • WLS28 |
| | 0.91 m | MQDEC-403SS | | | | |
| | 1.83 m | MQDEC-406SS | | | | |
| | 3.66 m | MQDEC-412SS | | | | |
| | 6.10 m | MQDEC-420SS | | | | |
| | 9.14 m | MQDEC-430SS | | | | |
| | 15.2 m | MQDEC-450SS | | | | |
| Male Right-Angle/ Female Straight | 0.91 m | MQDEC-403RS | 5.90 mm |  |  | <ul style="list-style-type: none"> • M12 • QS18 • Q20 • OMNI-BEAM (QDH suffix) • Q45 dc sensors (Q5 suffix) • MINI-BEAM dc SM312 sensors • S18, M18, T18, Q25, S30, T30, Q40 • QM42/QMT42 • SLM • R58A • T30UX • T18U • TL50 • TL30F • K50 • K80 • PVA • VTB and STB • EZ-LIGHT • WL50 • WLS28 |
| | 1.83 m | MQDEC-406RS | | | | |
| | 3.66 m | MQDEC-412RS | | | | |
| | 6.10 m | MQDEC-420RS | | | | |
| | 9.14 m | MQDEC-430RS | | | | |
| | 15.2 m | MQDEC-450RS | | | | |

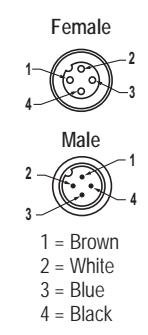
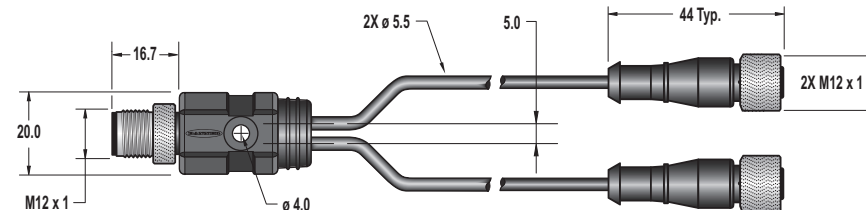
4-Pin Threaded M12/Euro-Style Splitter Cordsets Flat Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/300V dc, 4.0A
 Temperature: -40° to +105° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cord

| Connections | | | | Cable Diameter | Pinout | Used With |
|--|-------------------|----------------------|---------|---|---|-----------|
| Model | Branches (Female) | Trunk (Male) | | | | |
| CSB-M1240M1240 | No branch | No trunk | 5.50 mm |  | <ul style="list-style-type: none"> • Sensors w/4-Pin Euro QD • EZ-LIGHT • DX80 (10 to 30V dc) • DX85 • WLS28 | |
| CSB-M1240M1241 | 2 x 0.30 m | No trunk | | | | |
| CSB-M1241M1241 | | 0.30 m | | | | |
| CSB-M1248M1241 | | 2.50 m | | | | |
| CSB-M12415M1241 | | 4.60 m | | | | |
| CSB-M12425M1241 | | 7.60 m | | | | |
| CSB-UNT425M1241 | | 7.60 m Untermated | | | | |
| Dimensions (mm) | | | |  | <ul style="list-style-type: none"> 1 = Brown 2 = White 3 = Blue 4 = Black | |
|  | | | | | | |

4-Pin Threaded M12/Euro-Style Splitter Cordsets Rounded Junction

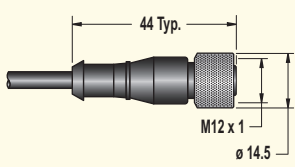
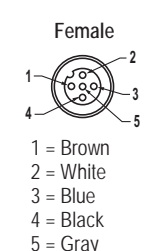
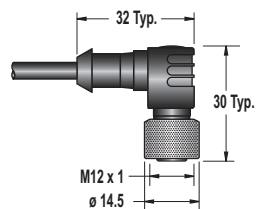
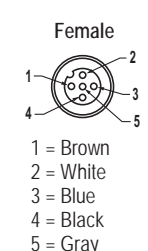
Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0A
 Temperature: -40° to +105° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cord

| Connections | | | | | |
|---|-------------------|--------------|----------------|---|---|
| Model | Branches (Female) | Trunk (Male) | Cable Diameter | Pinout | Used With |
| CSRB-M1240M1241 | 0.31 m | No Trunk | 5.50 mm |  | <ul style="list-style-type: none"> • Sensors w/4-Pin Euro QD • EZ-LIGHT |
| CSRB-M1240M1242 | 0.61 m | | | | |
| CSRB-M1240M1243 | 0.91 m | | | | |
| CSRB-M1240M1244 | 1.22 m | | | | |
| Dimensions (mm) | | | | | |
|  | | | | | |

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference

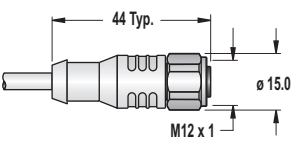
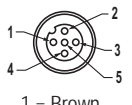
5-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|-------------|----------------|---|--|--|
| Straight | 0.50 m | MQDC1-501.5 | 5.60 mm |  |  | <ul style="list-style-type: none"> • MINI-BEAM <i>Expert</i> • QS30 • PicoDot • Q45 Laser Retro • R55F • SL30 & SL30E • SL10 & SL10E • VTB (2-color) • QL56 • Q60 • PVD • STB • K50 • K80 • DX80 • DX81 • DX85 • EZ-LIGHT • STB w/em relay • High-Intensity Area Lights • High-Intensity Ring Lights • Sealed Backlights |
| | 1.83 m | MQDC1-506 | | | | |
| | 4.57 m | MQDC1-515 | | | | |
| | 9.14 m | MQDC1-530 | | | | |
| Right-Angle | 1.83 m | MQDC1-506RA | 5.60 mm |  |  | <ul style="list-style-type: none"> • MINI-BEAM <i>Expert</i> • QS30 • PicoDot • Q45 Laser Retro • R55F • SL30 & SL30E • SL10 & SL10E • VTB (2-color) • QL56 • Q60 • PVD • STB • K50 • K80 • DX80 • DX81 • DX85 • EZ-LIGHT • STB w/em relay • High-Intensity Area Lights • High-Intensity Ring Lights • Sealed Backlights |
| | 4.57 m | MQDC1-515RA | | | | |
| | 9.14 m | MQDC1-530RA | | | | |

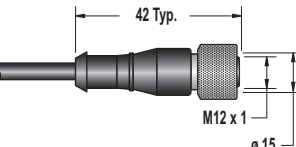
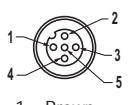
5-Pin Threaded M12/Euro-Style Cordsets Washdown

Cable: Polypropylene jacket and connector body, stainless steel coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP68

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|------------|----------------|--|--|-----------|
| Straight | 1.83 m | MQDCWD-506 | 4.50 mm |  | Female  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray | • M25U |
| | 9.14 m | MQDCWD-530 | | | | |

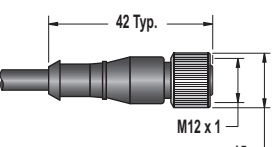
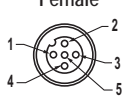
5-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 20 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|------------|----------------|---|---|---|
| Straight | 1.83 m | MQDC20-506 | 6.00 mm |  | Female  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray | <ul style="list-style-type: none"> • High Intensity Area Lights • High Intensity Ring Lights • Sealed Linear Array Lights • Sealed Backlights NOTE: Except stainless steel models |
| | 4.57 m | MQDC20-515 | | | | |
| | 9.14 m | MQDC20-530 | | | | |

5-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, 316 stainless steel coupling nut
 Conductors: 20 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|--------------|----------------|--|--|--|
| Straight | 1.83 m | MQDC20SS-506 | 6.00 mm |  | Female  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray | <ul style="list-style-type: none"> • Sealed High Intensity Area Lights (Stainless Steel) • Sealed Linear Array Lights (Stainless Steel) • Sealed Backlights |
| | 4.57 m | MQDC20SS-515 | | | | |
| | 9.14 m | MQDC20SS-530 | | | | |

5-Pin Threaded M12/Euro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|--------------|----------------|-----------------|--|--|
| Straight | 1.83 m | MQDEC2-506 | 5.60 mm | | <p>Female</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p> | <ul style="list-style-type: none"> • R58E • QT50U dc sensors • S18U • T30U • M25U • Q45U • Q45UR • LX • QT50R |
| | 4.57 m | MQDEC2-515 | | | | |
| | 9.14 m | MQDEC2-530 | | | | |
| | 15.2 m | MQDEC2-550 | | | | |
| Right-Angle | 1.83 m | MQDEC2-506RA | 5.60 mm | | <p>Female</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p> | <ul style="list-style-type: none"> • R58E • QT50U dc sensors • S18U • T30U • M25U • Q45U • Q45UR • LX • QT50R |
| | 4.57 m | MQDEC2-515RA | | | | |
| | 9.14 m | MQDEC2-530RA | | | | |
| | 15.2 m | MQDEC2-550RA | | | | |

5-Pin Threaded M12/Euro-Style Cordsets with Green/Yellow Ground Wire

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|-----------|----------------|-----------------|--|---|
| Straight | 4.57 m | QDE-515D | 5.50 mm | | <p>Female</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Green/Yellow</p> | <ul style="list-style-type: none"> • EZ-SCREEN w/4-pin or 5-pin QD (14 & 30 mm Resolution) |
| | 7.62 m | QDE-525D | | | | |
| | 15.2 m | QDE-550D | | | | |
| | 22.9 m | QDE-575D | | | | |
| | 30.5 m | QDE-5100D | | | | |

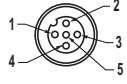

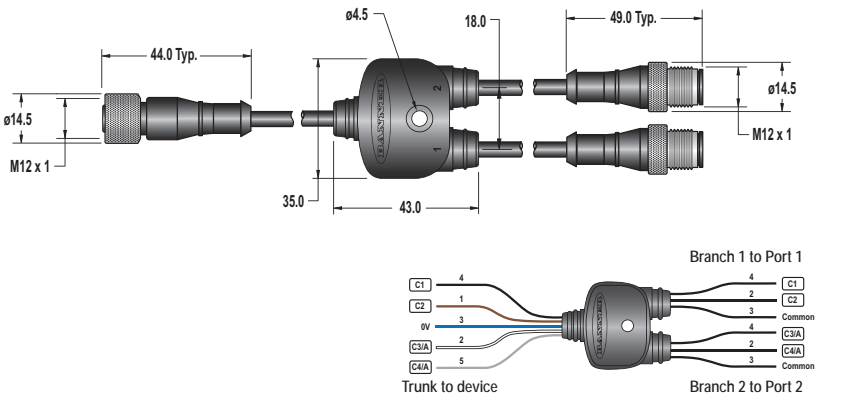
5-Pin Threaded M12/Euro-Style Cordsets Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-----------------------------------|--------|-------------|----------------|-----------------|--|---|
| Female Straight/ Male Straight | 0.31 m | DEE2R-51D | 5.60 mm | | <p>Female</p> <p>Male</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Green/Yellow</p> | <ul style="list-style-type: none"> • MINI-BEAM Expert • QS30 • PicoDot • Q45 Laser Retro • R55F • SL30 & SL30E • SL10 & SL10E • SLC1 • Q60 • PVD • STB • VTB (2-color) • DX85 • DX81 • EZ-SCREEN w/4-pin or 5-pin QD (14 & 30 mm Resolution) • AC Interface Boxes |
| | 0.91 m | DEE2R-53D | | | | |
| | 2.44 m | DEE2R-58D | | | | |
| | 4.57 m | DEE2R-515D | | | | |
| | 7.62 m | DEE2R-525D | | | | |
| | 15.2 m | DEE2R-550D | | | | |
| | 22.9 m | DEE2R-575D | | | | |
| | 30.5 m | DEE2R-5100D | | | | |

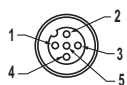

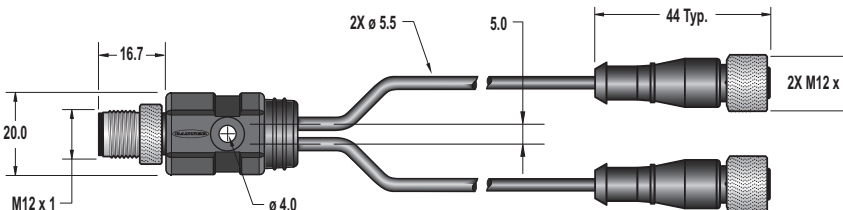
5-Pin Threaded M12/Euro-Style to 4-Pin Threaded M12/Euro Style Combiner Cordset—Flat Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nuts
 Conductor: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/300V dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67
 Wiring: Combiner Y-cord

| Connections | | | | | | |
|---|-----------------------------|-------------------------|----------------|---|--|--|
| Model | Branches (Male) | Trunk (Female) | Cable Diameter | Pinout | Used With | |
| CSF-M12F51M12M41 | 4-pin Euro QD 2 x 0.31 m | 5-pin Euro QD 0.31 m | 5.50 mm | <p>Female</p>  <p>Male</p>  | <ul style="list-style-type: none"> • 3 or 4 Segmented EZ-LIGHT Tower Lights • 3 or 4 function TL50 Tower Lights <p>NOTE: Use to connect device to a "2-output" I/O block</p> | |
| Dimensions (mm) | | | | | | |
|  <p>Trunk to device</p> <p>Branch 1 to Port 1</p> <p>Branch 2 to Port 2</p> | | | | | | |
| | | | | <p>Trunk</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p> | <p>Branch 1</p> <p>1 = NC 2 = Brown 3 = Blue 4 = Black</p> | <p>Branch 2</p> <p>1 = NC 2 = Gray 3 = Blue 4 = White</p> |

5-Pin Threaded M12/Euro-Style Splitter Cordset—Rounded Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductor: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cord

| Connections | | | | | |
|---|--------------------|--------------------|----------------|---|---|
| Model | Branches (Female) | Trunk (Male) | Cable Diameter | Pinout | Used With |
| CSRB-M1250M125.47M125.73 | Branch 1 0.14 m | Branch 2 0.22 m | No trunk | <p>Female</p>  <p>Male</p>  | <ul style="list-style-type: none"> • EZ-LIGHTs w/5-Pin Euro QD • DX80 (FlexPower) |
| Dimensions (mm) | | | | | |
|  <p>Trunk to device</p> <p>Branch 1 to Port 1</p> <p>Branch 2 to Port 2</p> | | | | | |
| | | | | <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Green/Yellow</p> | |

8-Pin Threaded M12/Euro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 75V ac/dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|----------|----------------|-----------------|--|--|
| Straight | 1.83 m | MQDC-806 | 5.60 mm | | <p>Female</p> <p>1 = White 5 = Gray 2 = Brown 6 = Pink 3 = Green 7 = Blue 4 = Yellow 8 = Shield</p> | <ul style="list-style-type: none"> • LT3 • LG5 • LG10 |
| | 4.58 m | MQDC-815 | | | | |
| | 9.14 m | MQDC-830 | | | | |

8-Pin Threaded M12/Euro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 75V ac/dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|-----------|----------------|-----------------|---|---|
| Straight | 1.83 m | MAQDC-806 | 5.60 mm | | <p>Female</p> <p>1 = White 5 = Gray 2 = Brown 6 = Pink 3 = Green 7 = Blue 4 = Yellow 8 = Red</p> | <ul style="list-style-type: none"> • EZ-ARRAY Emitters/Receivers |
| | 4.58 m | MAQDC-815 | | | | |
| | 9.14 m | MAQDC-830 | | | | |
| | 15.2 m | MAQDC-850 | | | | |

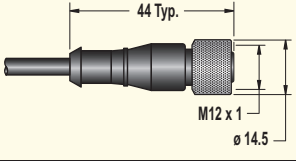
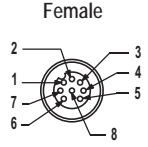
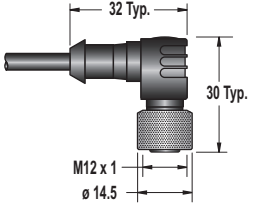
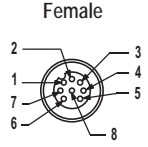
8-Pin Threaded M12/Euro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|------------|----------------|-----------------|--|--|
| Straight | 1.83 m | MQLH-806-F | 6.00 mm | | <p>Female</p> <p>1 = White 5 = Gray 2 = Brown 6 = Green 3 = Shield 7 = Blue 4 = Yellow 8 = Shield</p> | <ul style="list-style-type: none"> • LH |
| | 4.58 m | MQLH-815-F | | | | |
| | 9.14 m | MQLH-830-F | | | | |

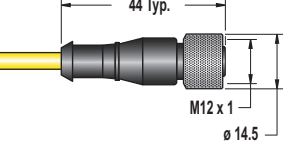
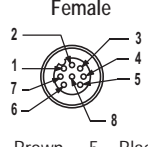
8-Pin Threaded M12/Euro-Style Cordsets with Open-Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 75V ac/dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|--------------|----------------|--|--|--|
| Straight | 1.83 m | MQDC2S-806 | 5.60 mm |  | <p>Female</p>  <p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red</p> | <ul style="list-style-type: none"> • QC50 • QCX50 • EZ-LIGHT • iVu TG—Integrated Touch Screen models |
| | 4.57 m | MQDC2S-815 | | | | |
| | 9.14 m | MQDC2S-830 | | | | |
| | 15.2 m | MQDC2S-850 | | | | |
| Right-Angle | 1.83 m | MQDC2S-806RA | 5.60 mm |  | <p>Female</p>  <p>1 = White 2 = Brown 3 = Green 4 = Yellow 5 = Gray 6 = Pink 7 = Blue 8 = Red</p> | <ul style="list-style-type: none"> • QC50 • QCX50 • EZ-LIGHT • iVu TG—Integrated Touch Screen models |
| | 4.57 m | MQDC2S-815RA | | | | |
| | 9.14 m | MQDC2S-830RA | | | | |
| | 15.2 m | MQDC2S-850RA | | | | |

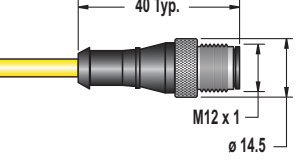
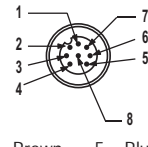
8-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 75V ac/dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model* | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|-----------|----------------|--|---|--|
| Straight | 4.57 m | QDE-815D | 6.00 mm |  | <p>Female</p>  <p>1 = Brown 5 = Black 2 = Or/Bl 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet</p> | <ul style="list-style-type: none"> • EZ-SCREEN w/8-pin QD (14 & 30 mm Resolution) • EZ-SCREEN LP w/8-pin QD (14 & 25 mm Resolution) • EZ-SCREEN w/8-pin QD (Point & Grid) • EZ-SCREEN Type 2 |
| | 7.62 m | QDE-825D | | | | |
| | 15.3 m | QDE-850D | | | | |
| | 22.9 m | QDE-875D | | | | |
| | 30.5 m | QDE-8100D | | | | |

8-Pin Threaded M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model* | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|-------------|----------------|--|---|--|
| Straight | 4.57 m | QDE2R4-815D | 5.50 mm |  | <p>Male</p>  <p>1 = Brown 5 = Blue 2 = Not Used 6 = Not Used 3 = Not Used 7 = Not Used 4 = Black 8 = White</p> | <ul style="list-style-type: none"> • EZ-SCREEN Receiver (Cascade) CSSI QD (14 & 30 mm) • EZ-SCREEN LP Receiver (Cascade) CSSI QD and a DELPEF-810 (14 & 25 mm) <p>NOTE: For connection of E-Stop or other hard/relay contacts.</p> |
| | 7.62 m | QDE2R4-825D | | | | |
| | 15.2 m | QDE2R4-850D | | | | |

* Standard cordsets are yellow PVC with black overmold. For black PVC and overmold, add suffix B to model number (example, DEE2R-81DB)

8-Pin Threaded M12/Euro-Style Cordsets with Shield Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-----------------------------------|--------|-------------|----------------|-----------------|--|-----------|
| Male Straight/ Female Straight | 1.83 m | MQLH-806-MF | 6.00 mm | | | • LH |
| | 4.57 m | MQLH-815-MF | | | | |
| | 9.14 m | MQLH-830-MF | | | | |
| Male Straight/ Male Straight | 0.30 m | MQLH-801-MM | 6.00 mm | | <p>1 = White 5 = Gray 2 = Brown 6 = Green 3 = Shield 7 = Blue 4 = Yellow 8 = Shield</p> | |

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
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8-Pin Threaded M12/Euro-Style Cordsets Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP68

| Style | Length | Model* | | | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-----------------------------------|--------|-----------------|------------------|-------------------|----------------|-----------------|--------|--|
| | | 8-pin/ 8-pin | 8-pin/ 4-pin† | 8-pin/ 5-pin** | | | | |
| Female Straight/ Male Straight | 0.31 m | DEE2R-81D | DEE8-41D | DEE8-51D | 6.00 mm | | | <ul style="list-style-type: none"> • EZ-SCREEN w/8-pin QD (14 & 30 mm Resolution) • EZ-SCREEN LP w/8-pin QD (14 & 25 mm Resolution) • EZ-SCREEN w/8-pin QD (Point & Grid) • EZ-SCREEN Type 2 (DEE2R only) • AC Interface Boxes (DEE2R only) |
| | 0.91 m | DEE2R-83D | — | — | | | | |
| | 2.44 m | DEE2R-88D | DEE8-48D | DEE8-58D | | | | |
| | 4.57 m | DEE2R-815D | DEE8-415D | DEE8-515D | | | | |
| | 7.62 m | DEE2R-825D | DEE8-425D | DEE8-525D | | | | |
| | 15.2 m | DEE2R-850D | — | — | | | | |
| | 22.9 m | DEE2R-875D | — | — | | | | |
| | 30.5 m | DEE2R-8100D | — | — | | | | |

* Standard cordsets are yellow PVC with black overmold. For black PVC and overmold, add suffix B to model number (example, DEE2R-81DB)

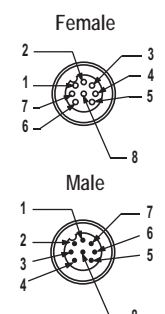
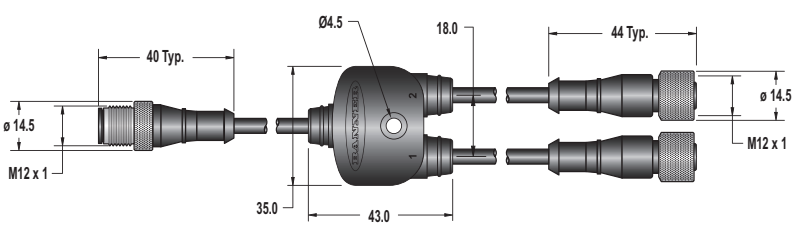
** For connection to safety BUS gateway/node, a "smart" self-monitored safety module, safety controller or safety PLC.

† DEE8-4..D do not have the pin 5 GND/chassis connection. GND/chassis connection should be made via the mounting hardware.

8-Pin Threaded M12/Euro-Style Splitter Cordsets with Shield—Flat Junction

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cord

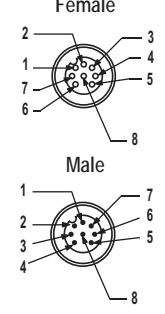
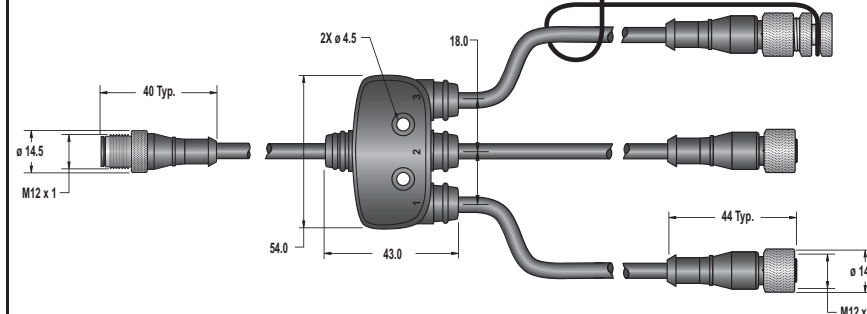
Connections

| Model | Branches (Female) | Trunk (Male) | Cable Diameter | Pinout | Used With |
|--|-------------------|--------------|----------------|---|-----------|
| CSB-M1280M1280-LH | No branches | No trunk | 6.00 mm |  | • LH |
| CSB-M1281M1282-LH | 0.60 m | 0.30 m | | | |
| Dimensions (mm) | | | | | |
|  | | | | | |

8-Pin Threaded M12/Euro-Style Splitter Cordsets with Shield—Flat Junction

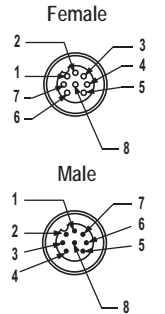
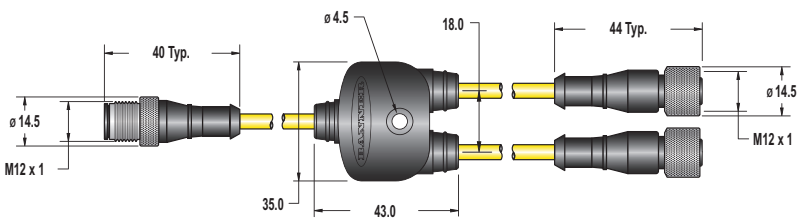
Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24 AWG (shielded), gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +150° C Environmental Rating: IP67
 Wiring: Parallel wired Y-cord

Connections

| Model | Branches (Female) | Trunk (Male) | Cable Diameter | Pinout | Used With |
|--|-------------------|--------------|----------------|---|-----------|
| CSB3-M1281M1282-LH | 0.60 m | 0.30 m | 6.00 mm |  | • LH |
| Dimensions (mm) | | | | | |
|  | | | | | |

8-Pin Threaded M12/Euro-Style Splitter Cordsets—Flat Junction

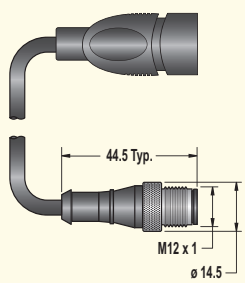

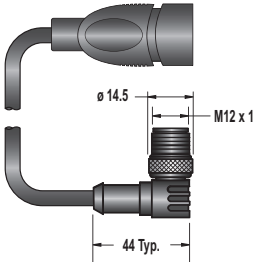

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: -40° to +105° C Environmental Rating: IP68
 Wiring: Parallel wired Y-cord

| Connections | | | | | |
|---|-------------------|------------------------|----------------|---|---|
| Model | Branches (Female) | Trunk (Male) | Cable Diameter | Pinout | Used With |
| CSB-M1280M1280 | No branches | No trunk | 6.00 mm |  <p>Female</p> <p>Male</p> <p>1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet</p> | <ul style="list-style-type: none"> EZ-ARRAY EZ-LIGHT Indicator Lights EZ-SCREEN w/8-pin QD (14 & 30 mm Resolution) EZ-SCREEN LP w/8-pin QD (14 & 25 mm Resolution) EZ-SCREEN w/8-pin QD (Point & Grid) EZ-SCREEN Type 2 AC Interface Boxes |
| CSB-M1281M1281 | 2 x 0.3 m | 0.3 m | | | |
| CSB-M1288M1281 | | 2.5 m | | | |
| CSB-M12815M1281 | | 4.6 m | | | |
| CSB-M12825M1281 | | 7.6 m | | | |
| CSB-UNT825M1281* | | 7.6 m Untersminated | | | |
| Dimensions (mm) | | | | | |
|  | | | | | |

* Standard cordsets are yellow PVC with black overmold. For black PVC and overmold, add suffix B to model number (example, CSB-M1280M1280B).

8-Pin Threaded M12/Euro-Style to USB Cordsets Double Ended

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut on Euro QD end
 Conductors: 28 AWG or 24 AWG, gold-plated contacts
 Voltage Rating: 60V ac/75V dc
 Temperature: -40° to +90° C

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------------------|--------|------------------|----------------|---|---|---|
| Straight Euro QD/USB | 0.15 m | MQDEC-8005-USB | 4.80 mm |  |  <p>USB</p> | <ul style="list-style-type: none"> iVu TG & BCR—Integrated Touch Screen models |
| | 0.30 m | MQDEC-801-USB | | | | |
| | 0.90 m | MQDEC-803-USB | | | | |
| | 3.00 m | MQDEC-810-USB | | | | |
| Right-Angle Euro QD/USB | 0.15 m | MQDEC-8005RA-USB | 4.80 mm |  |  <p>Male</p> | |
| | 0.30 m | MQDEC-801RA-USB | | | | |
| | 0.90 m | MQDEC-803RA-USB | | | | |
| | 3.00 m | MQDEC-810RA-USB | | | | |

8-Pin Threaded M12/Euro-Style to Molex Cordsets Double Ended

Cable: Euro: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut

Molex: Nylon (polyamide)/PUR (polyurethane)

Conductors: 24 AWG, gold-plated contacts

Voltage Rating: 30V ac/dc 2.0 A

Temperature: -40° to +105° C

Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------------------------|--------|----------------|----------------|-----------------|--|---|
| Straight Euro QD/ Molex | 0.91 m | IVURD-MX-803 | 6.10 mm | | <p>Molex</p> <p>Male</p> <p>1 = Orange 5 = Green 2 = Brown 6 = Blue 3 = Wh/Bn 7 = Wh/Or 4 = Wh/Bl 8 = Wh/Gn</p> | <ul style="list-style-type: none"> iVu RD35 remote display |
| | 1.83 m | IVURD-MX-806 | | | | |
| | 4.57 m | IVURD-MX-815 | | | | |
| | 9.14 m | IVURD-MX-830 | | | | |
| | 15.2 m | IVURD-MX-850 | | | | |
| Right-Angle Euro QD/ Molex | 0.91 m | IVURD-MX-803RA | 6.10 mm | | <p>Molex</p> <p>Male</p> <p>1 = Orange 5 = Green 2 = Brown 6 = Blue 3 = Wh/Bn 7 = Wh/Or 4 = Wh/Bl 8 = Wh/Gn</p> | <ul style="list-style-type: none"> iVu RD35 remote display |
| | 1.83 m | IVURD-MX-806RA | | | | |
| | 4.57 m | IVURD-MX-815RA | | | | |
| | 9.14 m | IVURD-MX-830RA | | | | |
| | 15.2 m | IVURD-MX-850RA | | | | |

8-Pin Threaded M12/Euro-Style QD to RD Cordsets

Cable: Euro: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut

RD: Nylon (polyamide)/PUR (polyurethane) RD connector

Conductors: 22 AWG, gold-plated contacts

Voltage/Current Rating: 60V ac/75V dc, 2.0 A

Temperature: 0° to +55° C

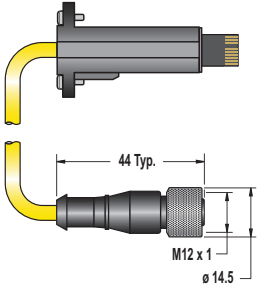
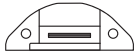
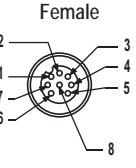
Environmental Rating: IP67

| Style | Length | Model* | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------------------|--------|-------------|----------------|-----------------|--|---|
| RD/ Male Straight | 0.31 m | DELPE-81D | 6.00 mm | | <p>RD</p> <p>Male</p> <p>1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet</p> | <ul style="list-style-type: none"> EZ-SCREEN LP w/RD (14 & 25 mm Resolution) <p>NOTE: Requires QDE-8...D, DEE2R-8..D, CSB-M128... or other M12/Euro QD cordset</p> |
| | 0.91 m | DELPE-83D | | | | |
| | 2.44 m | DELPE-88D | | | | |
| | 4.57 m | DELPE-815D | | | | |
| | 7.62 m | DELPE-825D | | | | |
| | 15.2 m | DELPE-850D | | | | |
| | 22.9 m | DELPE-875D | | | | |
| | 30.5 m | DELPE-8100D | | | | |

* Standard cordsets are yellow PVC with black overmold. For black PVC cable and overmold, add suffix B to model number (example, DELPE-81DB).

8-Pin Threaded M12/Euro-Style QD to RD Cordsets

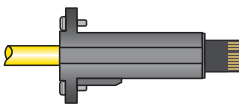

Cable: Euro: PVC jacket, PVC connector body, nickel-plated brass coupling nut
 RD: Nylon (polyamide)/PUR (polyurethane) RD connector
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: 0° to +55° C Environmental Rating: IP67

| Style | Length | Model* | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|---------------------------|--------|-------------|----------------|---|---|---|
| RD/ Female Straight | 0.31 m | DELPEF-81D | 6.00 mm |  |  RD  Female 1 = Brown 5 = Black 2 = Or/Bk 6 = Blue 3 = Orange 7 = Gn/Ye 4 = White 8 = Violet | • EZ-SCREEN LP (Cascade) w/RD (14 & 25 mm); requires QDE2R4-8...D cordset or connection of E-stop or other hard/relay contact; for connection to DEE2R-8..D or to EZ-SCREEN LP w/8-pin QD |
| | 0.91 m | DELPEF-83D | | | | |
| | 2.44 m | DELPEF-88D | | | | |
| | 4.57 m | DELPEF-815D | | | | |

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RD to Flying Lead Cordsets

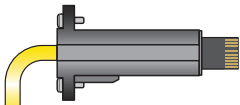

Cable: PVC jacket, nylon (polyamide)/PUR (polyurethane) RD connector
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: 0° to +55° C Environmental Rating: IP67

| Style | Length | Model* | | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------|--------|------------|-------------|----------------|---|---|---|
| | | 8 wire | 4 wire† | | | | |
| RD | 4.57 m | RDLP-815D | RDLP6G-415D | 6.00 mm |  |  RD | • EZ-SCREEN LP w/RD (14 & 25 mm Resolution) |
| | 7.62 m | RDLP-825D | RDLP6G-425D | | | | |
| | 15.2 m | RDLP-850D | RDLP6G-450D | | | | |
| | 22.9 m | RDLP-875D | — | | | | |
| | 30.5 m | RDLP-8100D | — | | | | |

† For connection of E-Stop or other hard/relay contacts. See EZ-SCREEN installation manual p/n 140044 for more information.

RD to RD Cordsets

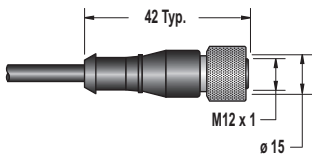
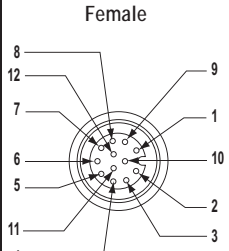
Cable: PVC jacket, nylon (polyamide)/PUR (polyurethane) RD connector
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/75V dc, 2.0 A
 Temperature: 0° to +55° C Environmental Rating: IP67

| Style | Length | Model* | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------|--------|-------------|----------------|---|---|---|
| RD/RD | 0.05 m | DELP-110E | 6.00 mm |  |  RD | • EZ-SCREEN LP w/RD Cascading (14 & 25 mm Resolution) |
| | 0.30 m | DELP-111E | | | | |
| | 0.91 m | DELP-113E | | | | |
| | 2.44 m | DELP-118E | | | | |
| | 4.57 m | DELP-1115E | | | | |
| | 7.62 m | DELP-1125E | | | | |
| | 15.2 m | DELP-1150E | | | | |
| | 22.9 m | DELP-1175E | | | | |
| | 30.5 m | DELP-11100E | | | | |

* Standard cordsets are yellow PVC with black overmold. For black PVC cable and overmold, add suffix B to model number (example, DELP-110EB).

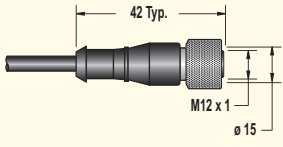
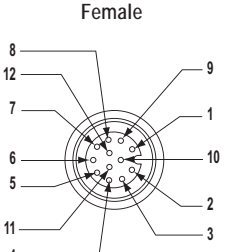
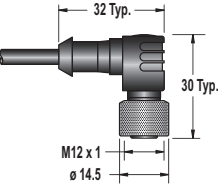
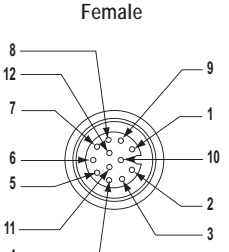
12-Pin M12/Euro-Style Cordsets with Open Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 20 and 24 AWG, gold-plated contacts
 Voltage Rating: 250V ac/300V dc
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|-------------|----------------|--|---|---|
| Straight | 1.83 m | MQDC2S-1206 | 7.50 mm |  | <p>Female</p>  <p>1 = White 7 = Blue 2 = Brown 8 = Red 3 = Green 9 = Orange 4 = Yellow 10 = Lt. Blue 5 = Gray 11 = Black 6 = Pink 12 = Violet</p> | <ul style="list-style-type: none"> • IP68 Sealed P4 • iVu BCR—Integrated Touch Screen models • iVu Plus <p>(For CE compliance)</p> |
| | 4.57 m | MQDC2S-1215 | | | | |
| | 9.14 m | MQDC2S-1230 | | | | |
| | 15.2 m | MQDC2S-1250 | | | | |
| | 22.9 m | MQDC2S-1275 | | | | |

12-Pin M12/Euro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 24, 20 AWG, gold-plated contacts
 Voltage Rating: 300V ac/dc, 2.0, 7.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|-------------|----------------|--|---|---|
| Straight | 1.83 m | iVUC-1206 | 7.50 mm |  | <p>Female</p>  <p>1 = White 7 = Blue 2 = Brown 8 = Red 3 = Green 9 = Orange 4 = Yellow 10 = Lt. Blue 5 = Gray 11 = Black 6 = Pink 12 = Violet</p> | <ul style="list-style-type: none"> • iVu TG—BCR Remote Touch Screen models • iVu BCR—Integrated Touch Screen models • iVu Plus |
| | 4.57 m | iVUC-1215 | | | | |
| | 9.14 m | iVUC-1230 | | | | |
| | 15.2 m | iVUC-1250 | | | | |
| | 22.9 m | iVUC-1275 | | | | |
| Right-Angle | 1.83 m | iVUC-1206RA | 7.50 mm |  | <p>Female</p>  <p>1 = White 7 = Blue 2 = Brown 8 = Red 3 = Green 9 = Orange 4 = Yellow 10 = Lt. Blue 5 = Gray 11 = Black 6 = Pink 12 = Violet</p> | <ul style="list-style-type: none"> • iVu TG—BCR Remote Touch Screen models • iVu BCR—Integrated Touch Screen models • iVu Plus |
| | 4.57 m | iVUC-1215RA | | | | |
| | 9.14 m | iVUC-1230RA | | | | |
| | 15.2 m | iVUC-1250RA | | | | |
| | 22.9 m | iVUC-1275RA | | | | |

12-Pin Threaded M12/Euro-Style QD to DB15 Cordsets

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With | |
|------------------------------|--------|------------|----------------|-----------------|--------|--|---|
| Straight (High Flex)/DB15 | 1.83 m | PPC06SHF | 7.60 mm | | | <p>Female</p> <p>1 = Blue 7 = Not Used 2 = Violet 8 = Pink 3 = Green 9 = Gray 4 = Red 10 = Brown 5 = White 11 = Yellow 6 = Black 12 = Drain</p> <p>Male</p> | <ul style="list-style-type: none"> • Pro • Mini Pro • Sealed Pro |
| | 3.96 m | PPC13SHF | | | | | |
| | 7.01 m | PPC23SHF | | | | | |
| | 9.75 m | PPC32SHF | | | | | |
| Right-Angle (High Flex)/DB15 | 1.83 m | PPC06SRAHF | 7.60 mm | | | <p>Female</p> <p>1 = Blue 7 = Not Used 2 = Violet 8 = Pink 3 = Green 9 = Gray 4 = Red 10 = Brown 5 = White 11 = Yellow 6 = Black 12 = Drain</p> <p>Male</p> | <ul style="list-style-type: none"> • Pro • Mini Pro • Sealed Pro |
| | 3.96 m | PPC13SRAHF | | | | | |
| | 7.01 m | PPC23SRAHF | | | | | |
| | 9.75 m | PPC32SRAHF | | | | | |

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference

12-Pin M16 Cordsets

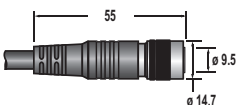
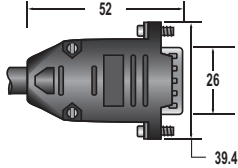
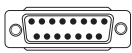
Cable: PVC jacket, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 60V ac/dc, 4.0 A
 Temperature: 40° to +80° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|-------------|----------------|-----------------|--|---|
| Straight | 3.05 m | MQDC-1210ST | 7.60 mm | | <p>Female</p> <p>1 = White 7 = Red 2 = Brown 8 = Black 3 = Green 9 = Violet 4 = Yellow 10 = Gy/Pk 5 = Gray 11 = Rd/Bu 6 = Pink 12 = Blue</p> | <ul style="list-style-type: none"> • LT7 |
| | 9.14 m | MQDC-1230ST | | | | |
| | 24.4 m | MQDC-1280ST | | | | |

12-Pin QD Cordsets

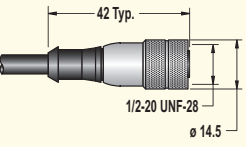

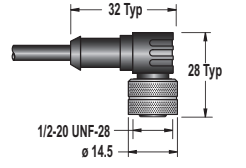

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|--------|----------------|-----------------|---|---|
| Straight | 1.83 m | P4C06 | 7.70 mm | | <p>Female</p> <p>1 = Yellow 7 = White 2 = Gray 8 = Lt. Blue 3 = Orange 9 = Violet 4 = Pink 10 = Green 5 = Black 11 = Blue 6 = Red 12 = Brown</p> <p>Shield = Bare Metal</p> | <ul style="list-style-type: none"> • P4 • PPSIM with terminal strip to P4 |
| | 7.01 m | P4C23 | | | | |
| | 9.75 m | P4C32 | | | | |
| | 15.2 m | P4C50 | | | | |
| | 22.9 m | P4C75 | | | | |
| | 34.0 m | P4C110 | | | | |

12-Pin QD to DB15 Cordsets

| Style | Length | Model | Cable Diameter | Dimensions (mm) | | Pinout | Used With |
|-------------------|--------|----------|----------------|---|--|---|---------------|
| Straight/ DB15 | 2.00 m | P4C06SIM | 6.9 mm |  |  | Female | • P4 to PPSIM |
| | 7.00 m | P4C23SIM | | | | Male | |
| | 10.0 m | P4C32SIM | | | |  | |

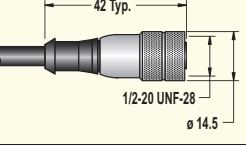

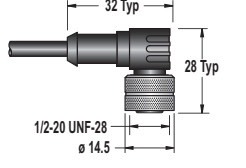

3-Pin Micro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40 to +80° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|------------|----------------|--|---|-----------------------------------|
| Straight | 1.83 m | MQDC-306 | 5.20 mm |  | Female  1 = Green 2 = Red/Black 3 = Red/White | • MINI-BEAM ac SM2A312 sensors |
| | 4.57 m | MQDC-315 | | | | |
| | 9.14 m | MQDC-330 | | | | |
| Right-Angle | 1.83 m | MQDC-306RA | 5.20 mm |  | Female  1 = Green 2 = Red/Black 3 = Red/White | • MINI-BEAM ac SM2A312 sensors |
| | 4.57 m | MQDC-315RA | | | | |
| | 9.14 m | MQDC-330RA | | | | |

4-Pin Micro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|------------|----------------|--|---|---|
| Straight | 1.83 m | MQAC-406 | 5.70 mm |  | Female  1 = Red/Black 2 = Red/White 3 = Red 4 = Green | • QS18 ac/dc sensors • Q45 ac series (suffix Q1) • S18, M18, T18, Q25, S30, T30 & Q40 ac sensors (suffix Q1) • Q60 |
| | 4.57 m | MQAC-415 | | | | |
| | 9.14 m | MQAC-430 | | | | |
| Right-Angle | 1.83 m | MQAC-406RA | 5.70 mm |  | Female  1 = Red/Black 2 = Red/White 3 = Red 4 = Green | • QS18 ac/dc sensors • Q45 ac series (suffix Q1) • S18, M18, T18, Q25, S30, T30 & Q40 ac sensors (suffix Q1) • Q60 |
| | 5.00 m | MQAC-415RA | | | | |
| | 9.14 m | MQAC-430RA | | | | |

4-Pin Micro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage Rating: 125V ac/150V dc
 Temperature: -40° to +80° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|-------------|----------------|-----------------|---|--|
| Straight | 1.83 m | MQEAC-406 | 5.7 mm | | <p>Female</p> <p>1 = Red/Black 2 = Red/White 3 = Red 4 = Green</p> | <ul style="list-style-type: none"> • SI-HG80 hinge-style switches |
| | 4.57 m | MQEAC-415 | | | | |
| | 9.14 m | MQEAC-430 | | | | |
| Right-Angle | 1.83 m | MQEAC-406RA | 5.70 mm | | <p>Female</p> <p>1 = Red/Black 2 = Red/White 3 = Red 4 = Green</p> | <ul style="list-style-type: none"> • SI-HG80 hinge-style switches |
| | 4.57 m | MQEAC-415RA | | | | |
| | 9.14 m | MQEAC-430RA | | | | |

5-Pin Micro-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG with 22 AWG drain wire (shielded), gold-plated contacts
 Voltage/Current Rating: 250V ac/dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|--------------|----------------|-----------------|--|---|
| Straight | 1.83 m | MQVR3S-506 | 6.10 mm | | <p>Female</p> <p>1 = Brown 2 = White 3 = Yellow 4 = Black 5 = Blue</p> | <ul style="list-style-type: none"> • QT50U ac/dc sensors • EZ-LIGHT ac indicators |
| | 4.57 m | MQVR3S-515 | | | | |
| | 9.14 m | MQVR3S-530 | | | | |
| Right-Angle | 1.83 m | MQVR3S-506RA | 6.10 mm | | <p>Female</p> <p>1 = Brown 2 = White 3 = Yellow 4 = Black 5 = Blue</p> | <ul style="list-style-type: none"> • QT50U ac/dc sensors • EZ-LIGHT ac indicators |
| | 4.57 m | MQVR3S-515RA | | | | |
| | 9.14 m | MQVR3S-530RA | | | | |

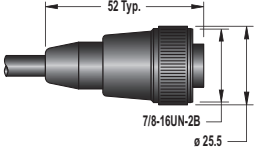
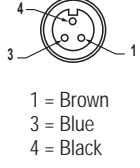
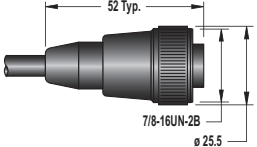
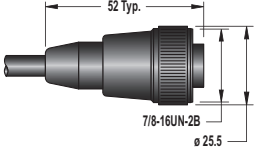
6-Pin Micro-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 22 AWG, gold-plated contacts
 Voltage/Current Rating: 125V ac, 4.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-------------|--------|-------------|----------------|-----------------|---|--|
| Straight | 1.83 m | MQEAC-606 | 5.60 mm | | <p>Female</p> <p>1 = Red/White 2 = Red 3 = Green 4 = Red/Yellow 5 = Red/Black 6 = Red/Blue</p> | <ul style="list-style-type: none"> • SI-HG63 hinge-style switches |
| | 4.57 m | MQEAC-615 | | | | |
| | 9.14 m | MQEAC-630 | | | | |
| Right-Angle | 1.83 m | MQEAC-606RA | 5.60 mm | | <p>Female</p> <p>1 = Red/White 2 = Red 3 = Green 4 = Red/Yellow 5 = Red/Black 6 = Red/Blue</p> | <ul style="list-style-type: none"> • SI-HG63 hinge-style switches |
| | 4.57 m | MQEAC-615RA | | | | |
| | 9.14 m | MQEAC-630RA | | | | |

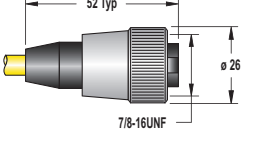
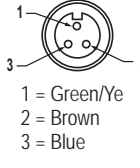
3-Pin Mini-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
 Conductors: 18 AWG, PVC insulation, gold-plated contacts
 Voltage/Current Rating: 300V ac/dc, 9.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With | | | | |
|----------|--------|------------|----------------|--|--|---|---|--|---|--|
| Straight | 1.83 m | MBCC-306 | 7.00 mm |  | Female  1 = Brown 3 = Blue 4 = Black | <ul style="list-style-type: none"> • Q45 • SM30 Intrinsically safe dc sensors | | | | |
| | 3.66 m | MBCC-312 | | | | | | | | |
| | 9.14 m | MBCC-330 | | | | | | | | |
| Straight | 1.83 m | SMICC-306 | | | 7.00 mm |  | 1 = Red/Black 3 = Red/White 4 = Green | <ul style="list-style-type: none"> • SM30 2-wire ac sensors | | |
| | 3.66 m | SMICC-312 | | | | | | | | |
| | 9.14 m | SMICC-330 | | | | | | | | |
| Straight | 1.83 m | SM30CC-306 | | | | | 7.00 mm |  | 1 = Red/Black 3 = Red/White 4 = Green | <ul style="list-style-type: none"> • SM30 2-wire ac sensors |
| | 3.66 m | SM30CC-312 | | | | | | | | |

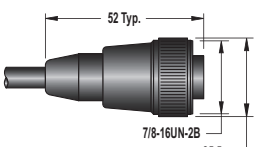
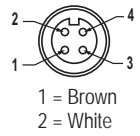
3-Pin Mini-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 18 AWG, PVC insulation, gold-plated contacts
 Voltage Rating: 250V ac/300 dc
 Temperature: -40° to +80° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|-----------|----------------|--|---|--|
| Straight | 4.75 m | QDS-315C | 7.00 mm |  | Female  1 = Green/Ye 2 = Brown 3 = Blue | <ul style="list-style-type: none"> • EZ-SCREEN Emitters w/3-pin QD (Point & Grid) |
| | 7.62 m | QDS-325C | | | | |
| | 15.2 m | QDS-350C | | | | |
| | 22.9 m | QDS-375C | | | | |
| | 30.5 m | QDS-3100C | | | | |

4-Pin Mini-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
 Conductors: 18 AWG, gold-plated contacts
 Voltage/Current Rating: 300V ac/dc, 9.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|----------|----------------|--|---|--|
| Straight | 1.83 m | MBCC-406 | 7.00 mm |  | Female  1 = Brown 2 = White 3 = Blue 4 = Black | <ul style="list-style-type: none"> • Q45 dc sensors (suffix Q) • OMNI-BEAM dc power blocks • SM30 dc sensors • OTB w/solid-state output • STB with solid-state output |
| | 3.66 m | MBCC-412 | | | | |
| | 9.14 m | MBCC-430 | | | | |

5-Pin Mini-Style Cordsets

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
 Conductors: 18 AWG, gold-plated contacts
 Voltage/Current Rating: 300V ac/dc, 9.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|----------|----------------|-----------------|--|--|
| Straight | 1.83 m | MBCC-506 | 7.00 mm | | <p>Female</p> <p>1 = Black 2 = Blue 3 = Yellow 4 = Brown 5 = White</p> | <ul style="list-style-type: none"> • Q45 Laser Retro • OMNI-BEAM ac power blocks • OMNI-BEAM dc w/ e/m relay • OTB & LTB w/SPDT relay • Q45 5-wire ac • STB with e/m relay |
| | 3.66 m | MBCC-512 | | | | |
| | 9.14 m | MBCC-530 | | | | |

5-Pin Mini-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut
 Conductors: 22 AWG (shielded), PVC insulation, gold-plated contacts
 Voltage/Current Rating: 300V ac/dc, 9.0 A
 Temperature: -40° to +80° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|-----------|----------------|-----------------|--|--|
| Straight | 1.83 m | MBCC2-506 | 6.10 mm | | <p>Female</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Yellow</p> | <ul style="list-style-type: none"> • QT50U • Q45U • Q45UR |
| | 3.66 m | MBCC2-512 | | | | |
| | 9.14 m | MBCC2-530 | | | | |

5-Pin Mini-Style Cordsets with Green/Yellow Grounding Wire

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut
 Conductors: 20 AWG, gold-plated contacts
 Voltage/Current Rating: 250V ac/300V dc, 9.0 A
 Temperature: -40° to +90° C Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|----------|----------------|-----------------|---|--|
| Straight | 4.75 m | QDS-515C | 7.00 mm | | <p>Female</p> <p>1 = Black 2 = Blue 3 = Gn/Ye 4 = Brown 5 = White</p> | <ul style="list-style-type: none"> • EZ-SCREEN Receivers w/5-pin QD & TEST (Point & Grid) |
| | 7.62 m | QDS-525C | | | | |
| | 15.2 m | QDS-550C | | | | |

5-Pin Mini-Style Cordsets with Shield and "Twisted Pair"

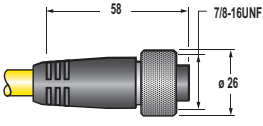
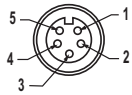
Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut

Conductors: 20 AWG (shielded), PVC insulation, gold-plated contacts

Voltage Rating: 250V ac/300V dc

Temperature: -40° to +90° C

Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|-------------|-------------|----------------|---|---|--|
| Straight | 4.57 m | QDC-515C | 7.00 mm |  | <p>Female</p>  <p>1 = Black 2 = Blue 3 = Drain 4 = Brown 5 = White</p> | <ul style="list-style-type: none"> • MINI-ARRAY • High-Resolution MINI-ARRAY |
| | 7.62 m | QDC-525C | | | | |
| | 15.2 m | QDC-550C | | | | |
| | 22.9 m | MAQDC-575C | | | | |
| | 30.5 m | MAQDC-5100C | | | | |
| | 38.1 m | MAQDC-5125C | | | | |
| 45.7 m | MAQDC-5150C | | | | | |

8-Pin Mini-Style Cordsets

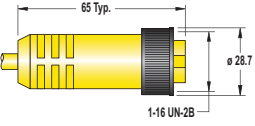
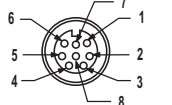
Cable: PVC jacket, PUR (polyurethane) connector body, nylon coupling nut

Conductors: 20 AWG, PVC insulation, gold-plated contacts

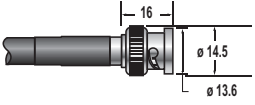

Voltage Rating: 250V ac/300V dc

Temperature: -40° to +80° C

Environmental Rating: IP67

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------|--------|----------|----------------|---|---|---|
| Straight | 4.51 m | QDS-815C | 6.90 mm |  | <p>Female</p>  <p>1 = Brown 2 = Or/Bk 3 = Orange 4 = White 5 = Black 6 = Blue 7 = Gn/Ye 8 = Violet</p> | <ul style="list-style-type: none"> • EZ-SCREEN Receivers w/8-pin QD (Point & Grid) • DUO-TOUCH SG Run Bar |
| | 7.62 m | QDS-825C | | | | |
| | 15.2 m | QDS-850C | | | | |
| | 22.9 m | QDS-875C | | | | |

BNC Coaxial Video Cordsets

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|------------------------|--------|-------|----------------|---|---|---|
| Video Coaxial with BNC | 1.83 m | BNC06 | 6.00 mm |  | <p>Male</p>  | <ul style="list-style-type: none"> • Pro • P4 |
| | 4.57 m | BNC15 | | | | |
| | 9.14 m | BNC30 | | | | |
| | 14.6 m | BNC48 | | | | |

BNC to 4-Pin Threaded M8/Pico-Style Cordsets with Shield

Cable: PVC jacket, PUR (polyurethane) connector body, nickel-plated brass coupling nut on QD end
 Conductors: 26 AWG
 Voltage/Current Rating: 125V ac/125V dc, 4.0 A
 Temperature: -40° to +105° C Environmental Rating: IP67

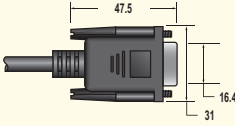
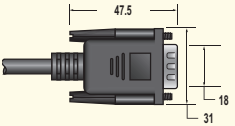
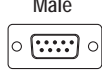
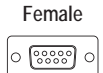
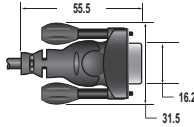
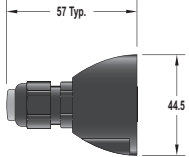
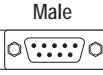

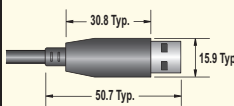
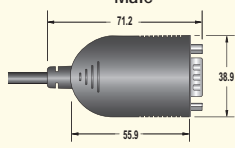
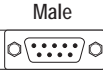

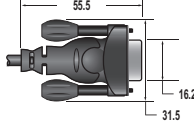
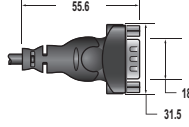
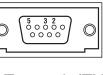
| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|-----------------------------|--------|------------|----------------|-----------------|--|------------------|
| BNC/ Pico QD Straight | 2.00 m | PKG4M-2/CS | 4.40 mm | | <p>Female</p> <p>1 = Brown 3 = Blue 2 = Not Used 4 = Drain</p> <p>Male</p> | • IP68 Sealed P4 |
| | 5.00 m | PKG4M-5/CS | | | | |
| | 9.00 m | PKG4M-9/CS | | | | |

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference

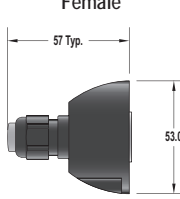
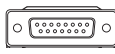
Communication Cordsets

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|--|--------|-------------|----------------|-----------------|---|---|
| 5-Pin M12/ Euro-Style, Straight | 1.83 m | MQDMC-506 | 5.60 mm | | <p>Male</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p> | • EZ-ARRAY to INTUSB485-1 USB Serial Adapter |
| | 4.57 m | MQDMC-515 | | | | |
| | 9.14 m | MQDMC-530 | | | | |
| 5-Pin M12/ Euro-Style, Right-Angle | 1.83 m | MQDMC-506RA | 5.60 mm | | <p>Male</p> <p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray</p> | • EZ-ARRAY to INTUSB485-1 USB Serial Adapter |
| | 4.57 m | MQDMC-515RA | | | | |
| | 9.14 m | MQDMC-530RA | | | | |

DB9 Communication Cordsets

| Style | Length | Model | Cable Diameter | Dimensions (mm) | | Pinout | Used With |
|-------------------------|--------|---------------|----------------|--|--|--|---|
| Male DB9/ Female DB9 | 1.83 m | DB9P06 | 6.00 mm | Female  Male  | | Male  Female  | • Pro |
| | 4.57 m | DB9P15 | | | | | |
| | 9.14 m | DB9P30 | | | | | |
| Male DB9/ Female DB9 | 3.00 m | AG4-PCD9-3 | 5.00 mm | Female  Male  | | Male  USB  | • AG4 |
| | 5.00 m | AG4-PCD9-5 | | | | | |
| | 10.0 m | AG4-PCD9-10 | | | | | |
| Male DB9/USB | 1.00 m | AG4-PCD9USB-1 | 4.6 mm | Female  Male  | | Male  USB  | • AG4 Serial-to USB Adapter |
| Male DB9/ Female DB9 | 2.00 m | MASC | 5.00 mm | Female  Male  | | Female  2 = Transmit (TX) 3 = Receive (RX) 5 = Ground (GRD) | • MINI-ARRAY • High-Resolution MINI-ARRAY |

DB15 Configuration/Machine Interface Cordsets

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With | |
|-------|--------|--------------|----------------|---|--------|--|-------|
| DB15 | 5.00 m | AG4-CPD15-5 | 8.50 mm | Female  | | Female  | • AG4 |
| | 10.0 m | AG4-CPD15-10 | | | | | |
| | 25.0 m | AG4-CPD15-25 | | | | | |
| | 50.0 m | AG4-CPD15-50 | | | | | |

RJ45 Ethernet Cordsets

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|--------------------------|--------|--------|----------------|-----------------|-------------|--|
| Cat5e Shielded | 2.13 m | STP07 | 6.80 mm | | <p>Male</p> | <ul style="list-style-type: none"> • Pro • P4 • SC22-3E |
| Cat5e Crossover Shielded | | STPX07 | | | | |
| Cat5e Shielded | 7.62 m | STP25 | | | | |
| Cat5e Crossover Shielded | | STPX25 | | | | |
| Cat5e Shielded | 15.2 m | STP50 | | | | |
| Cat5e Crossover Shielded | | STPX50 | | | | |
| Cat5e Shielded | 22.9 m | STP75 | | | | |
| Cat5e Crossover Shielded | | STPX75 | | | | |

- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference

RJ45 Ethernet to 4-Pin Threaded M8/Pico-Style Cordsets

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------------|--------|------------|----------------|-----------------|--|--|
| Cat5e Shielded | 2.00 m | IVUC-E-406 | 6.00 mm | | <p>Male</p> | <ul style="list-style-type: none"> • iVu Plus |
| | 5.00 m | IVUC-E-415 | | | | |
| | 9.00 m | IVUC-E-430 | | | | |
| | 16.0 m | IVUC-E-450 | | | | |
| | 23.0 m | IVUC-E-475 | | | | |
| | | | | | <p>Female</p> <p>1 = Blue 2 = White/Blue 3 = White/Orange 4 = Orange</p> | |

RJ45 Ethernet to 8-Pin Threaded M12/Euro-Style Cordsets

| Style | Length | Model | Cable Diameter | Dimensions (mm) | Pinout | Used With |
|----------------|--------|---------------|----------------|-----------------|--|--|
| Cat5e Shielded | 1.83 m | STP-MAQDC-806 | 7.90 mm | | <p>Male</p> | <ul style="list-style-type: none"> • IP68 Sealed P4 |
| | 4.57 m | STP-MAQDC-815 | | | | |
| | 9.14 m | STP-MAQDC-830 | | | | |
| | | | | | <p>Male</p> <p>1 = Wh/Bl 5 = Wh/Gr 2 = Wh/Br 6 = Wh/Or 3 = Brown 7 = Blue 4 = Orange 8 = Green</p> | |

QD End-Caps

Replace or convert EZ-SCREEN Grid and Point hard-wire terminal chamber end cap to QD model.

| Style | Model | Dimensions | Used With |
|---------------|-----------|---|---|
| 3-pin Mini QD | EZA-QDE-3 | Converts terminal chamber end cap to QD model | • EZ-SCREEN Emitters w/Terminal Chamber (Point & Grid) |
| 5-pin Mini QD | EZA-QDE-5 | | • EZ-SCREEN Emitters w/Terminal Chamber & TEST (Point & Grid) |
| 8-pin Mini QD | EZA-QDR-8 | | • EZ-SCREEN Receivers w/Terminal Chamber (Point & Grid) |

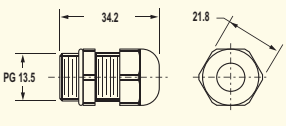
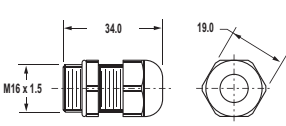
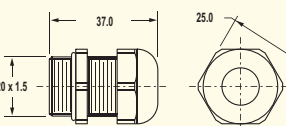
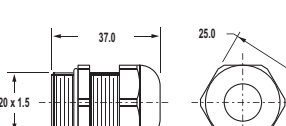
Unterminated Bulk Cable

Cable: PVC jacket
 Conductors: 20 AWG, PVC insulation
 Voltage Rating: 250V ac/300V dc
 Temperature: -40° to +80° C

| Length | Models | Dimensions | Used With |
|--------|-----------|--|--|
| 7.6 m | UTB-325C | 3-conductor (Brown, Blue, Green/Yellow) | • EZ-SCREEN Emitters w/Terminal Chamber (Point & Grid) • AC Interface Boxes |
| 15.2 m | UTB-350C | | |
| 30.4 m | UTB-3100C | | |
| 76.2 m | UTB-3250C | | |
| 7.6 m | UTB-525C | 5-conductor (Black, Blue, Brown, White, Green/Yellow) | • EZ-SCREEN Emitters w/Terminal Chamber & TEST (Point & Grid) • AC Interface Boxes |
| 15.2 m | UTB-550C | | |
| 30.4 m | UTB-5100C | | |
| 76.2 m | UTB-5250C | | |
| 7.6 m | UTB-825C | 8-conductor (Brown, Orange/Black, Orange, White, Black, Blue, Violet, Green/Yellow) | • EZ-SCREEN Receivers w/Terminal Chamber (Point & Grid) • AC Interface Boxes • DUO-TOUCH SG Run Bars |
| 15.2 m | UTB-850C | | |
| 30.4 m | UTB-8100C | | |
| 76.2 m | UTB-8250C | | |

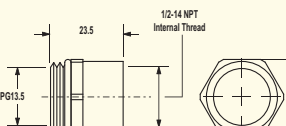
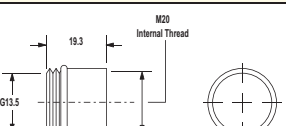
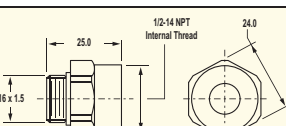
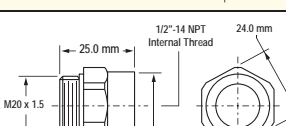
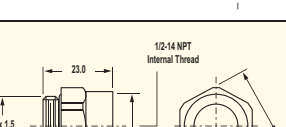
Cable Glands

- Secures the cable end in the housing and seals the point of connection.
- Available for EZ-SCREEN Point and Grid, rope pulls and safety interlock switches.

| Model | Size | For Cable Diameter | Dimensions | Used With |
|-------------|-------------------|--------------------|---|--|
| SI-QS-CG13 | PG13.5 Plastic | 3.0 to 8.0 mm |  | <ul style="list-style-type: none"> • EZ-SCREEN w/Terminal Chamber (Point & Grid) |
| SI-QS-CGM16 | M16 x 1.5 Plastic | 3.0 to 8.0 mm |  | <ul style="list-style-type: none"> • SI-QS75 Safety Interlock Switches • SI-LS83 Safety Interlock Switches |
| SI-QS-CGM20 | M20 x 1.5 Plastic | 5.0 to 12.0 mm |  | <ul style="list-style-type: none"> • SI-QS90 Safety Interlock Switches • SI-LS100 Safety Interlock Switches • SI-LS31 Safety Interlock Switches • SI-LS42 Safety Interlock Switches • RP-LS42 Rope Pull Switches |
| SI-QM-CGM20 | M20 x 1.5 Metal | 5.0 to 12.0 mm |  | <ul style="list-style-type: none"> • SI-LM40 Safety Interlock Switches • SI-QM100 Safety Interlock Switches • SI-LM40 Safety Interlock Switches • RP-RM83 Rope Pull Switches • RP-LM40 Rope Pull Switches • RP-QM72/QMT72 Rope Pull Switches • RP-QM90 Rope Pull Switch |

Conduit Adapters

- Connects conduit of different diameters.
- Available for EZ-SCREEN Point and Grid, rope pulls and safety interlock switches.

| Model | Size | Thread Conversion | Dimensions | Used With |
|--------------|--------------------------|----------------------------|---|--|
| SI-QM-13 | 1/2" NPT to PG13.5 Metal | PG 13.5 to 1/2" NPT |  | <ul style="list-style-type: none"> • EZ-SCREEN w/Terminal Chamber (Point & Grid) |
| SI-QM-13-M20 | M20 to PG13.5 Metal | PG 13.5 to M20 |  | <ul style="list-style-type: none"> • EZ-SCREEN w/Terminal Chamber (Point & Grid) |
| SI-QS-M16 | 1/2" - 14 NPT Plastic | M16 x 1.5 to 1/2" - 14 NPT |  | <ul style="list-style-type: none"> • SI-QS75 Safety Interlock Switches • SI-LS83 Safety Interlock Switches |
| SI-QS-M20 | 1/2" - 14 NPT Plastic | M20 x 1.5 to 1/2" - 14 NPT |  | <ul style="list-style-type: none"> • SI-QS90 Safety Interlock Switches • SI-LS100 Safety Interlock Switches • SI-LS31 Safety Interlock Switches • SI-LS42 Safety Interlock Switches • RP-LS42 Rope Pull Switches |
| SI-QM-M20 | 1/2" - 14 NPT Metal | M20 x 1.5 to 1/2" - 14 NPT |  | <ul style="list-style-type: none"> • SI-LM40 Safety Interlock Switches • SI-QM100 Safety Interlock Switches • SI-LM40 Safety Interlock Switches • RP-RM83 Rope Pull Switches • RP-LM40 Rope Pull Switches • RP-QM72/QMT72 Rope Pull Switches • RP-QM90 Rope Pull Switch |

Accessories

Brackets

Cordsets

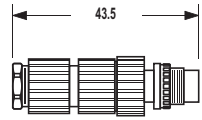
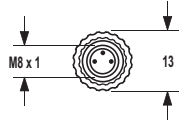
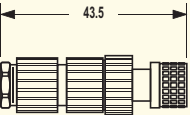
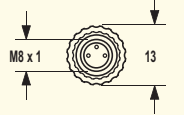
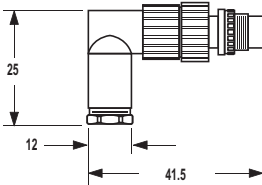
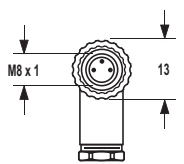
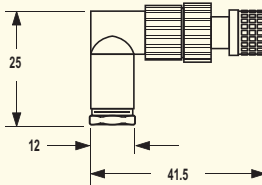
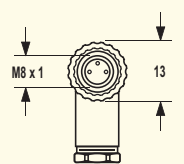
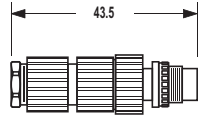
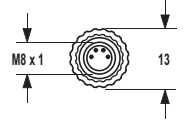
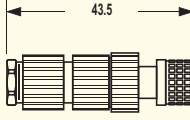

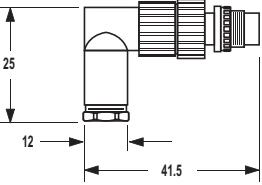
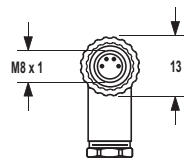
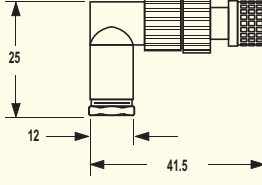
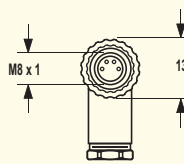
Retroreflectors

Miscellaneous

Reference

Pico-Style Field-Wireable Connectors (M8)

Contacts: Gold-plated, rated 60V ac/dc max., 4.0 A max.
 Cable Diameter: 4.0 to 5.0 mm
 Temperature: -25° to +70° C
 Environmental Rating: NEMA 6P, IP67

| Style | Model | Dimensions | Pinout |
|--------------------------------|-----------|--|---|
| 3-Pin Male Straight | FIC-M8M3 |  |  |
| 3-Pin Female Straight | FIC-M8F3 |  |  |
| 3-Pin Male Right-Angle | FIC-M8M3A |  |  |
| 3-Pin Female Right-Angle | FIC-M8F3A |  |  |
| 4-Pin Male Straight | FIC-M8M4 |  |  |
| 4-Pin Female Straight | FIC-M8F4 |  |  |
| 4-Pin Male Right-Angle | FIC-M8M4A |  |  |
| 4-Pin Female Right-Angle | FIC-M8F4A |  |  |

Euro-Style Field-Wireable Connectors (M12)

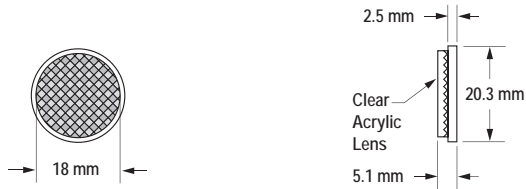
Contacts: Gold-plated; 4-pin models rated 250V ac/dc max., 4.0 A max.; 5-pin models rated 50V ac/dc max., 4.0 A max.
 Cable Diameter: 4.0 to 5.0 mm
 Temperature: -25° to +90° C
 Environmental Rating: NEMA 6P, IP67

| Style | Model | Dimensions | Pinout |
|--------------------------|------------|------------|--------|
| 4-Pin Male Straight | FIC-M12M4 | | |
| 4-Pin Female Straight | FIC-M12F4 | | |
| 4-Pin Male Right-Angle | FIC-M12M4A | | |
| 4-Pin Female Right-Angle | FIC-M12F4A | | |
| 5-Pin Male Straight | FIC-M12M5 | | |
| 5-Pin Female Straight | FIC-M12F5 | | |
| 5-Pin Male Right-Angle | FIC-M12M5A | | |
| 5-Pin Female Right-Angle | FIC-M12F5A | | |

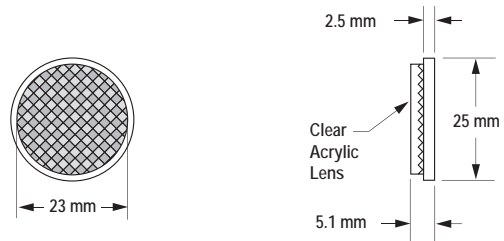
- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference

BRT-6

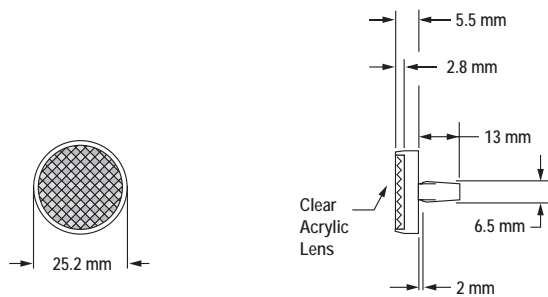
Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C

**BRT-1**

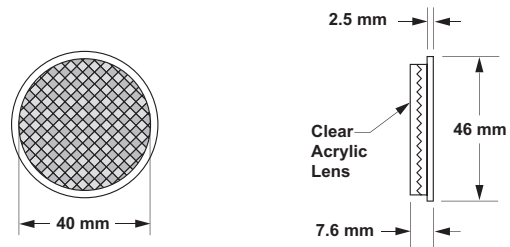
Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C

**BRT-25R**

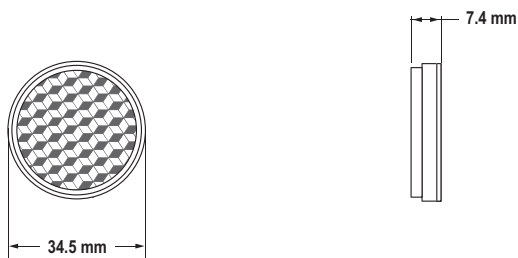
Description: Round, rivet-secured acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C

**BRT-1.5**

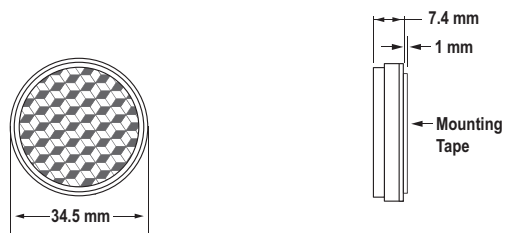
Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C

**BRT-34**

Description: Round, acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C

**BRT-34T**

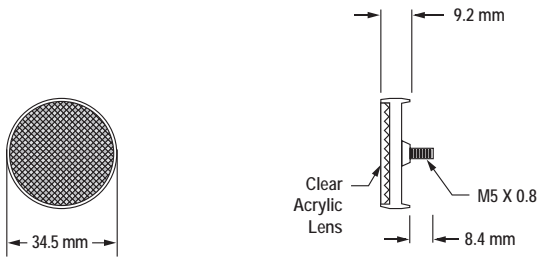
Description: Round, acrylic target includes mounting tape
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C



More
on next
page

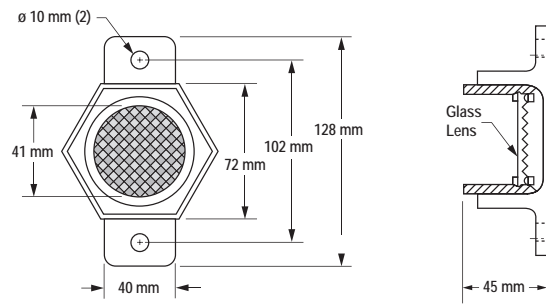
BRT-35DM

Description: Round, acrylic target with mounting stud
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



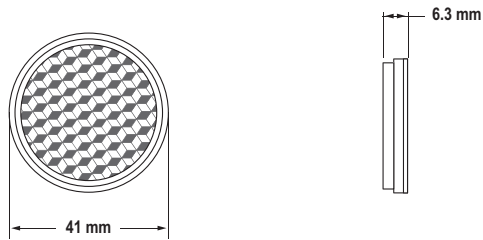
BRT-41AHT

Description: Round, borosilicate (Pyrex type) glass target
 Reflectivity Factor: 1.0
 Temperature: -20° to +200° C



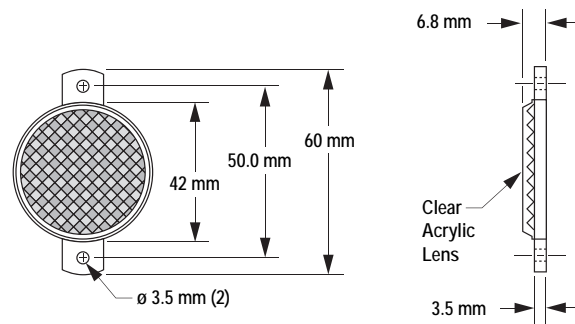
BRT-42

Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: 65° C



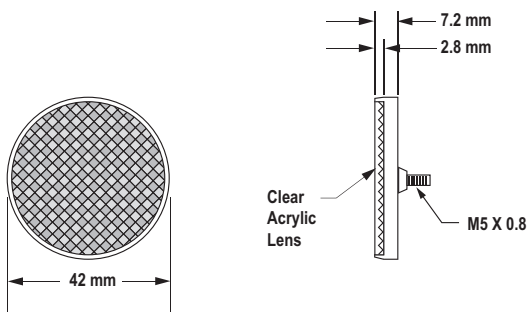
BRT-42A

Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C



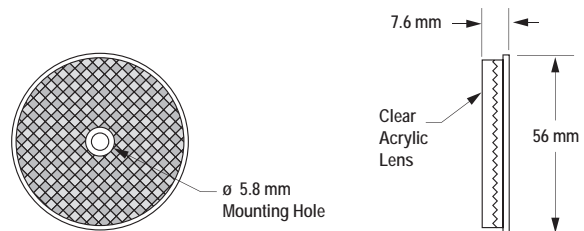
BRT-42D

Description: Round, acrylic target with mounting stud
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C



BRT-2A

Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: 65° C



BRT-50
 Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C

7.2 mm
 2.8 mm
 Clear Acrylic Lens
 50.8 mm

BRT-50D
 Description: Round, acrylic target with mounting stud
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 620.

10.2 mm
 2.8 mm
 Clear Acrylic Lens
 10 mm
 M5 X 0.8
 50.8 mm

BRT-50R
 Description: Round, rivet-secured acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 620.

5.5 mm
 2.8 mm
 Clear Acrylic Lens
 13 mm
 6.5 mm
 2 mm
 50.8 mm

BRT-3
 Description: Round, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 620.

9 mm
 Clear Acrylic Lens
 84 mm
 ø 4.8 mm Mounting Hole

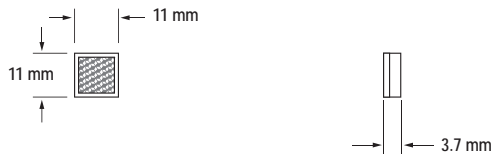
BRT-84
 Description: Round, acrylic target
 Reflectivity Factor: 1.4
 Max. Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 620.

7.4 mm
 Clear Acrylic Lens
 84 mm
 ø 4.5 mm Mounting Hole

More on next page

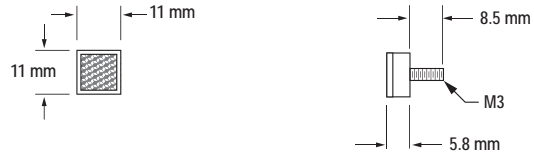
BRT-11X11M

Description: Square, acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



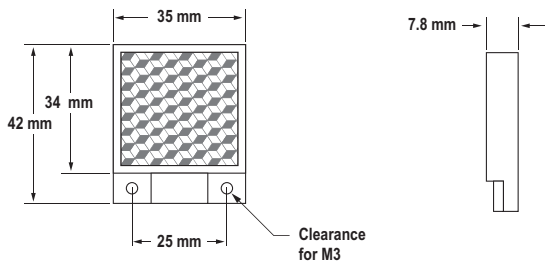
BRT-11X11MD

Description: Square, acrylic target with mounting stud
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



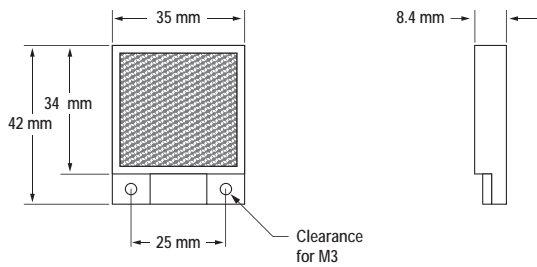
BRT-35X35B

Description: Square, acrylic target
 Reflectivity Factor: 1.3
 Temperature: -20° to +60° C



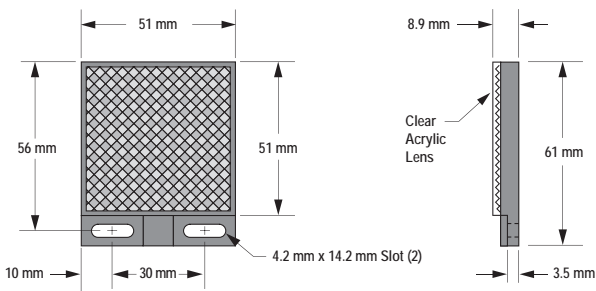
BRT-35X35BM

Description: Square, acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



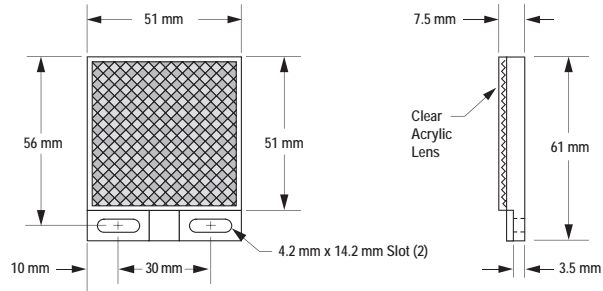
BRT-2X2

Description: Square, acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: 50° C
 Others: Optional brackets are available. See page 620.



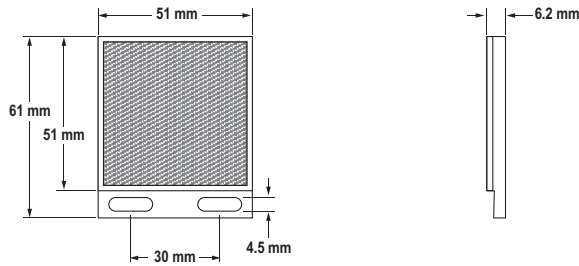
BRT-2X2LVC

Description: Square, acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: -20° to +60° C
 Others: Optional brackets are available. See page 620.



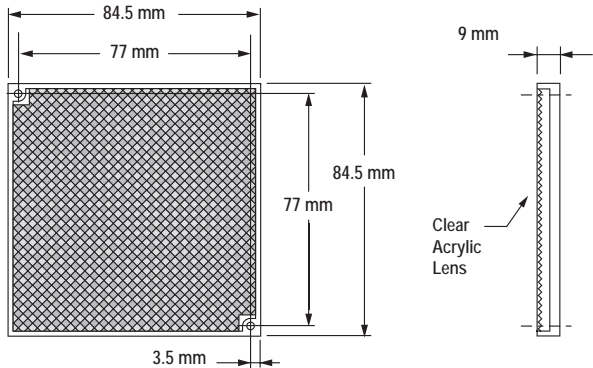
BRT-51X51BM

Description: Square, acrylic target
 Reflectivity Factor: 1.5 Max. Temperature: 50° C
 Other: This target has micro-prism geometry. Optional brackets are available on page 620. Replaces reflector BRT-36X40BM.



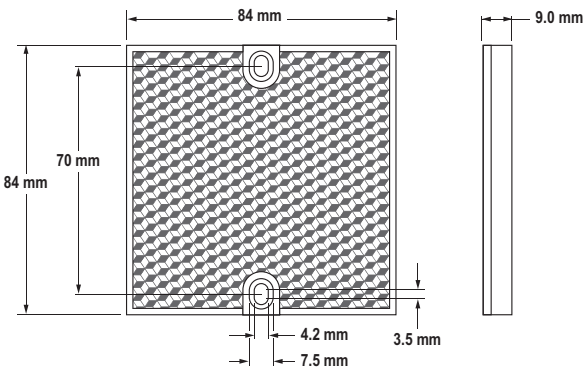
BRT-77X77C

Description: Square, acrylic target
 Reflectivity Factor: 2.0
 Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 620.



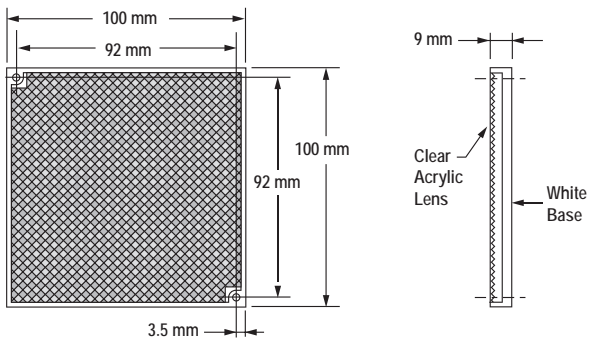
BRT-84X84A

Description: Square, acrylic target
 Reflectivity Factor: 2.0
 Temperature: -20° to +60° C



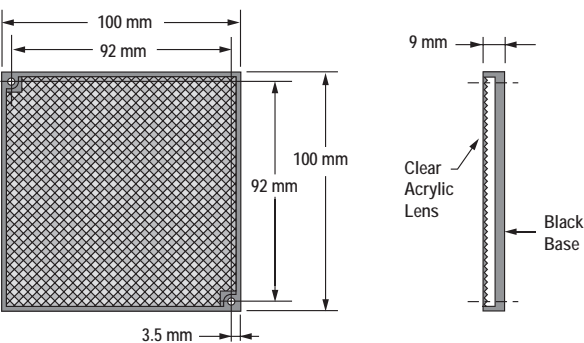
BRT-92X92C

Description: Square, acrylic target
 Reflectivity Factor: 3.0
 Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 620.



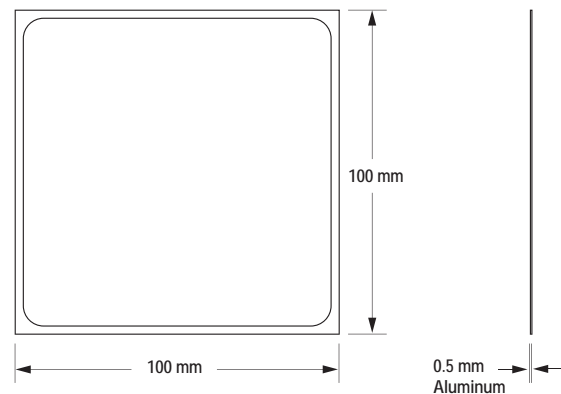
BRT-92X92CB

Description: Square, acrylic target with black mounting base
 Reflectivity Factor: 3.0
 Max. Temperature: 50° C
 Other: Optional brackets are available. See page 620.



BRT-4HT

Description: Square, aluminum target
 Reflectivity Factor: 0.15
 Max. Temperature: 480° C
 Other: This target is not recommended for polarized retroflective sensors.



More on next page

BRT-250

250 x 250 mm

BRT-540

540 x 540 mm

BRT-700

700 x 700 mm

Temperature: -20° to +50° C

Other: Square reflector with rigid aluminum backing for use with LT7



Accessories

Brackets

Cordsets

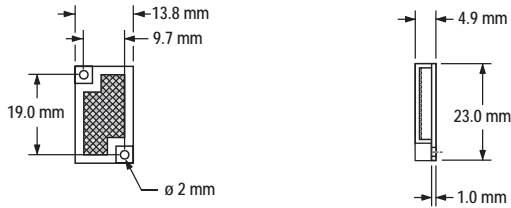
Retroreflectors

Miscellaneous

Reference

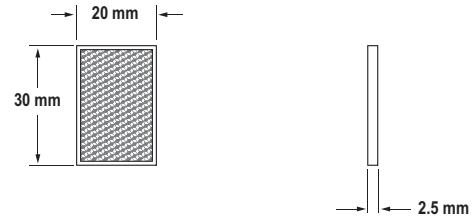
BRT-23X14CM

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



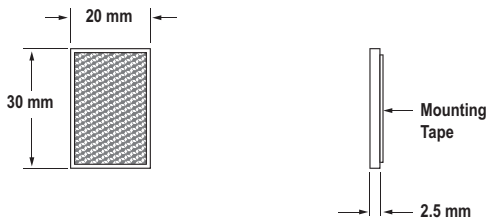
BRT-30X20M

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C



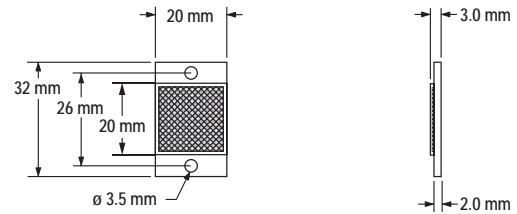
BRT-30X20MT

Description: Rectangular, acrylic target includes mounting tape
 Reflectivity Factor: 1.2
 Temperature: -20° to 60° C



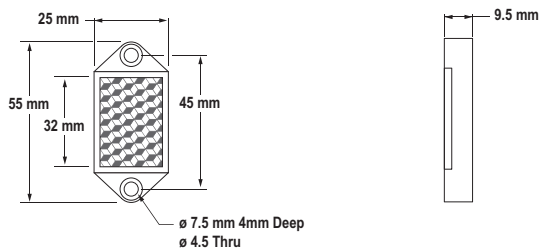
BRT-32X20AM

Description: Rectangular, thin profile acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



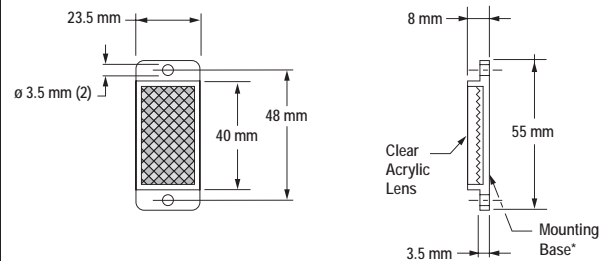
BRT-32X22A

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.3
 Max. Temperature: 65° C



**BRT-35X20A
 BRT-35X20AB**

Description: Rectangular, acrylic target*
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C

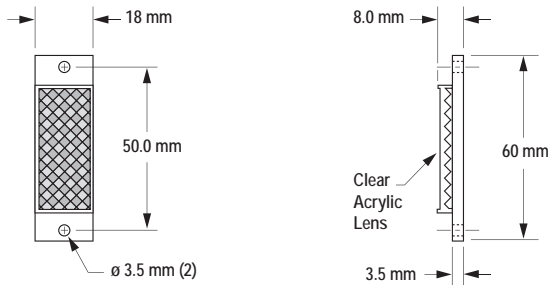


*Mounting base available in white (BRT-35X20A) or black (BRT-35X20AB).



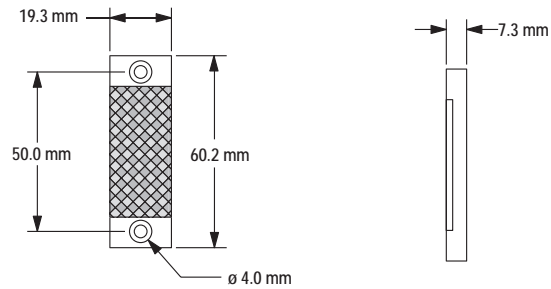
BRT-40X18A

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C



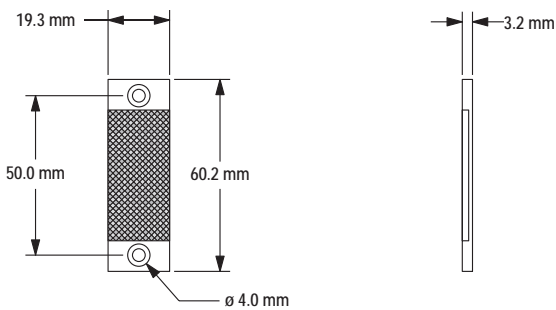
BRT-40X19A

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.3
 Temperature: -20° to +60° C



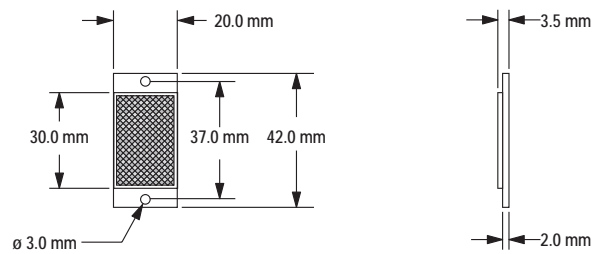
BRT-40X19AM

Description: Rectangular, thin profile acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



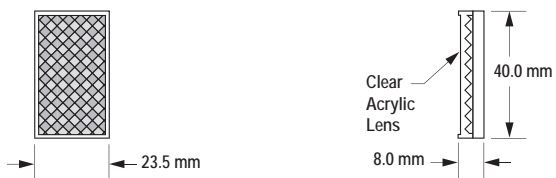
BRT-40X20AM

Description: Rectangular, thin profile acrylic target
 Reflectivity Factor: 1.2
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



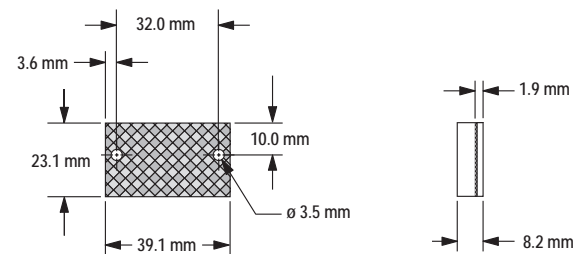
BRT-40X23

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C



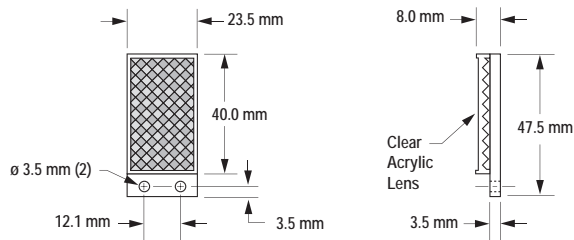
BRT-40X23A

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Max. Temperature: -20° to +60° C



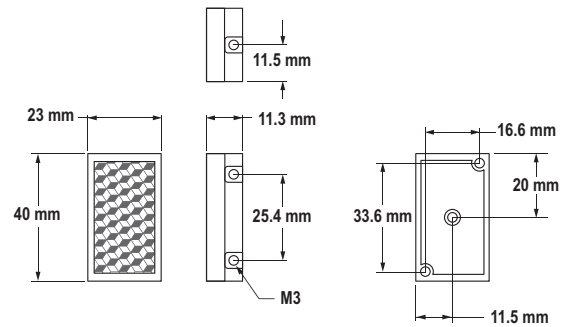
BRT-40X23B

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Max. Temperature: -20° to +60° C



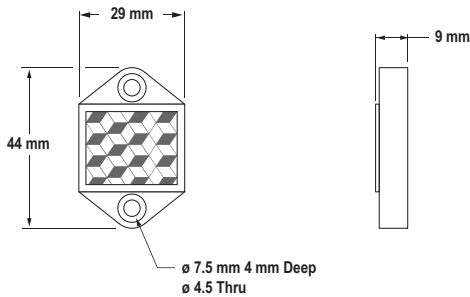
BRT-40X23ABC

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Max. Temperature: 50° C



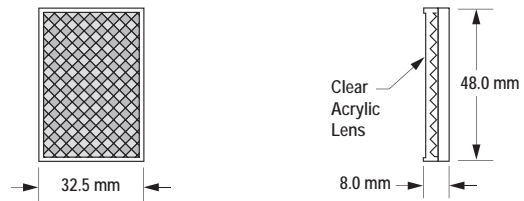
BRT-44X29A6

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.1
 Max. Temperature: 50° C
 Other: 6 mm facets: close to the face retroreflective sensing with bifurcated lens.



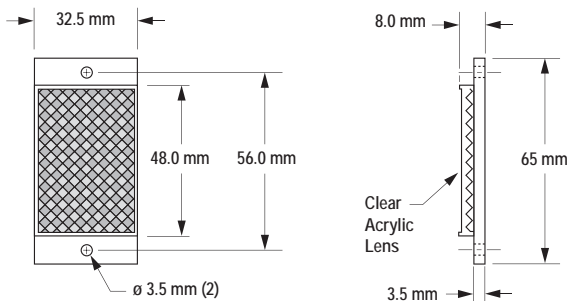
BRT-48X32

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C



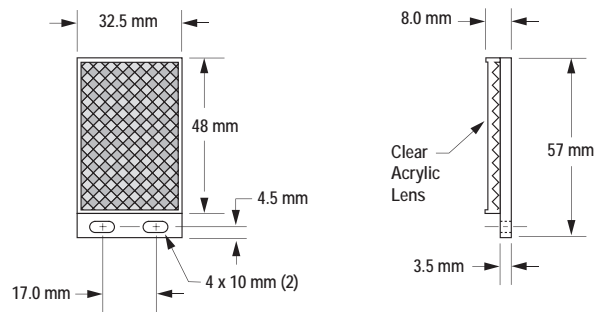
BRT-48X32A

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.0
 Max. Temperature: -20° to +60° C



BRT-48X32B

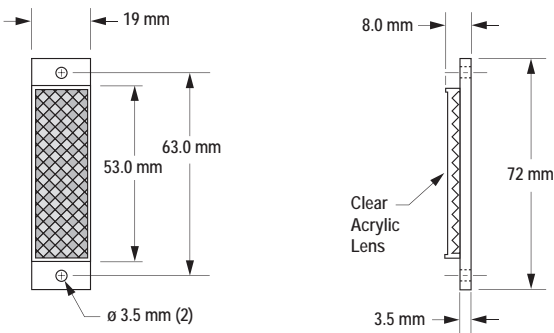
Description: Rectangular, acrylic target
 Reflectivity Factor: 1.0
 Temperature: -20° to +60° C



More on next page

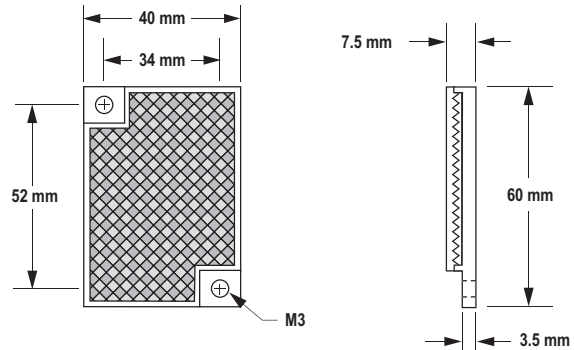
BRT-53X19A

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Max. Temperature: -20° to +60° C



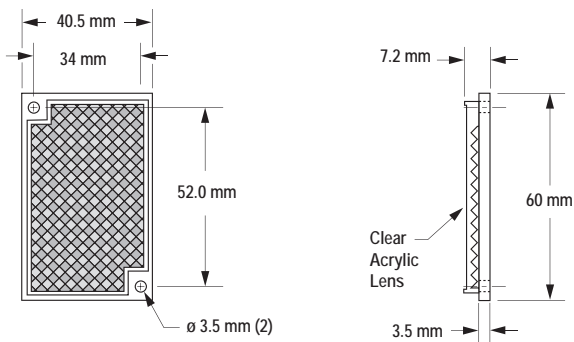
BRT-60X40AF

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4 Max. Temperature: -20° to +60° C
 Other: Anti-fogging coating for use around steam. Optional brackets are available. See page 620.



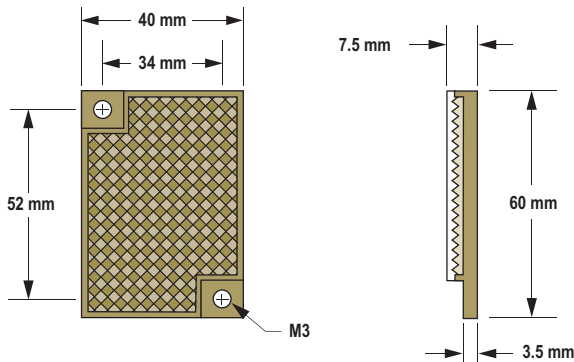
BRT-60X40C

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4 Max. Temperature: -20° to +60° C
 Other: Optional brackets are available. See page 620.



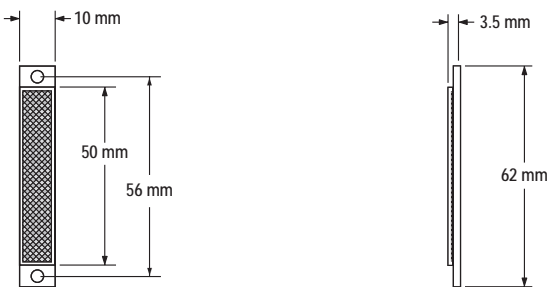
BRT-60X40IP69K

Description: Rectangular, acrylic target (color is amber)
 Reflectivity Factor: 1.4 Max. Temperature: -20° to 140° C
 Other: Chemically resistant and IP69K washdown rated. Optional brackets are available. See page 620.



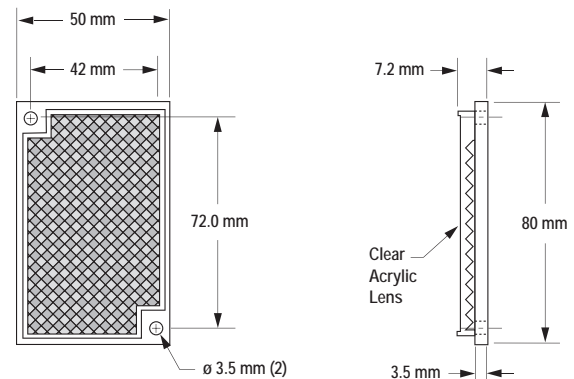
BRT-62X10AM

Description: Rectangular, thin profile acrylic target
 Reflectivity Factor: 1.2
 Max. Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.



BRT-80X50C

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C



More on next page

BRT-80X50CM
 Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C
 Other: This target has micro-prism geometry.

BRT-100X18A
 Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C

BRT-100X50
 Description: Rectangular, acrylic target
 Reflectivity Factor: 1.5
 Temperature: -20° to +60° C

BRT-100X55A
 Description: Rectangular, acrylic target
 Reflectivity Factor: 1.5
 Temperature: -20° to +60° C

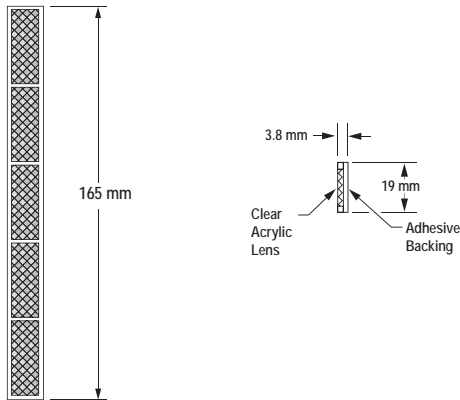
BRT-150X18A
 Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C

BRT-150X18T
 Description: Rectangular, acrylic target includes mounting tape.
 Reflectivity Factor: 1.4
 Temperature: -20° to 60° C



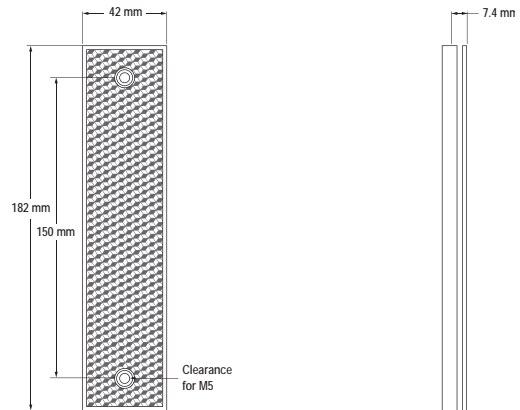
BRT-L

Description: Rectangular, acrylic target
 Reflectivity Factor: 0.8
 Max. Temperature: 65° C



BRT-180X40A

Description: Rectangular, acrylic target
 Reflectivity Factor: 1.4
 Temperature: -20° to +60° C



Accessories

Brackets

Cordsets

Retroreflectors

Miscellaneous

Reference

Retroreflective Tape

NOTE: Sensing range and signal strength at any given sensor-to-target distance will vary due to target reflectivity and target area. A "Reflectivity Factor" is included for each target model to help predict sensor performance, relative to the excess gain curve plotted for target model BRT-3. Consider, also, target area when predicting performance. Changing to a high reflectivity reflector (like BRT-92X92C) may also extend sensor range and/or reduce the need for frequent reflector maintenance. A high reflectivity factor AND large surface area are needed for maximum range.

| Reflectivity Factor | Maximum Temperature | Size | Model | Unit |
|---------------------|---------------------|--------------|-----------------------------|--------------|
| 0.7 | 60° C | 75 x 75 mm | BRT-THG-3X3-10 | 10 per pack |
| 0.7 | 60° C | 100 x 100 mm | BRT-THG-4X4-5 | 5 per pack |
| 0.7 | 60° C | 216 x 280 mm | BRT-THG-8.5X11-2 | 2 per pack |
| 0.7 | 60° C | 457 x 914 mm | BRT-THG-18X36 | Single sheet |
| 0.7 | 60° C | 25 mm wide | BRT-THG-1-100 | 2.5 m length |
| 0.7 | 60° C | 50 mm wide | BRT-THG-2-100 | 2.5 m length |
| 0.7 | 60° C | 75 mm wide | BRT-THG-3-100 | 2.5 m length |
| 0.07 | 175° C | 25 mm wide | BRT-THT-100 [†] | 2.5 m length |
| 0.2 | 85° C | 25 mm wide | BRT-T-100CC | 2.5 m length |
| 0.8 | 60° C | 50 x 50 mm | BRT-TVHG-2X2* | 4 per pack |
| 0.8 | 60° C | 203 x 254 mm | BRT-TVHG-8X10P [†] | 1 per pack |



NOTE: Retroreflective material has a pressure-sensitive adhesive. For maximum adhesion, surfaces must be clean and dry before applying. For best results, use full size; target may be trimmed as necessary.

[†] These targets are not recommended for polarized retroreflective sensors.

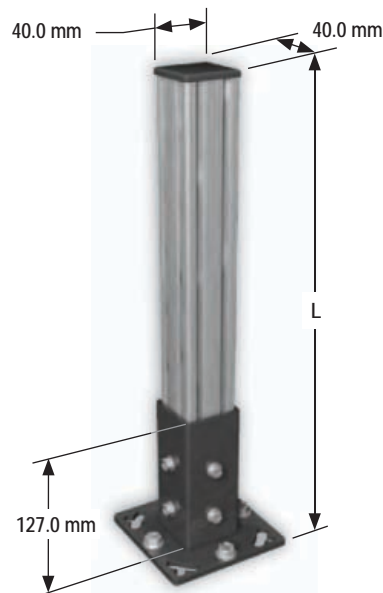
* These are sealed micro-prism style pieces and may not be cut.

Suitable for use with Laser sensors, VS3 sensors and SME312LPC model sensors.

Not suggested for close range (less than 102 mm) except with VS3 sensors.

MSA Stands

- Supports emitter, receiver or corner mirror
- Available without stand base, for attaching to a surface
- Assembles easily
- Includes mounting hardware
- Provides mounting T-slots with center dimension of 20 mm



MSA Series Stands

| Used With** | Stand Height (L) | Useable Stand Length | Model* |
|--|------------------|----------------------|-----------|
| EZ-SCREEN, PICO-GUARD Grids/Points, Mirrors, EZ-ARRAY, MINI-ARRAY and High-Resolution MINI-ARRAY | 616 mm | 483 mm | MSA-S24-1 |
| | 1073 mm | 940 mm | MSA-S42-1 |

* Available without a base by adding suffix **NB** to model number (example, MSA-S24-1NB).

** Adapter brackets EZA-MBK-2 (2 each) are required for mounting EZ-SCREEN Grid and Point emitters/receivers or SSM Series mirrors (ordered separately).

More on next page

MSA Series Stands (cont'd)

| Used With** | Stand Height (L) | Useable Stand Length | Model* |
|--|------------------|----------------------|-------------|
| EZ-SCREEN, PICO-GUARD Grids/Points, Mirrors, EZ-ARRAY, MINI-ARRAY and High-Resolution MINI-ARRAY | 1682 mm | 1550 mm | MSA-S66-1 |
| | 2140 mm | 2007 mm | MSA-S84-1 |
| | 2673 mm | 2667 mm | MSA-S105-1 |
| SFP12 Safety Points | 1067 mm | 940 mm | SFPA-AG12-1 |
| SFP30 Safety Points | 1067 mm | 940 mm | SFPA-AG30-1 |

* Available without a base by adding suffix **NB** to model number (example, **MSA-S24-1NB**).

** Adapter brackets EZA-MBK-2 (2 each) are required for mounting EZ-SCREEN Grid and Point emitters/receivers or SSM Series mirrors (ordered separately).

Run Bar Telescoping Stands

- Locates touch buttons 800 to 1232 mm above the floor surface
- Includes swivel-mount bracket to mount Run Bar (Run Bar not included, see page 570)
- Made of cold-rolled steel; black powdercoat finish



STBA...S1



STBA...S2

Telescoping Stands

| Used with | Description | Model |
|-------------|--|-------------|
| STB-VP6-RB1 | <ul style="list-style-type: none"> • Floor-mounted telescoping stand • Stationary base with 4 mounting holes in corners | STBA-RB1-S1 |
| STB-VP6-RB2 | | STBA-RB2-S1 |
| STB-VP6-RB1 | <ul style="list-style-type: none"> • Free-standing, telescoping stand • Movable H-shaped floor base with mounting holes 560 mm apart | STBA-RB1-S2 |
| STB-VP6-RB2 | | STBA-RB2-S2 |

Adjustable Mounting Systems

- Provides flexible mounting and positioning of sensors and lights
- Includes 3" and 6" column mounting kits for mounting area lights and backlights
- Features Bogen Arm and clamp for use with *P4* and *Pro* sensors
- Offers 2" mounting knuckle assembly for spot lights



Adjustable Mounting Systems

| Used With | Description | Model |
|----------------------------|----------------------------------|----------|
| Pro P4 Vision Lights | 3" Column, Base, and Knuckle Kit | SMBPPK3 |
| | 6" Column, Base, and Knuckle Kit | SMBPPK6 |
| | Mounting Bracket Knuckle | SMBPPK |
| | 3" Column | SMBPPKE3 |
| | 6" Column | SMBPPKE6 |
| | Mounting Bracket Base | SMBPPKB |
| | 2" Mounting Knuckle Assembly | SMBPPLK |
| | Bogen Arm with Single Knob | SMBPPF1 |
| | Bogen Arm Clamp | SMBPPFB |

Elevated Use—Stand-off Pipe, Brackets and Adapters

| | Description | Length | Model | Used With |
|--|--|--------|---------------|--|
| | Thermoplastic Acetal adapter and cover %J0- q1 ó KMPJ,AK.2& | — | SA-M30TE12 | Connects TL50 to 1/2" NPSM/DN15 pipe |
| | Thermoplastic Acetal adapter and cover %J0- q1 ó KMPJ,AK.2& | — | SA-M30E12 | Connects K50L & K80L to 1/2" NPSM/DN15 pipe |
| | Pq^fkibpp pjbibi mmb %ó KMPJ,AK.2& | 150 mm | SOP-E12-150SS | K50L K80L TL50 |
| | | 300 mm | SOP-E12-300SS | |
| | Anodized aluminum pipe (1/2" NPSM/D15) | 150 mm | SOP-E12-150A | SOP-E12-150A SOP-E12-300A SOP-E12-150SS SOP-E12-300SS |
| | | 300 mm | SOP-E12-300A | |
| | Thermoplastic Acetal mounting base %ó KMPJ,AK.2 q1 J0-¿ | — | SA-E12M30 | |
| | Stainless steel bracket for wall or other flat surfaces | — | SMBE12USS | |

Elevated Use—Enclosure Mounts and Extensions

Accessories



Brackets

Cordsets



Retroreflectors

Miscellaneous

Reference

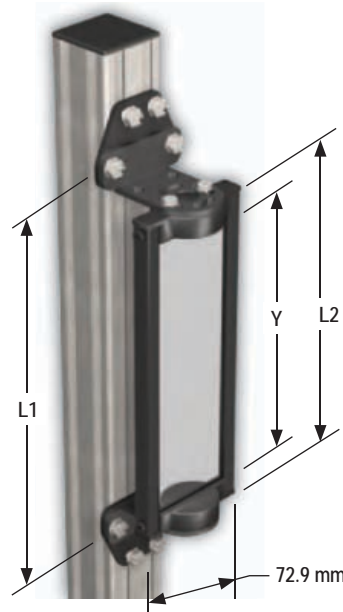
| | Description | Length | Model | Used With |
|---|---|--------|--------------|--------------|
|  | Thermoplastic Acetal standoff with 30 mm mounting base for cabinet mounting or use with most 30 mm brackets | 75 mm | SA-M30M30-75 | K50L |
| | Zinc coated, oversized right-angle legend plate for identification labels | — | SA-30RL55X93 | SA-M30M30-75 |
|  | Thermoplastic Acetal standoff with 22.5 mm mounting base for cabinet mounting | 50 mm | SA-M22M22-50 | K30L |

Elevated Use—Hanging Bracket

| | Description | Length | Model | Used With |
|---|--|--------|----------------|--|
|  | Zinc coated bracket with strain relief for mounting one device | — | SA-30RL55X93C | K50 Push Button VTB |
|  | Zinc coated bracket for mounting two devices | — | SA-30DRL55X93C | Sensors and indicators with 30 mm base or barrel mount |

MSM Corner Mirrors

- Compact for light-duty applications
- Available in 12 lengths
- Decreases range by 8%
- Rated 85% efficiency



MSM Corner Mirrors
(shown with standard brackets and MSAMB** adapter
bracket mounted on MSA stand)

MSM Corner Mirrors

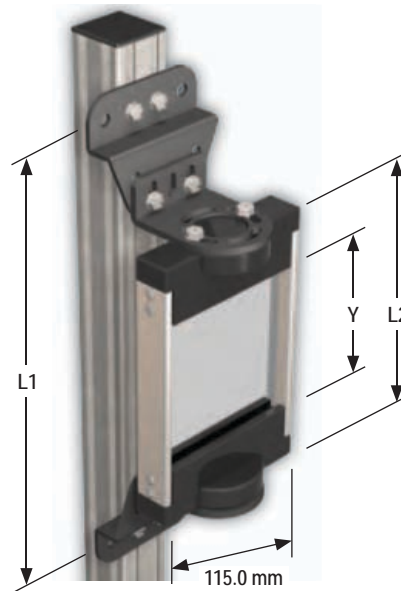
| Reflective Area (Y) | Mounting Height (L1)* | Mirror Height (L2) | Model |
|---------------------|-----------------------|--------------------|--------|
| 165 mm | 221 mm | 191 mm | MSM4A |
| 267 mm | 323 mm | 292 mm | MSM8A |
| 356 mm | 411 mm | 381 mm | MSM12A |
| 457 mm | 513 mm | 483 mm | MSM16A |
| 559 mm | 615 mm | 584 mm | MSM20A |
| 660 mm | 716 mm | 686 mm | MSM24A |
| 762 mm | 818 mm | 787 mm | MSM28A |
| 864 mm | 919 mm | 889 mm | MSM32A |
| 965 mm | 1021 mm | 991 mm | MSM36A |
| 1067 mm | 1123 mm | 1092 mm | MSM40A |
| 1168 mm | 1224 mm | 1194 mm | MSM44A |
| 1270 mm | 1326 mm | 1295 mm | MSM48A |

* The mounting brackets may be inverted from the positions shown (flanges pointing "inward" instead of "outward," as shown). When this is done, dimension L1 decreases by 57 mm.

** MSAMB adapter bracket kit included with each MSA stand.

SSM Corner Mirrors

- Robust for heavy-duty applications
- Extra wide for use with long-range optical safety systems
- Available in stainless steel for harsh applications
- Available in 20 lengths
- Rated 85% efficiency for SSM models and 50% on SSM-S models
- Decreases range by 8% for SSM models and 30% for SSM-S models



SSM and SSM-S Corner Mirrors
 (shown with standard brackets and EZA-MBK-2**
 adapter bracket mounted on MSA stand)

SSM Glass Corner Mirrors

| Reflective Area (Y) | Mounting Height (L1)* | Mirror Height (L2) | Model | |
|---------------------|-----------------------|--------------------|----------|-----------------|
| | | | Glass | Stainless Steel |
| 100 mm | 211 mm | 178 mm | SSM-100 | SSM-100-S |
| 150 mm | 261 mm | 228 mm | SSM-150 | SSM-150-S |
| 200 mm | 311 mm | 278 mm | SSM-200 | SSM-200-S |
| 250 mm | 361 mm | 328 mm | SSM-250 | SSM-250-S |
| 375 mm | 486 mm | 453 mm | SSM-375 | SSM-375-S |
| 475 mm | 586 mm | 553 mm | SSM-475 | SSM-475-S |
| 550 mm | 661 mm | 628 mm | SSM-550 | SSM-550-S |
| 675 mm | 786 mm | 753 mm | SSM-675 | SSM-675-S |
| 825 mm | 936 mm | 903 mm | SSM-825 | SSM-825-S |
| 875 mm | 986 mm | 953 mm | SSM-875 | SSM-875-S |
| 975 mm | 1086 mm | 1053 mm | SSM-975 | SSM-975-S |
| 1100 mm | 1211 mm | 1178 mm | SSM-1100 | SSM-1100-S |
| 1175 mm | 1286 mm | 1253 mm | SSM-1175 | SSM-1175-S |
| 1275 mm | 1386 mm | 1353 mm | SSM-1275 | SSM-1275-S |
| 1400 mm | 1511 mm | 1478 mm | SSM-1400 | SSM-1400-S |
| 1475 mm | 1586 mm | 1553 mm | SSM-1475 | SSM-1475-S |
| 1550 mm | 1661 mm | 1628 mm | SSM-1550 | SSM-1550-S |
| 1675 mm | 1786 mm | 1753 mm | SSM-1675 | SSM-1675-S |
| 1750 mm | 1861 mm | 1828 mm | SSM-1750 | SSM-1750-S |
| 1900 mm | 2011 mm | 1978 mm | SSM-1900 | SSM-1900-S |

* The mounting brackets may be inverted from the positions shown (flanges pointing "inward" instead of "outward," as shown). When this is done, dimension L1 decreases by 58 mm.

** One EZA-MBK-2 adapter bracket kit required if used with a MSA stand.

NOTE: The total range decreases by approximately 8% per mirror.

Tubular Enclosures

- Available for EZ-ARRAY™, MINI-ARRAY® or EZ-SCREEN® standard 14 & 30 mm
- Ideal for high-pressure washdown environments
- Made of clear FDA-grade polycarbonate tubing, with acetal end caps
- Includes stainless mounting brackets and hardware
- Rated NEMA 4X; IP67



EZA-TE Tubular Enclosures

| Emitter/Receiver Model | | Used With Emitter/Receiver | Enclosure Height (L) | Model |
|------------------------|-----------|----------------------------|----------------------|-------------|
| EZ-SCREEN | EZ-ARRAY | Defined Area/Array Length | | |
| SLS.-150 | EA5.-150 | 150 mm | 439 mm | EZA-TE-150 |
| SLS.-300 | EA5.-300 | 300 mm | 541 mm | EZA-TE-300 |
| SLS.-450 | EA5.-450 | 450 mm | 744 mm | EZA-TE-450 |
| SLS.-600 | EA5.-600 | 600 mm | 846 mm | EZA-TE-600 |
| SLS.-750 | EA5.-750 | 750 mm | 1024 mm | EZA-TE-750 |
| SLS.-900 | EA5.-900 | 900 mm | 1151 mm | EZA-TE-900 |
| SLS.-1050 | EA5.-1050 | 1050 mm | 1354 mm | EZA-TE-1050 |
| SLS.-1200 | EA5.-1200 | 1200 mm | 1455 mm | EZA-TE-1200 |
| SLS.-1350 | — | 1350 mm | 1608 mm | EZA-TE-1350 |
| SLS.-1500 | EA5.-1500 | 1500 mm | 1760 mm | EZA-TE-1500 |
| SLS.-1650 | — | 1650 mm | 1913 mm | EZA-TE-1650 |
| SLS.-1800 | EA5.-1800 | 1800 mm | 2065 mm | EZA-TE-1800 |

NOTE: Use of the enclosure affects the sensing range of the emitter/receiver used: when in pairs, range can be reduced by 50%.

MSA-TE Tubular Enclosures

| Used With | | Enclosure Height (L) | Model |
|----------------------------|-------------------------------|----------------------|-----------|
| Emitter/Receiver Model | Emitter/Receiver Array Length | | |
| MINI-ARRAY | BMEL616A/BMRL616A | 439 mm | MSA-TE-8 |
| | BMEL632A/BMLR632A | | |
| High-Resolution MINI-ARRAY | MAHE6A/MAHR6A | 233 mm | |
| MINI-ARRAY | BMEL1216A/BMRL1216A | 541 mm | MSA-TE-12 |
| | BMEL1232A/BMRL1232A | | |
| High-Resolution MINI-ARRAY | MAHE13A/MAHR13A | 396 mm | |
| MINI-ARRAY | BMEL1816A/BMRL1816A | 744 mm | MSA-TE-20 |
| | BMEL1832A/BMRL1832A | | |
| High-Resolution MINI-ARRAY | MAHE19A/MAHR19A | 559 mm | |
| MINI-ARRAY | BMEL2416A/BMRL2416A | 846 mm | MSA-TE-24 |
| | BMEL2432A/BMRL2432A | | |
| High-Resolution MINI-ARRAY | MAHE26A/MAHR26A | 721 mm | MSA-TE-28 |

NOTE: Use of the enclosure affects the sensing range of the emitter/receiver used: when in pairs, range can be reduced by 50%.

More on next page

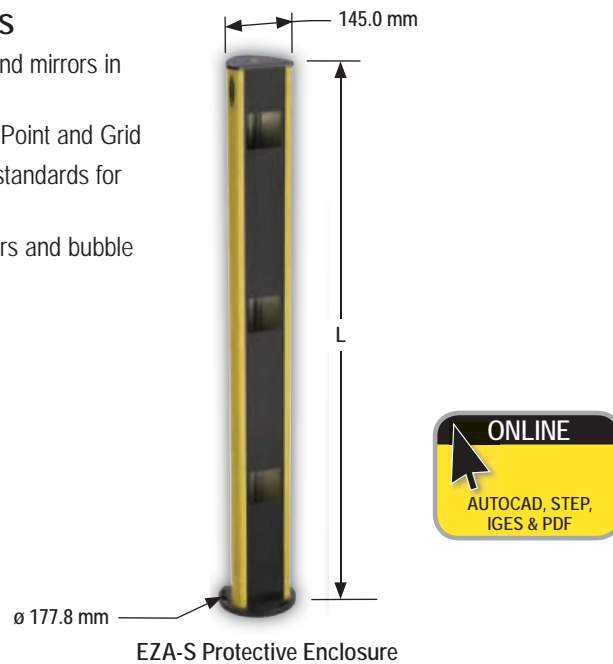
MSA-TE Tubular Enclosures (cont'd)

| Used With | | Emitter/Receiver Array Length | Enclosure Height (L) | Model |
|----------------------------|---------------------|-------------------------------|----------------------|-----------|
| Emitter/Receiver Model | | | | |
| MINI-ARRAY | BMEL3016A/BMRL3016A | 810 mm | 1049 mm | MSA-TE-32 |
| | BMEL3032A/BMRL3032A | | | |
| High-Resolution MINI-ARRAY | MAHE32A/MAHR32A | 884 mm | | |
| MINI-ARRAY | BMEL3616A/BMRL3616A | 963 mm | 1151 mm | MSA-TE-36 |
| | BMEL3632A/BMRL3632A | | | |
| High-Resolution MINI-ARRAY | MAHE38A/MAHR38A | 1046 mm | | |
| MINI-ARRAY | BMEL4216A/BMRL4216A | 1115 mm | 1354 mm | MSA-TE-44 |
| | BMEL4232A/BMRL4232A | 1115 mm | | |
| High-Resolution MINI-ARRAY | MAHE45A/MAHR45A | 1212 mm | | |
| MINI-ARRAY | BMEL4816A/BMRL4816A | 1267 mm | 1455 mm | MSA-TE-48 |
| | BMEL4832A/BMRL4832A | | | |
| High-Resolution MINI-ARRAY | MAHE51A/MAHR51A | 1377 mm | | |

NOTE: Use of the enclosure affects the sensing range of the emitter/receiver used: when in pairs, range can be reduced by 50%.

EZA-S Protective Enclosures

- Provide rugged protection for sensors and mirrors in high-traffic areas
- Available for mirrors and EZ-SCREEN® Point and Grid
- Meets ANSI/RIA 15.06 and ISO 13855 standards for beam spacing
- Includes independently adjustable mirrors and bubble level to simplify alignment
- Rotates up to 20°



EZA-S EZ-SCREEN® Protective Enclosures

| Used With | | Enclosure Height (L) | No. of Openings | Application Standard | Models |
|------------------------|---------------------------------|----------------------|-----------------|------------------------------|-------------|
| Emitter/Receiver Model | Emitter/Receiver Protected Area | | | | |
| SG..4-300 | 900 mm | 1543 mm | 4 | ANSI/RIA R15.06 ISO 13855 | EZA-S300 |
| | | | | | EZA-S300-M* |
| SG..3-400 | 800 mm | 1238 mm | 3 | ANSI/RIA R15.06 ISO 13855 | EZA-S400 |
| | | | | | EZA-S400-M* |

* Model numbers with suffix M include vertical mirrors for perimeter-guarding applications.
Model numbers with suffix M45 include two 45°-mounted mirrors for access-guarding applications.

NOTE: The rear-surfaced glass mirrors are rated at 85% efficiency per mirror and reduce maximum range by 8% per mirror.



EZA-S EZ-SCREEN® Protective Enclosures (cont'd)

| Used With | | Enclosure Height (L) | No. of Openings | Application Standard | Models |
|------------------------|---------------------------------|----------------------|-----------------|----------------------|--------------|
| Emitter/Receiver Model | Emitter/Receiver Protected Area | | | | |
| SG..2-500 | 500 mm | 1035 mm | 2 | ISO 13855 | EZA-S500 |
| SP.1 | — | | | | EZA-S500-M |
| SG..3-533 | 1066 mm | 1543 mm | 3 | ANSI/RIA R15.06 | EZA-S533 |
| | | | | | EZA-S533-M |
| SG..2-584 | 584 mm | 1238.2 mm | 2 | ANSI/RIA R15.06 | EZA-S584 |
| SP.1 | — | | | | EZA-S584-M |
| | | | | | EZA-S584-M45 |

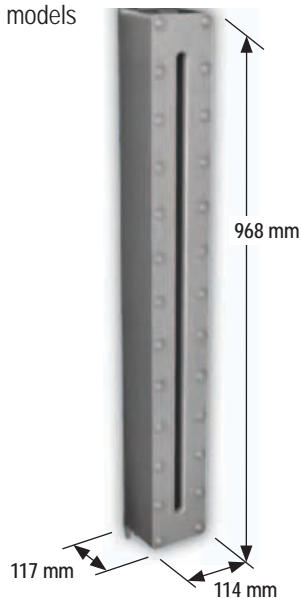
* Model numbers with suffix **M** include vertical mirrors for perimeter-guarding applications.

Model numbers with suffix **M45** include two 45°-mounted mirrors for access-guarding applications.

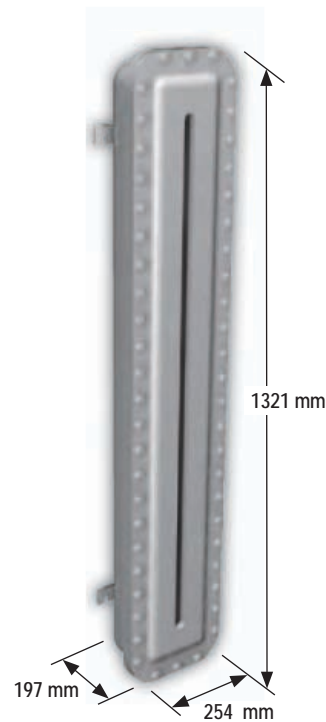
NOTE: The rear-surfaced glass mirrors are rated at 85% efficiency per mirror and reduce maximum range by 8% per mirror.

Explosion-Proof Enclosures

- Protects light screen in environments with flammable gases, liquids or dust
- Available for EZ-SCREEN® 14 and 30 resolution models
- Complies with UL and CSA for use in specific hazardous atmospheres
- Includes mounting brackets and hardware
- Reduces range by approximately 25% per emitter/receiver pair



Model ..XPE-32
Explosion-Proof Enclosure



Model ..XPE-43
Explosion-Proof Enclosure

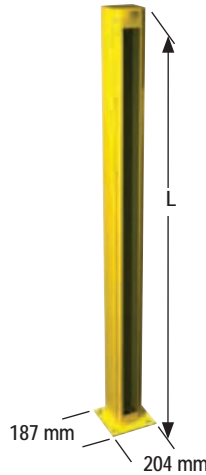
Explosion-Proof Enclosures

| Used With | | Model |
|-------------------------------------|-------------------------------|-----------|
| Model Family | Emitter/Receiver Defined Area | |
| EZ-SCREEN (14 and 30 mm Resolution) | 450 to 600 mm | SS-XPE-32 |
| EZ-SCREEN (14 and 30 mm Resolution) | 750 to 1050 mm | SS-XPE-43 |

NOTE: Use of enclosure affects the sensing range of emitter/receiver used: when used in pairs, range can be reduced by 25%.

Heated Enclosures

- Available for MINI-ARRAY® or High-Resolution MINI-ARRAY®
- Protects emitter/receiver in outdoor environments
- Includes humidistat and resistance wires to keep window free of condensation, snow or ice
- Provides choice of stainless steel or aluminum housings



- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference

MINI-ARRAY® and High-Resolution MINI-ARRAY® Heated Enclosures

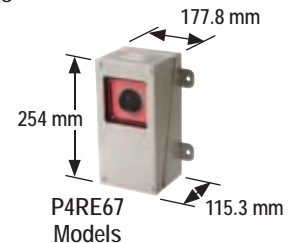
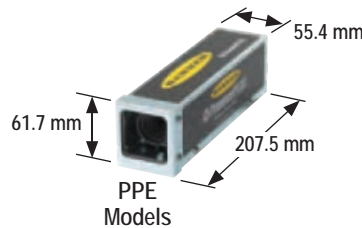
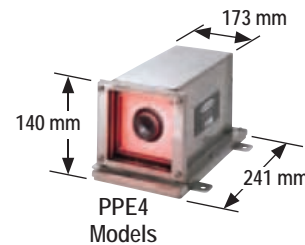
| Material | Finish** | Array Length | Overall Enclosure/Height (L) | Clear Window Height | Model |
|-----------------|-------------|-----------------|------------------------------|---------------------|--------------------|
| Aluminum | Painted | 133 to 1210 mm | 1.7 m | 1.5 m | BMHE4A/BMHL4G |
| Aluminum | Painted | 1505 to 1514 mm | 2.0 m | 1.8 m | BMHE5A/BMHL5G |
| Aluminum | Painted | 1810 to 1819 mm | 2.2 m | 2.0 m | BMHE6A/BMHL6G |
| Stainless Steel | Painted | 133 to 1210 mm | 1.7 m | 1.5 m | BMHE4SS/BMHL4GSS |
| Stainless Steel | Painted | 1505 to 1514 mm | 2.0 m | 1.8 m | BMHE5SS/BMHL5GSS |
| Stainless Steel | Painted | 1810 to 1819 mm | 2.2 m | 2.0 m | BMHE6SS/BMHL6GSS |
| Stainless Steel | Non-painted | 133 to 1210 mm | 1.7 m | 1.5 m | BMHE4SSN/BMHL4GSSN |
| Stainless Steel | Non-painted | 1505 to 1514 mm | 2.0 m | 1.8 m | BMHE5SSN/BMHL5GSSN |
| Stainless Steel | Non-painted | 1810 to 1819 mm | 2.2 m | 2.0 m | BMHE6SSN/BMHL6GSSN |

* Enclosures require a power supply (see page 739).

** Standard color is Federal Safety Yellow (Federal Standard color# 23538). Contact Factory for other colors.

PLUS® Enclosure Kits

- Protects sensor, ring light or both
- Keeps dust and dirt off lens and light
- Prevents accidental bumps and scratches
- Discourages vandalism and tampering
- Helps maintain lens focus by enclosing the lens and sensor
- Available in models that protect camera and light during washdown
- Offers choice of models with glass or plastic viewport



PLUS® Enclosure Kits

| Description | Used With | Model |
|---|-------------------------------|----------|
| Heavy-duty stainless-steel enclosure kit glass viewport; NEMA 6 rated | P4 (right-angle) & Ring Light | P4RE67-G |
| Heavy-duty stainless-steel enclosure kit polycarbonate viewport; NEMA 6 rated | | P4RE67-P |

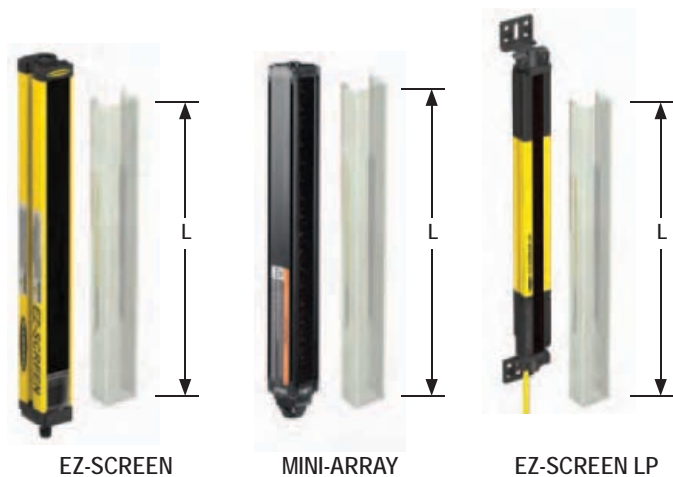


PLUS® Enclosure Kits (cont'd)

| Description | Used With | Model |
|---|-------------------------|---------|
| Heavy-duty cold-rolled steel industrial protection kit glass viewport; NEMA 1 rated | Pro Camera & Lens | PPE-G |
| Heavy-duty cold-rolled steel industrial protection kit polycarbonate viewport; NEMA 1 rated | | PPE-P |
| Replacement viewport glass | PPE-G | PPE-RG |
| Replacement viewport polycarbonate | PPE-P | PPE-RP |
| Straight Mounting bracket | PPE-P & PPE-G | SMBPPES |
| Right-angle mounting bracket | | SMBPPEA |
| Front mounting bracket | | SMBPPEF |
| Heavy-duty stainless-steel enclosure kit glass viewport; NEMA 4 rated | Pro Camera & Ring Light | PPE4-G |
| Heavy-duty stainless-steel enclosure kit polycarbonate viewport; NEMA 4 rated | | PPE4-P |

Lens Shields

- Covers the lens of the emitter/receiver to prevent damage
- Available for the LX, EZ-ARRAY™, MINI-ARRAY® and EZ-SCREEN®
- Installs easily
- Made of rugged polycarbonate



EZ-ARRAY™ & EZ-SCREEN® (14 & 30 mm Resolution) Lens Shields

| Installation* | Used With | | | Lens Shield Length (L) | Model |
|---------------|-----------|-------------|---------------------------|------------------------|------------|
| | EZ-ARRAY | EZ-SCREEN | Defined Area/Array Length | | |
| Adhesive | EA5..150 | — | 150 mm | 218 mm | EZS-150EA |
| Snap-on | | | | 196 mm | EZSS-150EA |
| Adhesive | — | SLS..-150.. | 150 mm | 258 mm | EZS-150 |
| Snap-on | | | | 236 mm | EZSS-150 |
| Adhesive | EA5..300 | SLS..-300.. | 300 mm | 368 mm | EZS-300 |
| Snap-on | | | | 346 mm | EZSS-300 |
| Adhesive | EA5..450 | SLS..-450.. | 450 mm | 518 mm | EZS-450 |
| Snap-on | | | | 496 mm | EZSS-450 |
| Adhesive | EA5..600 | SLS..-600.. | 600 mm | 667 mm | EZS-600 |
| Snap-on | | | | 645 mm | EZSS-600 |
| Adhesive | EA5..750 | SLS..-750.. | 750 mm | 817 mm | EZS-750 |
| Snap-on | | | | 795 mm | EZSS-750 |
| Adhesive | EA5..900 | SLS..-900.. | 900 mm | 967 mm | EZS-900 |
| Snap-on | | | | 945 mm | EZSS-900 |

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

More on next page

EZ-ARRAY™ & EZ-SCREEN® (14 & 30 mm Resolution) Lens Shields (cont'd)

Accessories
Brackets
Cordsets
Retroreflectors
Miscellaneous
Reference

| Installation* | Used With | | | Lens Shield Length (L) | Model |
|---------------|-----------|--------------|---------------------------|------------------------|-----------|
| | EZ-ARRAY | EZ-SCREEN | Defined Area/Array Length | | |
| Adhesive | EA5..1050 | SLS..-1050.. | 1050 mm | 1116 mm | EZS-1050 |
| Snap-on | | | | 1094 mm | EZSS-1050 |
| Adhesive | EA5..1200 | SLS..-1200.. | 1200 mm | 1266 mm | EZS-1200 |
| Snap-on | | | | 1244 mm | EZSS-1200 |
| Adhesive | — | SLS..-1350.. | 1350 mm | 1416 mm | EZS-1350 |
| Snap-on | | | | 1394 mm | EZSS-1350 |
| Adhesive | — | SLS-1650.. | 1650 mm | 1715 mm | EZS-1650 |
| Snap-on | | | | 1693 mm | EZSS-1650 |
| Adhesive | EA5..1500 | SLS..-1500.. | 1500 mm | 1565 mm | EZS-1500 |
| Snap-on | | | | 1543 mm | EZSS-1500 |
| Adhesive | EA5..1800 | SLS..-1800.. | 1800 mm | 1865 mm | EZS-1800 |
| Snap-on | | | | 1843 mm | EZSS-1800 |
| Snap-on | EA5..2100 | — | 2100 mm | 2144 mm | EZSS-2100 |
| Snap-on | EA5..2400 | — | 2400 mm | 2444 mm | EZSS-2400 |

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

MINI-ARRAY® Lens Shields

| Installation | Used With | | Lens Shield Length (L)* | Model | |
|--------------|------------------------|---------------------|-------------------------|---------|-------|
| | Emitter/Receiver Model | Array Length | | | |
| Adhesive | MINI-ARRAY | BMEL1216A/BMRL1216A | 286 mm | 341 mm | MSS12 |
| | | BMEL1232A/BMRL1232A | 295 mm | | |
| | | BMEL2416A/BMRL2416A | 591 mm | 643 mm | MSS24 |
| | | BMEL2432A/BMRL2432A | 600 mm | | |
| | | BMEL3616A/BMRL3616A | 895 mm | 948 mm | MSS36 |
| | | BMEL3632A/BMRL3632A | 905 mm | | |
| | | BMEL4816A/BMRL4816A | 1200 mm | 1253 mm | MSS48 |
| | | BMEL4832A/BMRL4832A | 1210 mm | | |

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Other lens shield lengths are available, contact factory at 1-888-373-6767.

EZ-SCREEN® LP (14 & 25 mm Resolution) Lens Shields

| Installation* | Used With | | Lens Shield Length (L) | Model |
|---------------|------------------------|--|------------------------|-----------|
| | Emitter/Receiver Model | | | |
| Snap-on | SLP..-270 | | 270 mm | LPSS-270 |
| | SLP..-410 | | 410 mm | LPSS-410 |
| | SLP..-550 | | 550 mm | LPSS-550 |
| | SLP..-690 | | 690 mm | LPSS-690 |
| | SLP..-830 | | 830 mm | LPSS-830 |
| | SLP..-970 | | 970 mm | LPSS-970 |
| | SLP..-1110 | | 1110 mm | LPSS-1110 |

More on next page

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

EZ-SCREEN® LP (14 & 25 mm Resolution) Lens Shields (cont'd)

| Installation* | Used With | | Lens Shield Length (L) | Model |
|---------------|------------------------|--|------------------------|-----------|
| | Emitter/Receiver Model | | | |
| Snap-on | SLP..-1250 | | 1250 mm | LPSS-1250 |
| | SLP..-1390 | | 1390 mm | LPSS-1390 |
| | SLP..-1530 | | 1530 mm | LPSS-1530 |
| | SLP..-1670 | | 1670 mm | LPSS-1670 |
| | SLP..-1810 | | 1810 mm | LPSS-1810 |

NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

* Adhesive models are polycarbonate with neoprene gasket. Snap-on models are constructed of copolyester.

EZ-SCREEN® Grids and Points Lens Shields—Adhesive Backed

| Type | Lens Shield Length (L) | Emitter/Receiver Model | Emitter/Receiver Protected Height | Model |
|-------|------------------------|------------------------|-----------------------------------|----------|
| Point | 149 mm | SP.1 | — | EZS-149 |
| Grid | 684 mm | SG..2-500 | 500 mm | EZS-684 |
| | 768 mm | SG..2-584 | 584 mm | EZS-768 |
| | 984 mm | SG..3-400 | 800 mm | EZS-984 |
| | 1251 mm | SG..3-533 | 900 mm | EZS-1251 |
| | 1084 mm | SG..4-300 | 1066 mm | EZS-1084 |

Polycarbonate construction with neoprene gasket

EZ-SCREEN® Type 2 Lens Shields—Adhesive Backed

| Used With | | Lens Shield Length (L) | Model |
|------------------------|-------------------------------|------------------------|----------|
| Emitter/Receiver Model | Emitter/Receiver Defined Area | | |
| LS2..30-150 | 150 mm | 210 mm | LSS-150 |
| LS2..30-300 | 300 mm | 360 mm | LSS-300 |
| LS2..30-450 | 450 mm | 510 mm | LSS-450 |
| LS2..30-600 | 600 mm | 660 mm | LSS-600 |
| LS2..30-750 | 750 mm | 810 mm | LSS-750 |
| LS2..30-900 | 900 mm | 959 mm | LSS-900 |
| LS2..30-1050 | 1050 mm | 1109 mm | LSS-1050 |
| LS2..30-1200 | 1200 mm | 1558 mm | LSS-1200 |
| LS2..30-1350 | 1350 mm | 1708 mm | LSS-1350 |
| LS2..30-1500 | 1500 mm | 1858 mm | LSS-1500 |

Polycarbonate construction with neoprene gasket.

LX Lens Shields

| Installation | Used With | | Lens Shield Length (L) | Model |
|--------------|------------------------|--------------|------------------------|-------|
| | Emitter/Receiver Model | Array Length | | |
| Adhesive | LX3 models | 67 mm | 98.3 mm | LXS3 |
| | LX6 models | 143 mm | 174.5 mm | LXS6 |
| | LX12 models | 295 mm | 326.9 mm | LXS12 |

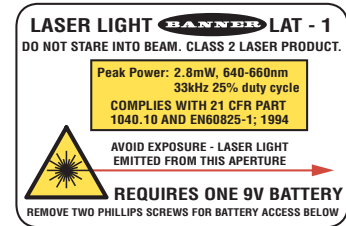
NOTE: When shields are installed on both the emitter and receiver, maximum operating range is reduced by 20%.

Laser Alignment Tools

- Simplifies the alignment of any emitter/receiver pair
- Available for EZ-SCREEN®, PICO-GUARD™, LT7, and 18 and 30 mm barrel sensors
- Includes a built-in bubble level
- Uses one 9-volt battery, which is included (some models)






LAT-1 Laser Alignment Tool (shown without clip)



- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference


Laser Alignment Tools

| Used With | | Supply Voltage | LAT-1 with Clip Kit | Clip w/Target* |
|---|-------------------------------|---|---------------------|----------------|
| EZ-SCREEN Grid or Points and PICO-GUARD Grids | | 9V battery for 20 hours of continuous use | LAT-1-HD | EZA-LAT-1 |
| EZ-SCREEN 14 & 30 mm Resolution | | | LAT-1-SS | EZA-LAT-2 |
| EZ-SCREEN LP 14 & 25 mm Resolution | | | LAT-1-LP | LPA-LAT-1 |
| EZ-SCREEN Type 2 | | | LAT-1-LS | LSA-LAT-1 |
| EZ-SCREEN Grid or Points, PICO-GUARD Grids, EZ-SCREEN 14 & 30 mm Resolution, EZ-SCREEN LP 14 & 25 mm Resolution and EZ-SCREEN Type 2 | | 9V battery for 20 hours of continuous use | LAT-1 | - |
| PICO-GUARD SFP12 Safety Points | | | LAT-1-SFP12 | SFA-LAT-12 |
| PICO-GUARD SFP30 Safety Points | | | LAT-1-SFP30 | SFA-LAT-30 |
| Description | Used With | Supply Voltage | Model | |
|  <p>LAT-2 shown with LT7</p> <ul style="list-style-type: none"> • Allows for long distance alignment greater than 50 m • Clip-on attachment for sensor | LT7 | — | LAT-2 | |
|  <ul style="list-style-type: none"> • Enables easy sensor alignment at long distances • Kit includes one SMB1812 bracket and M12 laser emitter (Class 2 visible red laser) • Clip-on attachment for 18 mm threaded barrel sensors | 18 mm threaded barrel sensors | 10 to 30V dc | LAT1812 | |
|  <ul style="list-style-type: none"> • Enables easy sensor alignment at long distances • Kit includes one SMB3012 bracket and M12 laser emitter (Class 2 visible red laser) • Clip-on attachment for 30 mm threaded barrel sensors | 30 mm threaded barrel sensors | 10 to 30V dc | LAT3012 | |

* LAT-1 purchased separately.

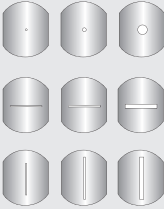
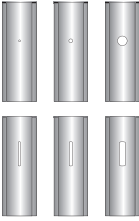
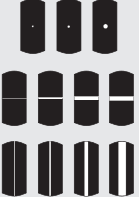
BEAM-TRACKER™ Alignment Tool

The BEAM-TRACKER is a low-cost, wireless, battery-operated, and completely self-contained photoelectric diagnostic sensor. It is a quick and simple way to evaluate photoelectric system performance. It receives light from all modulated photoelectric emitters and transmits light to receivers to check the system operation. It has a built-in frequency emitter that will be detected by any Banner photoelectric receiver, as well as by those of most other photoelectric manufacturers. It is a valuable tool for locating the center of the beam when installing long-range opposed-mode photoelectric sensor pairs and for locating sources of severe EMI and RFI noise.

| | Supply Voltage | Beam | Construction | Model |
|---|---|-----------------|----------------|-------|
|  | 9V battery for 10 hours of continuous use | 70 kHz infrared | Cyclac® T case | BT-1 |

Apertures and Aperture Kits

Opposed-mode sensors may be fitted with apertures which narrow or shape the effective beam of the sensor to more closely match the size of profile of the object to be sensed. A common example is the use of "line" or "slit" type aperture when wire or thread is being sensed.

| Aperture Description | Units | Model | Product | Used With |
|-----------------------------------|-------|--------------|---|------------------------|
| Circular, 0.5 mm dia. | 6 | APQS18-020 |  | QS18 Opposed-mode |
| Circular, 1.0 mm dia. | 6 | APQS18-040 | | |
| Circular, 2.5 mm dia. | 6 | APQS18-100 | | |
| Horizontal, slotted, 0.5 x 6.4 mm | 6 | APQS18-020H | | |
| Horizontal, slotted, 1.0 x 6.4 mm | 6 | APQS18-040H | | |
| Horizontal, slotted, 2.5 x 6.4 mm | 6 | APQS18-100H | | |
| Vertical, slotted, 0.5 x 12.7 mm | 6 | APQS18-020V | | |
| Vertical, slotted, 1.0 x 12.7 mm | 6 | APQS18-040V | | |
| Vertical, slotted, 2.5 x 12.7 mm | 6 | APQS18-100V | | |
| Kit with 2 of each aperture | 18 | APQS18-DVHX2 | | |
| Circular, 0.5 mm dia. | 2 | APQ20-0.5 |  | Q20 Opposed-mode |
| Circular, 1 mm dia. | 2 | APQ20-1 | | |
| Circular, 2 mm dia. | 2 | APQ20-2 | | |
| Vertical, slotted, 0.5 mm | 2 | APQ20-0.5V | | |
| Vertical, slotted, 1 mm | 2 | APQ20-1V | | |
| Vertical, slotted, 2 mm | 2 | APQ20-2V | | |
| Kit with 2 of each aperture | 12 | APK-Q20 | | |
| Circular, 0.5 mm dia. | 20 | AP31-020 |  | MINI-BEAM Opposed-mode |
| Circular, 1.0 mm dia. | 20 | AP31-040 | | |
| Circular, 2.5 mm dia. | 20 | AP31-100 | | |
| Horizontal, slotted, 0.5 x 6.4 mm | 20 | AP31-020H | | |
| Horizontal, slotted, 1.0 x 6.4 mm | 20 | AP31-040H | | |
| Horizontal, slotted, 2.5 x 6.4 mm | 20 | AP31-100H | | |
| Horizontal, slotted, 5.1 x 6.4 mm | 20 | AP31-200H | | |
| Vertical, slotted, 0.5 x 12.7 mm | 20 | AP31-020V | | |
| Vertical, slotted, 1.0 x 12.7 mm | 20 | AP31-040V | | |
| Vertical, slotted, 2.5 x 12.7 mm | 20 | AP31-100V | | |
| Vertical, slotted, 5.1 x 12.7 mm | 20 | AP31-200V | | |
| Kit with 2 of each aperture | 22 | AP31-DVHX2 | | |

More on next page

Apertures and Aperture Kits (cont'd)

Accessories

Brackets

Cordsets

Retroreflectors

Miscellaneous

Reference

| Aperture Description | Units | Model | Product | Used With |
|---|-------|--------------|---------|----------------------|
| Kit includes 3 round apertures of: 0.5, 1.0 & 2.5 mm dia. | 3 | AP18SC* | | S18 & M18 |
| Kit includes 3 rectangular apertures of: 0.5, 1.0 & 2.5 mm dia. | 3 | AP18SR* | | S18 & M18 |
| Kit includes 3 round apertures of: 0.5, 1.0 & 2.5 mm dia. | 3 | AP18SCN* | | T18 & YM18 |
| Kit includes 3 rectangular apertures of: 0.5, 1.0 & 2.5 mm dia. | 3 | AP18SRN* | | T18 & TM18 |
| * Kits include Teflon® FEP® lens, o-ring and thread-on housing. | | | | |
| Kit with glass lens to protect plastic sensor lens from chemical environments | 1 | APG18S | | S18, M18, T18 & TM18 |
| Circular, 0.5 mm dia. | 10 | APQ12-.5 | | Q12 Opposed-mode |
| Circular, 1.0 mm dia. | 10 | APQ12-1 | | |
| Circular, 1.5 mm dia. | 10 | APQ12-1.5 | | |
| Circular, 2.0 mm dia. | 10 | APQ12-2 | | |
| Horizontal, slotted, 0.5 mm dia. | 10 | APQ12-.5H | | |
| Horizontal, slotted, 1.0 mm dia. | 10 | APQ12-1H | | |
| Vertical, slotted, 0.5 mm dia. | 10 | APQ12-.5V | | |
| Vertical, slotted, 1.0 mm dia. | 10 | APQ12-1V | | |
| Protective jacket, 4 mm square | 10 | APQ12-4S | | |
| Kit containing 2 of each aperture | 18 | APKQ12 | | |
| Circular, 2 openings, 0.5 & 1.0 mm dia. | 2 | APVS2-0204 | | VS2 Opposed-mode |
| Circular, 2 openings, 1.5 and 2.0 mm dia. | 2 | APVS2-0608 | | |
| Horizontal (1) and vertical (1), slotted, 0.5 mm wide | 2 | APVS2-02R | | |
| Horizontal (1) and vertical (1), slotted, 1.0 mm wide | 2 | APVS2-04R | | |
| Circular, 1.0 mm dia. | 6 | APQS30-040 | | QS30 Opposed-mode |
| Circular, 2.5 mm dia. | 6 | APQS30-100 | | |
| Circular, 5 mm dia. | 6 | APQS30-200 | | |
| Horizontal, slotted, 1 x 12 mm | 6 | APQS30-040H | | |
| Horizontal, slotted, 2.5 x 12 mm | 6 | APQS30-100H | | |
| Horizontal, slotted, 5 x 12 mm | 6 | APQS30-200H | | |
| Vertical, slotted, 1 x 17 mm | 6 | APQS30-040V | | |
| Vertical, slotted, 2.5 x 17 mm | 6 | APQS30-100V | | |
| Vertical, slotted, 5 x 17 mm | 6 | APQS30-200V | | |
| Kit with 2 of each aperture | 18 | APQS30-DVHX2 | | |

* Teflon® is a registered trademark of Dupont™.

Ultrasonic Wave Guides

Guide attaches to 18 mm threaded barrel of ultrasonic sensors to focus ultrasonic sensing beam.

| | Size | Style | Model | Used With |
|--|--------------------|--------|-----------|---------------|
| | 5.0 mm inside dia. | Barrel | UWG18-5.0 | QS18U S18U |
| | 6.4 mm inside dia. | Barrel | UWG18-6.4 | |


Replacement Lens Assemblies

Lens assemblies are field-replaceable. In addition, some lenses may be used to convert from one sensing mode to another, or to change the sensing range of a particular sensor. The possible conversions are listed in the table below.

| Replacement Lens for | Possible Sensing Mode or Range Changes | Model | Used With |
|-------------------------------------|--|-----------|-----------|
| LVAG | Change LV to LVAG | UC-300AG | MINI-BEAM |
| W and DBZ | Change D to DBZ and F to DBZ | UC-300BZ | |
| C, CV and CVG | Change CV2 to CV | UC-300C.7 | |
| C2 and CV2 | Change CV to CV2 | UC-300C2 | |
| E and R | — | UC-300E | |
| EL and RL | Extend range of E/R | UC-300EL | |
| EPD | — | UC-300EPD | |
| F and FV | Change D to F and DBZ to F | UC-300F | |
| FP (old style) | — | UC-300FP | |
| FP | — | UC-300FP2 | |
| LV and D | Change F to D, LVAG to LV and DBZ to D | UC-300L | |
| LP | — | UC-300LP | |
| RPD | — | UC-300RPD | |
| E, R, DL, DX and LV | N/A | UC-45L | |
| LL | | UC-45LL | |
| LLP | | UC-45LLP | |
| LP | | UC-45LP | |
| D | | UC-45D | |
| F and FV | | UC-45F | |
| FP | | UC-45FP | |
| CV | | UC-45C | |
| CV4 | | UC-45C4 | |
| CV, CVB and CVG | N/A | OUC-C | OMNI-BEAM |
| D | | OUC-D | |
| F, FAC, FV, FVB, FVG, FX, EF and RF | | OUC-F | |
| FP, FPB and FPG | | OUC-FP | |
| DX, LV, E and R | | OUC-L | |
| LVAG and LVAGC | | OUC-LAG | |
| R58E | N/A | UC-R55 | R58E |


Portable Demo Box

The Portable Demo Box is used to power dc self-contained photoelectric sensors for testing purposes. It is battery-powered and features bicolor LEDs which indicate sensor output status and output type (NPN or PNP). It is designed for a 4-pin Euro-style connector, but cable adapters are available to convert to Pico-style or Mini-style connectors. A 4-pin wiring barrier is mounted on the top of the box to allow connection of cabled dc sensors.

| | Supply Voltage | Cable Type | Model | Cable Adapters |
|---|----------------|------------|-------|--|
|  | 3 - 9V battery | 4-pin Euro | DBQ5 | Euro-to-Pico p/n 39536 Euro-to-Mini p/n 39537 |


Test Power Supply

Test power supply is a 1 amp power supply used to power *P4* sensors and lighting for proving an application without integration into a control panel.

| | Input | Input | Trigger Option | Model | Used With |
|---|-------------|-------------------------|---|-------|---------------------------|
|  | 100-240V ac | North America (AC plug) | <ul style="list-style-type: none"> • 24V dc NPN Sensor • Continuous pulse • Single pulse | P4D1 | <i>P4</i> Vision Lighting |



Accessories
Brackets
Cordsets
Retroreflectors
Miscellaneous
Reference

A-GAGE® MINI-ARRAY® Series Power Supplies for Heated Enclosures

| | Used With | Primary | Secondary | Models |
|---|----------------------|----------------|-----------|---------|
|  | Two BMHE4 Enclosures | 105 to 130V ac | 23V ac | BMHPS4 |
| | Two BMHE5 Enclosures | 105 to 130V ac | 27V ac | BMHPS5 |
| | Two BMHE6 Enclosures | 105 to 130V ac | 35V ac | BMHPS6 |
| | One BMHE4 Enclosure | 105 to 130V ac | 23V ac | BMHPS14 |
| | One BMHE5 Enclosure | 105 to 130V ac | 27V ac | BMHPS15 |
| | One BMHE6 Enclosure | 105 to 130V ac | 35V ac | BMHPS16 |




Continuous Power Supplies

12 or 24V dc power supplies provide power to dc sensors, safety products and specialty lights.

| | Input | Input Cord | Outputs | Output Cable | Model | Used With |
|---|--------------------------|------------|--|--------------|-------------------------------------|--|
|  | 100-240V ac 50/60 Hz | — | 24V dc @ 4 A max. | — | PSDINA-24-4 (DIN-rail mountable) | dc Sensors Vision Lights |
|  | 115/230V ac, 50-60 Hz | — | 24V dc (22.5-28.5V dc adj.) @ 2.5 A (60 W) | — | PSDINA-24* (DIN-rail mountable) | Safety products requiring a SELV rating (EN 60950) |



* These products are not stocked and are non-returnable.

USB Serial Adapter

| | Description | Power | Model | Used With |
|---|---|-----------|---------------|-----------|
|  | USB to RS-485 serial adapter with integral communication cordset and USB cable for advanced configuration with a PC. | USB Cable | EZA-USB485-01 | EZ-ARRAY |
|  | USB to RS-485 serial adapter with integral communication cordset and USB cable for easy configuration of a single sensor or a network of sensors. | USB Cable | INTUSB485-LH | LH |
|  | USB to RS-485 serial adapter for advanced configuration with a PC. NOTE: Communication cordset ordered separately. | USB Cable | INTUSB485-1 | EZ-ARRAY |



Power Supplies and Interface Modules

The power supplies provide a low-cost interface between ac power supply and dc-operated sensors. They can source up to 100 milliamps. All models are available with integral TEACH push button and remote TEACH function. The interface module is a passive module that allows additional status indicators to be located in the user's control cabinet. It provides remote indication and TEACH capability.

| | Description | Sensor Input | Input Supply | Sensor Supply | Models |
|---|--|--------------|--------------|---------------|----------|
|  | Power Supply e/m relay output, status lights, and TEACH button | NPN | 24V ac | 15V dc | PS24-1N |
| | | PNP | | | PS24-1P |
| NPN | | 115V ac | PS115-1N | | |
| PNP | | | PS115-1P | | |
|  | Passive Interface Module Status lights and TEACH button | — | 10-30V dc | — | SIM-525T |


Sensor Interface Modules

Low-cost modules provide a dc powered interface for sensors.

| | Input | Outputs | Connections | Model | Used With |
|---|-----------|--|---|----------|-----------------|
|  | 10-30V dc | Current Sinking (NPN) | Two 13-pin Terminals | PPSIM-NT | PresencePLUS P4 |
| | | | One 13-pin Terminals One DB-15 Connector | PPSIM-NC | |
| | | Current Sourcing (PNP) | Two 13-pin Terminals | PPSIM-PT | |
| | | | One 13-pin Terminals One DB-15 Connector | PPSIM-PC | |
|  | 10-30V dc | Current Sinking (NPN)/ Current Sourcing (PNP) | Two 13-pin Terminals | IVUSIM | iVu |


Light Interface Modules

Low-cost interface module allows strobe operation of Banner vision lighting with any vision sensor or system.

| | Input | Strobe Output | Model | Used With |
|---|--------|-----------------|-------|-----------------|
|  | 24V dc | 5V @ 10 mA max. | PPLIM | Vision lighting |



EZ-LIGHT™ Controllers

- Manually operated controllers for Andon, call-for-parts and machine status indication
- Toggle switch model can control up to 5 indicators simultaneously

| | Description | Switch Function | Supply Voltage | Model | Used With |
|---|---------------------------|-----------------|----------------|-------|--|
|  | 5 toggle switches | ON-OFF-FLASH | 30V dc | LC80T | EZ-LIGHT indicators with PNP input |
| | 12-position rotary switch | | | LC80R | |


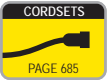
AC Emitter/Receiver Interface Boxes

- Provides AC power for up to three receivers or two cascaded emitter/receiver pairs, with external device monitoring (EDM) available.
- Supplies +24V dc power at 0.7 amps (16.8 W max. power) and accepts input voltages from 100-250V ac (50-60 Hz).

| | Safety Outputs | EDM | Emitter/ Receiver Connection | AC Power Connection | Output and EDM Connections | Model | Used with |
|--|----------------|--|------------------------------|---------------------|----------------------------|--------------------|-----------|
|   | 3 NO | Selectable 1- or 2-Channel or no EDM | 8-Pin M12/Euro QD | Hard-wired | Hard-wired | EZAC-R9-QE8 | EZ-SCREEN |
| | 2 NO & 1 NC | | | Hard-wired | Hard-wired | EZAC-R11-QE8 | |
| | 1 NO & 1 SPDT | 1-Channel | | 3-Pin Mini QD | 8-Pin Mini QD | EZAC-R15A-QE8-QS83 | |
| | 1 NO & 1 NC | Power Monitoring | | 3-Pin Mini QD | 5-Pin Mini QD | EZAC-R8N-QE8-QS53 | |
| | 2 NO | | | 3-Pin Mini QD | 5-Pin Mini QD | EZAC-R10N-QE8-QS53 | |

AC Emitter Interface Boxes

- Provides AC power for up to four emitters, with external device monitoring (EDM) available.
- Supplies +24V dc power at 0.7 amps (16.8 W max. power) and accepts input voltages from 100-250V ac (50-60 Hz).

| | Emitter Connection | AC Power Connection | Model | Used with |
|--|--------------------|---------------------|----------------|--|
|   | 8-Pin M12/Euro QD | Hard-wired | EZAC-E-QE8 | <ul style="list-style-type: none"> • EZ-SCREEN SLSE...Q8 (without Test input) • EZ-SCREEN SLPE.. |
| | 5-Pin M12/Euro QD | Hard-wired | EZAC-E-QE5 | <ul style="list-style-type: none"> • EZ-SCREEN SLSE...Q5 (with Test input) |
| | 8-Pin M12/Euro QD | 3-Pin Mini QD | EZAC-E-QE8-QS3 | <ul style="list-style-type: none"> • EZ-SCREEN SLSE...Q8 (without Test input) • EZ-SCREEN SLPE.. |
| | 5-Pin M12/Euro QD | 5-Pin Mini QD | EZAC-E-QE5-QS5 | <ul style="list-style-type: none"> • EZ-SCREEN SLSE...Q5 (with Test input) |

NC = Normally Closed, NO = Normally Open

AC Interface Box Specifications



Important Notice:

European Community Machinery Directive 2006/42/EC

The EZ-Screen EZAC- Interface Boxes comply with Machinery Directive 98/37/EC, but not with Machinery Directive 2006/42/EC. Therefore, these Interface Boxes can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

Mechanically Linked Contactors*

Provides an additional 10 or 18 amp carrying capability to any safety system.

| | Coil Voltage | Contacts | Contact Rating | Dimensions (h x w x l) | Model | Used With |
|---|--------------|-------------|-----------------------|------------------------|-------------------|---|
|  | 120V ac | 3 NO & 1 NC | 10 amps | 57 x 44 x 58 mm | 11-BG00-31-A12060 | <ul style="list-style-type: none"> • EZ-SCREEN • PICO-GUARD • SC22-3/-3E |
| | 24V dc | | 10 amps (thermal) | 57 x 44 x 58 mm | 11-BG00-31-D-024 | |
|  | 120V ac | 3 NO & 1 NC | 18 amps** | 80 x 44 x 80 mm | BF1801A-12060 | |
| | 24V dc | | 18 amps** (inductive) | 80 x 44 x 80 mm | BF1801L-024 | |


NC = Normally Closed, NO = Normally Open, minimum switching current (power): 5 mA @ 17V dc (85 mw)

* One Arc Suppressor is needed for each relay across the coil (see below).

** NC contact is rated at 10 amps

Auxiliary Contacts for Mechanically Linked Contactors




Adds contacts to mechanically linked contactors.

| | Contacts | Positively Guided | Model | Used With |
|---|----------|-------------------|-------------|--------------|
|  | 4 NO | No (Aux. only) | 11-BGX10-40 | 11-BG Series |
| | 3 NO | Yes | 11-G484-30 | BF Series |

NC = Normally Closed, NO = Normally Open

Suppressors for Mechanically Linked Contactors

Extends the life of the actuating device—such as a light screen or control module—that uses a mechanically linked contactor.

| | Voltage | Model | Used With |
|---|-------------|--------------|-------------------|
|  | 48V dc | 11-BGX77-048 | 11-BG00-31-D024 |
| | 125-240V ac | 11-BGX77-240 | 11-BG00-31-A12060 |
|  | 48V dc | 11-G318-48 | BF1801L-024 |
|  | 125-240V ac | BFX77-240 | BF1801A-12060 |

NC = Normally Closed, NO = Normally Open

Task Lights

| | Models |
|---|---|
|  | <ul style="list-style-type: none"> • Work Light Strip • Work Light Area • Work Light • Work Light Spot See page 416 |


- Accessories
- Brackets
- Cordsets
- Retroreflectors
- Miscellaneous
- Reference

EZ-LIGHT™ Indicators

| | Models |
|---|---|
|  | <ul style="list-style-type: none"> • Tower Lights • Multi-Color, General-Purpose • Multi-Color, Multi-Function • Sensor Emulators • Indicators for Safety devices • Call Light • Segmented Displays • Daylight Visible • Traffic Lights See page 441 |




Indicator Lamps

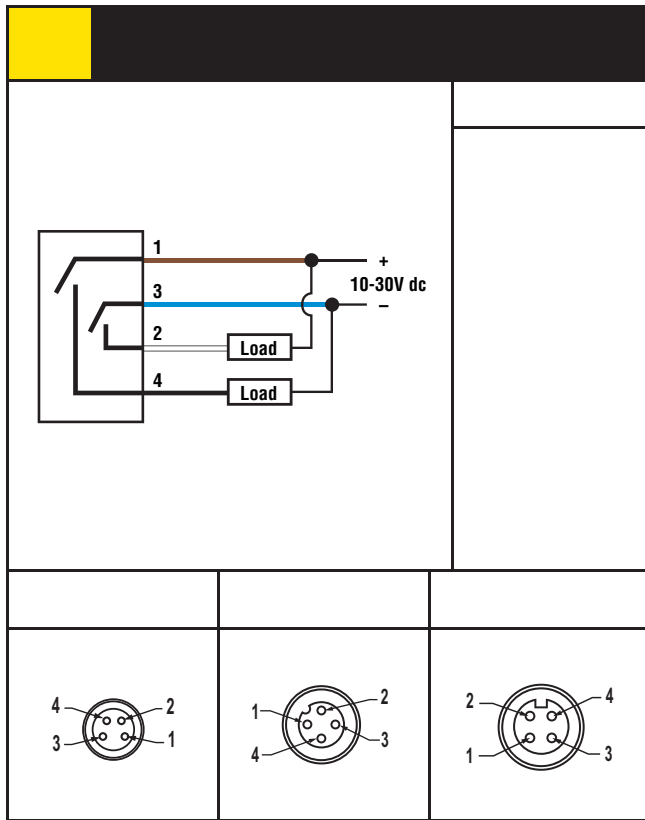
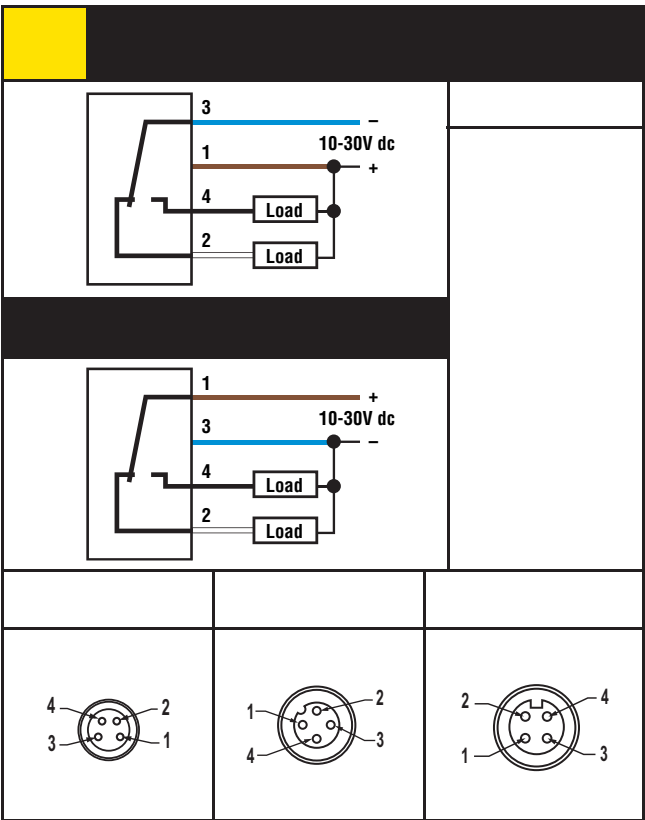
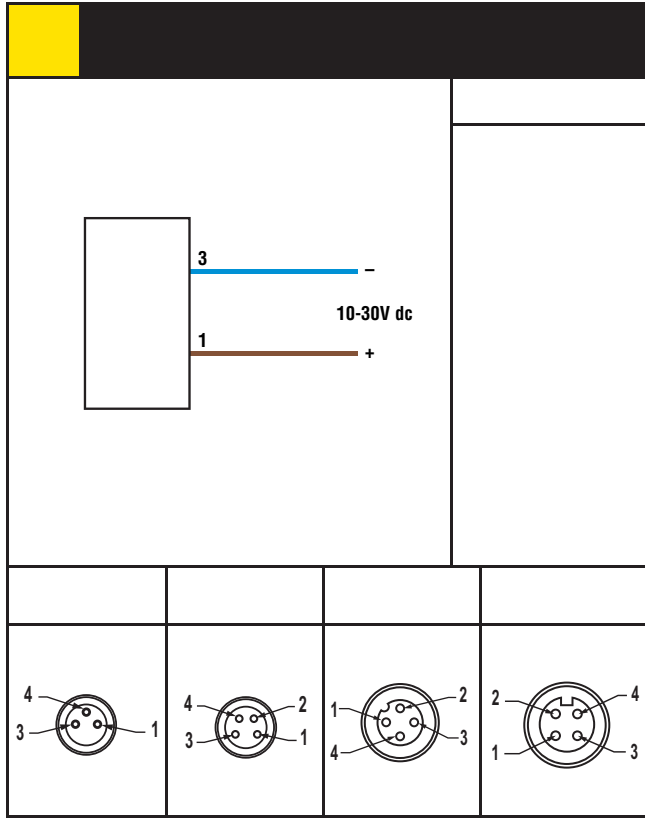
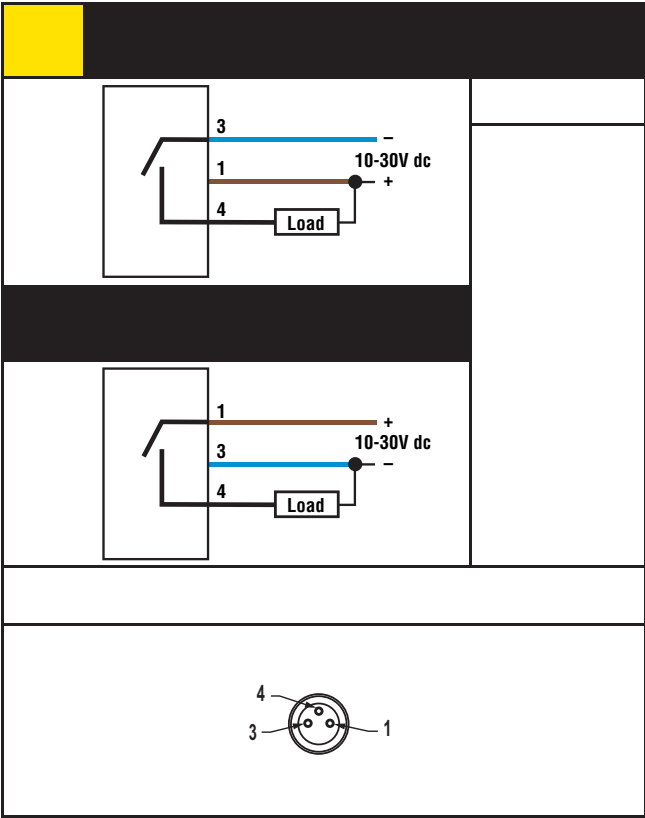
- Indicates whether a switch is open or closed
- Available in red or green, 120V ac or 24V ac/dc

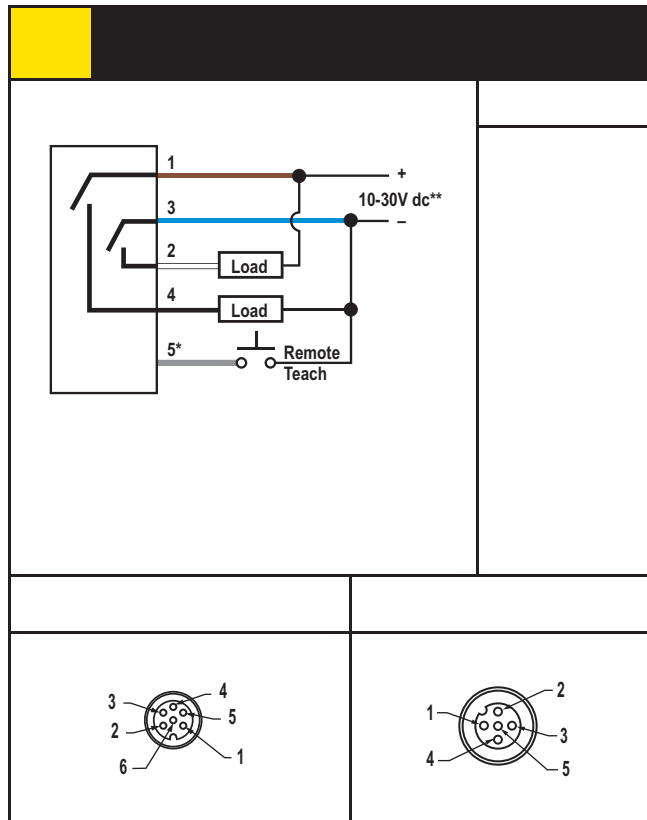
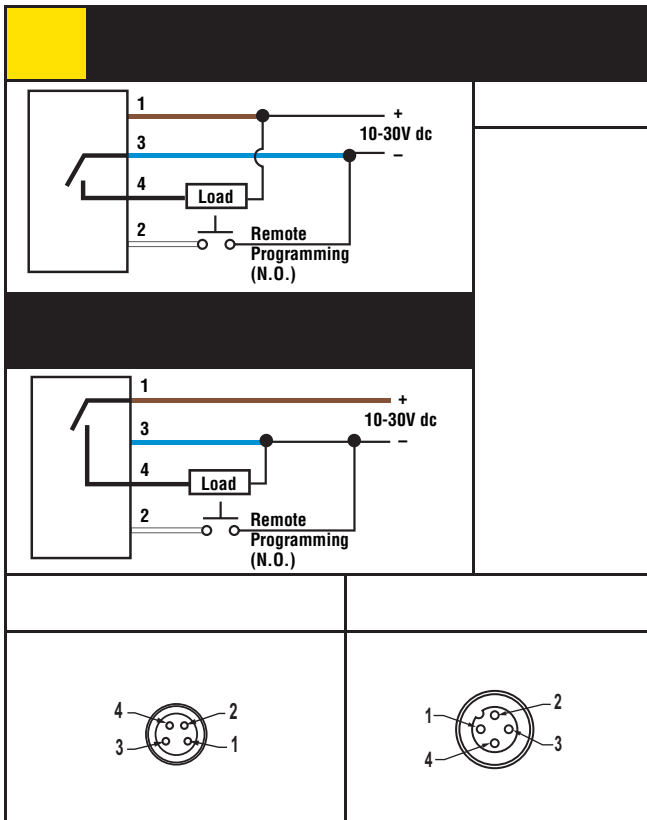
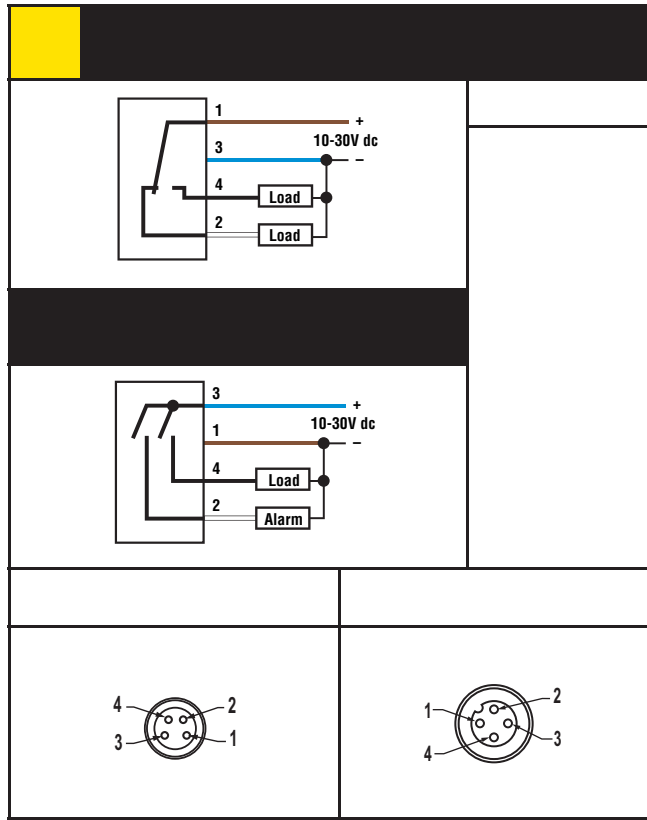
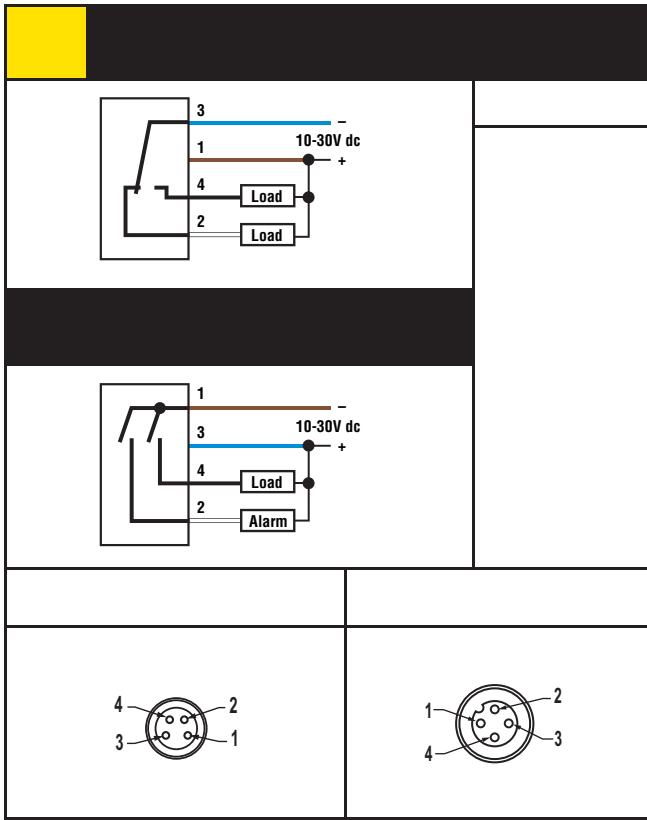
| | Supply Voltage | Lamp Color | Thread | Models | Used With |
|---|----------------|------------|-----------|-----------|--|
|  | 24V ac/dc | Red | M20 x 1.5 | SI-PL3T-R | <ul style="list-style-type: none"> • SI-QS90 Safety Interlock Switches • SI-LS42 Safety Interlock Switches • SI-QM100 Safety Interlock Switches • RP-LS42 Rope Pull Switches • RP-QM72/QMT72 Rope Pull Switches • RP-RM83 Rope Pull Switches • RP-QM90 Rope Pull Switch |
| | 120V ac | | | SI-PL3A-R | |
| | 24V ac/dc | Green | | SI-PL3T-G | |
| | 120V ac | | | SI-PL3A-G | |

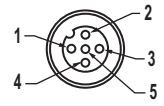
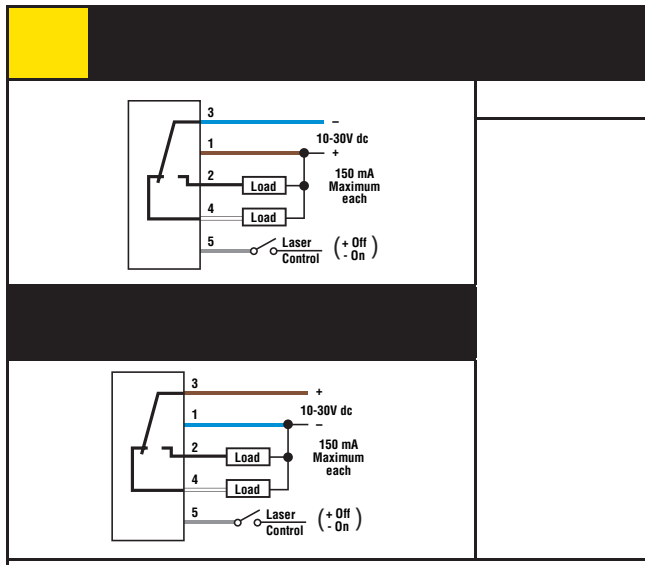
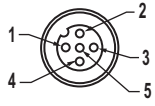
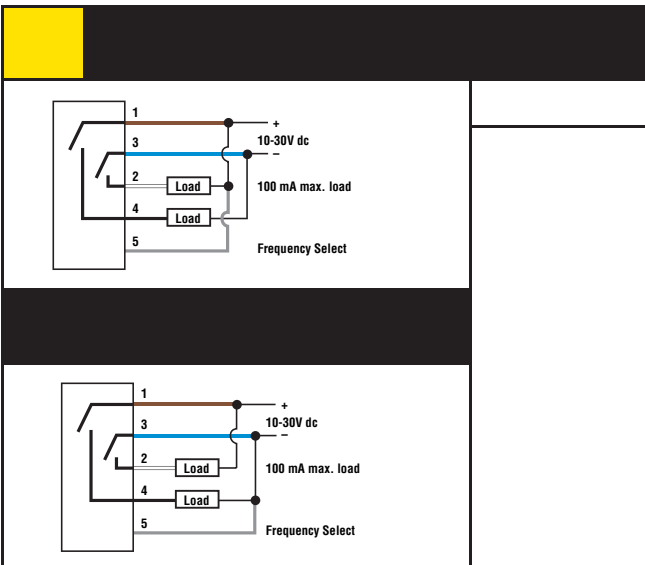
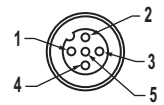
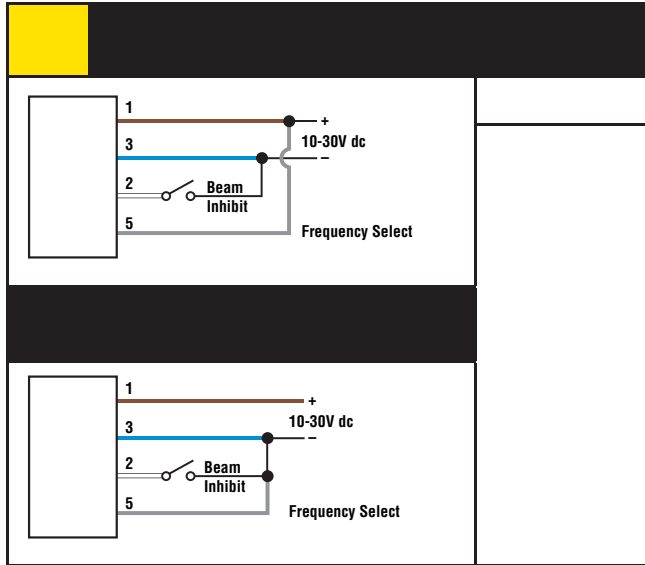
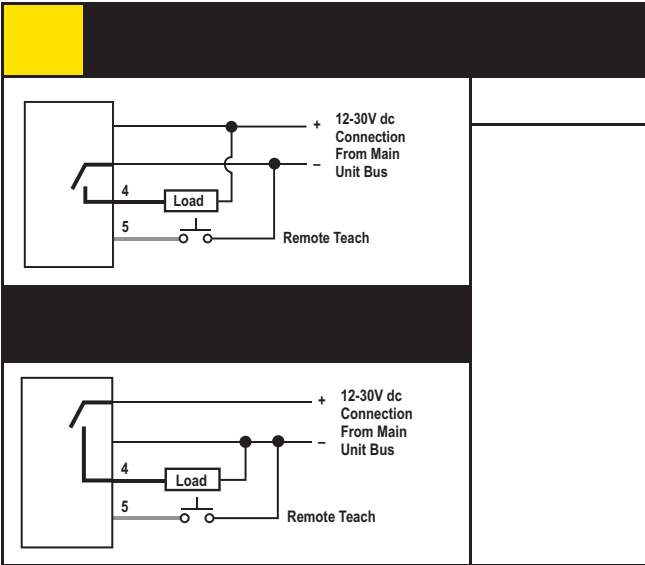
Muting Lamps

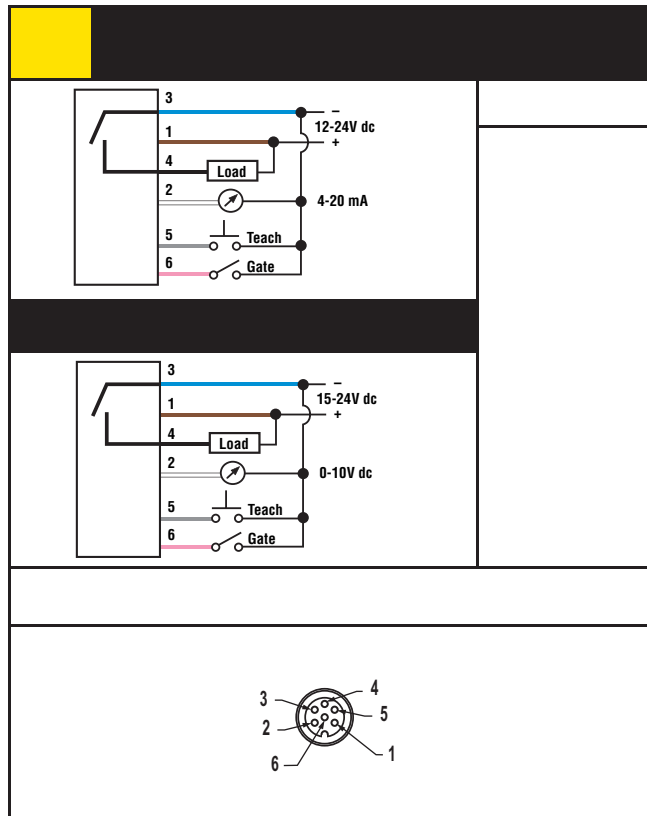
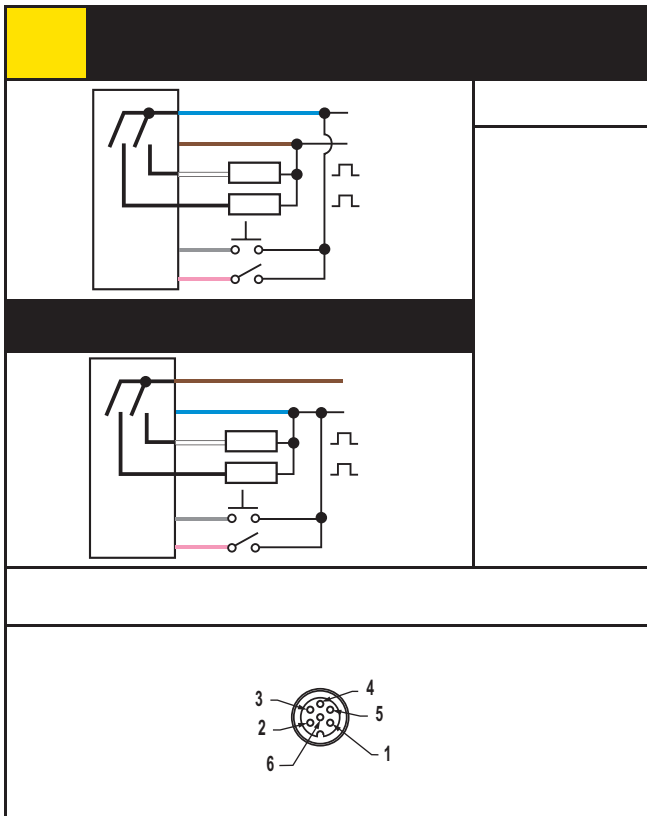
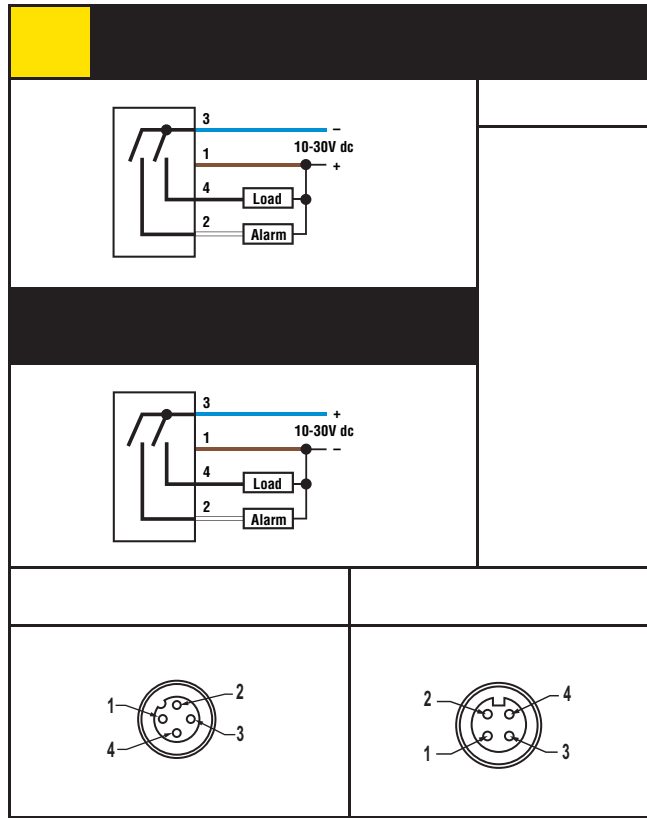
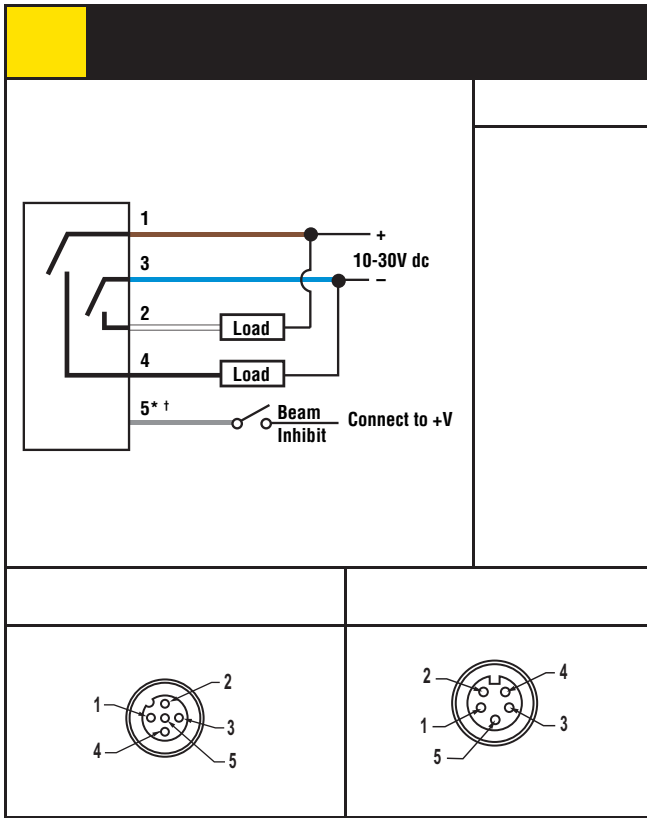
- Indicates when muting is active for optical safety systems with a muting module.
- Uses a solid-state LEDs light, eliminating the need to replace bulbs.

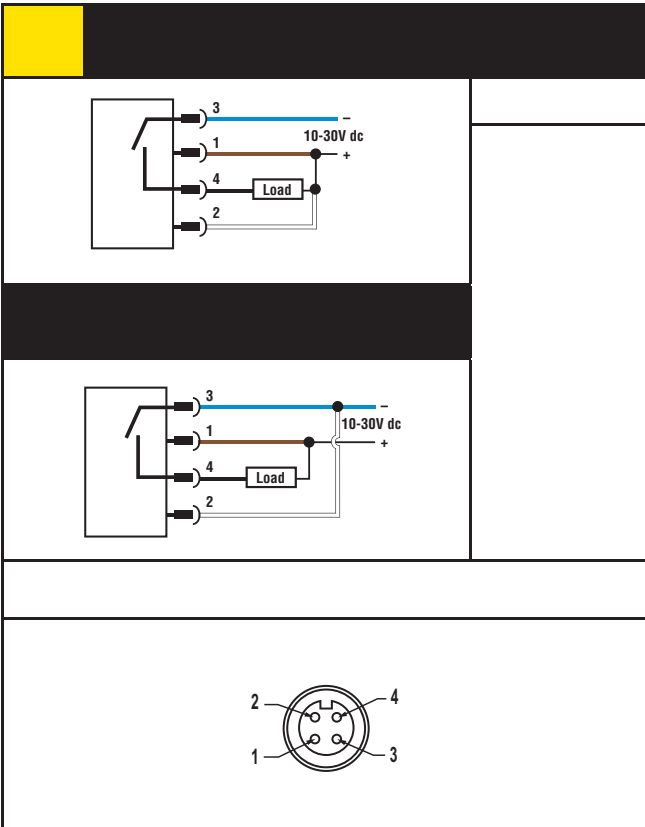
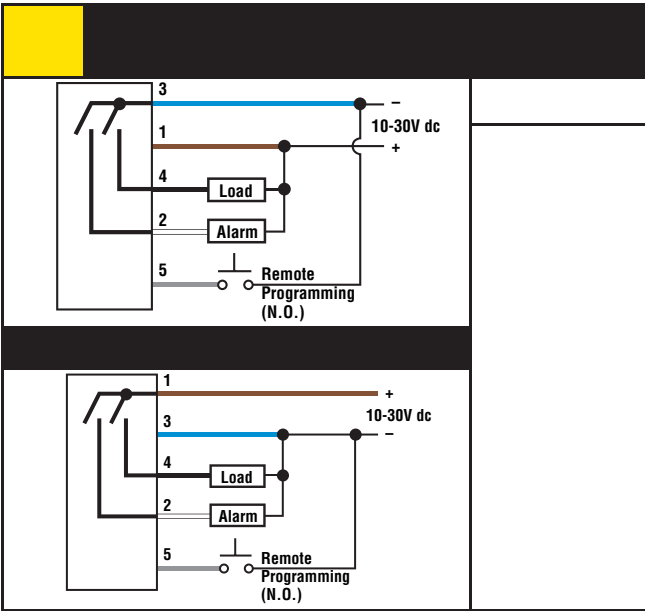
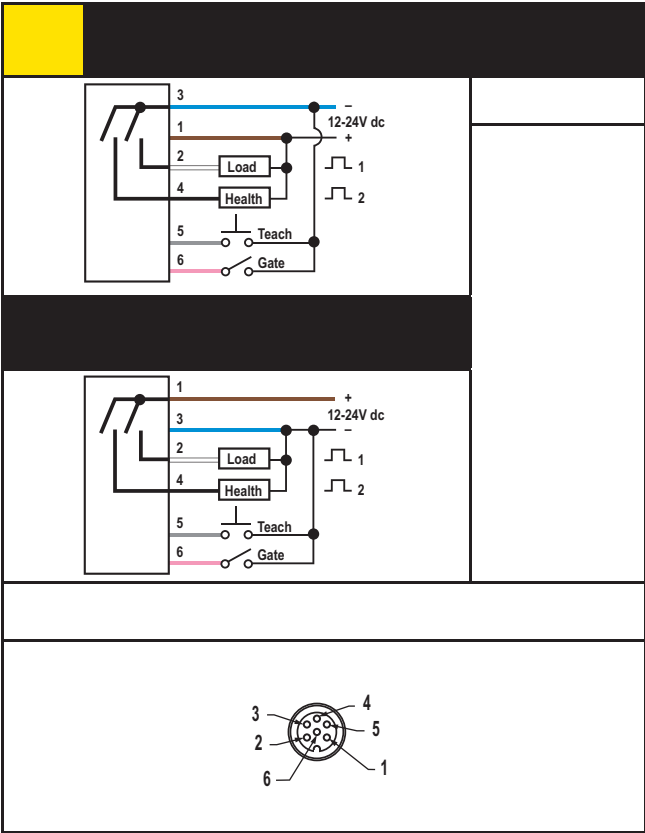
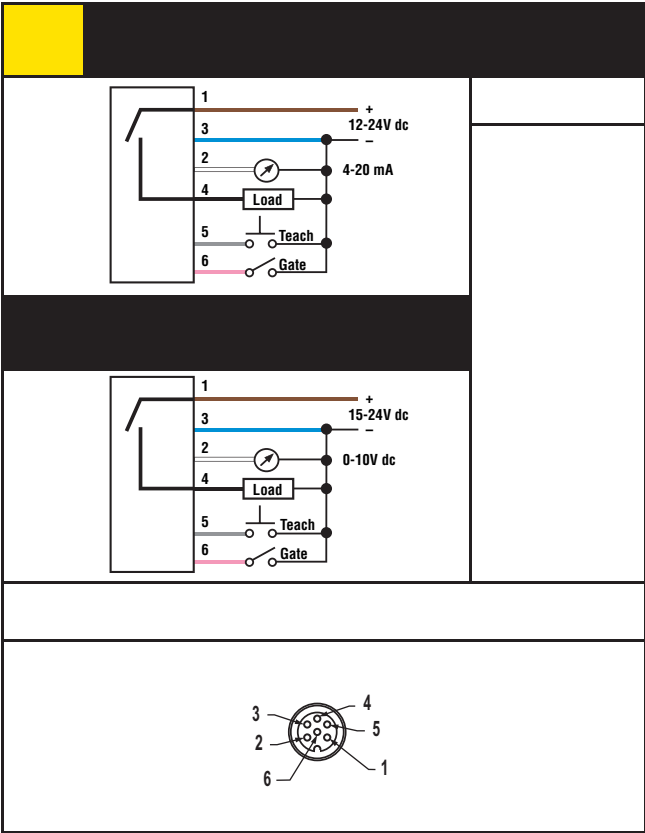
| | Supply Voltage | Lamp Color | Overall Height | Models | Used with |
|---|---------------------|--------------------------------|----------------|------------|---|
|  | 18-30V dc or 24V ac | Red, Yellow, Green | 142.6 mm | TL50GYRQ | <ul style="list-style-type: none"> • PICO-GUARD • EZ-SCREEN • Muting Modules |
| | | Yellow | 61.2 mm | TL50YQ | |
| | | White | | TL50WQ | |
|  | +24V dc | Red Green Yellow (Amber) | Ø 18 mm | M18RGR5PNQ | |
|  | 24V ac/dc | Amber | 383 mm | SSA-ML-A | |
| | | White (clear) | | SSA-ML-W | |

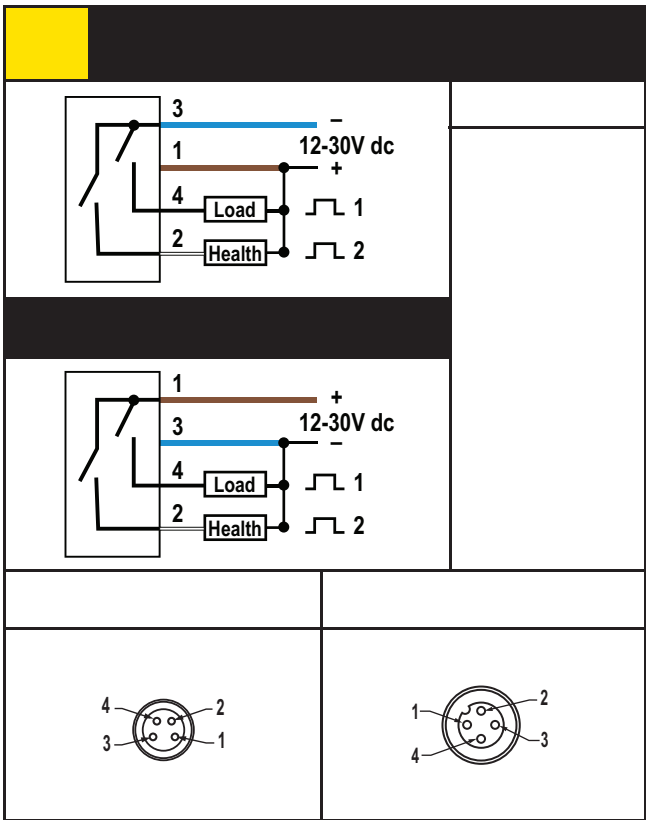
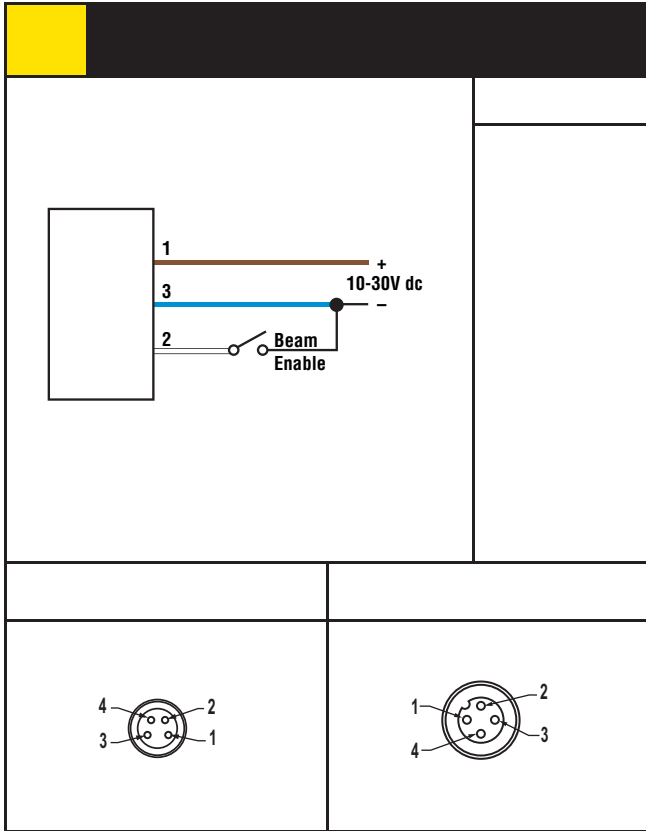
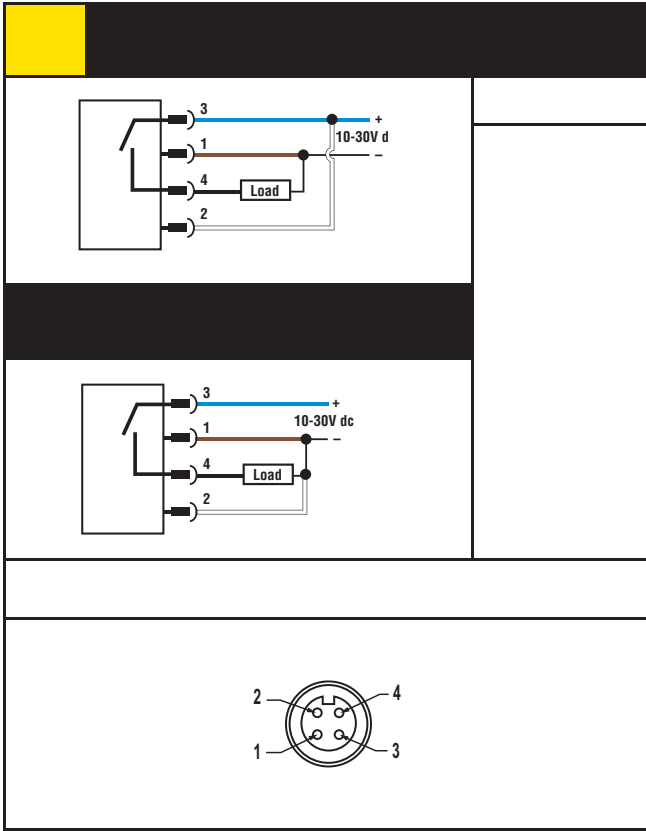


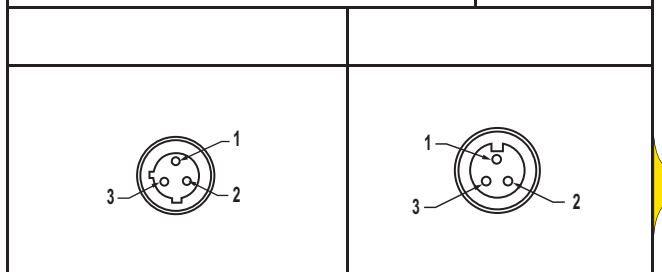
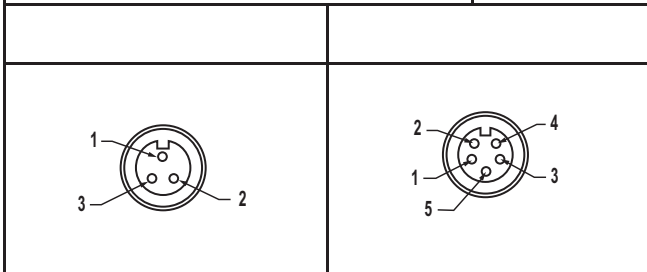
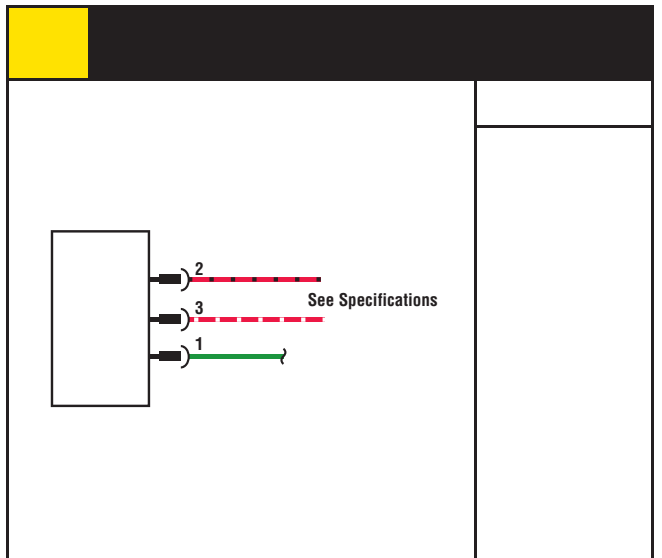
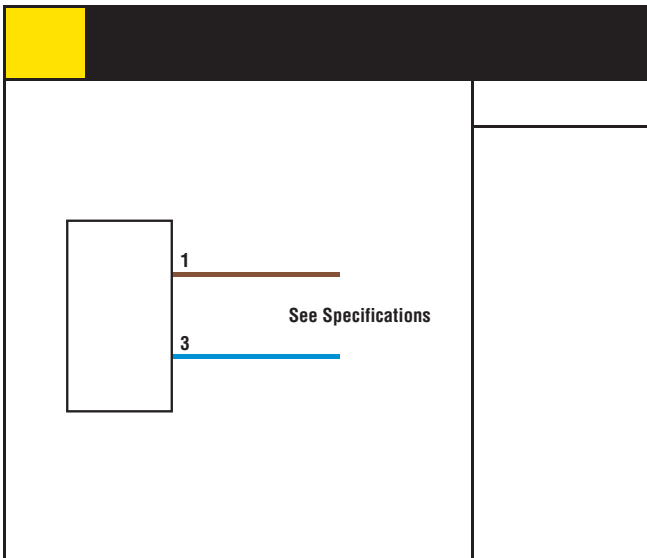
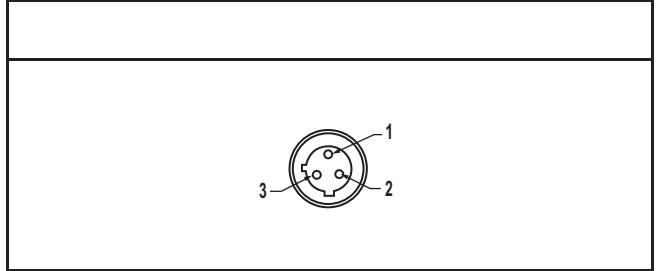
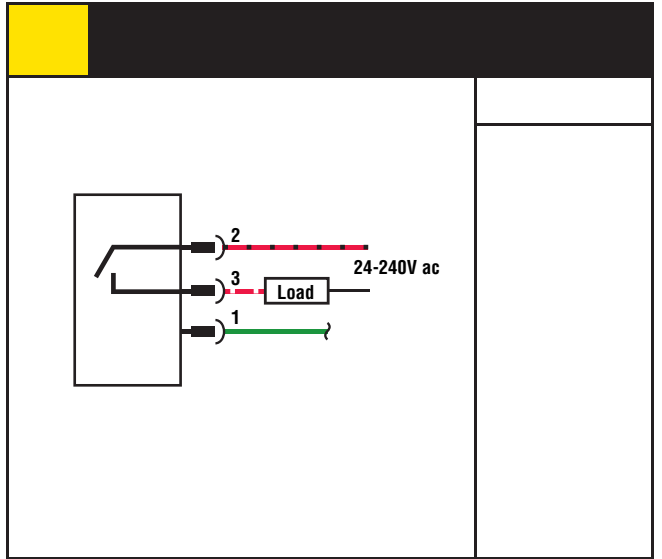
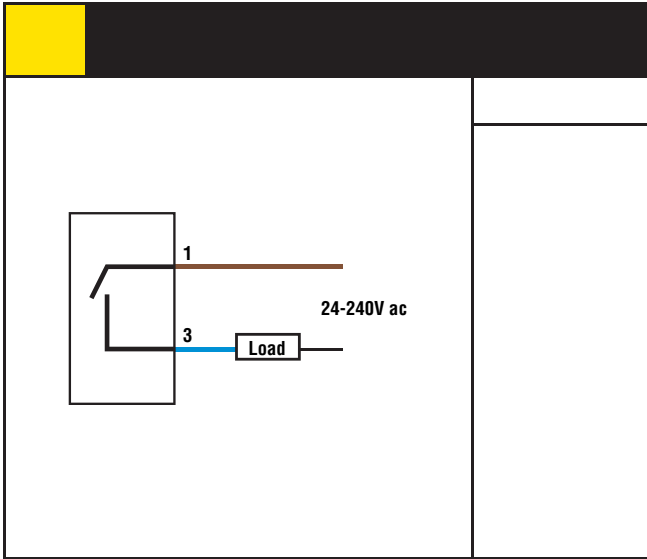


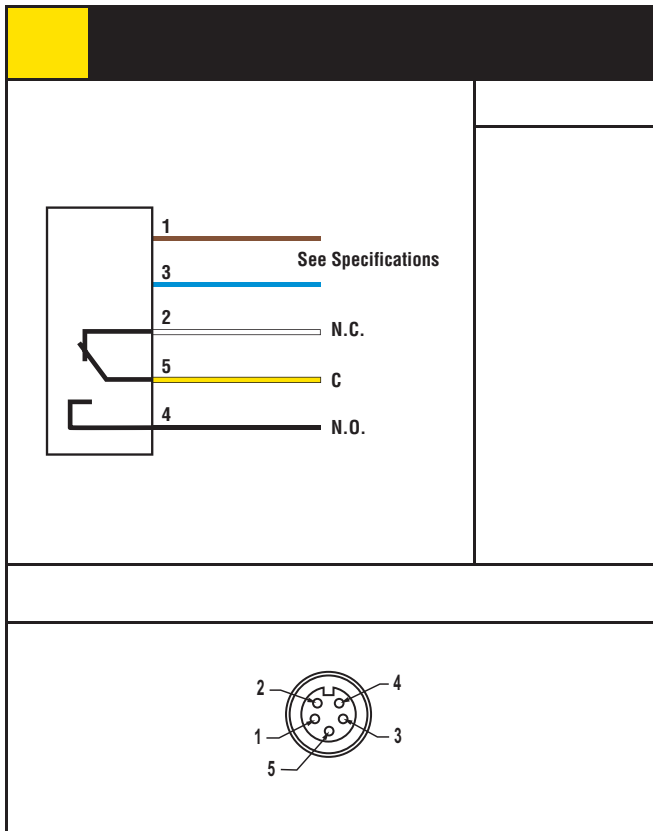
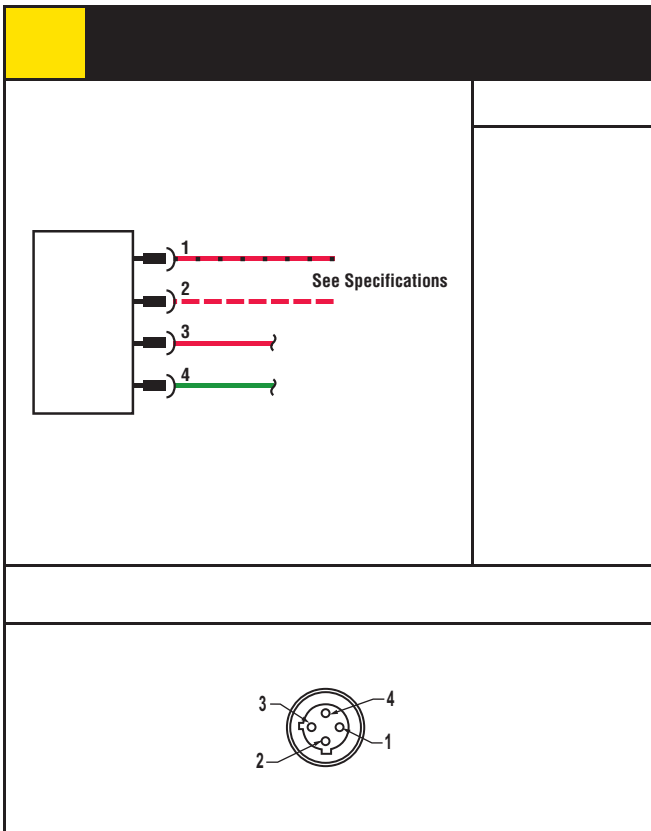
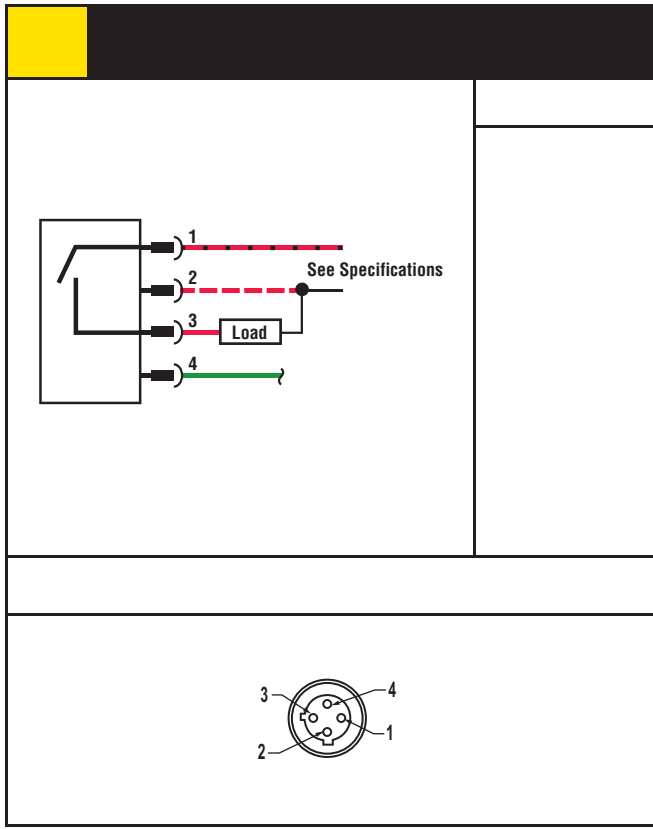
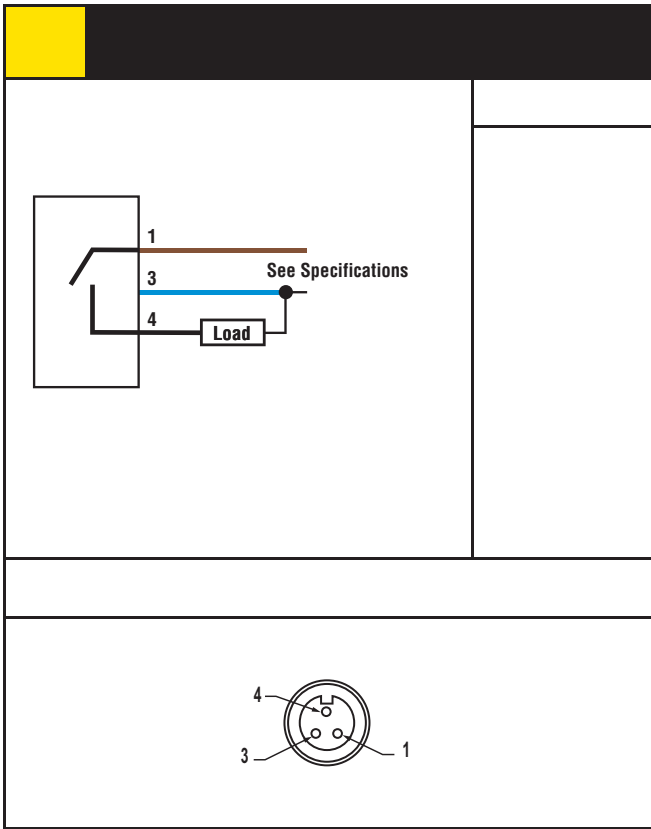


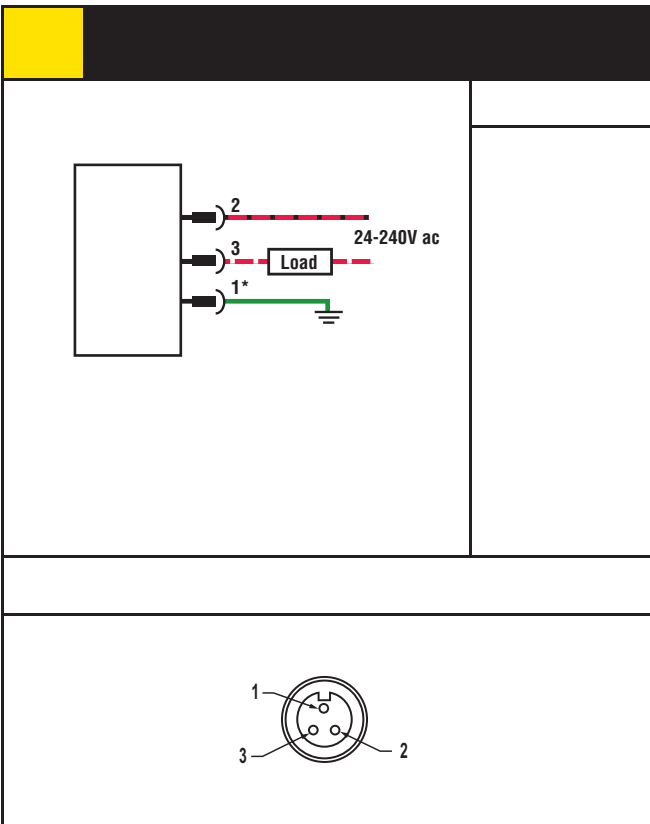
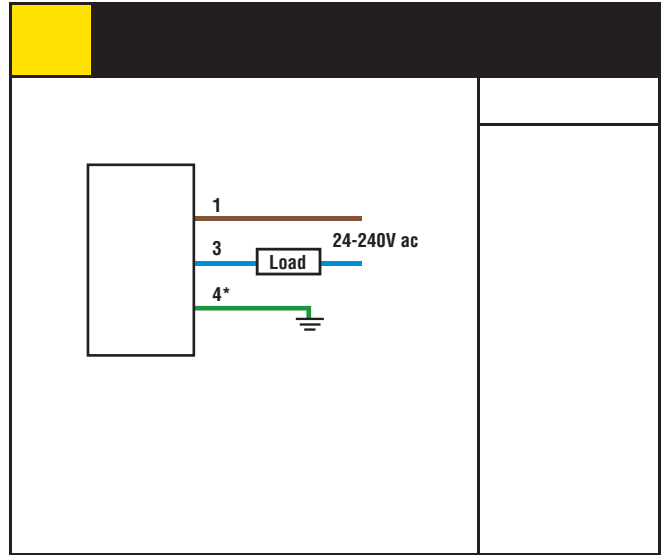
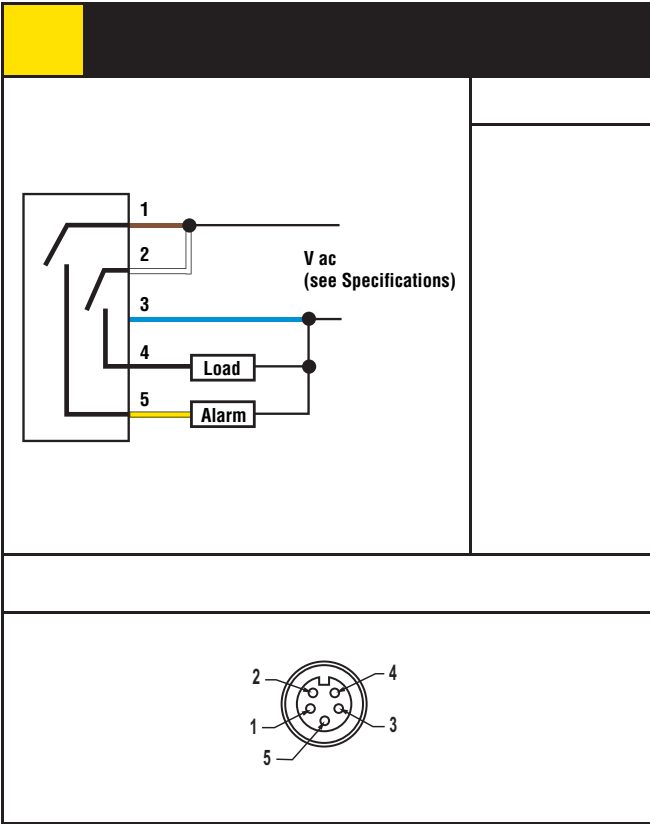


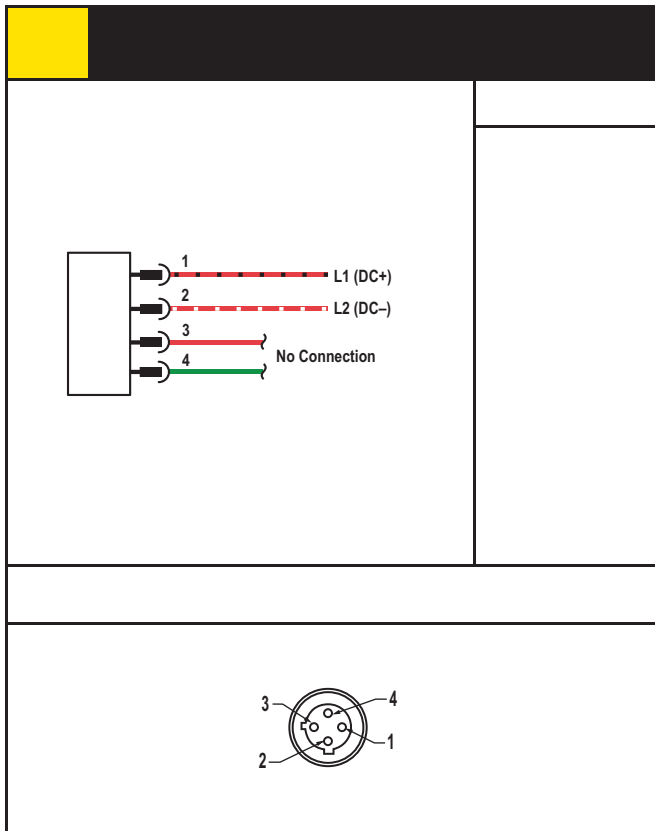
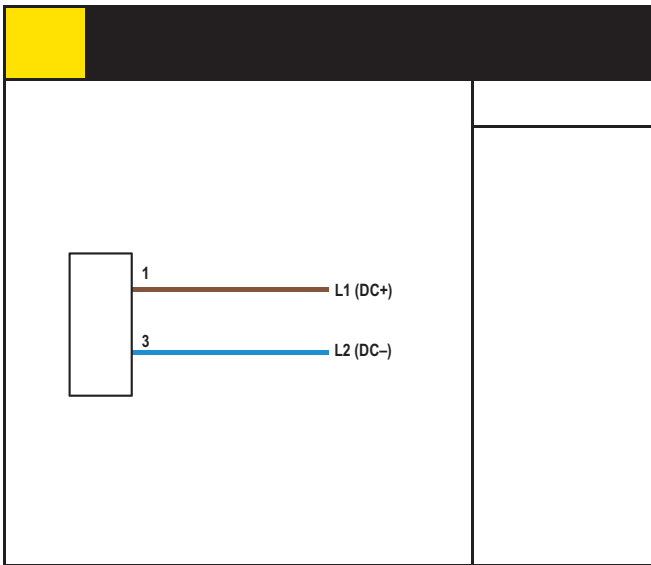
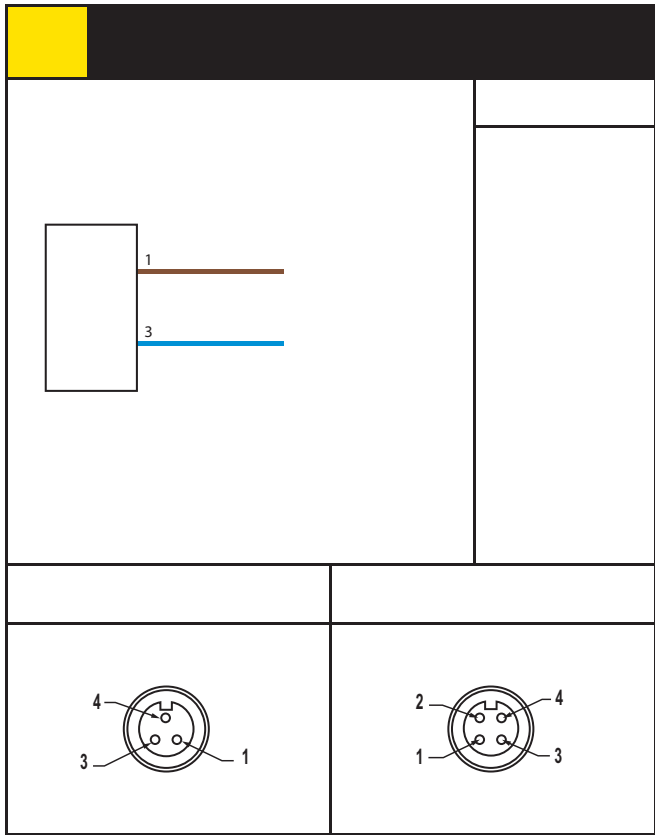
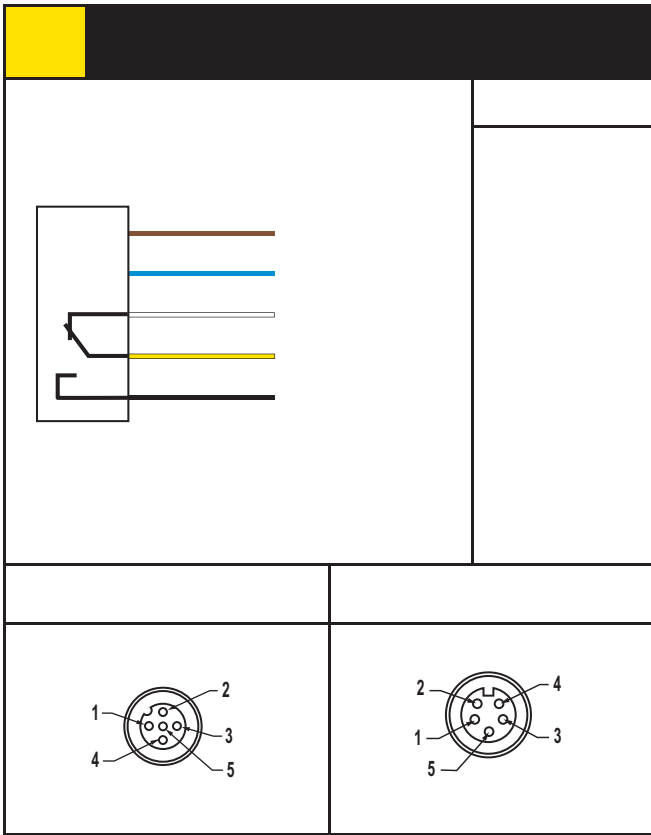


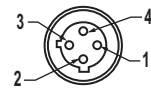
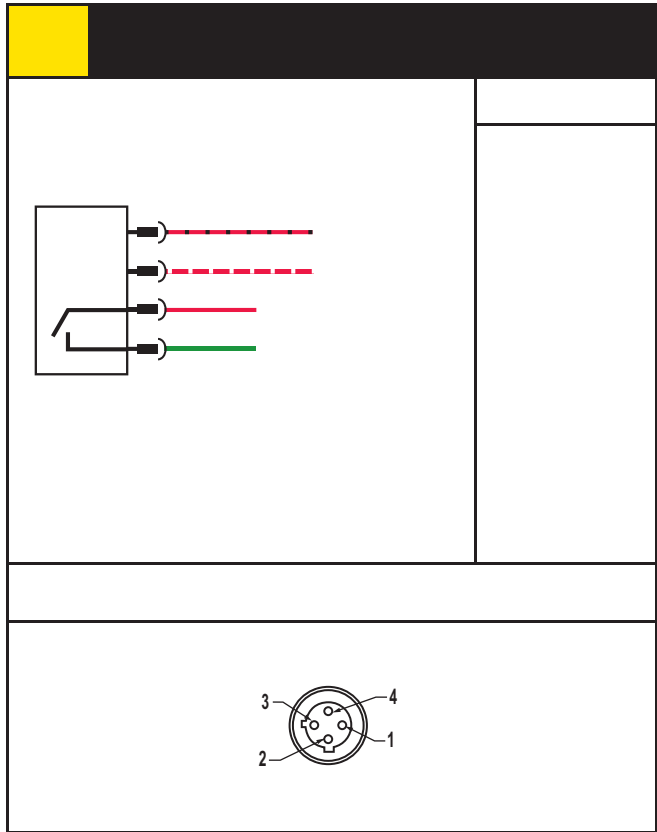
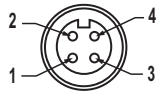
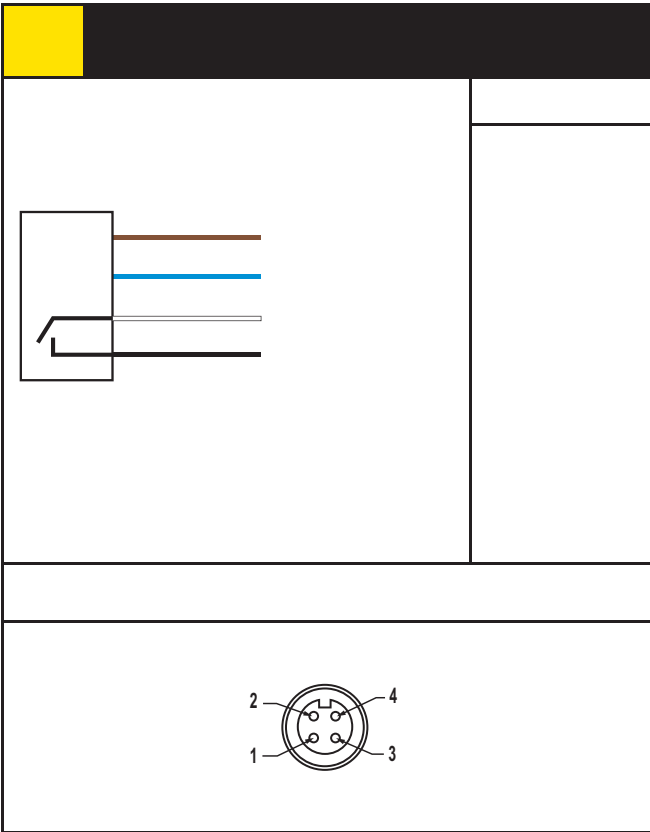
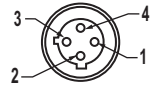
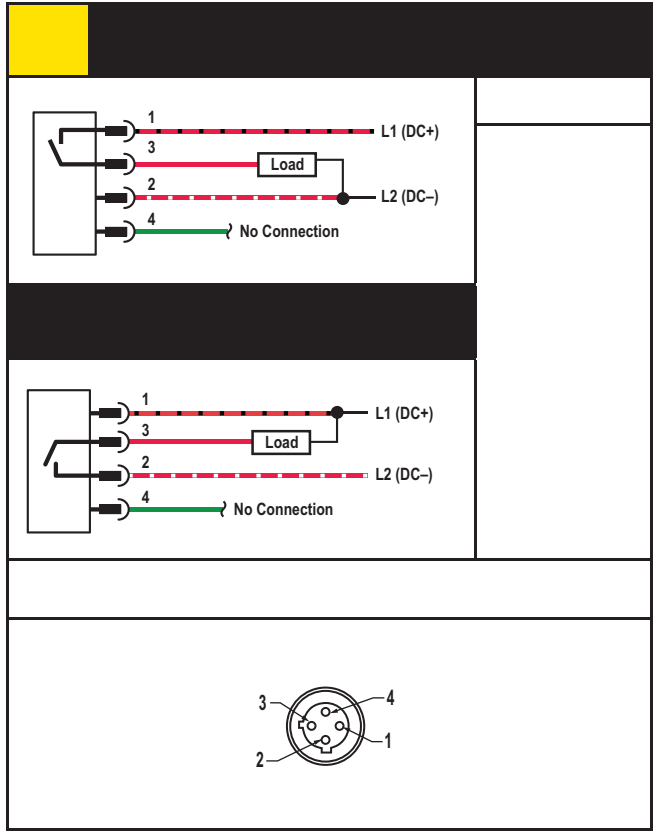
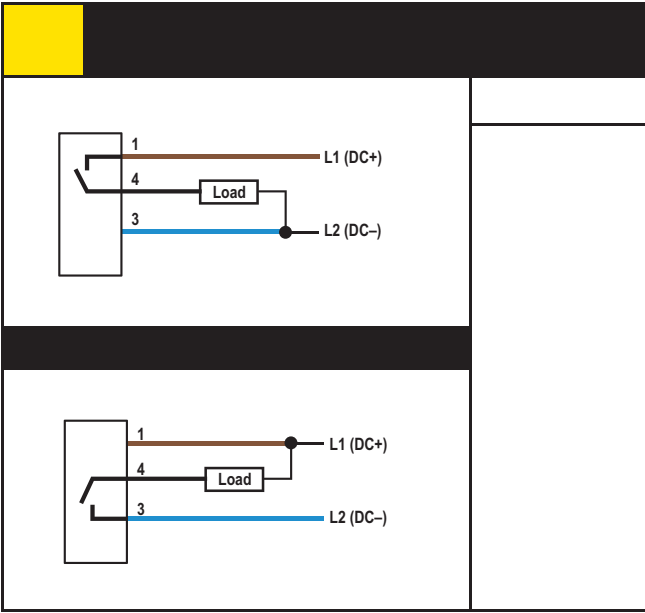


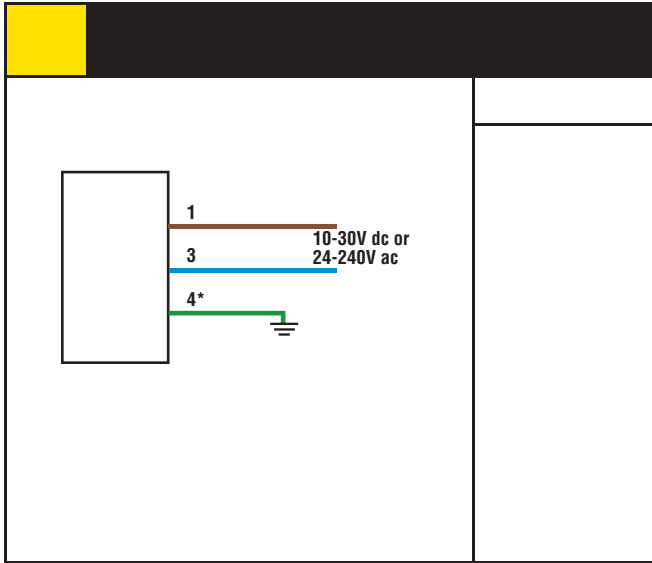
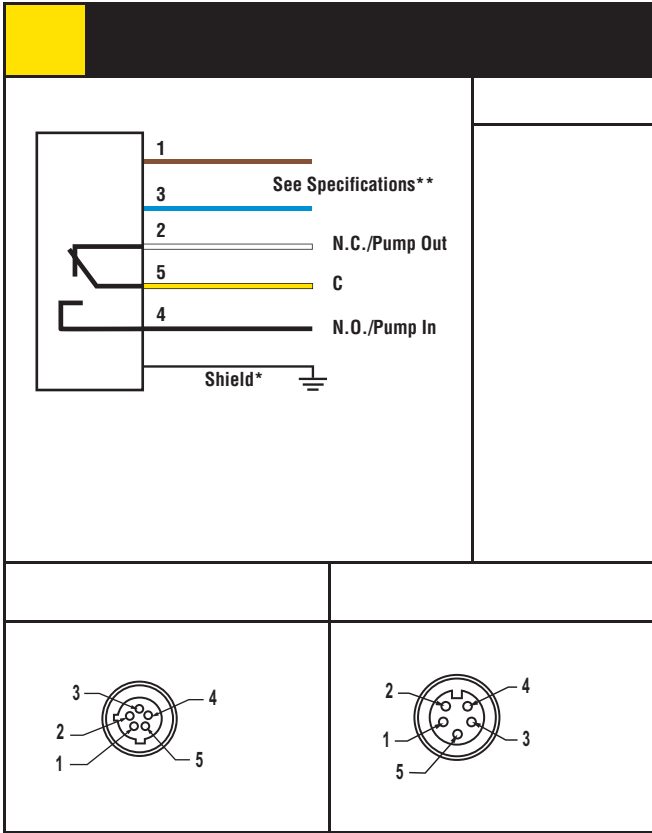


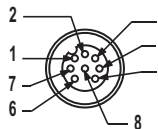
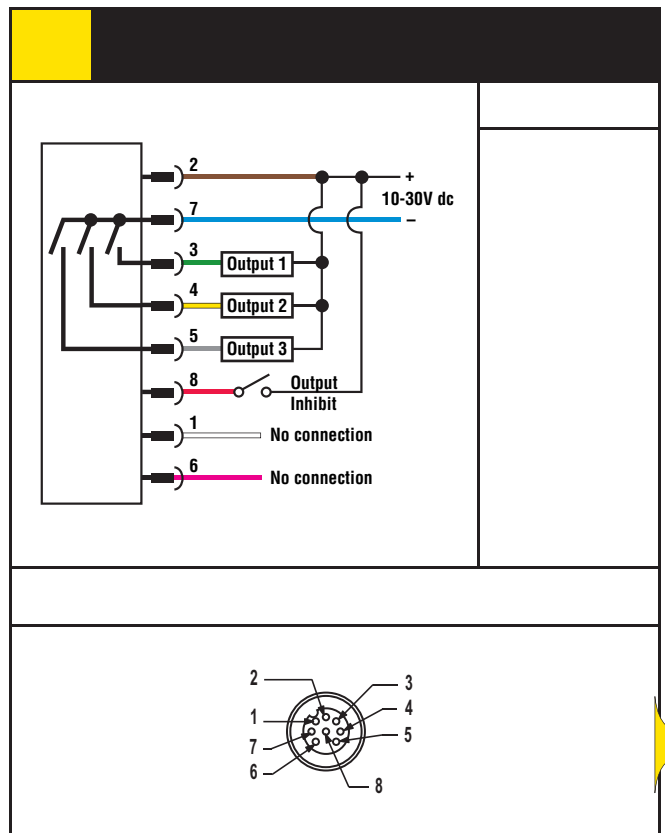
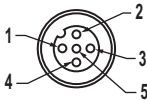
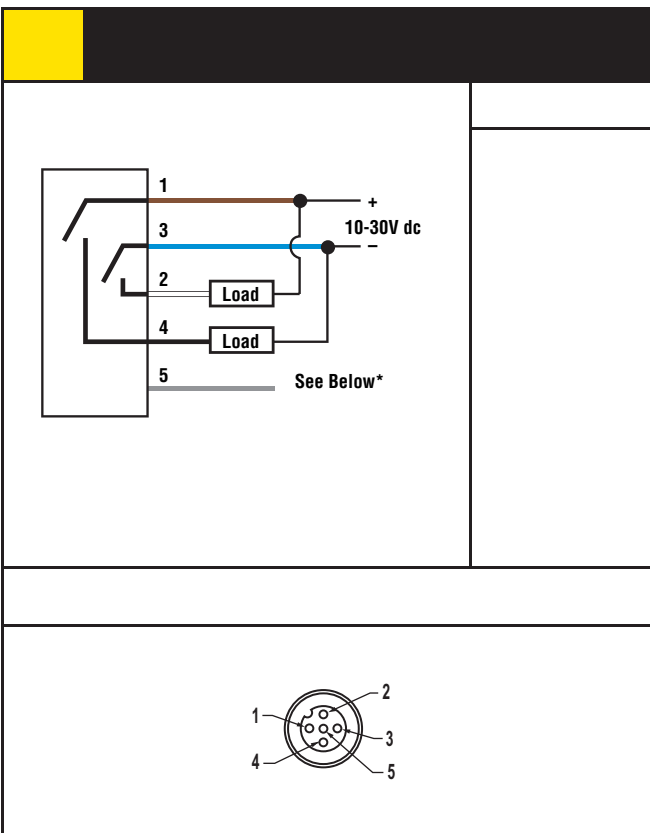
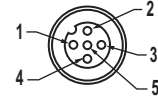
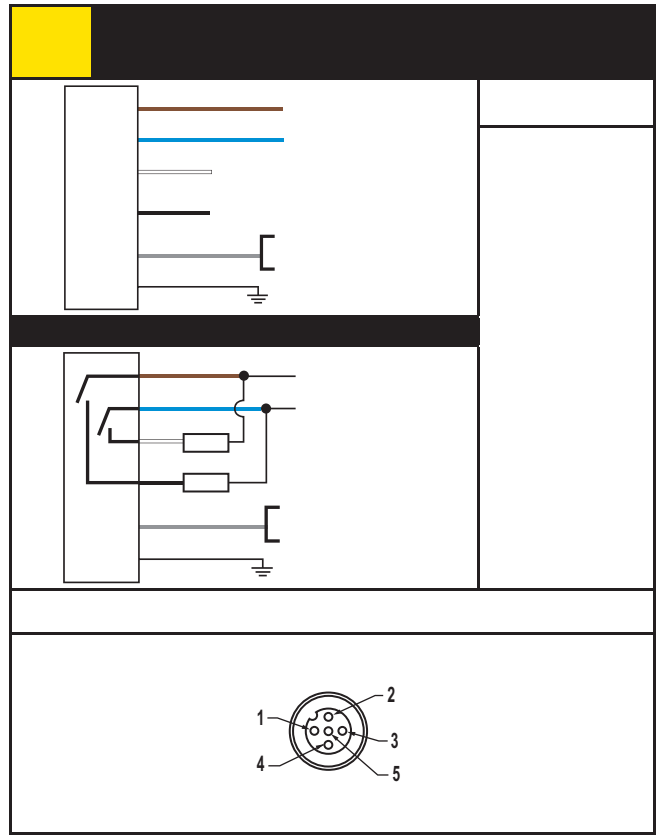
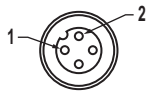
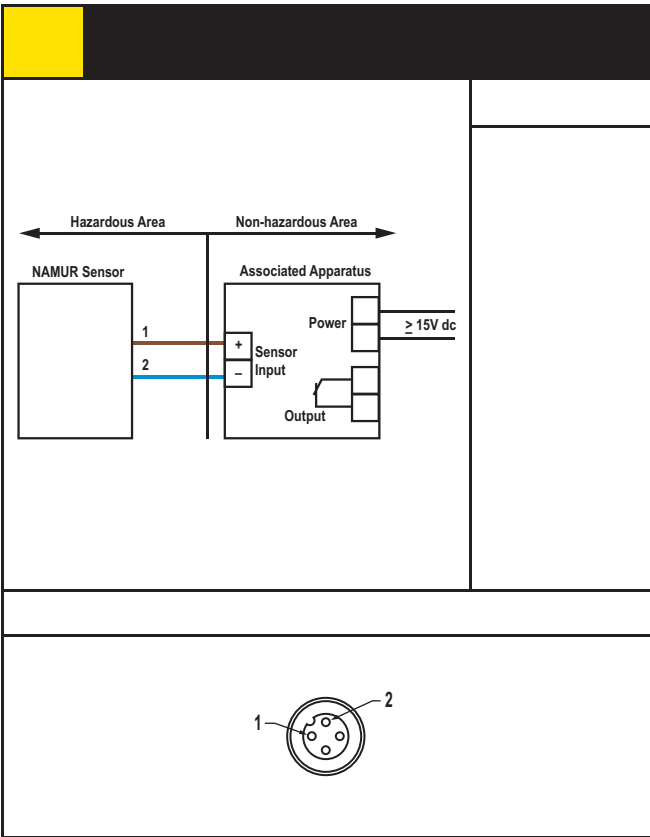


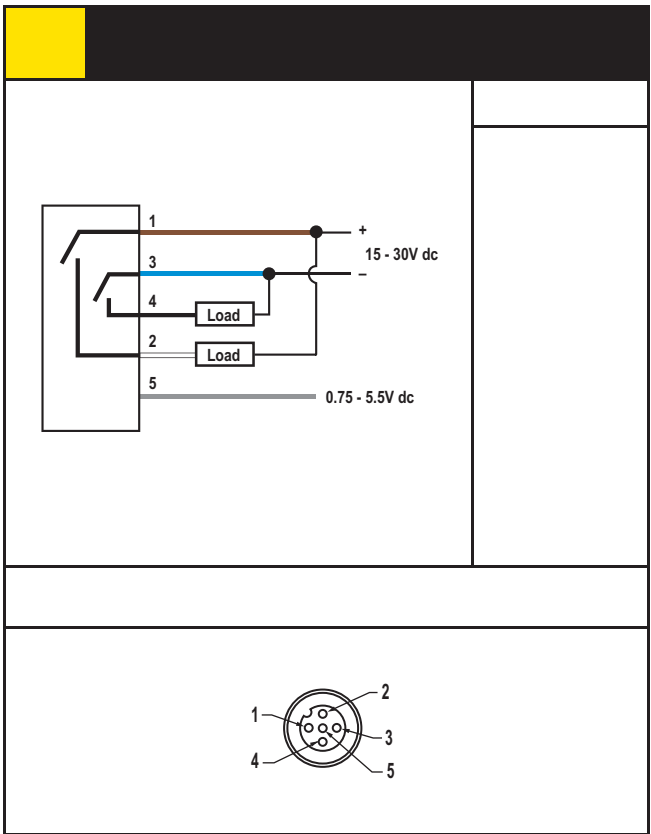
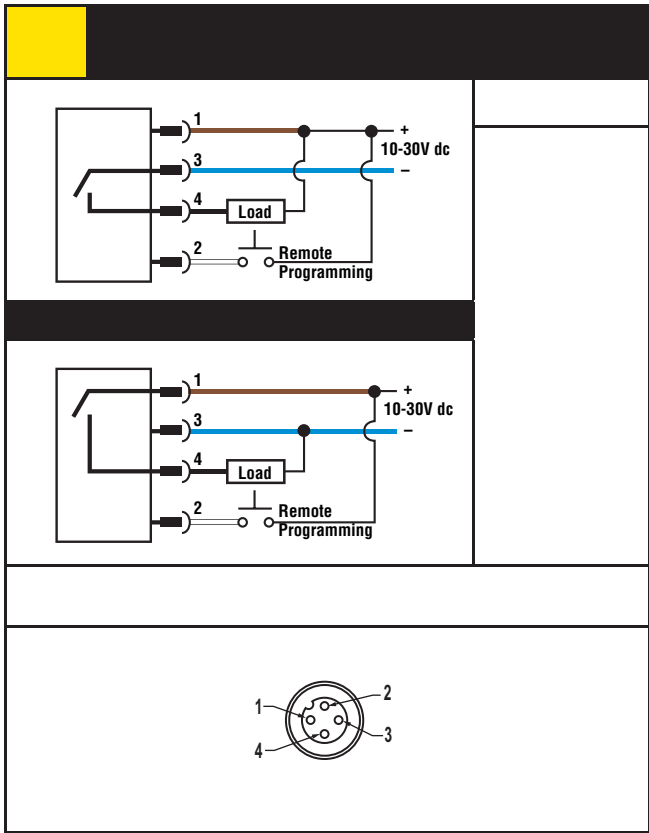
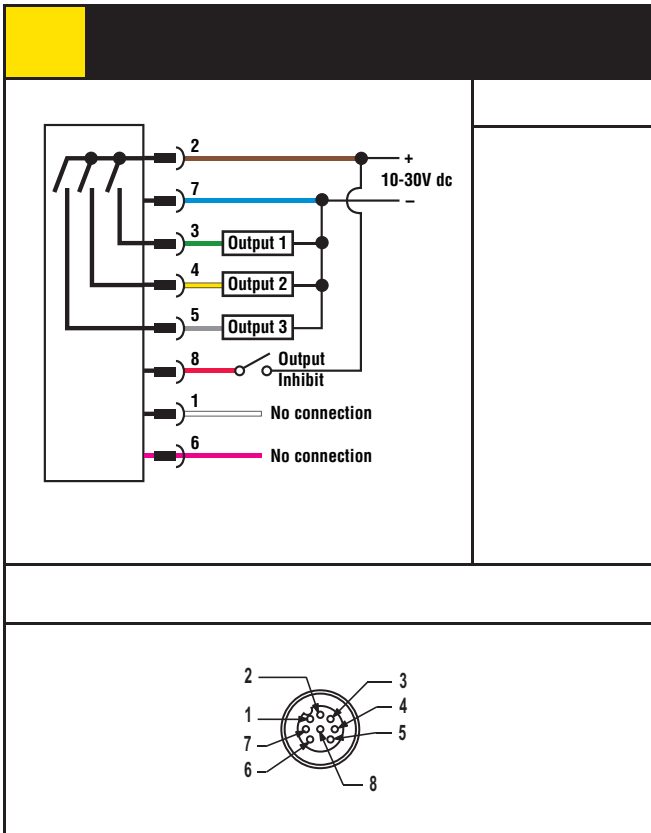


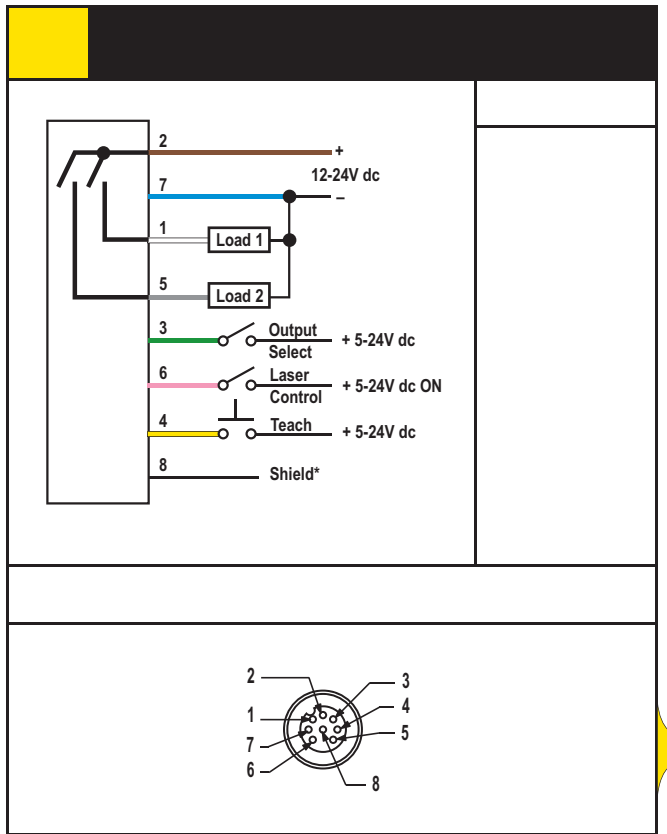
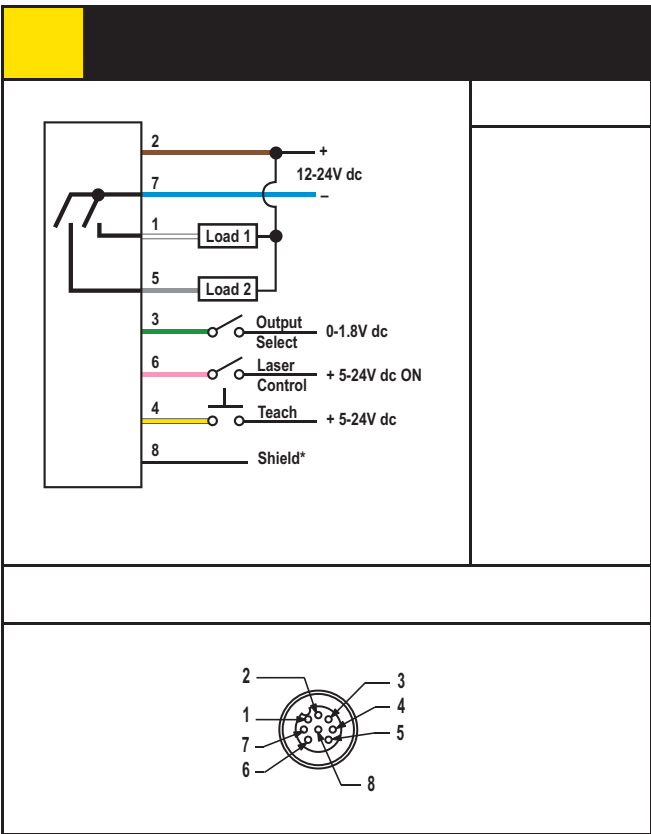
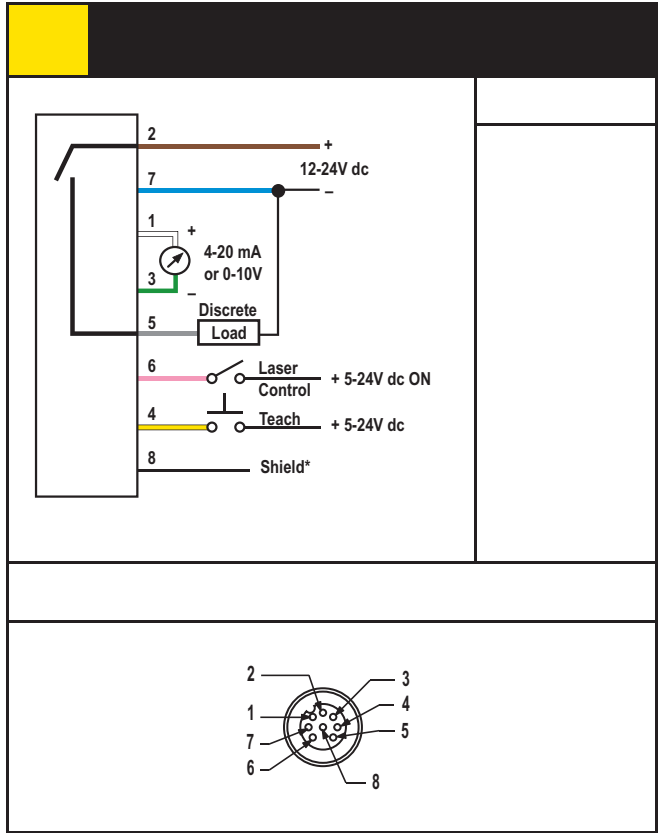
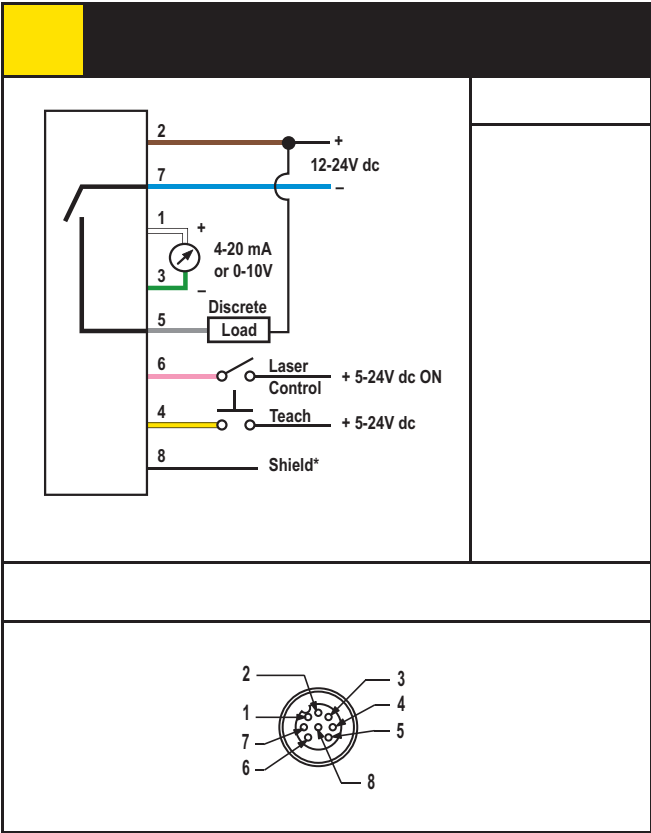


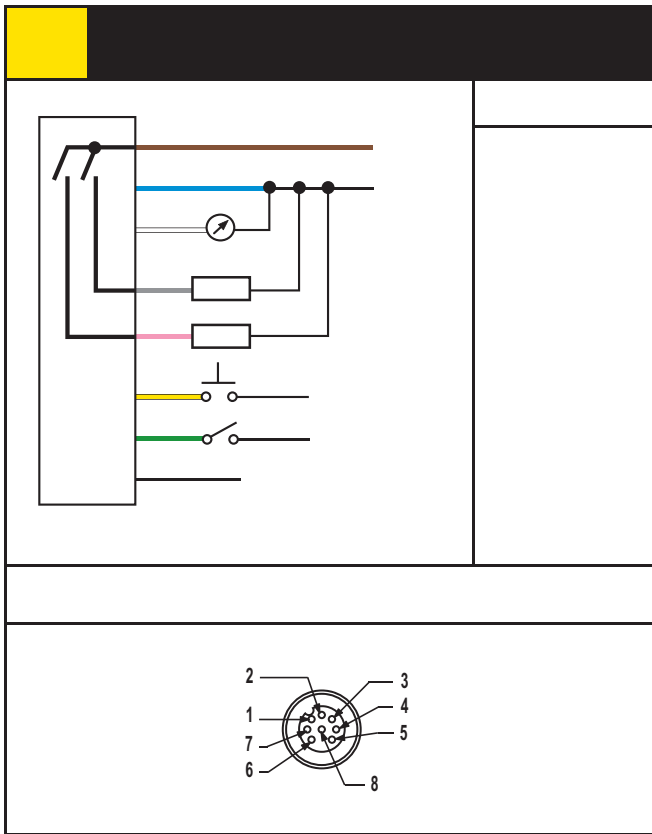
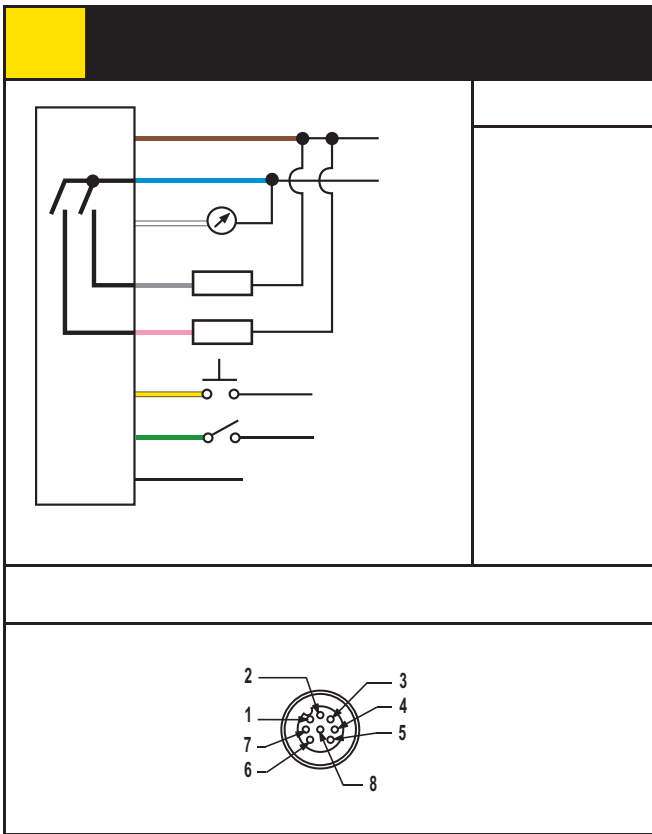
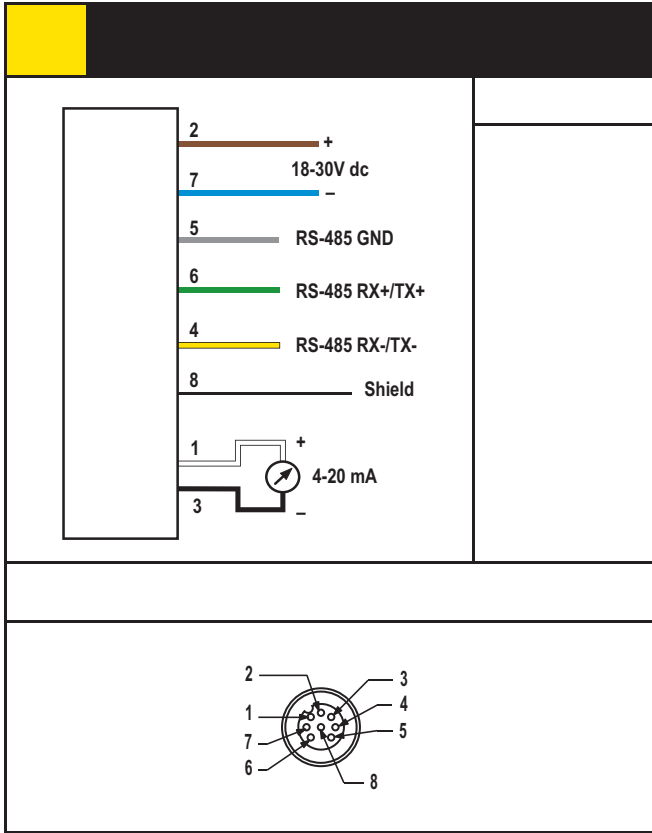
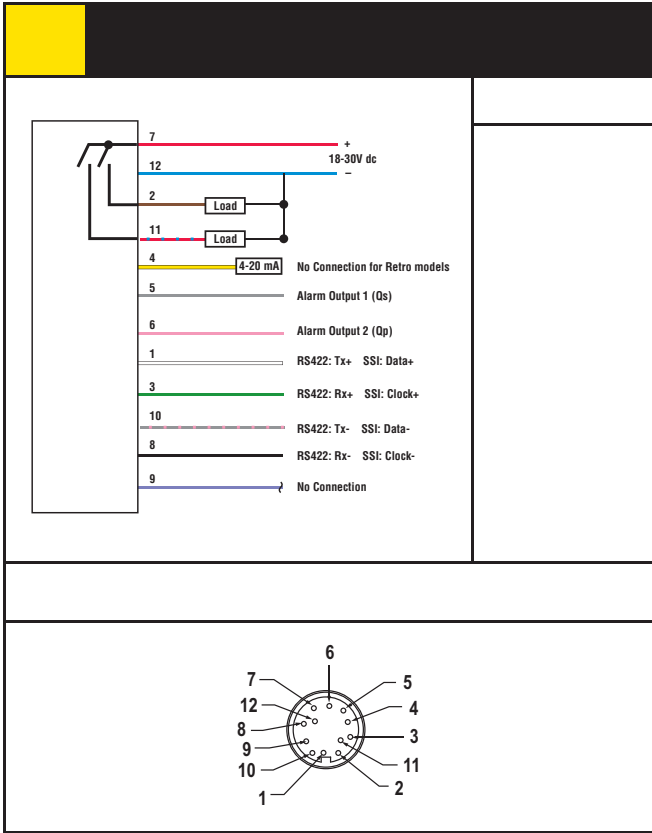


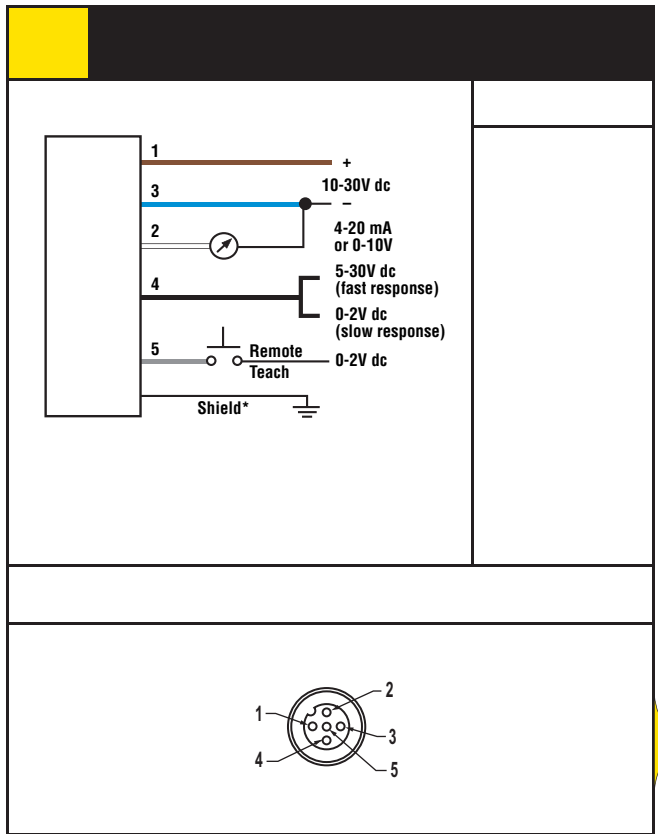
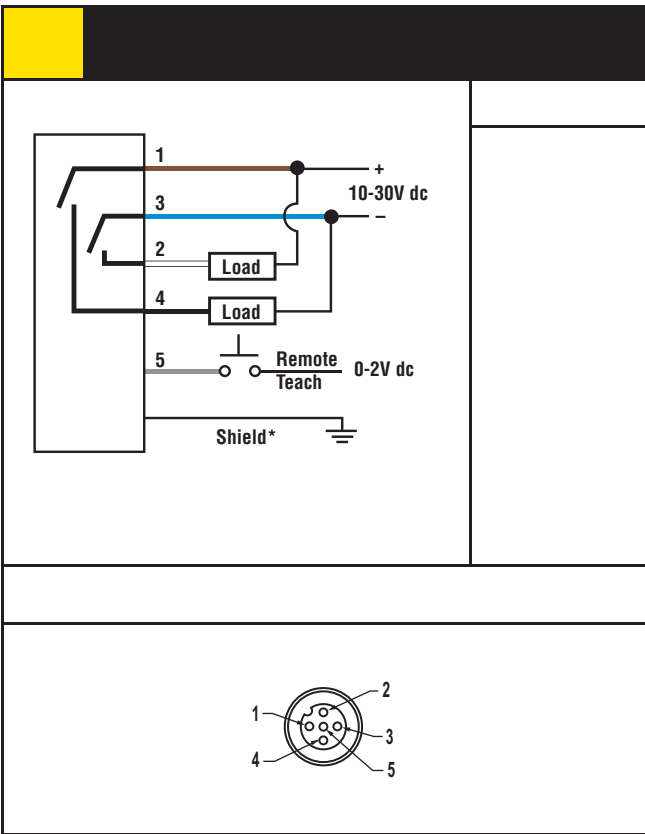
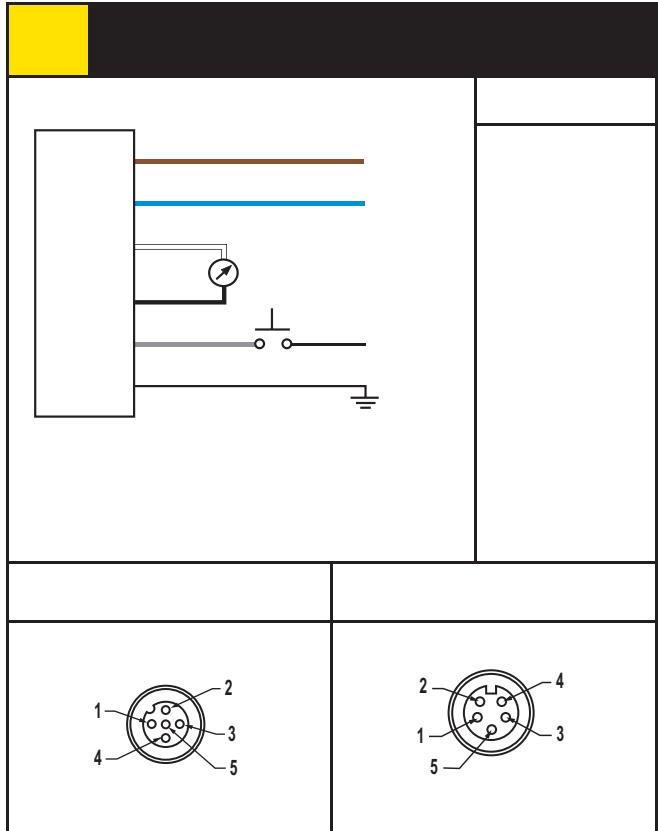
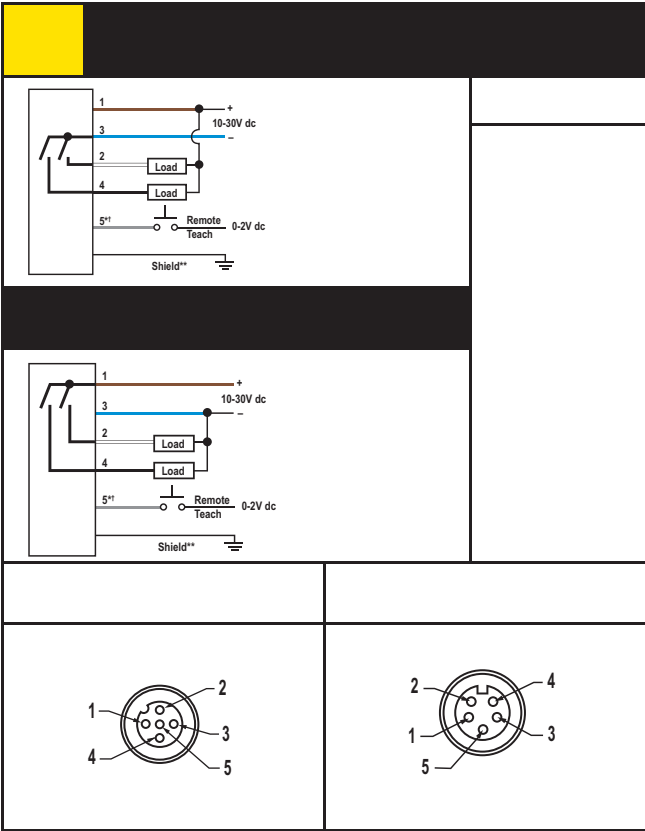


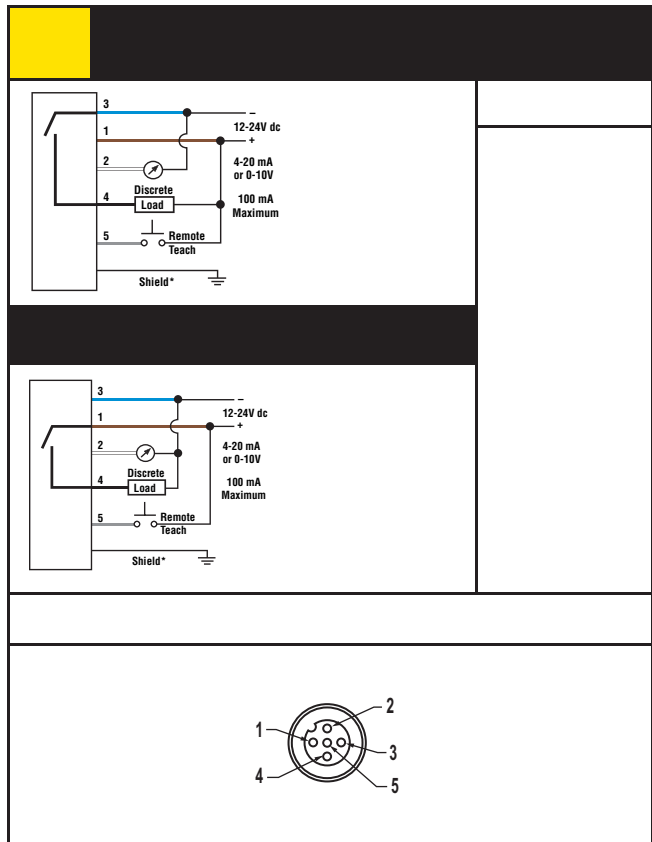
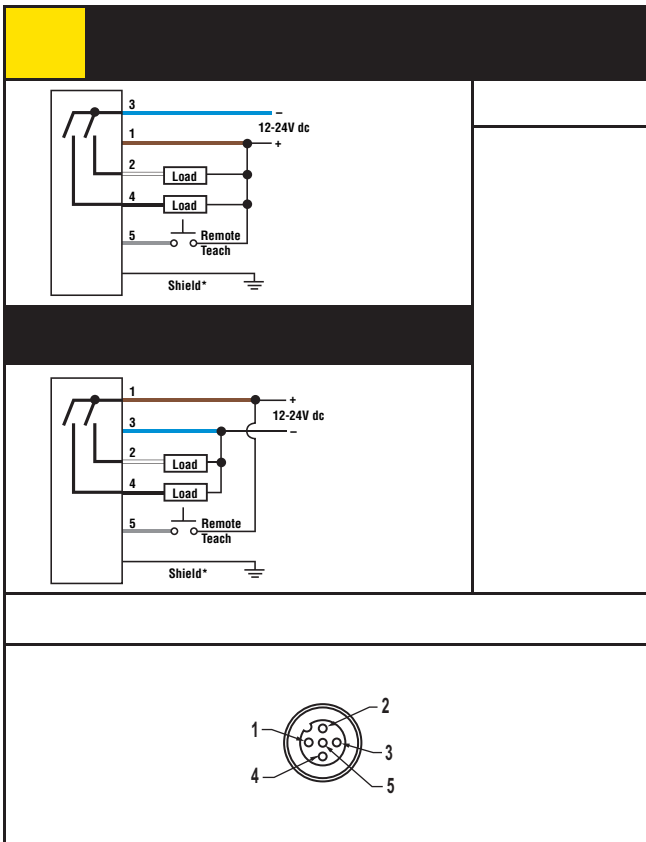
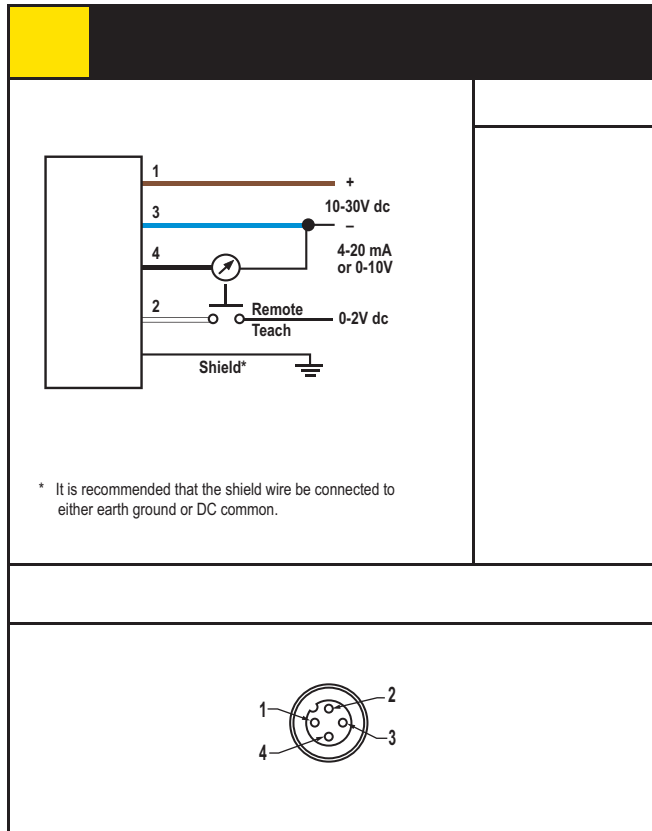
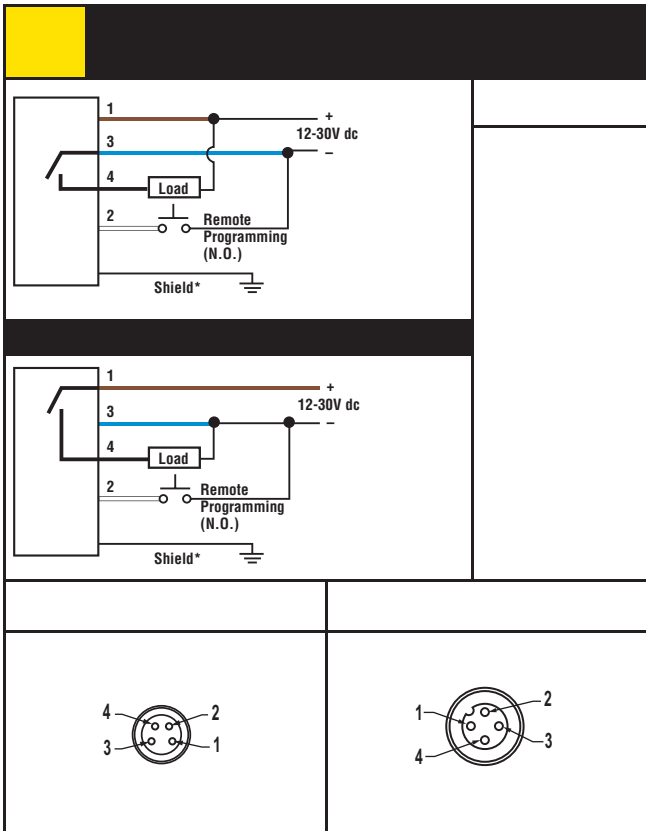


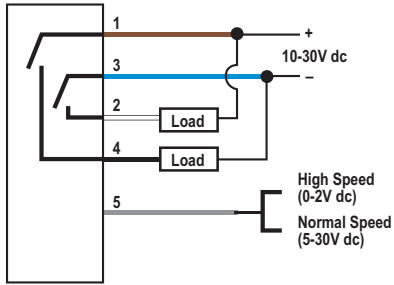




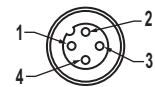
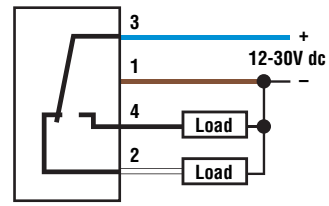
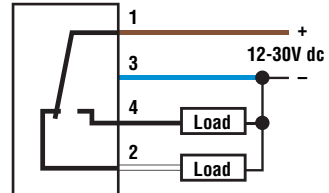
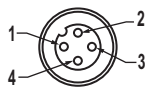
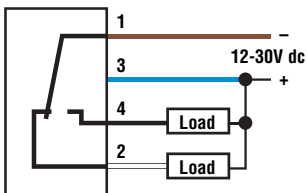
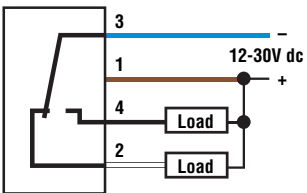
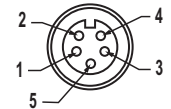
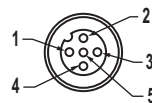
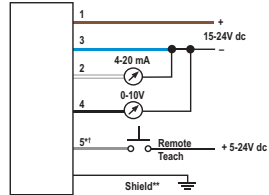
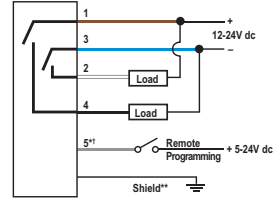
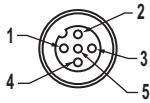


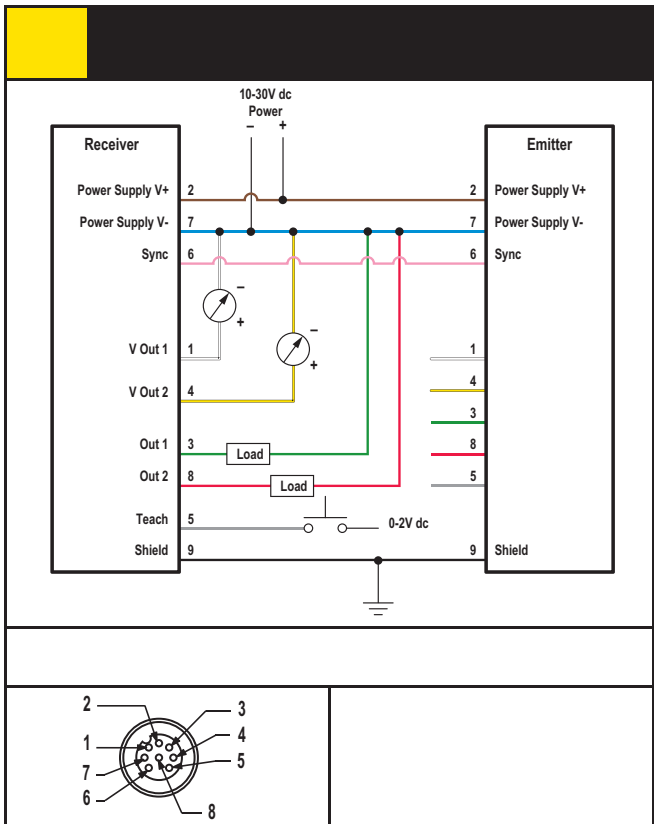
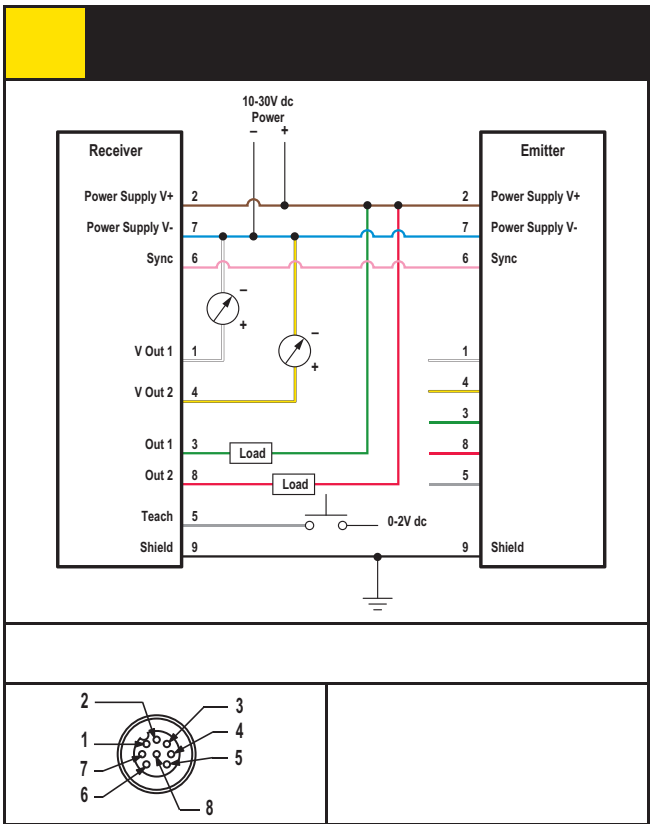
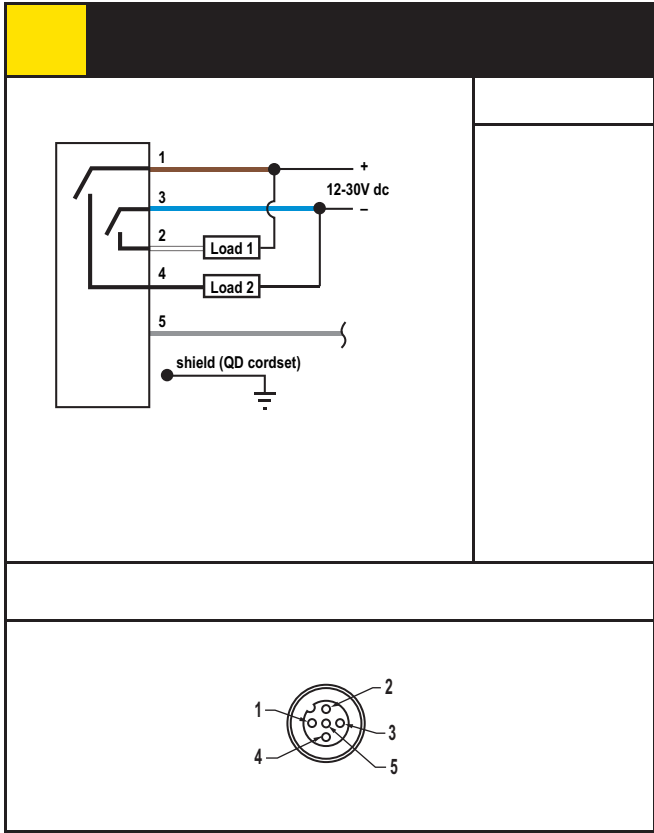
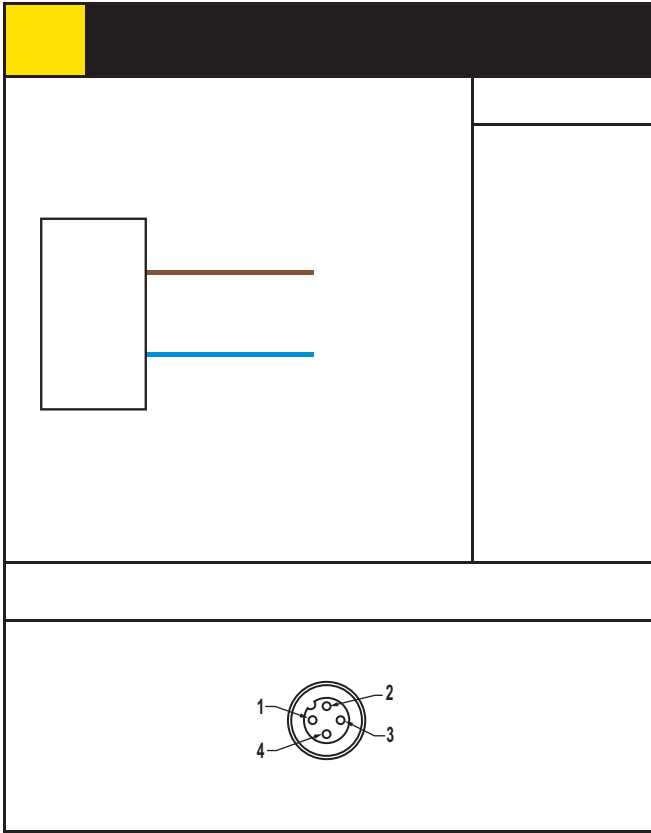


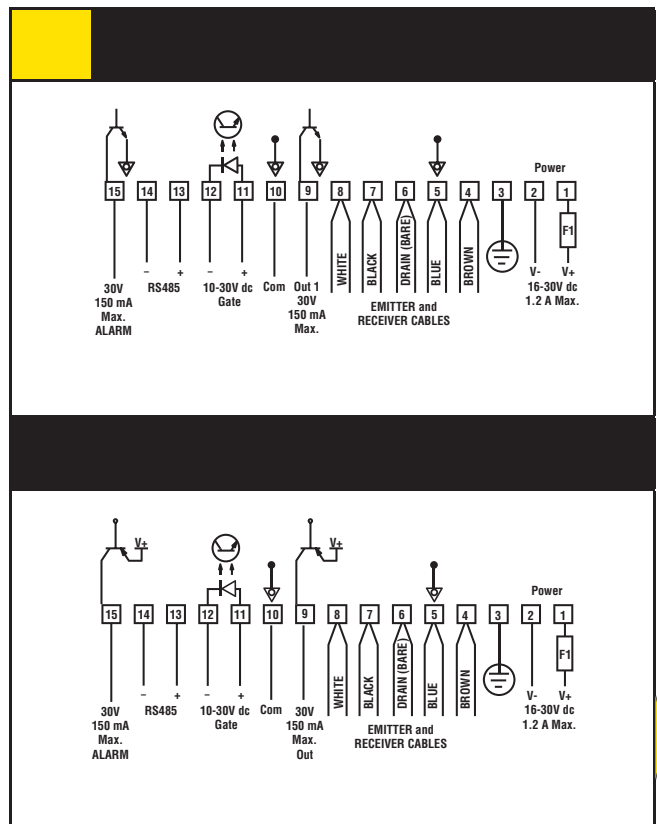
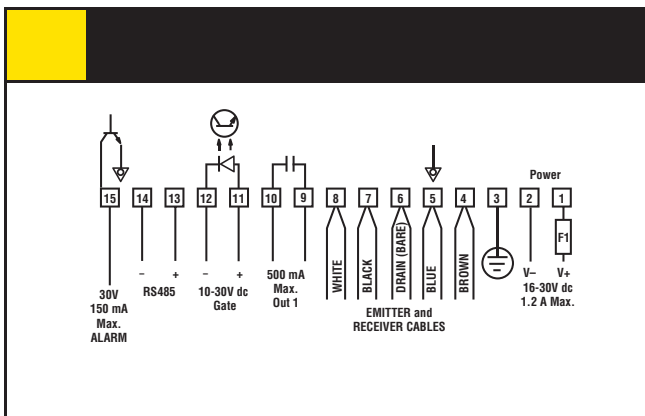
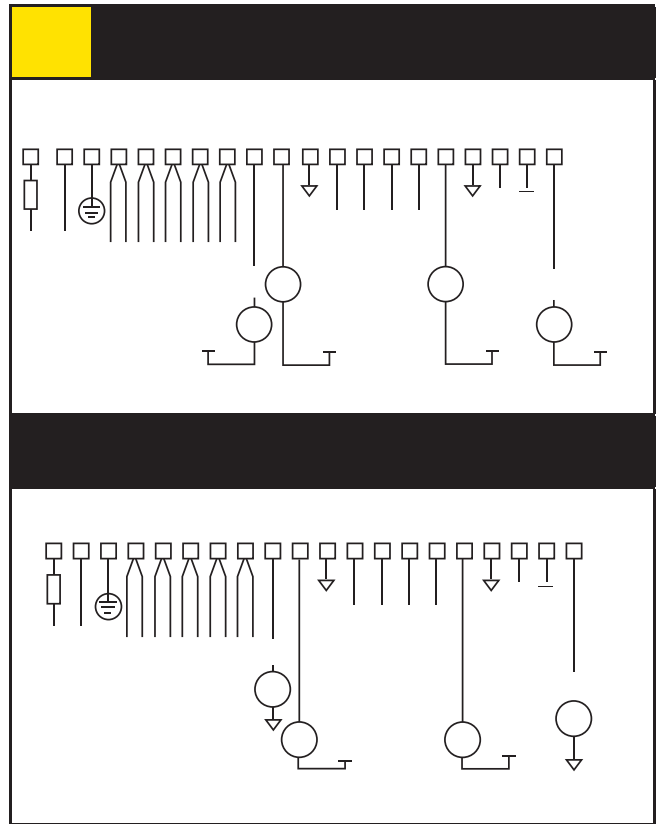
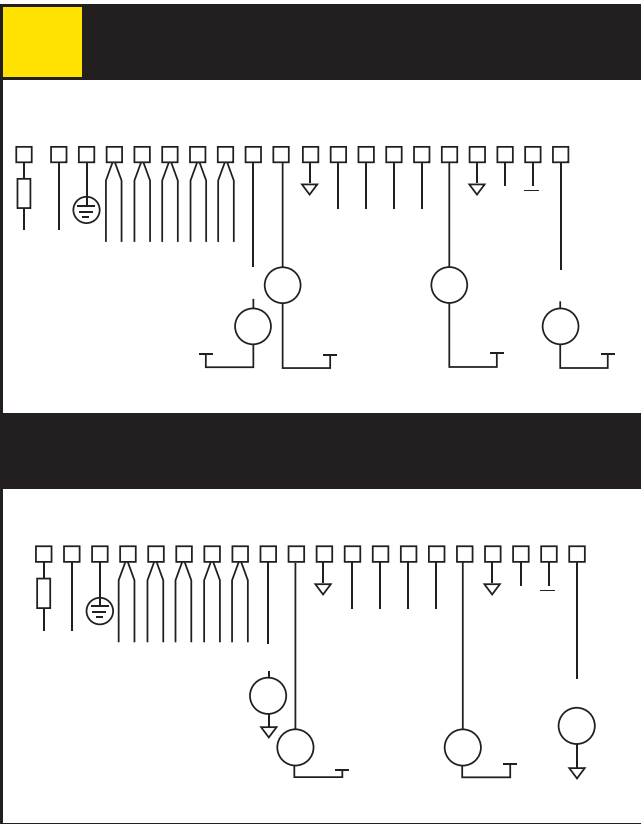


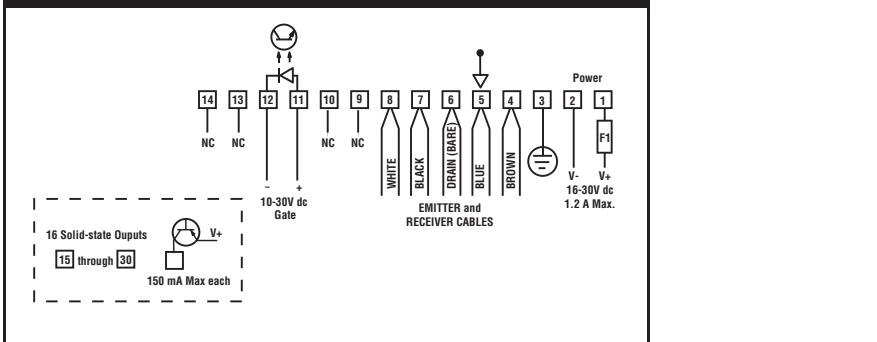
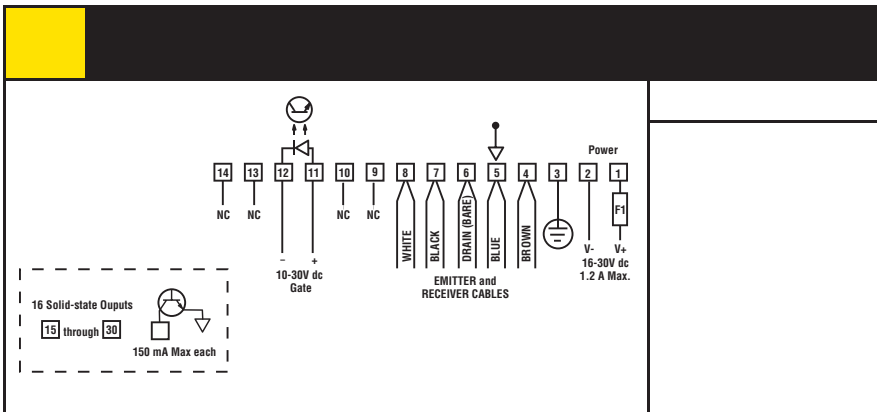
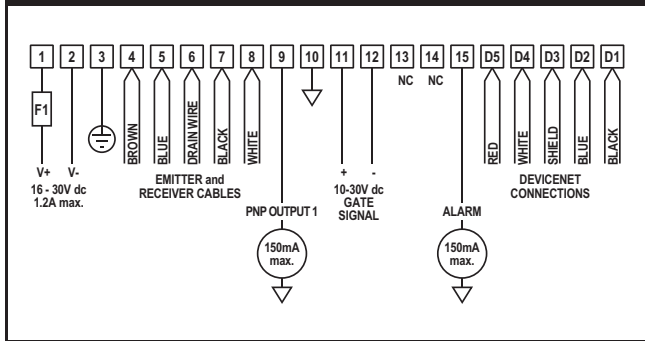
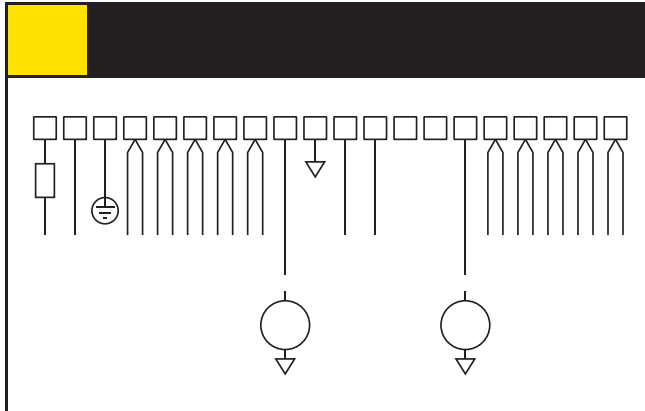
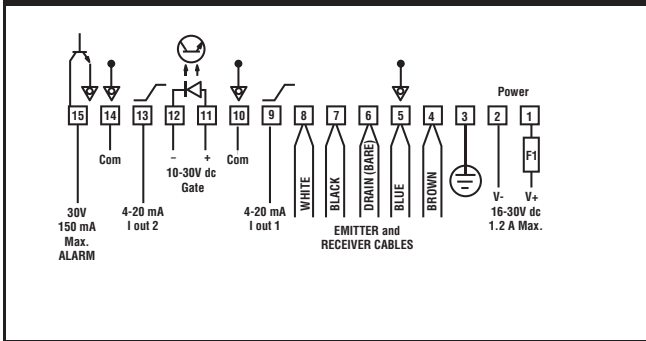
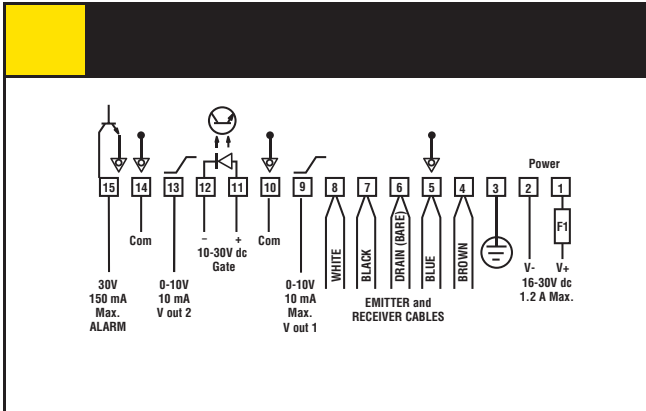


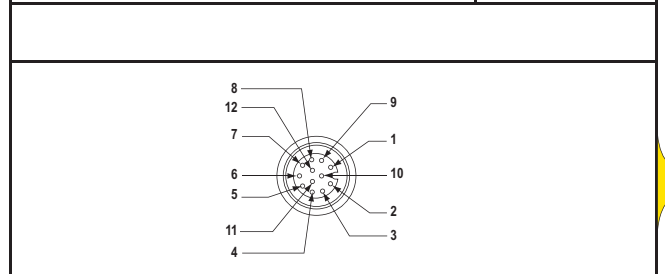
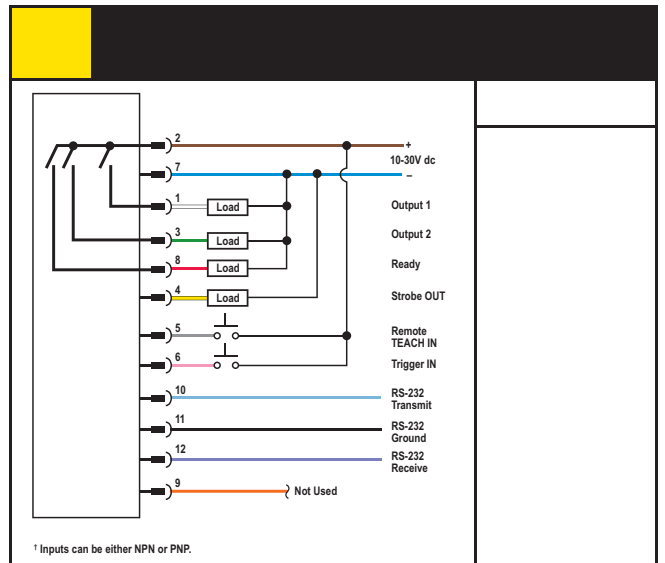
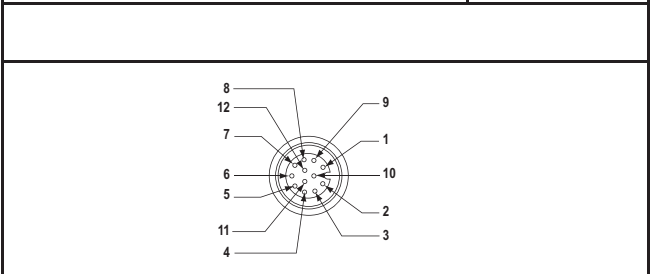
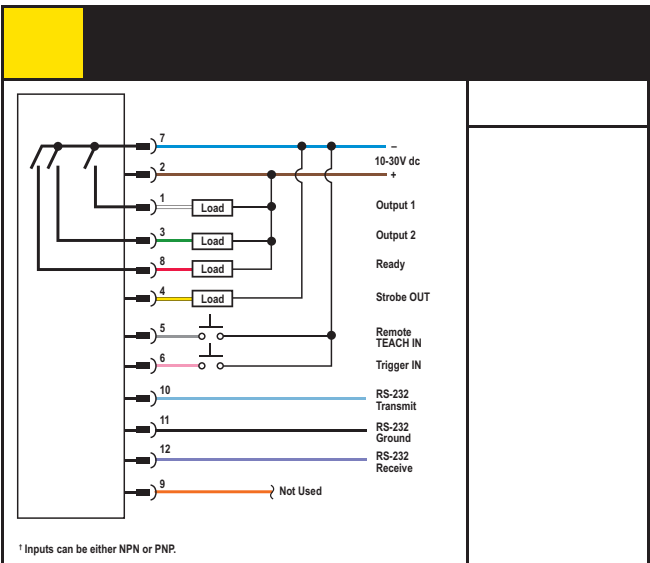
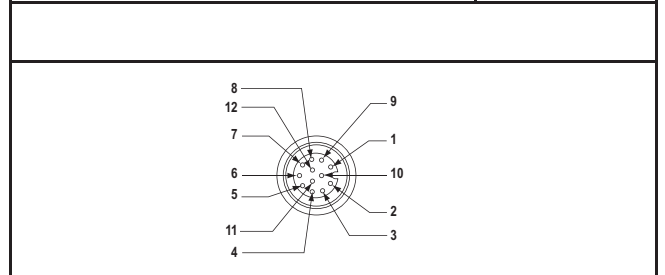
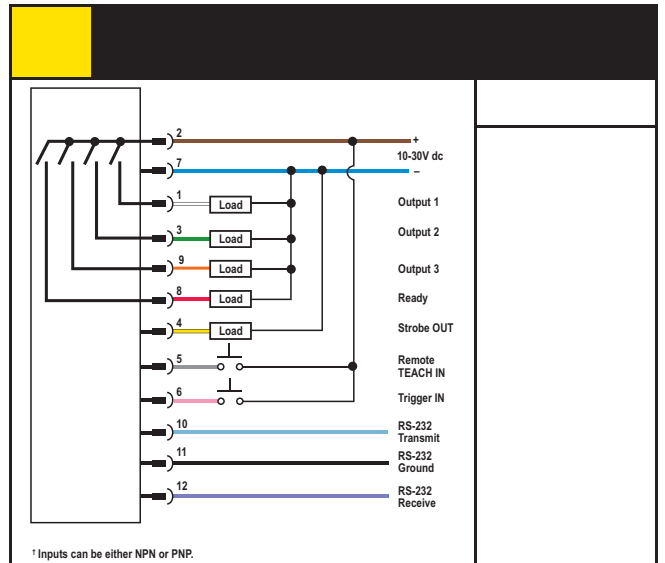
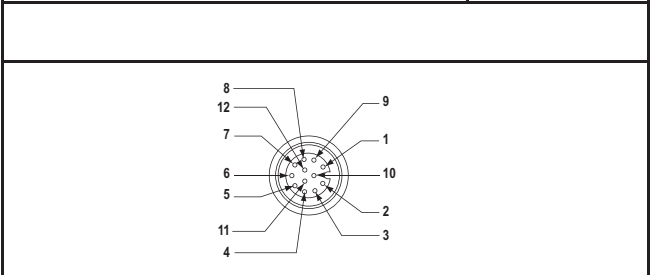
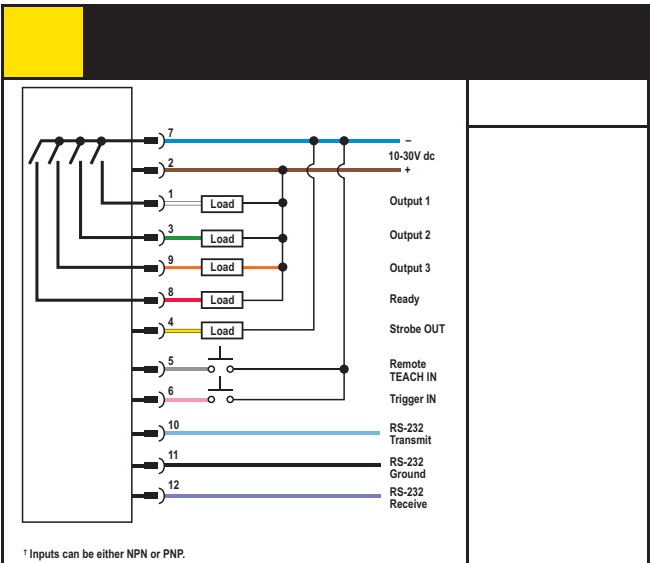
* It is recommended that the shield wire be connected to either earth ground or DC common.

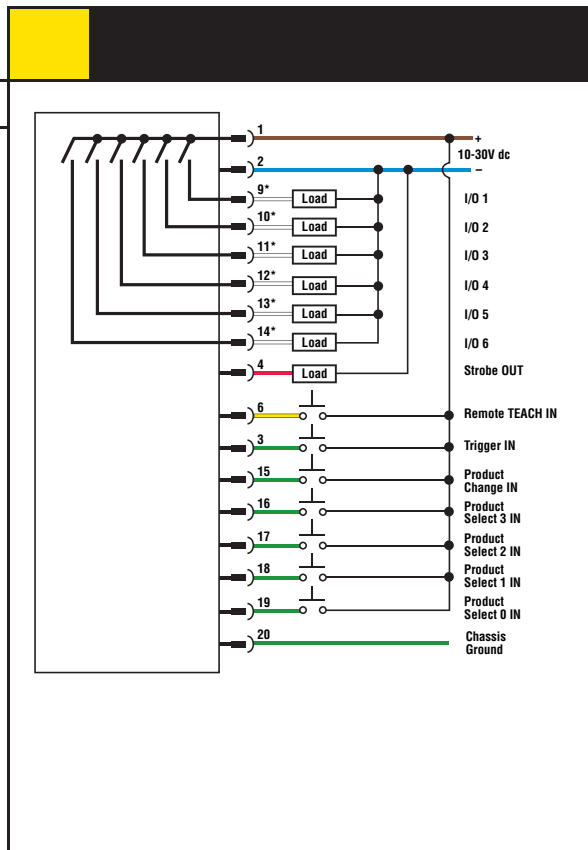
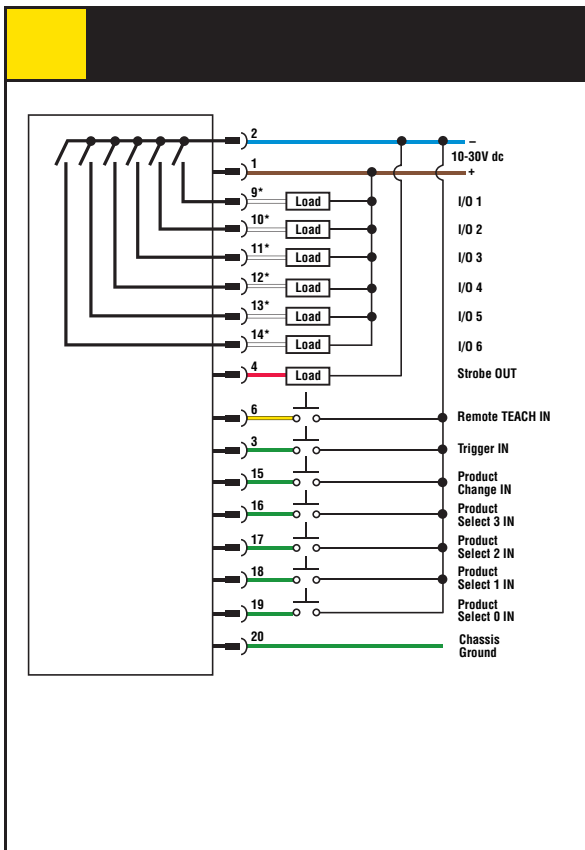
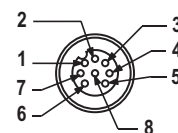
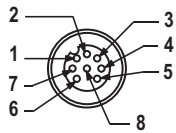
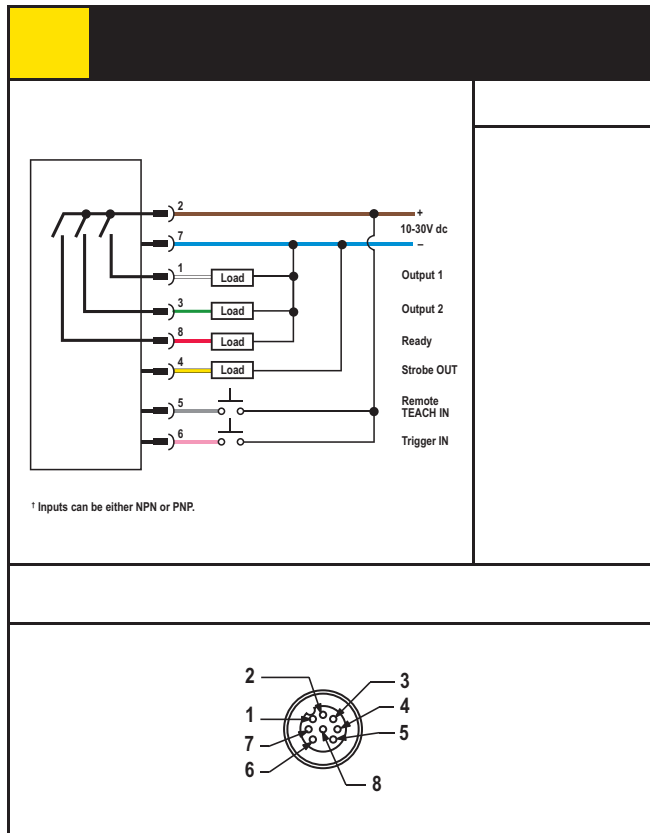
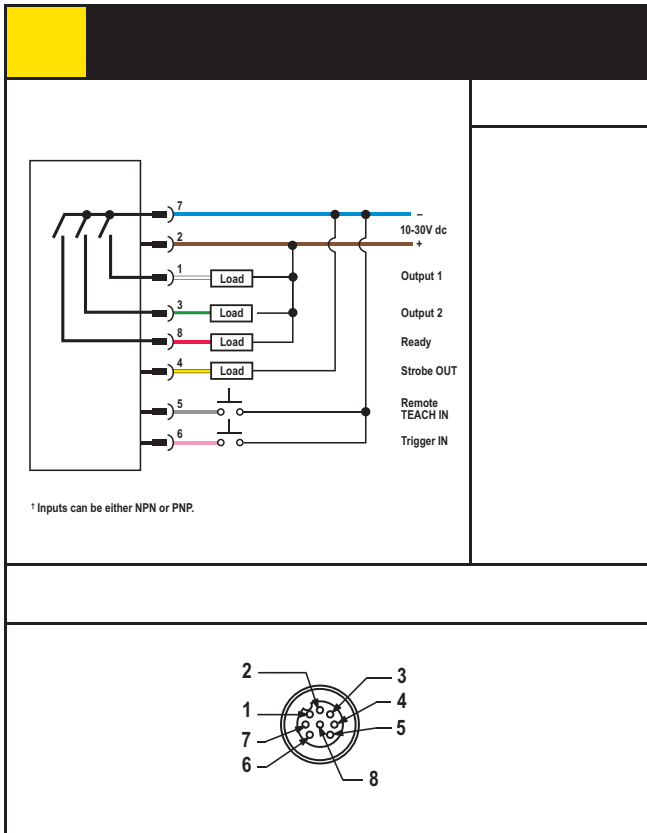


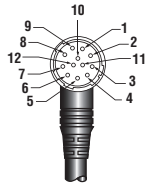
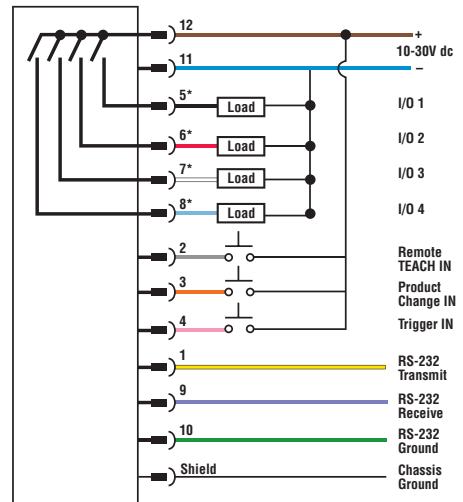
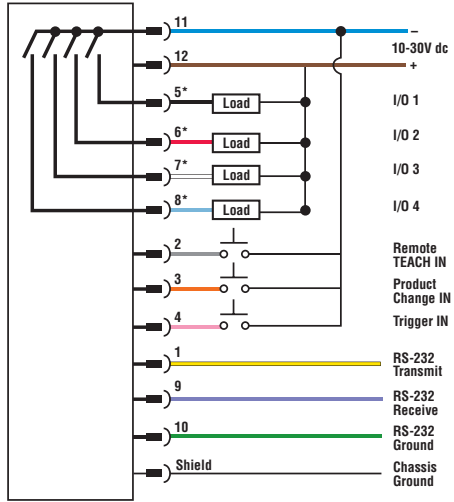


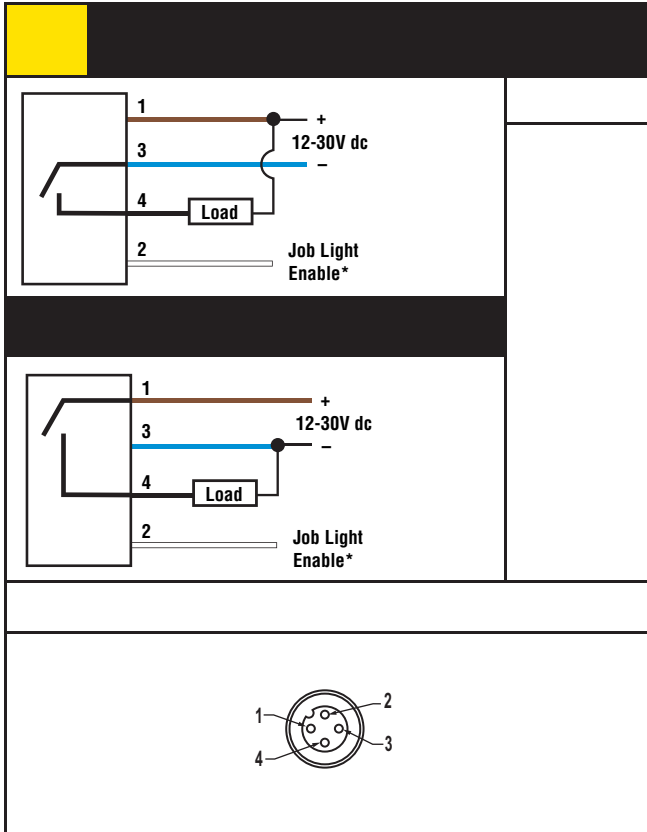
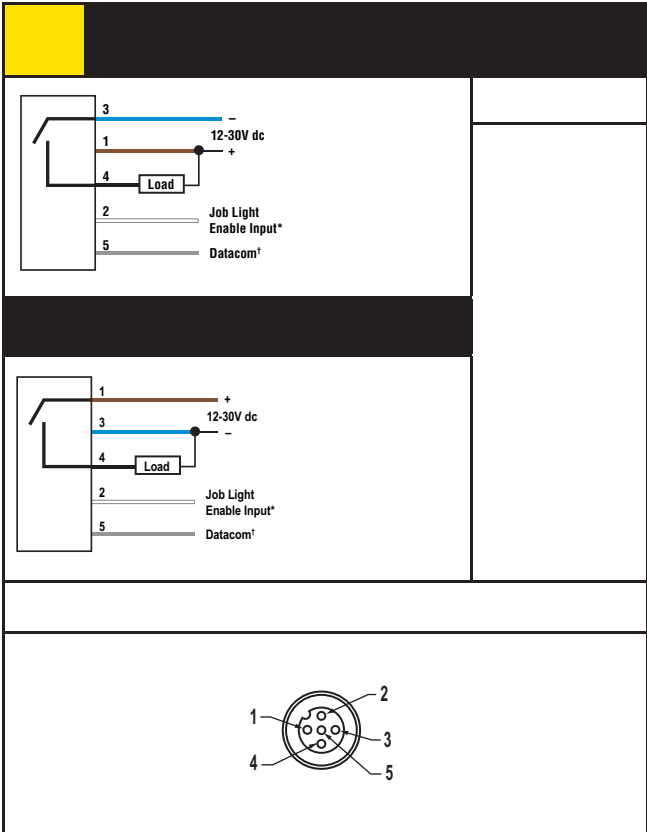
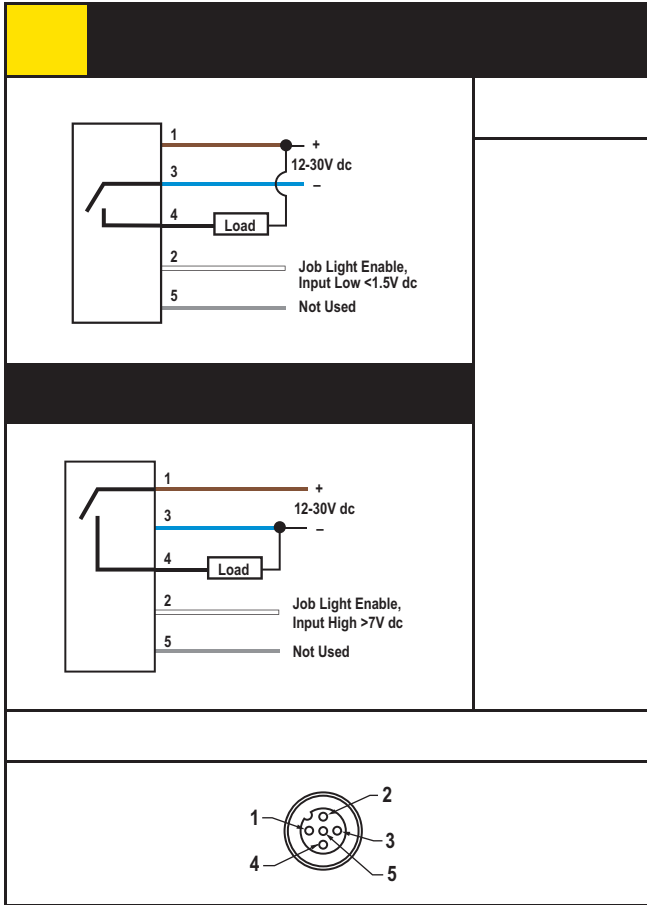
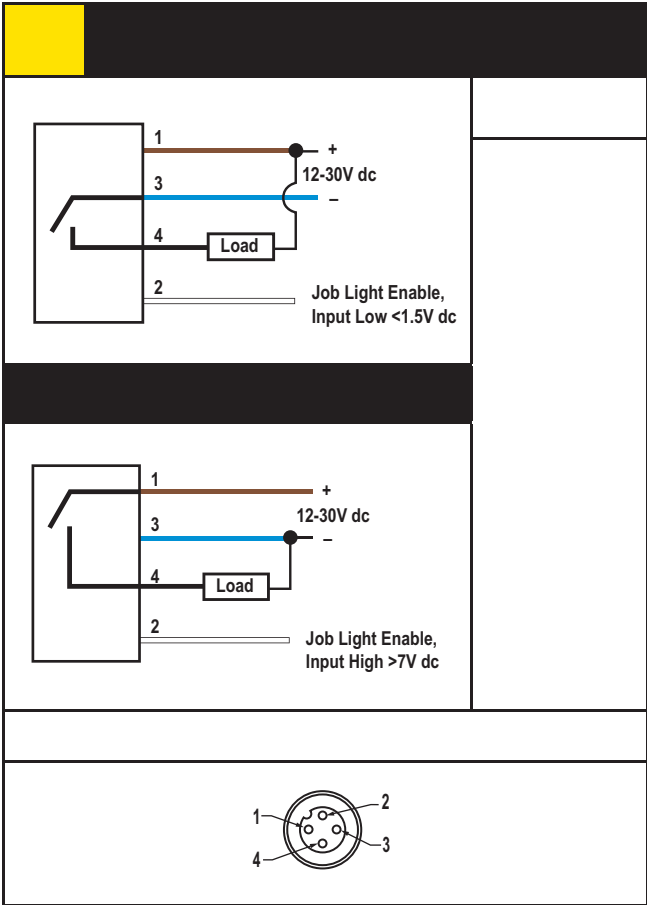


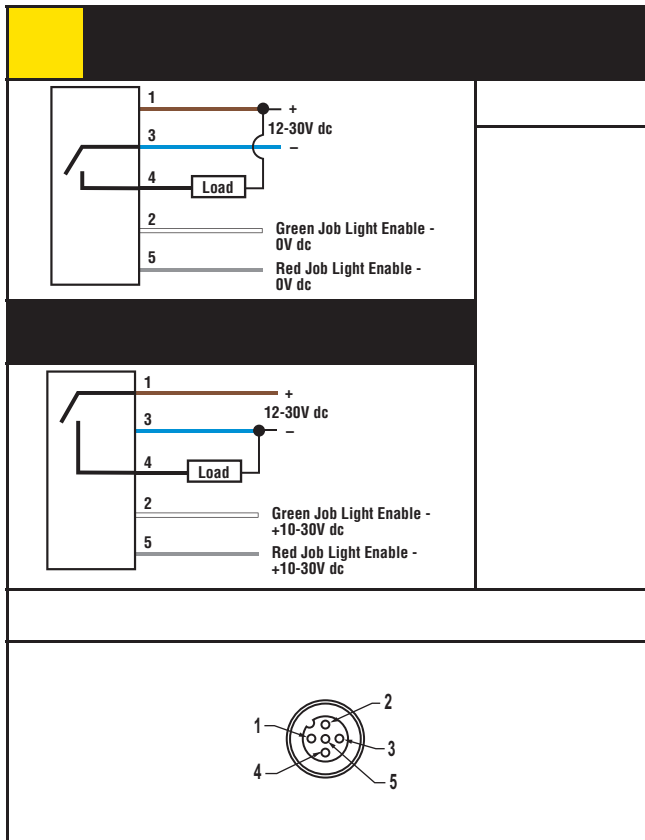
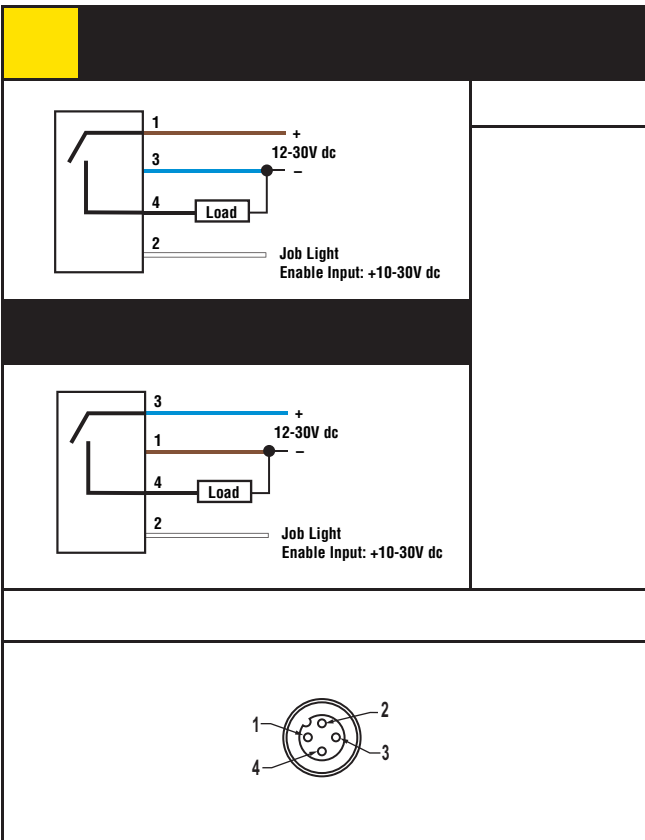
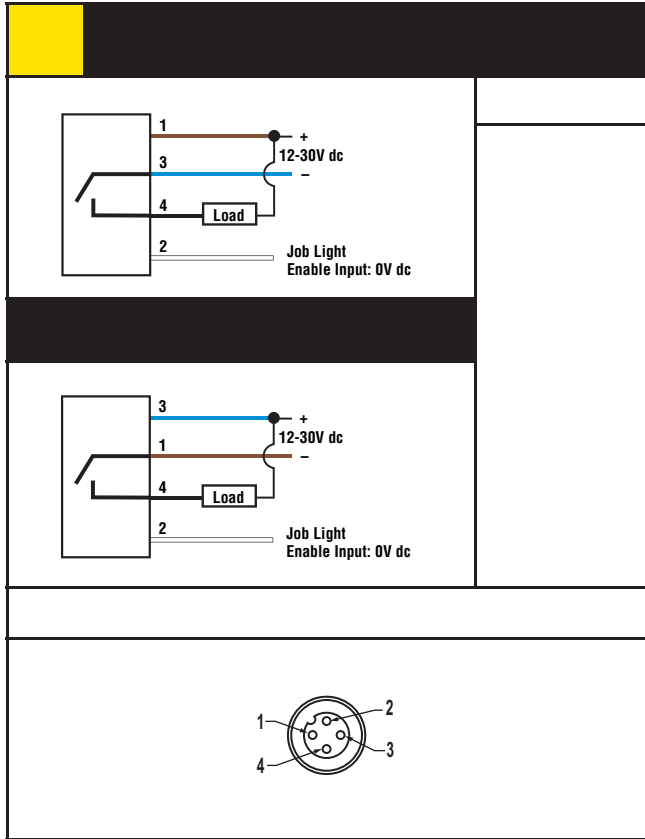
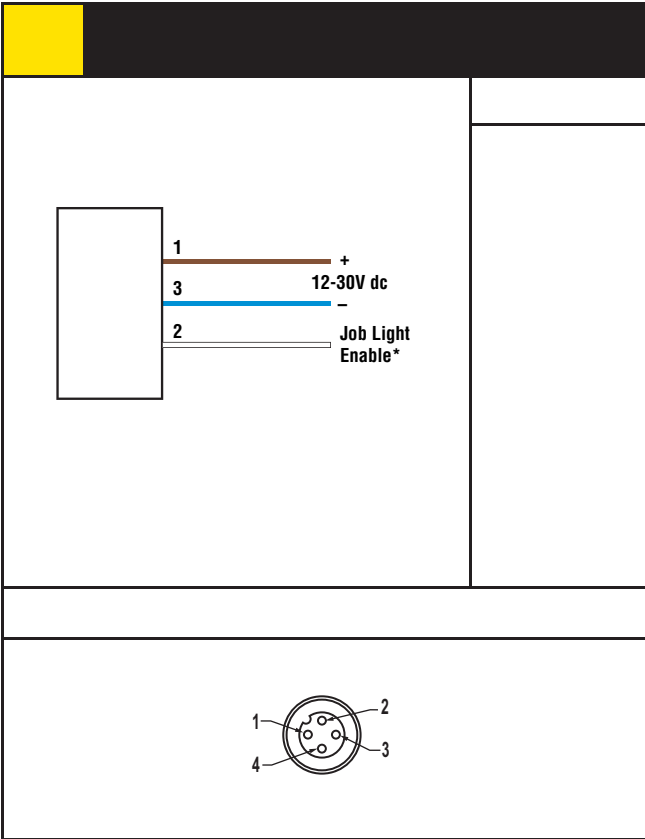


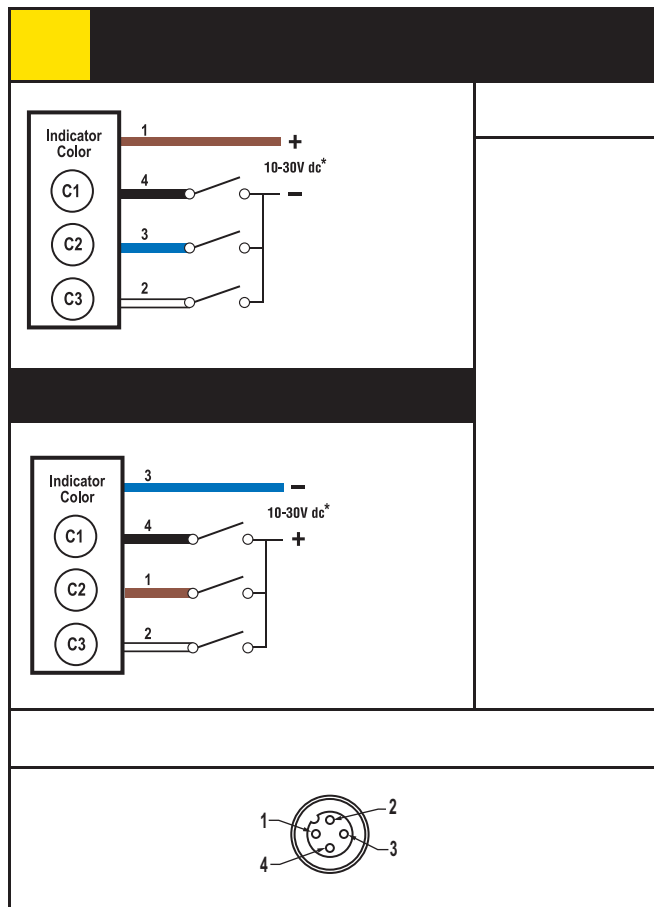
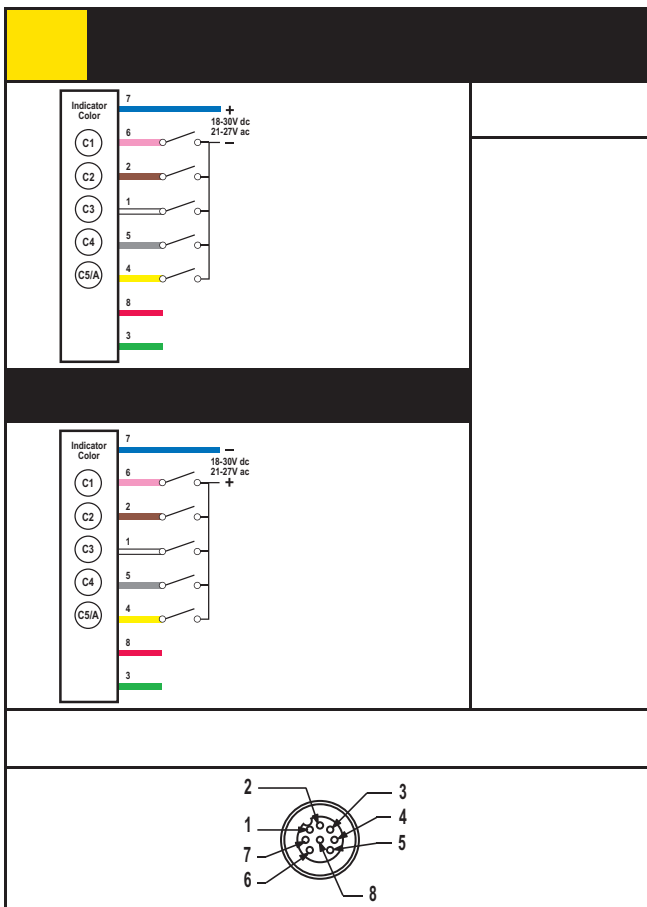
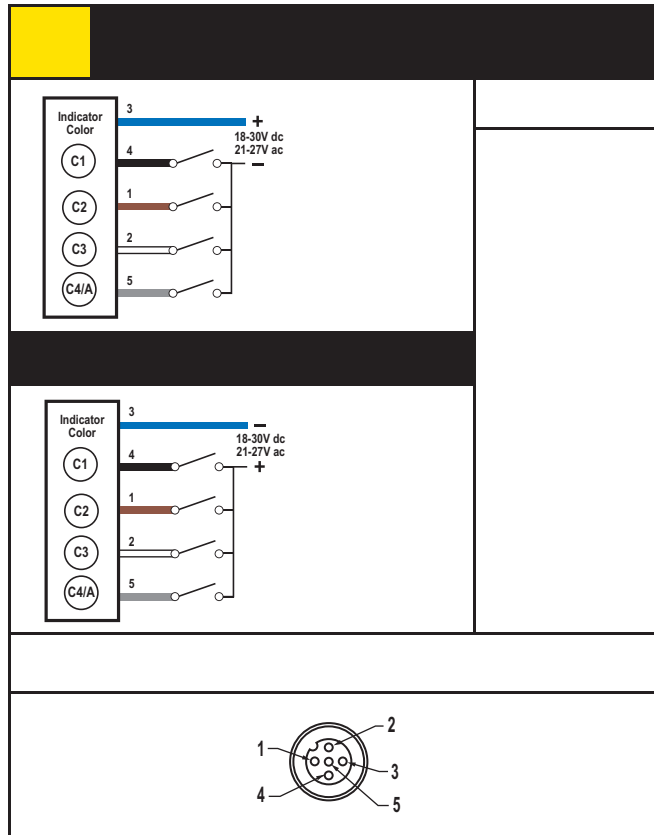
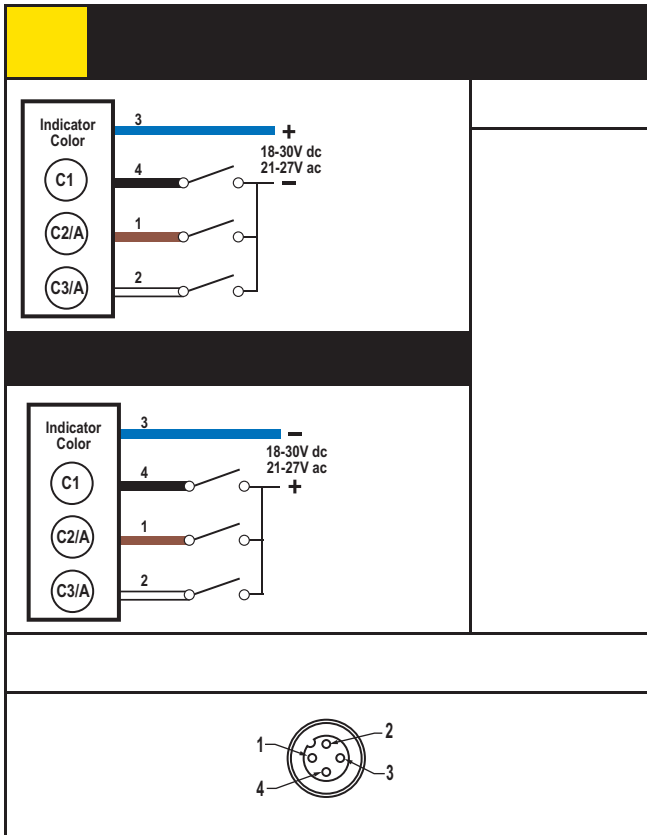


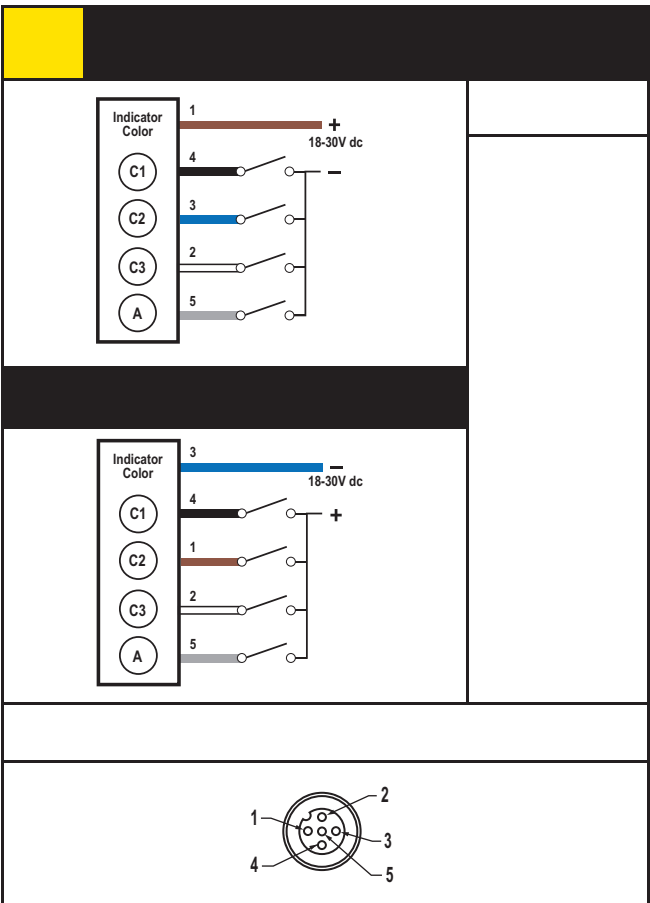
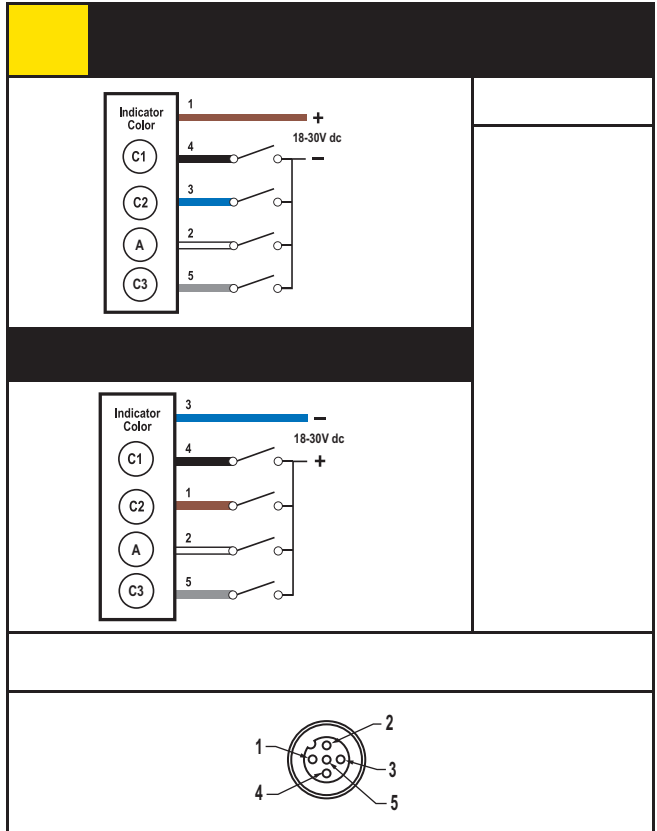
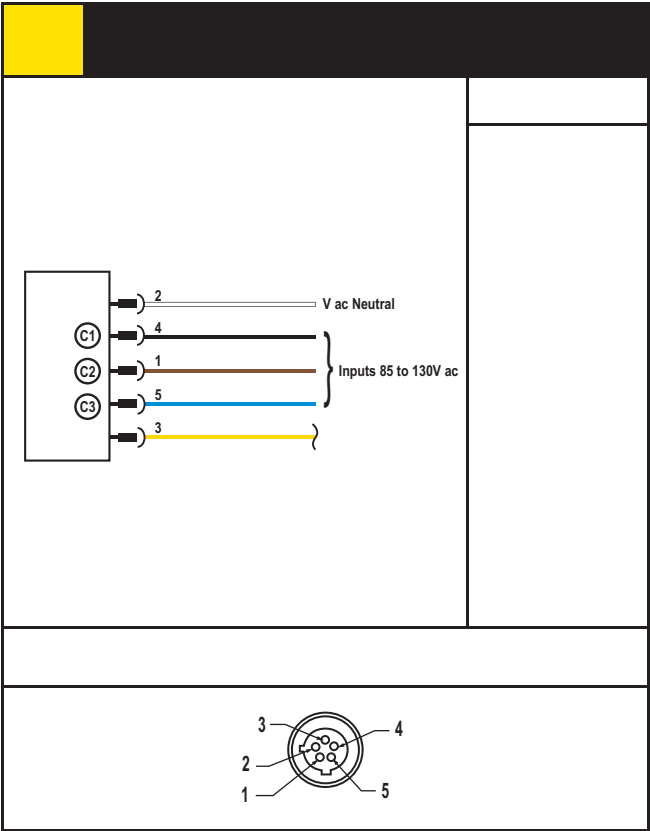


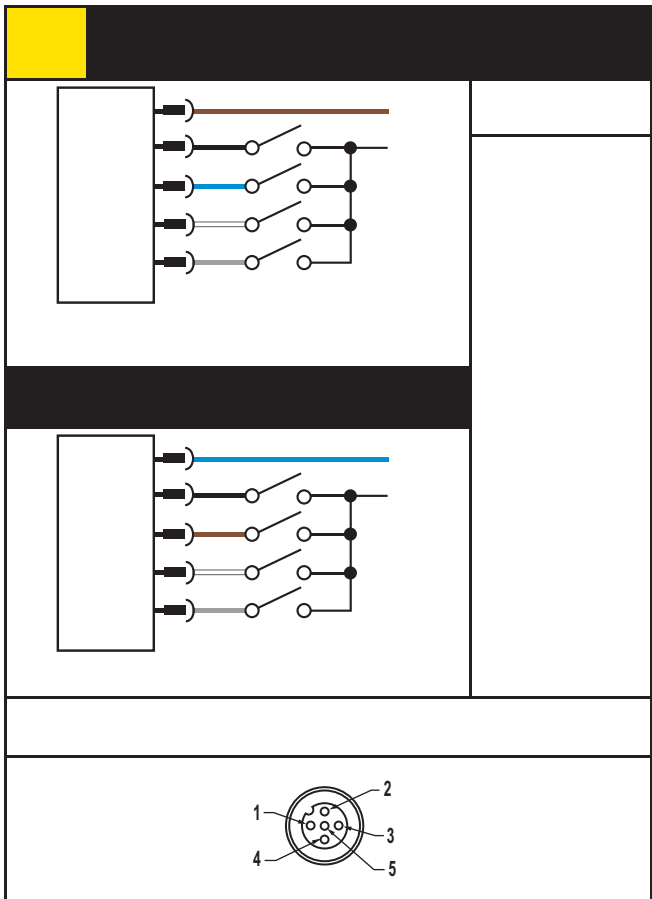
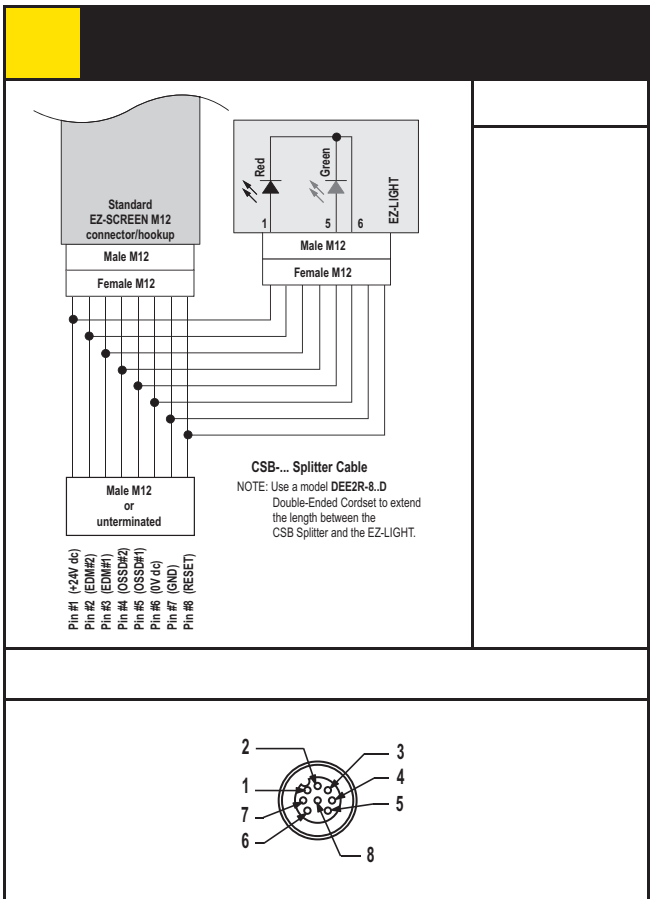
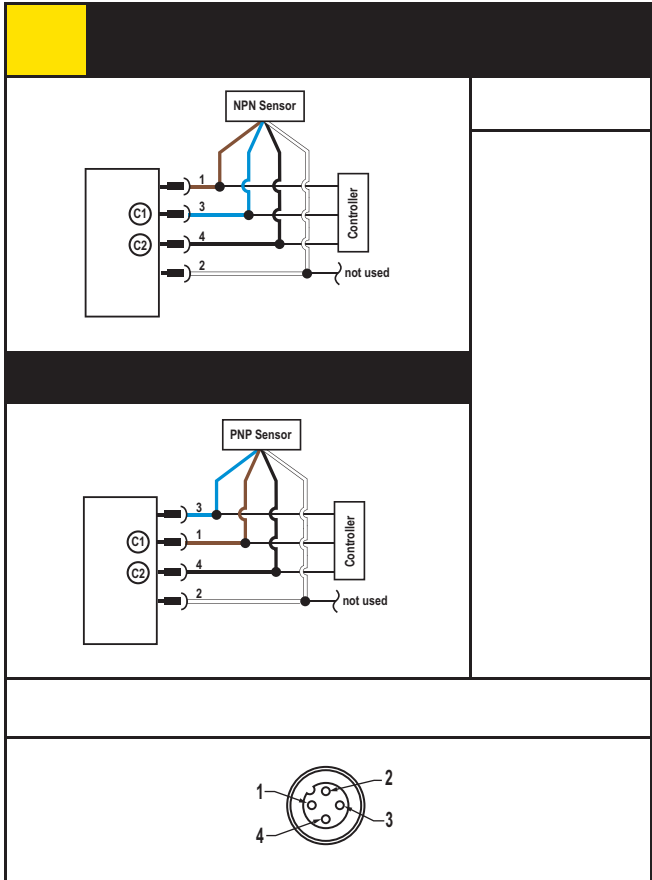
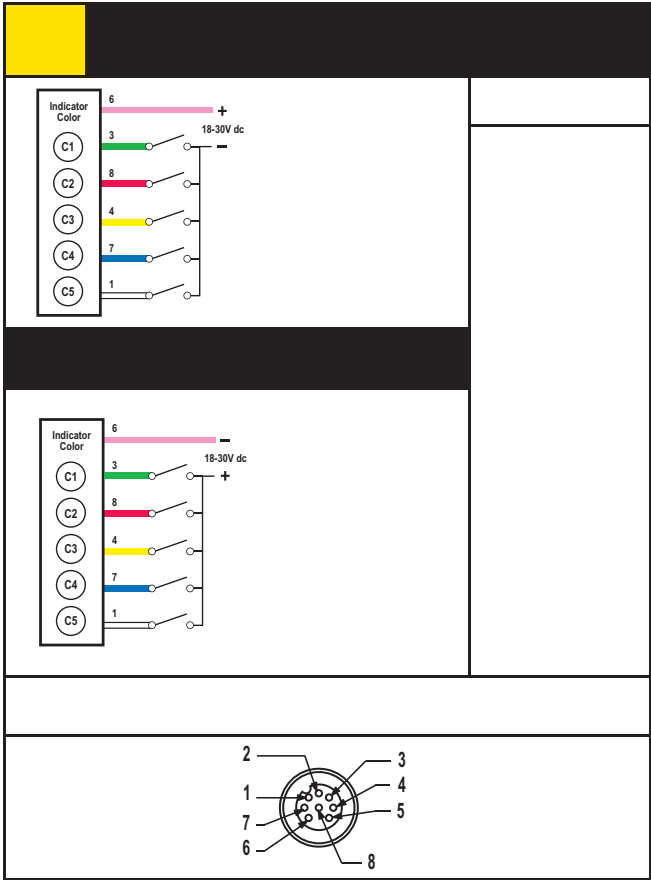


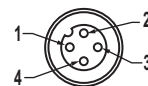
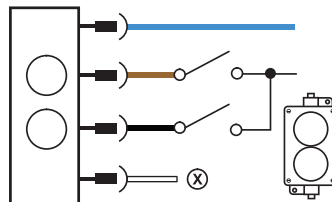
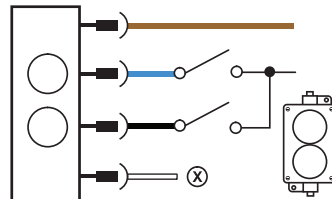
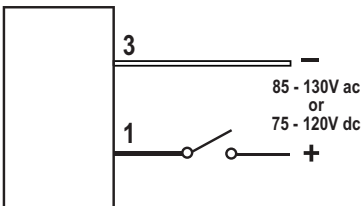
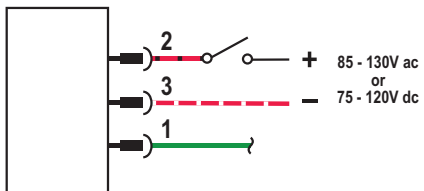
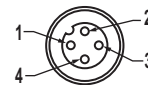
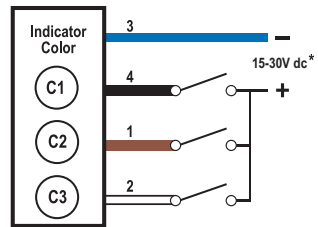
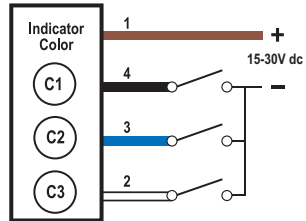
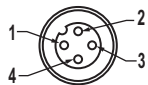
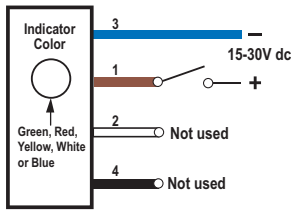
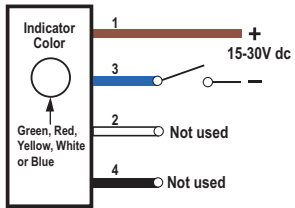


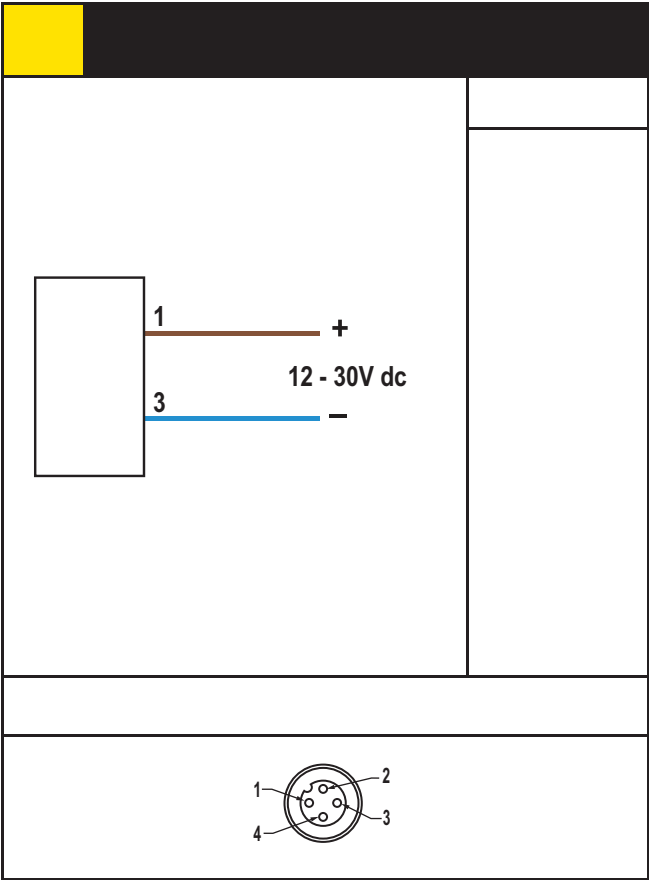


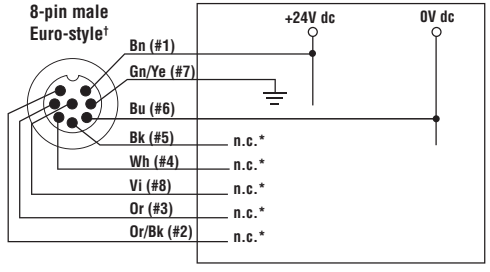




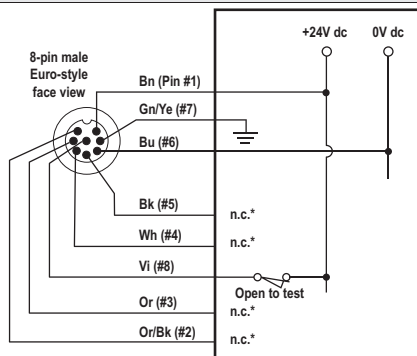
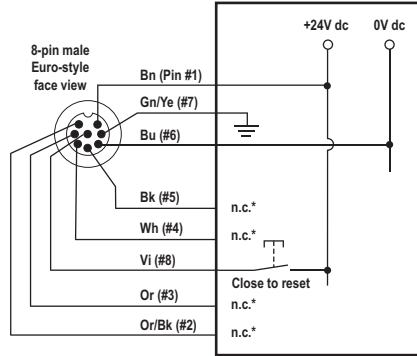
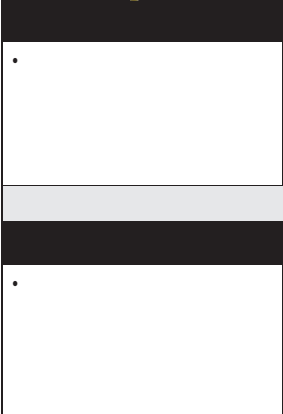
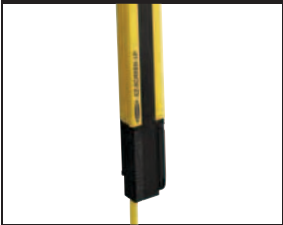
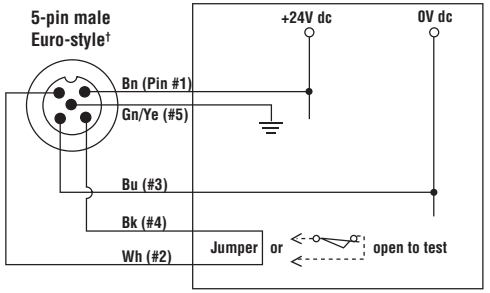


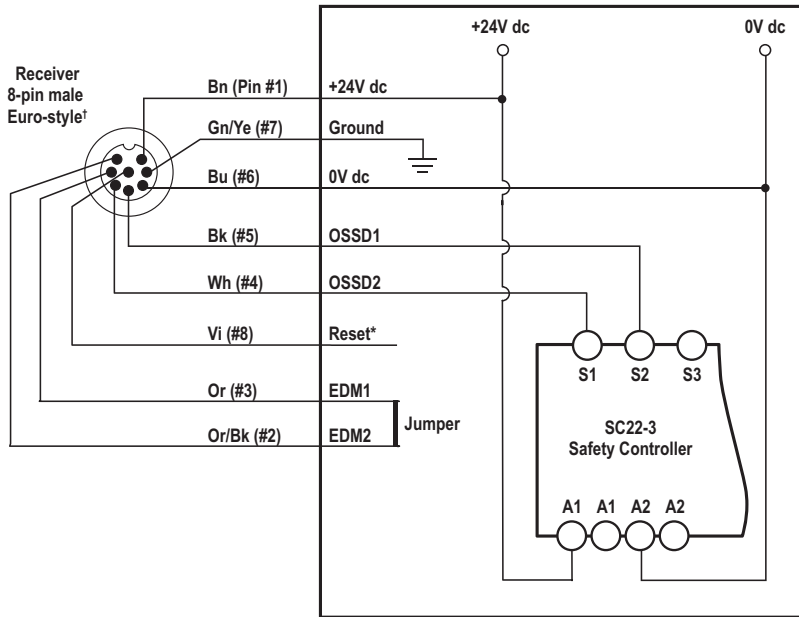
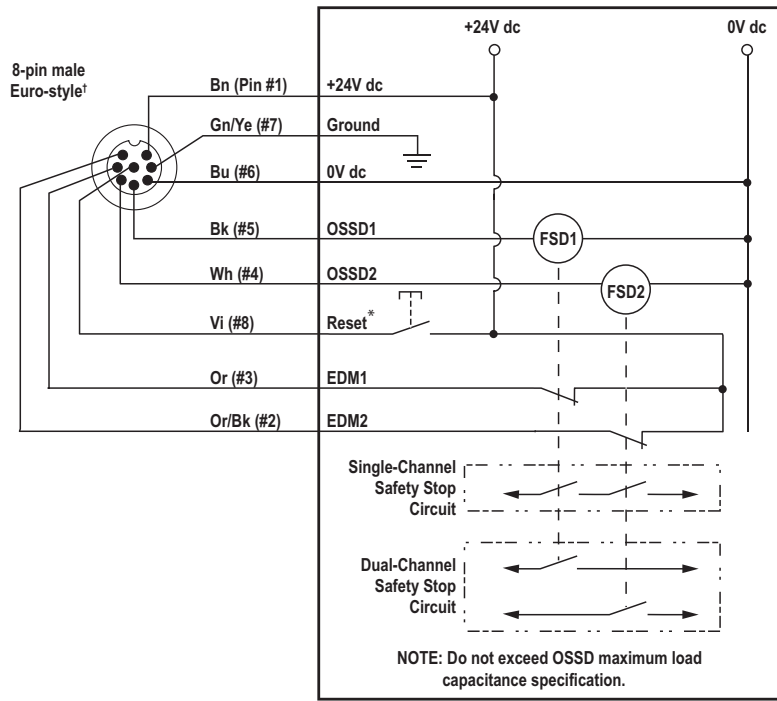


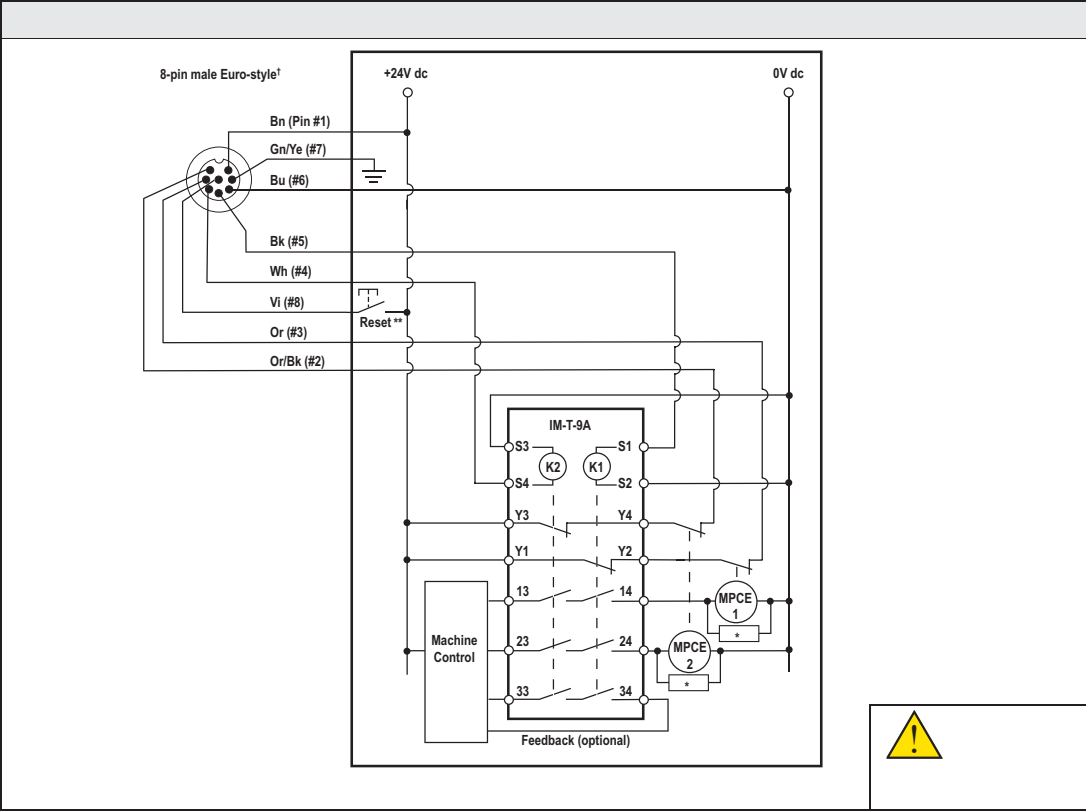
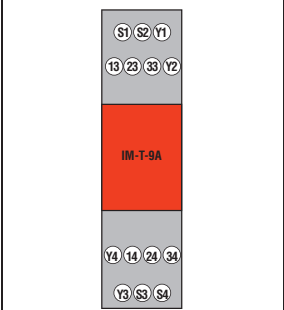
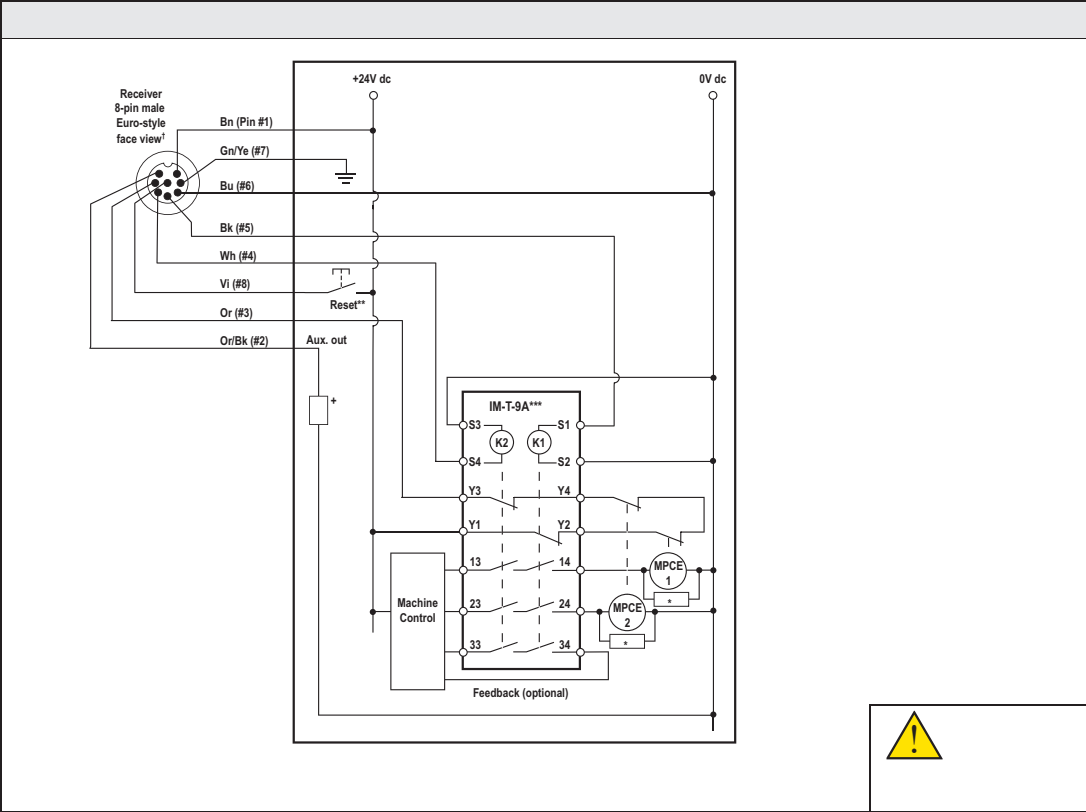
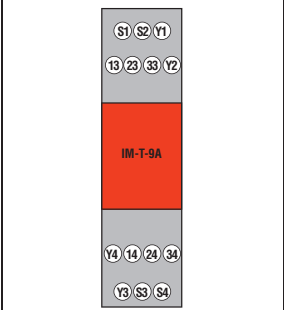


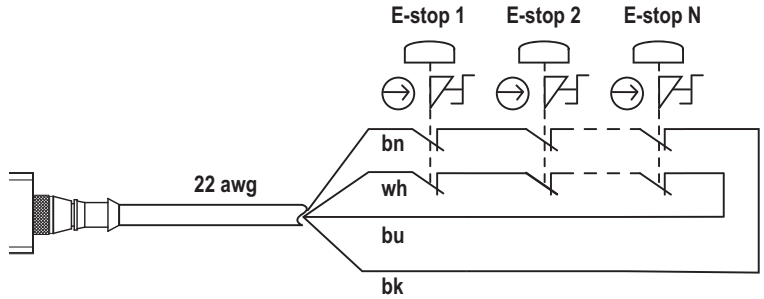
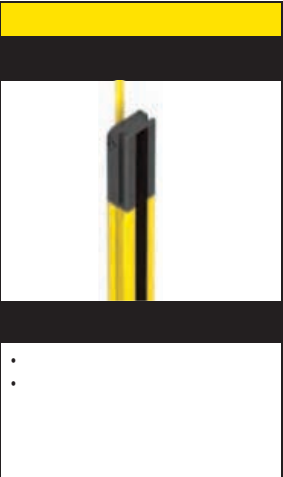


*NOTE: Pins 2, 3, 4, 5, and 8 are not connected, or are paralleled to same color wire from the 8-pin receiver cable



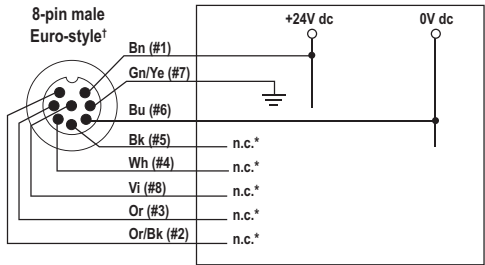


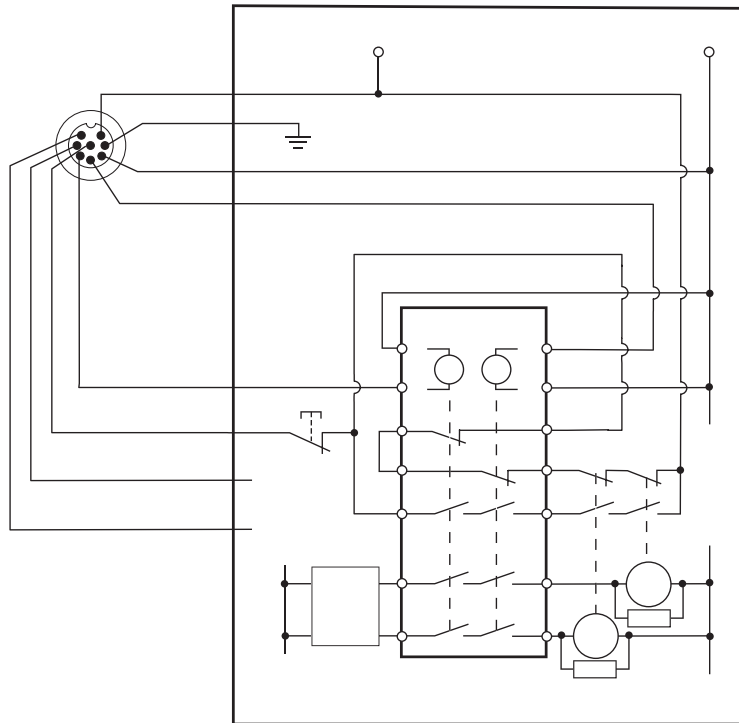
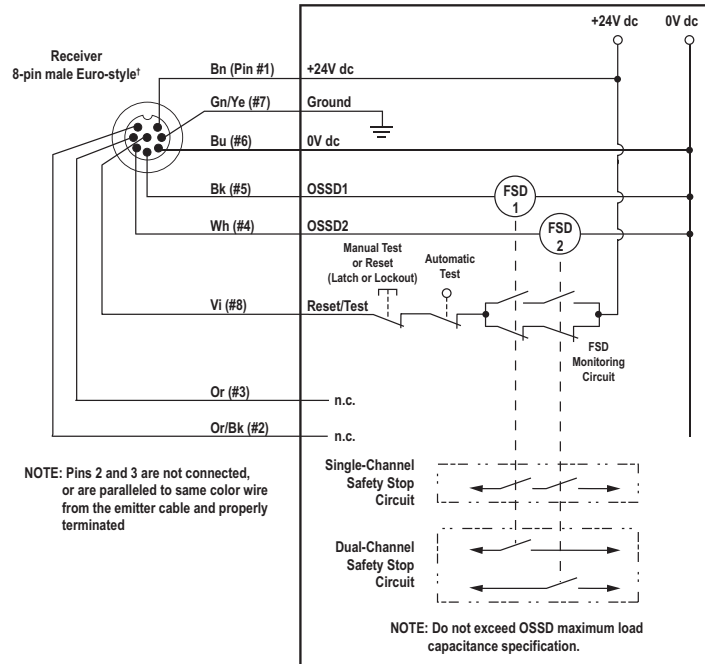


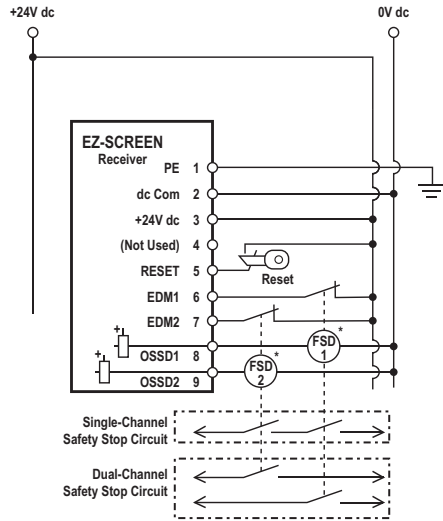
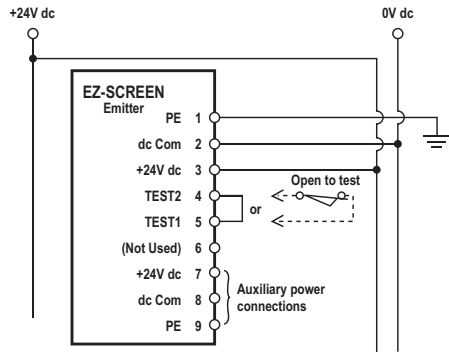


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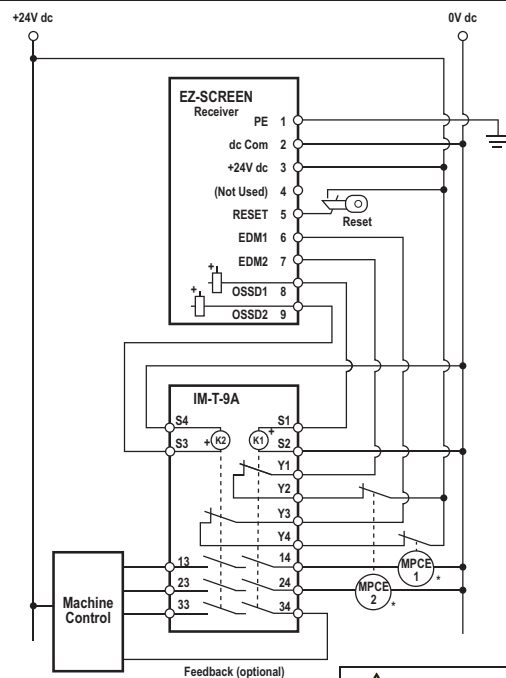
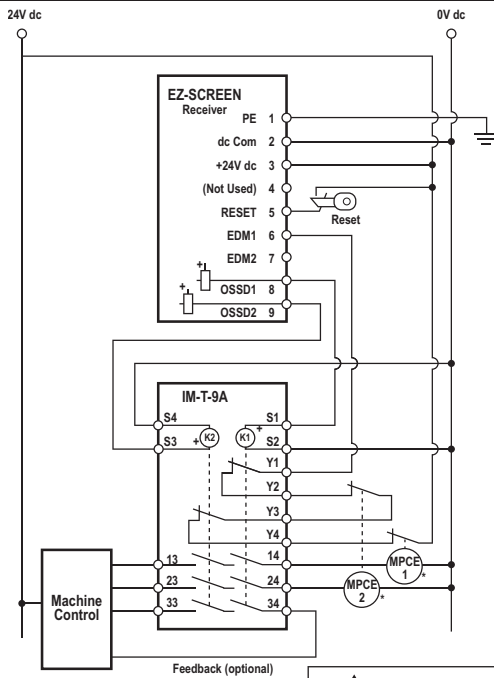
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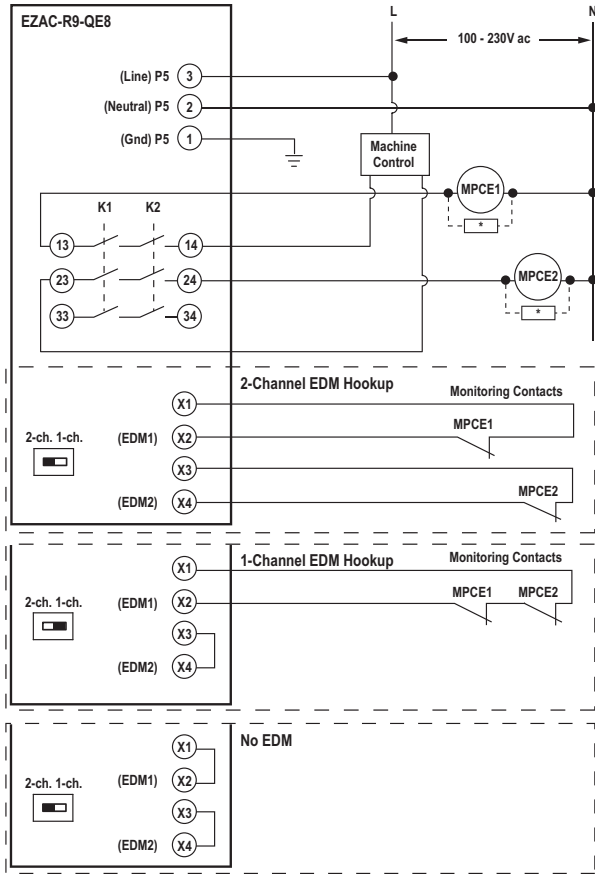
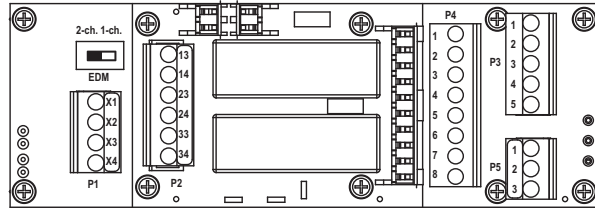
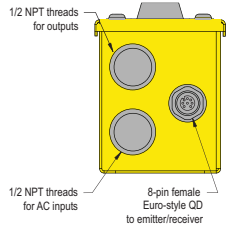


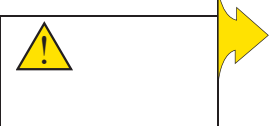
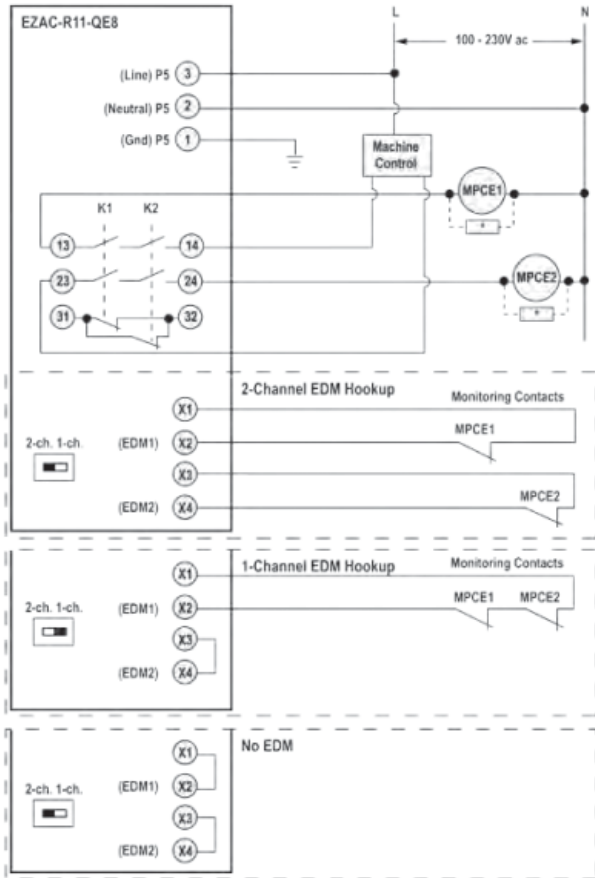
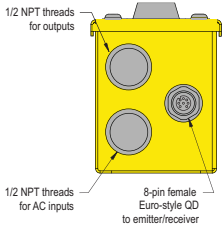
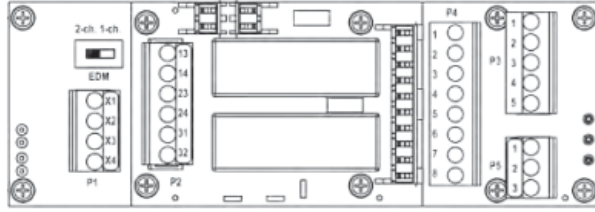


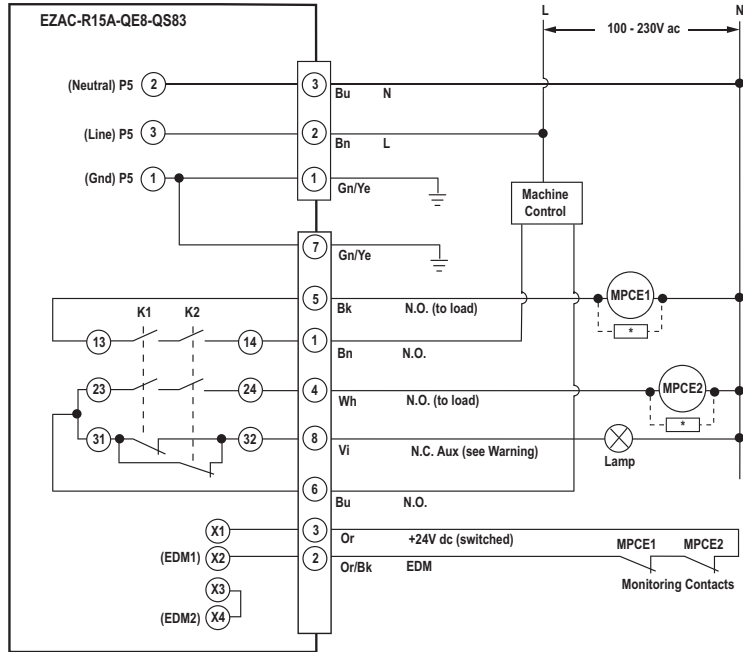
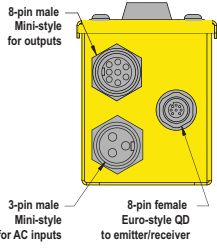


NOTE: Do not exceed OSSD maximum load capacitance specification.



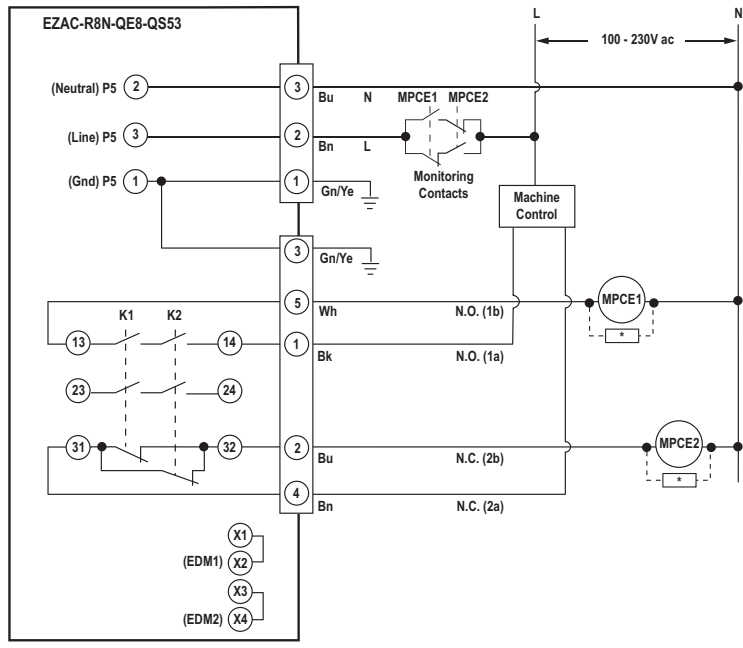






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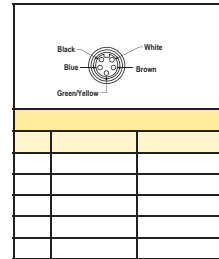
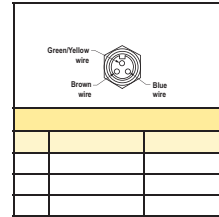
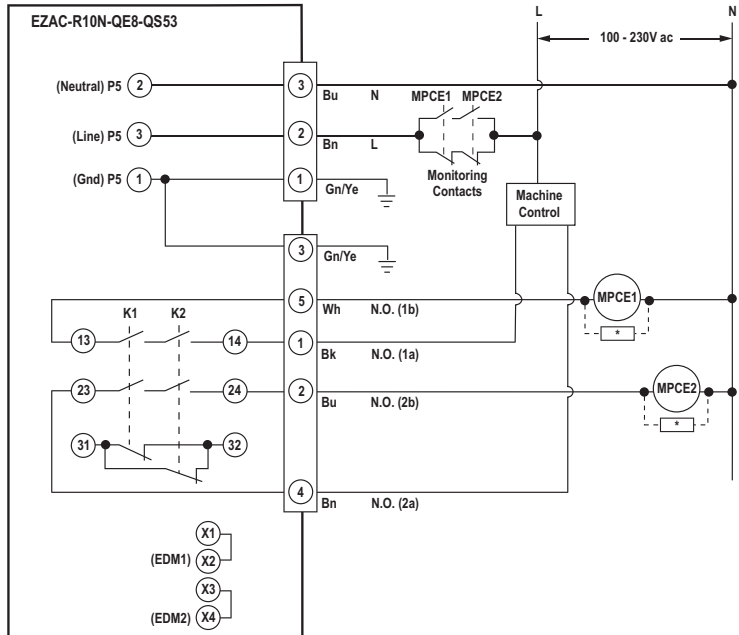
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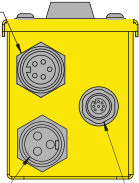
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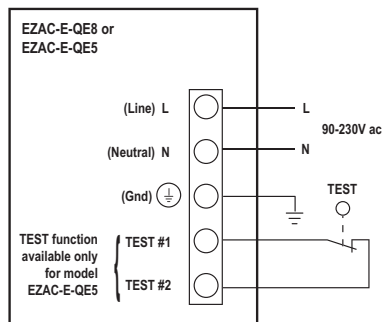
5-pin male Mini-style for outputs



3-pin male Mini-style for AC inputs

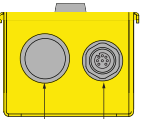


8-pin female Euro-style QD to emitter/receiver



1/2 NPT threads AC inputs

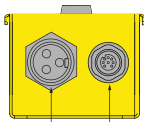
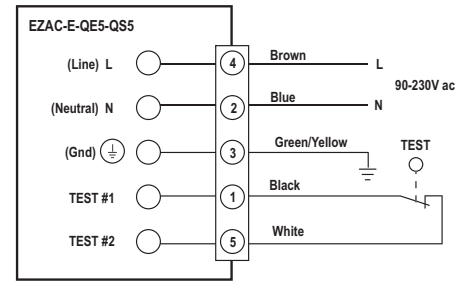
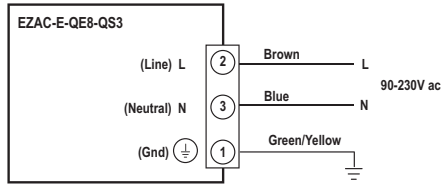
5-pin Euro-style QD to emitter



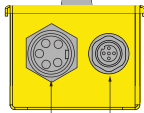
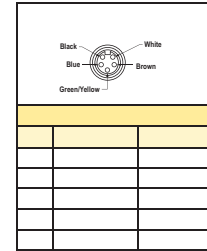
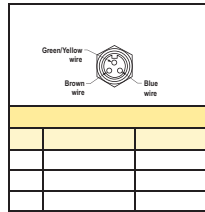
1/2 NPT threads AC inputs

8-pin Euro-style QD to emitter

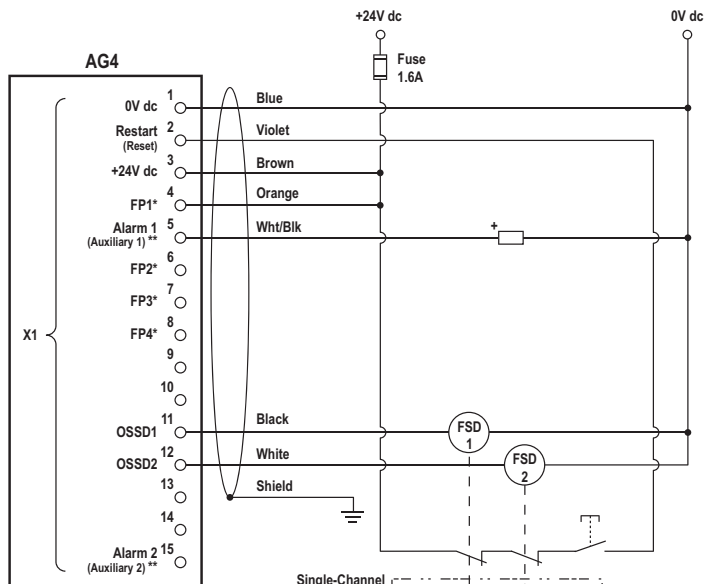




3-pin male Mini-style AC inputs
8-pin Euro-style QD to emitter

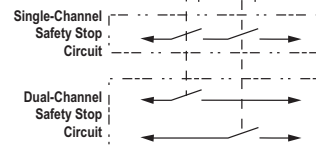


5-pin male Mini-style AC inputs
5-pin Euro-style QD to emitter



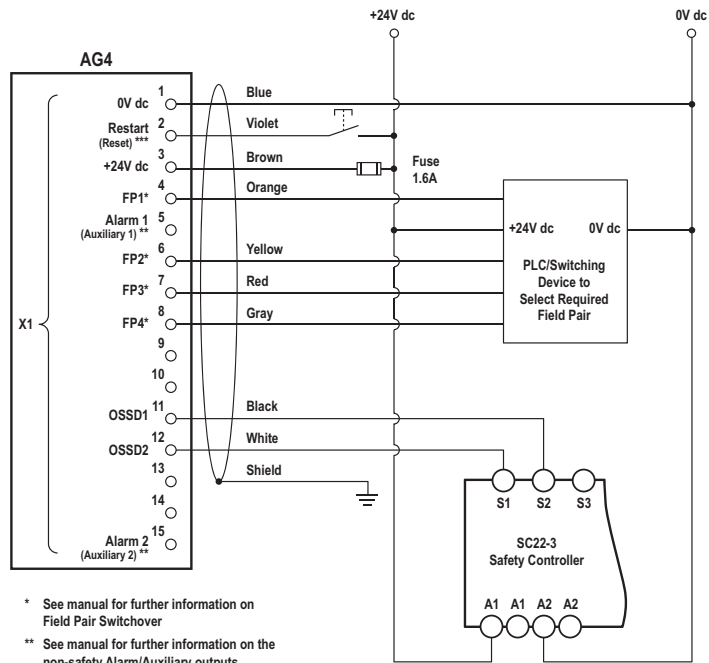
* Figure shows Field Pair #1 selected. See manual for further information on Field Pair Switchover

** See manual for further information on the non-safety Alarm/Auxiliary outputs.

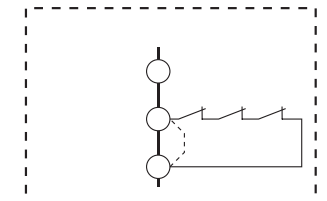
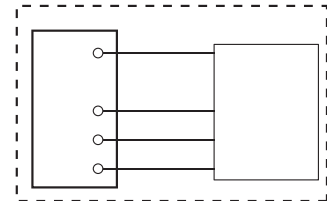
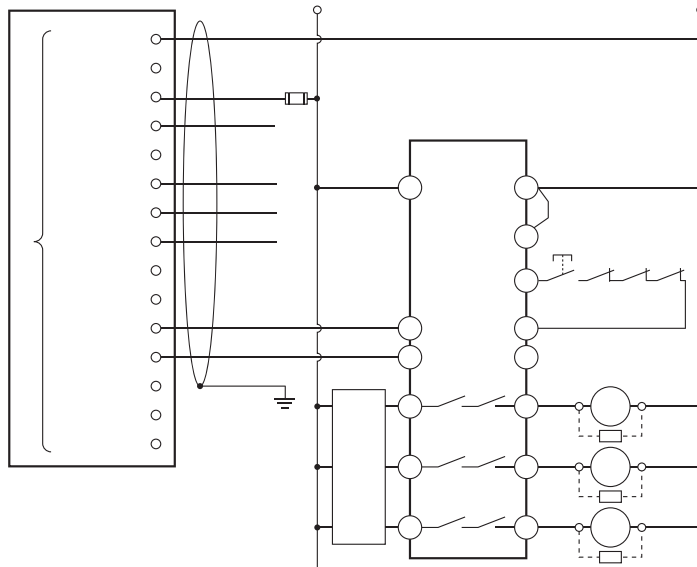


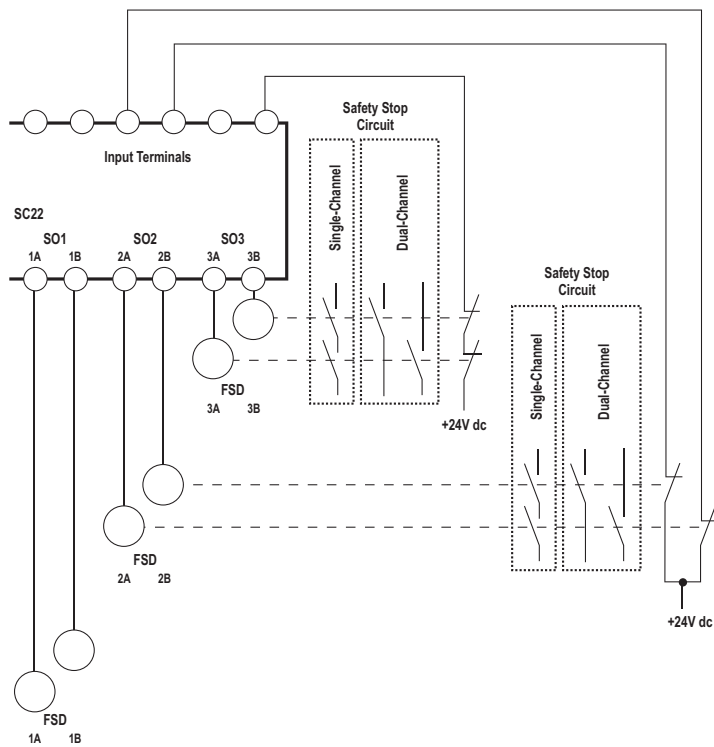
NOTE: Do not exceed OSSD maximum load capacitance specification.

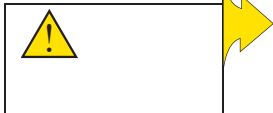
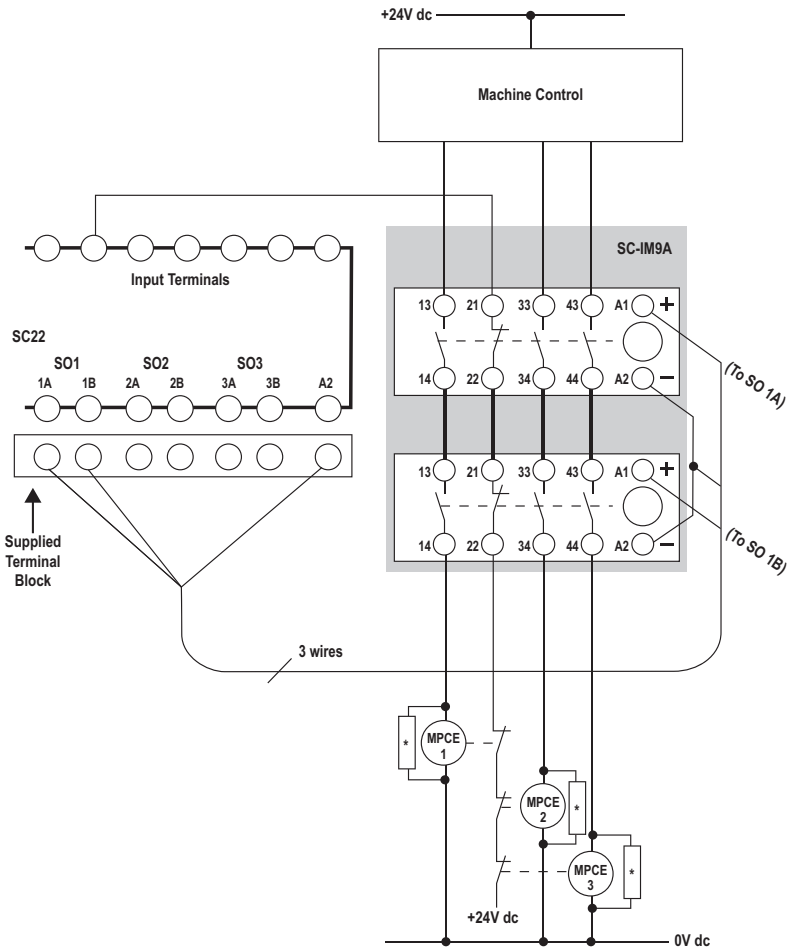


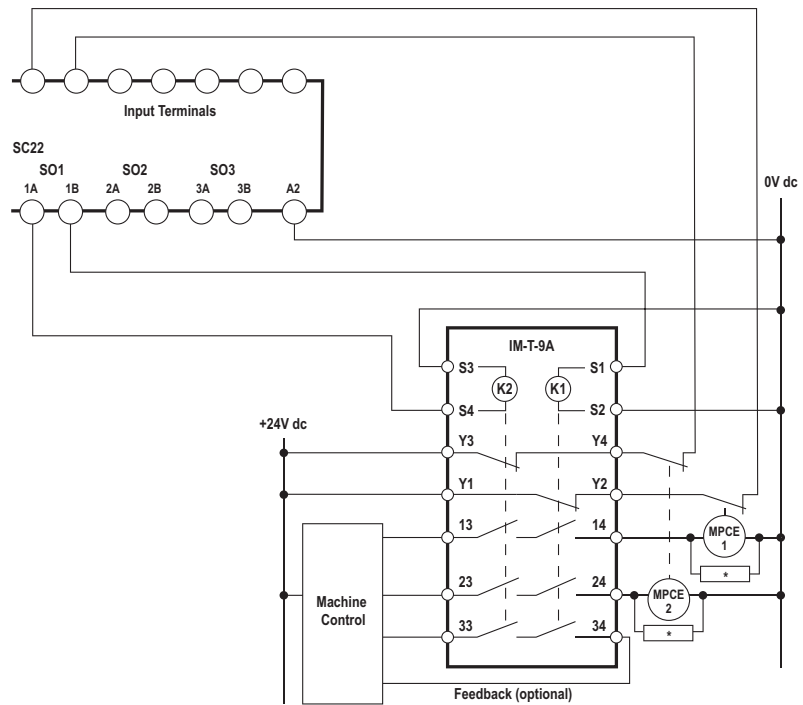
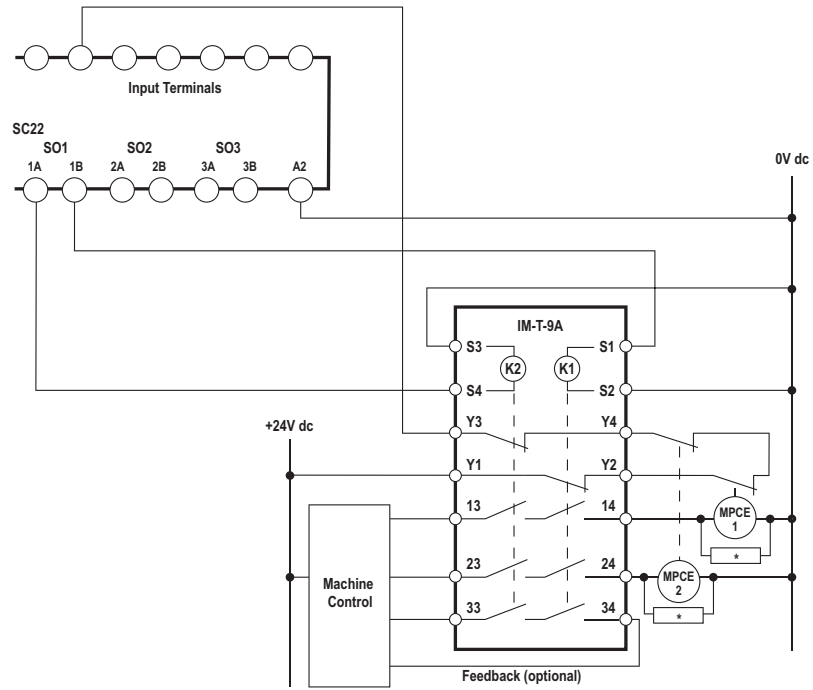


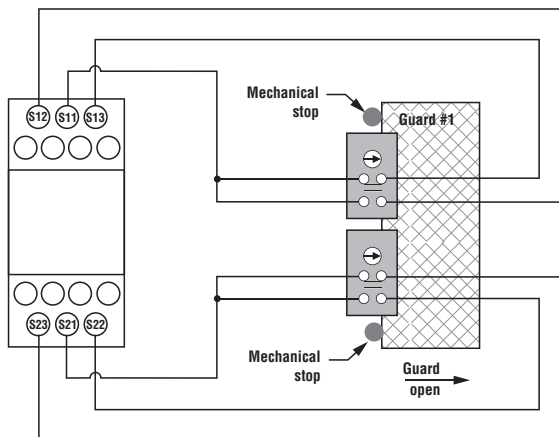
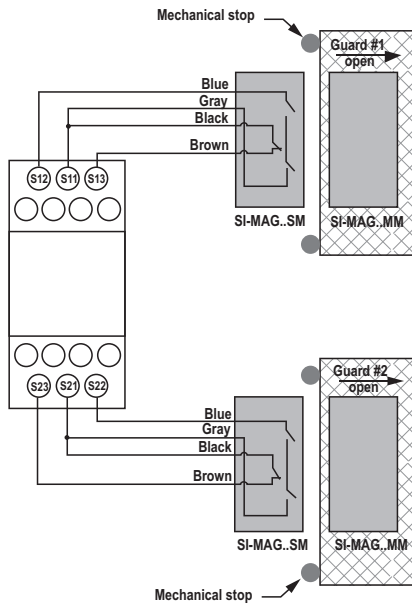
- * See manual for further information on Field Pair Switchover
- ** See manual for further information on the non-safety Alarm/Auxiliary outputs.
- *** The Manual Reset function can be accomplished by the SC22-3 or other safety rated logic device. In this case the scanner is configured for automatic start/restart (Reset).





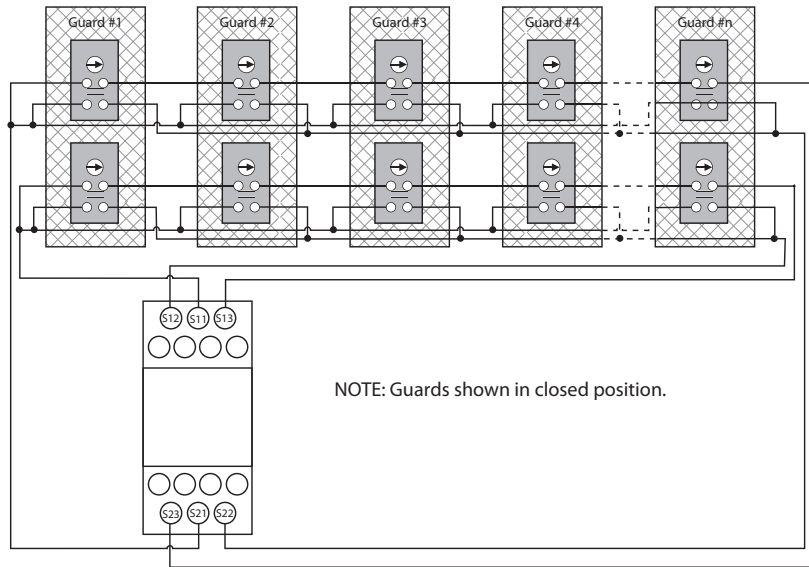
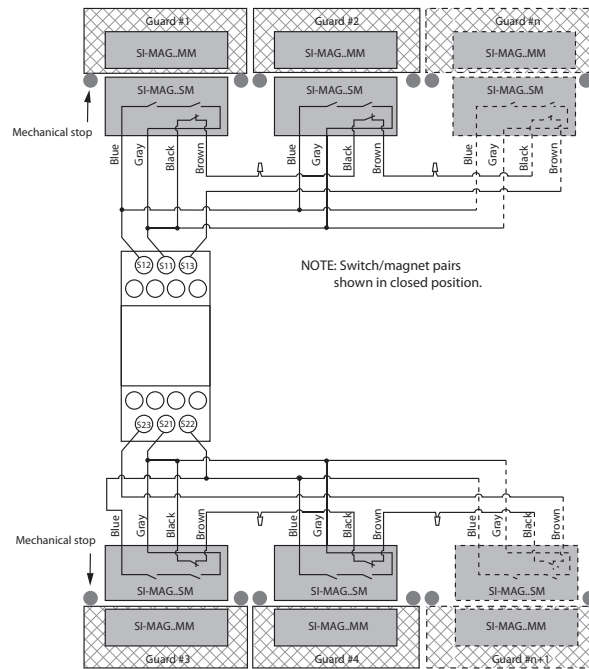


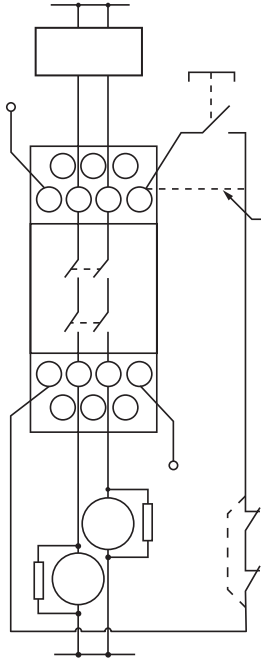


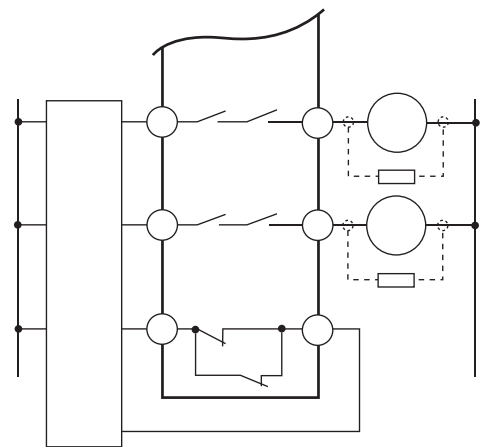
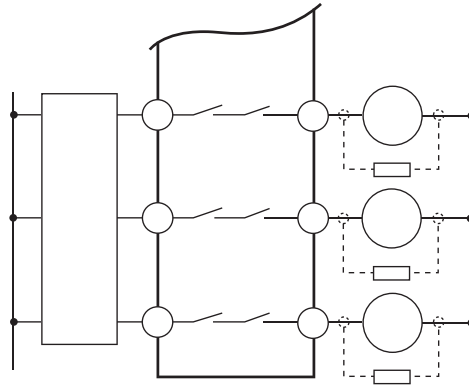
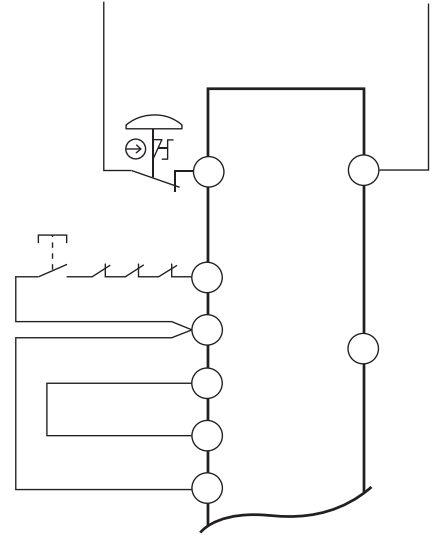
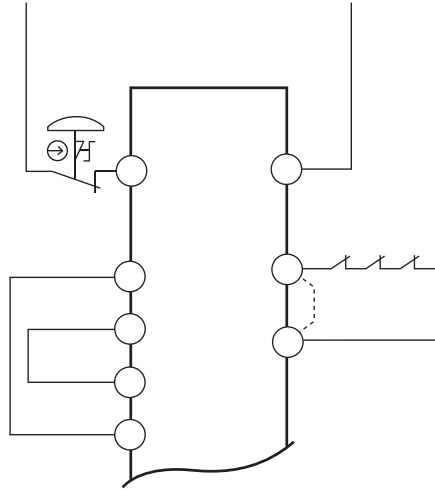
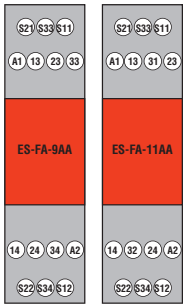


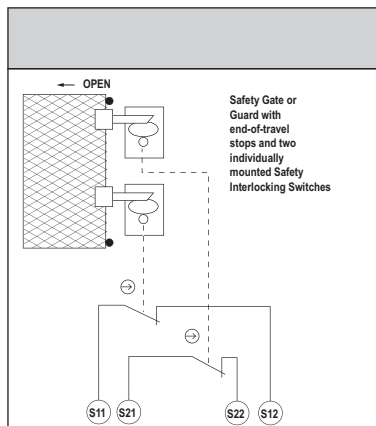
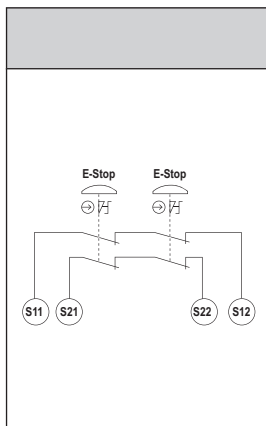
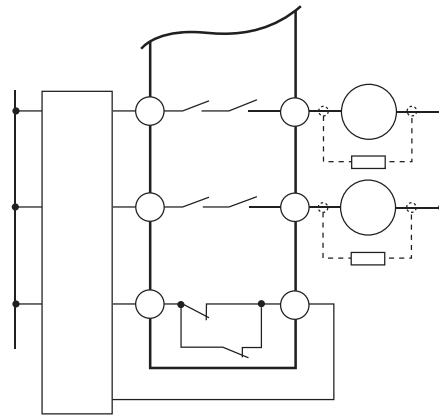
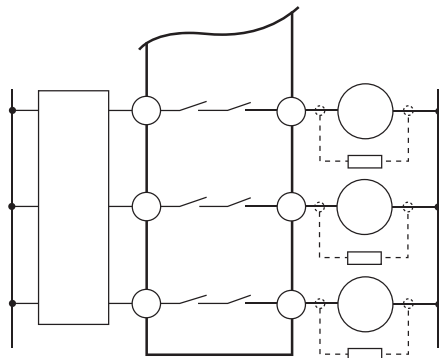
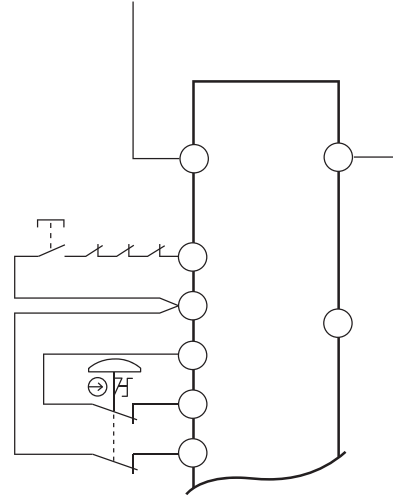
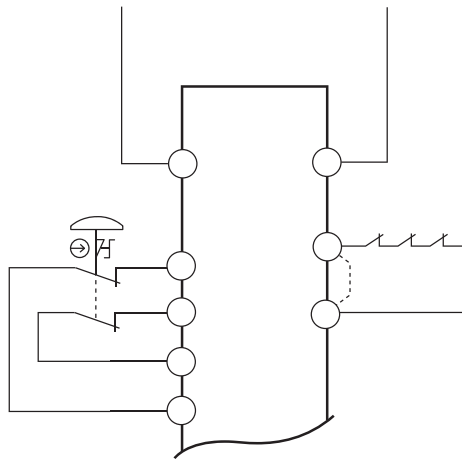
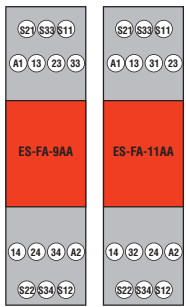
NOTE: Guard shown in closed position.

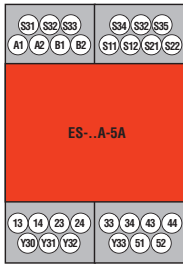
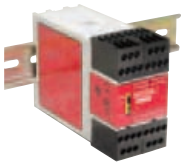




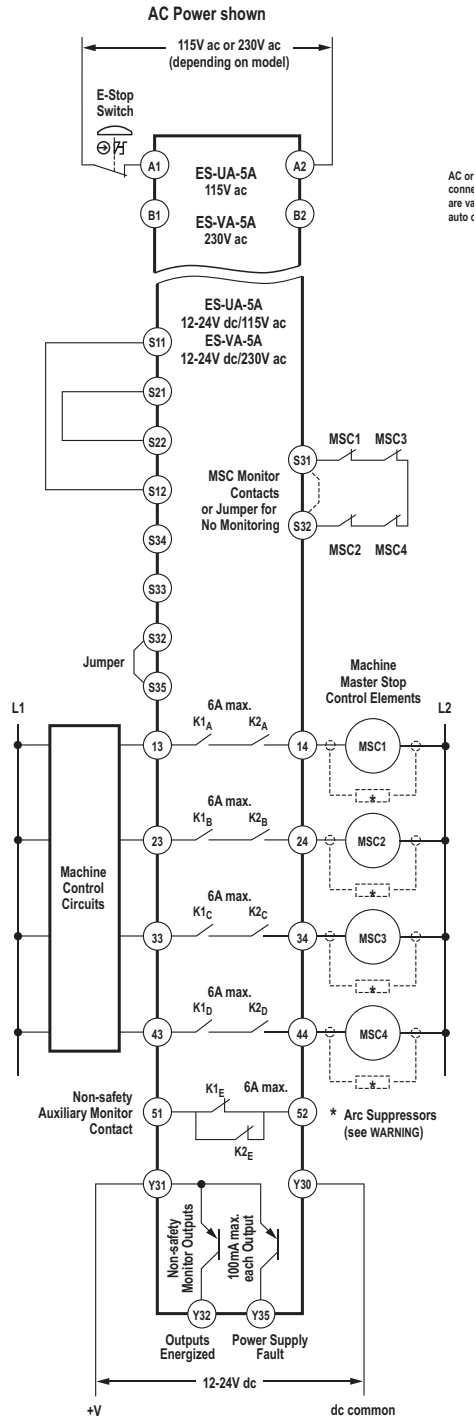




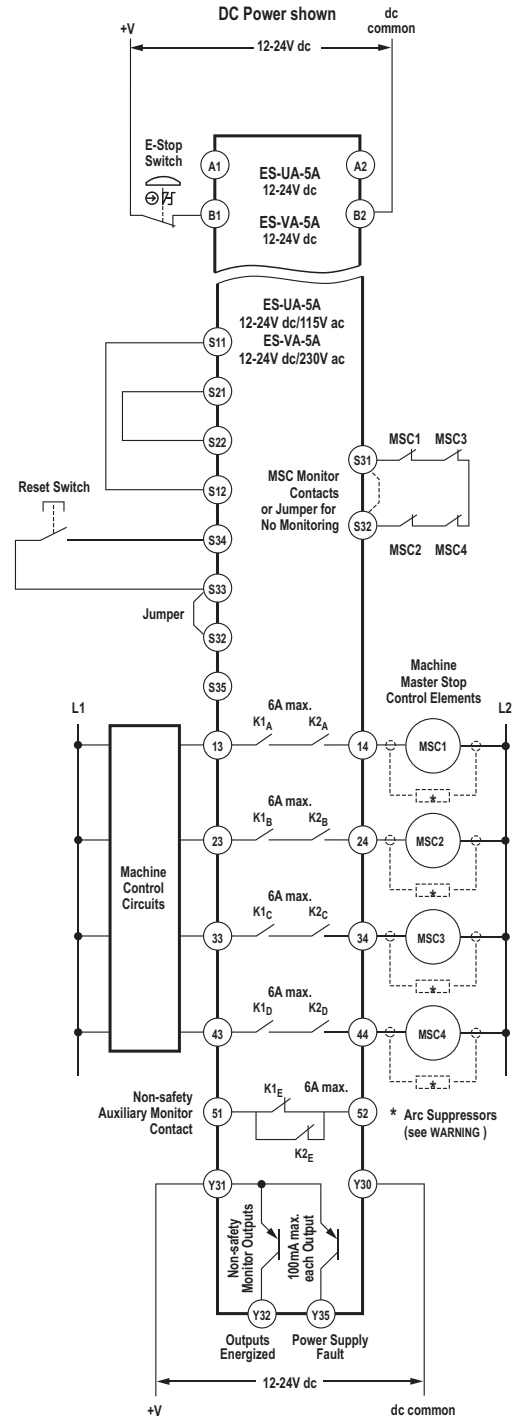


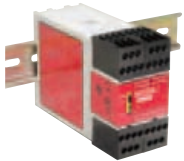


Auto Reset



Manual Reset





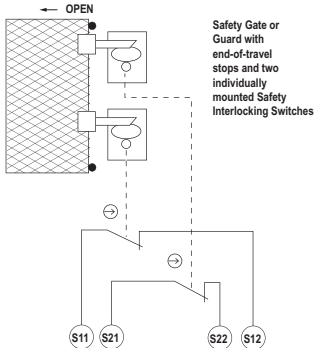
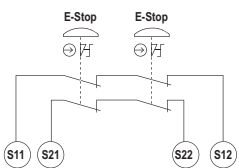
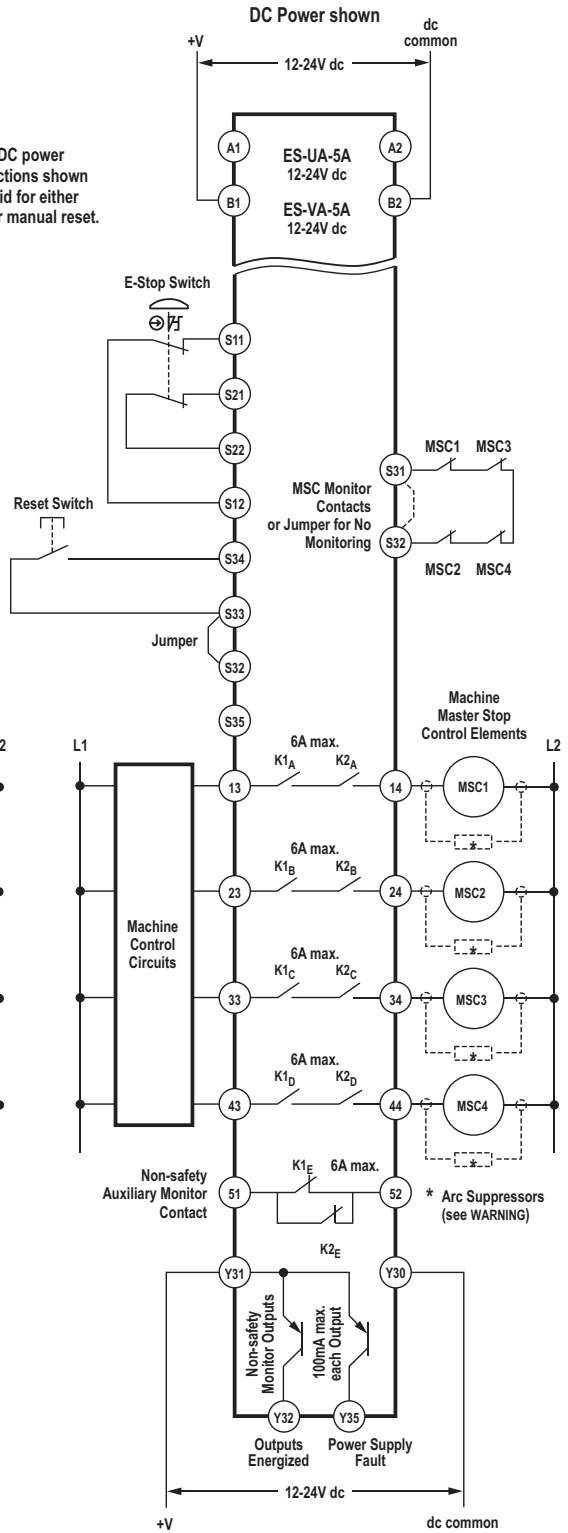
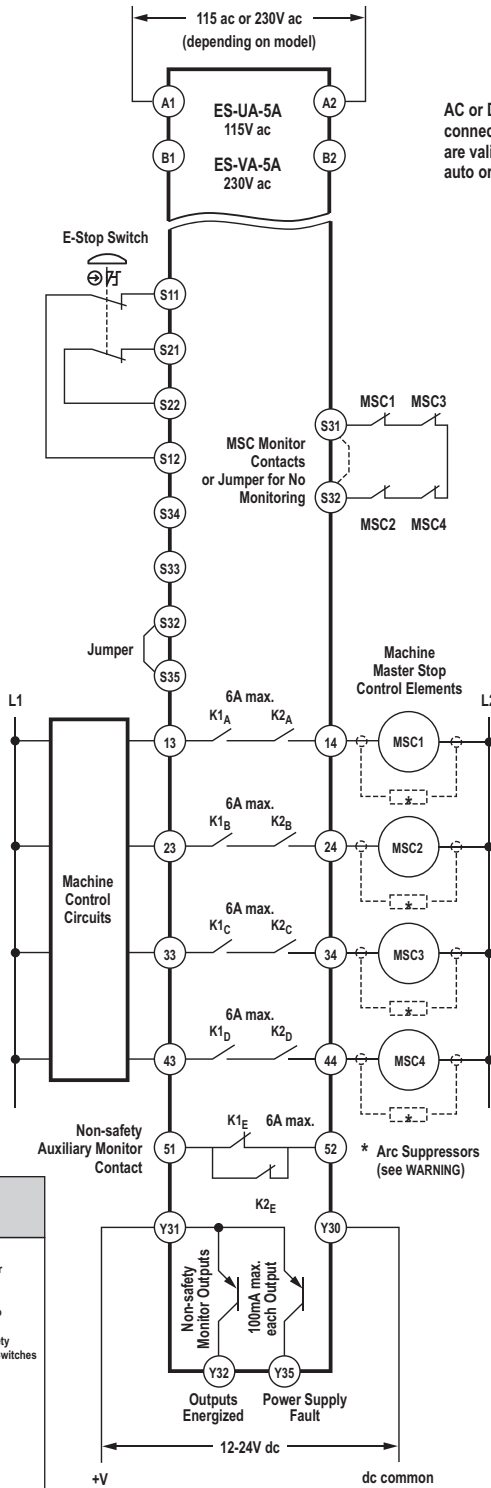
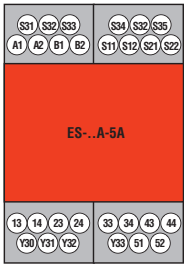
Auto Reset

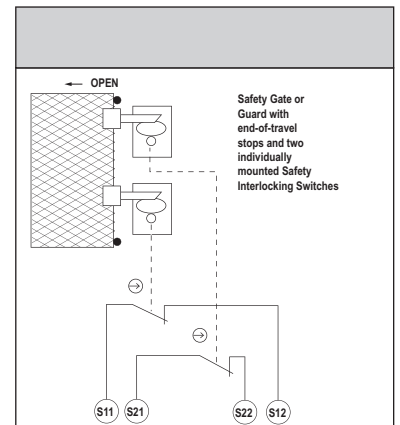
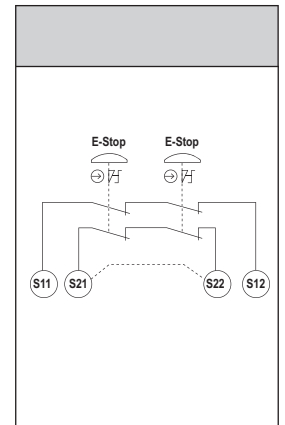
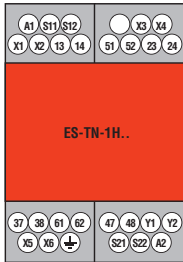
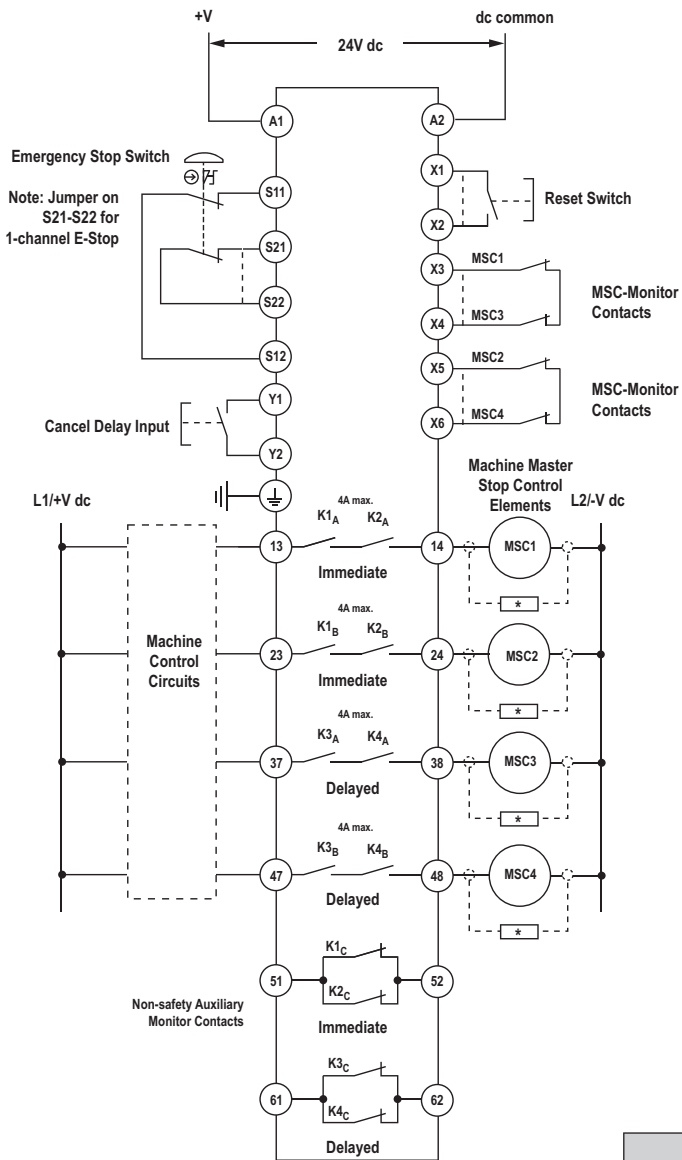
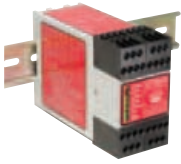
AC Power shown

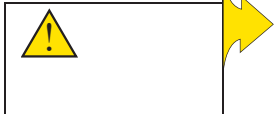
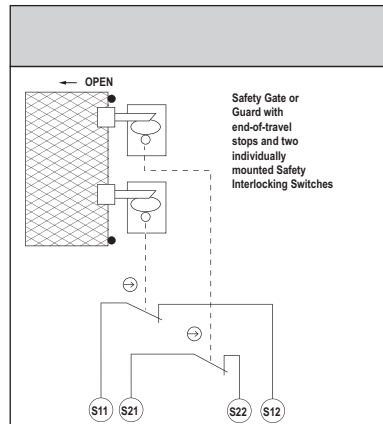
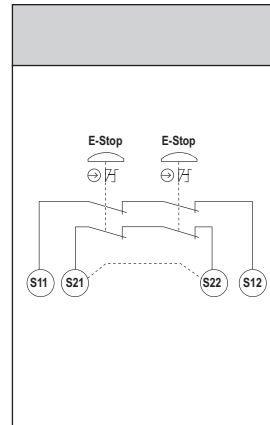
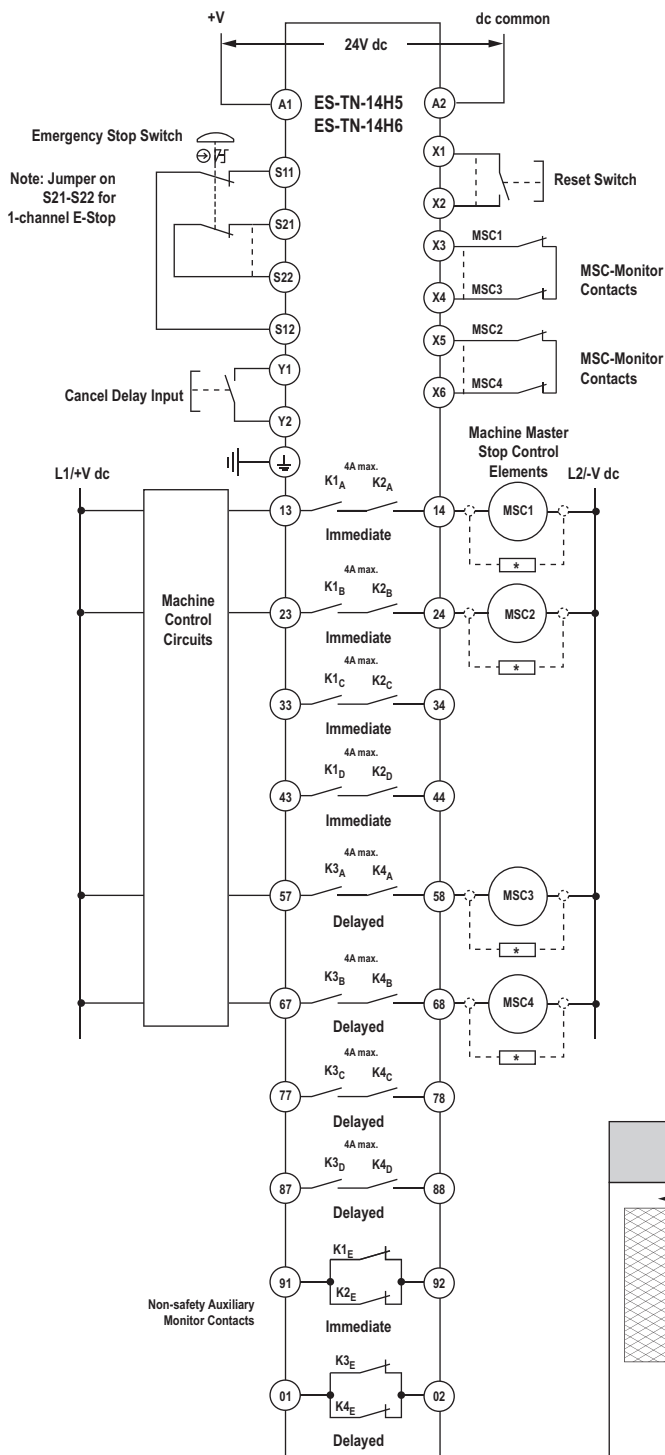
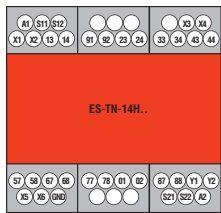
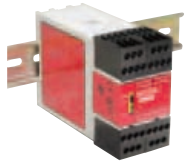
Manual Reset

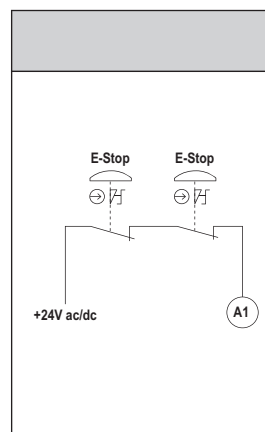
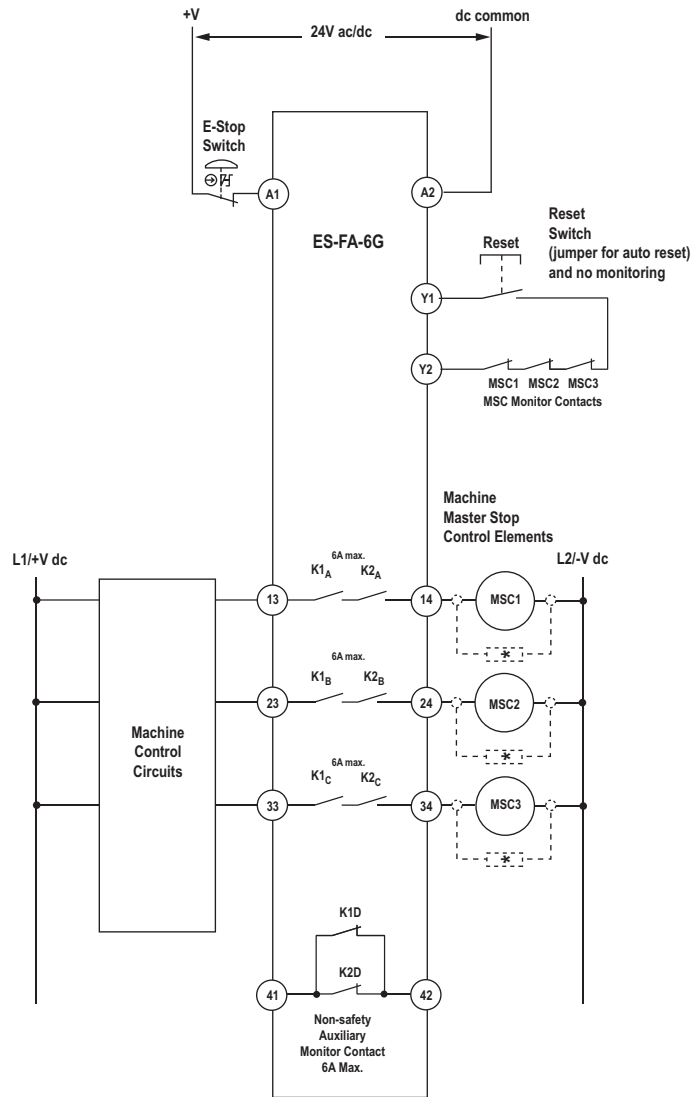
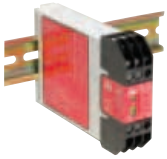
DC Power shown

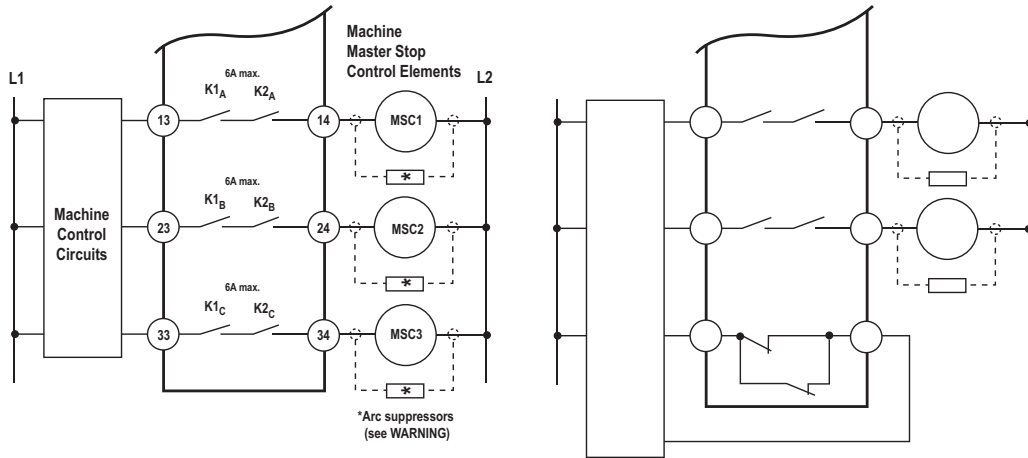
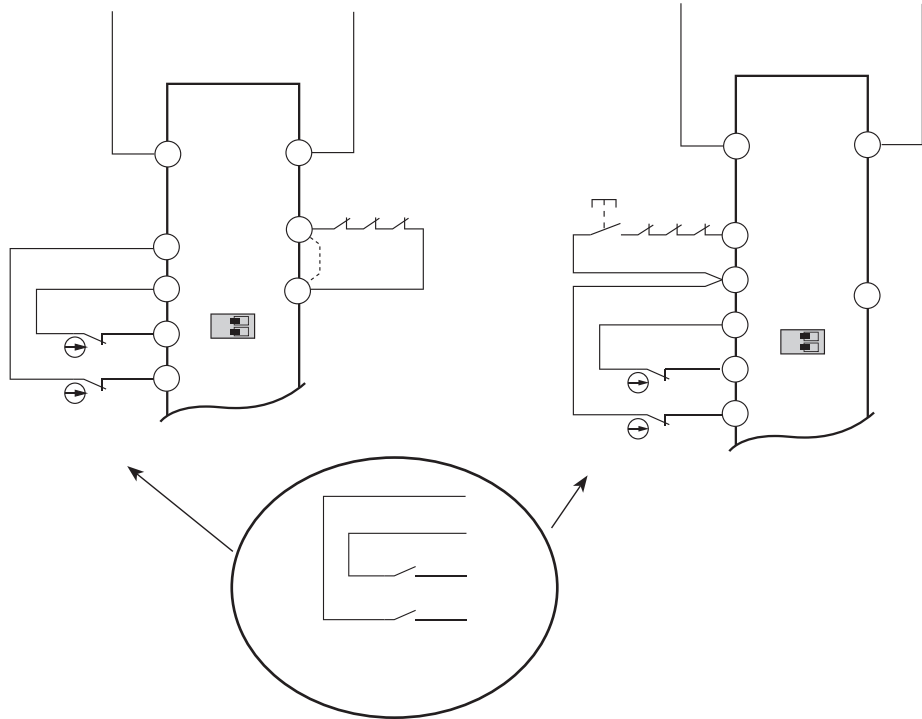
AC or DC power connections shown are valid for either auto or manual reset.

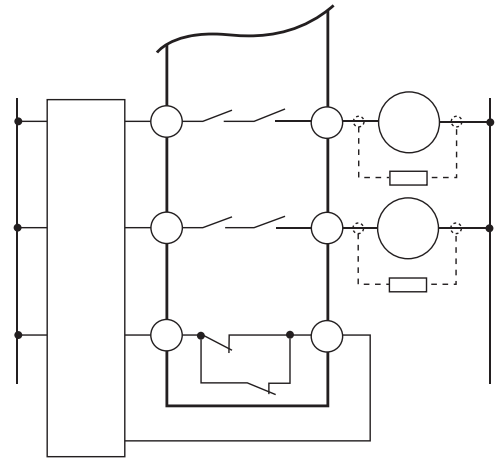
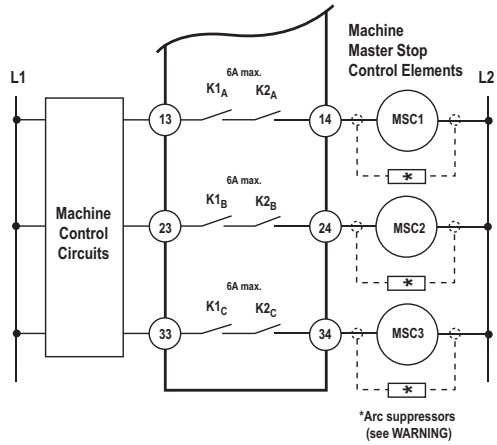
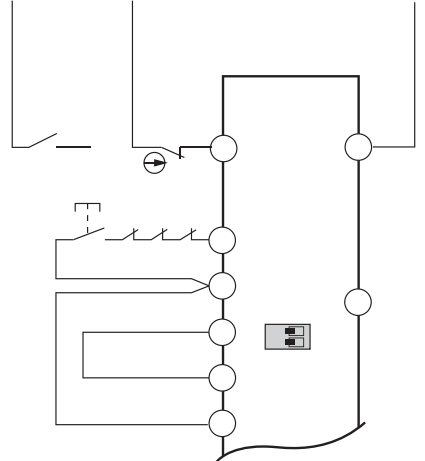
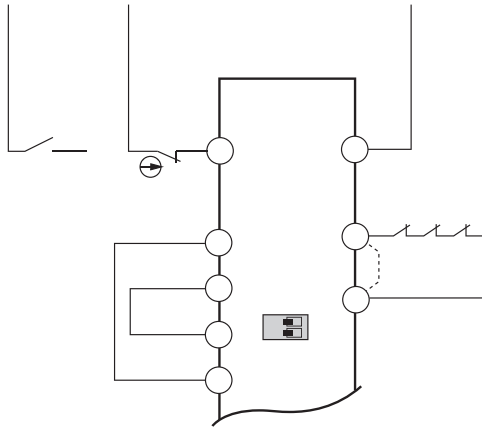
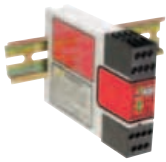


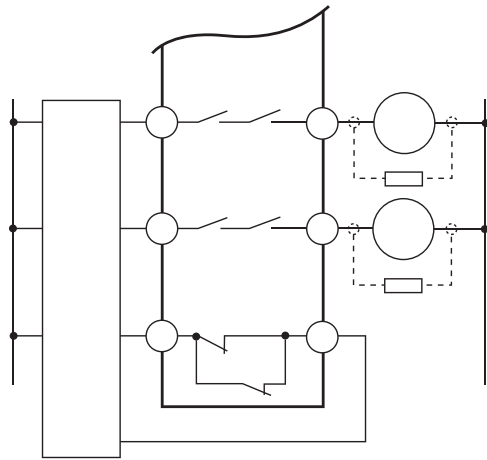
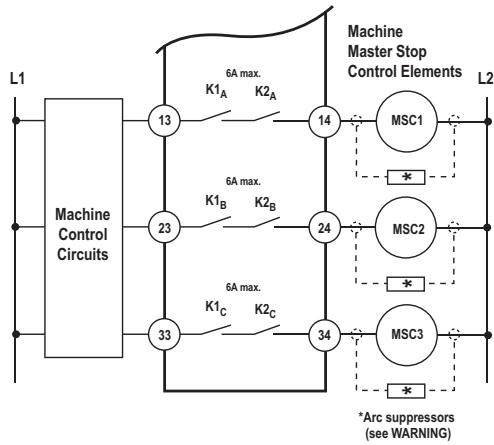
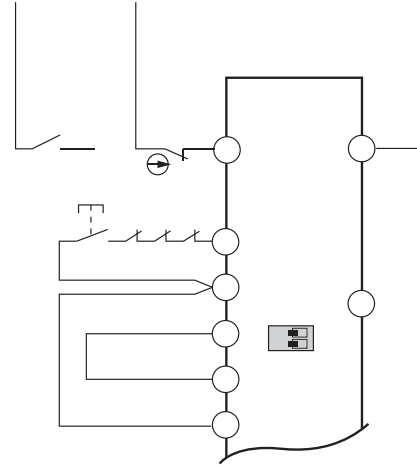
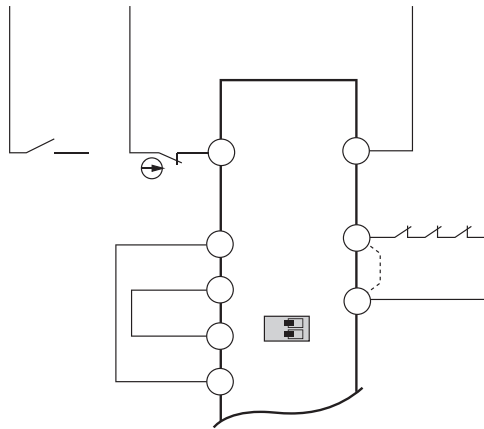


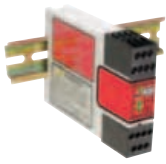




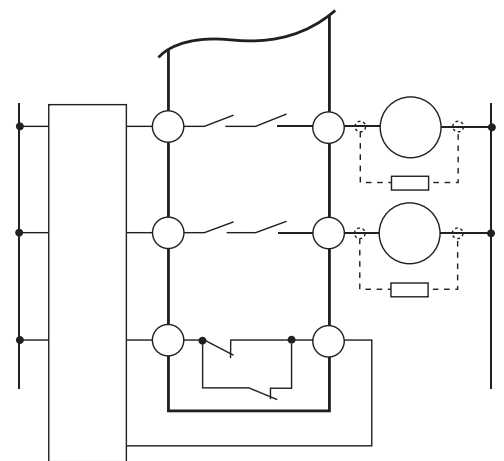
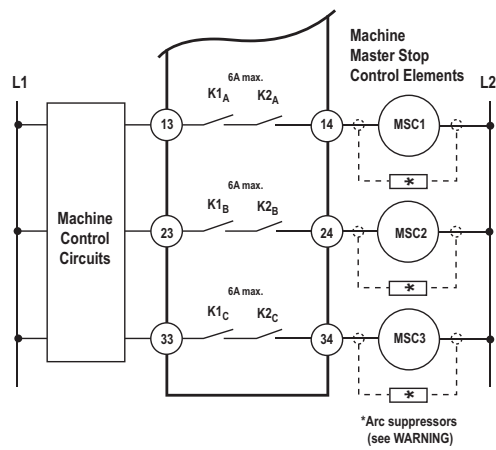
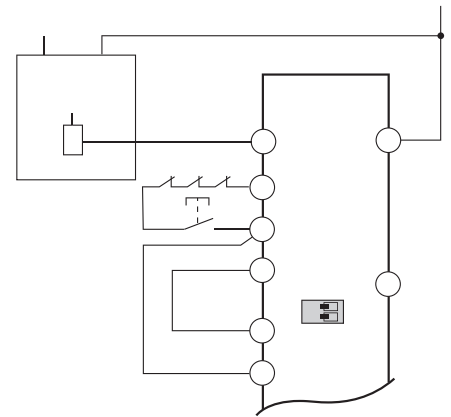
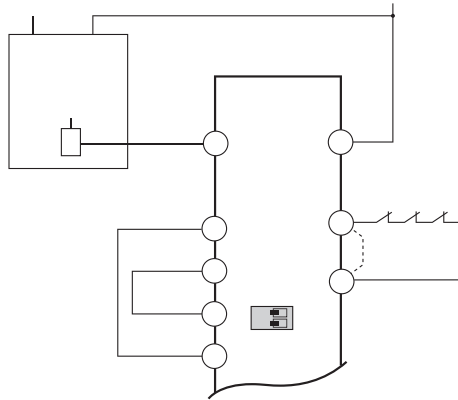


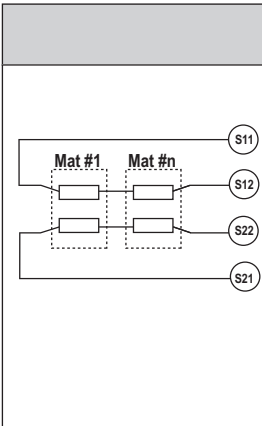
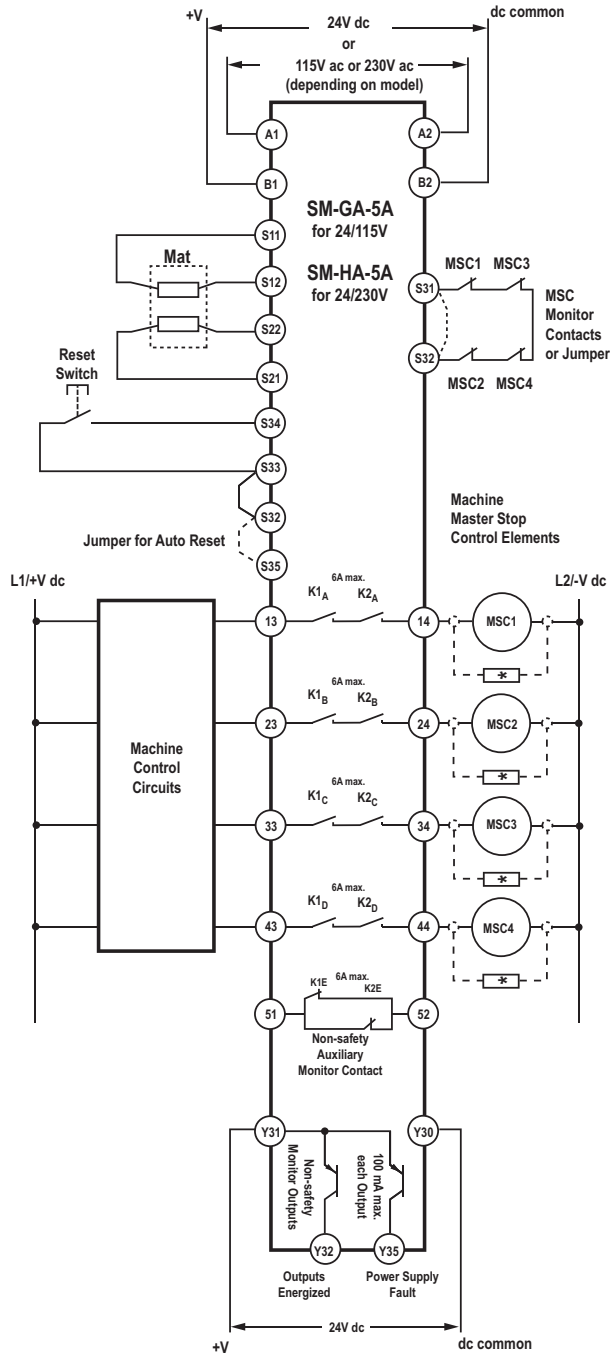
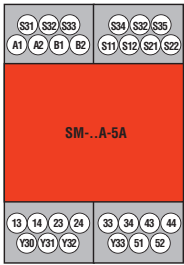
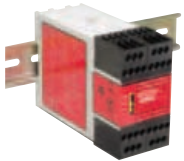


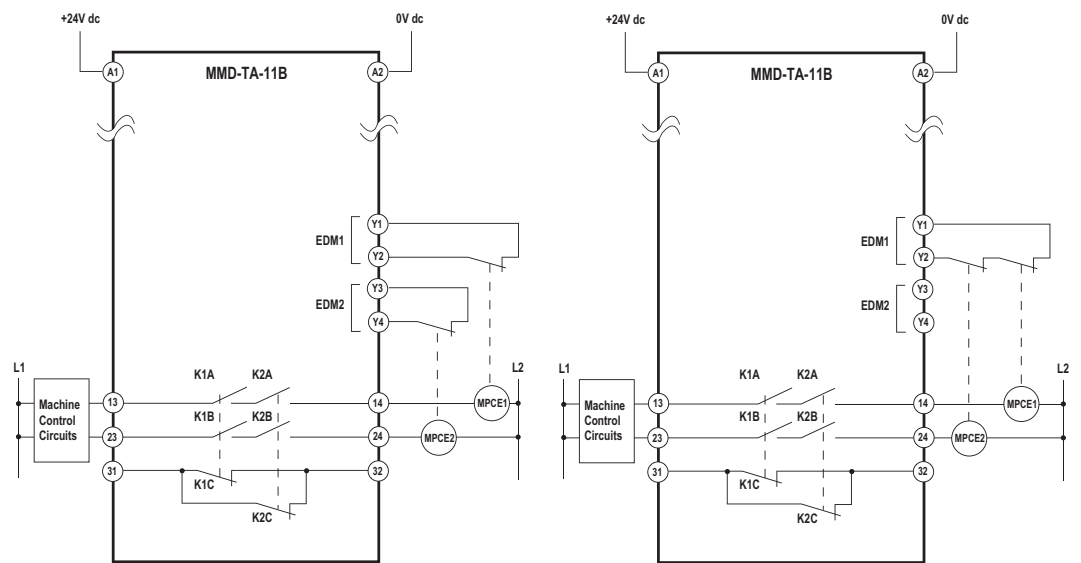
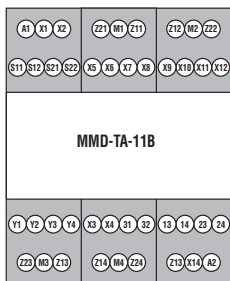
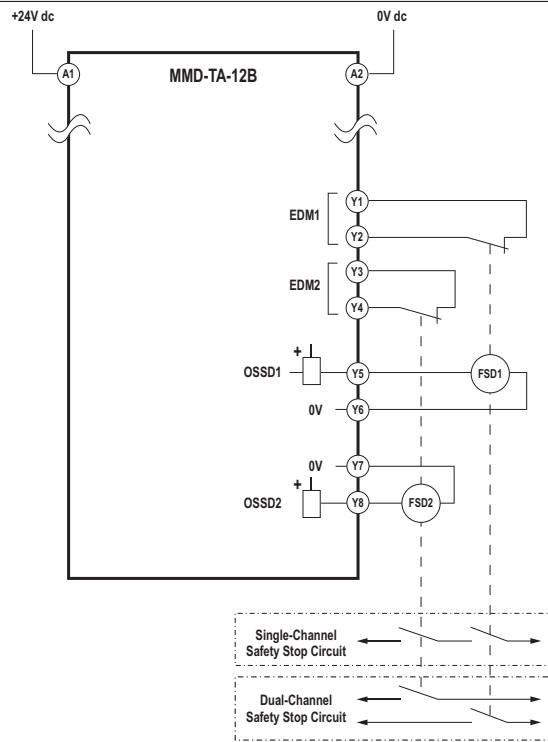
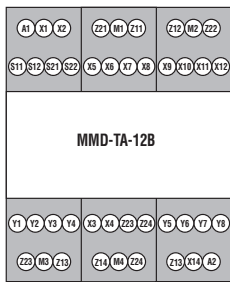


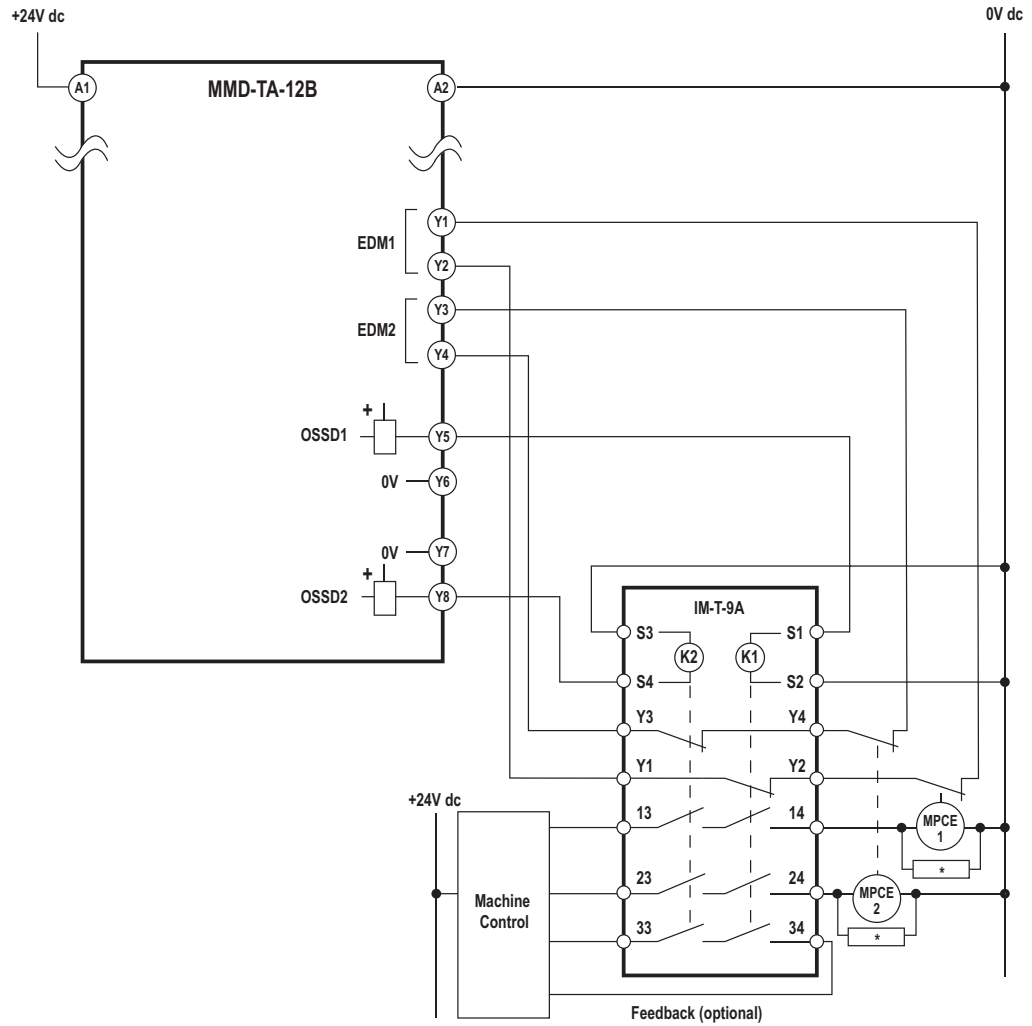
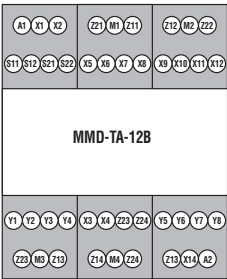


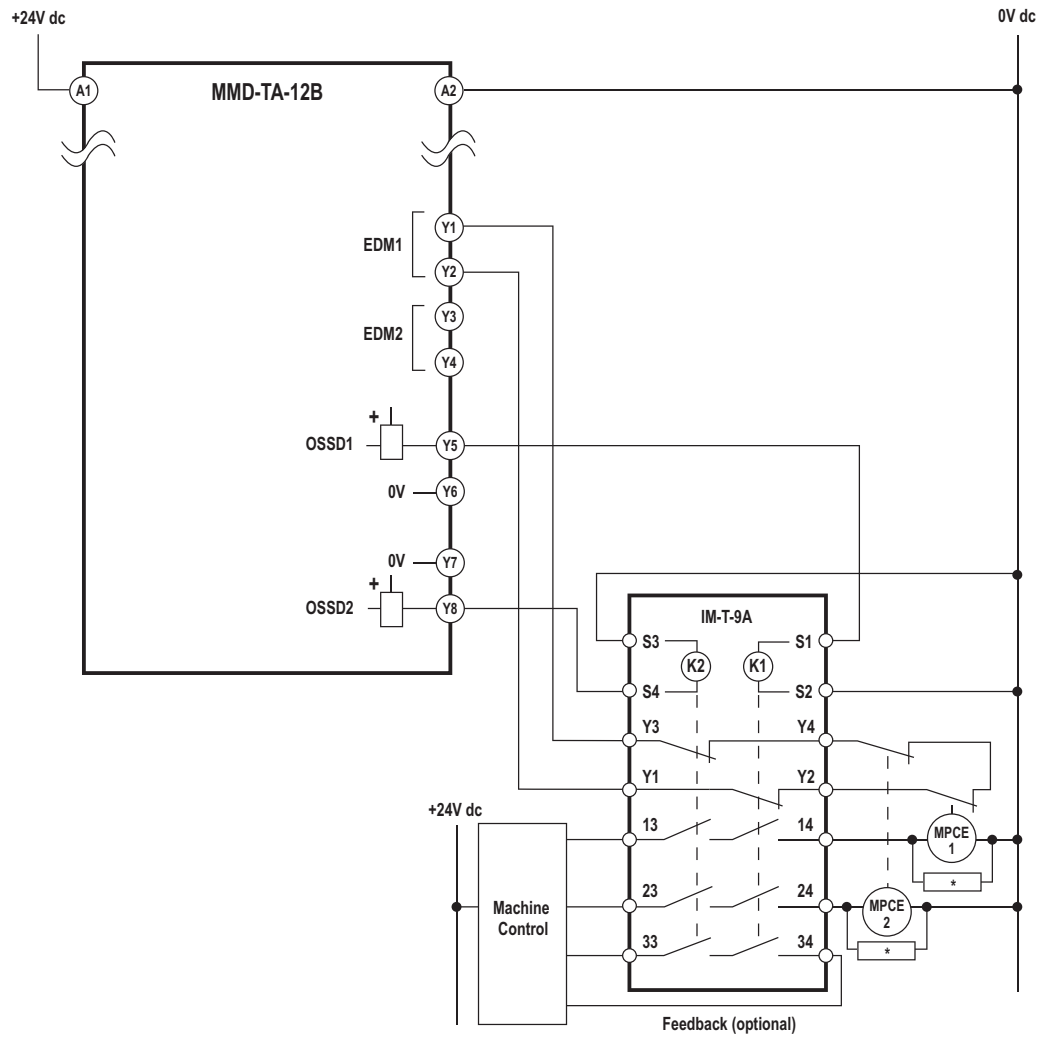
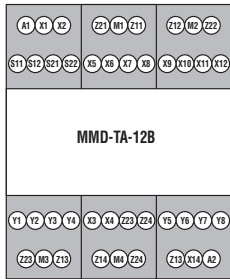
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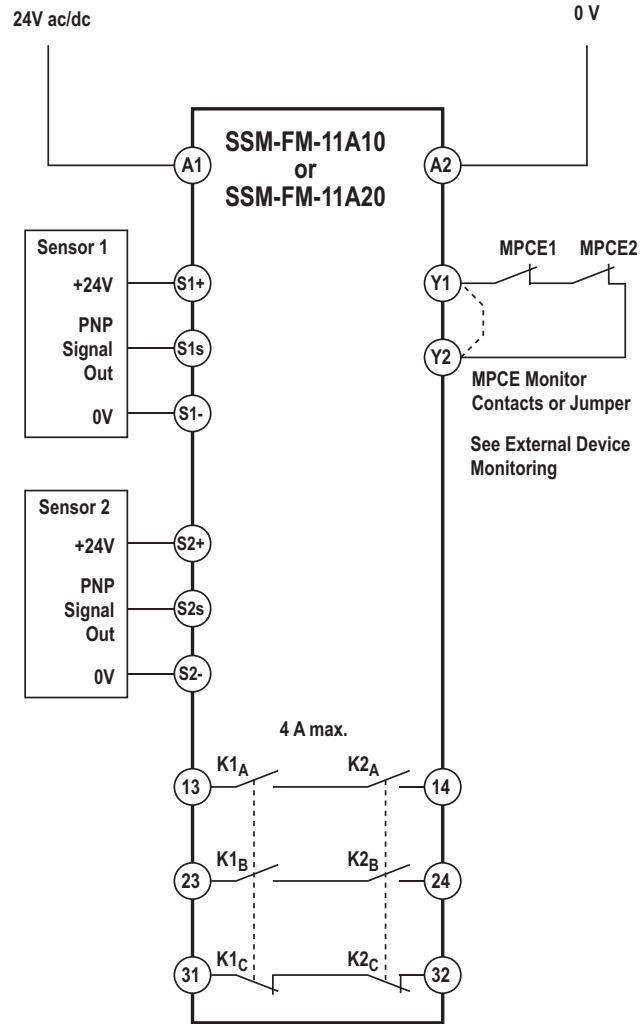
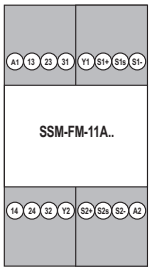


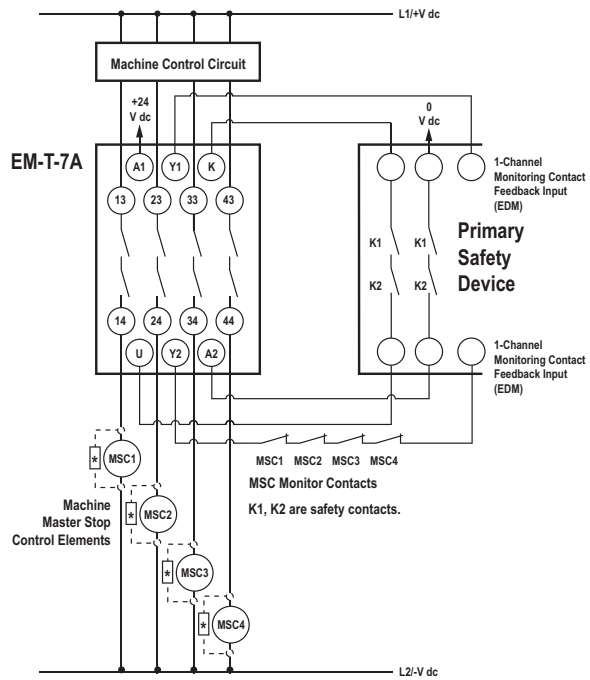
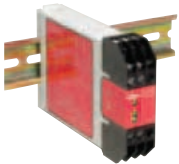
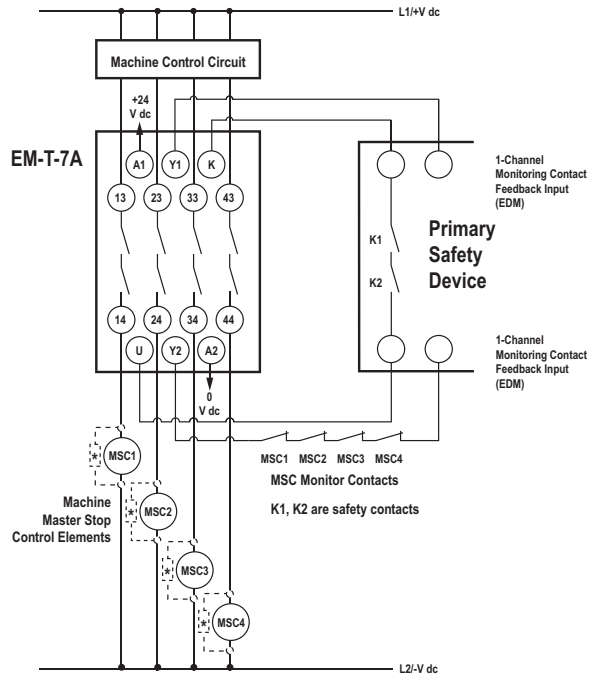
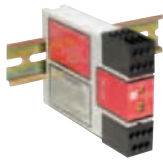


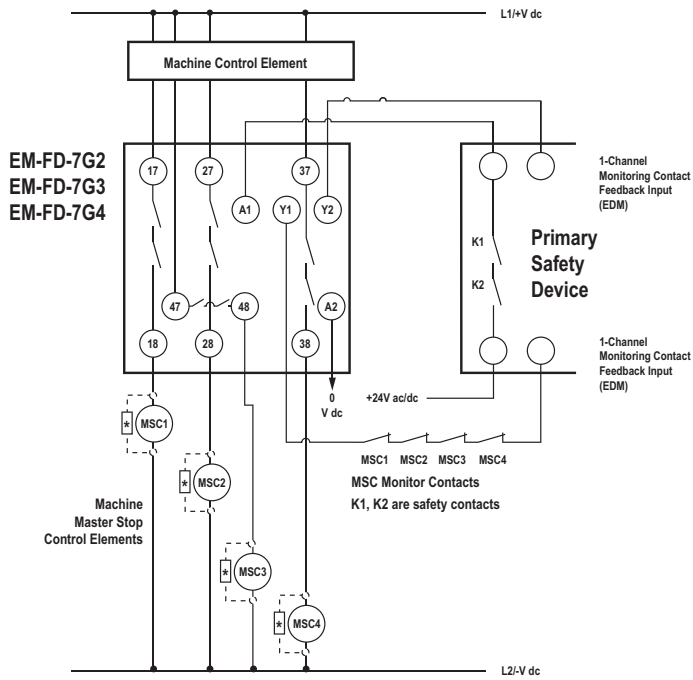
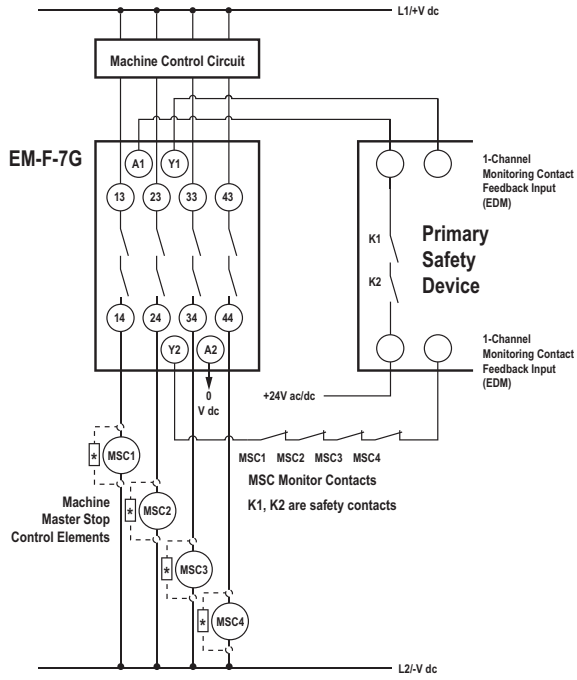
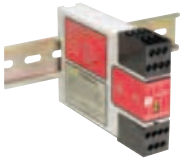


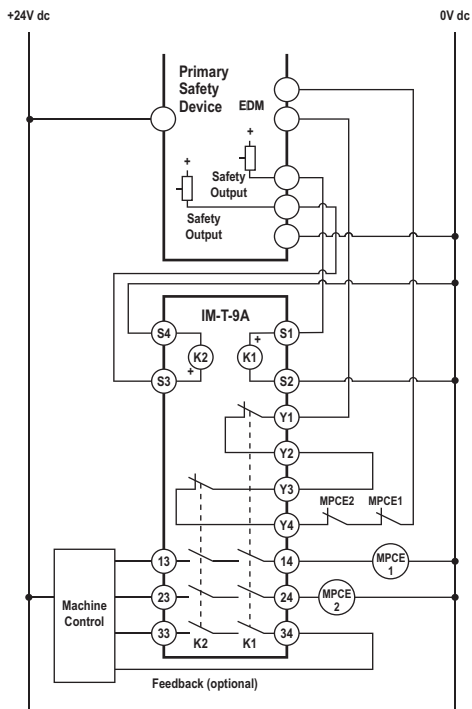
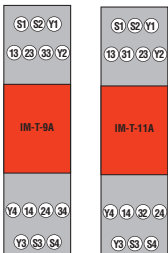
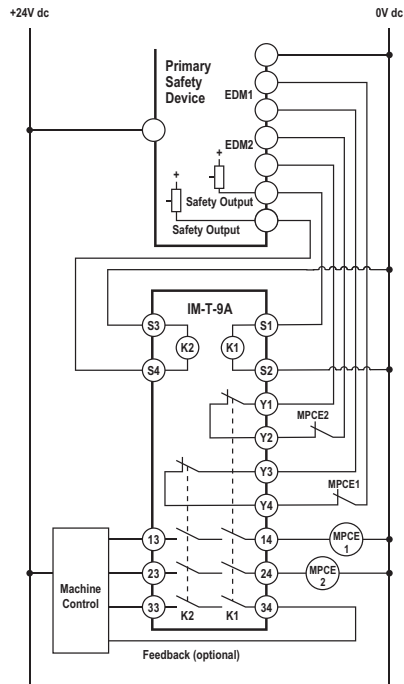
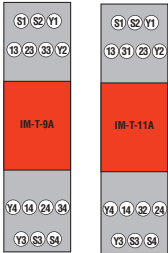


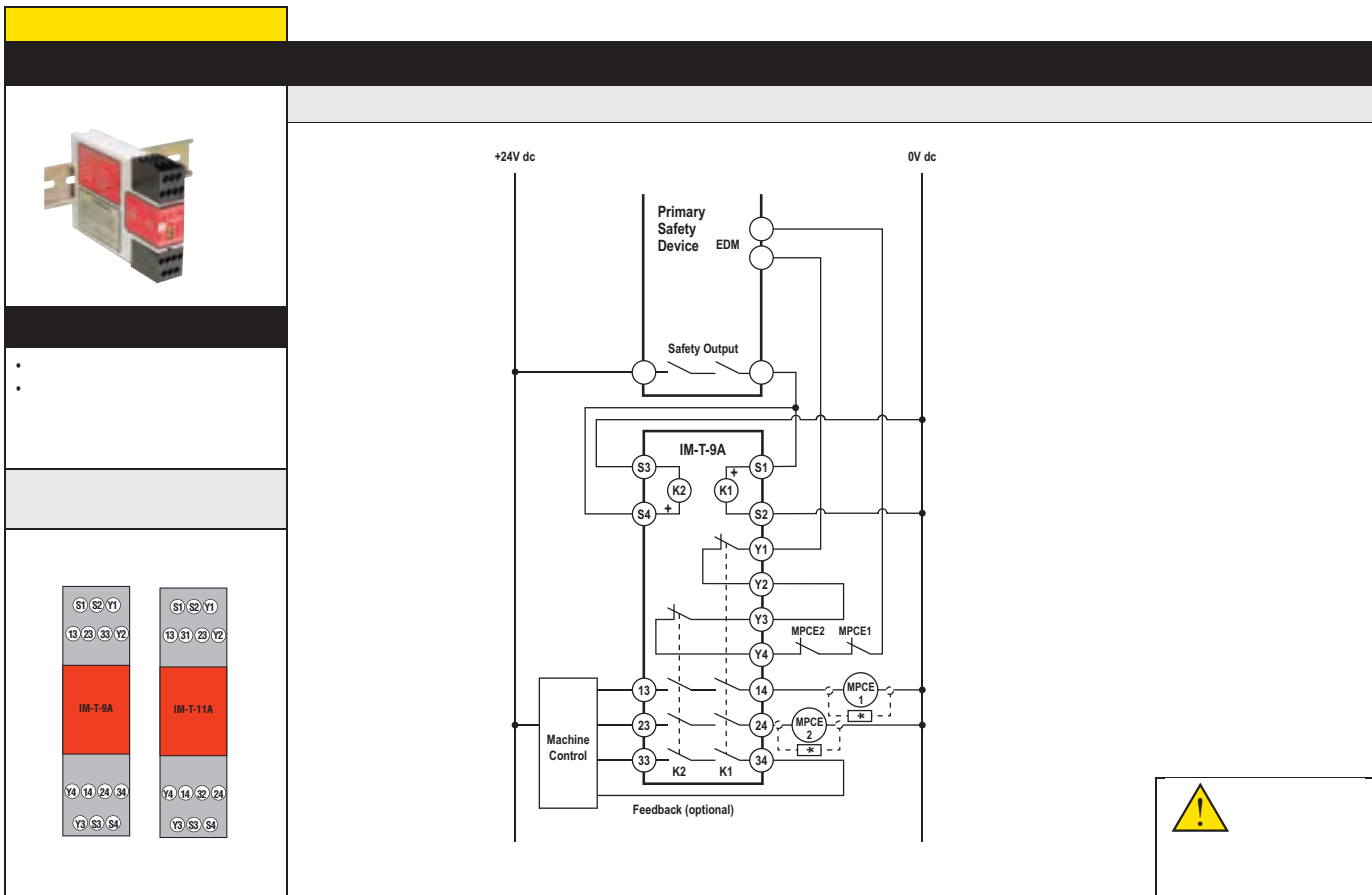
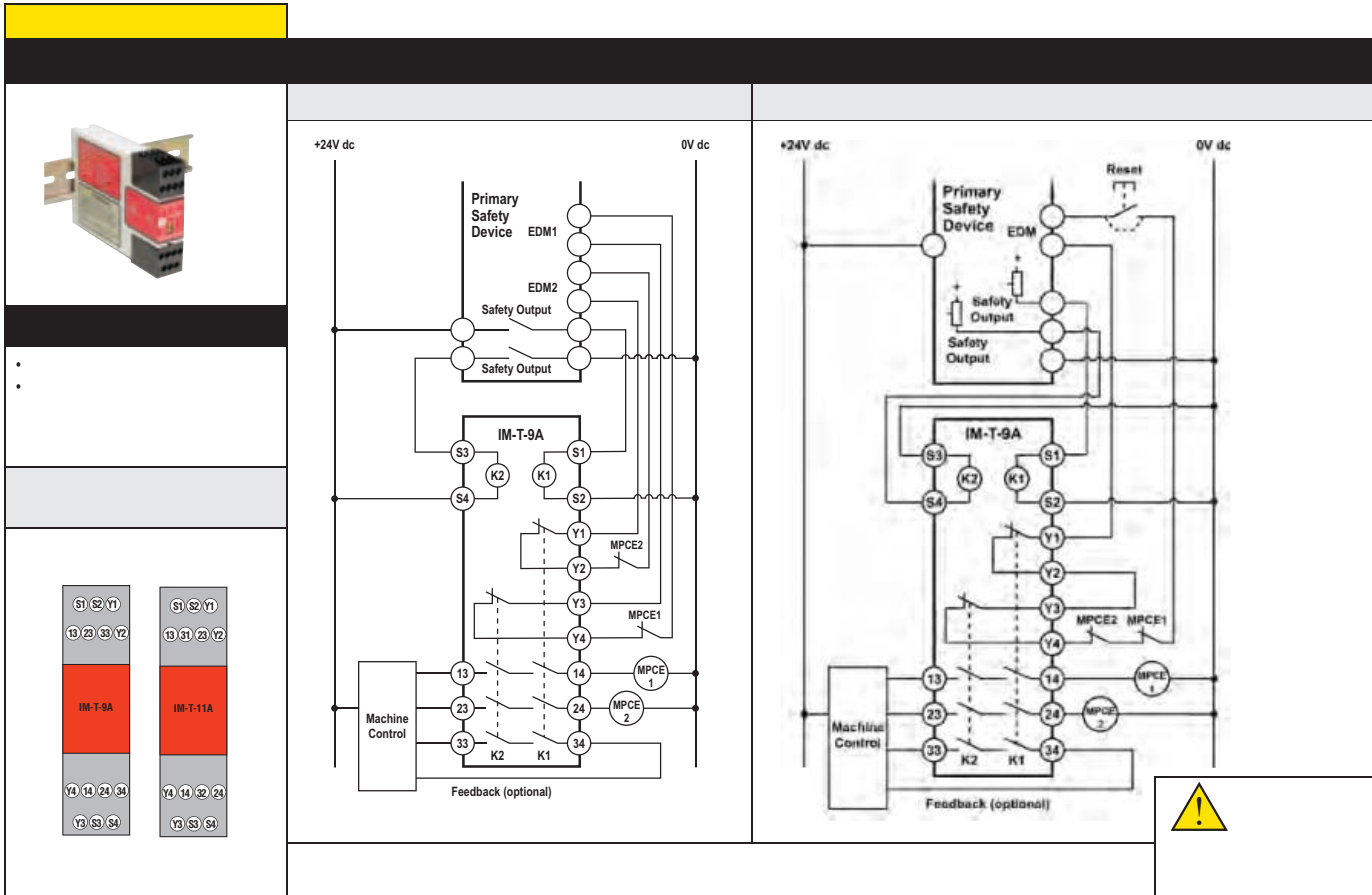


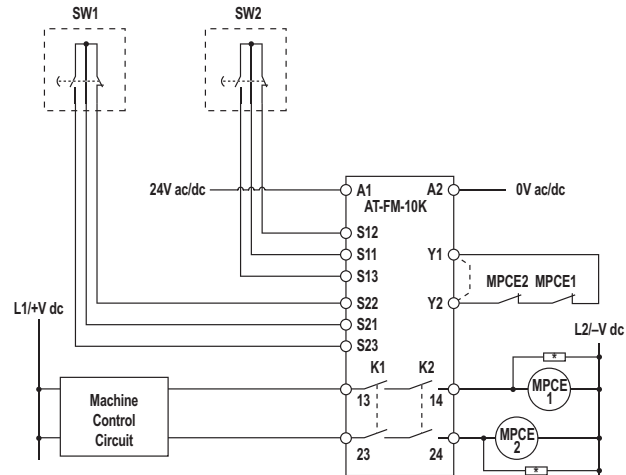
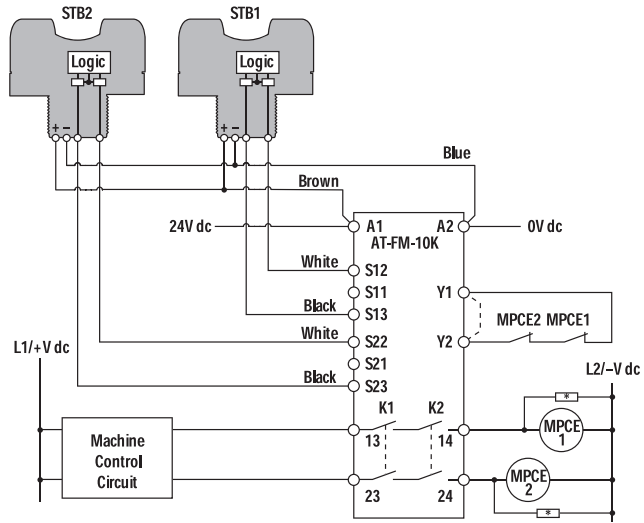
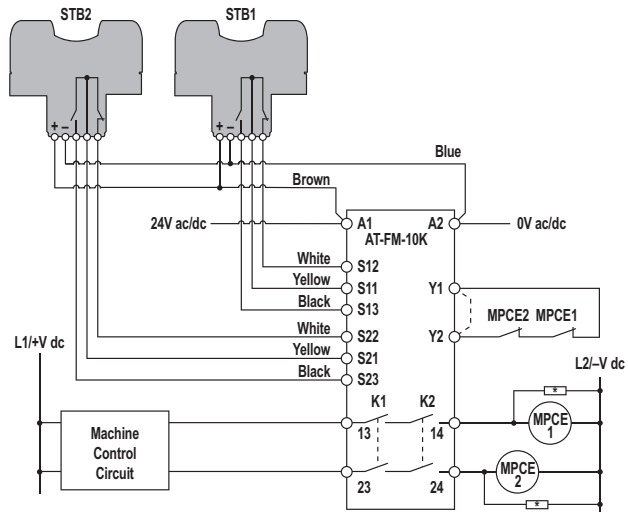


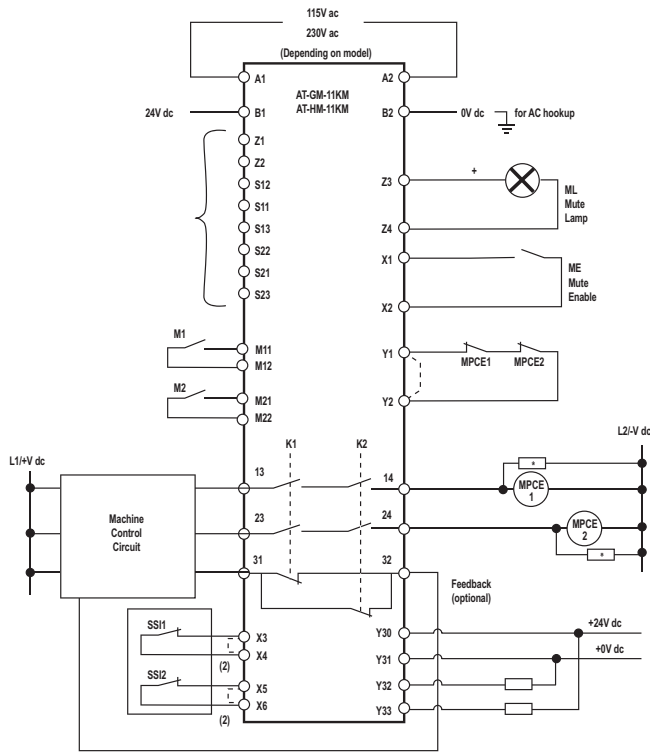
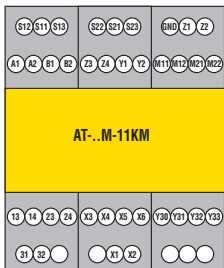
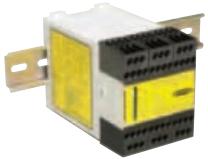
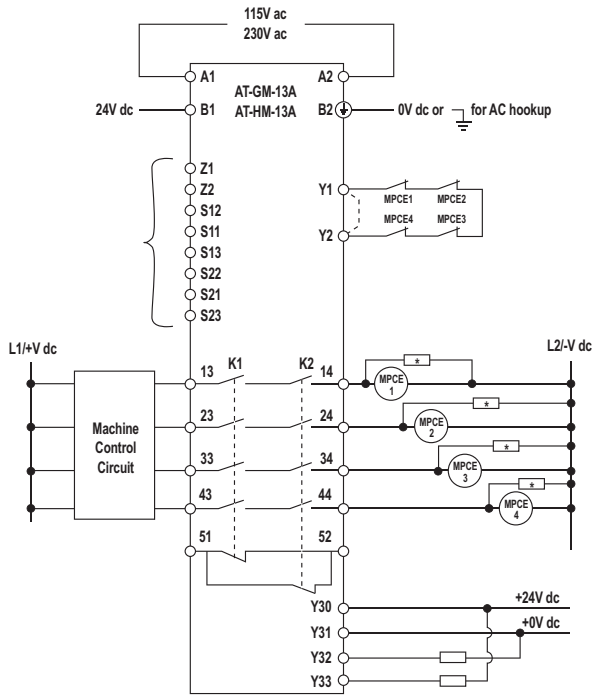
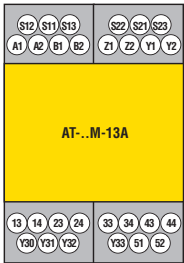
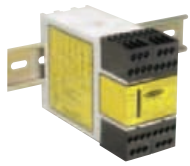


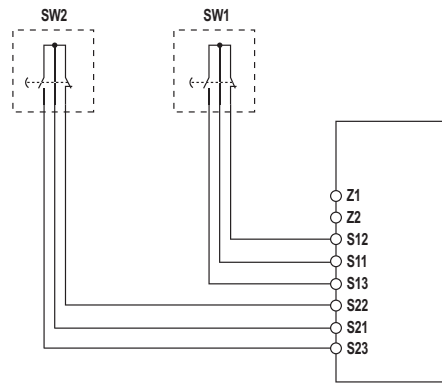
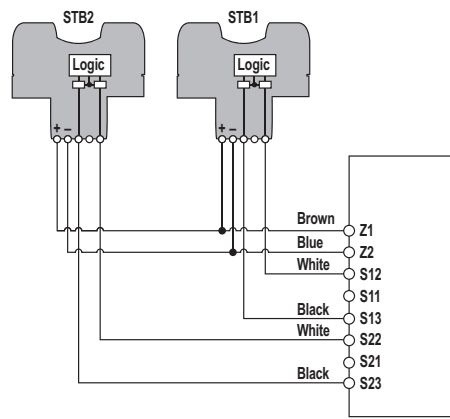
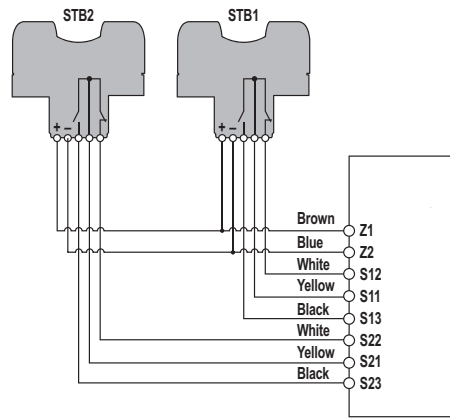


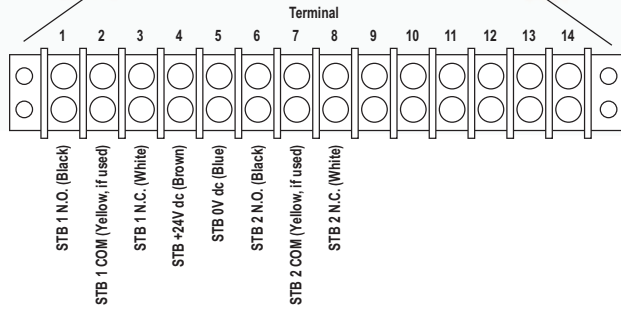
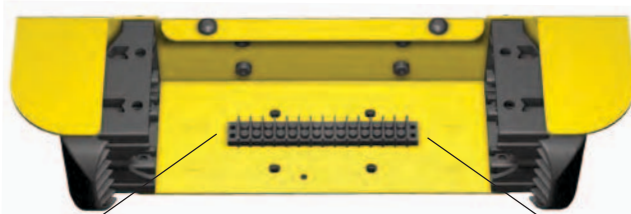








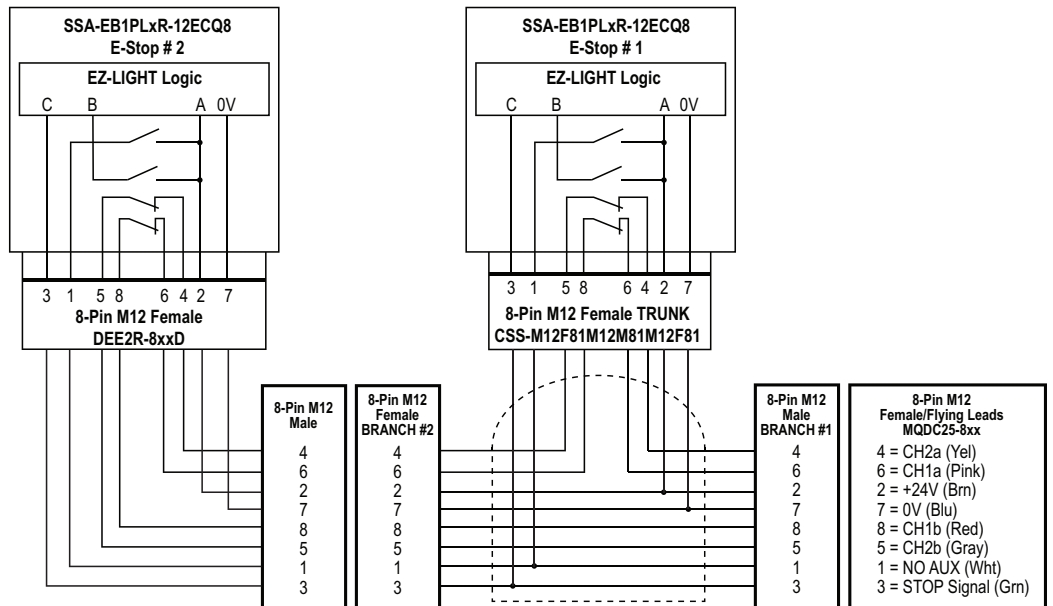
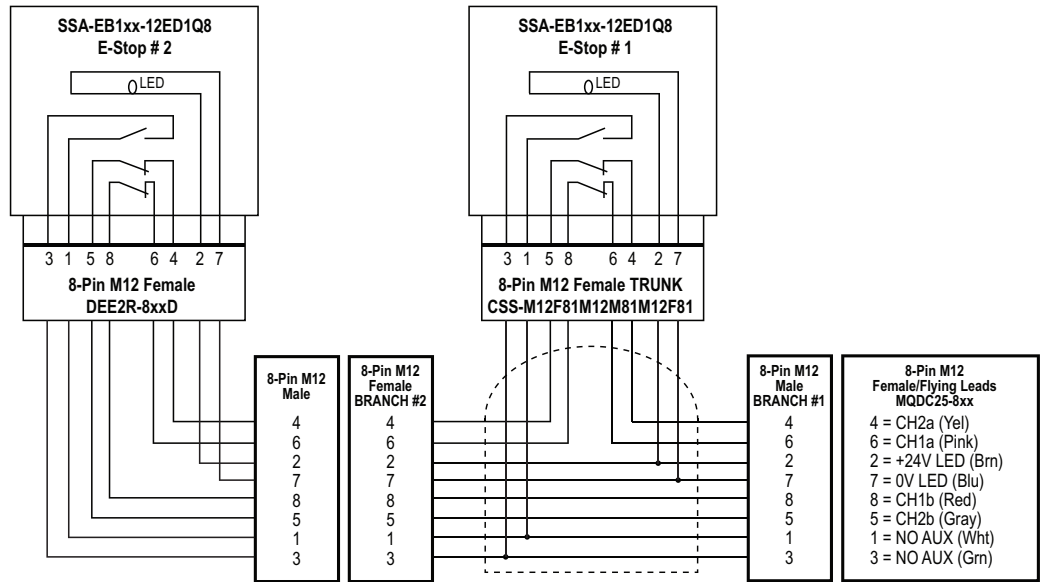


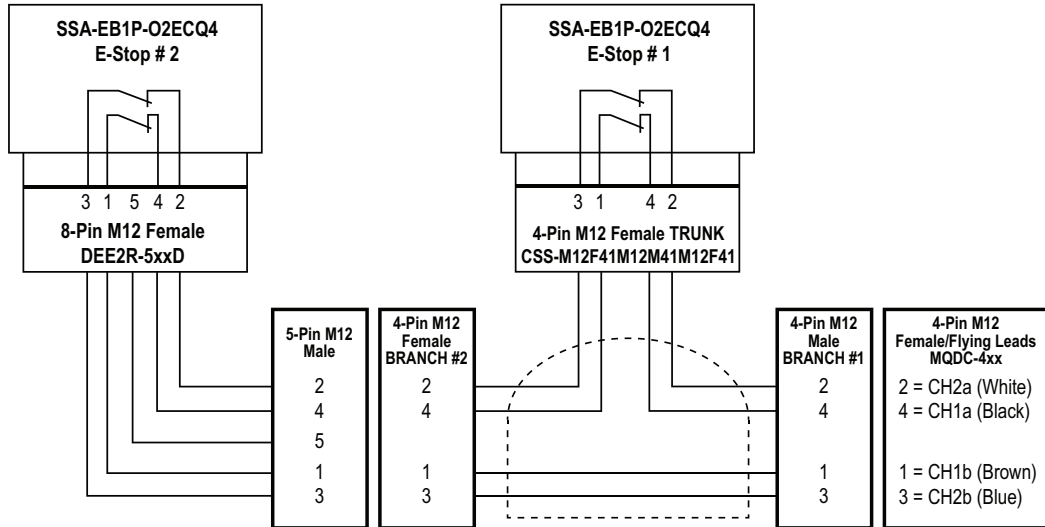
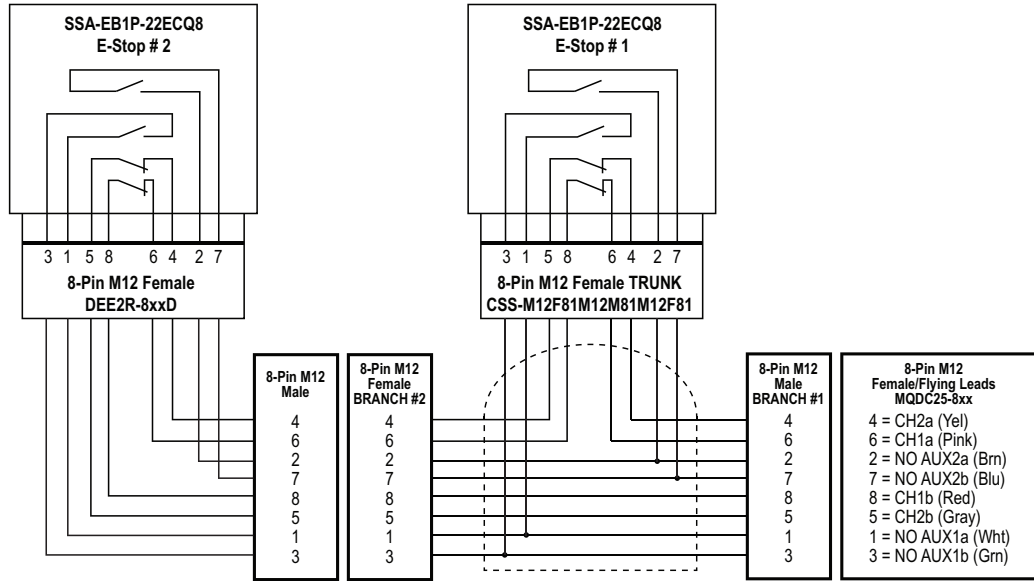


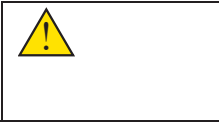
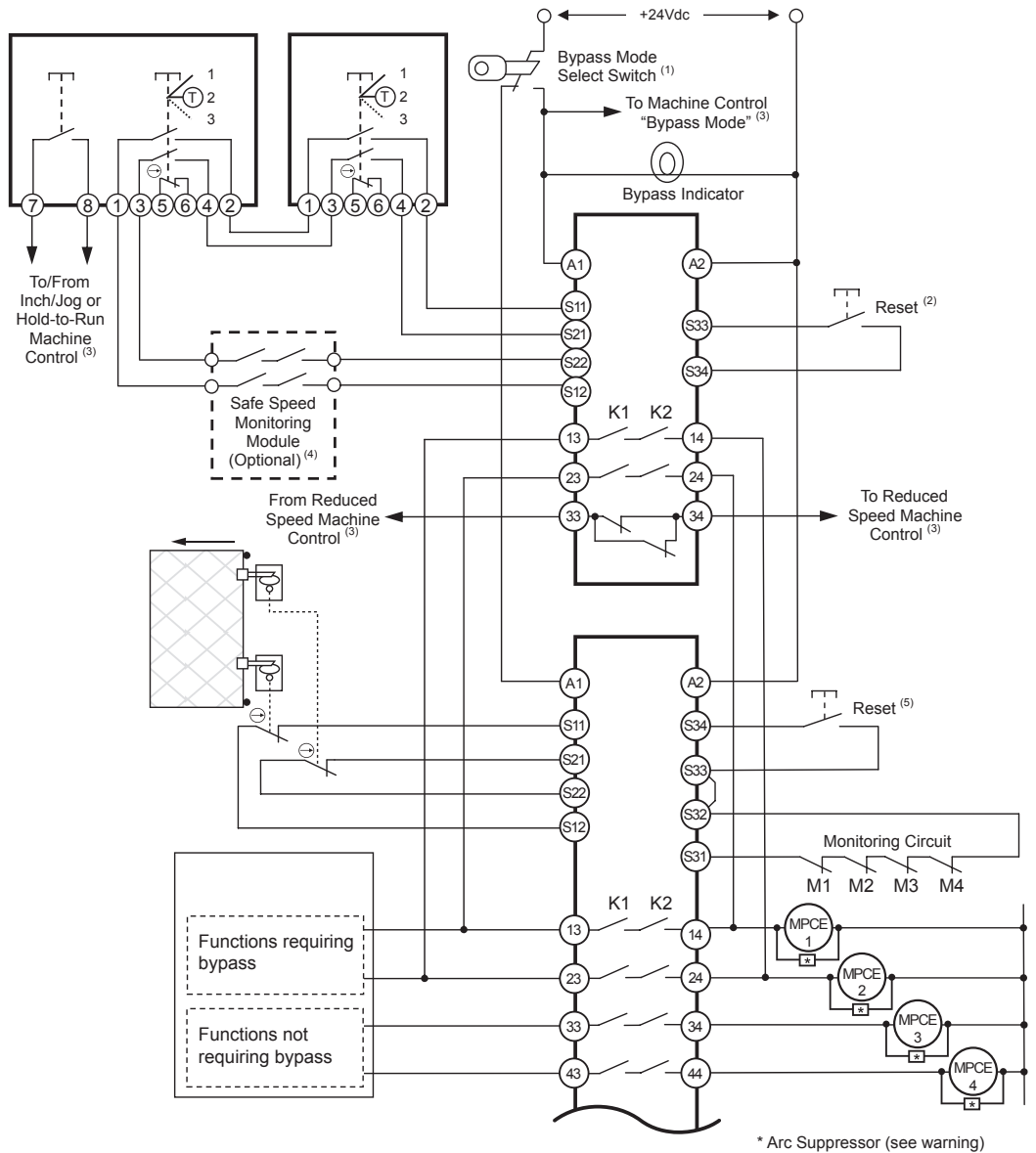
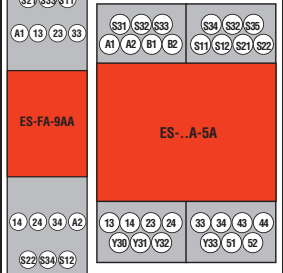
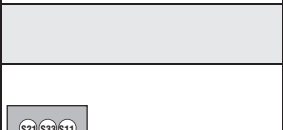
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- Blue wire connected to 0V dc
- Supply Voltage and Current = 10 to 30V dc, 60 mA max.











| | | <ul style="list-style-type: none"> All sensor types; choice depends on range, excess gain and electrical and performance requirements. |
|--|---|--|
| | <ul style="list-style-type: none"> Metal processing Painting applications Paper manufacturing Outdoor applications | <ul style="list-style-type: none"> Use when above +100° C; max. to 480° C. Use polycarbonate fibers up to +125° C. |
| | <ul style="list-style-type: none"> Meat processing Food processing Chemical processing Outdoor applications | <ul style="list-style-type: none"> Use below -40° C; min. to -140° C. |
| | <ul style="list-style-type: none"> Food processing Car washes Pharmaceuticals Bottling plants Outdoor applications | <ul style="list-style-type: none"> Sensors with NEMA 6 ratings represent the best moisture seals and can resist occasional and prolonged (NEMA 6P) submersion. NEMA 4 and 6 ratings: Can withstand low-pressure washdown. NEMA tests do not take into account the elevated pressures and temperatures of solutions used to wash equipment in food processing applications. See NEMA and IP enclosure ratings chart online. Condensation can be eliminated by using unlensed fiber optics. |
| | <ul style="list-style-type: none"> Semiconductors Chemical Lumber Pulp/paper Amusement parks (UV light) | <ul style="list-style-type: none"> Stainless steel sensor housings. Glass fiber optic assemblies in stainless steel sheathing. Fiber optic assemblies without epoxy (available by special order). Fiber optic assemblies with PVC jackets. Thermoplastic polyester housings; see chart online. Teflon sheathing; protect the sensing tip from direct contact with concentrated acids. Polyethylene jacket of standard plastic fiber optic cables resists acids, but can degrade with prolonged contact. |
| | <ul style="list-style-type: none"> Lumber Ceramics ovens Paper Steel Mining | <ul style="list-style-type: none"> Excess gain data should be carefully evaluated. Opposed-mode sensors with excess gain above 1000x. Smaller lens concentrates the beam for greater penetrating ability. Larger lenses will yield greater range, but will disperse available sensing energy. For metal targets and short sensing ranges. |
| | <ul style="list-style-type: none"> Metal (stamping) Printing (presses) Packaging | <ul style="list-style-type: none"> Lightweight sensing components; smaller sensors. Anti-vibration mounts placed between the sensor and mounting bracket. Glass or plastic fiber optic assemblies can withstand more than 100 Gs of acceleration. Glass fibers cannot tolerate repeated flexing. Use plastic, hi-flex or coiled fibers. Remote sensors can withstand up to 15 Gs of acceleration. One-piece self-contained sensors with epoxy-encapsulated circuitry withstand up to 10 Gs of acceleration. |
| | <ul style="list-style-type: none"> Chemicals/Gas/Oil/Refinery Grain elevators Airbag manufacturers | <ul style="list-style-type: none"> Special sensing equipment must be installed, using measures to avoid sources of ignition. See chart defining Hazardous Location Classifications online. NAMUR photoelectric sensors. Glass and plastic fiber optics. (Plastic fiber optics are preferred, as it is easier to seal around the fiber bundle at the barrier between the hazardous and safe environment). |



| ° F (Fahrenheit) | 212° F | 32° F | ° F = (° C x 9/5) + 32 |
|-------------------------|--------|-------|------------------------|
| (Celsius or Centigrade) | | | ° C = (° F - 32) x 5/9 |

For temperatures not given in the table, use the conversion formula above.

One of the ISM bands in the radio spectrum that is recognized worldwide. Experiences more path loss than 900 MHz band.

A sensor designed to wire in series with its load, exactly like a limit switch. A 2-wire sensor remains powered when the load is "off" by a residual "leakage current" that flows through the load.

One of the ISM bands in the radio spectrum recognized in North America, Australia, and Israel; characterized by lower throughput but better range and

(Analog to Digital Converter) An electronic device that converts data from analog form to digital, or binary code for a computer.

(Alternating Current) A sinusoidal current rated at a given frequency.

The rate of change of velocity, with respect to time.

A type of perimeter guarding, typically used to guard doorways, cell entries or exits, walkways, and machine

1. The degree to which a measured value is similar to an actual value. 2. The extent to which vision sensors can correctly measure and obtain a true value of a

The difference between indicated value and actual value, at room temperature. In most cases, the accuracy of a measurement and inspection sensor is comprised of two main sources of error: the resolution and the linearity.

The manner in which outside information is brought into an analysis system; an image acquisition generally involves A/D conversion.

A guard that can be adjusted to accommodate various jobs or set-ups.

Adjustable-field sensors use two receivers and a comparator circuit to cancel sensing response whenever the intensity of the reflected light reaching the long-range receiver exceeds the intensity of the reflected light reaching the close-range receiver. As a result, any object lying beyond the sensor's "cutoff point" can be reliably ignored.

Positioning of a sensor so that the maximum amount of the emitted energy reaches the receiver sensing

Abbreviation for Amplitude Modulation. Type of modulations in which the data signal is "attached" to a carrier wave by varying the amplitude of the carrier

(Amp) A unit of measurement of electric current.

A device that accepts a small signal and outputs a larger signal generally matching the characteristics of the input signal. Amplifiers are available to boost electrical and optical signals.

Pertaining to a class of devices or circuits in which the output varies as a continuous function of the input.

A sensor output that varies over a range of voltage (or current) and is proportional to some sensing parameter (as opposed to a digital output).

A logic function in which all of two or more defined input conditions must exist simultaneously before a load is energized (A and B and C = output).

The included angle of the area of sensor response.

See Effective Aperture Angle (EAA)

The angle at which light strikes a surface.

1) The angle formed between two lines drawn from the most widely separated points in the object plane to the center of the lens. 2) The angle between the axis of observation and perpendicular to the specimen

An electronic component used to transmit and receive radio waves, in a narrow frequency range.

The function of the control system designed to limit the machine to a single stroke or cycle even if the tripping or actuating means is held operated.

A feature of a two-hand control where both hand controls must be released before the machine can

1. The size of a lens opening. 2. A mechanical part attached to a lens used to restrict the size of a lens opening.

Overall design or structure of a system or network, including all hardware and software.

A safeguarding technique that provides a means of continually sensing or detecting an individual within an area adjacent to or associated with a hazard.

An area light provides even illumination in a concentrated area.

A safeguarding device that creates a sensing plane to detect the presence of an individual or object.

Acronym of American Standard Code for Information Interchange. Pronounced askee. An 8 bit coded character set used to represent alphanumeric, punctuation marks and certain special control characters.

Acronym for Application Specific Integrated Circuit. A chip designed for a specific application rather than a general-purpose chip such as a microprocessor.

The width to height of an object. The ratio states the relationship of one side to the other. A computer monitor is 4:3, meaning 4 units wide by 3 units high.

Describes serial communication that does not use a receive and transmit synchronizing clock signal to transmit data.

Lessening or loss of signal intensity during

A safety light screen system feature that enables the system to be powered up into the RUN mode (or recover from a power interruption) without requiring a

A barrier, signal, light or signage that warns individuals of an approaching, present, or the proximity of a hazard.

The parts of a scene in and around the Feature of Interest (FOI) that are not "of interest" to the software.

A photoelectric proximity sensing mode with response that is similar to a diffuse sensor, but with a defined range limit. Two background s fixed-field and adjustable-field.

Lighting option that provides even, low-intensity light. It is placed behind the target and aimed directly back towards the camera. The resulting silhouette can be inspected for proper size and shape.

A section of the RF spectrum.

Width of radio frequency band. For analog signals, this is measured in Hertz. With digital signals, bandwidth describes the amount of data that can be transferred through a signal connection in a given time, measured in bits or bytes per second.

A coding system designed to be read and decoded by optical scanners. One dimensional or linear bar codes are made up of black bars and white spaces, representing a string of numbers or letters. Two-dimensional bar codes are read on two axes and typically contain more data in a smaller space.

Data rate in bits per second.

The cone of sonic energy emitted by an ultrasonic sensor that diverges with distance.

The portion of a beam that must be blocked to cause an individual photo receiver to change state. One of the factors in determining resolution of a safety light screen. Also known as effective beam diameter.

A two-dimensional graph of a sensor's response. Beam patterns are helpful in predicting the performance of the sensor.

The distance from the center of one beam to the center of an adjacent beam, and one factor in determining resolution of a safety light screen. Also known as beam pitch.

| | | |
|---|---|---|
| The radius below which an optical fiber should not be bent. Usually bend radius is a function of tensile strength. | A high-frequency waveform that can be modulated in amplitude, phase or frequency to carry a signal from a transmitter to a radio receiver. | The failure of multiple components or equipment resulting from the same root cause. |
| A fiber optic assembly that is branched to combine emitted light with received light in the same assembly. | Series connection (or "daisy-chaining") of multiple | (CNC) An auxiliary (non-safety) output that is always in an opposite state to its associated normally open safety output, even in the event of a single failure. |
| An exclusive Banner output circuit design that offers either sinking (NPN) or sourcing (PNP) output, depending upon the polarity with which the two DC supply leads are connected. | An uncontrolled stop produced by immediately removing power to the machine actuators. | The dual output configuration of a sensing device, where one output is normally open and the other is normally closed. |
| Locking a Node to a specific Gateway by teaching the Node the Gateway's unique serial number. After a Node is bound, the Node only accepts data from the Gateway to which it is bound. | A controlled stop achieved with power remaining to the machine actuators. Power is removed after the stop is achieved. | Devices used to assure or supplement the operation of a primary safeguard. |
| The dual output configuration of a DC sensing device, where one output switch is a sinking device (NPN) and the other output switch is a sourcing device (PNP). The solid-state equivalent of a DPST relay (for most loads). | A controlled stop with power left available to the machine actuators. | One of the current-carrying parts of a relay, switch, or connector that open and close to complete associated |
| An optional function that allows a light screen system to ignore objects located within the sensing field so as not to create an OFF-state of the safety outputs and cause a Trip or Latch condition. | Abbreviation for Charge Coupled Device. An analog device that captures light for conversion to electricity. | Refers to the construction of a relay or a switch, in many configurations, for example, SPDT (Form C), with one normally open, one normally closed, and one common between the two. |
| The area close to a sensor lens, where light energy is returned to the emitter rather than the receiver, rendering the sensor effectively blind. This effect is most pronounced with some retroreflective sensors. | A path for communications. A range of radio frequencies used by a transceiver during | Dirt, dust, smoke, or fog in the sensing path; plus dirt, dust, fog, oil, grease, or soot build-up on the face of a sensor can all contribute to attenuation of the light energy available for sensing. |
| A connected region in an image in which all pixels have the same gray-level value. | A single letter, digit or punctuation mark requiring one byte storage. | Functionality that allows a sensor to take pictures continuously without being triggered by an external device. |
| A condition that occurs when an opaque object of sufficient size interrupts one or more light screen beams. When a blocked condition occurs, OSSD1 and OSSD2 outputs simultaneously turn off within the system response time. | 1. An electronic path between two or more components capable of providing a number of channels. 2. Interconnection of conductors to carry | The ratio of the amount of light falling on the receiver in the "light" condition as compared to the "dark" condition. Optimizing contrast in any sensing situation will increase the reliability of the sensing system. |
| Lighting of objects or surfaces at an angle close to perpendicular so that the light is reflected back into the optics directly. | The material surrounding the core of an optical fiber. The cladding has a lower refractive index (faster speed) to keep the light in the core. | A relay that is used to perform logic functions in a machine control circuit. |
| A high-speed data transmission rate, where two or more signals may share the cable. | Acronym for Complementary Metal Oxide Semiconductor. A CMOS-based chip that records the intensities of light as variable charges similar to a CCD chip. | A method of ensuring the performance integrity of a control system or device. Control circuits are designed and constructed so that a single failure or fault within the system does not prevent the normal stopping action from being applied to the machine when required, or does not create unintended machine action, but does prevent initiation of successive machine action until the failure is corrected. |
| Describes the ability of high-powered modulated opposed mode sensors to "see" through paper, thin cardboard, opaque plastics, and materials of similar optical density. | Threaded lens mount developed from 16 mm movie work; used extensively for closed-circuit television. | The stopping of machine motion while retaining power to machine actuators during the stopping process. |
| A common pathway or circuit between multiple devices. One of the primary network configurations or topologies. | Abbreviation for Complementary Normally Closed | A special variation of diffuse mode photoelectric proximity sensing which uses additional optics to create a small, intense, and well-defined image at a fixed distance from the front surface of the sensor |
| A network architecture in which multiple devices are connected by a shared communication line. | A protective layer applied over the fiber cladding to protect it from the environment. | The central region of an optical fiber through which light is transmitted. It has a higher refractive index (slower speed) than the surrounding cladding. |
| An optical fiber cable that has connectors installed on one or both ends. | A light source that emits light in parallel beams. | A prism having three mutually perpendicular surfaces and a hypotenuse face. Used in retroreflectors. |
| | Also known as registration marks or index marks, color marks are used extensively in packaging applications for registering the cutoff of wrapping or bagging materials so that product names and other information always appear in the same location. | |
| | The process by which a lens converts a divergent beam into a parallel beam of light. | |
| | The change in output when the color of a target changes. | |

A device that combines two or more fiber optic signals into one, or divides one fiber optic signal into two or

1. Transfer of energy from one circuit to another.
2. Transfer of light energy using a fiber optic cable. This term does not imply that a coupler is used.

The maximum angle from the central axis of a fiber optic cable at which light can be confined within the

Optical crosstalk occurs when a photoelectric receiver responds to light from an adjacent emitter.

The flow of electrons through a circuit. Measured in "amperes."

The output of a DC device that switches ground (DC common) to a load. The load is connected between the output of the device and the positive side of the power supply. The switching components is usually an open collector NPN transistor, with its emitter tied to the negative side of the supply voltage.

The output of a DC device that switches positive DC to a load. The load is connected between the output of the device and the ground (DC common) side of the power supply. The switching component is usually an open collector PNP transistor, with its emitter tied to the positive side of the supply voltage.

Definable point at which the a sensor will actuate or will cease to operate. All objects beyond the cutoff point are ignored by the sensor. Cutoff point can be influenced by the range of the sensor and by its other physical specifications.

The Gateway polls the Node at user-defined intervals.

One of two sensing conditions in a sensing application which is characterized by a lower level of received sensing energy, or in some case, no energy. See also Light Condition.

(D/O) The initiation of a photoelectric sensor's output (or of timing logic) when the receiver goes sufficiently dark. See also Light Operate.

Lighting of object or surfaces at very shallow or low angles so that the light does not enter the optics directly.

A current that flows only in one direction through a

The region where the sensor cannot make

The "screen of light" generated by a safety light screen system, defined by the height and the separation of the emitter and receiver. When the defined area is interrupted by an opaque object of a specified cross section, a Trip or Latch condition results.

A discrete input point must detect a specific number of inputs low before the input is considered to have changed state.

A discrete input point must detect a specific number of inputs high before the input is considered to have changed state.

The distance, length or the size of the sensing surface or field from the outer edge toward the hazard. Also known as "depth of detection."

Compensation factor for distance an object can penetrate the sensing field of a Presence Sensing Safeguarding Device (PSSD) before the device reliably detects the intrusion and signals a stop. Often abbreviated as Dpf.

The range of distance within which a sensor has a response. Used to define the response pattern of proximity-mode sensors, especially ultrasonic and photoelectric convergent, fixed-field and adjustable-field sensors.

The in-focus range of an imaging system. Measured from the distance behind an object to the distance in front of the object with all objects appearing in focus.

The range of lens to image plane distance having the image formed by the lens appearing in focus.

Unique identifier for each wireless device on a network.

The bus-type wiring scheme, specifically for automation sensors, that allows sensors and controllers to exchange data over a single cable.

The bending of light rays as they pass around corners or through holes smaller than their own wavelengths.

Soft lighting that is scattered from a variety of angles in order to eliminate shadows and view highly specular

A photoelectric proximity sensing mode in which light from the emitter strikes a surface of an object at some arbitrary angle and is diffused from the surface at all angles.

A light source that illuminates a target from many directions, eliminating shadows or glare.

A sensor that exists in only one of two states: "on" or "off." The outputs of most sensors and sensing systems is digital.

Sampling and conversion of image or signal into a digital code by scanning or using an analog to digital

(Deutsches Institut für Normung) A collection of German industry standards.

A two-layer semiconductor that allows current to flow in only one direction.

A variation of the diffuse photoelectric sensing mode in which the emitted beam and the receiver's field of view are both very wide.

The practice of using components, circuitry or operation of different designs, architectures or functions to achieve redundancy and to reduce the possibility of common mode failures.

(Double-Pole Double-Throw) A relay with two sets of single-pole double-throw (Form C) contacts that are operated simultaneously by a single action.

See Depth Penetration Factor.

(Double-Pole Single-Throw) A switch configuration that has four terminals. One pair is used to connect or disconnect to the other pair.

A precision resistor used to convert a 4 to 20 mA signal to a voltage signal.

Abbreviation for Direct Sequence Spread Spectrum. A method for generating spread spectrum transmissions where the transmitted signal is sent at a much higher frequency than the original signal, spreading the energy over a much wider band medium interference environments. The receiver is able to de-spread the transmission and filter the original message. DSSS is useful for sending large amounts of data in low to

Duplication or redundant system that minimizes the possibility of a failure to danger in the event of a single fault. This is because the second independent channel maintains the ability to arrest dangerous motion.

A change in pixel values exceeding some threshold between two adjacent regions of relatively uniform values. Edges correspond to changes in brightness corresponding to a discontinuity in surface orientation, reflectance, or illumination.

The maximum angle of deviation from the optical alignment of the emitter and the receiver within which the safety light screen continues in normal operation. Also known as Angle of Divergence/Acceptance, or Field-of-View.

The "working" part of a photoelectric beam. Not to be confused with the actual radiation pattern of the emitter, or with the field of view of the receiver.

Any device using electrical energy to produce mechanical movements.

Conventional switching relays consisting of "hard" contacts (metal-to-metal), switched to opened or closed position by applying voltage to an electromagnetic coil.

An assembly of devices and/or components working together for protective tripping or presence sensing purposes and comprising as a minimum: a sensing device, controlling/monitoring devices, and output signal switching devices. See IEC61496-1

A control function that is initiated by a single human action to arrest dangerous machine motion, or otherwise avert arising or reduce existing hazards to persons, damage to machinery or to work in progress. See ANSI/NPFA79, IEC60204-1, or ISO13850.

Abbreviation for Electromagnetic Interference. Electrical "noise" which may interfere with proper operation of sensors, programmable logic controllers, counters, data recorders, and other sensitive electronic equipment.

A measurement of the thermal signature and characteristics of different materials and surfaces.

1. The sensor containing the source of sensing energy in opposed-mode sensing. 2. The emitting device within any sensor (e.g. LED, laser diode, ultrasonic transducer, etc.). 3. The light-emitting component of a safety light screen system, consisting of a row of synchronized modulated LEDs. The emitter, together with the receiver (placed opposite), creates a "screen of light" called the defined area.

Access method for computer network (Local Area Networks) communications, defined by the IEEE as the 802.3 standard.

A configuration allowing a light screen system to ignore stationary objects (such as brackets or fixtures) that interrupt a specific number of light beams.

The measurement of the amount of light falling on the receiver of a sensing system over and above the minimum amount of light required to just operate the sensor's amplifier.

A means by which a safeguarding device monitors the state of external devices that may be controlled by the safety device.

A design or event in which a failure or fault within a system causes the hazardous machine motion or process to achieve a safe state (Commonly confused with "fail-safe").

A description of a circuit or system that is guaranteed not to fail in the event of a malfunction so that the catastrophic loss of function is not possible.

An event in which an item (e.g. component, circuit, or device) ceases to perform its required function.

A failure which delays or prevents a safety system from arresting dangerous machine motion, thereby increasing risk to personnel.

Refers to a change in a sensor's output, when there should be no change.

Any response time that is faster than 1 millisecond.

The state of an item (e.g. component, circuit, device or machine) characterized by its inability to perform a required function. A fault is often the result of a failure of the item itself, but may exist without prior failure. See Failure.

The ability to minimize or eliminate known possible failures or faults through design, selection of components, or implementation of additional

The ability of a system to function as it was designed even in the presence of faults or failures.

Used in vision applications to describe any characteristic descriptive of an image or a region in an image.

A ceramic, plastic or stainless steel part of a fiber optic termination that holds the end of the fiber and aligns it to the sensor for fiber mounting.

Abbreviation for Frequency Hopping Spread Spectrum. A method for generating spread spectrum transmissions where the signal is switched between different frequency channels in a pseudorandom sequence known by both the transmitter and the receiver pair. FHSS is useful for sending small, redundant packets of data in a high interference

A thin filament of glass or plastic consisting of a core (inner region) and a cladding (outer region) and a protective coating.

Transparent fibers of glass or plastic used for conducting and guiding light energy. Used in photoelectrics as "light pipes" to conduct sensing light into and out of a sensing area.

The area of response of an optical sensor.

The area of object space imaged at the focal plane of

A device placed over a light source or a sensor to select or reject specific frequencies of light.

Component of a safety-related control system that interrupts the circuit to the machine primary control element (MPCE) when the output signal switching device (OSSD) goes to the OFF-state.

A way to configure a light screen system to ignore stationary objects (such as brackets or fixtures) that are always present at a specific location within the defined area.

Fixed-field sensors use two receivers and a comparator circuit to cancel sensing response whenever the intensity of the reflected light reaching the long-range receiver exceeds the intensity of the reflected light reaching the close-range receiver.

The ability of a device to take multiple types of power including battery, line, or solar.

Abbreviation for Frequency modulation. A type of modulation in which the data signal is "attached" to the carrier wave by varying the frequency of the

Abbreviation for Failure Mode and Effects Analysis, a testing procedure by which potential failure modes

in a system are analyzed to determine their results or effects on the system.

The distance from a lens' principal point to the corresponding focal point. Also referred to as the equivalent focal length and the effective focal length.

Abbreviation for Feature of Interest. The crucial visual information within the imaged scene that the customer is trying to detect for an inspection.

Relay contacts that are mechanically-linked, so that when the relay coil is energized or de-energized, all of the linked contacts move together. If one set of contacts in the relay becomes immobilized, no other contact of the same relay will be able to move. The function of forced-guided contacts is to enable the safety circuit to check the status of the relay. Forced-guided contacts are also known as "mechanically-linked contacts," "positive-guided contacts," "captive contacts," "locked contacts," or "safety relays."

Abbreviation for Field of View. The area of object space imaged at the focal plane of a camera.

The number of recurrences of a periodic phenomenon in a unit of time. Electrical frequency is measured in Hertz (Hz).

The maximum frequencies an analog sensor can track. All analog sensors have an inherent response time that limits their ability to measure periodic motions at high frequencies.

An arrangement in which the object is illuminated and viewed from the same side.

An increase in signal power, voltage, or current by an

An electronic device used to set the gain or the switching threshold of a sensor. Also known as a sensitivity adjustment.

A combinational logic circuit having one or more input channels.

A wireless network master communication device used to control and initiate commands to other devices in the system. Serves as a "portal" from one network to another and communicates between the wireless network and the central control process.

Section 5(a)(1) of the Occupational Safety and Health Act of 1970 (Public Law 91-596, 91st Congress, S.2193, 29Dec1970) places primary accountability on the employer for work place safety. "5(a)(1) Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees." OSHA inspectors often use section 5(a)(1) of the "General Duty Clause" as the bases of citations resulting from on-site inspections.

(29CFR1910.212) requires that one or more methods of machine guarding shall be provided to protect the operator and other employees from hazards, and the guarding device shall be in conformity with any appropriate standards.

Gigahertz. 1 GHz=1000 MHz.

Glass fiber assemblies are constructed of a bundle of individual glass fibers, contained and protected by a sheath (typically a flexible armored cable).

Minimum guidelines that specify commonly-used and recognized design principles, well-tried and robust components, and safety practices to make the workplace free of industry recognized hazards and compliant to relevant standards.

Variations of values from white, through shades of gray, to black in a digitized image with black assigned the value of zero and white the value of one.

A conducting path between an electric circuit or equipment and the earth, or some conducting body serving in place of the earth.

A protective physical barrier that prevents an individual from accessing a hazardous area.

The machine whose point of operation or other hazardous area is guarded by the safety system.

Acronym for Graphical User Interface, a graphics-based interface through which a user may communicate with a computer.

Antenna type whose overall span is one half the length of the wave that can be transmitted.

A hand-operated mechanism or device used as an actuating control. Two normally open "input switches" are used as hand controls in a two-hand control system

Screens, bars, or other mechanical barriers affixed to the frame of the machine intended to prevent entry by personnel into the hazardous area(s) of a machine.

A potential source of harm.

The closest reachable point of the hazardous area.

An area that poses an immediate or impending physical hazard.

A circumstance in which a person is exposed to a hazard, or any specific activity done on or around the machine during its lifecycle that results in a potential source of harm. See B11.TR3 for further information.

An air-tight seal.

1. The act of changing from one frequency to another.
2. The device to device transmission link, such as from the Master device to the Slave device.

Describes several aspects of a sensor: body style, housing material, and sealing capacity.

Intentional time lag added to a circuit to prevent false actuation or intermittent operation (chatter).

(Hertz) The international unit of frequency, equal to one cycle per second. Named after the German physicist, Heinrich Rudolph Hertz.

(Input-Output) Provides communication channels to system and to manufacturing process.

Projection of an object or a scene onto an imager chip.

The capture and generation of an image of an object or scene on the imager chip. Involves the use of illumination, optics, filters and the vision sensor.

The degree to which an image shows contrast.

The physical device that replaces film in a digital camera system. Two common types are CCD and CMOS. Also known as imager or image sensor.

A fiber optic assembly having one control end and one sensing end. Usually used in pairs in the opposed sensing mode.

Sensors with an oscillator and coil which radiate an electromagnetic field that induces eddy currents on the surface of metallic objects approaching the sensor

1. The signal (voltage or current) applied to a circuit to cause the output of that circuit to change state.
2. The terminals, jacks or receptacle provided for reception of the input signal.

The power source required by an electric or electronic device (e.g. a self-contained sensor) in order for the device to operate properly.

1. The process of examining a part to match the part to a known "good" reference.
2. A specific file or program run in the vision software to look at a specific part. Also known as a recipe.

The degree to which a circuit, system or device can be expected to perform unimpaired an anticipated function in the event of a fault. Integrity depends on several characteristics including fault tolerance, fault exclusion, risk reduction, reliable and well-tried components, well-tried safety principles, and other design considerations.

Degree of strength of electricity, light, heat or sound

A guard or barrier interfaced with a machine control system so as to restrict access to or prevent inadvertent access to the hazard.

A Lockout condition due to an internal safety system

A design technique applied to electrical equipment, such as sensors, switches, and wiring for hazardous locations. The technique involves limiting energy to a level below that required to ignite a specific hazardous atmosphere. Intrinsic safety design often eliminates the requirement for explosion-proof enclosures. (Also see "NAMUR".)

A protective component designed to limit the voltage and current in an explosive area. The barrier functions outside of the explosive location to divert abnormal energy to ground.

Analog photoelectric sensors provide a variable voltage or current output signal that is inversely related to and decreases with the strength of the light signal. Also known as negative slope.

A rating system established by the IEC which defines the suitability of sensor and sensor system enclosures for various environments. Similar to NEMA ratings for

Abbreviation for Industrial, Scientific, and Medical band. Part of the radio spectrum that does not require

A key-operated switch used to reset a safety system to the RUN mode following a Lockout condition or to reset a safety system from a Latch condition.

Abbreviation for kilohertz, 1000 hertz.

In a safety light screen application, the installation

and a horizontal sensing field. Gains advantages of both area guarding and point-of-operation guarding techniques to reduce the possibility of pass-through hazards.

(Local Area Network) A computer network dedicated to sharing data among several single-user computers.

(Light Amplification by the Stimulated Emission of Radiation) A device that creates a narrow, intense and coherent light. Many lasers deliver light in an almost-perfectly parallel collimated beam that is very pure, approaching a single wavelength.

The response of a safety or safeguarding device in which an OFF-state is maintained after the device has been actuated until the safeguard is cleared, re-closed, or re-armed and a manual reset is performed.

Setting in which an output will stay on until the inspection result from subsequent inspection changes.

Maximum acceptable delay between transmission and

An undesirable small value stray current which flows over or through an insulator.

Abbreviation for Light Emitting Diode. A semiconductor that emits light when current flows through it.

Any type of marking, sign, or inscription which identifies the device type, function or purpose.

The optical component of a sensor that collimates or focuses light rays onto a receiver optoelement (photoelectric sensing) or an imager chip (vision sensing).

One of two sensing conditions in a sensing application which is characterized by a higher level of received sensing energy. This term is generally used in photoelectric sensing. See Dark Condition.

(L/O) The program mode for a photoelectric sensor in which the output energizes (or the timing logic begins) when the receiver becomes sufficiently light. See also Darl Operate.

See Active Opto-electronic Protective Device.

Any device serving as a source of illumination.

The physical relationship between the light source, the target object and the vision sensor.

The way a light source is physically positioned relative to the object it is illuminating.

An unobstructed radio path between a radio's transmitter and receiver status.

The normal in-plant power line supply voltage which is usually 120 or 220/240 or 440V ac.

The maximum deviation above or below the ideal output of the sensor.

A general term for a device (or a circuit) that draws power when switched by another device or circuit.

A safety system condition that is automatically attained in response to certain failure modes (an internal lockout). When a Lockout condition occurs, the safety system's safety outputs turn OFF, the failure must be corrected, and a manual reset is required to return the system to RUN mode.

Methods used to condition a sensor output signal by way of timing or counting, or to coordinate control of a process by comparing multiple sensor outputs.

A sensing system accessory that interprets one or more input signals and modifies and/or combines those input signals for control of a process.

A graph with logarithmic x and y scales. A logarithmic scale reveals percentage changes. A change from 100 to 200, for example, is presented in the same way as a change from 1,000 to 2,000.

Low-angle lighting enhances the contrast of surface

An electrically-powered element, external to the safety system, which directly controls the machine's normal operating motion in such a way that the element is last (in time) to operate when machine motion is either initiated or arrested. (Examples include motor/motor contactors, magnetic clutch brake, or electrically operated valve.)

The time between the activation of a stopping device and the instant when the dangerous parts of the machine reach a safe state.

An electrically-powered element, independent of the machine primary control element(s), capable of removing power from the machine's actuator (prime mover) of the relevant hazardous parts and is typically controlled by the secondary switching device (SSD).

Computerized image measurement, analysis, and interpretation used to improve production processes and quality.

A relay that is used to provide electrical power to the machine control circuitry. Typically interfaced with the Master Start/Stop (ON/OFF) and Emergency Stop

An electrically-powered device, external to the E-stop Safety Module, that provides a safety stop by immediately removing electrical power to the hazard and, if necessary, by applying braking to dangerous motion. This stopping action is accomplished by removing power to the actuator coil of either Master Stop Control Element.

Model for communication protocol between devices or processes, in which one device initiates commands (master) and other devices respond (slave). The Gateway is the Master device to the Nodes which are the Slave devices.

See Forced-Guided Contact.

One millionth of a second. 1 microsecond = 0.000001 second or 0.001 millisecond.

One thousandth of a second. 1 millisecond = 0.001 second or 1000 microseconds.

A unit of power equal to one thousandth (10^{-3}) of a

The minimum-diameter object that a safety light screen system can reliably detect. Objects of this diameter or greater will be detected anywhere in the defined area. A smaller object can pass undetected through the light if it passes exactly midway between two adjacent light beams.

An openly-published, communication protocol that is a means of connecting almost any industrial electronic device. Runs at layer 7 of the OSI model. Defines message structure for a client/server environment. Often used with TCP/IP over Ethernet and runs on RS-232 or RS-485.

In photoelectrics, modulation of an emitter means to turn it on and off at a high frequency (typically several kilohertz). A modulated sensor's receiver and amplifier are tuned to the frequency of modulation. Only the modulated light is amplified, and all other light which reaches the receiver is ignored.

The verification of system components to detect failures or faults of any part of the monitored system that could affect the performance of safety-related

The automatic suspension of the safeguarding function of a safety device during a non-hazardous portion of the machine cycle.

Devices and sensors designed for use with certified switching amplifiers with intrinsically-safe circuits. NAMUR sensors are most commonly used in explosive environments.

Unit of length used to specify the wavelength of light energy. 1 nm = 0.000000001 meter.

Abbreviation for Normally Closed.

Analog photoelectric sensors provide a variable voltage or current output signal that is inversely related to and decreases with the strength of the light signal. Also known as inverting output.

The National Electrical Manufacturers Association (NEMA) has established guidelines for specifying the degree of sealing offered by any particular electrical enclosure design.

A system-level parameter allowing multiple radio devices to operate as a complete wireless network. Enables multiple wireless networks to be co-located within range of each other.

Abbreviation for Normally Open.

A wireless network slave device used to provide sensing capability in a remote area or on the factory floor. This device aggregates and communicates data back to a gateway device for transmission back to a

(Electrical) Describes undesirable energy that may cause false response of sensing system logic or may be falsely recognized as a received signal by a sensor amplifier. Includes EMI and RFI.

Analog photoelectric sensors provide a variable voltage or current output signal that is directly related to and increases with the strength of the light signal. Also known as positive slope.

Designation that states the contacts of a switch or relay are closed or connected when at rest. When activated, the contacts open or separate.

Designation that states the contacts of a switch or relay are normally open or not connected. When activated, the contacts close or become connected.

A transistor available as an output switch in DC sensors and logic modules. Usually configured with its collector open and its emitter connected to ground (DC common). In this configuration, a load is connected between the output (collector) and the positive of the DC supply. This output configuration is also called a "sinking" output.

Used in analog sensing and control to describe the minimum voltage (or current) in an analog output range. Analog sensors have an adjustment for setting the null value.

Abbreviation for Optical Character Recognition. Recognition of each character in a string by a vision system.

The state in which the output circuit is interrupted and does not permit the flow of current.

Timing logic in which the output energizes immediately when an input signal is received, and remains energized as long as the input signal is present.

Unit of measurement for resistance and impedance.

Omn-directional antenna. Antenna that radiates power equally in all directions and is equally receptive to signals from all directions.

The state in which the output circuit is complete and permits the flow of current.

On-axis lighting provides even, diffused illumination for flat, reflective surfaces.

Timing logic in which timing begins at the leading edge of an input signal, but the output is energized only after the preset ON-delay has elapsed.

A term used to describe a material that blocks the passage of light energy.

Refers to the range of voltage in which the sensor or device can operate.

A photoelectric sensing mode in which the emitter and receiver are positioned opposite each other so that the light from the emitter shines directly at the receiver. An object is detected when it breaks the light beam that is established between the two.

An unwanted situation which occurs when a photoelectric receiver responds to light from an adjacent emitter.

Deflection of one or more beams around an object in the defined area which may result in reduced detection capability of a light screen or in the worst case, of an object being allowed to pass through undetected. The result of locating a sensing field next to a highly reflective surface e.g. stainless steel, glossy paint.

To swing back and forth between a minimum and maximum value. One complete oscillation is regarded as one cycle.

Open Systems Interconnection. A methodology used for communication and computer network protocol design, where the functions of the protocol are divided into seven layers.

1. The section of a sensor or control circuit that energizes and/or de-energizes the attached load (or input). 2. The useful energy delivered by a circuit or device.

The time from when the inspection is triggered until the sensor output turns on.

The time from when an output turns on until it turns off. Also known as Pulsed Output.

Abbreviation for Output Signal Switching Device. The safety outputs of a safeguarding device that are used to initiate a stop signal by achieving an OFF-state. (Note: Includes, but is not limited to, solid-state outputs, relay contacts, or other electrical contacts.)

Connection of two or more parts of a circuit to the same pair of terminals, so that current divides between the parts.

A situation that may exist when personnel pass through a safeguard (at which point the hazard stops or is removed), and then continue into the guarded area. At this point the safeguard may not be able to prevent an unexpected start or restart of the machine with personnel within the guarded area.

Describes attenuation as a function of wavelength of the operating frequency and the distance between the transmitter and receiver.

Model for communication protocol in which any device in the network can send and receive data, and initiate

A safeguarding technique that provides a barrier or means of detection at the boundary of a hazard or hazardous area.

A resistive photosensitive device in which the resistance varies in inverse proportion to the amount of incident light.

A semiconductor diode in which the reverse current varies with illumination. Characterized by linearity of its output over several magnitudes of light intensity, very fast response time, and wide range of color response.

An electrical device that responds to a change in the intensity of light falling upon it.

A phototransistor is a photojunction device in which current flow is directly proportional to the amount of incident light.

Acronym for picture element. The smallest unit on a display screen.

Abbreviation for Programmable Logic Controller. A control device that employs the hardware architecture of a computer and relay ladder diagram language.

A transistor available as an output switch in DC sensors. Usually configured with its collector open and its emitter connected to the positive of the sensor supply voltage. In this configuration, a load is connected between the output (collector) and ground (DC common). This output configuration is also called a "sourcing" output.

The location of a machine where material or a workpiece is positioned and a machine function is performed upon it.

Safeguards, such as hard guards or safety light screens, which are designed to protect personnel from hazardous machine motion associated with the machine's point of operation.

Indicates a direct connection between two devices in a network.

The alignment of the perpendicular electrical and magnetic fields that make up a light wave.

Light which has all component waves in the same direction of displacement. Natural light is made up of waves having a variety of displacements.

A filter that polarizes light passing through it.

Thermoplastics characterized by high-impact strength, light weight, and flexibility. Used as a shatter-resistant substitute for glass.

Safety switch that employs a rigid mechanical link from the actuator to open Normally Closed contacts. The normal operation of the switch will force apart contacts, even those that are welded shut.

Analog photoelectric sensors provide a variable voltage or current output signal that is directly related to and increases with the strength of the light signal. Also known as non-inverting output.

See Forced-guided contact.

A variable resistor, primarily used as a voltage divider. Potentiometers are used to set sensor sensitivity (as a threshold adjustment).

Monitoring function accomplished through a series-parallel connection of contacts that provide feedback about the machine's status. Power is supplied to the

module as long as both contactors work as they should.

A Lockout condition of a safety light screen system that, if Auto Power-Up is OFF, occurs when the system is powered up (including power-ups after a loss of power).

A device that creates a sensing area to detect the presence of an individual or object.

An application in which a presence-sensing device is used to start the cycle of a machine.

Abbreviation for Presence-Sensing Safeguarding Device. A presence-sensing device used as a safeguard.

A type of input/output that is not factory set and therefore can have its purpose changed. This I/O can be reprogrammed for general output, pass, fail, ready, error and general input.

Division of protocol design into smaller of parts, each of which accomplish smaller tasks. Layering keeps each design simple.

(Sensing) Direct sensing of an object by its presence

In retroreflective sensing, "proxing" is used to describe undesirable reflection of the sensing beam directly back from an object that is supposed to break the

The time from when an output turns on until it turns off. Also known as Output Duration.

An individual who, by possession of a recognized degree or certificate of professional training, or by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work.

Antenna type whose overall span is one quarter the length of the wave that can be transmitted.

1. Transmission or reception of electromagnetic radiation in the radio frequency band, used to send information through a medium without the use of wires. 2. Equipment used to transmit and receive radio signals.

The specified maximum operating distance of a sensor or sensing system.

Relation in degree or number between two similar things.

1. The transducer element that responds to the sensing energy. 2. The name for the half of an opposed pair of photoelectric or ultrasonic sensors that receives the sensing energy from the emitter.

3. The light-receiving component of a safety light screen system, consisting of a row of synchronized phototransistors. The receiver, together with the emitter (placed opposite), creates a "screen of light" called the defined area.

A configuration that allows a light screen system to intentionally ignore the interruption of consecutive light beams within the defined area. The effect is to ignore multiple objects with cross-sections less than a certain size, while increasing the size of an object that will be reliably detected anywhere within the defined area. Sometimes called "Floating Blanking."

The duplication of components or circuitry providing the same function should a component or circuit fail.

The return of light waves from surfaces on which they are incident.

A measure of the efficiency of any material surface as a reflector of light, as compared to a Kodak white test card, which is arbitrarily rated at 90% reflectivity.

The bending of light rays as they pass through a transmission medium of one refractive index into a medium with a different refractive index.

The area inside defined boundaries that the user wants to analyze.

An electromechanical device that opens or closes contacts in response to a small current or voltage change of an electric circuit. This device effects the operation of other devices in the same or another

The ability of a machine's circuits and components to consistently perform its stated function within its specifications without failing.

Remote sensor describes the part of a photoelectric component system that contains only the optical elements. The circuitry for system power, amplification, logic, and output switching are all located at a central location, typically a control

A measure of the repeat accuracy of a sensor and/or timer and/or control mechanism. Usually expressed as a distance or time.

A communication device that extends the transmission range of a data signal by amplifying or regenerating the signal. Used in long-distance transmission.

The use of a manually-operated switch to restore the safety outputs to the ON state from a Latch condition, or return to the RUN mode from a Lockout condition.

The degree of sharpness of a displayed or printed character or image. On screen, resolution is expressed as a matrix of dots.

1. The smallest detectable change in position or size of an object. 2. The closest distance between two objects (points) in an image identifiable as two separate objects rather than one object. 3. The minimum size (diameter or cross section) of

an object that a safety light screen will reliably detect. Calculated by adding the beam spacing dimension to effective beam diameter. Objects of this size or larger will be detected anywhere in the sensing field.

The time required for the output of a sensor or sensing system to respond to a change of the input signal (e.g. a sensing event). Also known as response speed.

A retroreflective photoelectric sensor contains both the emitter and receiver. A light beam is established between the sensor and a special retroreflective target. As in opposed sensing, an object is detected when it interrupts this beam.

A reflector made out of highly reflective material is used in retroreflective sensing to return the emitted light directly back to the sensor.

Radio Frequency. Electromagnetic signals in the radio band.

Abbreviation for Radio Frequency Interference. Interference caused by electromagnetic radiation at radio frequencies to sensors or other sensitive electronic circuitry. RFI may generate false signals or random triggering of equipment or processes.

A ring light provides diffused illumination over a small

The probability of the occurrence of harm and its severity.

A procedure used in machine safety to identify, document and eliminate or reduce hazards in a particular machine or process.

Abbreviation for Region of Interest. The area inside defined boundaries that the user wants to analyze.

Industrial standard for serial transmission between computers and peripheral devices.

Received Signal Strength Indication. The measurement of the strength of received signal strength in a wireless environment. See Site Survey.

A guard (barrier) or safeguarding device used to protect personnel from hazards by preventing or restricting access, or by detecting the presence of an individual.

Measures (including guards, safeguarding devices, awareness devices, safeguarding methods, or safe work procedures) used to protect personnel from hazards which cannot reasonably be eliminated, or from the risks which cannot be sufficiently reduced by inherently safe design measures.

A device that detects or prevents inadvertent access to a hazard (i.e. not a guard or a barrier). Also known as a Protective Device.

A technique or means to reduce the risk of harm to personnel from a machine hazard which includes but is not limited to Safety Light Screens, Emergency Stop Buttons, Guards (barriers), Interlocking, Enabling Pendants, Two-hand Control, Restraints, or Lockout/Tagout equipment.

The calculated distance between a hazard and its associated safeguard.

A safeguarding device consisting of a sensing edge and a control, used to detect individuals who comes into contact with the sensing edge.

A switch on a guard barrier used to detect if the guard is opened. Designed to prevent intentional defeat. Electromechanical safety interlock switches use positive opening contacts. Other forms of safety interlock switch include magnetic, RF tag, optical, or inductive.

See safety light screen.

A safeguarding device comprising an LED array emitter and receiver element which creates a sensing field or plane. When an individual or object interrupts this sensing field, the light screen detects the interruption and initiates a stop command. Also known as Active Opto-electronic Protective Device -AOPD, Presence Sensing Safeguarding Device, safety light curtain, light devices and optical guards.

A safeguarding device consisting of a sensing surface and a control. The sensing surface is capable of detecting the presence of individual(s) on its surface.

A device that performs a specific safety function(s) and consists of monitored, multiple, mechanically-linked relays, or monitored solid-state safety outputs. Commonly confused with a single, discrete mechanically-linked "safety" relay. Also known as Safety Interface Module or Safety Relay Modules.

An electromechanical relay with force-guided contacts which allow the monitoring of a safety device's circuit to check relay status. See also force-guided contacts.

Removal of power to the Machine Primary Control Elements that allow for an orderly cessation of motion for safeguarding purposes. Also known as a Protective Stop.

An interface which provides the means to integrate external devices to effect a stop command. It consists of two input channels (A&B), which are compatible with devices that have two Normally Open hard contacts or relay outputs.

Supervisory Control And Data Acquisition. Process control system that collects data from sensors or machines in remote areas and sends them to a central computer for control and management.

An output which, in a lock-out condition, performs a back-up safety function by going to the OFF-state and initiating an appropriate machine control action.

A circuit with the capability to verify that all of its own critical safety circuit components, along with their redundant backups, are operating properly.

Describes a sensor that contains the sensing element, amplifier, power supply, and output switch in a single package.

The method or way in which a sensor detects an object.

An adjustment made to a sensor's amplifier that determines the sensor's ability to discriminate between different levels of received sensing energy (e.g. between two light levels reaching a photoelectric receiver).

A device that senses a change in a physical quantity, such as light intensity, and converts that change into a useful control signal.

The calculated distance between a hazard and its associated safeguard. See Safety distance.

A socket that receives a standard connector and protocol connecting external devices to a computer's

The connection of components end to end in a circuit, that provide a single path for the current.

An actuation or adjustment feature of some Banner sensors, which simplifies the process of setting the sensor's operating sensitivity. With a single user input, the sensor automatically sets the operating sensitivity below the threshold.

Condition initiated by the user to control a sensor's output(s) during sensing events. This condition may use one or two parameters (depending on the sensing technology being used) within which is an acceptable range for sensing events to occur.

An object's physical and optical characteristic, often

An outer covering that protects optical fibers. Can be made of stainless steel flexible conduit, PVC, or some other type of flexible tubing.

The ratio of the maximum value of an output signal to the standard deviation amplitude of the noise on the signal.

Concurrent events, actions, or actuations occurring within a specific time frame. This time frame is 0.5 second in a Two-Hand Control or Two-Hand Trip applications per ANSI B11.19, ANSI/RIA R15.06 and ISO 13851 (Note: ISO 13851 defines this as synchronous actuation).

The output of a DC device that switches ground (DC common) to a load. The load is connected between the output of the device and the positive side of the power supply.

An alignment technique used in diffuse, retroreflective, and convergent-mode photoelectric sensing to increase the optical contrast ratio.

A coil equipped with a movable iron core that will produce linear motion as a result of current passing through the coil (the iron core is pulled into the center of the coil). When current is removed, a spring returns the iron core to the original position.

Any element that can control current without moving parts, heated filaments, or vacuum gaps.

A solid-state device where switching is accomplished by a solid-state element such as a transistor or SCR.

The output of a DC device that switches positive DC to a load. The load is connected between the output of the device and the ground (DC common) side of the power supply.

Abbreviation for Single Pole Double Throw. Refers to a three terminal switch or a relay (electromechanical or solid-state) having one normally open (Form A) contact and one normally closed (Form B) contact that have an electrically common point (complementary switching). Also known as Form C.

Describing a mirror-like finish that returns light energy at an equal and opposite angle from the angle of incident light.

A technique in which the transmitter sends (or spreads) a signal over a wide range of frequencies. The receiver then concentrates the frequencies to recover the information.

Abbreviation for Single Pole Single Throw. Refers to a switch or a relay contact (electromechanical or solid-state) with a single contact that is either normally open or normally closed.

A specification, criterion or benchmark that is widely used, accepted or is sanctioned and codified by a standards agency. Safety standards are minimum requirements for product and machine design, manufacture, use and evaluation.

A network topology where all nodes are connected to a central node. This central node is responsible for gathering and distributing data among the other nodes.

Additional means used to prevent or hinder personnel from accessing the guarded hazard by augmenting the primary means of safeguarding.

A measure of the efficiency of any material surface as a reflector of light, as compared to a Kodak white test card which is arbitrarily rated at 90% reflectivity.

The transistor, a solid-state device designed to switch DC current, can be either NPN or PNP. Some sensors offer Bipolar output, both NPN and PNP or BiModal output, either NPN or PNP.

The signal level at which the sensor's output turns on or off. Often used interchangeably with threshold.

1. Any object being sensed 2. A retroreflective material that returns light back to a sensor

Abbreviation for Transmission Control Protocol/Internet Protocol. A protocol for communication between computers, used as a standard for transmitting data over networks and as the basis for standard Internet protocols.

Time Division Multiple Access. A wireless network communication architecture that provides a given slot of time for each device on the network. Provides guaranteed opportunity for each device to transmit to the gateway.

A feature on some Banner sensors which allows the sensor to "learn" the light and dark sensing conditions, based on user inputs. The sensor can then automatically adjust the sensitivity to place the operating threshold midway between threshold for the light and the dark condition.

A "thermometer" for measuring heat radiation consisting of several thermocouple junctions.

In photoelectric sensing, threshold is the point at which adequate received signal level overcomes sensor circuit hysteresis and causes the sensor output to change state. It is also the point at which the light and dark condition are differentiated.

See "opposed sensing mode."

The pattern of interconnection between devices in a communication network. Some examples include: Bus, Ring, or Star configurations.

A device that converts energy of one form into another form. The sensing element of a non-contact presence sensor that converts a change in incident sensing energy (e.g. light, sound, etc) into a proportional electrical quantity such as voltage or current.

An active semiconductor device having three or more electrodes. The three main electrodes used are the emitter, base and collector.

Movement in the X and/or Y direction from a known

Term used to describe materials that have the property of reflecting a part and transmitting a part of incident radiation.

Permitting passage of electromagnetic radiation of specified frequencies, such as visible light or radio

A mechanism, usually a photoelectric sensor, that initiates the vision sensor to take action when a prespecified event occurs.

The response of a safety or safeguarding device in which an ON-state is achieved when the safeguard is cleared, re-closed, or re-armed, without operator

The resetting, reclosing, or clearing of a safeguard causing the initiation of machine motion or operation. Trip Initiate is not allowed as a means to initiate a machine cycle per NFPA 79 and ISO 60204-1, and is commonly confused with PSDI.

Abbreviation for Transistor Transistor Logic. A digital circuit composed of bipolar transistors wired in a certain manner. Indicates a digital rather than an analog circuit.

An actuating control that requires concurrent actuation of both of the operator's hands to initiate and control machine motion during the hazardous portion of the machine cycle.

An actuating control that requires concurrent actuation of both of the operator's hands to initiate the machine cycle. Typically used on full revolution clutch or single-stroke machines.

A set of design, construction and testing requirements for light screens described by IEC 61496. The "types" perform differently in the presence of faults and under influences from environmental conditions. Type 2 requirements are less stringent than those for Type 3 or Type 4

A set of design, construction and testing requirements for light screens described by IEC 61496. The "types" perform differently in the presence of faults and under influences from environmental conditions. Type 4 requirements are the most stringent.

Abbreviation for "Underwriters Laboratory, Inc.", a testing agency for products sold in the United States. A device that has "UL approval" has been type-tested and approved by Underwriter's Laboratory as meeting certain electrical and/or safety codes.

Sound energy at frequencies just above the range of human hearing, starting at about 20 kHz. Banner ultrasonic sensors function at between 75 to 400 kHz, depending on model.

The stopping of machine motion by removing power to the machine actuators, all brakes and/or other mechanical stopping devices being activated.

Abbreviation for Universal Safety Stop Interface. An interface that provides a means to integrate external devices to effect a stop command. It consists of two input channels (A&B), which are compatible with Banner solid-state OSSD outputs with "handshake" verification (two-wire hookup), or with devices that have two normally open hard contacts or relay outputs (four-wire hookup).

Abbreviation for ultraviolet. Invisible short wavelength light energy that lies immediately beyond the violet end of the color spectrum between approximately 100 and 380 nm.

An oscillating change in displacement, with respect to a fixed reference.

The wavelength range of 400-750 nm to which the human eye is sensitive.

Electronic imaging applied in manufacturing settings for the purpose of control, whether it is process control, machine tool control, robot control or quality control. Vision sensing is used to improve production processes and quality.

A tool set included in vision software used to analyze an image and extract information for judgment criteria.

The force, or pressure, of electricity that exists between two points and is capable of producing a flow of current when a closed circuit is connected between the two points.

A physical activity that rises and falls, or advances and retreats periodically as it travels through a medium.

The maximum change from zero of the characteristic of the wave.

The angle at which a wave is propagated from one point to another.

In a periodic wave, the distance between points of corresponding phase of two consecutive wave cycles.

Refers to radio wave transmission used to transfer data or signals between locations that have no physical connections.

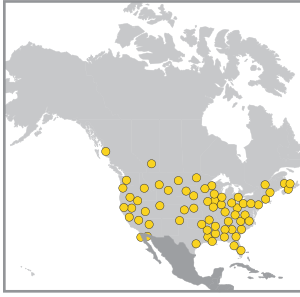
Network of low-power electronic devices combining sensing and processing ability. The devices communicate wirelessly to a gateway device, connecting remote areas to the central control

The distance from the camera to the object under

Electromagnetic radiation with high frequency, short wavelengths between .01-10 nm, able to penetrate solid objects.

Antenna type that is directionally sensitive to signals received from the front and less sensitive to those received from the sides or rear.

To electronically or optically enlarge or reduce the size of an image.



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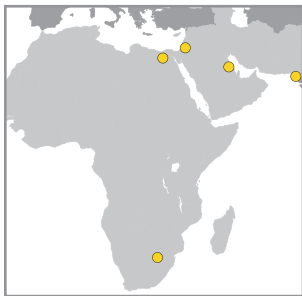


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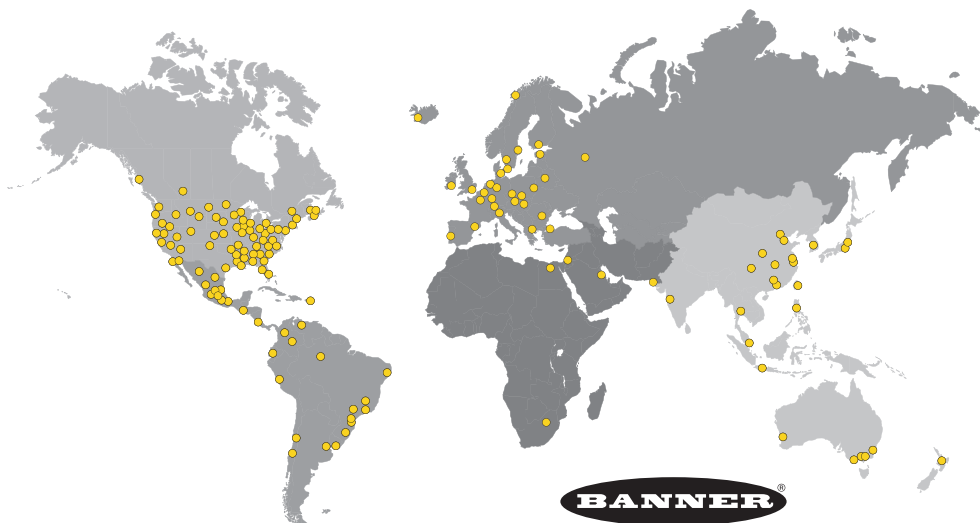
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| BRT-40X20AM |
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| BRT-540 |
| BRT-60X40AF |
| BRT-60X40C |
| BRT-60X40IP69K |
| BRT-62X10AM |
| BRT-700 |
| BRT-77X77C |
| BRT-80X50C |
| BRT-80X50CM |
| BRT-84 |
| BRT-84X84A |
| BRT-92X92C |
| BRT-92X92CB |
| BRT-L |
| BRTR-CC20E |
| BRT-THG-1-100 |
| BRT-THG-18X36 |
| BRT-THG-2-100 |
| BRT-THG-3-100 |
| BRT-THG-3X3-10 |
| BRT-THG-4X4-5 |
| BRT-THG-8.5X11-2 |
| BRT-THT-100 |
| BRT-TVHG-2X2 |
| BRT-TVHG-8X10P |
| BT-1 |
| BT13.5ST5 |
| BT23S |
| BT23SM600 |
| BT23SM900 |

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| BTA23S | CSB3-M1281M1282-LH | D12DAB6FVQ | DELPE-1150EB |
| BTA23SM600 | CSB-M1240M1240 | D12E2N6FP | DELPE-1175E |
| BTA23SM900 | CSB-M1240M1241 | D12E2N6FV | DELPE-1175EB |
| BTETA1.53S | CSB-M12415M1241 | D12E2P6FP | DELPE-118E |
| BTETA1.53SM600 | CSB-M1241M1241 | D12E2P6FV | DELPE-118EB |
| BWA-2O2-C | CSB-M12425M1241 | D12EN6FP | DELPE-8100D |
| BWA-2O5-C | CSB-M1248M1241 | D12EN6FV | DELPE-8100DB |
| BWA-2O6-A | CSB-M1280M1280 | D12EP6FP | DELPE-815D |
| BWA-2O7-C | CSB-M1280M1280-LH | D12EP6FV | DELPE-815DB |
| BWA-2O8-A | CSB-M12815M1281 | D12SN6FP | DELPE-81D |
| BWA-9O2-C | CSB-M1281M1281 | D12SN6FPH | DELPE-81DB |
| BWA-9O5-B | CSB-M1281M1282-LH | D12SN6FPHQ | DELPE-825D |
| BWA-9O6-A | CSB-M12825M1281 | D12SN6FPQ | DELPE-825DB |
| BWA-9Y10-A | CSB-M1288M1281 | D12SN6FPY | DELPE-83D |
| BWA-9Y6-A | CSB-M831M831 | D12SN6FPY1 | DELPE-83DB |
| BWA-EF1086 | CSB-UNT213M831F1241 | D12SN6FPY1Q | DELPE-850D |
| BWA-EF14128 | CSB-UNT425M1241 | D12SN6FPYQ | DELPE-850DB |
| BWA-EF866 | CSF-M12F51M12M41 | D12SN6FV | DELPE-875D |
| BWA-HW-006 | CSRB-M1240M1241 | D12SN6FVQ | DELPE-875DB |
| BWA-HW-016 | CSRB-M1240M1242 | D12SN6FVY | DELPE-88D |
| BWA-HW-017 | CSRB-M1240M1243 | D12SN6FVY1 | DELPE-88DB |
| BWA-PA108 | CSRB-M1240M1244 | D12SN6FVY1Q | DELPEF-815D |
| BWA-PA1412 | CSRB-M1250M125.47M125.73 | D12SN6FVYQ | DELPEF-81D |
| BWA-PA86 | | D12SP6FP | DELPEF-83D |
| BWA-PM12 | D10AFP | D12SP6FPH | DELPEF-88D |
| BWA-PM6 | D10AFPG | D12SP6FPHQ | DF-G1-KS-Q5 |
| BWA-PM8 | D10AFPGQ | D12SP6FPQ | DF-G1-NS-2M |
| BWA-SOLAR-001 | D10AFPGY | D12SP6FPY | DF-G1-NS-9M |
| BWC-1MRSFRSB02 | D10AFPGYQ | D12SP6FPY1 | DF-G1-NS-Q3 |
| BWC-1MRSFRSB1 | D10AFPQ | D12SP6FPY1Q | DF-G1-NS-Q5 |
| BWC-1MRSFRSB2 | D10AFPY | D12SP6FPYQ | DF-G1-NS-Q7 |
| BWC-1MRSFRSB4 | D10AFPYQ | D12SP6FV | DF-G1-PS-2M |
| BWC-1MRSMN05 | D10B2NFP | D12SP6FVQ | DF-G1-PS-9M |
| BWC-1MRSMN2 | D10B2PFP | D12SP6FVY | DF-G1-PS-Q3 |
| BWC-4MNFN15 | D10B5FP | D12SP6FVY1 | DF-G1-PS-Q5 |
| BWC-4MNFN3 | D10BFP | D12SP6FVY1Q | DF-G1-PS-Q7 |
| BWC-4MNFN30 | D10BFPG | D12SP6FVYQ | DIN-35-105 |
| BWC-4MNFN6 | D10BFPGQ | DB9P06 | DIN-35-140 |
| BWC-LFNBMN-DC | D10BFPPQ | DB9P15 | DIN-35-70 |
| BWC-LMRSFRPB | D10DNCFP | DB9P30 | DX70K2M6ED1 |
| | D10DNCFPQ | DBQ5 | DX70K2M6EM1 |
| CI2B-1 | D10DNFP | DEE2R-5100D | DX70K9M6ED1 |
| CI2BK-1 | D10DNFPQ | DEE2R-515D | DX70K9M6EM1 |
| CI2BK-2 | D10DNFPQ | DEE2R-51D | DX80DR2M-H |
| CI3RC2 | D10DNFPQ | DEE2R-525D | DX80DR9M-H |
| CIB-1 | D10DPCFP | DEE2R-53D | DX80G2M2S-P |
| CL50GRXAN | D10DPCFPQ | DEE2R-550D | DX80G2M2S-P7 |
| CL50GRXANQ | D10DPFP | DEE2R-575D | DX80G2M2S-P7C |
| CL50GRXANQP | D10DPFPQ | DEE2R-58D | DX80G2M6S0P0M4M4 |
| CL50GRXAP | D10DPFPQ | DEE2R-8100D | DX80G2M6S0P0M4M4C |
| CL50GRXAPQ | D10INFP | DEE2R-815D | DX80G2M6S0P0V4V4 |
| CL50GRXAPQP | D10INFPQ | DEE2R-81D | DX80G2M6S0P0V4V4C |
| CL50GRXN | D10INFPQ | DEE2R-825D | DX80G2M6S4P4M2M2 |
| CL50GRXNQ | D10IPFP | DEE2R-83D | DX80G2M6S4P4M2M2C |
| CL50GRXNQP | D10IPFPQ | DEE2R-850D | DX80G2M6S4P4V2V2 |
| CL50GRXP | D10IPFPQ | DEE2R-875D | DX80G2M6S4P4V2V2C |
| CL50GRXPQ | D10IPFPQ | DEE2R-88D | DX80G2M6S4P8 |
| CL50GRXPQP | D10UNFP | DELPE-110E | DX80G2M6S4P8C |
| CL50GRYAN | D10UNFPQ | DELPE-110EB | DX80G2M6S6N6 |
| CL50GRYANQ | D10UNFPQ | DELPE-11100E | DX80G2M6S6N6C |
| CL50GRYANQP | D10UNFPQ | DELPE-11100EB | DX80G2M6S6P6 |
| CL50GRYAP | D10UPFP | DELPE-1115E | DX80G2M6S6P6C |
| CL50GRYAPQ | D10UPFPQ | DELPE-1115EB | DX80G2M6S8P4 |
| CL50GRYN | D10UPFPQ | DELPE-111E | DX80G2M6S8P4C |
| CL50GRYNQ | D10UPFPQ | DELPE-111EB | DX80G2M6S-P2 |
| CL50GRYNQP | D10UPFPQ | DELPE-1125E | DX80G2M6S-P2C |
| CL50GRYP | D12DAB6FP | DELPE-1125EB | DX80G2M6S-P8 |
| CL50GRYPQ | D12DAB6FPQ | DELPE-113E | DX80G2M6S-P8C |
| CL50GRYPQP | D12DAB6FV | DELPE-113EB | DX80G9M2S-P |
| | | DELPE-1150E | DX80G9M2S-P7 |

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| DX80G9M2S-P7C |
| DX80G9M6S0P0M4M4 |
| DX80G9M6S0P0M4M4C |
| DX80G9M6S0P0V4V4 |
| DX80G9M6S0P0V4V4C |
| DX80G9M6S4P4M2M2 |
| DX80G9M6S4P4M2M2C |
| DX80G9M6S4P4V2V2 |
| DX80G9M6S4P4V2V2C |
| DX80G9M6S4P8 |
| DX80G9M6S4P8C |
| DX80G9M6S6N6 |
| DX80G9M6S6N6C |
| DX80G9M6S6P6 |
| DX80G9M6S6P6C |
| DX80G9M6S8P4 |
| DX80G9M6S8P4C |
| DX80G9M6S-P2 |
| DX80G9M6S-P2C |
| DX80G9M6S-P8 |
| DX80G9M6S-P8C |
| DX80N2X1S1S |
| DX80N2X1S2A1 |
| DX80N2X1S2N1M1 |
| DX80N2X1S2N1V1 |
| DX80N2X1S-P1E |
| DX80N2X1S-P3E |
| DX80N2X1W0P0ZR |
| DX80N2X2S0P0R |
| DX80N2X2S0P0RC |
| DX80N2X2S2N2M2 |
| DX80N2X2S2N2M2C |
| DX80N2X2S2N2T |
| DX80N2X2S2N2TC |
| DX80N2X2S2N2V2 |
| DX80N2X2S2N2V2C |
| DX80N2X2S2S |
| DX80N2X2S4A2 |
| DX80N2X2S4A2C |
| DX80N2X2S-P1 |
| DX80N2X2S-P1C |
| DX80N2X2S-P3 |
| DX80N2X2S-P3C |
| DX80N2X2S-P7 |
| DX80N2X2S-P7C |
| DX80N2X6S0P0M4M4 |
| DX80N2X6S0P0M4M4C |
| DX80N2X6S0P0V4V4 |
| DX80N2X6S0P0V4V4C |
| DX80N2X6S4P4M2M2 |
| DX80N2X6S4P4M2M2C |
| DX80N2X6S4P4V2V2 |
| DX80N2X6S4P4V2V2C |
| DX80N2X6S4P8 |
| DX80N2X6S4P8C |
| DX80N2X6S6N6 |
| DX80N2X6S6N6C |
| DX80N2X6S6P6 |
| DX80N2X6S6P6C |
| DX80N2X6S8P4 |
| DX80N2X6S8P4C |
| DX80N2X6S-P2 |
| DX80N2X6S-P2C |
| DX80N9X1S1S |
| DX80N9X1S2A1 |
| DX80N9X1S2N1M1 |
| DX80N9X1S2N1V1 |
| DX80N9X1S-P1E |
| DX80N9X1S-P3E |
| DX80N9X1S-P4E |

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| DX80N9X1W0P0ZR |
| DX80N9X2S0P0R |
| DX80N9X2S0P0RC |
| DX80N9X2S2N2M2 |
| DX80N9X2S2N2M2C |
| DX80N9X2S2N2T |
| DX80N9X2S2N2TC |
| DX80N9X2S2N2V2 |
| DX80N9X2S2N2V2C |
| DX80N9X2S2S |
| DX80N9X2S4A2 |
| DX80N9X2S4A2C |
| DX80N9X2S-P1 |
| DX80N9X2S-P1C |
| DX80N9X2S-P3 |
| DX80N9X2S-P3C |
| DX80N9X2S-P4 |
| DX80N9X2S-P4C |
| DX80N9X2S-P7 |
| DX80N9X2S-P7C |
| DX80N9X6S0P0M4M4 |
| DX80N9X6S0P0M4M4C |
| DX80N9X6S0P0V4V4 |
| DX80N9X6S0P0V4V4C |
| DX80N9X6S4P4M2M2 |
| DX80N9X6S4P4M2M2C |
| DX80N9X6S4P4V2V2 |
| DX80N9X6S4P4V2V2C |
| DX80N9X6S4P8 |
| DX80N9X6S4P8C |
| DX80N9X6S6N6 |
| DX80N9X6S6N6C |
| DX80N9X6S6P6 |
| DX80N9X6S6P6C |
| DX80N9X6S8P4 |
| DX80N9X6S8P4C |
| DX80N9X6S-P2 |
| DX80N9X6S-P2C |
| DX80P2A6S-P |
| DX80P2T6S-P |
| DX80P9A6S-P |
| DX80P9T6S-P |
| DX81 |
| DX81H |
| DX81P6 |
| DX83A |
| DX83T |
| DX85M0P0M4M4 |
| DX85M0P0M4M4C |
| DX85M4P4M2M2 |
| DX85M4P4M2M2C |
| DX85M4P8 |
| DX85M4P8C |
| DX85M6P6 |
| DX85M6P6C |
| DX85M8P4 |
| DX85M8P4C |
| DX85M-P7 |
| DX85M-P7C |
| DX85M-P8 |
| DX85M-P8C |
| DX99N2X1S0N0R4X0D0 |
| DX99N2X1S2N0B2X0D0 |
| DX99N2X1S2N0M2X0D1 |
| DX99N2X1S2N0M2X0D2 |
| DX99N2X1S2N0T4X0D0 |
| DX99N2X1S2N0V2X0D1 |
| DX99N2X1S2N0V2X0D2 |
| DX99N9X1S0N0R4X0D0 |
| DX99N9X1S2N0B2X0D0 |

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| DX99N9X1S2N0V2X0D2 |
| DXER9 |
| EA5E1050Q |
| EA5E1200Q |
| EA5E1500Q |
| EA5E150Q |
| EA5E1800Q |
| EA5E2100Q |
| EA5E2400Q |
| EA5E300Q |
| EA5E450Q |
| EA5E600Q |
| EA5E750Q |
| EA5E900Q |
| EA5R1050NIXMODQ |
| EA5R1050NUXMODQ |
| EA5R1050PIXMODQ |
| EA5R1050PUXMODQ |
| EA5R1200NIXMODQ |
| EA5R1200NUXMODQ |
| EA5R1200PIXMODQ |
| EA5R1200PUXMODQ |
| EA5R1500NIXMODQ |
| EA5R1500NUXMODQ |
| EA5R1500PIXMODQ |
| EA5R1500PUXMODQ |
| EA5R150NIXMODQ |
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| EA5R150PIXMODQ |
| EA5R150PUXMODQ |
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| EA5R2100PUXMODQ |
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| EA5R750PUXMODQ |
| EA5R900NIXMODQ |
| EA5R900NUXMODQ |
| EA5R900PIXMODQ |
| EA5R900PUXMODQ |
| ED1G-L20MB-1N |
| ED1G-L21SM-1N |
| ED1G-L21SMB-1N |

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| ED9Z-GH1 |
| EM-F-7G |
| EM-FD-7G2 |
| EM-FD-7G3 |
| EM-FD-7G4 |
| EM-T-7A |
| ES-FA-11AA |
| ES-FA-6G |
| ES-FA-9AA |
| ES-TN-14H5 |
| ES-TN-14H6 |
| ES-TN-14H1 |
| ES-TN-1H10 |
| ES-TN-1H11 |
| ES-TN-1H12 |
| ES-TN-1H2 |
| ES-TN-1H3 |
| ES-TN-1H4 |
| ES-TN-1H5 |
| ES-TN-1H6 |
| ES-TN-1H7 |
| ES-TN-1H8 |
| ES-TN-1H9 |
| ES-UA-5A |
| ES-VA-5A |
| EZA-ADE-1 |
| EZA-ADE-2 |
| EZA-ADR-1 |
| EZA-ADR-2 |
| EZA-AP-1 |
| EZAC-E-QE5 |
| EZAC-E-QE5-QS5 |
| EZAC-E-QE8 |
| EZAC-E-QE8-QS3 |
| EZA-CP-13 |
| EZAC-R10N-QE8-QS53 |
| EZAC-R11-QE8 |
| EZAC-R15A-QE8-QS83 |
| EZAC-R8N-QE8-QS53 |
| EZAC-R9-QE8 |
| EZA-ECE-1 |
| EZA-ECR-1 |
| EZA-LAT-1 |
| EZA-LAT-2 |
| EZA-MBK-1 |
| EZA-MBK-11 |
| EZA-MBK-12 |
| EZA-MBK-2 |
| EZA-MBK-20U |
| EZA-MBK-21 |
| EZA-MBK-3 |
| EZA-MBK-4 |
| EZA-MBK-5 |
| EZA-MBK-9 |
| EZA-QDE-3 |
| EZA-QDE-5 |
| EZA-QDR-8 |
| EZA-RBK-1 |
| EZA-RR-1 |
| EZA-S300 |
| EZA-S300-M |
| EZA-S400 |
| EZA-S400-M |
| EZA-S500 |
| EZA-S500-M |
| EZA-S500-M45 |
| EZA-S533 |
| EZA-S533-M |

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| EZA-S584 | FIC-M8M4A | ITA23S | IVURD-MXK-830RA |
| EZA-S584-M | FLTB | ITA23SM600 | IVURD-MXK-850 |
| EZA-S584-M45 | FLTG | ITA23SM900 | IVURD-MXK-850RA |
| EZA-SW-1 | FLTI | ITETA1.53S | IVURGNB04 |
| EZA-TBE-1 | FLTMB | ITETA1.53SM600 | IVURGNB06 |
| EZA-TBR-1 | FLTMG | IVUBC | IVURGNB08 |
| EZA-TE-1050 | FLTMI | IVURBNI06 | IVURGNB12 |
| EZA-TE-1200 | FLTMR | IVURBNI08 | IVURGNB16 |
| EZA-TE-1350 | FLTR | IVURBNI12 | IVURGNB25 |
| EZA-TE-150 | FLTUV | IVURBNI16 | IVURGNB04 |
| EZA-TE-1500 | | IVURBNI25 | IVURGNB06 |
| EZA-TE-1650 | GM-FA-10J | IVURBNR04 | IVURGNB08 |
| EZA-TE-1800 | | IVURBNR06 | IVURGNB12 |
| EZA-TE-300 | HFFB12AC | IVURBNR08 | IVURGNB16 |
| EZA-TE-450 | HFFB12DC | IVURBNR12 | IVURGNB25 |
| EZA-TE-600 | HFFB812ACR | IVURBNR16 | IVURGNB04 |
| EZA-TE-750 | HFFB8AC110 | IVURBNR25 | IVURGNB06 |
| EZA-TE-900 | HFFB8AC230 | IVURBNW04 | IVURGNB08 |
| EZA-TP-1 | HFFB8ACR | IVURBNW06 | IVURGNB12 |
| EZA-USB485-01 | HFFB8DC | IVURBNW08 | IVURGNB16 |
| EZS-1050 | HFFW12AC | IVURBNW12 | IVURGNB25 |
| EZS-1084 | HFFW12ACR | IVURBNW16 | IVURGNB04 |
| EZS-1200 | HFFW12DC | IVURBNW25 | IVURGNB06 |
| EZS-1251 | HFFW14DC | IVURBNX04 | IVURGNB08 |
| EZS-1350 | HFFW15AC110 | IVURBNX06 | IVURGNB12 |
| EZS-149 | HFFW15AC230 | IVURBNX08 | IVURGNB16 |
| EZS-150 | HFFW15ACR | IVURBNX12 | IVURGNB25 |
| EZS-1500 | HFFW24AC | IVURBNX16 | IVURGNB04 |
| EZS-150EA | HFFW24ACR | IVURBNX25 | IVURGNB06 |
| EZS-1650 | HFFW36AC | IVURBPI04 | IVURGNB08 |
| EZS-1800 | HFFW36ACR | IVURBPI06 | IVURGNB12 |
| EZS-300 | HFFW48AC | IVURBPI08 | IVURGNB16 |
| EZS-450 | HFFW48ACR | IVURBPI12 | IVURGNB25 |
| EZS-600 | HFFW8AC110 | IVURBPI16 | IVURGNB04 |
| EZS-684 | HFFW8AC230 | IVURBPI25 | IVURGNB06 |
| EZS-750 | HFFW8ACR | IVURBPR04 | IVURGNB08 |
| EZS-768 | HFFW8DC | IVURBPR06 | IVURGNB12 |
| EZS-900 | | IVURBPR08 | IVURGNB16 |
| EZS-984 | IA.31.7ST5ETA | IVURBPR12 | IVURGNB25 |
| EZSS-1050 | IA.82.5PT5 | IVURBPR16 | IVURGNB04 |
| EZSS-1200 | IA.83.3ST5ETA | IVURBPR25 | IVURGNB06 |
| EZSS-1350 | IA1.53SMETA | IVURBPW04 | IVURGNB08 |
| EZSS-150 | IA1.53SMETAM600 | IVURBPW06 | IVURGNB12 |
| EZSS-1500 | IA1.53SMTA | IVURBPW08 | IVURGNB16 |
| EZSS-150EA | IA1.53SMTAM600 | IVURBPW12 | IVURGNB25 |
| EZSS-1650 | IA23S | IVURBPW16 | IVURGNB04 |
| EZSS-1800 | IA23SM600 | IVURBPW25 | IVURGNB06 |
| EZSS-2100 | IA23SM900 | IVURBPX04 | IVURGNB08 |
| EZSS-2400 | IAM.752S | IVURBPX06 | IVURGNB12 |
| EZSS-300 | IAM.752SM600 | IVURBPX08 | IVURGNB16 |
| EZSS-450 | IAT23S | IVURBPX12 | IVURGNB25 |
| EZSS-600 | IAT23SM600 | IVURBPX16 | IVURGNB04 |
| EZSS-750 | IAT23SM8M900 | IVURBPX25 | IVURGNB06 |
| EZSS-900 | IB6RP | IVURD-MX-803 | IVURGNB08 |
| | IF23P | IVURD-MX-803RA | IVURGNB12 |
| FIC-M12F4 | IMP.753P | IVURD-MX-806 | IVURGNB16 |
| FIC-M12F4A | IMT.442P | IVURD-MX-806RA | IVURGNB25 |
| FIC-M12F5 | IMT.753SMVF | IVURD-MX-815 | IVURGNB04 |
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| LCF75LR |
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| LEDA70SW-G |
| LEDA70SW-P |
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| LEDAPFK70 |
| LEDAPFK70S |
| LEDAPFKS |
| LEDAW |
| LEDAWS |
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LEDGLA580XD6-PHQ
LEDGLA580XD6-PLQ
LEDGLA580XD6-XQ
LEDGLA580XD6-XQ
LEDGLA580XG6-PHQ
LEDGLA580XG6-PLQ
LEDGLA580XG6-XQ
LEDGLA580XG6-XQ
LEDGLA580XP6-PHQ
LEDGLA580XP6-PLQ
LEDGLA580XP6-XQ
LEDGLA580XP6-XQ
LEDGLA870XD6-PHQ
LEDGLA870XD6-PLQ
LEDGLA870XD6-XQ
LEDGLA870XD6-XQ
LEDGLA870XG6-PHQ
LEDGLA870XG6-PLQ
LEDGLA870XG6-XQ
LEDGLA870XG6-XQ
LEDGLA870XP6-PHQ
LEDGLA870XP6-PLQ
LEDGLA870XP6-XQ
LEDGLA870XP6-XQ
LEDGO100M
LEDGO100M-D
LEDGO50M
LEDGO50M-D
LEDGR62X62M
LEDGR62X62W
LEDGR70XD4-PM
LEDGR70XD4-PQ
LEDGR70XD4-XM
LEDGR70XD4-XQ
LEDGR80X80M
LEDGR80X80W
LEDGR90S-G
LEDGR90S-P
LEDGRM62X62W
LEDGS50L11
LEDGS50L11-XQ
LEDGS50L20
LEDGS50L20-XQ
LEDGS50L5
LEDGS50L5-XQ
LEDGSM
LEDGSW
LEDIA62X62M
LEDIA62X62W
LEDIA70AD5-PQ
LEDIA70AD5-XQ
LEDIA70AG5-PQ
LEDIA70AG5-XQ
LEDIA70AP5-PQ
LEDIA70AP5-XQ
LEDIA70SSD5-PQ
LEDIA70SSD5-XQ
LEDIA70SSG5-PQ
LEDIA70SSG5-XQ
LEDIA70SSP5-PQ
LEDIA70SSP5-XQ
LEDIA70XD5-PM
LEDIA70XD5-PQ
LEDIA70XD5-XM
LEDIA70XD5-XQ
LEDIA80X80M

LEDIA80X80W
LEDIB150X150PW2-XQ
LEDIB225X150PW2-XQ
LEDIB300X150PW2-XQ
LEDIB70X70M
LEDIB70X70W
LEDIB75X150PW2-XQ
LEDIB85X220M
LEDIB85X220W
LEDII150-3M
LEDII150-3W
LEDILA1160XD6-PHQ
LEDILA1160XD6-PLQ
LEDILA1160XD6-XQ
LEDILA1160XG6-PHQ
LEDILA1160XG6-PLQ
LEDILA1160XG6-XQ
LEDILA1160XP6-PHQ
LEDILA1160XP6-PLQ
LEDILA1160XP6-XQ
LEDILA145XD6-XQ
LEDILA145XG6-XQ
LEDILA145XP6-PQ
LEDILA290AD6-XQ
LEDILA290AG6-XQ
LEDILA290AP6-XQ
LEDILA290SSD6-XQ
LEDILA290SSG6-XQ
LEDILA290SSP6-XQ
LEDILA290XD6-PHQ
LEDILA290XD6-PLQ
LEDILA290XD6-XQ
LEDILA290XG6-PHQ
LEDILA290XG6-PLQ
LEDILA290XG6-XQ
LEDILA290XP6-PHQ
LEDILA290XP6-PLQ
LEDILA290XP6-XQ
LEDILA435AD6-XQ
LEDILA435AG6-XQ
LEDILA435AP6-XQ
LEDILA435SD6-XQ
LEDILA435SSG6-XQ
LEDILA435SSP6-XQ
LEDILA435XD6-PHQ
LEDILA435XD6-PLQ
LEDILA435XD6-XQ
LEDILA435XG6-PHQ
LEDILA435XG6-PLQ
LEDILA435XG6-XQ
LEDILA435XP6-PHQ
LEDILA435XP6-PLQ
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LEDILA580XD6-PLQ
LEDILA580XD6-XQ
LEDILA580XG6-PHQ
LEDILA580XG6-PLQ
LEDILA580XG6-XQ
LEDILA580XP6-PHQ
LEDILA580XP6-PLQ
LEDILA580XP6-XQ
LEDILA870XD6-PHQ
LEDILA870XD6-PLQ

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| LEDILA870XD6-XQ |
| LEDILA870XD6-XQ |
| LEDILA870XG6-PHQ |
| LEDILA870XG6-PLQ |
| LEDILA870XG6-XQ |
| LEDILA870XP6-PHQ |
| LEDILA870XP6-PLQ |
| LEDILA870XP6-XQ |
| LEDIO100M |
| LEDIO100M-D |
| LEDIO50M |
| LEDIO50M-D |
| LEDIR62X62M |
| LEDIR62X62W |
| LEDIR70XD4-PM |
| LEDIR70XD4-PQ |
| LEDIR70XD4-XM |
| LEDIR70XD4-XQ |
| LEDIR80X80M |
| LEDIR80X80W |
| LEDIR90S-G |
| LEDIR90S-P |
| LEDIR90SS-G |
| LEDIR90SS-P |
| LEDIRM62X62W |
| LEDIS50L14 |
| LEDIS50L14-XQ |
| LEDIS50L5 |
| LEDIS50L5-XQ |
| LEDLA1160XCDW-P |
| LEDLA1160XWDW-P |
| LEDLA1160XW-G |
| LEDLA1160XW-P |
| LEDLA145XCDW-P |
| LEDLA145XWDW-P |
| LEDLA145XW-G |
| LEDLA145XW-P |
| LEDLA290SCDW-P |
| LEDLA290SVDW-P |
| LEDLA290SW-G |
| LEDLA290SW-P |
| LEDLA290XCDW-P |
| LEDLA290XWDW-P |
| LEDLA290XW-G |
| LEDLA290XW-P |
| LEDLA435SCDW-P |
| LEDLA435SVDW-P |
| LEDLA435SW-G |
| LEDLA435SW-P |
| LEDLA435XCDW-P |
| LEDLA435XWDW-P |
| LEDLA435XW-G |
| LEDLA435XW-P |
| LEDLA580SCDW-P |
| LEDLA580SVDW-P |
| LEDLA580SW-G |
| LEDLA580SW-P |
| LEDLA580XCDW-P |
| LEDLA580XWDW-P |
| LEDLA580XW-G |
| LEDLA580XW-P |
| LEDLA870XCDW-P |
| LEDLA870XWDW-P |
| LEDLA870XW-G |
| LEDLA870XW-P |
| LEDLAPFK290S |
| LEDLAPFK580S |
| LEDR70CDW |
| LEDRA62X62M |
| LEDRA62X62W |

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| LEDRA70AD5-PQ |
| LEDRA70AD5-XQ |
| LEDRA70AG5-PQ |
| LEDRA70AG5-XQ |
| LEDRA70AP5-PQ |
| LEDRA70AP5-XQ |
| LEDRA70SSD5-PQ |
| LEDRA70SSD5-XQ |
| LEDRA70SSG5-PQ |
| LEDRA70SSG5-XQ |
| LEDRA70SSP5-PQ |
| LEDRA70SSP5-XQ |
| LEDRA70XD5-PM |
| LEDRA70XD5-PQ |
| LEDRA70XD5-XM |
| LEDRA70XD5-XQ |
| LEDRA80X80M |
| LEDRA80X80W |
| LEDRB150X150PW2-XQ |
| LEDRB225X150PW2-XQ |
| LEDRB300X150PW2-XQ |
| LEDRB70X70M |
| LEDRB70X70W |
| LEDRB75X150PW2-XQ |
| LEDRB85X220M |
| LEDRB85X220W |
| LEDRCDW |
| LEDRCDWS |
| LEDRCW |
| LEDRCWS |
| LEDRDW |
| LEDRDWS |
| LEDRI150-3M |
| LEDRI150-3W |
| LEDRLA1160XD6-PHQ |
| LEDRLA1160XD6-PLQ |
| LEDRLA1160XD6-XQ |
| LEDRLA1160XG6-PHQ |
| LEDRLA1160XG6-PLQ |
| LEDRLA1160XG6-XQ |
| LEDRLA1160XP6-PHQ |
| LEDRLA1160XP6-PLQ |
| LEDRLA1160XP6-XQ |
| LEDRLA145XD6-XQ |
| LEDRLA145XG6-XQ |
| LEDRLA145XP6-XQ |
| LEDRLA290AD6-XQ |
| LEDRLA290AG6-XQ |
| LEDRLA290AP6-XQ |
| LEDRLA290SSD6-XQ |
| LEDRLA290SSG6-XQ |
| LEDRLA290SSP6-XQ |
| LEDRLA290XD6-PHQ |
| LEDRLA290XD6-PLQ |
| LEDRLA290XD6-XQ |
| LEDRLA290XG6-PHQ |
| LEDRLA290XG6-PLQ |
| LEDRLA290XG6-XQ |
| LEDRLA290XP6-PHQ |
| LEDRLA290XP6-PLQ |
| LEDRLA290XP6-XQ |
| LEDRLA435AD6-XQ |
| LEDRLA435AG6-XQ |
| LEDRLA435AP6-XQ |
| LEDRLA435SSD6-XQ |
| LEDRLA435SSG6-XQ |
| LEDRLA435SSP6-XQ |
| LEDRLA435XD6-PHQ |
| LEDRLA435XD6-PLQ |
| LEDRLA435XD6-XQ |

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| LEDRLA435XG6-PHQ |
| LEDRLA435XG6-PLQ |
| LEDRLA435XG6-XQ |
| LEDRLA435XP6-PHQ |
| LEDRLA435XP6-PLQ |
| LEDRLA435XP6-XQ |
| LEDRLA580AD6-XQ |
| LEDRLA580AG6-XQ |
| LEDRLA580AP6-XQ |
| LEDRLA580SSD6-XQ |
| LEDRLA580SSG6-XQ |
| LEDRLA580SSP6-XQ |
| LEDRLA580XD6-PHQ |
| LEDRLA580XD6-PLQ |
| LEDRLA580XD6-XQ |
| LEDRLA580XG6-PHQ |
| LEDRLA580XG6-PLQ |
| LEDRLA580XG6-XQ |
| LEDRLA580XP6-PHQ |
| LEDRLA580XP6-PLQ |
| LEDRLA580XP6-XQ |
| LEDRLA870XD6-PHQ |
| LEDRLA870XD6-PLQ |
| LEDRLA870XD6-XQ |
| LEDRLA870XG6-PHQ |
| LEDRLA870XG6-PLQ |
| LEDRLA870XG6-XQ |
| LEDRLA870XP6-PLQ |
| LEDRO100M |
| LEDRO100M-D |
| LEDRO50M |
| LEDRO50M-D |
| LEDRPFK70 |
| LEDRPFK90 |
| LEDRR62X62M |
| LEDRR62X62W |
| LEDRR70XD4-PM |
| LEDRR70XD4-PQ |
| LEDRR70XD4-XM |
| LEDRR70XD4-XQ |
| LEDRR80X80M |
| LEDRR80X80W |
| LEDRR90S-G |
| LEDRR90S-P |
| LEDRR90SS-G |
| LEDRR90SS-P |
| LEDRRM62X62W |
| LEDRRPFK |
| LEDRRPFKS |
| LEDRS50L11 |
| LEDRS50L11-XQ |
| LEDRS50L20 |
| LEDRS50L20-XQ |
| LEDRS50L5 |
| LEDRS50L5-XQ |
| LEDRSM |
| LEDRSW |
| LEDUV365A70AG5-PQ |
| LEDUV365A70AG5-XQ |
| LEDUV365LA1160XG6-PHQ |
| LEDUV365LA1160XG6-PLQ |
| LEDUV365LA1160XG6-XQ |
| LEDUV365LA145XG6-XQ |
| LEDUV365LA290AG6-XQ |
| LEDUV365LA290SSG6-XQ |
| LEDUV365LA290XG6-PHQ |
| LEDUV365LA290XG6-PLQ |
| LEDUV365LA290XG6-XQ |
| LEDUV365LA580AD6-XQ |
| LEDUV365LA580AG6-XQ |
| LEDUV365LA580AP6-XQ |
| LEDUV365LA580SSD6-XQ |
| LEDUV365LA580SSG6-XQ |

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| LEDUV365LA435AG6-XQ |
| LEDUV365LA435SSG6-XQ |
| LEDUV365LA435XG6-PHQ |
| LEDUV365LA435XG6-PLQ |
| LEDUV365LA435XG6-XQ |
| LEDUV365LA580AG6-XQ |
| LEDUV365LA580SSG6-XQ |
| LEDUV365LA580XG6-PHQ |
| LEDUV365LA580XG6-PLQ |
| LEDUV365LA580XG6-XQ |
| LEDUV365LA870XG6-PHQ |
| LEDUV365LA870XG6-PLQ |
| LEDUV365LA870XG6-XQ |
| LEDUV395A70AD5-PQ |
| LEDUV395A70AD5-XQ |
| LEDUV395A70AG5-PQ |
| LEDUV395A70AG5-XQ |
| LEDUV395A70AP5-PQ |
| LEDUV395A70AP5-XQ |
| LEDUV395A70XD5-PM |
| LEDUV395A70XD5-PQ |
| LEDUV395A70XD5-XM |
| LEDUV395A70XD5-XQ |
| LEDUV395LA1160XD6-PHQ |
| LEDUV395LA1160XD6-PLQ |
| LEDUV395LA1160XD6-XQ |
| LEDUV395LA1160XG6-PHQ |
| LEDUV395LA1160XG6-PLQ |
| LEDUV395LA1160XG6-XQ |
| LEDUV395LA1160XP6-PHQ |
| LEDUV395LA1160XP6-PLQ |
| LEDUV395LA1160XP6-XQ |
| LEDUV395LA145XD6-XQ |
| LEDUV395LA145XG6-XQ |
| LEDUV395LA145XP6-XQ |
| LEDUV395LA290AD6-XQ |
| LEDUV395LA290AG6-XQ |
| LEDUV395LA290AP6-XQ |
| LEDUV395LA290SSD6-XQ |
| LEDUV395LA290SSG6-XQ |
| LEDUV395LA290SSP6-XQ |
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| LEDUV395LA290XD6-PLQ |
| LEDUV395LA290XD6-XQ |
| LEDUV395LA290XG6-PHQ |
| LEDUV395LA290XG6-PLQ |
| LEDUV395LA290XG6-XQ |
| LEDUV395LA290XP6-PHQ |
| LEDUV395LA290XP6-PLQ |
| LEDUV395LA290XP6-XQ |
| LEDUV395LA435AD6-XQ |
| LEDUV395LA435AG6-XQ |
| LEDUV395LA435AP6-XQ |
| LEDUV395LA435SSD6-XQ |
| LEDUV395LA435SSG6-XQ |
| LEDUV395LA435SSP6-XQ |
| LEDUV395LA435XD6-PHQ |
| LEDUV395LA435XD6-PLQ |
| LEDUV395LA435XD6-XQ |
| LEDUV395LA435XG6-PHQ |
| LEDUV395LA435XG6-PLQ |
| LEDUV395LA435XG6-XQ |
| LEDUV395LA580AD6-XQ |
| LEDUV395LA580AG6-XQ |
| LEDUV395LA580AP6-XQ |
| LEDUV395LA580SSD6-XQ |
| LEDUV395LA580SSG6-XQ |

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| LEDUV395LA580SSP6-XQ | LEDWLA145XP6-XQ | LEDWR90SS-P | LPSS-1390 |
| LEDUV395LA580XD6-PHQ | LEDWLA290AD6-XQ | LEDWRM62X62W | LPSS-1530 |
| LEDUV395LA580XD6-PLQ | LEDWLA290AG6-XQ | LEDWS50L11 | LPSS-1670 |
| LEDUV395LA580XD6-XQ | LEDWLA290AP6-XQ | LEDWS50L11-XQ | LPSS-1810 |
| LEDUV395LA580XG6-PHQ | LEDWLA290SSD6-XQ | LEDWS50L20 | LPSS-270 |
| LEDUV395LA580XG6-PLQ | LEDWLA290SSG6-XQ | LEDWS50L20-XQ | LPSS-410 |
| LEDUV395LA580XG6-XQ | LEDWLA290SSP6-XQ | LEDWS50L5 | LPSS-550 |
| LEDUV395LA580XP6-PHQ | LEDWLA290XD6-PHQ | LEDWS50L5-XQ | LPSS-690 |
| LEDUV395LA580XP6-PLQ | LEDWLA290XD6-PLQ | LEDWSM | LPSS-830 |
| LEDUV395LA580XP6-XQ | LEDWLA290XD6-XQ | LEDWSW | LPSS-970 |
| LEDUV395LA870XD6-PHQ | LEDWLA290XG6-PHQ | LEK | LS2E30-1050Q8 |
| LEDUV395LA870XD6-PLQ | LEDWLA290XG6-PLQ | LEKS | LS2E30-1200Q8 |
| LEDUV395LA870XD6-XQ | LEDWLA290XG6-XQ | LG10A65NI | LS2E30-1350Q8 |
| LEDUV395LA870XG6-PHQ | LEDWLA290XP6-PHQ | LG10A65NIQ | LS2E30-1500Q8 |
| LEDUV395LA870XG6-PLQ | LEDWLA290XP6-PLQ | LG10A65NU | LS2E30-150Q8 |
| LEDUV395LA870XG6-XQ | LEDWLA290XP6-XQ | LG10A65NUQ | LS2E30-300Q8 |
| LEDUV395LA870XP6-PHQ | LEDWLA435AD6-XQ | LG10A65PI | LS2E30-450Q8 |
| LEDUV395LA870XP6-PLQ | LEDWLA435AG6-XQ | LG10A65PIQ | LS2E30-600Q8 |
| LEDUV395LA870XP6-XQ | LEDWLA435AP6-XQ | LG10A65PU | LS2E30-750Q8 |
| LEDUV395R70XD5-PM | LEDWLA435SSD6-XQ | LG10A65PUQ | LS2E30-900Q8 |
| LEDUV395R70XD5-PQ | LEDWLA435SSG6-XQ | LG5A65NI | LS2LK30-450Q88-1RE50 |
| LEDUV395R70XD5-XM | LEDWLA435SSP6-XQ | LG5A65NIQ | LS2LK30-450Q88-2RE15 |
| LEDUV395R70XD5-XQ | LEDWLA435XD6-PHQ | LG5A65NU | LS2LK30-750Q88-1RE15 |
| LEDUV395S50L11 | LEDWLA435XD6-PLQ | LG5A65NUQ | LS2LK30-750Q88-2RE15 |
| LEDUV395S50L11 | LEDWLA435XD6-XQ | LG5A65PI | LS2LK30-900Q88-1RE15 |
| LEDUV395S50L11-XQ | LEDWLA435XG6-PHQ | LG5A65PIQ | LS2LK30-900Q88-2RE15 |
| LEDUV395S50L11-XQ | LEDWLA435XG6-PLQ | LG5A65PU | LS2LP30-1050Q88 |
| LEDUV395S50L20 | LEDWLA435XG6-XQ | LG5A65PUQ | LS2LP30-1200Q88 |
| LEDUV395S50L20 | LEDWLA435XP6-PHQ | LG5B65NI | LS2LP30-1350Q88 |
| LEDUV395S50L20-XQ | LEDWLA435XP6-PLQ | LG5B65NIQ | LS2LP30-1500Q88 |
| LEDUV395S50L20-XQ | LEDWLA435XP6-XQ | LG5B65NU | LS2LP30-150Q88 |
| LEDUV395S50L5 | LEDWLA580AD6-XQ | LG5B65NUQ | LS2LP30-300Q88 |
| LEDUV395S50L5 | LEDWLA580AG6-XQ | LG5B65PI | LS2LP30-450Q88 |
| LEDUV395S50L5-XQ | LEDWLA580AP6-XQ | LG5B65PIQ | LS2LP30-600Q88 |
| LEDUV395S50L5-XQ | LEDWLA580SSD6-XQ | LG5B65PU | LS2LP30-750Q88 |
| LEDWA62X62M | LEDWLA580SSG6-XQ | LG5B65PUQ | LS2LP30-900Q88 |
| LEDWA62X62W | LEDWLA580SSP6-XQ | LH150IX485QP | LS2LR30-1050Q8 |
| LEDWA70AD5-PQ | LEDWLA580XD6-PHQ | LH30IX485QP | LS2LR30-1200Q8 |
| LEDWA70AD5-XQ | LEDWLA580XD6-PLQ | LH80IX485QP | LS2LR30-1350Q8 |
| LEDWA70AG5-PQ | LEDWLA580XD6-XQ | LMF04 | LS2LR30-1500Q8 |
| LEDWA70AG5-XQ | LEDWLA580XG6-PHQ | LMF06 | LS2LR30-150Q8 |
| LEDWA70AP5-PQ | LEDWLA580XG6-PLQ | LMF08 | LS2LR30-300Q8 |
| LEDWA70AP5-XQ | LEDWLA580XG6-XQ | LMF12 | LS2LR30-450Q8 |
| LEDWA70SSD5-PQ | LEDWLA580XP6-PHQ | LMF16 | LS2LR30-600Q8 |
| LEDWA70SSD5-XQ | LEDWLA580XP6-PLQ | LMF25 | LS2LR30-750Q8 |
| LEDWA70SSG5-PQ | LEDWLA580XP6-XQ | LPA-LAT-1 | LS2LR30-900Q8 |
| LEDWA70SSG5-XQ | LEDWLA870XD6-PHQ | LPA-MBK-11 | LS2TK30-1200Q88-2RE25 |
| LEDWA70SSP5-PQ | LEDWLA870XD6-PLQ | LPA-MBK-12 | LS2TK30-1500Q88-2RE25 |
| LEDWA70SSP5-XQ | LEDWLA870XD6-XQ | LPA-MBK-120 | LS2TK30-150Q88-1RE15 |
| LEDWA70XD5-PM | LEDWLA870XG6-PHQ | LPA-MBK-135 | LS2TK30-150Q88-2RE25 |
| LEDWA70XD5-PQ | LEDWLA870XG6-PLQ | LPA-MBK-180 | LS2TK30-300Q88-1RE25 |
| LEDWA70XD5-XM | LEDWLA870XG6-XQ | LPA-MBK-20 | LS2TK30-300Q88-1RE50 |
| LEDWA70XD5-XQ | LEDWLA870XP6-PHQ | LPA-MBK-21 | LS2TK30-300Q88-2RE15 |
| LEDWA80X80M | LEDWLA870XP6-PLQ | LPA-MBK-22 | LS2TK30-300Q88-2RE25 |
| LEDWA80X80W | LEDWLA870XP6-XQ | LPA-MBK-90 | LS2TK30-450Q88-1RE25 |
| LEDWB150X150PW2-XQ | LEDWO100M | LPA-MBK-P1110 | LS2TK30-450Q88-2RE25 |
| LEDWB225X150PW2-XQ | LEDWO100M-D | LPA-MBK-P1250 | LS2TK30-600Q88-1RE15 |
| LEDWB300X150PW2-XQ | LEDWO50M | LPA-MBK-P1390 | LS2TK30-600Q88-2RE25 |
| LEDWB75X150PW2-XQ | LEDWO50M-D | LPA-MBK-P1530 | LS2TK30-750Q88-1RE15 |
| LEDWLA1160XD6-PHQ | LEDWR62X62M | LPA-MBK-P1670 | LS2TK30-750Q88-1RE50 |
| LEDWLA1160XD6-PLQ | LEDWR62X62W | LPA-MBK-P1810 | LS2TK30-900Q88-1RE100 |
| LEDWLA1160XD6-XQ | LEDWR70XD5-PM | LPA-MBK-P270 | LS2TK30-900Q88-1RE15 |
| LEDWLA1160XG6-PHQ | LEDWR70XD5-PQ | LPA-MBK-P410 | LS2TK30-900Q88-1RE25 |
| LEDWLA1160XG6-PLQ | LEDWR70XD5-XM | LPA-MBK-P550 | LS2TK30-900Q88-1RE50 |
| LEDWLA1160XG6-XQ | LEDWR70XD5-XQ | LPA-MBK-P690 | LS2TK30-900Q88-2RE25 |
| LEDWLA1160XP6-PHQ | LEDWR80X80M | LPA-MBK-P830 | LS2TK30-900Q88-2RE75 |
| LEDWLA1160XP6-PLQ | LEDWR80X80W | LPA-MBK-P970 | LS2TP30-1050Q88 |
| LEDWLA1160XP6-XQ | LEDWR90S-G | LPA-TP-1 | LS2TP30-1200Q88 |
| LEDWLA145XD6-XQ | LEDWR90S-P | LPSS-1110 | LS2TP30-1350Q88 |
| LEDWLA145XG6-XQ | LEDWR90SS-G | LPSS-1250 | LS2TP30-1500Q88 |

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| LS2TP30-150Q88 |
| LS2TP30-300Q88 |
| LS2TP30-450Q88 |
| LS2TP30-600Q88 |
| LS2TP30-750Q88 |
| LS2TP30-900Q88 |
| LS2TR30-1050Q8 |
| LS2TR30-1200Q8 |
| LS2TR30-1350Q8 |
| LS2TR30-1500Q8 |
| LS2TR30-150Q8 |
| LS2TR30-300Q8 |
| LS2TR30-450Q8 |
| LS2TR30-600Q8 |
| LS2TR30-750Q8 |
| LS2TR30-900Q8 |
| LSA-LAT-1 |
| LSS-1050 |
| LSS-1200 |
| LSS-1350 |
| LSS-150 |
| LSS-1500 |
| LSS-300 |
| LSS-450 |
| LSS-600 |
| LSS-750 |
| LSS-900 |
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| LX15R |
| LX15RQ |
| LX18E |

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| LX21R |
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| LX3E |
| LX3EQ |
| LX3ESR |
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| LX3R |
| LX3RQ |
| LX3RSR |
| LX3RSRQ |
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| LX6EQ |
| LX6ESR |
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| LX6RQ |
| LX6RSR |
| LX6RSRQ |
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| LX9EQ |
| LX9R |
| LX9RQ |
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| LXS3 |
| LXS6 |
| LZ3C8 |
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| M12PFF25Q5 |
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| M12PFF50Q5 |
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| M12PFF75 |

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| M18GRY2PQ |
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| M18GRYNQP |
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| M18GRYPQP |
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| M18GXYNQ |
| M18GXYNQP |
| M18GXYP |
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| M18GXYPQP |
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| M18GYX7NQ |
| M18GYX7NQP |
| M18GYX7P |
| M18GYX7PQ |
| M18GYX7PQP |
| M18RGX8PQ8 |
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| M25URBQ8 |
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| MAC16P-1 |
| MACI-1 |
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| MACNXDN-1 |
| MACP-1 |
| MACPXDN-1 |
| MACV-1 |
| MAHCIN-1 |
| MAHCIP-1 |
| MAHCVN-1 |
| MAHCVP-1 |
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| MAHE26A |
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| MAHE38A |
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| MAHE6A |
| MAHE70A |
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| MAHR45A |
| MAHR51A |
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| MAHR6A |
| MAHR70A |
| MAHR77A |
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| MAQDC-5125C |
| MAQDC-5150C |
| MAQDC-575C |
| MAQDC-806 |
| MAQDC-815 |
| MAQDC-830 |
| MAQDC-850 |
| MASC |
| MBCC2-506 |
| MBCC2-512 |
| MBCC2-530 |
| MBCC-306 |
| MBCC-312 |
| MBCC-330 |
| MBCC-406 |
| MBCC-412 |
| MBCC-430 |

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| MBCC-506 | MQDC-330 | MQVR3S-530RA | OSBFVB |
| MBCC-512 | MQDC-330RA | MSA-MBM-K45 | OSBFVG |
| MBCC-530 | MQDC-406 | MSA-S105-1 | OSBFX |
| MGA-K-1 | MQDC-406RA | MSA-S105-1NB | OSBLV |
| MGA-KSO-1 | MQDC-415 | MSA-S24-1 | OSBLVAG |
| MI9E | MQDC-415RA | MSA-S24-1NB | OSBLVAGC |
| MI9EQ | MQDC-430 | MSA-S42-1 | OSBR |
| MIAD9CV | MQDC-430RA | MSA-S42-1NB | OSBRF |
| MIAD9CV2 | MQDC-450 | MSA-S66-1 | OTBA5 |
| MIAD9CV2Q | MQDC-450RA | MSA-S66-1NB | OTBA5L |
| MIAD9CVQ | MQDC-806 | MSA-S84-1 | OTBA5LQD |
| MIAD9D | MQDC-815 | MSA-S84-1NB | OTBA5QD |
| MIAD9DQ | MQDC-830 | MSA-TE-12 | OTBB5 |
| MIAD9F | MQDCWD-506 | MSA-TE-20 | OTBB5L |
| MIAD9FQ | MQDCWD-530 | MSA-TE-24 | OTBB5LQD |
| MIAD9LV | MQDEC2-406 | MSA-TE-32 | OTBB5QD |
| MIAD9LVAG | MQDEC2-406RA | MSA-TE-36 | OTBVN6 |
| MIAD9LVAGQ | MQDEC2-415 | MSA-TE-44 | OTBVN6L |
| MIAD9LVQ | MQDEC2-415RA | MSA-TE-48 | OTBVN6LQD |
| MIAD9R | MQDEC2-430 | MSA-TE-8 | OTBVN6QD |
| MIAD9RQ | MQDEC2-430RA | MSM12A | OTBVP6 |
| MIAD9W | MQDEC2-506 | MSM16A | OTBVP6L |
| MIAD9WQ | MQDEC2-506RA | MSM20A | OTBVP6LQD |
| MMD-TA-11B | MQDEC2-515 | MSM24A | OTBVP6QD |
| MMD-TA-12B | MQDEC2-515RA | MSM28A | OTBVR81 |
| MQAC-406 | MQDEC2-530 | MSM32A | OTBVR81L |
| MQAC-406RA | MQDEC2-530RA | MSM36A | OTBVR81LQD |
| MQAC-415 | MQDEC-403RS | MSM40A | OTBVR81QD |
| MQAC-415RA | MQDEC-403SS | MSM44A | OTC-1-BK |
| MQAC-430 | MQDEC-406RS | MSM48A | OTC-1-GN |
| MQAC-430RA | MQDEC-406SS | MSM4A | OTC-1-RD |
| MQD9-406 | MQDEC-412RS | MSM8A | OTC-1-YW |
| MQD9-406RA | MQDEC-412SS | MSMB-3 | OUC-C |
| MQD9-415 | MQDEC-420RS | MSMB-MSM-45 | OUC-D |
| MQD9-415RA | MQDEC-420SS | MSMMB | OUC-F |
| MQD9-430 | MQDEC-430RS | MSS12 | OUC-FP |
| MQD9-430RA | MQDEC-430SS | MSS24 | OUC-L |
| MQDC-1210ST | MQDEC-450RS | MSS36 | OUC-LAG |
| MQDC-1230ST | MQDEC-450SS | MSS48 | |
| MQDC-1280ST | MQDEC-8005RA-USB | | |
| MQDC1-501.5 | MQDEC-8005-USB | OLM5 | P12-C1 |
| MQDC1-506 | MQDEC-801RA-USB | OLM8 | P22-C1 |
| MQDC1-506RA | MQDEC-801-USB | OLM8M1 | P32-C6 |
| MQDC1-515 | MQDEC-803RA-USB | OPBA2 | P4A1.3I |
| MQDC1-515RA | MQDEC-803-USB | OPBA2QD | P4A1.3R |
| MQDC1-530 | MQDEC-810RA-USB | OPBAE | P4AI |
| MQDC1-530RA | MQDEC-810-USB | OPBAEQD | P4AR |
| MQDC20-506 | MQDMC-506 | OPBB2 | P4BC1.3I |
| MQDC20-515 | MQDMC-506RA | OPBB2QD | P4BC1.3I-OC |
| MQDC20-530 | MQDMC-515 | OPBBE | P4BC1.3R |
| MQDC20SS-506 | MQDMC-515RA | OPBBEQD | P4BC1.3R-OC |
| MQDC20SS-515 | MQDMC-530 | OPBT2 | P4BCI |
| MQDC20SS-530 | MQDMC-530RA | OPBT2QD | P4BCI-OC |
| MQDC2S-1206 | MQEAC-406 | OPBT2QDH | P4BCR |
| MQDC2S-1215 | MQEAC-406RA | OPBTE | P4BCR-OC |
| MQDC2S-1230 | MQEAC-415 | OPBTEQD | P4C06 |
| MQDC2S-1250 | MQEAC-415RA | OPBTEQDH | P4C06SIM |
| MQDC2S-1275 | MQEAC-430 | OSBCV | P4C110 |
| MQDC2S-806 | MQEAC-430RA | OSBCVB | P4C23 |
| MQDC2S-806RA | MQEAC-606 | OSBCVG | P4C23SIM |
| MQDC2S-815 | MQEAC-606RA | OSBD | P4C32 |
| MQDC2S-815RA | MQEAC-615 | OSBDX | P4C32SIM |
| MQDC2S-830 | MQEAC-615RA | OSBE | P4C50 |
| MQDC2S-830RA | MQEAC-630 | OSBEF | P4C75 |
| MQDC2S-850 | MQEAC-630RA | OSBF | P4COI |
| MQDC2S-850RA | MQVR3S-506 | OSBFAC | P4COI-BC |
| MQDC-306 | MQVR3S-506RA | OSBFVP | P4COI-BCBD |
| MQDC-306RA | MQVR3S-515 | OSBFPPB | P4COI-BCBDOC |
| MQDC-315 | MQVR3S-515RA | OSBFPG | P4COI-BCOC |
| MQDC-315RA | MQVR3S-530 | OSBFV | P4COI-BD |
| | | | P4COI-BDOC |

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| P4COR-BC |
| P4COR-BCBD |
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| P4CORS |
| P4CORS-BC |
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| P4CORS-BCBDOC |
| P4CORS-BCOC |
| P4CORS-BD |
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| P4CORS-OC |
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| P4G1.3R |
| P4GI |
| P4GR |
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| P4O1.3I-OC |
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| P4ORS-OC |
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| P4SLC50-P |
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| PBAT46UHFMTA |
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| PBCT21X46U |
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| PBCT23TMB5M4 |
| PBCT23TMB5MTA |
| PBCT26U |
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| PBCT26UM4M2.5 |
| PBCT26UM4M2.5 |
| PBCT26UMFR |
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| PBCT46U |
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| PBE46UTMNL |
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| PBF16U |
| PBF26U |
| PBF43TMB5 |
| PBF46U |
| PBF46UHF |
| PBF46UM3MJ1.3 |
| PBF46UM3MJ1.3 |
| PBFM16U |
| PBFM1X43T5 |
| PBFM46U |
| PBFM46UHF |
| PBFMP16UMP.2 |
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| PBP46UHF |
| PBPF26U |
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| PD45VP6C100 |
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| PD45VP6C50Q |
| PD45VP6LLP |
| PD45VP6LLPQ |
| PDIA46U-LLD |
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| PDISM46UM5MA |
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| PDIT4100U |
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| PFS69S6T |
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| PIAT46UHFMTA |
| PIAT46UM.4X.4MT |
| PIAT66U |
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| PIES46UT |
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| PIPS66U |
| PIPSB46U |
| PIPSB46UHF |
| PIPSM26U |
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| PIRS1X166UM.4 |
| PIRS1X166UMPM.75 |
| PIRS1X166UMPMAL |
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| PIT1X46U |
| PIT26U |
| PIT26UHF |
| PIT26UMFR |
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| PIT46U |
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| PIU430U |
| PIU460U |
| PIU630U |
| PIU660U |
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| PKG3M-35-PSG3M |
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| PKG3M-9 |
| PKG4-2 |
| PKG4M-2 |
| PKG4M-2/CS |
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| PKG4M-5/CS |
| PKG4M-9 |
| PKG4M-9/CS |
| PKG4S-2 |
| PKG6Z-2 |
| PKG6Z-9 |
| PKG3M-10 |
| PKG3M-4 |
| PKG3M-7 |
| PKW3M-2 |
| PKW3M-5 |
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| PKW4M-5 |
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| PKW4Z-2 |
| PKW4ZS-2 |
| PKW6Z-2 |
| PKW6Z-9 |

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| PLIS-1 | PPROCAMSSI-P | PVA225N6EQ | Q12AP6FF15Q3 |
| PPC06SHF | PPROCAMSSR-G | PVA225N6Q | Q12AP6FF30Q3 |
| PPC06SRAHF | PPROCAMSSR-P | PVA225N6R | Q12AP6FF50Q3 |
| PPC13SHF | PPROCAMSSW-G | PVA225N6RQ | Q12AP6LPQ3 |
| PPC13SRAHF | PPROCAMSSW-P | PVA225P6 | Q12AP6LVQ3 |
| PPC23SHF | PPROCAMSW-G | PVA225P6E | Q12AP6RQ3 |
| PPC23SRAHF | PPROCAMSW-P | PVA225P6EQ | Q12RB6FF15 |
| PPC32SHF | PPROCTL | PVA225P6Q | Q12RB6FF15CR |
| PPC32SRAHF | PPROCTL1.3 | PVA225P6R | Q12RB6FF15Q |
| PPE4-G | PPROCTL1.3-BC | PVA225P6RQ | Q12RB6FF15Q5 |
| PPE4-P | PPROCTL1.3-BCBD | PVA300N6 | Q12RB6FF30 |
| PPE-G | PPROCTL1.3-BCBDOC | PVA300N6E | Q12RB6FF30CR |
| PPE-P | PPROCTL1.3-BCOC | PVA300N6EQ | Q12RB6FF30Q |
| PPE-RG | PPROCTL1.3-BD | PVA300N6Q | Q12RB6FF30Q5 |
| PPE-RP | PPROCTL1.3-BDOC | PVA300N6R | Q12RB6FF50 |
| PPLIM | PPROCTL1.3-OC | PVA300N6RQ | Q12RB6FF50CR |
| PPM8 | PPROCTL-BC | PVA300P6 | Q12RB6FF50Q |
| PPM9 | PPROCTL-BCBD | PVA300P6E | Q12RB6FF50Q5 |
| PPROCAM1.3Q | PPROCTL-BCBDOC | PVA300P6EQ | Q12RB6LP |
| PPROCAM1.3SB-G | PPROCTL-BCOC | PVA300P6Q | Q12RB6LPQ |
| PPROCAM1.3SB-P | PPROCTL-BD | PVA300P6R | Q12RB6LPQ5 |
| PPROCAM1.3SC-G | PPROCTL-BDOC | PVA300P6RQ | Q12RB6LV |
| PPROCAM1.3SC-P | PPROCTL | PVA375N6 | Q12RB6LVQ |
| PPROCAM1.3SG-G | PPROCTL-BC | PVA375N6E | Q12RB6LVQ5 |
| PPROCAM1.3SG-P | PPROCTL-BCBD | PVA375N6EQ | Q12RB6R |
| PPROCAM1.3SI-G | PPROCTL-BCBDOC | PVA375N6Q | Q12RB6RCR |
| PPROCAM1.3SI-P | PPROCTL-BCOC | PVA375N6R | Q12RB6RQ |
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| SA-30RL55X93C |
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| SA-K50A18 |
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| SA-M30E12 |
| SA-M30M30-75 |
| SA-M30TE12 |
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| SB12ANRQ3 |
| SB12APR |
| SB12APRQ3 |
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| SB12E1Q3 |
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| SB12RPR |
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| SC22-3E-CU1 |
| SC22-3E-S |
| SC22-3E-SU1 |
| SC22-3-S |
| SC22-3-SU1 |
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| SC-IM9B |
| SC-IM9C |
| SC-SC22-3 |
| SC-SC22-3E |
| SC-TC1 |
| SC-TS1 |
| SC-USB1 |
| SC-XM1 |
| SC-XM1-5 |
| SC-XMP |
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| SFA-IMB2 |
| SFA-LAT-12 |
| SFA-LAT-30 |
| SFPA-AG12-1 |
| SFPA-AG30-1 |
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| SGE2-500Q5 |
| SGE2-500Q8E |
| SGE2-584 |
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| SGE2-584Q8E |
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| SGE3-400Q5 |
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| SGE3-533Q5 |
| SGE3-533Q8E |
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| SGE4-300Q8E |
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| SGK3-533Q85-1RE15 |
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| SGP2-500Q88E |
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| SGR3-533Q8E |
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| SGXLK4-300Q88-1RE50 |
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| SGXLP3-533Q88E |
| SGXLP4-300 |
| SGXLP4-300Q83 |
| SGXLP4-300Q88E |
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| SI-HG63FQDL |
| SI-HG63FQDR |
| SI-HG63FQDRR |
| SI-HG80A |
| SI-HG80DQD |
| SI-HG80DQDR |
| SI-LM40KHD |
| SI-LM40KHE |
| SI-LM40KHF |
| SI-LM40KVD |
| SI-LM40KVE |
| SI-LM40MKHD |
| SI-LM40MKHE |

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| SI-LM40MKHFD | SI-MAG1MM | SLE30B6V | SLO30VB6Y |
| SI-LM40MKHFE | SI-MAG1MM90 | SLE30B6VQ | SLO30VB6YQ |
| SI-LM40MKHFF | SI-MAG1MMHF | SLE30B6VY | SLPCE14-1110 |
| SI-LM40MKVD | SI-MAG1SM | SLE30B6VYQ | SLPCE14-1110P8 |
| SI-LM40MKVE | SI-MAG1SMCO | SLM10B6 | SLPCE14-1250 |
| SI-LS100F | SI-MAG2MM | SLM10B6N | SLPCE14-1250P8 |
| SI-LS100MRFF | SI-MAG2SM | SLM10B6QPMA | SLPCE14-1390 |
| SI-LS100SF | SI-MAG3MM | SLM10B6QPMAN | SLPCE14-1390P8 |
| SI-LS100SRAF | SI-MAG3SM | SLM10N6Q | SLPCE14-1530 |
| SI-LS31HGD | SI-PL3A-G | SLM10N6QN | SLPCE14-1530P8 |
| SI-LS31HGE | SI-PL3A-R | SLM10P6Q | SLPCE14-1670 |
| SI-LS31HGLD | SI-PL3T-G | SLM10P6QN | SLPCE14-1670P8 |
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| SI-LS31HGRD | SI-QM100AMG | SLM120B6N | SLPCE14-1810P8 |
| SI-LS31HGRE | SI-QM100AMMG | SLM120B6QPMA | SLPCE14-410 |
| SI-LS31RTD | SI-QM100AMSG | SLM120B6QPMAN | SLPCE14-410P8 |
| SI-LS31RTE | SI-QM100ASG | SLM120N6Q | SLPCE14-550 |
| SI-LS42-COVER | SI-QM100DMG | SLM120N6QN | SLPCE14-550P8 |
| SI-LS42DMG | SI-QM100DMMG | SLM120P6Q | SLPCE14-690 |
| SI-LS42DMH | SI-QM100DMSG | SLM120P6QN | SLPCE14-690P8 |
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| SI-LS42DMJ | SI-QM100DSG | SLM180B6N | SLPCE14-830P8 |
| SI-LS42DMMG | SI-QM100DSH | SLM180B6QPMA | SLPCE14-970 |
| SI-LS42DMMGF | SI-QM-13 | SLM180B6QPMAN | SLPCE14-970P8 |
| SI-LS42DMMH | SI-QM-13-M20 | SLM180N6Q | SLPCE25-1110 |
| SI-LS42DMMHF | SI-QM-90A | SLM180N6QN | SLPCE25-1110P8 |
| SI-LS42DMMI | SI-QM-CGM20 | SLM180P6Q | SLPCE25-1250 |
| SI-LS42DMMIF | SI-QM-M20 | SLM180P6QN | SLPCE25-1250P8 |
| SI-LS42DMMJ | SI-QM-SB | SLM20B6 | SLPCE25-1390 |
| SI-LS42DMMJF | SI-QM-SMFA | SLM20B6N | SLPCE25-1390P8 |
| SI-LS42DMSG | SI-QM-SSA | SLM20B6QPMA | SLPCE25-1530 |
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| SMBWLS28RA |
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| SOP-E12-150SS |
| SOP-E12-300A |
| SOP-E12-300SS |
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| SPK1Q88E-1RE25 |
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| SPR1 |
| SPR1Q8 |
| SPR1Q8E |
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| SPXLE1Q8E |
| SPXLP1 |
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| SPXLP1Q88E |
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| SSA-EBP-02E |
| SSA-EBP-02L |
| SSA-EBP-11E |
| SSA-EBP-11L |
| SSA-EBP-12E |
| SSA-EBP-12L |
| SSA-ML-A |
| SSA-ML-W |
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| SSM-100-S |
| SSM-1100 |
| SSM-1100-S |
| SSM-1175 |
| SSM-1175-S |
| SSM-1275 |
| SSM-1275-S |
| SSM-1400 |
| SSM-1400-S |
| SSM-1475 |
| SSM-1475-S |
| SSM-150 |
| SSM-150-S |
| SSM-1550 |
| SSM-1550-S |
| SSM-1675 |
| SSM-1675-S |
| SSM-1750 |
| SSM-1750-S |
| SSM-1900 |
| SSM-1900-S |
| SSM-200 |
| SSM-200-S |
| SSM-250 |
| SSM-250-S |

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| SSM-375-S | T18AW3FF25 | T18SP6FF50Q | T30RW3LPQ1 |
| SSM-475 | T18AW3FF25Q1 | T18SP6L | T30RW3R |
| SSM-475-S | T18AW3FF50 | T18SP6LP | T30RW3RQ1 |
| SSM-550 | T18AW3FF50Q1 | T18SP6LPQ | T30SN6FF200 |
| SSM-550-S | T18AW3L | T18SP6LQ | T30SN6FF200Q |
| SSM-675 | T18AW3LP | T18SP6R | T30SN6FF400 |
| SSM-675-S | T18AW3LPQ1 | T18SP6RQ | T30SN6FF400Q |
| SSM-825 | T18AW3LQ1 | T18VN6UR | T30SN6FF600 |
| SSM-825-S | T18AW3R | T18VN6URQ | T30SN6FF600Q |
| SSM-875 | T18AW3RQ1 | T18VP6UR | T30SN6LP |
| SSM-875-S | T18GRXN | T18VP6URQ | T30SN6LPQ |
| SSM-975 | T18GRXNQ | T18XRYN | T30SN6R |
| SSM-975-S | T18GRXNQP | T18XRYNQ | T30SN6RQ |
| SSM-FM-11A10 | T18GRXP | T18XRYNQP | T30SP6FF200 |
| SSM-FM-11A20 | T18GRXPQ | T18XRYP | T30SP6FF200Q |
| SS-XPE-32 | T18GRXPQP | T18XRYPQ | T30SP6FF400 |
| SS-XPE-43 | T18GRYN | T18XRYPQP | T30SP6FF400Q |
| STBA-RB1-MB1 | T18GRYNQ | T303E | T30SP6FF600 |
| STBA-RB1-MB2 | T18GRYNQP | T303EQ1 | T30SP6FF600Q |
| STBA-RB1-MB3 | T18GRYP | T306E | T30SP6LP |
| STBA-RB1-S1 | T18GRYPQ | T306EQ | T30SP6LPQ |
| STBA-RB1-S2 | T18GRYPQP | T30AW3FF200 | T30SP6R |
| STBA-RB2-MB1 | T18GXYN | T30AW3FF200Q1 | T30SP6RQ |
| STBA-RB2-MB2 | T18GXYNQ | T30AW3FF400 | T30UDNA |
| STBA-RB2-MB3 | T18GXYNQP | T30AW3FF400Q1 | T30UDNAQ |
| STBA-RB2-S1 | T18GXYP | T30AW3FF600 | T30UDNB |
| STBA-RB2-S2 | T18GXYPQ | T30AW3FF600Q1 | T30UDNBQ |
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| STBVP6-RB1 | T18GYX7NQP | T30AW3RQ1 | T30UDPBQ |
| STBVP6-RB1E02 | T18GYX7P | T30GRXN | T30UHNA |
| STBVP6-RB1Q8 | T18GYX7PQ | T30GRXNQ | T30UHNAQ |
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| STBVP6-RB2E02 | T18RGX8PQ8 | T30GRXP | T30UHNBQ |
| STBVP6-RB2Q8 | T18RW3D | T30GRXPQ | T30UHPA |
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| STP-13 | T18RW3FF25Q1 | T30GRY2P | T30UINAQ |
| STP-14 | T18RW3FF50 | T30GRY2PQ | T30UINB |
| STP-15 | T18RW3FF50Q1 | T30GRY2PQP | T30UINB-CRFV |
| STP-16 | T18RW3L | T30GRYB11P | T30UINBQ |
| STP-17 | T18RW3LP | T30GRYN | T30UINBQ-CRFV |
| STP-18 | T18RW3LPQ1 | T30GRYNQ | T30UIPA |
| STP25 | T18RW3LQ1 | T30GRYNQP | T30UIPAQ |
| STP-3 | T18RW3R | T30GRYP | T30UIPB |
| STP50 | T18RW3RQ1 | T30GRYPQ | T30UIPB-CRFV |
| STP75 | T18SN6D | T30GRYPQP | T30UIPBQ |
| STP-MAQDC-806 | T18SN6DQ | T30GXYN | T30UIPBQ-CRFV |
| STP-MAQDC-815 | T18SN6FF100 | T30GXYNQ | T30UUNA |
| STP-MAQDC-830 | T18SN6FF100Q | T30GXYNQP | T30UUNAQ |
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| STPX25 | T18SN6FF25Q | T30GXYPQ | T30UUNB-CRFV |
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| STPX75 | T18SN6FF50Q | T30GYX7N | T30UUNBQ-CRFV |
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| STYLUS-10 | T18SN6LP | T30GYX7NQP | T30UUPAQ |
| | T18SN6LPQ | T30GYX7P | T30UUPB |
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| T186E | T18SN6RQ | T30RGX8PQ8 | T30UUPBQ-CRFV |
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| T186UE | T18SP6DQ | T30RW3FF200Q1 | T30UXDAQ8 |
| T186UEQ | T18SP6FF100 | T30RW3FF400 | T30UXDAQPMA |
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| TM186E Emitter |
| TM186EQ8 Emitter |
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| TM18AN6FF25 |
| TM18AN6FF25Q8 |
| TM18AN6FF50 |

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| TM18AN6R |
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| TM18AP6FF100 |
| TM18AP6FF100Q8 |
| TM18AP6FF25 |
| TM18AP6FF25Q8 |
| TM18AP6FF50 |
| TM18AP6FF50Q8 |
| TM18AP6LP |
| TM18AP6LPQ8 |
| TM18AP6R |
| TM18AP6RQ8 |
| TM18RN6LP |
| TM18RN6LPQ8 |
| TM18RN6R |
| TM18RN6RQ8 |
| TM18RP6LP |
| TM18RP6LPQ8 |
| TM18RP6R |
| TM18RP6RQ8 |
| TM18VN6FF100 |
| TM18VN6FF100Q8 |
| TM18VN6FF25 |
| TM18VN6FF25Q8 |
| TM18VN6FF50 |
| TM18VN6FF50Q8 |
| TM18VN6LP |
| TM18VN6LPQ8 |
| TM18VN6R |
| TM18VN6RQ8 |
| TM18VP6FF100 |
| TM18VP6FF100Q8 |
| TM18VP6FF25 |
| TM18VP6FF25Q8 |
| TM18VP6FF50 |
| TM18VP6FF50Q8 |
| TM18VP6LP |
| TM18VP6LPQ8 |
| TM18VP6R |
| TM18VP6RQ8 |
| UC-300AG |
| UC-300BZ |
| UC-300E |
| UC-300EL |
| UC-300EPD |
| UC-300F |
| UC-300FP |
| UC-300FP2 |
| UC-300L |
| UC-300LP |
| UC-300RPD |
| UC-45D |
| UC-45F |
| UC-45FP |
| UC-45L |
| UC-45LL |
| UC-45LLP |
| UC-45LP |
| UM-R55 |
| UM-FA-11A |
| UM-FA-9A |
| UPFA-1-100 |

| | | | |
|-------------|---------------|---------------|---------------|
| UPFA-2-100 | VS2RN5CV15 | VTBN6 | WLS28CW850XQ |
| USCMB-1 | VS2RN5CV15Q | VTBN6GR | WLS28CW990X |
| USCMB-2 | VS2RN5CV30 | VTBN6GRL | WLS28CW990XQ |
| USMB-1 | VS2RN5CV30Q | VTBN6GRLQ | WLS28XW1130X |
| USMB-6 | VS2RN5R | VTBN6GRQ | WLS28XW1130XQ |
| USMB-8 | VS2RN5RQ | VTBN6L | WLS28XW145X |
| UTB-3100C | VS2RP5CV15 | VTBN6LQ | WLS28XW145XQ |
| UTB-3250C | VS2RP5CV15Q | VTBN6Q | WLS28XW285X |
| UTB-325C | VS2RP5CV30 | VTBN6R | WLS28XW285XQ |
| UTB-350C | VS2RP5CV30Q | VTBN6RL | WLS28XW430X |
| UTB-5100C | VS2RP5R | VTBN6RLQ | WLS28XW430XQ |
| UTB-5250C | VS2RP5RQ | VTBN6RQ | WLS28XW570X |
| UTB-525C | VS3AN5XLP | VTBNB | WLS28XW570XQ |
| UTB-550C | VS3AN5XLPQ | VTBNBL | WLS28XW710X |
| UTB-8100C | VS3AN5XLV | VTBNBLQ | WLS28XW710XQ |
| UTB-8250C | VS3AN5XLVQ | VTBNBQ | WLS28XW850X |
| UTB-825C | VS3AP5XLP | VTBP6 | WLS28XW850XQ |
| UTB-850C | VS3AP5XLPQ | VTBP6B | WLS28XW990X |
| UWG18-5.0 | VS3AP5XLV | VTBP6BL | WLS28XW990XQ |
| UWG18-6.4 | VS3AP5XLVQ | VTBP6BLQ | |
| | VS3RN5XLP | VTBP6BQ | |
| VFT-M8MVS | VS3RN5XLPQ | VTBP6GR | |
| VS1AN5C10 | VS3RN5XLV | VTBP6GRL | |
| VS1AN5C10Q | VS3RN5XLVQ | VTBP6GRLQ | |
| VS1AN5C20 | VS3RP5XLP | VTBP6GRQ | |
| VS1AN5C20Q | VS3RP5XLPQ | VTBP6L | |
| VS1AN5CV10 | VS3RP5XLV | VTBP6LQ | |
| VS1AN5CV10Q | VS3RP5XLVQ | VTBP6Q | |
| VS1AN5CV20 | VSM46E | VTBP6R | |
| VS1AN5CV20Q | VSM46EQ7 | VTBP6RL | |
| VS1AP5C10 | VSM4AN6CV10 | VTBP6RLQ | |
| VS1AP5C10Q | VSM4AN6CV10Q7 | VTBP6RQ | |
| VS1AP5C20 | VSM4AN6CV20 | VURBN104 | |
| VS1AP5C20Q | VSM4AN6CV20Q7 | | |
| VS1AP5CV10 | VSM4AN6CV50 | WL50F | |
| VS1AP5CV10Q | VSM4AN6CV50Q7 | WL50FPB | |
| VS1AP5CV20 | VSM4AP6CV10 | WL50FPBQ | |
| VS1AP5CV20Q | VSM4AP6CV10Q7 | WL50FPBQP | |
| VS1RN5C10 | VSM4AP6CV20 | WL50FQ | |
| VS1RN5C10Q | VSM4AP6CV20Q7 | WL50FQP | |
| VS1RN5C20 | VSM4AP6CV50 | WL50SGL11Q | |
| VS1RN5C20Q | VSM4AP6CV50Q7 | WL50SGL20Q | |
| VS1RN5CV10 | VSM4RN6R | WL50SGL5Q | |
| VS1RN5CV10Q | VSM4RN6RQ7 | WL50SRL11Q | |
| VS1RN5CV20 | VSM4RP6R | WL50SRL20Q | |
| VS1RN5CV20Q | VSM4RP6RQ7 | WL50SRL5Q | |
| VS1RP5C10 | VSM56E | WL50SWL11Q | |
| VS1RP5C10Q | VSM56EQ7 | WL50SWL20Q | |
| VS1RP5C20 | VSM5AN6CV10 | WL50SWL5Q | |
| VS1RP5C20Q | VSM5AN6CV10Q7 | WLAW105X180 | |
| VS1RP5CV10 | VSM5AN6CV20 | WLAW105X180Q | |
| VS1RP5CV10Q | VSM5AN6CV20Q7 | WLAW190X180 | |
| VS1RP5CV20 | VSM5AN6CV50 | WLAW190X180Q | |
| VS1RP5CV20Q | VSM5AN6CV50Q7 | WLAW275X180 | |
| VS25E | VSM5AP6CV10 | WLAW275X180Q | |
| VS25EQ | VSM5AP6CV10Q7 | WLAW360X180 | |
| VS25EV | VSM5AP6CV20 | WLAW360X180Q | |
| VS25EVQ | VSM5AP6CV20Q7 | WLS28CW1130X | |
| VS2AN5CV15 | VSM5AP6CV50 | WLS28CW1130XQ | |
| VS2AN5CV15Q | VSM5AP6CV50Q7 | WLS28CW145X | |
| VS2AN5CV30 | VSM5RN6R | WLS28CW145XQ | |
| VS2AN5CV30Q | VSM5RN6RQ7 | WLS28CW285X | |
| VS2AN5R | VSM5RP6R | WLS28CW285XQ | |
| VS2AN5RQ | VSM5RP6RQ7 | WLS28CW430X | |
| VS2AP5CV15 | VSMQAN6CV20 | WLS28CW430XQ | |
| VS2AP5CV15Q | VSMQAN6CV50 | WLS28CW570X | |
| VS2AP5CV30 | VSMQAN6CV90 | WLS28CW570XQ | |
| VS2AP5CV30Q | VSMQAP6CV20 | WLS28CW710X | |
| VS2AP5R | VSMQAP6CV50 | WLS28CW710XQ | |
| VS2AP5RQ | VSMQAP6CV90 | WLS28CW850X | |

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