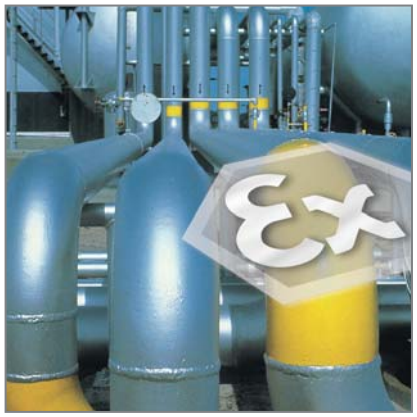
TURCK

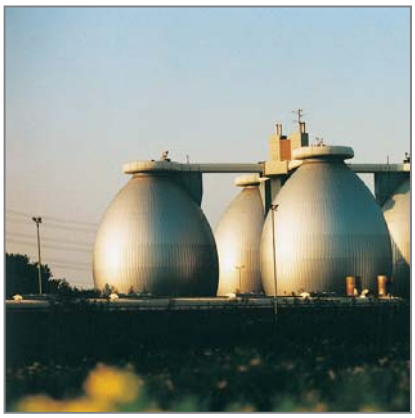
Industrial
Automation

INTERFACE TECHNOLOGY

Sense it! Connect it! Bus it! Solve it!

Interface technology





The company

The company

TURCK is one of the leading manufacturers in industrial automation. With more than 3,000 employees in 27 countries as well as sales partners in a further 60 states, we are always close to you. As a specialist in sensor, fieldbus, connection and interface technology and also Human Machine Interfaces (HMI) and RFID, we offer efficient solutions for factory and process automation. With our state-of-the-art production facilities in Germany, Switzerland, the USA, Mexico and China we, as a family-owned company, are able to react quickly and flexibly to the demands of local markets.

The product portfolio

Whether in machine and plant construction, in the sectors of automotive, transport and handling, food and beverage or in the chemical or pharmaceutical industry, automation solutions and products by TURCK increase the availability and efficiency of your systems. Moreover, you also lower your costs for purchasing, storage, installation and operational safety through effective product standardization. Branch-specific knowledge, gained through intensive dialog with customers paired with electronics development and production on the highest level, ensure optimal solutions for your automation tasks.

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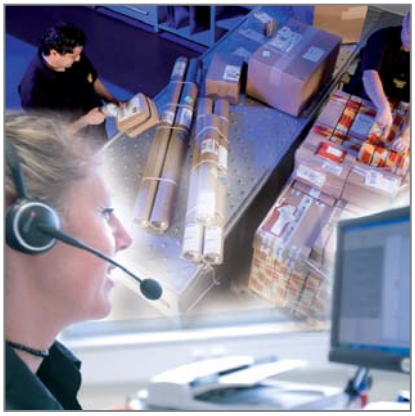


The service

Based on 50 years of experience and extensive know-how, we support our customers with efficient service in every project phase, from a first analysis up to tailor-made solutions and commissioning of your application. We aim at enhancing the efficiency and productivity of your production processes and machines continuously. The excellent quality of our products combined with the support of our specialists and fast delivery service guarantees you high system availability.

The product data base

Whether software tools for programming, configuration or commissioning support are required, data sheets or CAD data in 80 export formats, the TURCK product data base at www.turck.com helps you to find products and solutions fast, seven days a week, at any place worldwide and in nine different languages. You have access to nearly all products and solutions – clearly structured, completely documented and free for download.

Content

TURCK interface technology

TURCK offers the full range of interface products for control and automation, available in many different designs, types and with many functions for separating, conditioning, processing, converting and adapting digital and analog signals. The different product types meet the highest industrial standards and provide more flexibility for planning, building and extending industrial plants:

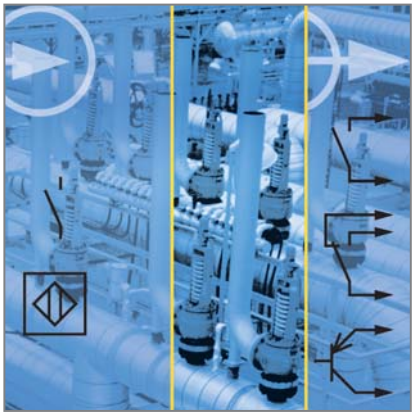
- IM series – universally applicable devices for DIN rail mounting with universal power supply unit and removable terminal blocks
- IMS series – slim 6.2 mm design for DIN rail mounting
- IMB series – high channel density for backplane mounting
- IMC series – distributed interface technology in IP67

How to find the right solution for my application?

The table of contents and the selection table provide a **general overview** of available product series and functions. Each chapter also includes the **type code** and a **short description** of each product series, explaining the essential functions and features. If you already know the type code of an item, please refer to the type index (page 130 f). It guides you to the desired product.

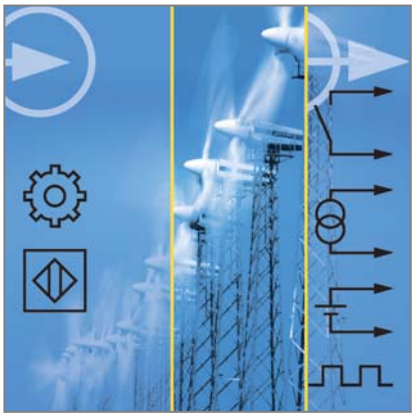
The **QR code** is new. You find it on the first page of each chapter. Just scan the code with a smartphone or a webcam and you are guided directly to our online product data base where you can find comprehensive information about the product groups of your choice.

Functions and applications



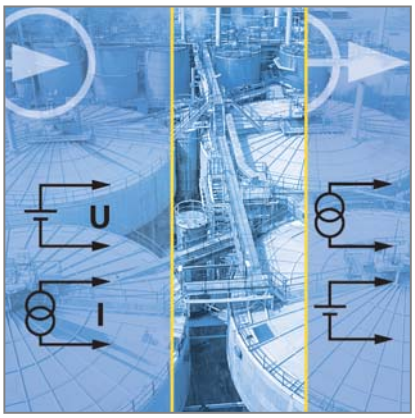
Isolating switching amplifiers

Isolating switching amplifiers are used for the galvanically separated transmission of binary signals provided by sensors and mechanical contacts. The devices are equipped with intrinsically safe control circuits and transmit binary signals from the Ex to the non-Ex area. Sensors according to DIN EN 60947-5-6 (NAMUR) and mechanical contacts can be connected.



Rotation speed monitors / pulse counters

In the field of control and regulation, the monitoring of rotary and oscillating motions is the primary task. The revolutions of drives or shafts as well as stroke and swivel motions can be monitored with rotation speed monitors. In order to achieve short response times for all applications, low frequencies are monitored according to the principle of period duration measurement and high frequencies are monitored with a time window.



Analog signal isolators – Input field side

Analog signal isolators are used to galvanically separate standard current and voltage signals, to condition them and if required, to transfer them between the Ex and the non-Ex area. Many analog signal isolators are HART® transmissible and support the parametrization of field devices via the HART® protocol.

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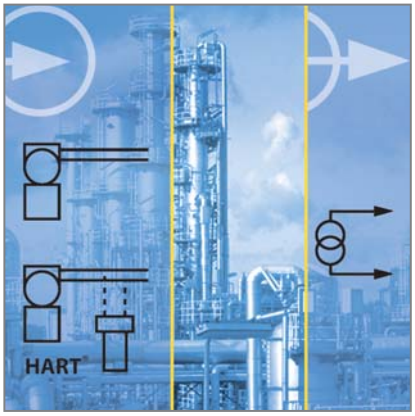
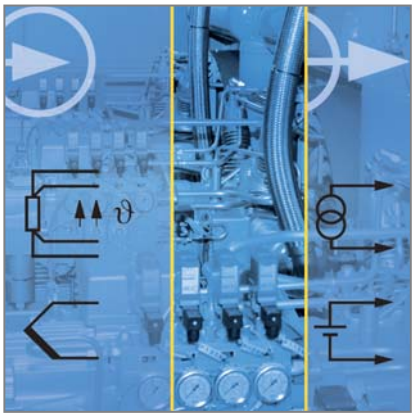


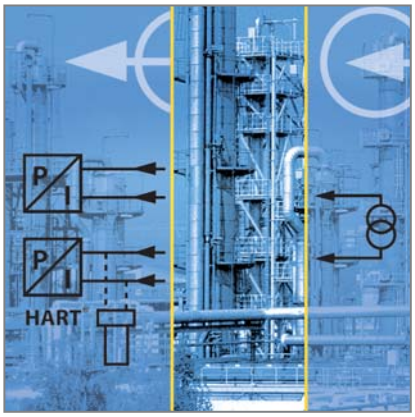
Isolating transducers

Isolating transducers detect physical quantities and convert them into electrical values via a transmitter at the input circuit. The electrical signals provided by the transmitter are processed, galvanically separated and if required transmitted between the Ex and the non-Ex area. Many isolating transducers are HART® transmissible and support the parametrization of field devices via the HART® protocol.



Temperature measuring amplifiers

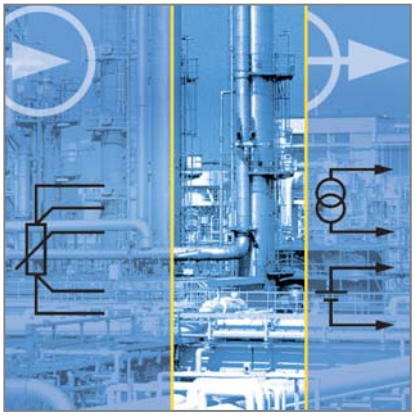
Temperature measuring amplifiers transform signals provided by thermo-couples or resistance temperature detectors (RTD) into standard signals of 0/2…10 V or 0/4…20 mA.



Analog signal isolators – Output field side intrinsically safe

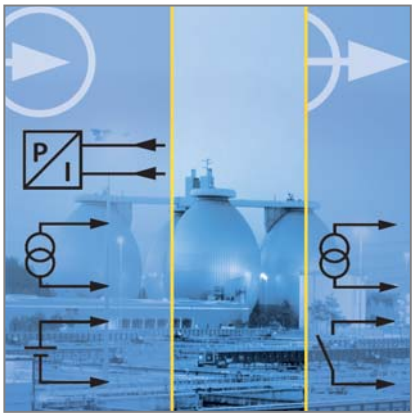
Analog signal isolators are used to galvanically separate standard current and voltage signals, to condition them and if required, to transfer them between the Ex and the non-Ex area. Typical applications are for example, the control of I/P converters (e.g. at control valves) or indicators in the Ex area. Many analog signal isolators are HART® transmissible and support the parametrization of field devices via the HART® protocol.

Functions and applications



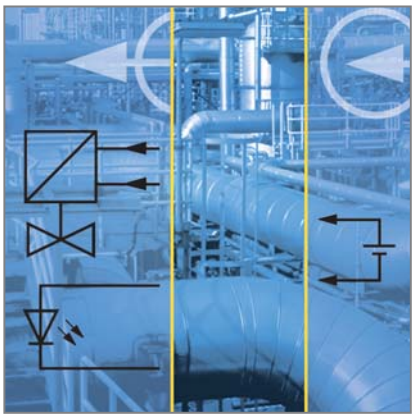
Potentiometer amplifiers

Potentiometer amplifiers convert the variable resistance value of a potentiometer in standard current or voltage signals. They can be connected to potentiometers in 3 or 5-wire technology.



Limit value indicators

Limit value indicators monitor values of standard current and voltage signals. They monitor the overrange or underrange of adjusted values and window limits (window function) and issue an alert message.



Solenoid drivers

Solenoid drivers supply galvanically separated as well as current and voltage limited power. Typical applications are the control of Ex i pilot valves as well as the supply of displays and transmitters.

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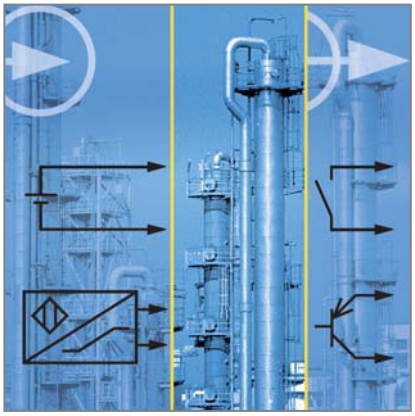
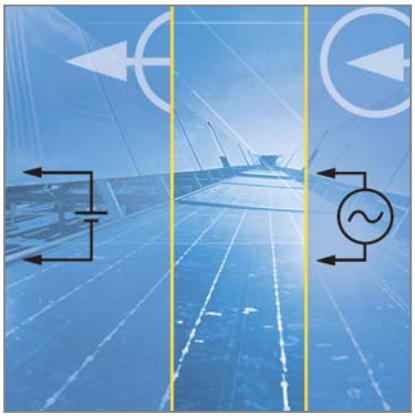


Relay couplers

Relay couplers galvanically separate any type of signal, convert all types of signals, such from 24 VDC to 230 VAC, suppress interference levels and amplify signals.



Power supplies

The switching, processing and monitoring devices often have to be fed with different currents and voltages not provided by the mains. We provide high-quality power adapters, to convert the mains alternating voltage from 230 VAC to 24 VDC for example.

Series and functions

Series	Isolating switching amplifiers	Rotation speed monitors Pulse counters	Analog signal isolators – Input field side	Isolating transducers	
Interface technology in modular housing					
 **Series IM** 104 x 18 x 110 mm 104 x 27 x 110 mm 110 x 27 x 110 mm	Channels: 1, 2, 3, 4 IM1-… IM12-… on page 18 ff	Channels: 1 IM21-… on page 22 ff	Channels: 1, 2 IM31-… on page 24 ff	Channels: 1, 2 IM33-… on page 30 ff	
 **Series IMS** 114.5 x 6,2 x 90 mm			Channels: 1, 2 IMS-AI-… on page 28 ff		
Interface technology for the backplane					
 **Series IMB** **backplane** (page 60): 176 x 210 mm **Interface cards** 118 x 18 x 103 mm	Channels: 4 IMB-DI-… on page 62 ff		Channels: 2 IMB-AI-… on page 64 ff	Channels: 2 IMB-AIA-… on page 66 ff	
Distributed Interface technology in IP67					
 **Series IMC** 100 x 32 x 25 mm	Channels: 2 IMC-DI-… on page 80 ff		Channels: 1 IMC-AI-… on page 82 ff	Channels: 1 IMC-AIA-… on page 84 ff	

	Temperature measuring amplifiers	Analog signal isolators – Output field side intrinsically safe	Potentiometer amplifiers	Limit switches	Valve control modules	Relay couplers	Power supply units
	Channels: 1 IM34-… on page 34 ff	Channels: 1, 2 IM35-… on page 40 ff	Channels: 1 IM36-… on page 44	Channels: 1 IM43-… on page 46 ff	Channels: 1, 2 IM72-… on page 48 ff	Channels: 1 ,2 IM73-… on page 50 ff	Channels: 1 IM82-… on page 52 ff
	Channels: 1 IMS-TI-… on page 38 ff						
	Channels: 2 IMB-TI-… on page 68 ff	Channels: 2 IMB-AO-… on page 70 ff			Channels: 4 IMB-DO-… on page 72 ff		
		Channels: 1 IMC-AO-… on page 86 ff			Channels: 1 IMC-DO-… on page 88 ff		

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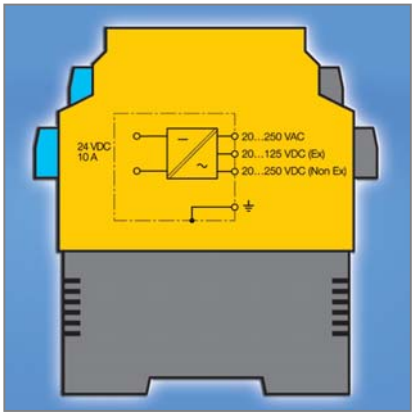
IM/IMS – Modular housings

IM and IMS series – Interface technology in modular housings

The interface modules of the IM and IMS series are incorporated in a compact housing which is simply snapped on a DIN rail EN 60715. They can be mounted close together, horizontally or vertically. The single and dual-channel IMS modules are 6.2 mm slim and offer functions such as galvanic isolation, signal conditioning and temperature detection. The 18 mm and 27 mm devices of the IM series can also be screwed on a panel. Thanks to a great variety of functions, these interface modules are suitable for many applications. In addition, they are equipped with a universal power supply unit 20…250 VUC, or 20…250 VAC / 20…125 VDC for Ex devices, allowing them to be connected to all industrial power supply networks.

Our strengths – Your advantages



Universal power supply units – Broad power range

Made for a broad power range of 20…250 VUC, or 20…250 VAC / 20…125 VDC, the IM modules can be connected to all industrial power supply networks. Device selection, stockage and spare parts inventory are thus considerably simplified. The universal power supply units from TURCK protect reliably against over and undervoltage, provided sufficient reserve capacity and fulfill the requirements for explosion protection. Further advantages of the modern interface devices are their flexibility and simple handling: The module have only two terminals for power supply. You can apply AC as well as DC power. Bipolar connection of DC power is also possible.

Removable terminal blocks – Simple and error-free installation

The IM devices are equipped with removable terminal blocks to simplify the project planning, retrofitting and maintenance of systems. They are easily mounted, you avoid wiring errors when replacing devices and you reduce mounting and follow-up costs. The IMs are available with screw and cage-clamp terminals and feature a well accessible terminal chamber with space for a 2.5 mm^2 thick wire (14 AWG). The connectors are coded with red pins, thus avoiding wrong plugging of terminal blocks.

Slim design, multichannel devices – High packing density

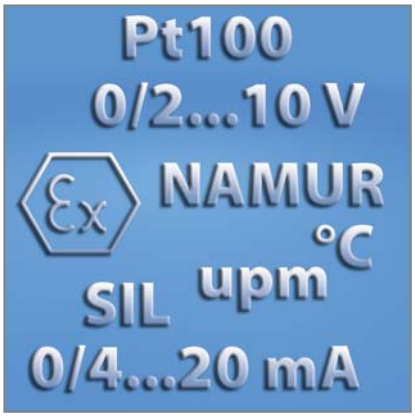
Separation, conversion, processing and conditioning of digital and analog signals – these are the unique features of the compact and slim IM and IMS devices. They are also available as dual and four-channel types. The multipurpose IM series offers the full range of solutions in a modular snap-fit housing only 110 mm deep and 18 or 27 mm wide. Being only 6.2 mm slim and easy to parametrize via DIP switch, the single and dual-channel IMS modules set new standards in terms of channel density and flexibility. They can be mounted very close together side-by-side, thus saving space in the cabinet and still remaining user-friendly and reliable.

Screw and snap-fit mounting – Flexible installation

The IM and IMS interface modules can be snapped on DIN rail acc. to DIN EN 60715 or screwed on a panel. Mounted side-by-side, they can either be aligned horizontally or vertically. The IM modules are also suitable for screw fixing on a mounting plate.

Different control concepts – Suited for every application

Interface modules have to prove their functionality in every day use. For this purpose, the devices have to meet the requirements of the application they are intended for. In order to meet the requirements in terms of handling, commissioning and diagnostics, our interface modules are available in different designs and also with different operating concepts. The product portfolio includes devices with DIP or rotary coding switch, teachable devices with intuitive menu navigation, up to modules that are easily parametrized and with FDT/DTM based diagnostics – we offer made-to-measure solutions for any requirements.



Broad choice of products – Made-to-measure solutions

The IM series with 1 to 4-channel technology offers multiple application possibilities for individual solutions. The devices combine features such as compact design, different operating concepts and configuration modes as well as many functions for separating, conditioning, processing, converting and adapting digital and analog signals. We also offer Ex area approved and SIL certified devices. No matter the purpose, whether for standard or special applications, for simple or complex requirements, manually adjusted or computer programmed, with standard status messages or different diagnostic functions: The IM series is universally applicable and covers the entire spectrum of tasks that need to be solved by efficient interface technology.

Type code

IM 12 - 2 2 1 Ex - MT / 24VDC

IM Design

- **IM** Interface module

12 Functional principle

- **1 –** isolating switching amplifier with line monitoring
- **1 2** isolating switching amplifier without line monitoring
- **2 1** rotation speed monitor/ frequency converter
- **3 1** analog input amplifier
- **3 3** isolating transducer
- **3 4** temperature amplifier
- **3 5** analog output amplifier
- **3 6** potentiometer amplifier
- **4 3** limit value indicator
- **7 2** digital output/ valve control module
- **7 3** relay coupling module
- **8 2** power supply unit/ power supply

- 2 2 1 Number of channels

Number of additional outputs

- **1** e.g. additional alarm output

Number of channels on control side

- **1** one output channel
- **2** two output channels
- **3** three output channels
- **4** four output channels
- **5** five output channels

Number of channels on field side

- **1** one input channel
- **2** two input channels
- **4** four input channels

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Ex	Device class	-	MT	Output type	/	24VDC	Power supply

Ex associated device with intrinsically safe field circuits

Output type

- **R** relay switching output
- **T** transistor switching output
- **I** analog current output 0/4…20 mA
- **U** analog voltage output 0/2…10 V
- **MT** MOSFET switching output
- **C** FDT/DTM parameterizable via computer
- **D** display
- **H** HART®

Power supply

- **24 VDC** supplied with 24 VDC
- **not specified** wide-range power supply
- **L** loop powered, supplied by the control circuit

Isolating switching amplifiers

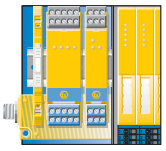
Isolating switching amplifiers of the IM series are approved for connection to intrinsically safe sensors acc. to EN 60947-5-6 (NAMUR) or mechanical contacts. Among the choices are single to four-channel devices, either with relay or transistor output. We also offer types with common alarm output and signal multiplier.

NO/NC mode as well as on/off switching of wire-break and short-circuit monitoring are separately adjustable via front panel switches. Operational readiness, switching status and errors are indicated by LEDs.

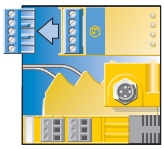
Features

- Single to four-channel isolating switching amplifiers for DIN rail mounting
- Galvanic separation of input circuits, output circuits and power supply
- Inputs for sensors acc. to EN 60947-5-6 (NAMUR) or mechanical contacts
- Relay, transistor or MOSFET switching outputs, changeover/NO
- Adjustable signal flow direction (NO/NC mode)
- ON/OFF switchable line monitoring (short-circuit, wire-break)
- SIL2
- Universal operating voltage
- Removable terminal blocks, reverse polarity protected

Properties



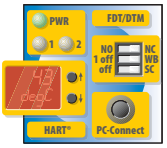
Housing styles
Modular housings, widths 18 mm or 27 mm, snapped on DIN rail or screwed on panel



Electrical connections
Screw or cage-clamp terminals, removable terminal blocks

I/O channels
1, 2, 3, 4-channel; intrinsically safe inputs; relay, transistor or MOSFET switching outputs

Approvals
ATEX, UL, FM, CSA, IECEx, GOST, SIL, NEPSI, TIIS



Operating mode/LEDs
Parametrized via DIP switch; operational readiness, switching status/errors indicated via LEDs

Special features
Approved for zone 2; common alarm output; signal multiplier

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

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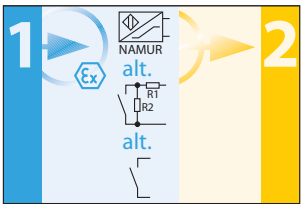
Isolating switching amplifier – 1-channel – 18 mm wide – Signal multiplier



General data

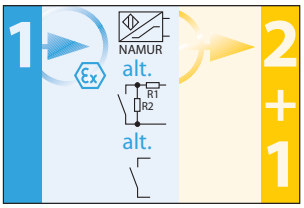
Operating voltage	20…250 VAC / 20…125 VDC	**Ambient temperature**	-25…+70 °C
Protection type	[Ex ia Ga] IIC; [Ex ia Da] IIIC	**Mounting instruction**	Mounting on DIN rail or mounting panel
Test voltage	2.5 kV	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Protection class	IP20	**Operating mode**	DIP switch
Power consumption	≤ 3 W		

NO/NC mode adjustable, input circuit monitoring of wire-break and short circuit (ON/OFF switchable)

Types and data – selection table

Type	Protection type	Output circuits	Switching current per output	Switching frequency	w	d
IM1-12EX-T	Ex nA [ic Gc] IIC/IIB T4	2 x transistor (potential-free, short-circuit protected)	≤ 50 mA	≤ 3000 Hz	w003	d001
IM1-12EX-MT	Ex nA [ic Gc] IIC/IIB T4	2 x MOSFET (potential-free, short-circuit protected)	≤ 90 mA	≤ 1000 Hz	w001	d001
IM1-12EX-R	Ex nA nC [ic Gc] IIC/IIB T4	2 x relays (NO)	≤ 2 A	≤ 10 Hz	w002	d001

Isolating switching amplifier – 1-channel – 18 mm wide – Common alarm output



General data

Operating voltage	20…250 VAC / 20…125 VDC	**Ambient temperature**	-25…+70 °C
Protection type	[Ex ia Ga] IIC; [Ex ia Da] IIIC	**Mounting instruction**	Mounting on DIN rail or mounting panel
Test voltage	2.5 kV	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Protection class	IP20	**Operating mode**	DIP switch
Power consumption	≤ 3 W		

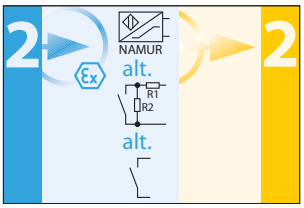
NO/NC mode adjustable, input circuit monitoring of wire-break and short circuit (ON/OFF switchable)

Types and data – selection table

Type	Protection type	Output circuits	Switching current per output	Switching frequency	w	d
IM1-121EX-R	Ex nA nC [ic Gc] IIC/IIB T4	2 x relays (NO)	≤ 2 A	≤ 10 Hz	w012	d001
IM1-121EX-T	Ex nA [ic Gc] IIC/IIB T4	2 x transistor (potential-free, short-circuit protected)	≤ 50 mA	≤ 3000 Hz	w013	d001

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Isolating switching amplifiers – 2-channel – 18 mm wide



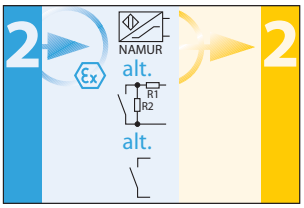
General data			
Operating voltage	20…250 VAC / 20…125 VDC	**Ambient temperature**	-25…+70 °C
Protection type	[Ex ia Ga] IIC; [Ex ia Da] IIIC	**Mounting instruction**	Mounting on DIN rail or mounting panel
Test voltage	2.5 kV	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Protection class	IP20	**Operating mode**	DIP switch
Power consumption	≤ 3 W		

NO/NC mode adjustable, input circuit monitoring of wire-break and short circuit (ON/OFF switchable)

Types and data – selection table

Type	Protection type	Output circuits	Switching current per output	Switching frequency	w	d
IM1-22EX-MT	Ex nA [ic Gc] IIC/IIB T4	2 x MOSFET (potential-free, short-circuit protected)	≤ 100 mA	≤ 1000 Hz	w004	d001
IM1-22EX-R	Ex nA nC [ic Gc] IIC/IIB T4	2 x relays (NO)	≤ 2 A	≤ 10 Hz	w005	d001
IM1-22EX-T	Ex nA [ic Gc] IIC/IIB T4	2 x transistor (potential-free, short-circuit protected)	≤ 50 mA	≤ 3000 Hz	w006	d001

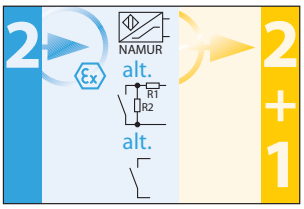
Isolating switching amplifiers – 2-channel – 18 mm wide – Signal multiplier



Type	IM12-22EX-R	**Protection class**	IP20
Operating voltage	20…250 VAC / 20…125 VDC	**Power consumption**	≤ 3 W
Protection type	[Ex ia Ga] IIC; [Ex ia Da] IIIC	**Ambient temperature**	-25…+70 °C
Protection type	Ex nA nC [ic Gc] IIC/IIB T4	**Mounting instruction**	Mounting on DIN rail or mounting panel
Output circuits	2 x relays (NO)	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Switching current per output	≤ 2 A	**Operating mode**	DIP switch
Switching frequency	≤ 10 Hz	**Wiring diagram**	w011
Test voltage	2.5 kV	**Dimension drawing**	d001

NO/NC mode adjustable

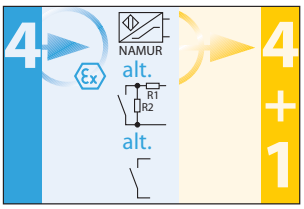
Isolating switching amplifiers – 2-channel – 27 mm wide – Common alarm output

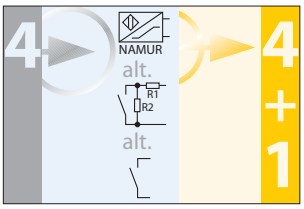


Type	IM1-231EX-R	**Protection class**	IP20
Operating voltage	20…250 VAC / 20…125 VDC	**Power consumption**	≤ 3 W
Protection type	[EEx ia] IIC	**Ambient temperature**	-25…+70 °C
Protection type	Ex nA nC [nL] IIC T4	**Mounting instruction**	Mounting on DIN rail or mounting panel
Output circuits	2 x relay (change-over)	**Electrical connection**	4 x 5-pole removable terminal blocks, reverse polarity protected, screw connection
Switching current per output	≤ 2 A	**Operating mode**	DIP switch
Switching frequency	≤ 10 Hz	**Wiring diagram**	w007
Test voltage	2.5 kV	**Dimension drawing**	d002

NO/NC mode adjustable, input circuit monitoring of wire-break and short circuit (ON/OFF switchable)

Isolating switching amplifiers – 4-channel – 27 mm wide





General data

Test voltage	2.5 kV	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection class	IP20	**Electrical connection**	4 x 5-pole removable terminal blocks, reverse polarity protected, screw connection
Power consumption	≤ 3 W	**Operating mode**	DIP switch
Ambient temperature	-25…+70 °C		

NO/NC mode adjustable, input circuit monitoring of wire-break and short circuit (ON/OFF switchable)

Types and data – selection table

Type	Operating voltage	Type of protection	Type of protection	Output circuits	Switching current per output	Switching frequency	w	d
IM1-451-R	20...250 VAC/ 20...250 VDC	-	-	5 x relays (NO)	≤ 2 A	≤ 10 Hz	w008	d002
IM1-451-T	20...250 VAC/ 20...250 VDC	-	-	5 x transistor (potential-free, short-circuit protected)	≤ 50 mA	≤ 3000 Hz	w009	d002
IM1-451EX-R	20...250 VAC/ 20...125 VDC	[EEx ia] IIC	Ex nA nC [nL] IIC T4	5 x relays (NO)	≤ 2 A	≤ 10 Hz	w010	d002
IM1-451EX-T	20...250 VAC/ 20...125 VDC	[EEx ia] IIC	Ex nA [nL] IIC T4	5 x transistor (potential-free, short-circuit protected)	≤ 50 mA	≤ 3000 Hz	w009	d002

w Wiring diagrams on page 92 ff
d Dimension drawings on page 102 ff

Rotation speed monitors / Pulse counters

The rotation speed monitors IM21-14…-CDTRI analyse and monitor for example pulse frequencies, revs and pulse trains of rotating motor parts, gears or turbines.

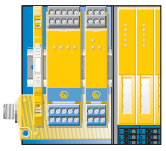
You can connect sensors acc. to EN 60947-5-6 (NAMUR) and 3-wire sensors or external signal sources to the non-Ex type. NAMUR sensors are monitored according to wire-break or short-circuit depending on the adjustment made. The current value is indicated on a display at the front.

The outputs are parametrized via push-buttons at the front or alternatively via FDT/DTM. The switching status of the corresponding output relay i.e. transistor is indicated by a yellow LED and operational readiness by a green LED.

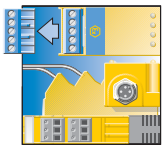
Features

- Single-channel rotation speed monitor/ frequency converter for DIN rail mounting
- Operating range 0.06 … 600000 min^{-1}
- Overrange and underrange monitoring of value and window limits
- Galvanic separation of input circuits, output circuits and power supply
- Control of sensors acc. to DIN EN 60947-5-6 (NAMUR)
- Line monitoring of wire-break/short-circuit
- 2 x relays, 1 x transistor output
- 1 x current output 0/4…20 mA
- Continuously switching output Ex nL IIC/IIB
- Universal operating voltage
- Removable terminal blocks, reverse polarity protected

Properties



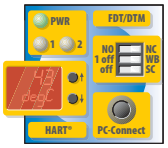
Housing styles
Modular housing, width 27 mm, snapped on DIN rail or screwed on panel



Electrical connections
Screw and cage-clamp terminals, removable terminal blocks

I/O channels
Single-channel; connection of sensors acc. to EN 60947-5-6; 2 x relays (NO), 1 x transistor, 1 x current output 0/4…20 mA, pulse output

Approvals
Ex type: ATEX, IECEx, FM, GOST, TIIS

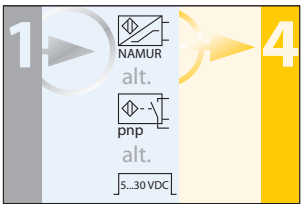


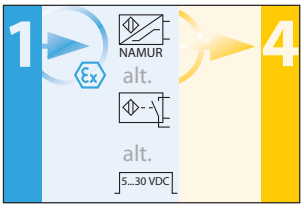
Operating mode/LEDs
Display; parametrized via FDT/DTM; with diagnostic function

Special features
Ex type: Approved for zone 2; ring buffer for 8000 measured values; pulse divider

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Rotation speed monitors – 1-channel – 27 mm wide – Display





General data

Output circuits	1 x transistor (potential-free, short-circuit protected), 2 x relays (NO)	**Protection class**	IP20
Switching current per output	2 A/50 mA	**Power consumption**	≤ 3 W
Switching frequency	≤ 10000 Hz	**Ambient temperature**	-25…+70 °C
Output current	0/4...20 mA	**Mounting instruction**	Mounting on DIN rail or mounting panel
Load resistance current output	≤ 0.6 kΩ	**Electrical connection**	4 x 5-pole removable terminal blocks, reverse polarity protected, screw connection
Fault current	0 / 22 mA adjustable	**Operating mode**	Teach button (display settings), parametrizable via PC, HART® protocol
Test voltage	2.5 kV		

Monitoring of rotation over/underspeed and window limits operating range 0.06 …600000/min. FDT/DTM programmable

Types and data – selection table

Type	Operating voltage	Protection type	Protection type	w	d
IM21-14-CDTRI	20…250 VAC / 20…250 VDC	-	-	w014	d002
IM21-14EX-CDTRI	20…250 VAC / 20…125 VDC	[Ex ia] IIC	Ex nA nC [nL] IIC/IIB T4	w015	d002

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Analog signal isolators – Input field side

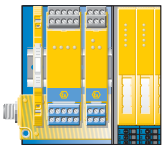
Standard active voltage or current signals are galvanically separated and transmitted from the Ex to the non-Ex area via the analog signal isolators IM31. We offer single and dual-channel devices with intrinsically safe input circuits 0/2…10 V resp. 0/4…20 mA and short-circuit proof output circuits 0/4…20 mA.

Two adjustments can be made via DIP switch at the front: Undamped 1:1 transmission of input signals or dead-zero signals (0…10 V resp. 0…20 mA) are output as live-zero signals (4…20 mA). Operational readiness is indicated by a green LED.

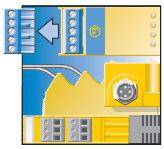
Features

- Analog signal isolators, single and dual-channel, intrinsically safe input circuits Ex ia
- Transmission of standard analog signals from the Ex to the non-Ex area
- Application area acc. to ATEX: II (1) G; II (1) D; II 3 G
- Galvanic separation of input circuits, output circuits and power supply
- Input circuit 0/2…10 V or 0/4…20 mA
- Output circuit 0/2…10 V or 0/4…20 mA
- Removable terminal blocks
- Universal operating voltage, reverse polarity protected

Properties



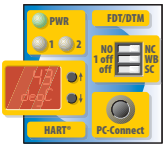
Housing styles
Modular housing, width 18 mm, snapped on DIN rail or screwed on panel



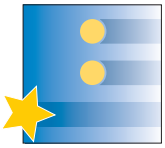
Electrical versions
Screw or cage-clamp terminals, removable terminal blocks

I/O channels
Single and dual-channel; intrinsically safe input, non-intrinsically safe output 0/2…10 V or 0…20 mA

Approvals
ATEX, UL, FM, IECEx, GOST



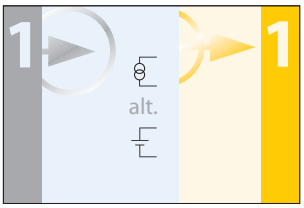
Operating mode/LEDs
Transmission behaviour adjustable via DIP switch: 1:1 / dead-zero / live-zero; operational readiness indicated by LED



Special features
Ex type: Approved for zone 2; signal multiplier

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

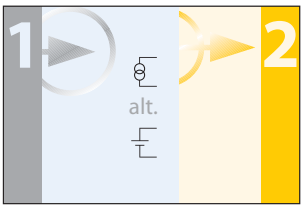
Analog signal isolator – 1-channel – 18 mm wide

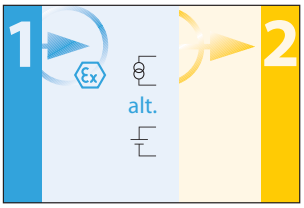


Type	IM31-11-I	**Protection class**	IP20
Operating voltage	20…250 VAC / 20…250 VDC	**Power consumption**	≤ 2.2 W
Analog input	0/4…20 mA; 0/2…10 V	**Ambient temperature**	-25…+70 °C
Input resistance (current)	50 Ω	**Mounting instruction**	Mounting on DIN rail or mounting panel
Input resistance (voltage)	50 Ω	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Output circuits	0/4...20 mA	**Operating mode**	DIP switch
Load resistance current output	≤ 0.5 kΩ	**Wiring diagram**	w020
Test voltage	2.5 kV	**Dimension drawing**	d001

Adjustable transmission behaviour: 1:1 transmission or dead-zero to live-zero conversion of signals

Analog signal isolator – 1-channel – 18 mm wide – Signal multiplier





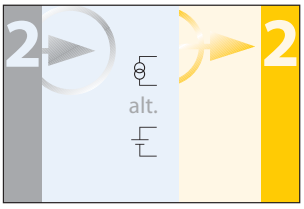
General data			
Analog input	0/4…20 mA; 0/2…10 V	**Protection class**	IP20
Input resistance (current)	50 Ω	**Power consumption**	≤ 2.2 W
Input resistance (voltage)	50 kΩ	**Ambient temperature**	-25…+70 °C
Output circuits	0/4...20 mA	**Mounting instruction**	Mounting on DIN rail or mounting panel
Load resistance current output	≤ 0.5 kΩ	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Test voltage	2.5 kV	**Operating mode**	DIP switch

Adjustable transmission behaviour: 1:1 transmission or dead-zero to live-zero conversion of signals

Types and data – selection table

Type	Operating voltage	Protection type	Protection type	w	d
IM31-12-I	20…250 VAC / 20…250 VDC	-	-	w022	d001
IM31-12EX-I	20…250 VAC / 20…125 VDC	[Ex ia Ga] IIC/IIB; [Ex ia Da] IIIC	Ex nA [ic Gc] IIC/IIB T4 Gc	w023	d001

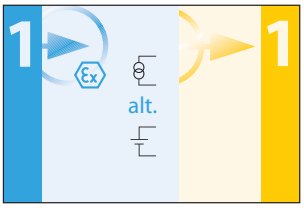
Analog signal isolator – 2-channel – 18 mm wide



Type	IM31-22-I	**Protection class**	IP20
Operating voltage	20…250 VAC / 20…250 VDC	**Power consumption**	≤ 2.2 W
Analog input	0/4…20 mA; 0/2…10 V	**Ambient temperature**	-25…+70 °C
Input resistance (current)	50 Ω	**Mounting instruction**	Mounting on DIN rail or mounting panel
Input resistance (voltage)	50 kΩ	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Output circuits	0/4...20 mA	**Operating mode**	DIP switch
Load resistance current output	≤ 0.5 kΩ	**Wiring diagram**	w021
Test voltage	2.5 kV	**Dimension drawing**	d001

Adjustable transmission behaviour: 1:1 transmission or dead-zero to live-zero conversion of signals

Analog signal isolator – 1-channel – 18 mm wide – Input field side intrinsically safe



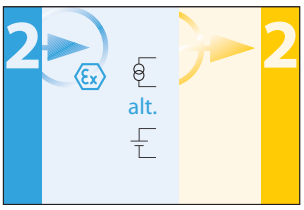
General data			
Operating voltage	20…250 VAC / 20…125 VDC	**Protection class**	IP20
Analog input	0/4…20 mA; 0/2…10 V	**Power consumption**	≤ 2.2 W
Input resistance (voltage)	50 kΩ	**Ambient temperature**	-25…+70 °C
Protection type	[Ex ia Ga] IIC/IIB; [Ex ia Da] IIIC	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	Ex nA [ic Gc] IIC/IIB T4 Gc	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Test voltage	2.5 kV	**Operating mode**	DIP switch

Adjustable transmission behaviour: 1:1 transmission or dead-zero to live-zero conversion of signals

Types and data – selection table

Type	Input resistance (current)	Output circuits	Load resistance current output	Load resistance voltage output	w	d
IM31-11EX-I	50 Ω	0/4...20 mA	≤ 0.5 kΩ	-	w016	d001
IM31-11EX-U	-	0/2...10 V	-	≥ 0.5 kΩ	w017	d001

Analog signal isolator – 2-channel – 18 mm wide – Input field side intrinsically safe



General data			
Operating voltage	20…250 VAC / 20…125 VDC	**Protection class**	IP20
Analog input	0/4…20 mA; 0/2…10 V	**Power consumption**	≤ 2.2 W
Input resistance (current)	50 Ω	**Ambient temperature**	-25…+70 °C
Input resistance (voltage)	50 kΩ	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	[Ex ia Ga] IIC/IIB; [Ex ia Da] IIIC	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Protection type	Ex nA [ic Gc] IIC/IIB T4 Gc	**Operating mode**	DIP switch
Test voltage	2.5 kV		

Adjustable transmission behaviour: 1:1 transmission or dead-zero to live-zero conversion of signals

Types and data – selection table

Type	Output circuits	Load resistance current output	Load resistance voltage output	w	d
IM31-22EX-I	0/4...20 mA	≤ 0.5 kΩ	-	w018	d001
IM31-22EX-U	0/2...10 V	-	≥ 0.5 kΩ	w019	d001

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Analog signal isolators IMS – width 6.2 mm

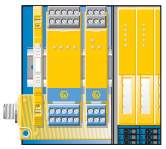
Galvanic isolation, signal conditioning and transmission in a slim 6.2 mm housing – these are the unique features provided by the IMS series for DIN rail mounting. The analog signal isolators galvanically separate and transmit standard active current signals. In addition to a dual-channel version for simple separation of signals without conditioning, we also offer a single-channel device with signal conditioning (dead-zero/live-zero).

Input and output signal (0/4…20 mA or 0…10 V) are adjusted via DIP switch. Galvanic separation of input, output and power supply is safe up to 1.5 kV for modules supplied with 24 VDC.

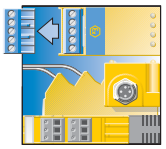
Features

- Analog signal isolator, single or dual-channel
- Modular housing, width 6.2 mm, for DIN rail mounting
- Dual-channel: Input 0/4…20 mA, output 0/4…20 mA, loop-powered
- Single-channel, adjustable: Input 0/4…20 mA / 0…10 V, Output 0/4…20 mA / 0…10 V
- Galvanic separation of input circuits, output circuits and power supply

Properties



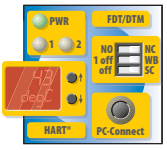
Housing styles
Modular housing, width 6.2 mm, snapped on DIN rail



Electrical versions
Screw terminals; terminal cross-section 2.5 mm ^{2}

I/O channels
Single or dual-channel; input and output 0/4…20 mA or 0…10 V

Approvals
UL

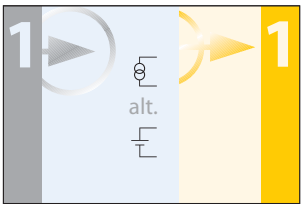


Operating mode/LEDs
Single-channel: Input/output parametrized via DIP switch; operational readiness indicated by LED

Special features
6.2 mm modular housing with high packing density

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

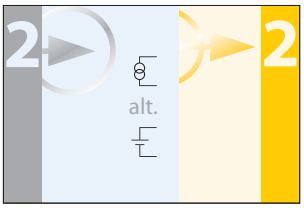
Analog signal isolator – 1-channel – 6.2 mm wide



Type	IMS-AI-UNI/24V	**Protection class**	IP20
Operating voltage	19…29 VDC	**Power consumption**	≤ 0.312 W
Analog input	0/4…20 mA; 0…10 V	**Ambient temperature**	-20…+60 °C
Input resistance (current)	100 Ω	**Mounting instruction**	Mounting on a DIN rail
Input resistance (voltage)	330 kΩ	**Electrical connection**	Screw terminals
Output circuits	0/4...20 mA / 0...10 V	**Operating mode**	DIP switch
Load resistance current output	≤ 0.4 kΩ	**Wiring diagram**	w024
Load resistance voltage output	≥ 1 kΩ	**Dimension drawing**	d003
Test voltage	1.5 kV		

Input and output signal types can be selected via a DIP switch matrix on the side.

Analog signal isolator – 2-channel – 6.2 mm wide



Type	IMS-AI-DLI-22-DLI/L	**Power consumption**	≤ 0.312 W
Voltage input	max. 29 VDC	**Ambient temperature**	-20…+60 °C
Input resistance (current)	100 Ω	**Mounting instruction**	Mounting on a DIN rail
Output circuits	0/4...20 mA	**Electrical connection**	Screw terminals
Load resistance current output	≤ 0.4 kΩ	**Operating mode**	DIP switch
Test voltage	1.5 kV	**Wiring diagram**	w025
Protection class	IP20	**Dimension drawing**	d003

The dual-channel analog signal isolator is loop-powered, making separate power supply redundant.

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Isolating transducers

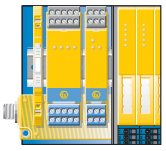
The single-channel HART® isolating transducers IM33 are used to operate intrinsically safe 2-wire HART® transducers in the Ex area and to transmit the intrinsically safe signals to the non-Ex area. Bidirectional transmission of analog and digital HART® communication signals is also possible. Alternatively, also active signals can be read in by 3 or 4-wire transmitters. Power supply max. 17 VDC.

The single and dual-channel devices features 0/4…20 mA input and output circuits. The input signals are transmitted 1:1 undamped to the outputs in the non-Ex area. Wire-break or short-circuit in the measuring transducer circuit are indicated as currents of 0 mA or > 22.5 mA. Operational readiness is indicated by a green LED.

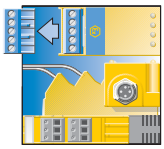
Features

- HART® isolating transducer, single and dual-channel, intrinsically safe input circuits Ex ia
- Power supply of 2-wire measuring transducers via HART® communication interface as well as connection to active 2-wire and passive 3-wire transmitters
- Power supply ≤ 17 VDC
- Application area acc. to ATEX: II (1) G; II (1) D; II 3G
- Galvanic separation of input circuits, output circuits and power supply
- Inputs and outputs 0/4…20 mA
- SIL 2
- Universal operating voltage
- Removable terminal blocks, reverse polarity protected

Properties



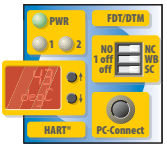
Housing styles
Modular housings, widths 18 mm or 27 mm, snapped on DIN rail or screwed on panel



Electrical versions
Screw or cage-clamp terminals, removable terminal blocks

I/O channels
Single and dual-channel; intrinsically safe inputs 0/4…20 mA; output 0/4…20 mA

Approvals
ATEX, UL, FM, IECEx, GOST, SIL

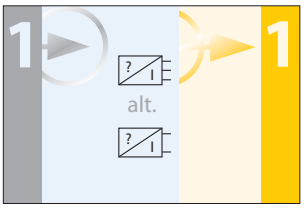


Operating mode/LEDs
Test sockets to connect a HART® handheld; operational readiness indicated by LED

Special features
HART® transmission, approved for zone 2

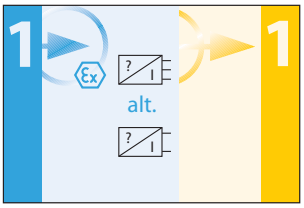
Internet link
To get all product information, just scan the QR code with a smartphone or webcam

HART® isolating transducer – 1-channel – 18 mm wide



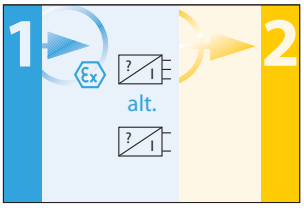
Type	IM33-11-HI/24VDC	**Protection class**	IP20
Operating voltage	19…29 VDC	**Power consumption**	≤ 2.2 W
Analog input	0/4…20 mA	**Ambient temperature**	-25…+70 °C
Supply voltage	≤17 V	**Mounting instruction**	Mounting on DIN rail or mounting panel
Input resistance (current)	250 Ω	**Electrical connection**	4 x 3-pole removable terminal blocks with test socket, reverse polarity protected, screw connection
Output circuits	0/4...20 mA	**Wiring diagram**	w031
Load resistance current output	≤ 0.5 kΩ	**Dimension drawing**	d004
Test voltage	2.5 kV		

Ex-HART® isolating transducer – 1-channel – 18 mm wide



Type	IM33-11EX-HI/24VDC	**Test voltage**	2.5 kV
Operating voltage	19…29 VDC	**Protection class**	IP20
Analog input	0/4…20 mA	**Power consumption**	≤ 2.2 W
Supply voltage	≤17 V	**Ambient temperature**	-25…+70 °C
Input resistance (current)	250 Ω	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	[EEx ia] IIC	**Electrical connection**	4 x 3-pole removable terminal blocks with test socket, reverse polarity protected, screw connection
Protection type	EEx nA nC [nL] IIC/IIB T4	**Wiring diagram**	w026
Output circuits	0/4...20 mA	**Dimension drawing**	d004
Load resistance current output	≤ 0.5 kΩ		

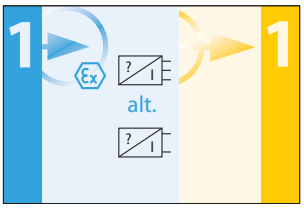
Ex-HART® isolating transducer – 18 mm wide – Signal multiplier

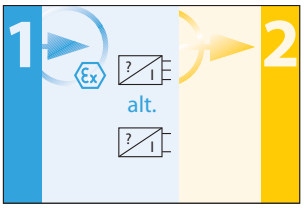


Type	IM33-12EX-HI/24VDC	**Test voltage**	2.5 kV
Operating voltage	19…29 VDC	**Protection class**	IP20
Analog input	0/4…20 mA	**Power consumption**	≤ 3.2 W
Supply voltage	≤17 V	**Ambient temperature**	-25…+70 °C
Input resistance (current)	250 Ω	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	[EEx ia] IIC	**Electrical connection**	4 x 3-pole removable terminal blocks with test socket, reverse polarity protected, screw connection
Protection type	EEx nA nC [nL] IIC/IIB T4	**Wiring diagram**	w034
Output circuits	0/4...20 mA	**Dimension drawing**	d004
Load resistance current output	≤ 0.5 kΩ		

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Ex-HART® isolating transducer – 1-channel – 27 mm wide





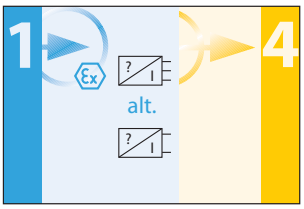
General data

Operating voltage	20…250 VAC / 20…125 VDC	**Load resistance current output**	≤ 0.5 kΩ
Analog input	0/4…20 mA	**Test voltage**	2.5 kV
Supply voltage	≤17 V	**Protection class**	IP20
Input resistance (current)	250 Ω	**Power consumption**	≤ 3 W
Protection type	[EEx ia] IIC	**Ambient temperature**	-25…+70 °C
Protection type	Ex [nL] nA IIC T4	**Mounting instruction**	Mounting on DIN rail or mounting panel
Output circuits	0/4...20 mA	**Electrical connection**	4 x 5-pole removable terminal blocks with test socket, reverse polarity protected, screw connection

Types and data – selection table

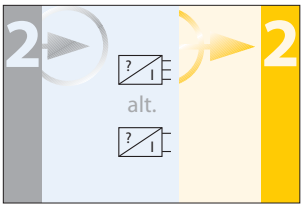
Type	w	d
IM33-11EX-HI	w027	d005
IM33-12EX-HI	w028	d005

Ex-HART® isolating transducer – 1-channel – 27 mm wide –Display



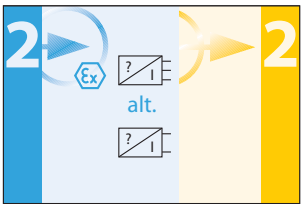
Type	IM33-14EX-CDRI	**Switching current per output**	≤ 6 A
Operating voltage	20…250 VAC / 20…125 VDC	**Test voltage**	2.5 kV
Analog input	0/4…20 mA; 0/2…10 V	**Protection class**	IP20
Supply voltage	≤17 V	**Power consumption**	≤ 3 W
Protection type	[EEx ia] IIC	**Ambient temperature**	-25…+70 °C
Protection type	EEx nA nC [nL] IIC/IIB T4 X	**Mounting instruction**	Mounting on DIN rail or mounting panel
Output circuits	0/4...20 mA	**Electrical connection**	4 x 5-pole removable terminal blocks, reverse polarity protected, screw connection
Fault current	0 / 22 mA adjustable	**Wiring diagram**	w033
Load resistance current output	≤ 0.5 kΩ	**Dimension drawing**	d002
Output circuits	3 x relays (NO)		

Ex-HART® isolating transducer – 2-channel – 18 mm wide



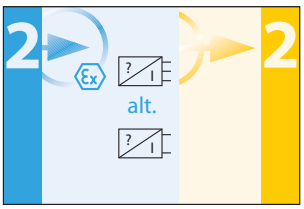
Type	IM33-22-HI/24VDC	**Protection class**	IP20
Operating voltage	19…29 VDC	**Power consumption**	≤ 3.2 W
Analog input	0/4…20 mA	**Ambient temperature**	-25…+70 °C
Supply voltage	≤17 V	**Mounting instruction**	Mounting on DIN rail or mounting panel
Input resistance (current)	250 Ω	**Electrical connection**	4 x 3-pole removable terminal blocks with test socket, reverse polarity protected, screw connection
Output circuits	0/4...20 mA	**Wiring diagram**	w029
Load resistance current output	≤ 0.5 kΩ	**Dimension drawing**	d004
Test voltage	2.5 kV		

Ex-HART® isolating transducer – 2-channel – 18 mm wide



Type	IM33-22EX-HI/24VDC	**Test voltage**	2.5 kV
Operating voltage	19…29 VDC	**Protection class**	IP20
Analog input	0/4…20 mA	**Power consumption**	≤ 3.2 W
Supply voltage	≤17 V	**Ambient temperature**	-25…+70 °C
Input resistance (current)	250 Ω	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	[EEx ia] IIC	**Electrical connection**	4 x 3-pole removable terminal blocks with test socket, reverse polarity protected, screw connection
Protection type	EEx nA nC [nL] IIC/IIB T4	**Wiring diagram**	w032
Output circuits	0/4...20 mA	**Dimension drawing**	d004
Load resistance current output	≤ 0.5 kΩ		

Ex-HART® isolating transducer – 2-channel – 27 mm wide



Type	IM33-22EX-HI	**Test voltage**	2.5 kV
Operating voltage	20…250 VAC / 20…125 VDC	**Protection class**	IP20
Analog input	0/4…20 mA	**Power consumption**	≤ 3 W
Supply voltage	≤17 V	**Ambient temperature**	-25…+70 °C
Input resistance (current)	250 Ω	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	[EEx ia] IIC	**Electrical connection**	4 x 5-pole removable terminal blocks with test socket, reverse polarity protected, screw connection
Protection type	Ex [nL] nA IIC T4	**Wiring diagram**	w030
Output circuits	0/4...20 mA	**Dimension drawing**	d005
Load resistance current output	≤ 0.5 kΩ		

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Temperature measuring amplifiers

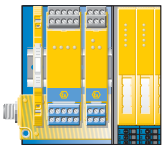
The IM34 temperature measuring amplifiers are designed to evaluate temperature-dependent changes of Ni100/ Pt100 resistors, thermocouples B, E, J, K, L, N, R, S, T or low voltage in a range of -160…+160 mV and to output them as temperature linear current signals. We also provide devices with an additional relay output for limit value monitoring. The devices are easily parametrized via PC and FDT/DTM.

The following adjustments can be made: 2, 3 or 4-wire technology, measuring range, wire-break monitoring, output behaviour in the event of input circuit faults, internal or external cold junction compensation, temperature unit and mode (resistance, thermocouple, low voltage and line compensation).

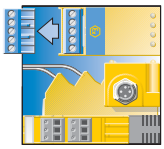
Features

- Temperature measuring amplifier, single-channel
- Input for Pt100/ Ni100 resistors in 2, 3 or 4-wire technology, variable resistors, thermocouples and millivolt signals
- Types with intrinsically safe input circuits Ex ia, approved for zone 2, additional limit value relay
- Current output 0/4…20 mA
- Galvanic separation of input circuits, output circuits and power supply
- Parametrized via PACTware™
- HART® transmission
- Removable terminal blocks
- Universal operating voltage, reverse polarity protected

Properties



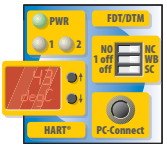
Housing styles
Modular housings, widths 18 mm or 27 mm, snapped on DIN rail or screwed on panel



Electrical versions
Screw or cage-clamp terminals, removable terminal blocks

I/O channels
Single-channel; Ni100/ Pt100, thermocouples, potentiometer or mV input; output 0/4…20 mA; limit value relay

Approvals
ATEX, UL, FM, IECEx, GOST

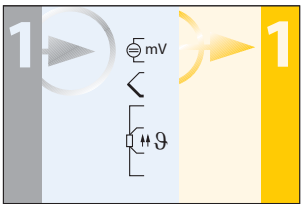


Operating mode/LEDs
Types with display, parametrized via FDT/ DTM; LEDs indicating operational readiness, switching status and errors

Special features
Approved for zone 2; ring buffer for 8000 measuring points (IM34-…CDRi)

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

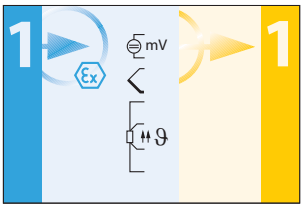
Temperature measuring amplifier – 1-channel – 18 mm wide



Type	IM34-11-CI	**Power consumption**	≤ 3 W
Operating voltage	19…29 VDC	**Ambient temperature**	-25…+70 °C
Output circuits	0/4...20 mA	**Mounting instruction**	Mounting on DIN rail or mounting panel
Fault current	0 / 22 mA adjustable	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Load resistance current output	≤ 0.6 kΩ	**Operating mode**	Parametrizable via PC, HART® protocol
Test voltage	2.5 kV	**Wiring diagram**	w038
Protection class	IP20	**Dimension drawing**	d001

Input for Pt100/ Ni100 resistors in 2, 3 or 4-wire technology, thermocouples and millivolt signals.

Ex-temperature measuring amplifier – 1-channel – 18 mm wide



General data			
Operating voltage	20…250 VAC / 20…125 VDC	**Test voltage**	2.5 kV
Protection type	[Ex ia Ga] IIC ; [Ex ia Da] IIIC ;	**Protection class**	IP20
Protection type	Devices with relay output Ex nA nC [nL] IIC/IIB T4; devices with transistor output Ex nA [nL] IIC/IIB T4	**Power consumption**	≤ 3 W
Output circuits	0/4...20 mA	**Ambient temperature**	-25…+70 °C
Fault current	0 / 22 mA adjustable	**Mounting instruction**	Mounting on DIN rail or mounting panel
Load resistance current output	≤ 0.6 kΩ	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection

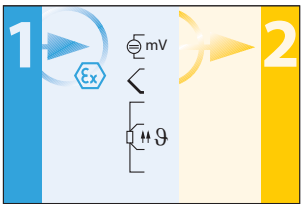
Input for Pt100/ Ni100 resistors in 2, 3 or 4-wire technology, thermocouples and millivolt signals.

Types and data – selection table

Type	Operating mode	w	d
IM34-11EX-CI	Parametrizable via PC, HART® protocol	w035	d001
IM34-11EX-I	Rotary coding switch	w036	d001

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Ex-temperature measuring amplifier – 1-channel – 18 mm wide – Signal multiplier



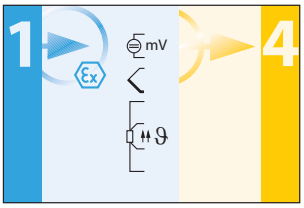
General data			
Operating voltage	20…250 VAC / 20…125 VDC	**Switching current per output**	≤ 2 A
Protection type	[Ex ia Ga] IIC ; [Ex ia Da] IIIC ;	**Test voltage**	2.5 kV
Protection type	Devices with relay output Ex nA nC [nL] IIC/IIB T4; devices with transistor output Ex nA [nL] IIC/IIB T4	**Protection class**	IP20
Output circuits	0/4...20 mA	**Power consumption**	≤ 3 W
Fault current	0 / 22 mA adjustable	**Ambient temperature**	-25…+70 °C
Load resistance current output	≤ 0.6 kΩ	**Mounting instruction**	Mounting on DIN rail or mounting panel
Output circuits	1 x relays (NO)	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection

Input for Pt100/ Ni100 resistors in 2, 3 or 4-wire technology, thermocouples and millivolt signals.

Types and data – selection table

Type	Operating mode	w	d
IM34-12EX-CRI	Parametrizable via PC, HART® protocol	w039	d001
IM34-12EX-RI	Rotary coding switch	w040	d001

Ex-temperature measuring amplifier – 1-channel – 27 mm wide – Display



Type	IM34-14EX-CDRI	**Protection class**	IP20
Operating voltage	20…250 VAC / 20…125 VDC	**Power consumption**	≤ 3 W
Protection type	[EEx ia] IIC	**Ambient temperature**	-25…+70 °C
Output circuits	0/4...20 mA	**Mounting instruction**	Mounting on DIN rail or mounting panel
Fault current	0 / 22 mA adjustable	**Electrical connection**	4 x 5-pole removable terminal blocks, reverse polarity protected, screw connection
Load resistance current output	≤ 0.6 kΩ	**Operating mode**	Teach button (display settings), parametrizable via PC, HART® protocol
Output circuits	1 x relays (NO)	**Wiring diagram**	w037
Switching current per output	≤ 2 A	**Dimension drawing**	d002
Test voltage	2.5 kV		

Input for Pt100/ Ni100 resistors in 2, 3 or 4-wire technology, variable resistors, thermocouples and millivolt signals

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Temperature measuring amplifier IMS – 6.2 mm

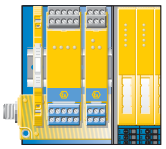
Galvanic isolation, signal conditioning and transmission in a slim 6.2 mm housing – these are the unique features provided by the IMS series for DIN rail mounting. A single-channel version is available for temperature measurement. Pt100 temperature probes in 2, 3 or 4-wire technology can be connected.

Measuring range (-50…+150 °C, 0 …+100 °C or 0…+200 °C) and output signal (0/4…20 mA or 0…10 V) are adjusted via DIP switch.

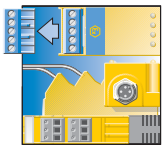
Features

- Temperature measuring amplifier, single-channel
- Modular housing, width 6.2 mm, for DIN rail mounting
- Input for Pt100
- Output signal 0/4…20 mA
- Output signal 0…10 V
- Galvanic separation of input circuits, output circuits and power supply

Properties



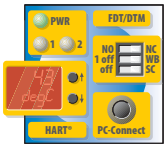
Housing styles
Modular housing, width 6.2 mm, snapped on DIN rail



Electrical connections
Screw terminals; terminal cross-section 2.5 mm²

I/O channels
Single-channel; input for Pt100 temperature probe; output 0/4…20 mA or 0…10 V

Approvals
UL

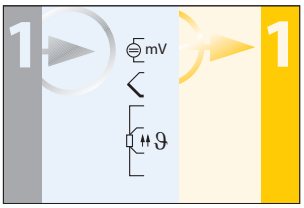


Operating mode/LEDs
Parametrized via DIP switch Pt100 temperature probe (2, 3 or 4-wire) and output type; operational readiness indicated by LED

Special features
6.2 mm modular housing with high packing density

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Temperature measuring amplifier – 1-channel – 6.2 mm wide



Type	IMS-TI-PT100/24V	**Power consumption**	≤ 0.32 W
Operating voltage	19…29 VDC	**Ambient temperature**	-20…+60 °C
Input resistance (voltage)	1000 kΩ	**Mounting instruction**	mounting on a DIN rail
Output circuits	0/4...20 mA / 0...10 V	**Electrical connection**	Screw terminals
Load resistance current output	≤ 0.4 kΩ	**Operating mode**	DIP switch
Load resistance voltage output	≥ 1kΩ	**Wiring diagram**	w041
Test voltage	1.5 kV	**Dimension drawing**	d003
Protection class	IP20		

Input for Pt100 in 2, 3 or 4-wire technology, connection mode and measuring range are adjusted via DIP switches at the front side.

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

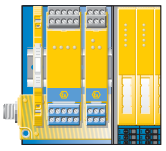
Analog signal isolators – Output field side intrinsically safe

Standard current signals are galvanically separated and transmitted (1:1) undamped via the IM35 signal isolator from the non-Ex to the Ex area. Bidirectional transmission of analog and digital HART® communication signals. Operational readiness indicated by LED. Typical applications are for example, the control of I/P converters (e.g. at control valves) or indicators in the Ex area. Handheld terminals can be connected to the inputs and outputs.

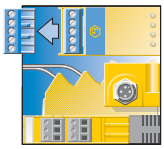
Features

- Analog signal isolator, single and dual-channel, intrinsically safe output circuits, DIN rail mounting
- Intelligent actuators supplied via HART® communication interface
- Application area acc. to ATEX: II (1) GD
- Galvanic separation of input circuits, output circuits and power supply
- Input circuit 0/4…20 mA
- Output circuit 0/4…20 mA, intrinsically safe
- SIL 2
- Universal operating voltage
- Removable terminal blocks, reverse polarity protected, 2 mm test socket

Properties



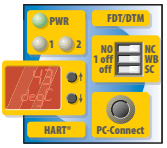
Housing styles
Modular housings, widths 18 mm and 27 mm, snapped on DIN rail or screwed on panel



Electrical connections
Screw or cage-clamp terminals, removable terminal blocks, 2 mm test socket

I/O channels
Single and dual-channel; input 0/4…20 mA; intrinsically safe output 0/4…20 mA

Approvals
ATEX, UL, FM, IECEx, GOST, SIL

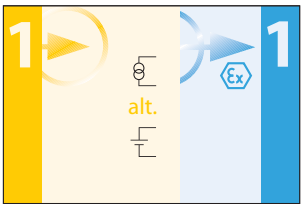


Operating mode/LEDs
Test sockets (2 mm) to connect a HART® handheld; operational readiness indicated by LED

Special features
Intelligent actuators supplied via HART® communication interface

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

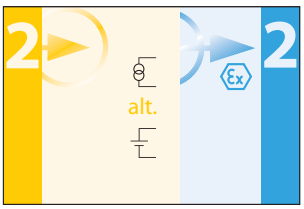
Analog signal isolator – 1-channel – 18 mm – Output field side intrinsically safe



Type	IM35-11EX-HI/24VDC	**Test voltage**	4.0 kV
Operating voltage	19…29 VDC	**Protection class**	IP20
Analog input	0/4…20 mA	**Power consumption**	≤ 2.2 W
Input resistance (current)	110 Ω	**Ambient temperature**	-25…+70 °C
Protection type	[Ex ia Ga] IIC; [Ex ia Da] IIIC	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	Ex nA [ic Gc] IIC T4 Gc	**Electrical connection**	4 x 3-pole removable terminal blocks with test socket, reverse polarity protected, screw connection
Output circuits	0/4...20 mA	**Wiring diagram**	w042
Load resistance current output	≤ 0.6 kΩ	**Dimension drawing**	d004

Intelligent actuators supplied via HART® communication interface

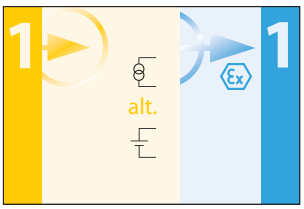
Analog signal isolator – 2-channel – 18 mm – Output field side intrinsically safe



Type	IM35-22EX-HI/24VDC	**Test voltage**	4.0 kV
Operating voltage	19…29 VDC	**Protection class**	IP20
Analog input	0/4…20 mA	**Power consumption**	≤ 2.2 W
Input resistance (current)	110 Ω	**Ambient temperature**	-25…+70 °C
Protection type	[Ex ia Ga] IIC; [Ex ia Da] IIIC	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	Ex nA [ic Gc] IIC T4 Gc	**Electrical connection**	4 x 3-pole removable terminal blocks with test socket, reverse polarity protected, screw connection
Output circuits	0/4...20 mA	**Wiring diagram**	w043
Load resistance current output	≤ 0.6 kΩ	**Dimension drawing**	d004

Intelligent actuators supplied via HART® communication interface

Analog signal isolator – 1-channel – 27 mm – Output field side intrinsically safe

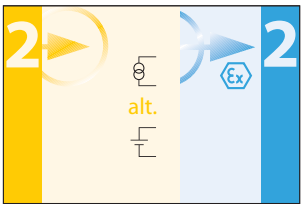


Type	IM35-11EX-HI	**Test voltage**	4.0 kV
Operating voltage	20…250 VAC / 20…125 VDC	**Protection class**	IP20
Analog input	0/4…20 mA	**Power consumption**	≤ 2 W
Input resistance (current)	110 Ω	**Ambient temperature**	-25…+70 °C
Protection type	G [Ex ia] IIC; D [Ex ia D]	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	Ex nA [nL] IIC/IIB T4 X	**Electrical connection**	4 x 5-pole removable terminal blocks with test socket, reverse polarity protected, screw connection
Output circuits	0/4...20 mA	**Wiring diagram**	w044
Load resistance current output	≤ 0.6 kΩ	**Dimension drawing**	d005

Intelligent actuators supplied via HART® communication interface

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Analog signal isolator – 2-channel – 27 mm – Output field side intrinsically safe



Type	IM35-22EX-HI	**Test voltage**	4.0 kV
Operating voltage	20…250 VAC / 20…125 VDC	**Protection class**	IP20
Analog input	0/4…20 mA	**Power consumption**	≤ 2.7 W
Input resistance (current)	110 Ω	**Ambient temperature**	-25…+70 °C
Protection type	G [Ex ia] IIC; D [Ex ia D]	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	Ex nA [nL] IIC/IIB T4 X	**Electrical connection**	4 x 5-pole removable terminal blocks with test socket, reverse polarity protected, screw connection
Output circuits	0/4...20 mA	**Wiring diagram**	w045
Load resistance current output	≤ 0.6 kΩ	**Dimension drawing**	d005

Intelligent actuators supplied via HART® communication interface

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Potentiometer amplifiers

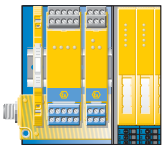
The single-channel potentiometer amplifiers of the IM36 series galvanically separate signals from 3-wire or 5-wire potentiometers and transfer them as standard analog signals from the Ex to the non-Ex area. The resistance value of the wiper contact, ranging from 0 Ω to the nominal resistance value (final value) of the potentiometer, is detected and processed linearly. Suitable for potentiometers with a nominal resistance of 800 and 20000 Ω.

Output circuit, input circuit and power supply are galvanically separated. Depending on the type, the devices are available either with current output 0…20 mA or voltage output 0…10 V. Operational readiness is indicated by a green LED.

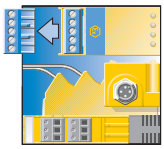
Features

- Potentiometer amplifier, single-channel, intrinsically safe input circuits Ex ia, for DIN rail mounting
- Transmission of potentiometer signals from the Ex area
- Application area acc. to ATEX: II (1) G
- Galvanic separation of input circuits, output circuits and power supply
- Nominal resistance of potentiometer: 800 Ω…20 kΩ
- Output circuit 0…20 mA or 0…10 V
- Universal operating voltage
- Removable terminal blocks, reverse polarity protected

Properties



Housing styles
Modular housing, width 18 mm, snapped on DIN rail or screwed on panel



Electrical connections
Screw or cage-clamp terminals, removable terminal blocks

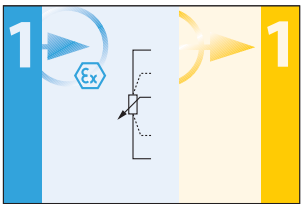
I/O channels
Single-channel, potentiometer input 800…20000 Ω, output 0…20 mA or 0…10 V

Approvals
ATEX, GOST

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Hans Turck GmbH & Co. KG ▪ Tel. +49 (208) 49 52-0 ▪ Fax +49 (208) 49 52-264

Potentiometer amplifier – 1-channel – 18 mm wide



General data

Operating voltage	19…29 VDC	**Power consumption**	≤ 2 W
Cable resistance	≤ 50 Ω	**Ambient temperature**	-25…+60 °C
Protection type	[EEx ia] IIC	**Mounting instruction**	Mounting on DIN rail or mounting panel
Test voltage	2.5 kV	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Protection class	IP20		

Connection of potentiometers in 3/5 wire technology

Types and data – selection table

Type	Output circuits	w	d
IM36-11EX-I/24VDC	0...20 mA	w046	d001
IM36-11EX-U/24VDC	0...10 V	w047	d001

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Limit value indicators

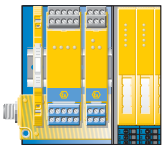
The single-channel limit value indicators of the IM43 series monitor current flows of 0/4…20 mA or voltage flows of 0/2…10 V. Alternatively, passive 2-wire or active 3-wire transmitters/sensors can be operated at the input. 3 relay outputs for limit value indication are available at the output. The IM43…Ri feature additionally a current output 0/4…20 mA. Limit values, signal flow direction and hysteresis can be adjusted via coded rotary switch, pushbutton or PC (FDT/DTM).

The universal isolating transducer IM43-14-CDRI features a two-line display. The setting of basic parameters is menu-driven using four pushbuttons. Further parametrization options are provided via the PC interface (FDT/DTM) or the current interface with HART® protocol.

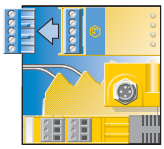
Features

- Limit value indicator, single-channel, DIN rail mounting
- Monitors three adjustable limit values of an analog input 0/4…20 mA or 0/2…10 V
- Power supply of passive 2-wire or active 3-wire transmitters/sensors
- Three relay outputs for limit value indication
- Current output 0/4…20 mA (IM43-…Ri)
- Galvanic separation of input circuits, output circuits and power supply
- Isolating transducer IM43-14-CDRi with display, parametrized via FDT/DTM or HART®transmissible current interface
- Removable terminal blocks
- Universal operating voltage, reverse polarity protected

Properties

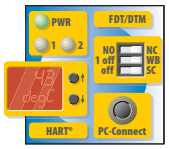


Housing styles
Modular housing, width 27 mm, snapped on DIN rail or screwed on panel

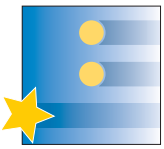


Electrical connections
Screw or cage-clamp terminals, removable terminal blocks

I/O channels
Single-channel; inputs 0/4…20 mA or 0/2…10 V or transmitters; outputs 3 x relays, 1 x 0/4…20 mA



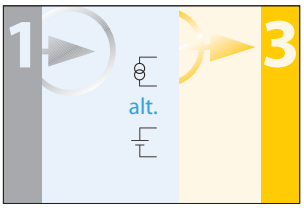
Operating mode/LEDs
Parametrized via coded rotary switch, push-button or PC (FDT/DTM); LEDs indicating operational readiness, switching status and errors

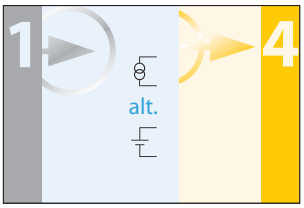


Special features
Ring buffer for 8000 measuring points; many diagnostic functions

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Limit value indicator – 1-channel – 27 mm wide



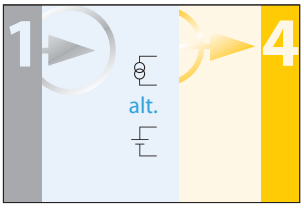


General data			
Operating voltage	20…250 VAC / 20…250 VDC	**Test voltage**	2.5 kV
Analog input	0/4…20 mA; 0/2…10 V	**Protection class**	IP20
Supply voltage	18 VDC	**Power consumption**	≤ 5 W
Input resistance (current)	50 Ω	**Ambient temperature**	-25…+70 °C
Input resistance (voltage)	50 kΩ	**Mounting instruction**	Mounting on DIN rail or mounting panel
Output circuits	3 x relays (NO)	**Electrical connection**	4 x 5-pole removable terminal blocks, reverse polarity protected, screw connection
Switching current per output	≤ 6 A		

Types and data – selection table

Type	Output circuits	Load resistance current output	Operating mode	w	d
IM43-14-SRI	0/4...20 mA	≤ 0.6 kΩ	Teach button	w048	d002
IM43-14-RI	0/4...20 mA	≤ 0.6 kΩ	Rotary coding switch	w049	d002
IM43-13-SR	-	-	Teach button	w048	d002
IM43-13-R	-	-	Rotary coding switch	w049	d002

Limit value indicator – 1-channel – 27 mm wide – Display



Type	IM43-14-CDRI	**Protection class**	IP20
Operating voltage	20…250 VAC / 20…250 VDC	**Power consumption**	≤ 3 W
Supply voltage	18 VDC	**Ambient temperature**	-25…+70 °C
Output circuits	0/4...20 mA	**Mounting instruction**	Mounting on DIN rail or mounting panel
Fault current	0 / 22 mA adjustable	**Electrical connection**	4 x 5-pole removable terminal blocks, reverse polarity protected, screw connection
Output circuits	3 x relays (NO)	**Operating mode**	Teach button (display settings), parametrizable via PC, HART® protocol
Switching current per output	≤ 6 A	**Wiring diagram**	w050
Test voltage	2.5 kV	**Dimension drawing**	d002

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Valve control modules

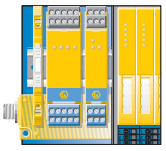
The solenoid drivers of the IM72-…EX/L series supply intrinsically safe, current/voltage limited power. Loads in the Ex area can thus be triggered directly. Within the scope of the European directive 94/9/EC (ATEX) connected loads can be operated in potentially explosive atmospheres caused by dust or gas, provided they comply with the applicable regulations.

Typical applications are the triggering of Ex i pilot valves as well as the supply of displays and transmitters. The output values of the single or dual-channel devices can be adjusted to the valves of different manufacturers. The loads are triggered when power is applied. The switching status of the related output is indicated by a yellow LED.

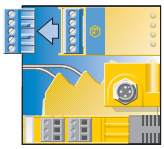
Features

- Solenoid drivers, single and dual-channel, intrinsically safe output circuits Ex ia
- Application area acc. to ATEX: II(1) GD
- Output voltage 13 VDC resp. 24 VDC
- Output current ≤ 40 mA
- Switching frequency ≤ 500 Hz
- SIL 3
- Loop-powered
- Galvanic separation of input and output circuits
- Removable terminal blocks, reverse polarity protected

Properties



Housing styles
Modular housing, width 18 mm, snapped on DIN rail or screwed on panel



Electrical connections
Screw or cage-clamp terminals, removable terminal blocks

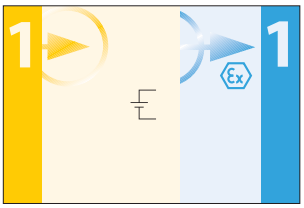
I/O channels
Single and dual-channel; intrinsically safe output circuits; input 19…30 V, output 24 V / 40 mA or 13 V / 28 mA

Approvals
ATEX, UL, FM, IECEx, GOST, SIL

Special features
Loop-powered

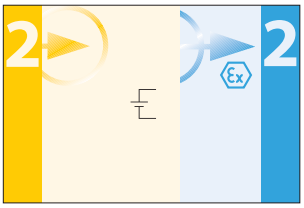
Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Valve control module – 1-channel – 18 mm wide



Type	IM72-11EX/L	**Protection class**	IP20
Voltage supply	Loop-powered	**Power consumption**	≤ 1.5 W
Current input	45 mA	**Ambient temperature**	-25…+60 °C
ON/OFF signal	0…5 / 19…30 VDC	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	[EEx ia] IIC	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Protection type	Ex nA [nL] IIC/IIB T4	**Wiring diagram**	w051
Output circuits	40 mA / U1=24 V 28 mA / U2=13 V	**Dimension drawing**	d001
Test voltage	2.5 kV		

Valve control module – 2-channel – 18 mm wide



Type	IM72-22EX/L	**Protection class**	IP20
Voltage supply	Loop-powered	**Power consumption**	≤ 2.2 W
Current input	45 mA	**Ambient temperature**	-25…+60 °C
ON/OFF signal	0…5 / 19…30 VDC	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	[EEx ia] IIC	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Protection type	Ex nA [nL] IIC/IIB T4	**Wiring diagram**	w052
Output circuits	40 mA / U1=24 V 28 mA / U2=13 V	**Dimension drawing**	d001
Test voltage	2.5 kV		

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Relay couplers

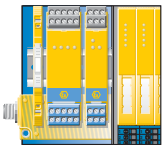
The IM73-12-R/… are single-channel relay couplers used as coupling modules for safe galvanic separation of binary signals. 2 synchronous controlled relays, each with 1 changeover contact are provided at the output. A yellow LED indicates the switching status of the output.

The relay coupler IM73-22Ex-R/24VUC is designed to switch intrinsically safe and current limited circuits and ensures safe galvanic isolation between contact and control circuit. The switching frequency is 50 Hz and thus much higher than that of standard relays. The reed relays with rhodium contacts are also suited for general control tasks. They are applied when standard relays reach their limits in terms of switching frequency and admissible contact ratings. The switching status is indicated via LEDs at the front.

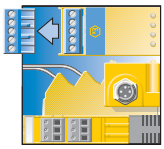
Features

- Coupling devices, single and dual-channel, DIN rail mounting
- Two relay outputs each with a changeover contact
- Input types 24 VDC, 230 VAC and 2 x 10…30 VUC
- Devices with galvanically separated contact and control circuit according to EN 60079-11
- SIL 3
- Removable terminal blocks, reverse polarity protected

Properties



Housing styles
Modular housing, width 18 mm, snapped on DIN rail or screwed on panel



Electrical connections
Screw or cage-clamp terminals, removable terminal blocks

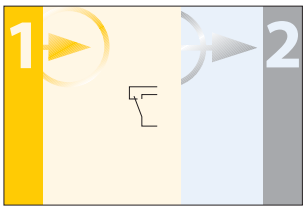
I/O channels
Single and dual-channel; inputs 24 VDC, 230 VAC, 10…30 VUC; relay outputs (change-over)

Approvals
ATEX, GOST

Special features
Approved for zone 2; SIL 3, reed relay with rhodium-plated pins

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Relay coupler – 1-channel – 18 mm wide



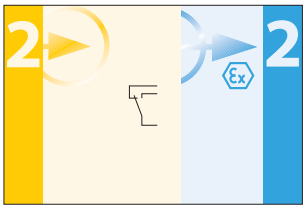
General data

Output circuits (digital)	2 x relay (changeover)	**Protection class**	IP20
Switching current per output	≤ 5 A	**Ambient temperature**	-25…+70 °C
Switching frequency	≤ 5 Hz	**Mounting instruction**	Mounting on DIN rail or mounting panel
Test voltage	2.5 kV	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection

Types and data – selection table

Type	Operating voltage	Voltage input	Voltage input	Current input	w	d
IM73-12-R/230VAC	184…276 VAC	-	184...276 VAC	15 mA	w053	d001
IM73-12-R/24VUC	19…29 VDC	19…29 VUC	-	25 mA	w054	d001

Ex relay coupler – 2-channel – 18 mm wide



Type	IM73-22Ex-R/24VUC	**Test voltage**	1.5 kV
Operating voltage	10…30 VDC	**Protection class**	IP20
Voltage input	10…30 VUC	**Ambient temperature**	-25…+70 °C
Current input	30 mA	**Mounting instruction**	Mounting on DIN rail or mounting panel
Protection type	[EEx ia] IIC	**Electrical connection**	4 x 3-pole removable terminal blocks, reverse polarity protected, screw connection
Output circuits (digital)	2 x relay (changeover)	**Wiring diagram**	w055
Switching current per output	≤ 240 mA	**Dimension drawing**	d001

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Power supplies

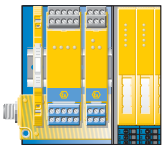
The IM82 is designed for DC loads. The power supply unit switches and monitors devices of the TURCK IM, IME, IMC and IMB series. It provides 24 VDC output voltage and 1.4/5 A output current depending on the type. It also provides safety extra-low voltage (SELV) acc. to EN 60950.

The IM82 is temperature-resistant up to 70 °C, overload resistive, features a power-good relay and is internationally approved.

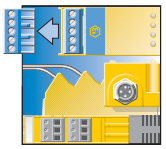
Features

- Power supply, DIN rail mounting
- Output voltage 24 VDC
- Output current 1.4 A / 5 A
- Overload protection
- Power-good relay and LED error indication (type 2414)
- Dynamic overload protection and high-temperature resistance (T_u to 70 °C) (Type 2450)
- Universal operating voltage
- Removable terminal blocks, reverse polarity protected

Properties



Housing styles
Modular housings, widths 18 mm or 66 mm, snapped on DIN rail or screwed on panel



Electrical connections
Screw or cage-clamp terminals, removable terminal blocks

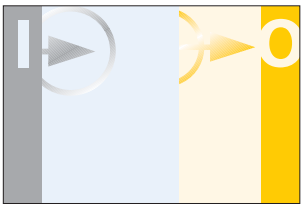
I/O channels
Output voltage 24 VDC, output current 1400 mA/ 5000 mA; power-good relay

Approvals
UL

Special features
Small-sized design with optimized ventilation, high efficiency

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

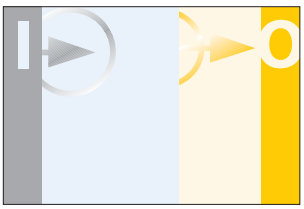
Power supply – 1-channel – 18 mm wide



Type	IM82-2414/94-265VAC	**Power consumption**	≤ 40 W
Operating voltage	94…265 VAC	**Ambient temperature**	-25…+70 °C
Output current	1400 mA	**Mounting instruction**	Mounting on DIN rail or mounting panel
Output circuits (digital)	1 x relay (changeover)	**Electrical connection**	4 x 5-pole removable terminal blocks with test socket, reverse polarity protected, screw connection
Switching current per output	≤ 2 A	**Wiring diagram**	w056
Test voltage	3.0 kV	**Dimension drawing**	d005
Protection class	IP20		

The IM82 power supply is designed for DC loads, especially for switching and monitoring devices of the TURCK interface module series IM, IME, IMC and IMB.

Power supply – 1-channel – 66 mm wide



Type	IM82-2450-PS	**Ambient temperature**	-10…+70 °C
Operating voltage	85…264 VAC / 100…375 VDC	**Mounting instruction**	Mounting on DIN rail or mounting panel
Output current	5000 mA	**Electrical connection**	Screw terminals
Test voltage	3.0 kV	**Wiring diagram**	w057
Protection class	IP20	**Dimension drawing**	d006

The IM82 power supply is designed for DC loads, especially for switching and monitoring devices of the TURCK interface module series IM, IME, IMC and IMB.

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Hans Turck GmbH & Co. KG ▪ Tel. +49 (2 08) 49 52-0 ▪ Fax +49 (208) 49 52-264

IMB – Interface module backplane

IMB – Interface technology for backplane mounting with system cable

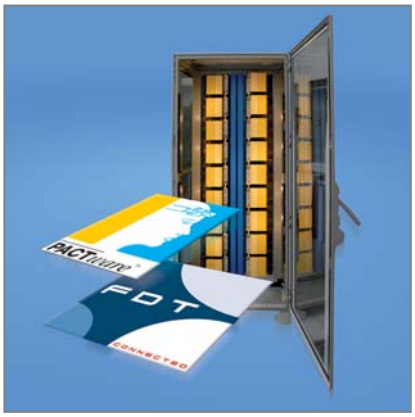
The IMB system from TURCK is an easy-to-install I/O solution for the cabinet. It offers a high packing density which cannot be achieved with DIN rail interfaces. The 176 x 210 mm IMB backplane can host up to eight interface cards, resulting into 32 digital or 16 analog I/Os per backplane. The interface cards are connected to the PLC via assigned slots on the backplane and a standard network connection. All cards are hot-swappable and can be plugged and unplugged during operation. Power can be supplied redundantly; decoupling takes place on the IMB cards. The backplane accommodates the entire connection level; galvanic as well as Ex separation of the I/O channels is achieved simply by plugging the interface cards in the corresponding slots. This helps you to cut down engineering efforts for the entire interface level in the event of maintenance and future extension of the system. HART® transmissible analog cards and DTM parametrizable temperature measuring amplifiers simplify parametrization and enhance the operating comfort.

Our strengths – Your advantages

Compact design, many mounting options

The 176 x 210 mm IMB backplane can host up to eight interface cards, resulting into 32 digital or 16 analog I/Os per backplane. A standard cabinet equipped on both sides thus accommodates up to 1152 digital or 576 analog channels. The backplane is snapped on a DIN rail with an adapter acc. to DIN EN 60715 TH35.

The adapter can be mounted in different ways, allowing the IMB system to be installed horizontally or vertically on the DIN rail. The backplanes can also be mounted side by side to accommodate several IMB systems.



Simple operation with FDT/DTM

HART® transmissible analog cards and DTM parametrizable temperature measuring amplifiers round-off the IMB solution and simplify parametrization. The IMB cards are easily and conveniently set up using free FDT/DTM-based engineering tools. This applies to simple parametrization, complex diagnostic functions as well as to commissioning. The IMB temperature measuring amplifiers are parametrizable via jack plug and also HART® protocol.

Passive backplane

The backplane is a purely passive unit and is used as a patch panel for I/O solutions. There are no active components on it, because any failure of these would lead to a complete outage of the isolation level. Each individual interface card is also protected, ensuring the functionality of the isolation level, even if single channels may fail.

advantages

Premoulded system cables for connection to the control system.

The IMB backplane is equipped with a standard system connection for connecting to the DCS system. The pin configuration of the analog and digital system connections is adapted to the connected control system. This therefore eliminates the need for special connection modules. You can use prefabricated and reasonably priced analog and digital system cables for the most common control systems. This means you not only benefit from the reduced stock requirement but also from the considerably reduced installation and maintenance required on the interface level.

Redundant power supply

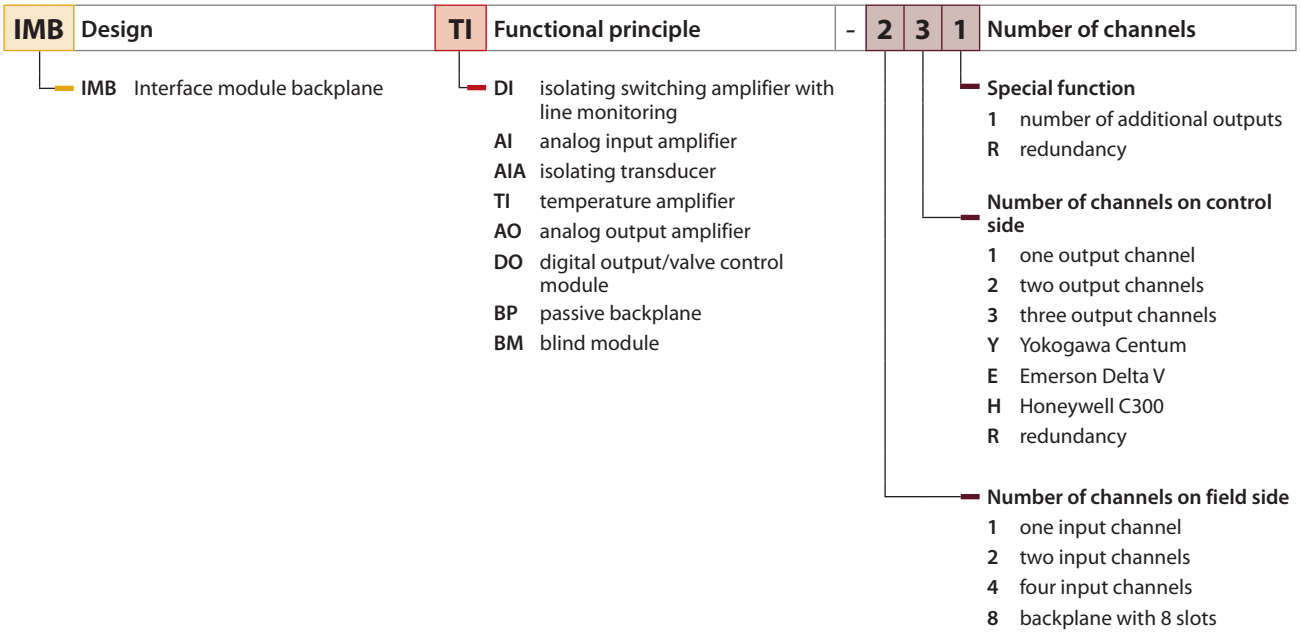
The IMB can be supplied redundantly via two separate power units. The electronics on the cards ensures the separation of the power supply units. Two removable terminal blocks on the backplane are intended for power supply.

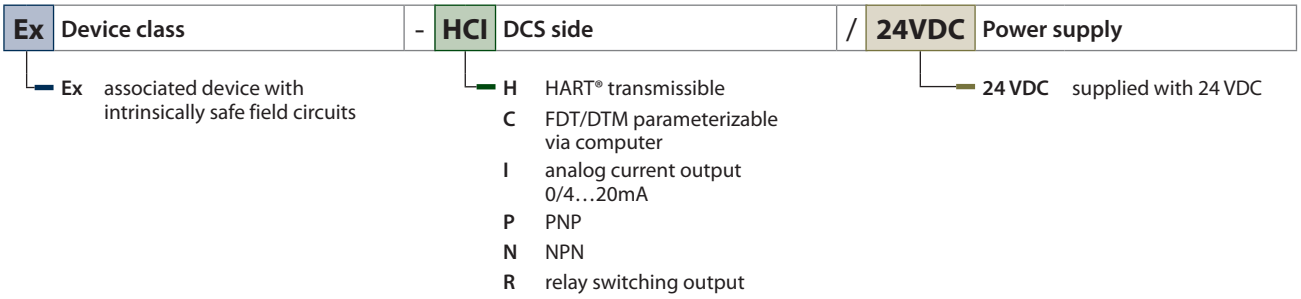
Hot-swappable cards

The IMB system not only operates with a high level of fail-safety and economy, it is also easy to handle: The backplane accommodates the entire connection level, and the I/O channels are galvanically separated when the interface cards are plugged in. The engineering required for the interface level is thus considerably reduced – during maintenance and with planned extension of the system. The intrinsically safe screw and cage-clamp terminals are easily accessible. The color-coded and spatially separated system connections effectively prevent connection errors and allow convenient hot swapping in the control cabinet.

Type code

IMB TI - 2 3 1 Ex - HCI / 24VDC




Ex
Device class
-
HCI
DCS side
/
24VDC
Power supply
Ex associated device with intrinsically safe field circuits
H HART® transmissible
C FDT/DTM parameterizable via computer
I analog current output 0/4…20mA
P PNP
N NPN
R relay switching output
24 VDC supplied with 24 VDC

Interface module backplane – Backplane

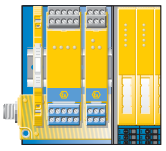
Up to eight interface cards have space on the 176 x 210 mm IMB backplane, resulting in 32 digital or 16 analog inputs and outputs per backplane. The backplane also hosts the connections for inputs, outputs, system cable and power supply. The intrinsically safe field circuits are connected via screw terminals; the control system is connected via prefabricated system cables. The IMB backplane can be supplied redundantly via two independent power supply units.

The backplane is a purely passive unit, and is used as a patch panel for I/O solutions. There are no active components on it, because any failure of these would lead to a complete outage of the separation level. The I/O channels are galvanically separated by the interface cards.

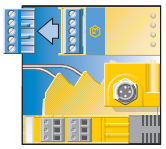
Features

- Module rack for the IMB system
- Snapped on DIN rail or screwed on panel.
- No active electronic components, no approval required
- High packing density; up to 32 channels per backplane and up to 36 backplanes per control cabinet
- Simple and convenient maintenance thanks to hot-swappable cards
- Premoulded, inexpensive cables for system connection: The pin configuration is customized to the corresponding control system.
- Integrated concept of redundancy
- Connection of a HART® multiplexer to parametrize intelligent HART® field devices

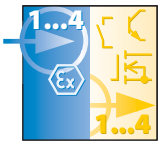
Properties



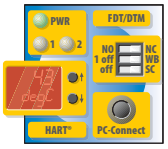
Housing styles
Backplane 176 x 210 mm; snapped on DIN rail or screwed on panel



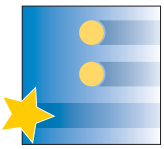
Electrical connections
Screw terminals for intrinsically safe field circuits; premoulded system cables for connection of the control system.



I/O channels
8 slots for interface cards; up 32 digital or 16 analog I/Os per backplane



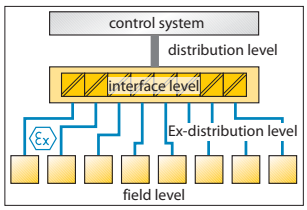
Operating mode/LEDs
Parametrized via FDT/DTM; HART® transmission; function control of I/O level via LEDs on interface cards



Special features
Inexpensive channels; DIN rail solution for fully equipped cabinets; hot-swappable cards

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Backplane – module racks – 8 slots



General data

Protection class IP20

Ambient temperature -25…+70 °C

Mounting instruction Mounting on DIN rail or mounting panel

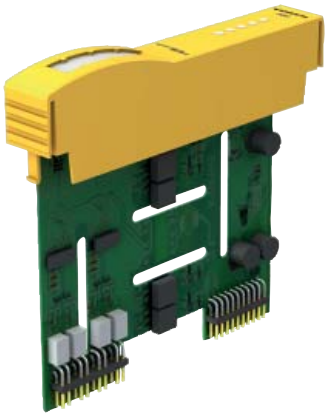
Types and data – selection table

Type	Control system	w	d
IMB-BP-8-Y-R	Yokogawa Centum	w058	d007
IMB-BP-8-E	Emerson Delta V	w058	d008
IMB-BP-8-H-IN	Honeywell C300 input signals	w058	d009
IMB-BP-8-H-OUT	Honeywell C300 output signals	w058	d009

w Wiring diagrams on page 92 ff

d Dimension drawings on page 102 ff

Isolating switching amplifiers



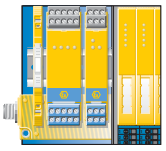
The four-channel isolating switching amplifiers of the IMB series feature intrinsically safe input circuits and transmit binary switching states galvanically separated. Sensors according to EN 60947-5-6 (NAMUR) or potential-free contacts can be connected to the device. Each of the output circuits feature a PNP and short-circuit proof transistor output as well as a common alarm output, depending on the device type.

A green LED indicates operational readiness, yellow LEDs indicate the switching status of the individual channels. The alarm status provided via the IMB module remains active until all slots of the IMB system are assigned and protection rating IP20 is ensured. Also available are dummy modules for the free slots.

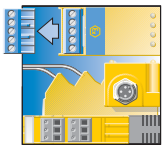
Features

- Four-channel isolating switching amplifiers (interface card) for the IMB system
- Galvanic separation of input and output circuits
- Intrinsically safe input circuits Ex ia for sensors acc. to EN 60947-5-6 (NAMUR) or mechanical contacts
- Application area acc. to ATEX: II (1) G, II (1) D
- Four transistor outputs, PNP, short-circuit proof
- SIL 2
- Input circuit monitoring of wire-break and short-circuit
- Common alarm output

Properties



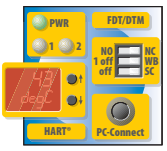
Housing styles
Interface card for IMB backplane system, 118 x 18 x 103 mm



Electrical connections
Connection to field circuits, control system and power supply via IMB backplane

I/O channels
Four-channel; intrinsically safe inputs; PNP, short-circuit proof transistor outputs

Approvals
ATEX, IECEx, SIL

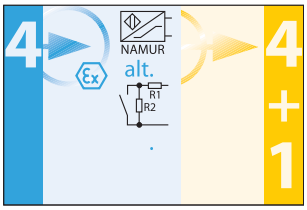


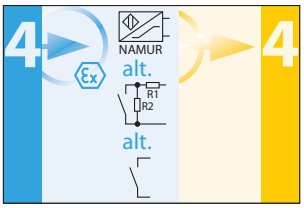
Operating mode/LEDs
Operational readiness and status indicated by LEDs

Special features
Common alarm output; coding keys protect against false plugging of interface cards

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Isolating switching amplifier – 4-channel





General data

Operating voltage	20…30 VDC	**Protection class**	IP20
Protection type	[Ex ia Ga] IIC; [Ex ia Da] IIIC	**Power consumption**	≤ 2 W
Switching voltage	20 V ± 3 %		
Switching current per output	≤ 3 mA	**Ambient temperature**	-25…+70 °C
Switching frequency	≤ 2000 Hz	**Mounting instruction**	Mounting and operation only in conjunction with the IMB backplane
Test voltage	2.5 kV		

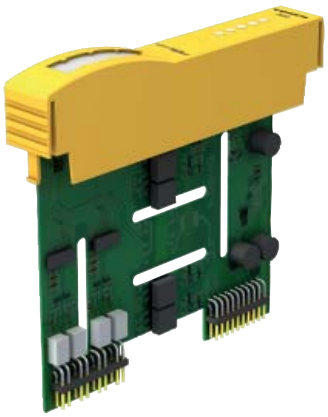
Types and data – selection table

Type	Output circuits	w	d
IMB-DI-451EX-P/24VDC	4 x transistors (PNP, short-circuit proof), 1 x alarm output	w059	d010
IMB-DI-44EX-P/24VDC	4 x transistors (PNP, short-circuit proof)	w060	d010

w Wiring diagrams on page 92 ff

d Dimension drawings on page 102 ff

Analog signal isolator – Input field side intrinsically safe



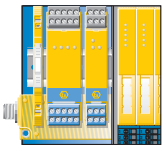
The dual-channel analog signal isolator IMB-AI-22Ex-Hi/24VDC galvanically separates and transmits active current signals from the Ex area to the non-Ex area. Each channel is assigned a current input and output of 0…20 mA. The input signals are transmitted without damping to the outputs in the non-Ex area. Operational readiness indicated by a green LED.

The alarm status provided via the IMB module remains active until all slots of the IMB system are assigned and so that degree of protection IP20 is ensured. Also available are dummy modules for the free slots.

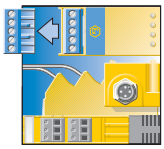
Features

- Dual-channel analog signal isolator (interface card) for the IMB system
- Transmission of active, intrinsically safe input signals
- Intrinsically safe input circuits Ex ia
- Application area acc. to ATEX: II (1) G, II (1) D
- Input circuit 0…20 mA
- Output circuit 0…20 mA, short-circuit protected
- Galvanic separation of input and output circuits
- SIL 3
- HART® transmissible

Properties



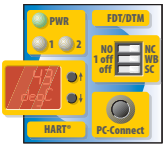
Housing styles
Interface card for IMB backplane system, 118 x 18 x 103 mm



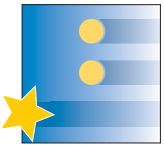
Electrical connections
Connection to field circuits, control system and power supply via IMB backplane

I/O channels
Dual-channel; intrinsically safe input 0…20 mA; short-circuit proof output 0…20 mA

Approvals
ATEX, IECEx, SIL



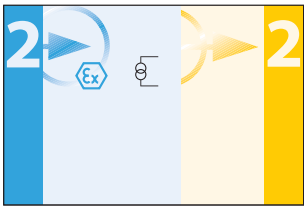
Operating mode/LEDs
Operational readiness indicated by LEDs



Special features
Common alarm output; coding keys protect against false plugging of interface cards

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

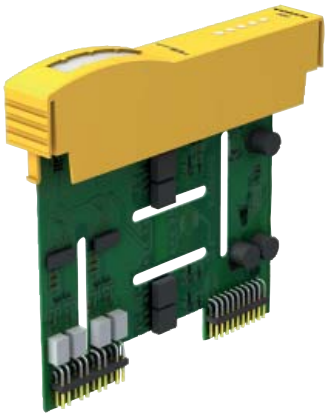
Analog signal isolator – 2-channel – Input field side intrinsically safe



Type	IMB-AI-22EX-HI/24VDC	**Protection class**	IP20
Operating voltage	20…30 VDC	**Power consumption**	≤ 1.2 W
Analog input	0 … 20 mA	**Ambient temperature**	-25…+70 °C
Protection type	[Ex ia Ga] IIC; [Ex ia Da] IIIC	**Mounting instruction**	Mounting and operation only in conjunction with the IMB backplane
Output current	0...20 mA	**Wiring diagram**	w061
Load resistance current output	≤ 0.7kΩ	**Dimension drawing**	d010
Test voltage	2.5 kV		

w Wiring diagrams on page 92 ff
d Dimension drawings on page 102 ff

Isolating transducers



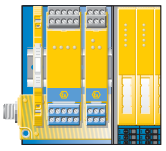
The dual-channel HART® isolating transducer IMB-AIA-22Ex-Hi/24VDC operates intrinsically safe 2-wire HART® transducers in the Ex area and transmits the measured signals 1:1 to the non-Ex area. Bidirectional transmission of analog and digital HART® communication signals is possible.

Each channel is assigned a current input and output, 4…20 mA. Due to the 1:1 transmission behaviour, wire-breaks are indicated with < 3.6 mA and short-circuits with > 21 mA. Operational readiness is indicated by a green LED. The alarm status provided via the IMB module remains active until all slots of the IMB system are assigned so that degree of protection IP20 is ensured. Also available are dummy modules for the free slots.

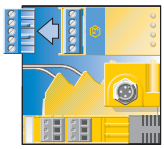
Features

- Dual-channel HART® isolating transducer (interface card) for the IMB system
- Supply of transmitters in the Ex area and transmission of intrinsically safe signals
- Intrinsically safe input circuits Ex ia
- Application area acc. to ATEX: II (1) G, II (1) D
- Input circuit 4…20 mA
- Output circuit 4…20 mA, short-circuit protected
- Galvanic separation of input and output circuits
- SIL 2
- HART® transmissible
- Alarm output

Properties



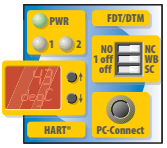
Housing styles
Interface card for IMB backplane system, 118 x 18 x 103 mm



Electrical connections
Connection to field circuits, control system and power supply via IMB backplane

I/O channels
Dual-channel; intrinsically safe input 4…20 mA; output 4…20 mA; alarm output

Approvals
ATEX, IECEx, SIL

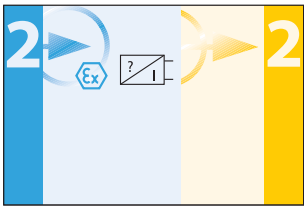


Operating mode/LEDs
Operational readiness indicated by LEDs

Special features
Common alarm output; coding keys protect against false plugging of interface cards

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

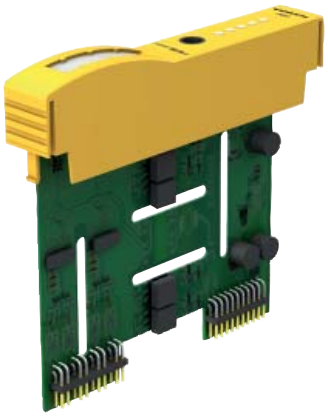
Isolating transducer – 2-channel



Type	IMB-AIA-22EX-HI/24VDC	**Test voltage**	2.5 kV
Operating voltage	20…30 VDC	**Protection class**	IP20
Supply voltage	≥13 V	**Power consumption**	≤ 2.1 W
Analog input	4 … 20 mA	**Ambient temperature**	-25…+70 °C
Protection type	[Ex ia Ga] IIB/IIC ; [Ex ia Da] IIIC	**Mounting instruction**	Mounting and operation only in conjunction with the IMB backplane
Output current	4...20 mA	**Wiring diagram**	w062
Load resistance current output	≤ 0.5 kΩ	**Dimension drawing**	d010

Wiring diagrams on page 92 ff
Dimension drawings on page 102 ff

Temperature measuring amplifiers



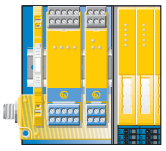
The dual-channel temperature measuring amplifiers of the IMB series are designed to evaluate the temperature-dependent changes of Ni100/Pt100, resistors, thermocouples, RTDs, low voltage and potentiometers and to output them as temperature linear current signals of 0/4…20 mA. A green LED indicates operational readiness; yellow LEDs indicate the switching status of the individual channels.

The devices are parametrized and configured via FDT/DTM. They can also be parametrized via the current interface (HART® protocol). The alarm status provided via the IMB module remains active until all slots of the IMB system are assigned so that degree of protection IP20 is ensured. Also available are dummy modules for the free slots.

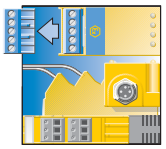
Features

- Dual-channel temperature measuring amplifier (interface card) for the IMB system
- IMB-TI-RTD: Input of Pt100/Ni100 resistors in 2 or 3-wire technology
- IMB-TI-TC: Input thermocouples, low voltage, RTDs, potentiometers, resistors
- Intrinsically safe input circuits Ex ia
- Application area acc. to ATEX: II (1) G, II (1) D
- Output circuit 0/4…20 mA
- Galvanic separation of input and output circuits
- Functional safety up to SIL 2
- Parametrization via FDT/DTM or HART® protocol
- Wire-break and short-circuit monitoring (resistor input)

Properties



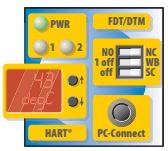
Housing styles
Interface card for IMB backplane system, 118 x 18 x 103 mm



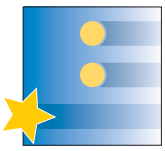
Electrical connections
Connection to field circuits, control system and power supply via IMB backplane

I/O channels
Dual-channel; intrinsically safe input: Pt100/Ni100 or thermocouples, RTD, low voltage, potentiometer; output 0/4…20 mA

Approvals
ATEX, IECEx



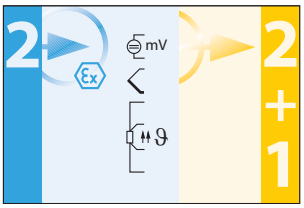
Operating mode/LEDs
Operational readiness and status indicated by LEDs; parametrized via FDT/DTM or HART® protocol



Special features
Common alarm output; coding keys protect against false plugging of interface cards

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Temperature measuring amplifier – 2-channel



General data

Operating voltage	20…30 VDC	**Test voltage**	2.5 kV
Protection type	[Ex ia Ga] IIB/IIC ; [Ex ia Da] IIIC	**Protection class**	IP20
Output current	0/4...20 mA	**Ambient temperature**	-25…+70 °C
Fault current	0 / 22 mA adjustable	**Mounting instruction**	Mounting and operation only in conjunction with the IMB backplane
Load resistance current output	≤ 0.6 kΩ	**Operating mode**	Parametrizable via PC, HART® protocol

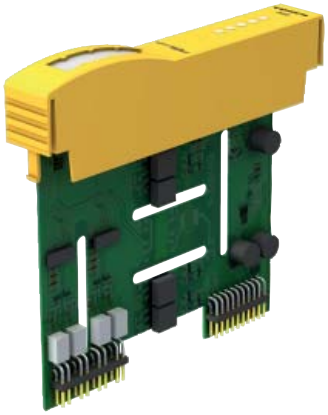
Computer based parametrization and configuration via Device Type Manager (DTM)

Types and data – selection table

Type	Power consumption	Input	w	d
IMB-TI-RTD-231EX-HCI/24VDC	≤ 3.2 W	Ni100/Pt100 resistors in 2,3, or 4-wire technology	w063	d010
IMB-TI-TC-231EX-HCI/24VDC	≤ 2.7 W	Thermocouples, RTDs and resistors in 2 or 3 wire technology; potentiometer; millivolt signals	w064	d010

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Analog signal isolators – Output field side intrinsically safe



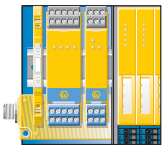
The dual-channel analog signal isolator IMB-AO-22Ex-Hi/24VDC transmits standard current signals galvanically separated and undamped 1:1 from the non-Ex to the Ex area. Each channel is assigned a current input and output of 4…20 mA. Bidirectional transmission of analog and digital HART® communication signals is also possible. Typical applications are for example, the control of I/P converters (e.g. at control valves) or indicators in the Ex area.

The input circuits switch to a high-impedance state in case of wire-break or short-circuit failures in the field circuit. Operational readiness indicated by a green LED. The alarm status provided via the IMB module remains active until all slots of the IMB system are assigned so that degree of protection IP20 is ensured. Also available are dummy modules for the free slots.

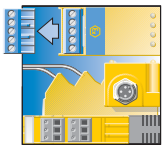
Features

- Dual-channel analog signal isolator (interface card) for the IMB system
- Transmission of intrinsically safe output signals
- Intrinsically safe output circuits Ex ia
- Application area acc. to ATEX: II (1) G, II (1) D
- Input circuit 4…20 mA
- Output circuit 4…20 mA
- Galvanic separation of input and output circuits
- SIL 3
- HART® transmissible

Properties



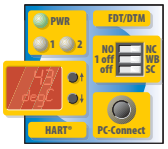
Housing styles
Interface card for IMB backplane system, 118 x 18 x 103 mm



Electrical connections
Connection to field circuits, control system and power supply via IMB backplane

I/O channels
dual-channel; input 4…20 mA; intrinsically safe output 4…20 mA

Approvals
ATEX, IECEx, SIL

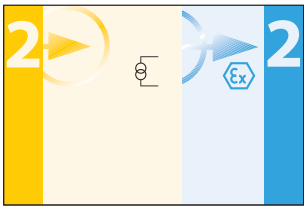


Operating mode/LEDs
Operational readiness indicated by LEDs

Special features
Coding keys protect against false plugging of interface cards.

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

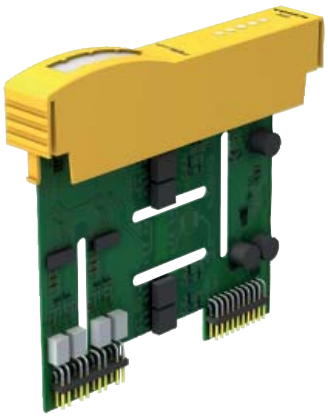
Analog signal isolator – 2-channel – Output field side intrinsically safe



Type	IMB-AO-22EX-HI/24VDC	**Protection class**	IP20
Operating voltage	20…30 VDC	**Power consumption**	≤ 2.2 W
Analog input	4 … 20 mA	**Ambient temperature**	-25…+70 °C
Protection type	[Ex ia Ga] IIC; [Ex ia Da] IIIC	**Mounting instruction**	Mounting and operation only in conjunction with the IMB backplane
Output current	4...20 mA	**Wiring diagram**	w065
Load resistance current output	≤ 0.7kΩ	**Dimension drawing**	d010
Test voltage	2.5 kV		

w Wiring diagrams on page 92 ff
d Dimension drawings on page 102 ff

Valve control modules



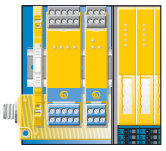
The four-channel solenoid drivers IMB-DO of the IMB series output intrinsically safe, current/voltage limited power. The output values are adjusted to valves of different manufacturers. Loads in the Ex area can be triggered directly. Typical applications are the control of Ex i pilot valves and the supply of signallers and transmitters in the Ex area.

A green LED indicates operational readiness; yellow LEDs indicate the switching status of the individual channels. The alarm status provided via the IMB module remains active until all slots of the IMB system are assigned so that degree of protection IP20 is ensured. Also available are dummy modules for free slots.

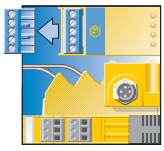
Features

- Four-channel solenoid driver (interface card) for the IMB system
- Supply of intrinsically safe, passive two-terminal networks
- Galvanic separation of input and output circuits
- Intrinsically safe output circuits Ex ia
- Types for PNP/NPN switching DCS/PLC cards
- Application area acc. to ATEX: II (1) G, II (1) D
- SIL 3
- Alarm output

Properties



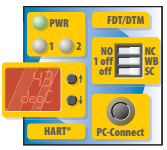
Housing styles
Interface card for IMB backplane system, 118 x 18 x 103 mm



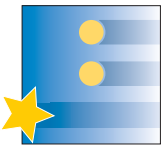
Electrical connections
Connection to field circuits, control system and power supply via IMB backplane

I/O channels
Four-channel; intrinsically safe output circuits; input 20…30 V, output 18 V / 30 mA.

Approvals
ATEX, IECEx, SIL



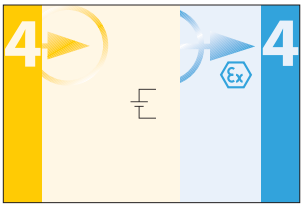
Operating mode/LEDs
Operational readiness indicated by LEDs



Special features
Coding keys protect against false plugging of interface cards.

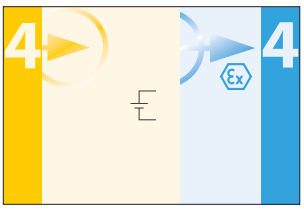
Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Valve control module – 4-channel – for npn switching DCS/PLC cards



Type	IMB-DO-44EX-N/24VDC	**Protection class**	IP20
Voltage supply	24 VDC	**Power consumption**	≤ 4.5 W
Current input	45 mA	**Ambient temperature**	-25…+70 °C
ON/OFF signal	0…5 / 20...30 VDC	**Mounting instruction**	Mounting and operation only in conjunction with the IMB backplane
Protection type	[Ex ia Ga] IIB; [Ex ia Da] IIIC	**Wiring diagram**	w066
Output current	30 mA	**Dimension drawing**	d010
Output voltage	18 V		
Test voltage	2.5 kV		

Valve control module – 4-channel – for pnp switching DCS/PLC cards



Type	IMB-DO-44EX-P/24VDC	**Protection class**	IP20
Voltage supply	24 VDC	**Power consumption**	≤ 4.5 W
Current input	45 mA	**Ambient temperature**	-25…+70 °C
ON/OFF signal	0…5 / 20...30 VDC	**Mounting instruction**	Mounting and operation only in conjunction with the IMB backplane
Protection type	[Ex ia Ga] IIB; [Ex ia Da] IIIC	**Wiring diagram**	w067
Output current	30 mA	**Dimension drawing**	d010
Output voltage	18 V		
Test voltage	2.5 kV		

Wiring diagrams on page 92 ff Dimension drawings on page 102 ff

IMC – Interface module cartridge

IMC – Distributed interface technology in IP67

Get more flexibility and move the intrinsic safety barrier from the cabinet to the field with the highly compact and rugged IMC series! The vibration resistant connectors of the IP67 rated modules guarantee stability, even under harsh environmental conditions.

The devices feature explosion protection category "intrinsic safety" and are galvanically separated. Local application is possible because of the 3 GD approval which allows use in explosion hazardous areas (zone 2) resulting from combustible dusts or gases (only in combination with the protective housing IMC-SG).

Our strengths – Your advantages

Protection class IP67

The IMC modules provide new possibilities in the field of process automation: The IS barrier can be moved from the control cabinet directly into the field, thus supporting distributed system structures. The IMC modules can be applied when needed and together with the standard cabinet solution, they provide additional flexibility. The IMC modules are highly compact, rugged and IP67 rated. The vibration resistant connectors guarantee stability, even under harsh environmental conditions.

Approved for Ex zone 2

The devices feature explosion protection category "intrinsic safety" and are galvanically separated. Local application is possible because of the 3 GD approval which allows use in explosion hazardous areas (zone 2) resulting from combustible dusts or gases. Connection cables are available in various length. Ex cables have injection moulded connectors on one end. Note: Application in zone 2 is only permitted with the optionally available protective housing IMC-SG.

Many functions

The IMC series (interface module cartridge) comprises standard modules with intrinsically safe input/output circuits for many different tasks and standard signals. The IM series includes dual-channel isolating switching amplifiers, analog signal isolators with 0/4…20 mA analog input/output circuits, isolating transducers with a 0/4…20 mA analog output circuit as well as valve control modules.

advantages

Plug-and-play with M12 connectors

Equipped with M12 male connectors and plug and play functionality, the IMCs are easily and safely installed and ready for use.

Type code

IMC Design

- **IMC** Interface modul cartridge

DI Functional principle

- **DI** isolating switching amplifier with line monitoring
- **SG** additional protection for IMC housing
- **AI** analog input amplifier
- **AIA** isolating transducer
- **AO** analog output amplifier
- **DO** digital output/valve control module

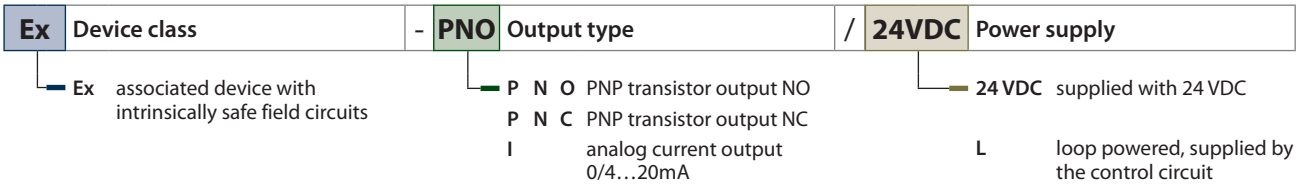
\- **2** **2** Number of channels

Number of channels on control side

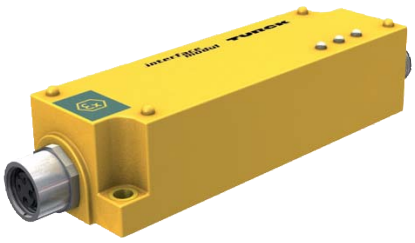
- **1** one output channel
- **2** two output channels

Number of channels on field side

- **1** one input channel
- **2** two input channels


Ex
Device class
-
PNO
Output type
/
24VDC
Power supply
Ex associated device with intrinsically safe field circuits
P N O PNP transistor output NO
P N C PNP transistor output NC
I analog current output 0/4…20mA
24 VDC supplied with 24 VDC
L loop powered, supplied by the control circuit

Isolating switching amplifiers



The dual-channel isolating switching amplifiers of the IMC series feature intrinsically safe input circuits and are used for the galvanically separated transmission of binary switching states.

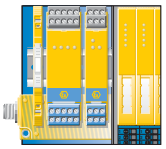
Sensors according to EN 60947-5-6 (NAMUR) or potential-free contactors can be connected to the device. Each output circuit features a PNP short-circuit proof transistor output which operates either as NO or NC contact, depending on the device type. A green LED indicates operational readiness, yellow LEDs indicate the switching status of the individual channels.

For unprotected mounting in zone 2 or 22 the connectors and the housing of the IMC module must be additionally protected against mechanical damage with the cover plate IMC-SG (Ident no. 7560016).

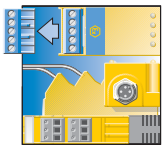
Features

- Dual-channel isolating switching amplifier with M12x1 connectors in IP67
- Galvanic separation of input and output circuits
- Intrinsically safe input circuits Ex ia for sensors acc. to EN 60947-5-6 (NAMUR) or mechanical contacts
- Application area acc. to ATEX: II (1) GD, II 3 GD
- Transistor outputs, PNP, short-circuit proof
- Input circuit monitoring of wire-break and short-circuit

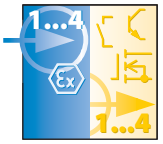
Properties



Housing styles
Interface module in IP67, 100 x 32 x 25 mm; screwed on panel

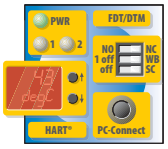


Electrical connections
M12 x 1 connectors



I/O channels
Dual-channel; intrinsically safe inputs; PNP, short-circuit proof transistor outputs; NO/NC

Approvals
ATEX, IECEx

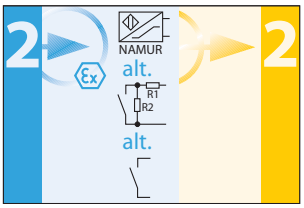


Operating mode/LEDs
Operational readiness and status indicated by LEDs

Special features
Distributed application in IP67 area

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Isolating switching amplifier – 2-channel – IP67



General data

Operating voltage	20…30 VDC	**Test voltage**	2.5 kV
Protection type	[Ex ia] IIC/IIB	**Protection class**	IP67
Protection type	Ex nA [nL] IIC/IIB T4 bzw. Ex tD A22 IP67 T96°C	**Ambient temperature**	-25…+70 °C
Output circuits	2 x transistors (pnp, short-circuit proof)	**Mounting instruction**	Mounting on panel
Switching current per output	≤ 50 mA	**Electrical connection**	M12 flange connection
Switching frequency	3000Hz		

Types and data – selection table

Type	Output type	w	d
IMC-Di-22Ex-PNO/24VDC	NO (normally open)	w068	d011
IMC-DI-22EX-PNC/24VDC	NC (normally closed)	w068	d011

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Analog signal isolator – Input field side intrinsically safe

The single-channel analog signal isolator IMC-AI-11Ex-I/L transmits galvanically separated standard current signals from the non-Ex to the Ex area and is also approved for zone 2. The signals are transmitted via an intrinsically safe current input and a current output 0…20 mA. You can connect active intrinsically safe transmitters and power sources to it in the Ex area.

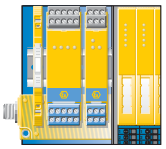
The analog signal isolator is loop-powered. Operational readiness indicated by a green LED.

For unprotected mounting in zone 2 or 22 the connectors and the housing of the IMC module must be additionally protected against mechanical damage with the cover plate IMC-SG (Ident no. 7560016).

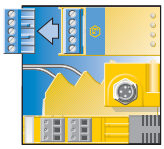
Features

- Single-channel analog signal isolator with M12 x 1 connectors
- Protection class IP67
- Transmission of intrinsically safe input signals
- Intrinsically safe input circuits Ex ia
- Application area acc. to ATEX: II (1) G, II (1) D
- Input circuit 0…20 mA
- Output circuit 0…20 mA
- Loop-powered
- Galvanic separation of input and output circuits

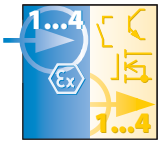
Properties



Housing styles
Interface module in IP67, 100 x 32 x 25 mm; screwed on panel

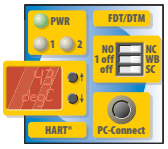


Electrical connections
M12 x 1 connectors



I/O channels
Single-channel; passive intrinsically safe input 0…20 mA; output 0…20 mA

Approvals
ATEX, IECEx

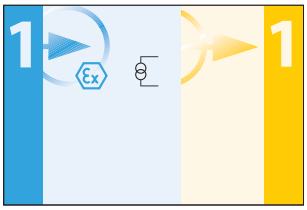


Operating mode/LEDs
Operational readiness indicated by LED

Special features
Distributed application in IP67 area; loop-powered

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

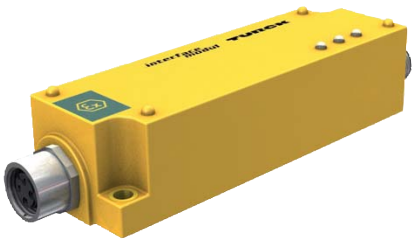
Analog signal isolator – 1-channel – IP67 – Input field side intrinsically safe



Type	IMC-AI-11EX-I/L	**Test voltage**	2.5 kV
Voltage input	max. 30VDC	**Protection class**	IP67
Analog input	0 … 20 mA	**Power consumption**	≤ 3 W
Protection type	[Ex ia] IIC/IIB	**Ambient temperature**	-25…+70 °C
Protection type	Ex nA [nL] IIC/IIB T4 bzw. Ex tD A22 IP67 T80°C	**Mounting instruction**	Mounting on panel
Current input	0…20 mA	**Electrical connection**	M12 flange connection
Output current	0...20 mA	**Wiring diagram**	w069
Load resistance current output	≤ 0.4 kΩ	**Dimension drawing**	d011

w Wiring diagrams on page 92 ff
d Dimension drawings on page 102 ff

Isolating transducers



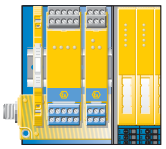
The single-channel analog signal isolator IMC-AIA-11Ex-i/24VDC transmits galvanically separated standard current signals from the non-Ex to the Ex area and is also approved for zone 2. The signals are transmitted via an intrinsically safe current input and a current output 4…20 mA. Passive, intrinsically safe 2-wire transmitters and current sinks in the Ex area can be connected to it. The device is designed for 24 VDC supply. Operational readiness indicated by a green LED.

For unprotected mounting in zone 2 or 22 the connectors and the housing of the IMC module must be additionally protected against mechanical damage with the cover plate IMC-SG (Ident no. 7560016).

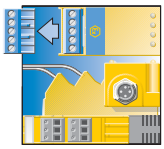
Features

- Single-channel analog signal isolator with M12 x 1 connectors
- Protection class IP67
- Transmission of intrinsically safe input signals
- Intrinsically safe input circuits Ex ia
- Application area acc. to ATEX: II (1) G, II (1) D
- Input circuit 0…20 mA
- Output circuit 0…20 mA
- Power supply 24 VDC
- Galvanic separation of input and output circuits

Properties



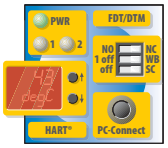
Housing styles
Interface module in IP67, 100 x 32 x 25 mm; screwed on panel



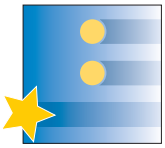
Electrical connections
M12 x 1 connectors

I/O channels
Single-channel; active intrinsically safe input 0…20 mA; output 0…20 mA

Approvals
ATEX, IECEx



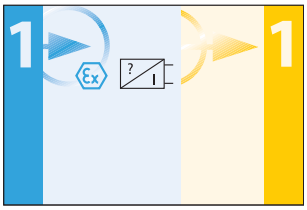
Operating mode/LEDs
Operational readiness indicated by LEDs



Special features
Distributed application in IP67 area

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Isolating transducer – 1-channel – IP67



Type	IMC-AIA-11EX-I/24VDC	**Test voltage**	2.5 kV
Operating voltage	20…30 VDC	**Protection class**	IP67
Supply voltage	≤14 V	**Power consumption**	≤ 1.5 W
Analog input	0 … 20 mA	**Ambient temperature**	-25…+70 °C
Protection type	[Ex ia] IIB	**Mounting instruction**	Mounting on panel
Protection type	Ex nA [nL] IIC/IIB T4 bzw. Ex tD A22 IP67 T80°C	**Electrical connection**	M12 flange connection
Output current	0/4...20 mA	**Wiring diagram**	w070
Load resistance current output	≤ 0.5 kΩ	**Dimension drawing**	d011

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Analog signal isolators – Output field side intrinsically safe

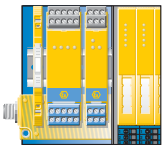
The single-channel analog signal isolator IMC-AO-11Ex-I/L transmits galvanically separated standard current signals from the non-Ex to the Ex area and is also approved for zone 2. The signals are transmitted via a current input and an intrinsically safe current output 0…20 mA. The output circuit is equipped with a short-circuit protected power source. Intrinsically safe analog actuators like I/P converters (e.g. at control valves) or displays can be applied in the Ex area. The analog signal isolator is loop-powered. Operational readiness indicated by a green LED.

For unprotected mounting in zone 2 or 22 the connectors and the housing of the IMC module must be additionally protected against mechanical damage with the cover plate IMC-SG (Ident no. 7560016).

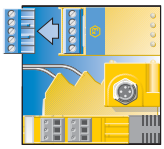
Features

- Single-channel analog signal isolator with M12 x 1 connectors
- Protection class IP67
- Transmission of intrinsically safe output signals
- Intrinsically safe output circuits Ex ia
- Application area acc. to ATEX: II (1) G, II (1) D
- Input circuit 0…20 mA
- Output circuit 0…20 mA
- Loop-powered
- Galvanic separation of input and output circuits

Properties



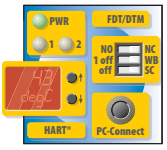
Housing styles
Interface module in IP67, 100 x 32 x 25 mm; screwed on panel



Electrical connections
M12 x 1 connectors

I/O channels
Single-channel; input 0…20 mA; intrinsically safe output 0…20 mA

Approvals
ATEX, IECEx

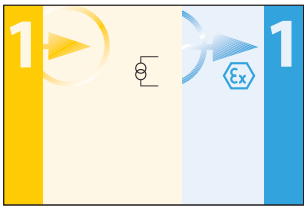


Operating mode/LEDs
Operational readiness indicated by LED

Special features
Distributed application in IP67 area; loop-powered

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Analog signal isolator – 1-channel – IP67 – Output field side intrinsically safe



Type	IMC-AO-11EX-I/L	**Protection class**	IP67
Analog input	0 … 20 mA	**Power consumption**	≤ 3.5 W
Protection type	[Ex ia] IIC/IIB	**Ambient temperature**	-25…+70 °C
Protection type	Ex nA [nL] IIC/IIB T4 bzw. Ex tD A22 IP67 T80°C	**Mounting instruction**	Mounting on panel
Output current	0...20 mA	**Electrical connection**	M12 flange connection
Load resistance current output	≤ 0.4 kΩ	**Wiring diagram**	w071
Test voltage	2.5 kV	**Dimension drawing**	d011

w Wiring diagrams on page 92 ff d Dimension drawings on page 102 ff

Valve control modules

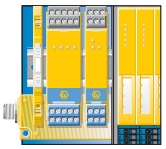
The single-channel solenoid drivers IMC-DO output intrinsically safe, current/voltage limited power. They can directly trigger loads in the Ex area. The output values are adjusted to valves of different manufacturers. Typical applications are the control of Ex i pilot valves and the supply of signallers and transmitters in potentially explosive atmospheres caused by dust or gas. The solenoid drivers are loop-powered. Switching state indicated by a yellow LED.

For unprotected mounting in zone 2 or 22 the connectors and the housing of the IMC module must be additionally protected against mechanical damage with the cover plate IMC-SG (Ident no. 7560016).

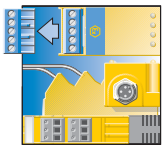
Features

- Single-channel solenoid drivers with M12 x 1 connectors
- Protection class IP67
- Galvanic separation of input and output circuits
- Intrinsically safe output circuit Ex ia
- Output current 40 mA
- Application area acc. to ATEX: II (1) G, II (1) D
- Loop-powered

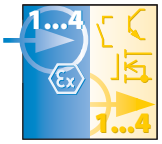
Properties



Housing styles
Interface module in IP67, 100 x 32 x 25 mm; screwed on panel

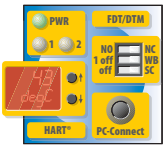


Electrical connections
M12 x 1 connectors



I/O channels
Single-channel; 45 mA/ max. 30 V; intrinsically safe output 40 mA

Approvals
ATEX, IECEx

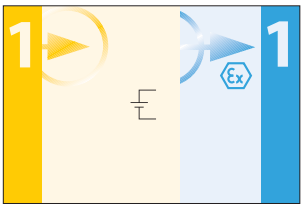


Operating mode/LEDs
Operational readiness indicated by LED

Special features
Distributed application in IP67 area; loop-powered

Internet link
To get all product information, just scan the QR code with a smartphone or webcam

Valve control module – 1-channel – IP67



Type	IMC-DO-11EX/L	**Protection class**	IP67
Current input	45 mA	**Power consumption**	≤ 1.7 W
ON/OFF signal	0…5 / 20...30 VDC	**Ambient temperature**	-25…+70 °C
Protection type	[Ex ia] IIC/IIB	**Mounting instruction**	Mounting on panel
Protection type	Ex nA [nL] IIC/IIB T4 resp. Ex tD A22 IP67 T86°C	**Electrical connection**	M12 flange connection
Output current	40 mA	**Wiring diagram**	w072
Test voltage	2.5 kV	**Dimension drawing**	d011

Wiring diagrams on page 92 ff
Dimension drawings on page 102 ff

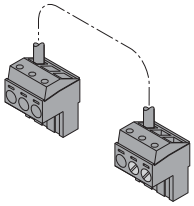
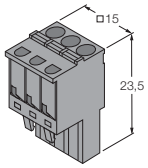
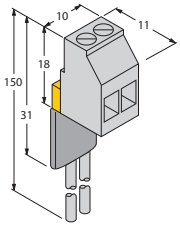
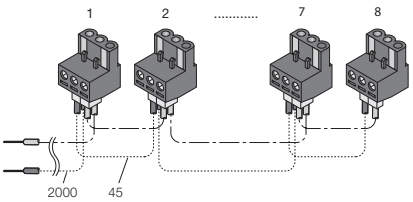
Accessories – IM/IMS, IMB and IMC series

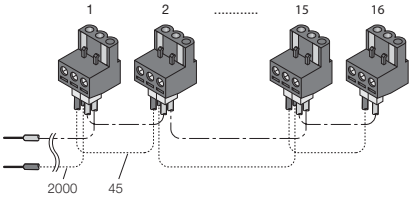
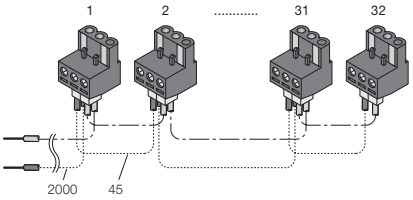
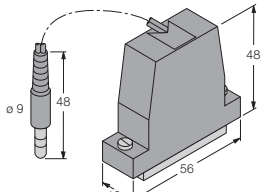
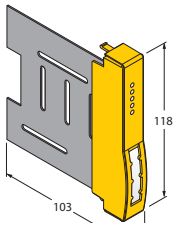
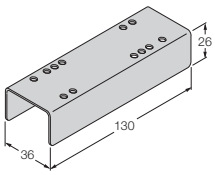
We offer the matching accessories for quick mounting, easy parametrization and safe protection of interface modules. From cage clamps, dummy modules, programming adapters and power buses up to IP67 rated housings: Each item is perfectly tailored to the IM, IMB, IMC and IMS modules, making installation and commissioning of your application easy.

Features

- Cage clamps for IM series
- Resistor modules and cold junction compensation for IM and IMB series
- Powerbus for the IM series
- Programming adapter for IM and IMB series
- Dummy module for IMB backplane
- Metal cover plate for protection of IMC devices, zones 2 and 22

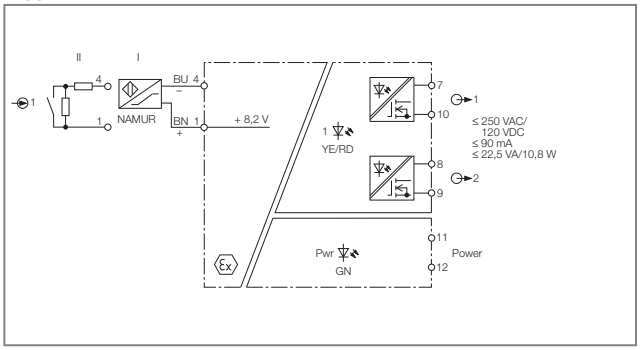
Types and data – Selection table

	Types	Short text
	**IM-3-CJT**	Cold junction compensation module for IM 34 temperature measuring amplifiers, width 18 mm
	**IM-CC-3X2BU/2BK**	Cage terminals for IM modules (non-Ex devices, width 18 mm), scope of delivery: 2 pcs. Blue terminals, 3-pole, 2 pcs. Black terminals, 3-pole
	**WM1**	The resistor module meets the requirements of line monitoring between a mechanical contact and a TURCK signal processor. The input circuit of the signal processor is designed for sensors acc. to EN 60947-5-6 (NAMUR) and equipped with a wire-break and short-circuit monitoring function.
	**PB-08/03**	Bus power supply for 8 TURCK IM interface modules

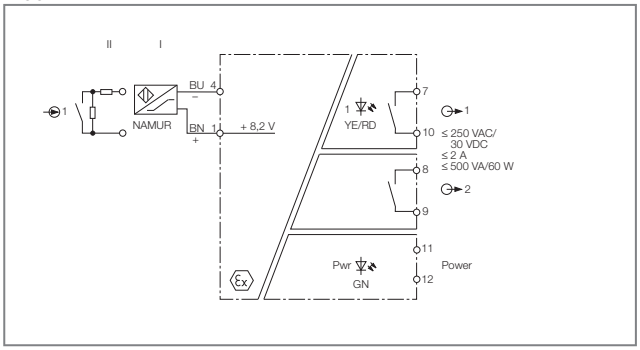
	Types	Short text
	**PB-16/03**	Bus power supply for 16 TURCK IM interface modules
	**PB-32/03**	Bus power supply for 32 TURCK IM interface modules
	**IM-PROG**	The programmable adapter IM-PROG is used for galvanic separation and to parametrize TURCK IM and IMB devices via FDT/DTM. USB connection via adapter
	**IMB-BM**	IMB dummy modules for TURCK interface module backplane IMB. They have to be plugged in free slots on the backplane to achieve protection rating IP20.
	**IMC-SG**	Protective housing for IMC modules to provide protection rating IP67 (requirement for mounting in Zone 2 or Zone 22)

Wiring diagrams

w001



w002



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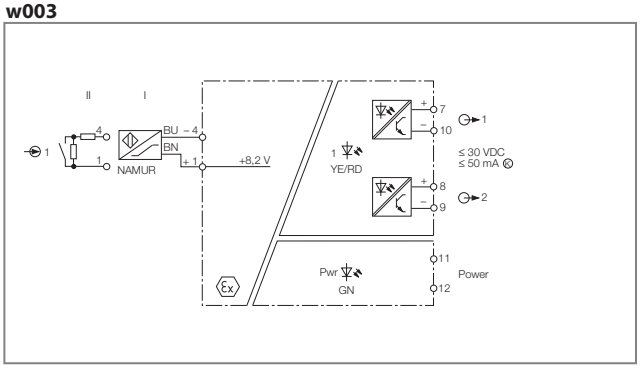

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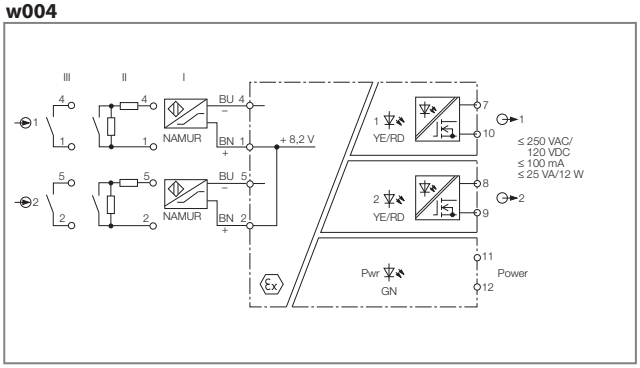

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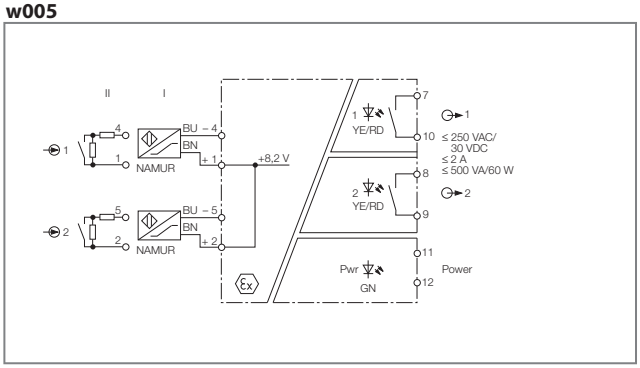

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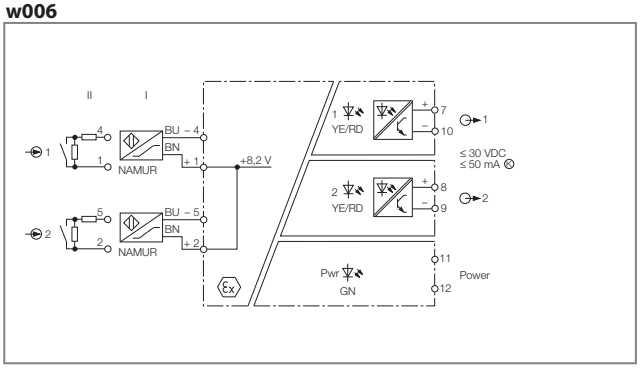

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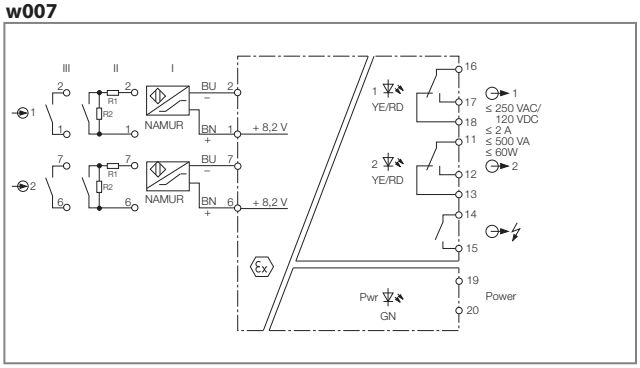

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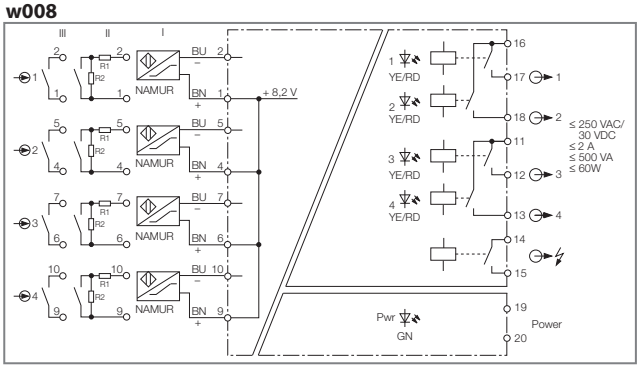

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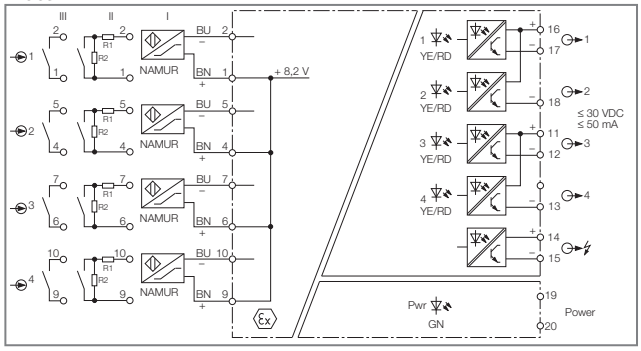

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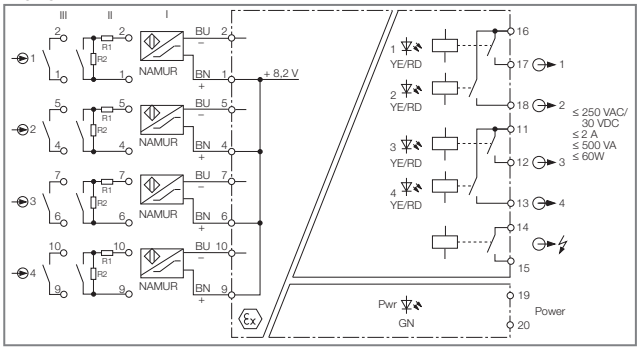

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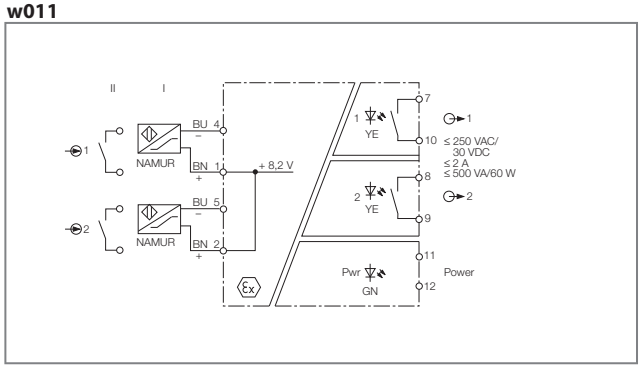

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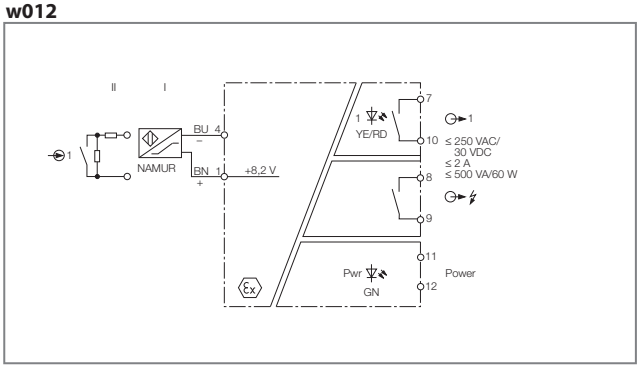

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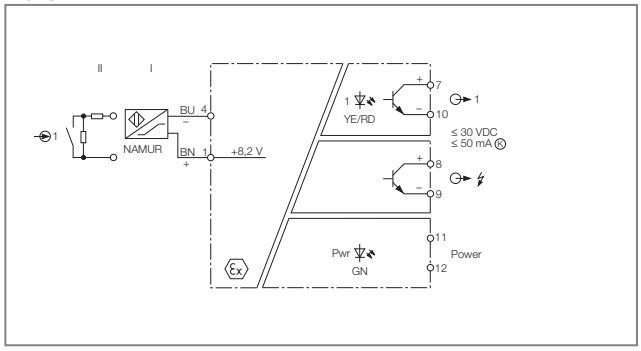

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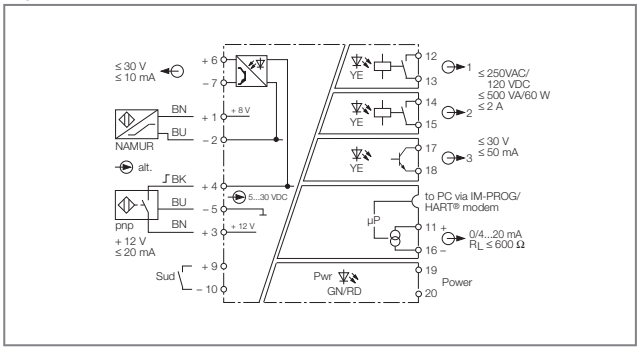

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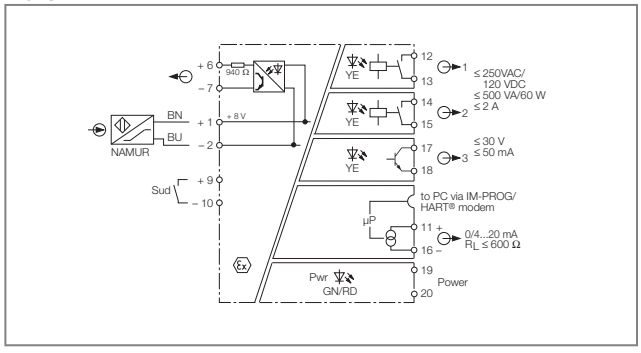

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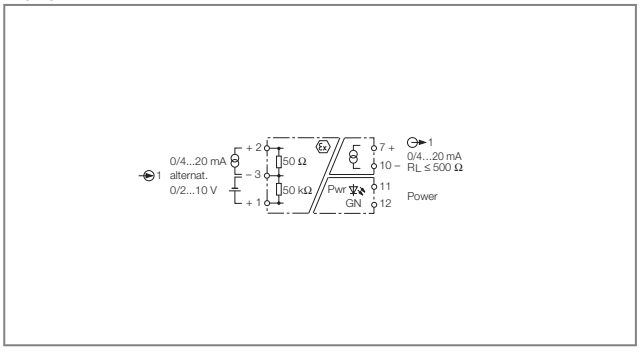
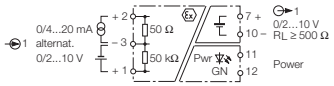


Wiring diagrams

w017



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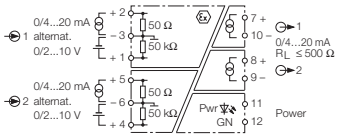

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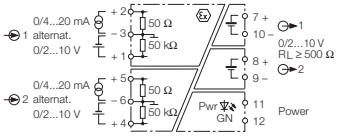

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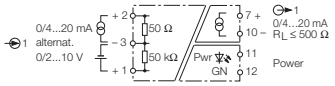

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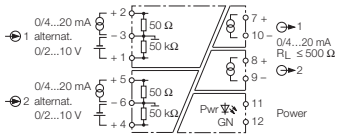

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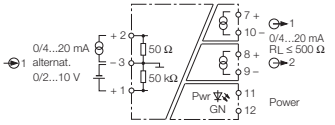

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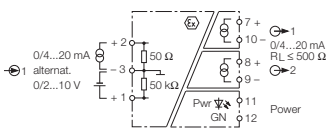

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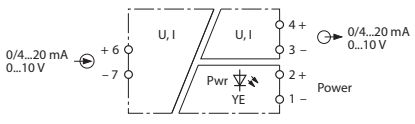

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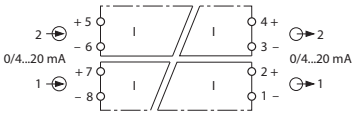

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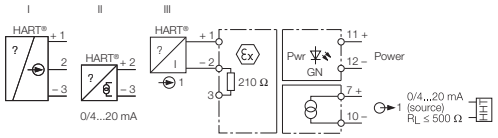

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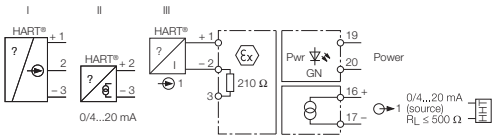

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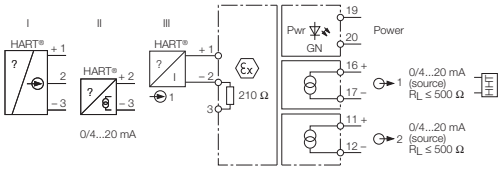

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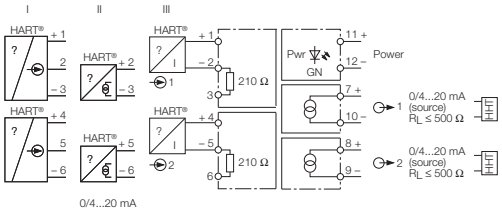

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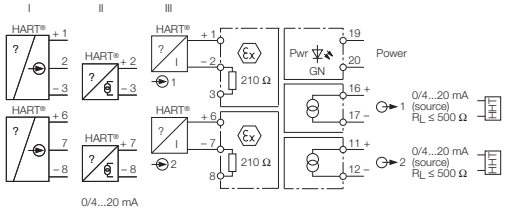

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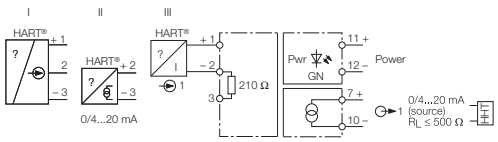

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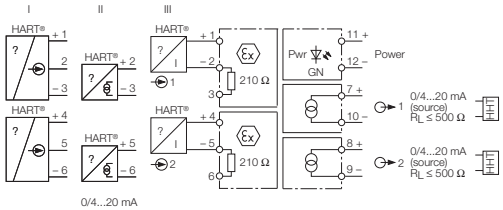

Wiring diagrams

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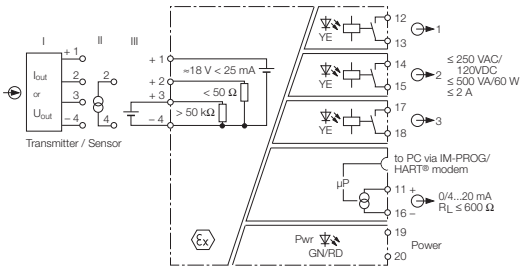

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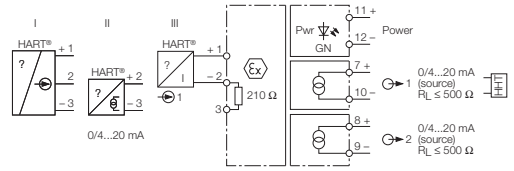

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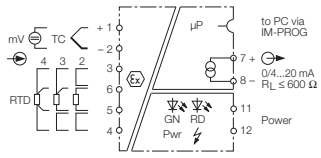

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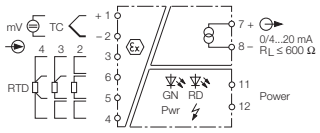

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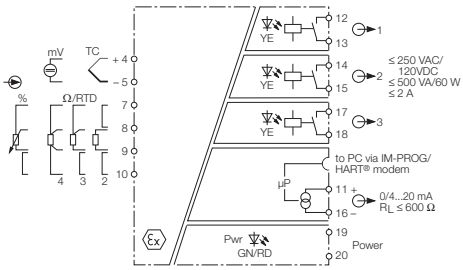

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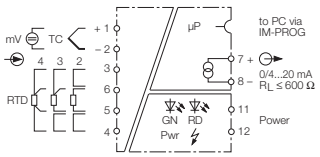

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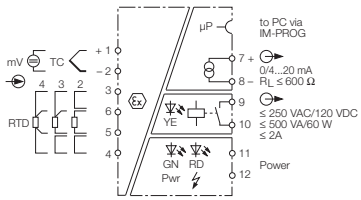

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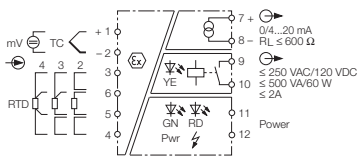

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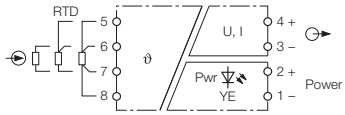

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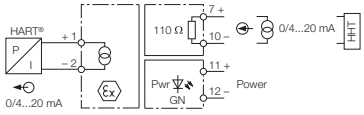

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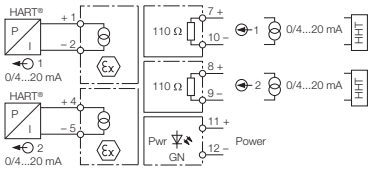

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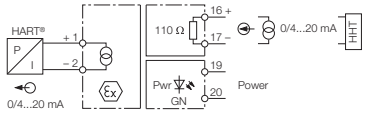

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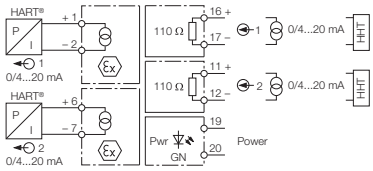

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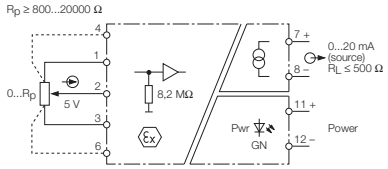

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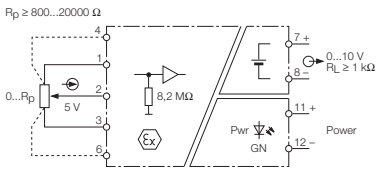

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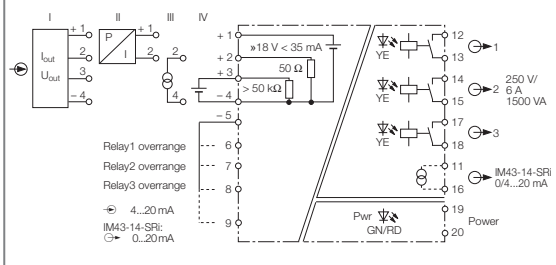
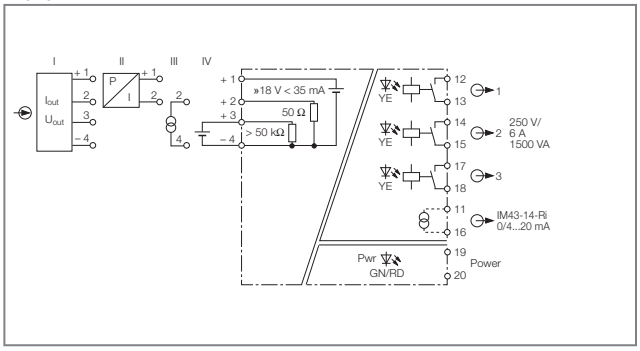


Wiring diagrams

Wiring diagrams

w049



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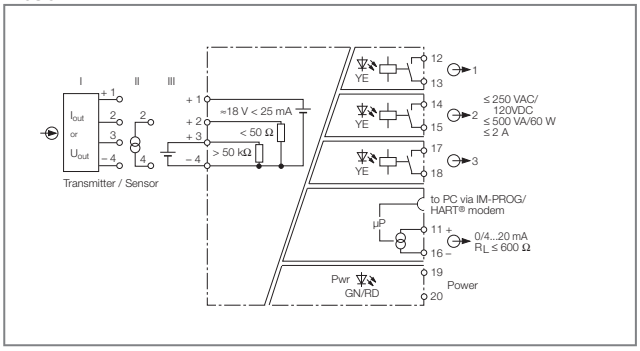

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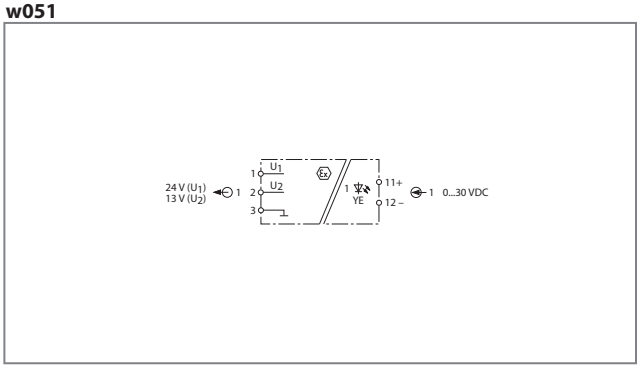

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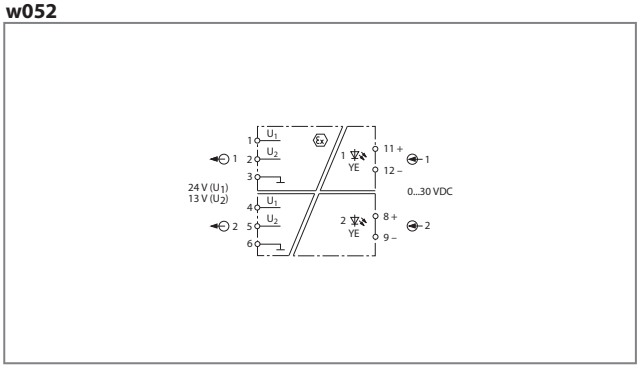

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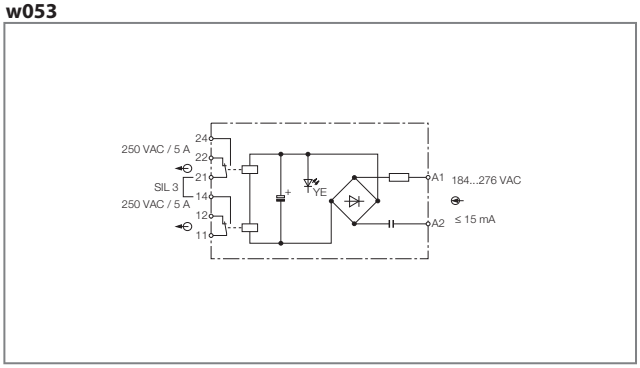

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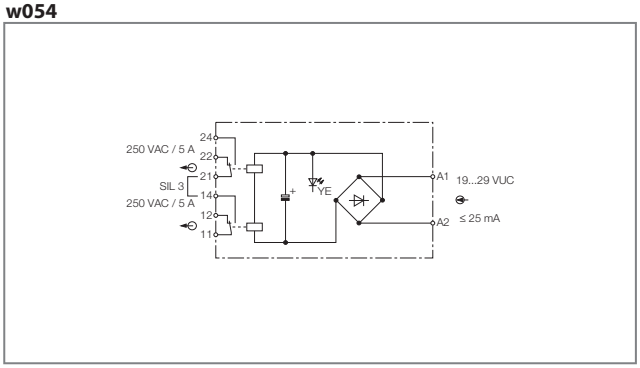

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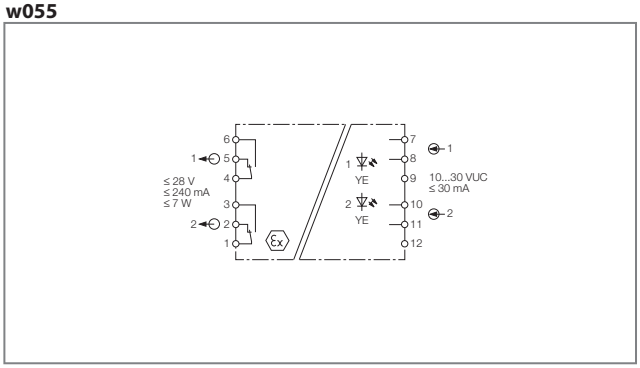

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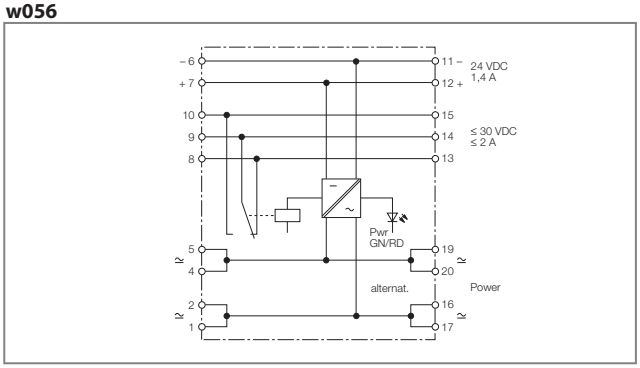

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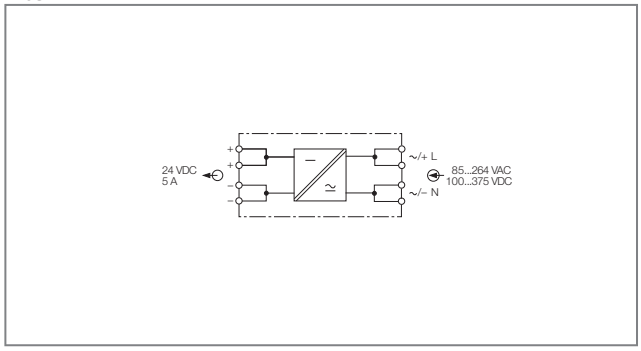

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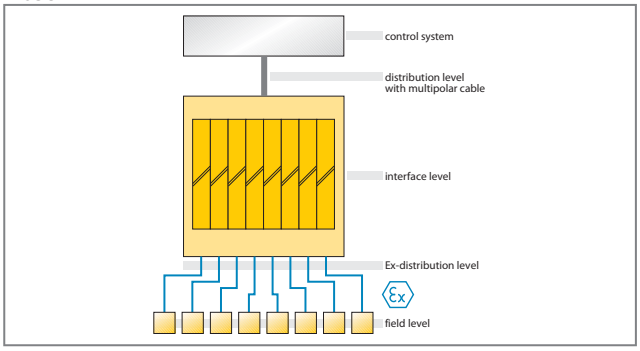

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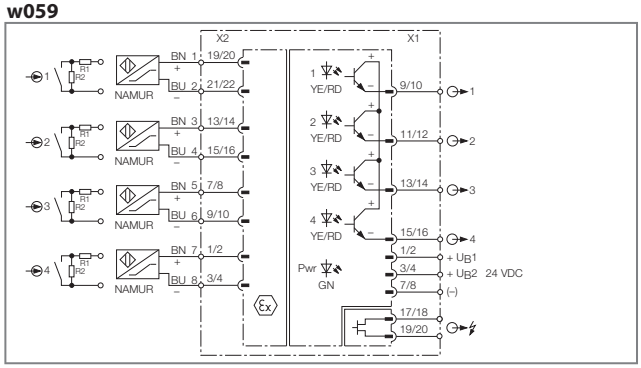

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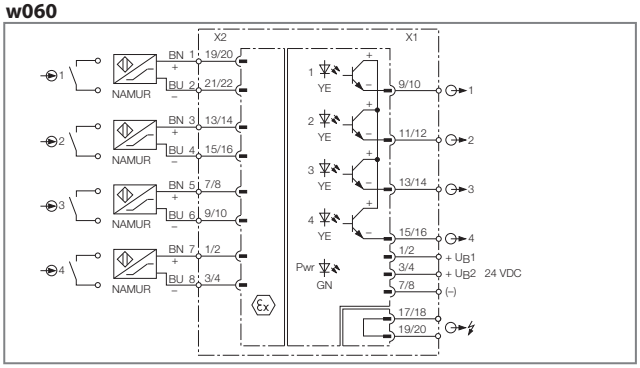

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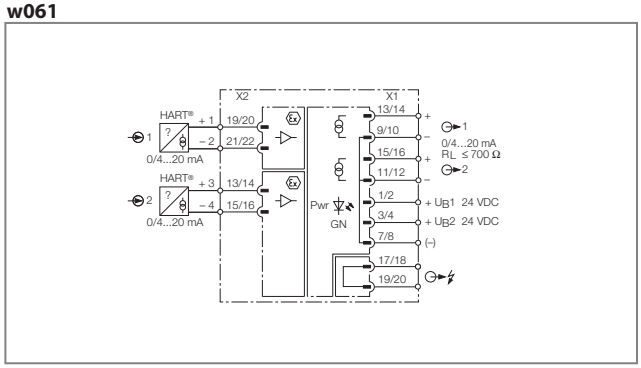

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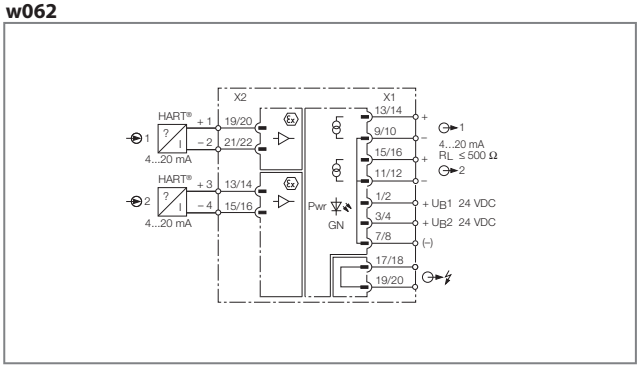

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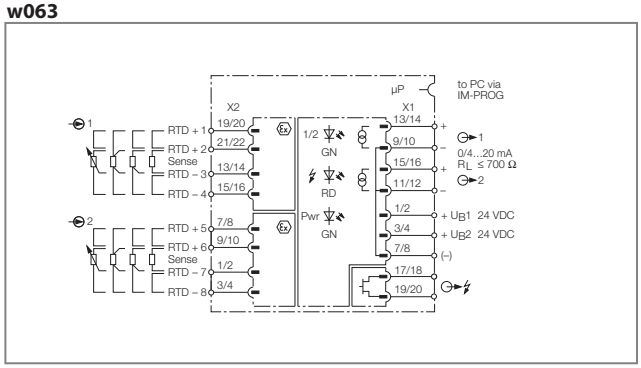

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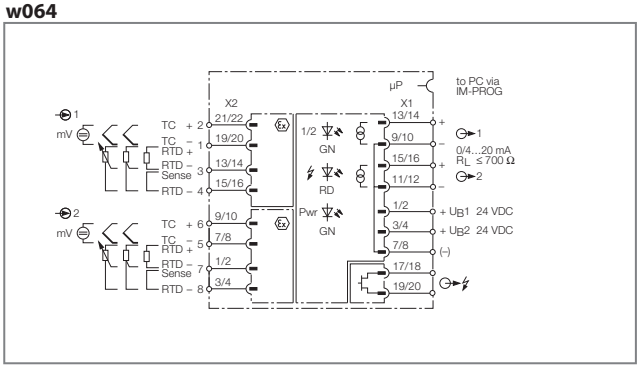

Wiring diagrams

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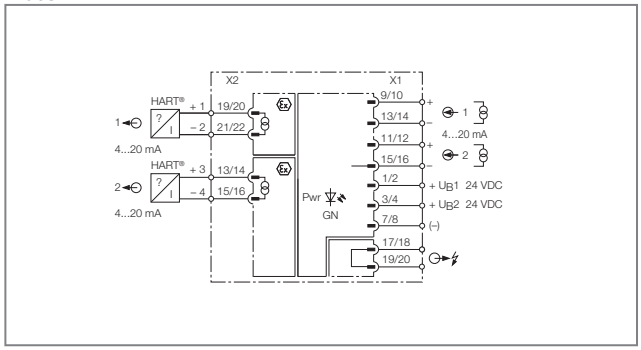

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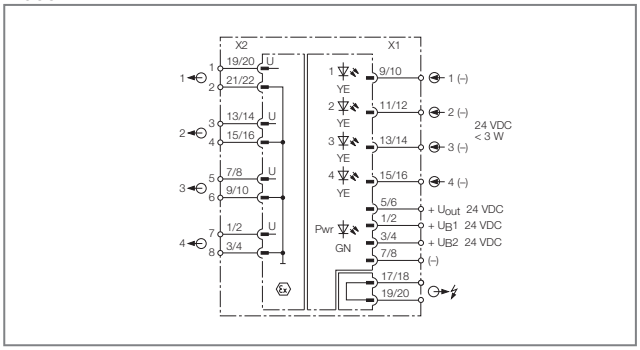

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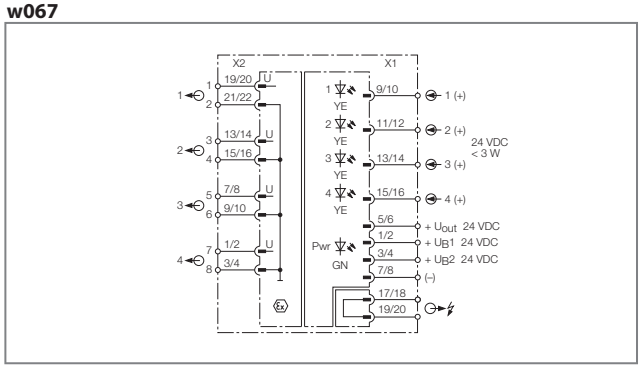

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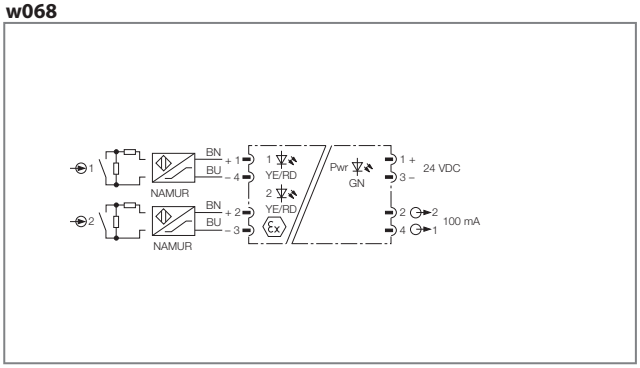

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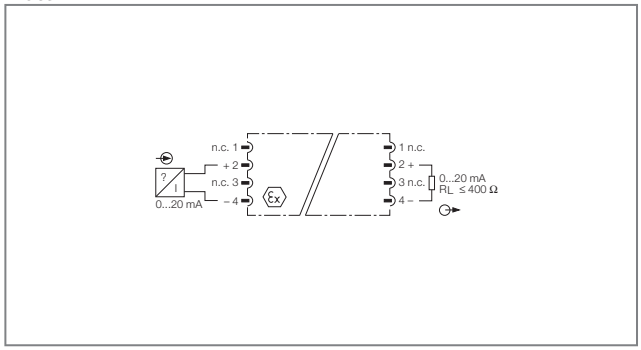

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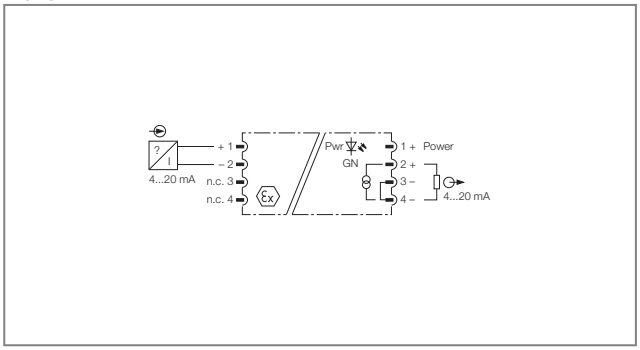

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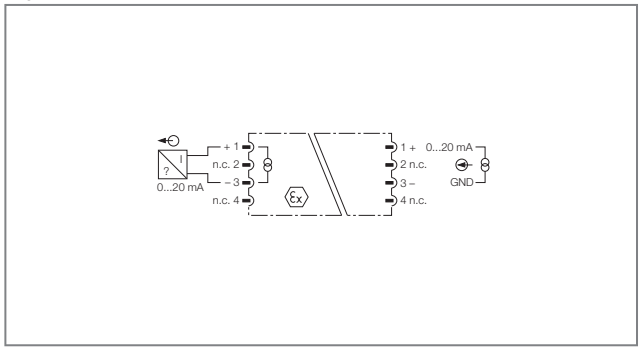

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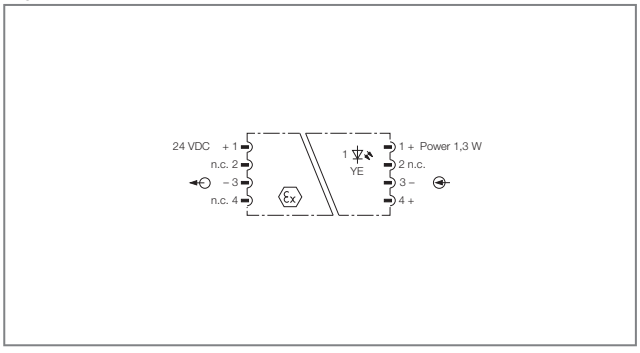

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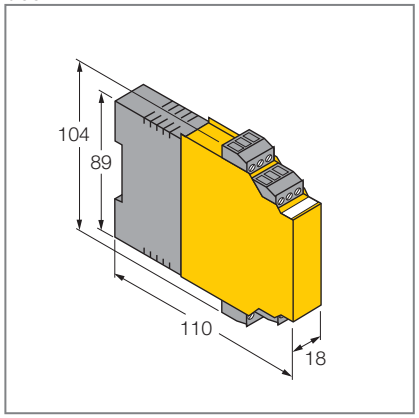
Dimension drawings

d001



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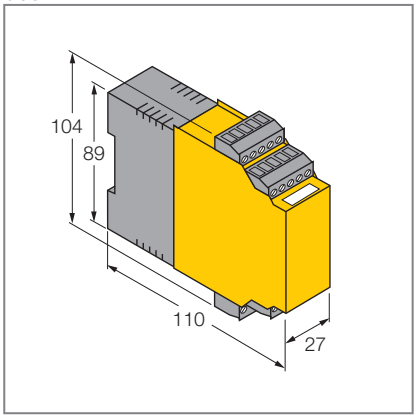

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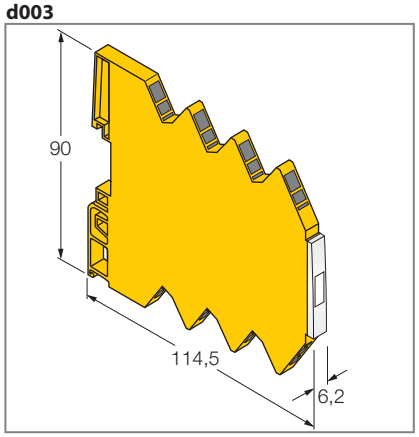

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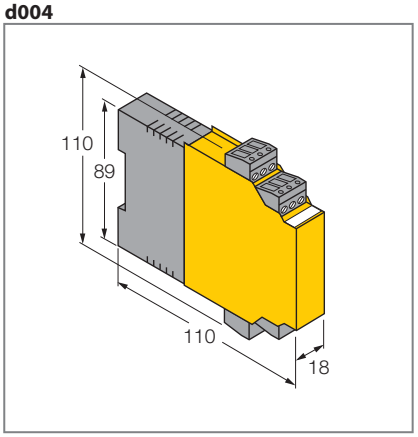

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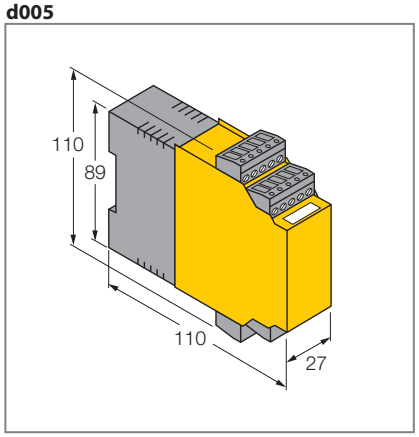

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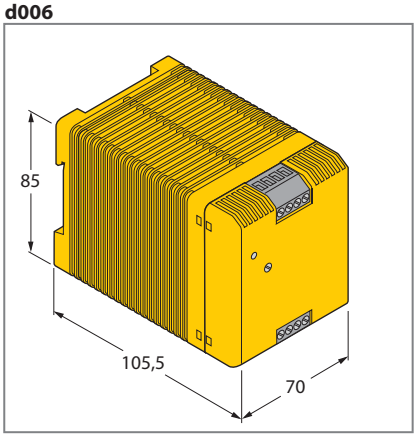

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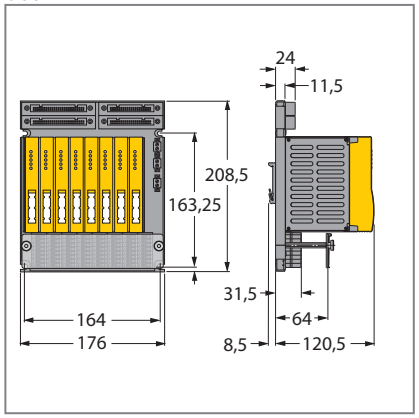

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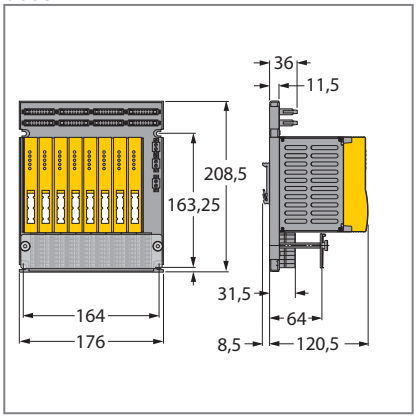

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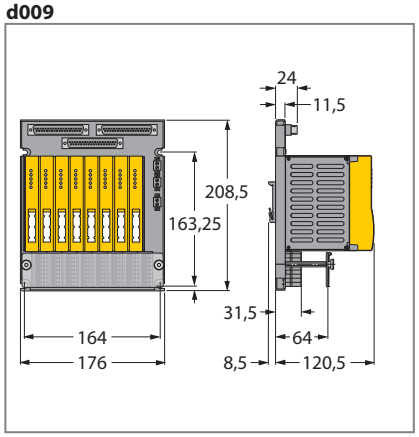

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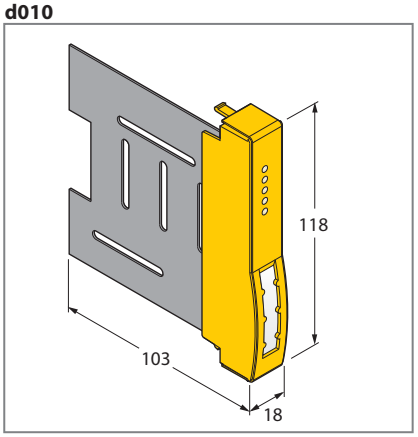

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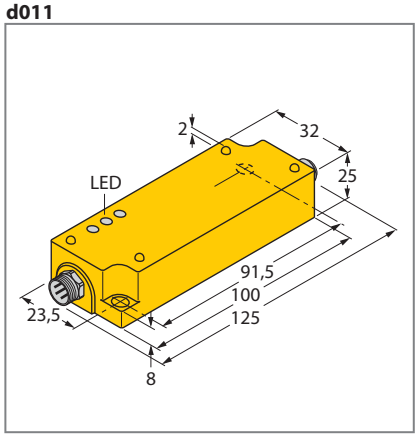


Explosion protection

Directives and standards

History

Until the end of 1975, numerous national directives covering the field of explosion protection existed in the individual European states. On 18 December 1975, the first framework directive on explosion protection (mining excluded) came into effect, applying in the member states of the European Union: 76/117/EC.

Until 1990 there were frequent amendments of this directive. This directive referred to the characteristics and structure of the equipment at issue and was directly related to standards. It applied exclusively to electrical equipment and explosion protection (except mining). The fact that national directives were still in effect restricted free trade in this area.

In the beginning of 1994, the "Framework Directive 94/9/EC of the European Parliament and Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres" was passed. This directive has regard to the "European Treaty" of 1985, in particular article 100a (amendment of 2 February 1992), establishing the European Community.

To find a general abbreviation for this new directive it was agreed to use the name ATEX 100a. ATEX is derived from the French "atmosphère explosible" (explosive atmosphere). Whenever the ATEX directive is quoted in our TURCK documentation, reference is made to the new directive of explosion protection ATEX 100a.

Within the member states of the European Union the ATEX 100a was translated into national legislation, e.g. in the Federal Republic of Germany by the "Gerätesicherheitsgesetz (§11 GSGV)" and the "Explosionsschutzverordnung (EXVO)".

The national directives applying to explosion protection were valid until 30.06.2003. The ATEX 100a came into force on the 01.07.2003 and has been updated and renamed to ATEX 95a.

Efforts to harmonize the explosion protection directives on international level, resulted in the establishment of the IEC 60079. The pursuit towards free trade worldwide was the leading motive for it. In a first step, the IECEx framework was defined, fixing the conditions of approval for devices. Furthermore a quality management system is stipulated to which the manufacturer must submit to. Within these measures, problems still persist in form of national directives, such as ATEX in Europe for example.

Installation and operation of electrical equipment in hazardous areas – standards and regulations

Involved with installation, acceptance and operation of electrical equipment are:

- The legislator having industrial supervision, trade organizations, TÜV and experts as supervisory authorities.
- All plant personnel are required to observe strict guidelines such as health and safety and other work regulations that govern the maintenance and operation of electrical equipment located in the hazardous area.
- Plant builders who must meet safety requirements according to EN 60079-14, (RL 1999/92/EG), ATEX 137.
- The manufacturers of components bound by constructional requirements set forth by IEC/EN 60079 and ATEX 95a (RL 94/9/EC).

EN 60079-14 and DIN VDE 0165 – Installation of electrical equipment in explosion hazardous areas

The DIN VDE 0165 standard includes the safety requirements that must be observed (e. g. identification and classification of explosion hazardous locations, temperature classes, cable routing, requirements for the installation of electrical devices in zones 0, 1 and 2, many specific provisions). Contrary to the standards described above, which are primarily for manufacturers, this standard applies to plant builders, operators and test personnel.

As EN 60079-14 this standard also includes the implementation of the ATEX requirements. Please note that the exemption clauses for components in its current form are no longer included. Individual components now also require a partial approval.

BetrSichV – Industrial safety regulations

The industrial safety regulations BetrSichV replaces inter alia the ElexV. BetrSichV provides information about the safety and health protection of work equipment and their intended use. Furthermore BetrSichV regulates the operational safety of systems requiring monitoring and the organization of health and safety of workers.

ATEX 137 – Directive for system operators

The directive 1999/92/EC of the European Parliament and Council of 16 December concerning the essential health and safety requirements is intended to guard workers against the potential hazards of an explosive atmosphere (formerly ATEX 118, now ATEX 137). It is directed at system operators and employers and contains binding regulations. Among other things, this stipulates the assessment of the risks resulting from a potentially explosive atmosphere, the classification of areas exposed to potentially explosive atmospheres and the keeping of an explosion protection document. The implementation of this directive replaces the operational safety regulations ElexV.

ExVO – Explosion protection directive

The ExVO regulates the placing on the market of devices, protective systems and components intended for use in potentially explosive atmospheres and is the German transposition of the directive 94/9/EC. It describes the essential health and safety requirements and mandatory conformity assessment procedures. The ExVO is thus mainly aimed at manufacturers of devices, maintenance and test personnel.

Like directive 94/9/EC, ExVO excludes the following equipment from its scope (summarised): Medical devices, explosive substances, or unstable chemicals, personnel protection equipment, seagoing vessels, offshore systems and products for military purposes.

EN 60079-0 – Electrical equipment for use in explosion hazardous areas, general requirements

EN 60079-0 contains general provisions for the construction and testing of any electrical apparatus to be used in explosion hazardous areas. The EN 60079 standards listed below describe different technical implementations of ignition protection classes:

- Pressure-tight encapsulation (EN 60079-1)
- Pressurized encapsulation (EN 60079-2)
- Powder-filled encapsulation (EN 60079-5)
- Oil immersion (EN 60079-6)
- Increased safety (EN 60079-7)
- Intrinsic safety (EN 60079-11)
- Ignition protection n (EN 60079-15)
- Moulded encapsulation (EN 60079-18)
- Intrinsically safe electrical systems (EN 60079-25)
- Optical radiation (EN 60079-28)

EN 60079-11 – Increased safety (i)

All methods of protection attempt to contain an explosion to the inside of the housing and to prevent penetration of an ignitable gaseous mixture.
The method of "intrinsic safety" is based on a different approach. It limits the electrical energy to such an extent, that elevated temperatures, sparks or arcs are incapable of generating the energy needed to ignite an explosive atmosphere.

Due to the limitation of electrical energy, these circuits are especially suited to application in the field of measuring, control and instrumentation. The method of "intrinsic safety" has some significant advantages over other protection methods, e.g. maintenance and wiring of live circuits. Thanks to the use of inexpensive components, these systems are easy to handle and cost effective, and several suppliers offer components with protection class "i"..

Definition of terms Explosion

An explosion is an exothermic reaction of a material (such as gas, fumes, or dust) occurring at a high reaction speed. The risk of an explosion exists wherever there is the probability of an explosive atmosphere containing flammable gases or vapours, flammable liquids, combustible dust, or ignitable flyings due to handling, processing, using and storing of these materials. Such hazardous atmospheres can be present for instance in chemical industries, gas stations, refineries, power plants, paint shops, vehicles, sewage plants, grain mills, airports, grain silos and filling plants.

Explosion hazards

Explosion hazards exist in locations

- in which ignitable concentrations of flammable gases or vapours can exist under normal operating conditions, or because of repair or of leakage, and when these conditions provide the probability that a dangerous fuel to air mixture will occur;
- where the explosive or ignitable mixtures can come in contact with a source of ignition and they continue to burn after ignition.

Explosive mixtures, generic term

A combustible mixture is an atmosphere containing substances that when mixed with air, gases or vapours, propel a reaction after ignition.

Explosive atmospheres

An explosive atmosphere contains gases, vapours or dust mixed with air as well as the usual filler materials that can explode spontaneously under atmospheric conditions.

Dangerous explosive atmospheres

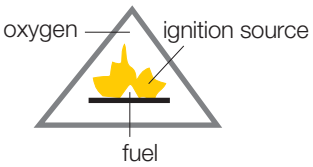
A dangerous explosive atmosphere is a mixture containing concentrations of flammable gases or vapours that, when ignited, can cause damage to persons directly or indirectly through an explosion.

Explosion hazardous area

An explosion hazardous area is a location where potentially explosive atmospheres may exist due to local operating conditions.

Ignition triangle

In order to have an explosion, the following three components must be present simultaneously:



Possible sources of ignition
- hot surfaces
- flames and hot gases
- mechanically generated sparks
- electrical installations
- transient currents
- static electricity
- lightning, ultrasonic energy

oxidizers
- air (21 % oxygen)
- pure oxygen
- oxygen releasing compounds (potassium permanganate)

Flammable substances
- Flammable concentrations of gases and powders from liquids or solids with ignition capability.

Explosive limits

A mixture is only explosive when its concentration falls within certain material specific limits. These limits are called the upper and lower explosive limits and are listed in according tables.

Flashpoint

The flash-point is the lowest temperature at which a liquid releases sufficient vapours that are ignitable by an energy source and extinguish when the energy source is removed.
An explosive atmosphere cannot occur when the flashpoint of a material is not exceeded during storage or handling.
Flammable liquids, which do not dissolve in water, constitute a source of danger. They are classified according to VbF (directive for the installation and operation of plants where flammable liquids are stored and handled). Further parameters to evaluate the danger are the glow temperature, the minimum ignition energy and the ignition temperature. These values are listed in according tables.

Primary and secondary explosion protection measures

Basically there are two methods used to prevent an explosion.

Primary explosion protection measure

The primary method prevents the formation of a dangerous atmosphere by one or more of the following measures:

- avoiding the use of flammable liquids
- increasing the flashpoint
- limiting the concentration to safe levels
- natural and technical ventilation
- monitoring the concentration

The primary method of protection is not further described. Please refer to the explosion protection regulations of the professional association of the chemical industry (Ex-RL) and EN 1127-1.

Secondary explosion protection measure

The secondary method comprises measures to prevent ignition of an explosive mixture. Here, constructive or electrical techniques are used to

- segregate the electrical parts of the equipment likely to ignite a dangerous mixture, by keeping the explosive atmosphere away from the ignition source
- prevent an explosion by impeding the propagation to the surrounding explosive atmosphere

In the following, secondary explosion protection measures are described.
The secondary protection method is frequently used, if primary protection does not provide adequate protection.

Electrical equipment featuring ignition protection class "Intrinsic Safety" (IEC/EN 60079-11)

The term "intrinsic safety" implies that the electrical energy of an intrinsically safe circuit is limited to such an extent that a thermal effect or spark is incapable of igniting an explosive atmosphere under specified conditions.

TURCK devices for use in explosion hazardous areas comply with the ignition protection class "intrinsic safety". The devices are divided into two different kinds of electrical equipment, intrinsically safe equipment and associated equipment. The different devices types are differently labelled (see "Marking of devices") .

Intrinsically safe electrical equipment incorporates only intrinsically safe circuits. Direct installation in explosion hazardous areas is permitted, provided that all related requirements are met. An example is a NAMUR sensor approved according to EN 60947-5-6 or a transmitter.

Associated electrical equipment is any equipment which may incorporate both intrinsically safe and non-intrinsically safe circuits. Intrinsically safe devices may be connected to associated electrical equipment, provided that all essential conditions for this kind of interconnected assembly are fulfilled. An isolating switching amplifier would be an associated electrical device and the connected NAMUR sensor is the intrinsically safe device.

Associated electrical equipment must generally be installed outside the hazardous area. If installed within the hazardous area, additional protection measures must be provided. Many TURCK devices are approved for zone 2, allowing to install devices in the Ex-area.

All TURCK devices featuring intrinsically safe circuits are classified as associated equipment, such as the *interfacemodul* type for example.

Simple electrical equipment

Devices defined as "simple equipment" maintain an exceptional position within this field. Simple components and simple equipment not generating or storing more than 1.5 V, 0.1 A and 25 mW, do not require approval. This includes thermocouples, photocells, switches, resistors and simple printed circuits, which feature defined and known parameters and do not affect the intrinsically safe circuit. A definition of simple electrical equipment is contained in EN 60079-11 and EN 60079-14.

Categories

Intrinsically safe and associated electrical equipment are divided into 3 categories according to EN 60079-11. This classification is determined by the failure probability and the ignition capability of the intrinsically safe circuitry.

Category "ia"

Category "ia" indicates that the electrical equipment should not be able to ignite a dangerous mixture during normal operation and in the event of a single fault, nor in the event of any combination of two faults. Intrinsic safety must be maintained even when two independent faults occur at the same time. Therefore, components of any equipment of category "ia" that are susceptible to faults must be present in triplicate.

Category "ib"

Electrical equipment classified as category "ib" should not be capable of causing ignition during normal operation and in the event of a single fault. Intrinsic safety must be maintained in the event of a single fault. A fault could be the failure of a component that is susceptible to disturbances. Any electrical equipment classified as "ib" must have all components in duplicate.

Category "ic"

Electrical equipment classified as category "ic" should not be capable of causing ignition during normal operation. This ignition protection class replaces the ignition protection class "nL" as from 2011 for installation in zone 2. The advantages of intrinsically safe circuits are thus also available there.

Ignition protection class n (EN 60079-15) (expiring in 2012)

Electrical equipment featuring ignition protection class n can only be installed in zone 2 or 22. It should neither cause ignition nor being serviced during normal operation. This should be guaranteed through labels and mechanical locking.

Groups and temperature classes

Electrical equipment for use in explosion hazardous areas is classified into groups and classes based on the likelihood of an explosion danger. This is of great importance from a safety aspect as well as an economical aspect because it determines the requirements that must be met by the electrical equipment. The definition of groups is based on the location in which the equipment is going to be used.

- Group I classified equipment may be used in mines susceptible to firedamp and must conform to EN 60079 and additional mining standards (e.g. EN 50303).
- Group II classified equipment may be used in all other potentially explosion hazardous areas.

Group II classified equipment is used in all explosion hazardous areas except mining applications susceptible to firedamp. Depending on the application, different flammable materials with different ignition energy ratings are needed. From a practical point of view, subdividing Group II is therefore necessary and makes sense, not only for economical reasons.
The subdivision of Group II equipment is based on the different ignition energy of the flammable materials. The different groups are classified by capital letters in ascending alphabetical order according to the hazard risk of the associated material. Materials belonging to group C require less ignition energy than Group A materials (see table 1) .

	T1	T2	T3	T4	T5	T6
I	methane					
II A	acetone, ethane, ethyl acetate, ammonia, benzene, acetic acid, carbon monoxide, methanol, propane, toluene	ethyl alcohol, i-amyl acetate, n-butane, n-butyl alcohol,	benzines, diesel fuel, aviation fuels, fuel oils, n-hexane	acetalde hyde, ethyl aether		
II B	town gas (coal gas)	ethyl-ene*)				
II C	hydrogen	ethyl-ene*)				carbon disulfide *)

*) no authorized regulations available

Tab. 1: Flammable materials - groups and temperature classes

Temperature class

The temperature class specifies the maximum allowable surface temperature of an apparatus. In this category, the explosion protected device can be approved for different temperature classes - a decision which depends on technical and economical considerations.

In the majority of cases, explosion proof equipment for the lowest temperature can be very expensive to buy and install. By comparison, using products featuring ignition protection class "intrinsic safety" is more efficient and cheaper. Only intrinsically safe equipment for direct installation in Ex areas requires temperature classification. Temperature classification is irrelevant for associated equipment.

Ignition temperature

The ignition temperature (defined as the temperature at which a mixture self-ignites during testing) directly relates to the temperature class. The temperature class indicates the maximum surface temperature of an apparatus and must be lower than the minimum ignition temperature of the flammable material to prevent an ignition (see table 2).

Temperature class IEC/EN NEC 505-10	Maximum surface temperature of device (°C)	Ignition temperatures of flammable materials (°C)
T1	450	> 450
T2	300	> 300 ≤ 450
	280	> 280 ≤ 300
	260	> 260 ≤ 280
	230	> 230 ≤ 260
	215	> 215 ≤ 230
T3	200	> 200 ≤ 300
	180	> 180 ≤ 200
	165	> 165 ≤ 180
	160	> 160 ≤ 165
T4	135	> 135 ≤ 200
	120	> 120 ≤ 135
T5	100	> 100 ≤ 135
T6	85	> 85 ≤ 100

Tab. 2: Temperature classes with maximum admissible surface temperatures

Device groups and categories according to the ATEX directive
The ATEX directive prescribes a clear marking of the application and the constructional level of safety. EN 60079-11 also provides detailed information on how the protection measures were realised and which applications are permitted and uses similar terms, but the information provided by EN 50020 and ATEX may be essentially different.

The first criterion of the ATEX directive is the device group. Like the groups described above, the different groups are defined and described according to their place of use.

- Device Group I: For mining underground with a potential hazard due to firedamp and/or combustible dusts.
- Device Group II: For all other locations in which a potentially explosive atmosphere exists.

The second criterion is the device category, defining the level of safety:

- Device category 1: Very high level of safety; devices featuring two independent means of protection; even in the event of rare device disturbances, the device remains functional and maintains the requisite level of safety.
- Device category 2: High level of safety; devices featuring one means of protection. Even in the event of frequently occurring device disturbances or equipment faults which normally have to be taken into account, the device provides the requisite level of safety.
- Device category 3: Normal safety; the device ensures the requisite level of safety during normal operation.

Devices classified as Group I (underground mining susceptible to firedamp) uses the prefix M, e. g. M1, in addition to the category classification.

The third criterion is the substance group which characterises the application of devices in particular atmospheres:

- Substance group G: Explosion protection in explosive atmospheres due to gases, vapours or mists (G: gas)
- Substance group D: Explosion protection in explosive atmospheres due to dusts (D: dust)

The equipment category also determines whether the device is an associated apparatus or an intrinsically safe apparatus. If it is an associated apparatus the device category is put into round brackets, for example II (1) G.

Equipment protection level EPL

Devices are classified according to their potential hazard. According to IEC 60079-0 equipment protection levels are defined as follows:

Gas explosion protection

EPL Ga:
- Device with very high protection level
- The device is no potential source of ignition and provides the requisite level of safety when used for its intended purpose and with irregularly arising faults.

EPL Gb:
- Device with high protection level
- The device is no potential source of ignition and provides the requisite level of safety when used for its intended purpose and with irregularly arising faults.

EPL Gc:
- Device with increased protection level
- The device is no potential source of ignition and provides the requisite level of safety.
- The device features additional protection to ensure the requisite level of safety with faults expected to occur regularly

Dust explosion protection

EPL Da
Device with very high protection level
- The device is no potential source of ignition and provides the requisite level of safety when used for its intended purpose and with irregularly arising faults.

EPL Db:
- Device with high protection level
- The device is no potential source of ignition and provides the requisite level of safety when used for its intended purpose and with irregularly arising faults.

EPL Dc:
- Device with increased protection level
- The device is no potential source of ignition and provides the requisite level of safety.
- The device features additional protection, to ensure the requisite level of safety with faults expected to occur regularly.

EPL and zones

Device protection rating	Zone
Ga	0
Gb	1
Gc	2
Da	20
Db	21
Dc	22

Devices with a higher protection rating can be use in applications with lower protection ratings. Devices approved for zone 0 can also be applied in zone 1 and devices for zone 20 in zone 21.

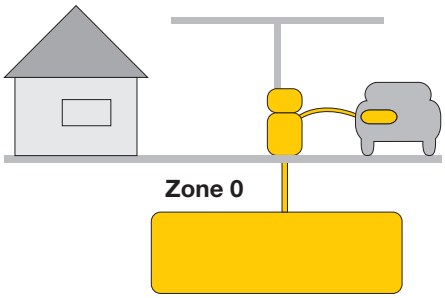
Zone classification

According to EN 60079-10 and EN 1127-1 explosion hazardous areas are divided into zones such as flammables gases, vapours, mists and combustible dust. The classification is based on the likelihood that a dangerous explosive atmosphere occurs. The ATEX directive has re-defined the zone division as follows:
Classification
- Zones 0, 1 and 2 for gases, vapour and mist
- Zones 20, 21 and 22 for dusts

Zone classification for gases

Zone 0

Zone 0 is a location in which ignitable concentrations of flammable gases or vapours are continuously or frequently present. The definition is extended by the term "frequently". The example shows a gas station with zones classified as 0.



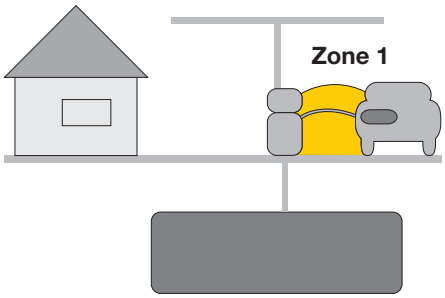
Intrinsically safe devices designed for use in zone 0 must meet category "ia" safety standards and must have no live contacts. Galvanic isolation between intrinsically safe and non-safe devices is to be preferred. If grounding of the intrinsically safe circuit is required for functionality, this must be done outside zone 0, but as close as possible to zone 0. The devices must as well be approved for gas groups IIA, IIB and IIC.

Zone 1

Zone 1 are locations in which an explosive atmospheres are likely to occur. Here ATEX does not incorporate any changes. The example shows the area near the gas pump during refuelling classified as zone 1.

Generally the following areas in industrial plants are considered to be zone 1 locations:

- in the vicinity of zone 0
- close to inspection openings
- near filling and draining devices
- inside of machinery

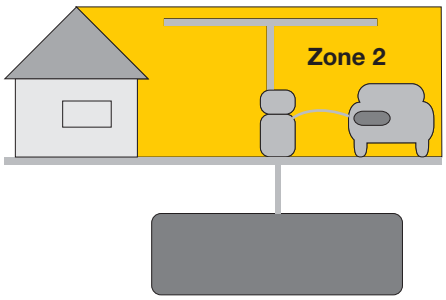


Any device certified for zone 1 must be group IIA, IIB or IIC and at least category "ib".

Zone 2

Zone 2 comprises areas in which an explosive and dangerous atmosphere is unlikely to occur, but, if it does, only for a short period. According to the ATEX definition, an explosive atmosphere should not occur, but, if it does, only infrequently and for a short period.

The following industrial areas comply with it:
- Areas near zone 0 and 1
- Areas near flange seals whenever standard flange joints are used
- Areas near pipes in closed rooms



Unlike apparatus for zones 0 and 1, devices for use in zone 2 do not require a test certificate by an authorized body. Devices must conform to category 3 and must meet the following criteria (EN 60079-15):

- restricted breathing enclosures (excess temperature 10 k only)
- sealed enclosures (various test methods/requirements)
- simple pressurized enclosure (like „p“ without purging)
- limited energy (intrinsic safety without safety factor, category "ic")

- encapsulated switching devices (simple pressurized enclosure)
- lower requirements for devices in zone 1, e.g.
  - clearance and creepage
  - housing impact test
  - plastic materials
  - construction of lamp holders and starters

Installation of devices in zone 0 to 2

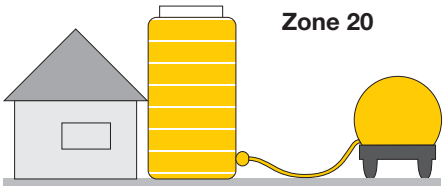
For installation in zones 0 to 2 (gas, vapour) it is required that intrinsically safe and associated devices must meet at least those requirements applying to the zone in which the intrinsically safe apparatus is to be installed. If a device meets higher requirements, operation is obviously permitted.

The national regulations apply to interconnected assembly and installation of devices. Please refer to "Guidelines for use of devices with intrinsically safe circuits" below.

Combustible dusts and fibers

Zone 20

According to ATEX, zone 20 is classified as an area in which a dangerous explosive atmosphere in the form of a dust cloud is continuously present, or occurs frequently, or for a long period. The possibility of a dust deposit with a known or excessive thickness is given. The presence of dust deposits as a single event does not constitute a zone 20 classification. Usually, these conditions can only prevail inside an enclosure, pipes and instruments.



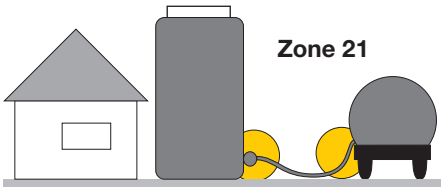
Areas, in which dust deposits occur, but where clouds of dust are not present constantly, frequently or for a long term, do not belong to this zone.

Zones 21 and 22

Zone 21:
Areas in which a potentially explosive atmosphere in the form of a dust cloud can occur occasionally during normal operation. Dust deposits or layers of combustible dust will usually be present.

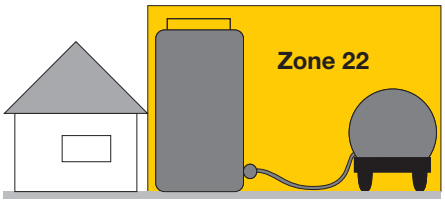
Zone classification	Likelihood of an explosive atmosphere	Compliance with safety requirements by	Requirements fulfilled by:		
			Equipment group	Related equipment category	Additional equipment category
Zone 0 (gas, …) Zone 20 (dust)	Continuously, for long periods or frequently	2 independent means of protection	II	1G (for gas, ...)	–
			III	1D (for dust)	
Zone 1 Zone 21	Occasionally	1 independent means of protection	II	2 G	1
			III	2 D	
Zone 2 Zone 22	Unlikely or infrequently - for a short period only	Normal operation	II	3 G	1 or 2
			III	3 D	

Tab. 3: Zone classification – equipment catagories



These can be areas in the close vicinity of filling or dust extraction stations, where dust deposits are present and explosive concentrations of flammable dust mixed with air may occur during normal operation.

Zone 22:
Areas in which it is unlikely that a potentially explosive atmosphere in the form of a dust cloud occurs during normal operation. If such an atmosphere occurs, then only for a short period, or in the event of dust accumulation, or in layers of combustible dust.



For example, areas in the vicinity of equipment containing dust which can escape through leakages and where dust deposits can build up (e.g. mills from which dust is released and accumulates).

Installation of devices in zone 20 to 22

Regarding areas of combustible dust, installation, operation and maintenance of devices are subject to the national regulations (acc. to EN 60079-14/61241-14). Intrinsically safe devices mounted in zone 20 to 22 must have the appropriate approval. Associated equipment does not require an approval for flammable dusts, an approval for gases and vapour is sufficient. It must be ensured that the limit values of intrinsic safety of the EC type examination certificate are met in the case of an interconnected assembly. Then it is permitted to mark the intrinsically safe device as II 1 D and the associated equipment as II (1) G. To avoid mistakes, the marking II (1) G, II (1) D is usual.

During installation the special conditions of dust protection must be observed. Simple devices for use in zones 20 to 22 must have an approval, whereas this is not necessary for simple devices applied in zones 0 to 2.

Marking of devices

Equipment for explosion protected areas must be clearly marked. There are two different types of marking.
According to CENELEC, marking of a device conforming to EN 50014/20 must provide the following information:

- manufacturer's name or trademark
- part number
- serial number
- authorized body
- Ex symbol
- ignition category, e.g. "ia"
- "x" after the test certificate number indicates that special conditions must be met (see certificate for special conditions)
- designated group together with the respective subdivision (e.g. IIC)
- temperature class or maximum surface temperature (for group II devices)
- test authority, date and file number
- device protection rating, e.g. "Ga"

An intrinsically safe device is to be marked as follows:

Ex ia IIC T6 Ga	
Ex	complies with European standard
ia	ignition category
IIC	explosion category
T6	temperature class
Ga	device protection rating

Associated equipment is to be marked as follows:

[Ex ia Ga] IIC	
Ex	complies with European standard
ia	ignition category
IIC	explosion category
Ga	device protection rating

The test certificate number of the EC type examination certificate acc. to the ATEX directive:

PTB 97 ATEX 2128X	
PTB	authorized body
97	year of examination
ATEX	acc. to directive 94/9/EG
2128	test certificate number
X	special conditions

Within the European Union the devices must meet the respective requirements. If the manufacturer fulfills these, he is permitted to affix the CE sign with the identification number of the notified body, which carried out the quality assurance system approval.

CE 0102

The test authority TÜV Hannover has the ID number 0044, EXAM (BVS) Bochum 0158 and PTB Braunschweig 0102.

AThe year of production and the constructional level of safety acc. to ATEX must also be contained in the device's marking. For intrinsically safe devices the marking would be:

II 1 G	
II	all areas except mining
1	very high safety level suited for zone 0
G	explosion protected against gas, vapour and mist

Associated equipment is identifiable by round brackets enclosing the device category:

II (1) G	
II	all areas except miningt
(1)	may not be installed in Ex areas
G	explosion protected against gas, vapour and mist

Manufacturer obligations

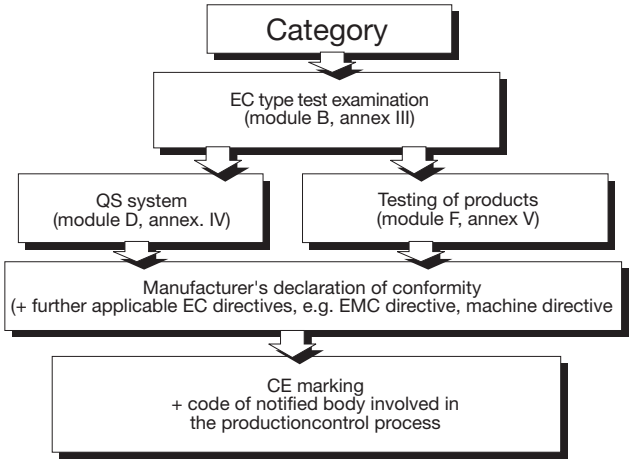
The manufacturer must provide a certificate of conformity and EC type examination certificate from an authorized test body.

The authorized body implements tests and certifies that the devices comply with the regulations and standards of the explosionhazardous area. The manufacturer is required to supply a type test sample to an authorized test body, which draws up a test report to be submitted to the notified body entitled to issue the EC type examination certificate after verifying conformity. Noti-fied bodies and external inspection bodies are registered centrally. The EC type examination certificate contains all Ex-relevant data for devices of zone 0 and 1.

It is the manufacturer's responsibility to keep a copy of the certificate. Along with the certificate, the manufacturer provides an instruction manual with all relevant Ex data. In addition, the manufacturer issues a declaration of conformity, stating that all applicable standards and directives are met. The user needs these documents to document compliance of the system installation.

CE marking of equipment

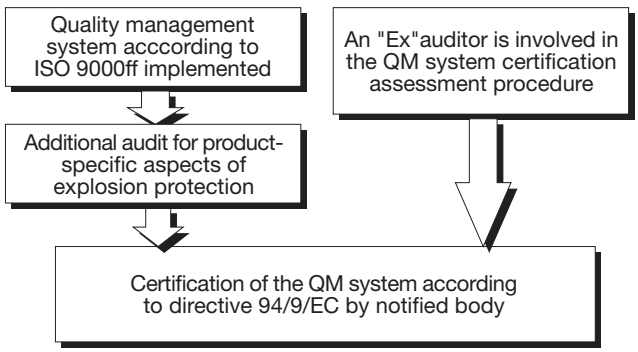
Devices for use in explosion hazardous areas are provided with the CE marking and the identification code of the testing authority. The assessment procedure for CE marking is clearly defined and depends on the device category. The example shown relates to device category 1, featuring the highest safety level. The applicable annexes of the directive 94/9/EC are also shown.



Different annexes apply to the various device categories.

QA – Assessment of the quality assurance system

The manufacturer of intrinsically safe devices, categories 1 and 2, must have an approved quality management system. This approval is needed to ensure that the manufacturer produces the devices according to the test type sample and that conformity to relevant protection regulations is given. Assessment of the quality assurance system is carried out by a notified body. Assessment can be achieved in two different ways:
Assessment and certification can be done directly within the scope of certification according to ISO 9000 ff. Approval of those fields associated with explosion protection is accomplished in cooperation with an expert of the notified body.
If the ISO certificate has already been granted, it is possible to certify those parts relating to explosion protection subsequently within the scope of an additional audit. The following illustration shows both possibilities:



TURCK's manufacturing sites for explosion protected devices are certified according to ISO 9001 and have a quality system approval.

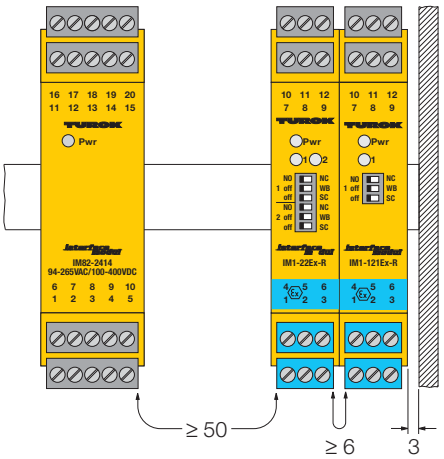
Guidelines for use of devices with intrinsically safe circuits

The national regulations and standards are the basis for use of devices with intrinsically safe circuits. These must be strictly observed and followed. The user is obliged to inform himself of all revisions. The following guidelines relate to the ATEX (94/9/EC) directive of the member states of the European Union, especially to the field of explosion protection in areas exposed to hazards by gas. If the device is classified as associated equipment with intrinsically safe and non-intrinsically safe circuits, it may not be installed in explosion hazardous areas. It is only permitted to connect intrinsically safe devices located in the hazardous area to the intrinsically safe circuits of this device. The intrinsically safe connections of TURCK devices carry a blue marking.

When interconnecting devices within such an assembly it is mandatory to provide a proof of intrinsic safety (EN 60079-14: 2004, chap. 12.2.5). This is required to verify that all data related to explosion protection of the devices allow joint operation. Verification must include the internal capacitances and inductances of the cables used. Please refer to the special section " Proof of intrinsic safety" for more information.

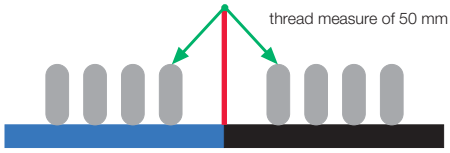
Intrinsically safe circuits should never be interconnected with non-safe circuits. Even if only interconnected once, it is possible that essential protective elements are damaged without the user being aware of this fact. A simple function test is not suited to verify a damage of this kind. Once intrinsically safe circuits have been connected to the non-intrinsically safe circuit, it is not permitted to use the device subsequently as intrinsically safe equipment. The governing regulations cover installation of intrinsically safe circuits, mounting to external connections, cable characteristics and cable installation. Cables and terminals with intrinsically safe circuits must be marked and separated from non-intrinsically safe circuits or feature appropriate isolation (> 1.500 VAC). The following is an excerpt from the requirements according to EN 60079-14:

- Protection against external electrical or magnetic fields, for example power lines
- Prevent conductor splicing of fine wires through wire sleeves
- Minimum cross section of 0.1 mm and also single wires of a conductor: 0.1 mm
- Protection against damage (mechanical, chemical, thermic)
- Armouring, metal cladding, shielding of cables and lines
- Common use of single-core non-sheathed cables of intrinsically and non-safe circuits in one line is not permitted
- Separate error assessment when using multi-conductor cables and lines
- If cables have to be color-marked, use light-blue.



When mounting IMB devices (interface module backplane), further instructions must be observed, owing to their open construction and special connection technology:

- The devices have to be mounted such as to comply at least with protection class IP20 acc. to IEC publication 60529. Generally, this is achieved by plugging dummy modules (IMB-BM) in the free slots.
- Connections for intrinsically safe and non-intrinsically safe circuits must either be separated by a physical barrier so that they are at least 50 mm (thread measure) apart from each other, or each connection must be provided with cable sleeves which cannot slip off and ensure covering of all bare parts.



A thread measure is defined as the distance between circuits separated by a physical barrier. The reason for this regulation is that it is possible to work with live intrinsically safe circuits; thus it must be avoided that these come into contact accidentally with any non-safe connection components. This distance is only required for external connections which can be accessed by the user. The minimum distance between two intrinsically safe circuits must be 6 mm and separation from other (grounded) metal parts must be 3 mm.

- IMB devices must be coded as a protection measure against mismatching. This is done by inserting coding keys in the appropriate bores; the matching openings are located in the corresponding retainers.

The approval expires, if the device is repaired, altered or opened by a person other than the manufacturer or an expert unless the device-specific instruction manual explicitly permits such interventions. Only an expert is familiar with the information on protection measures needed to assure that the device is still in accordance with the applicable regulations after such an intervention.

Visible damages to the device's housing (e. g. black or brown discoloration due to heat accumulation, perforation or deformation) indicate a serious error and the device must be turned off immediately. The associated equipment must also be checked.

Inspection of a device with regard to all relevant aspects of explosion protection may only be carried out by an expert or the manufacturer. Operation of the device is only permitted within the specified limits, e.g. the supply voltage may never exceed the maximum rating and the temperature range during operation must be strictly observed.

Intrinsically safe circuits with galvanic isolation - as is the case with TURCK devices - should not be grounded, unless not absolutely necessary from a functional point of view. Circuits without galvanic isolation, as provided by Zener barriers, always require grounding. EN 60079-14 includes the relevant grounding regulations. Within zone 0 earthing of a circuit is not necessary. If grounding is necessary for functional reasons, then it must be carried out in close vicinity of zone 0.

Prior to every initial set-up or after any change of the device interconnection within the assembly, it must be ensured that all applicable regulations, directives and framework directives are met, that all safety regulations are fulfilled and that the device is functioning properly. Only then is operation permitted.

Mounting and connection of the device should only be carried out by qualified and trained staff familiar with the relevant national and international regulations of explosion protection to ensure correct operation.

The system operator must ensure that the system is always in the required safe condition. The system must be inspected continuously and necessary maintenance work must be carried out immediately while observing the safety regulations. The system must be tested in case of need, latest every three years.

Cases of damage

The operator must report any explosion which could have been caused by the electrical equipment to the supervisory body.
The supervisory body is entitled to order an investigation by an expert.

Proof of intrinsic safety

According to EN 60079-14 a proof of intrinsic safety must be provided to confirm that equipment interconnected within an assembly meets the requirements of intrinsic safety. In this context, a clear distinction is made between two different types of circuits:

- Simple intrinsically safe circuit with a single associated device and at least one intrinsically safe device without additional supply.
- More than one associated devices capable of supplying electrical energy to the intrinsically safe circuit, not only during normal operation but also in a fault condition.

Simple circuit

The first definition of a simple intrinsically safe circuit requires the observance of all electrical limit values stated in the EC type examination certificate and the power characteristics. If these conditions are met, the user is entitled to keep a proof of intrinsic safety. Inductances and capacitances of the installed cables must be taken into account.
The intrinsic safety of a simple circuit is verified, if the limit values are maintained according to the following conditions:

Associated equipment	Conditions	Intrinsically safe device + cable
U_0	≤	U_I
I_0	≤	I_I
P_0	≤	P_I
L_0	≥	$L_I + L_C$
C_0	≥	$C_I + C_C$

This applies to circuits

- non-linear output characteristic of associated equipment and (at the same time)
- the presence of distributed reactances only.

If massed reactances are present and under the condition of linear limitation by the associated equipment, it must be checked if:
$C_0 > 1\%$ of C_I
$L_0 > 1\%$ of L_I
If one of the two conditions apply, the percentage of C_0 and L_0 must be reduced by half (50 % rule).

The cable characteristics provided by the manufacturer should be used. Should these not be available, the following typical values (acc. to EN 60017-14, part 12.2.2.2.) are recommended: 200 pF/m und 1 mH/m or 30 µH/Ω.

If the value P_0 of the associated equipment is not specified, a linear characteristic must be available, on the basis of which P_0 can be calculated: $P_0 = ¼ \times I_0 \times U_0$

Associated equipment

Designation	Type	Manufacturer	Test certificate no.	Expl. group	U_0 [V]	I_0 [mA]	P_0 [mW]	L_0 [µH]	C_0 [nF]
Isolating switching amplifier	IMB-DI-451EX-P/24VDC	TURCK	TÜV 08 ATEX 554880	[Ex ia Ga] IIC	12.0	12.4	37.2	10.0	0.49

Intrinsically safe equipment

No.	Designation	Type	Manufacturer	Test certificate no.	Expl. group	U_0 [V]	I_0 [mA]	P_0 [mW]	L_0 [µH]	C_0 [nF]
1	Proximity switch	BIM-INT-Y1X	TURCK	KEMA 01 ATEX 1264 X	EEx ia IIC T6	15.0	60.0	100.0	50.0	30.0
2	Proximity switch	BI1-EG05-Y1X	TURCK	KEMA 02 ATEX 1090 X	Ex ia IIC T6	20.0	60.0	80.0	150.0	150.0
	Cable inductances and capacitances: (Manufacturer spec. or LC = 1 mH/km, CC = 110 nF/km)			Total cable length: 130 m					0.13	14.3
	Total inductance and capacitance: (ΣLI and ΣCI)								50.13	44.3
	Intrinsic safety is achieved if all conditions are fulfilled: $U_0 \leq Ui$ $I_0 \leq Ii$ $P_0 \leq Pi$ $L_0 \geq \Sigma Li$ $C_0 \geq \Sigma Ci$									

Example – "Proof of intrinsic safety"

The connection of proximity switches to isolating switching amplifiers, or 2-wire transmitters to isolating transducers, or solenoid valves to a valve control module can be considered as simple circuits. The limit value indexes of the certificate of conformity and the EC type examination certificate differ. In this overview the indexes according to EN 60079-14 are used. Index "0" stands for maximum output values and "I" for maximum input values.
The proof of intrinsic safety should be laid down in a standardized document to facilitate clear documentation. The document should contain the date, the name of the manufacturer, the circuit type and the type code. A possible form of documentation is shown below.

Interconnection of several devices

The second case considers interconnection of several active associated devices. Here it is not permitted to apply the electric limit values of the EC type examination certificate for the proof of intrinsic safety. This case differs fundamentally from the first one.

Different limit values apply to an assembly of individually associated devices. Such an assembly will always be classified as equipment according to category "ib", even if the single devices comply with to category "ia". An assembly may therefore not be installed in zone 0.

A detailed description of interconnection and assembly is beyond the scope of this introduction. The related calculation methods and an example are contained in annexes A and B of EN 60079-14. Additionally, the ignition curves of IEC 60079-11 are needed. EN 50020 also contains the ignition curves.

Non-linear characteristics

When interconnecting associated devices whose typical curves are not entirely linear, a special procedure must be applied. This procedure is explained precisely in EN 60079-25.

Applicability of approvals / national approvals

Equipment certified according to the ATEX directive may be placed on the market, installed and put into service within the member states of the European Union.

Even though Switzerland does not belong to the EU, approvals according to ATEX are accepted. An approval by SEV is not required, if the customer provides the mandatory documentation, i.e. the instruction manual, the EC type examination certificate, the CE declaration and the certificate of the quality management audit relating to explosion protection.

Many states outside the European Union explicitly request their own national approval. Therefore TURCK devices feature approvals for many different countries. National approvals are required in countries such as the USA, Canada, China, Japan, Australia, CIS states, whereas other states accept approvals issued by other states. For this reason it is indispensable to be familiar with the national requirements.

In many states approvals are granted for a certain period only. Therefore it is recommended that a check is made whether the approval has expired or has been prolonged accordingly. If an approval expires after installation, many countries accept further operation.
Approvals according to ATEX and approvals in the USA and Canada are not subject to a time limit.

Overview of approvals

TURCK offers their customers the opportunity to view all valid approvals and to download these at: www.turck.com

Functional Safety (SIL)

SIL – Functional Safety in Process Automation

The IEC 61508 and IEC 61511 standards offer methods of making risk assessments of safety circuits. These standards define four safety levels which describe the measures required for the mitigation of risk in installation sections. All field devices are subjected to the rigorous test conditions and analyses stipulated by IEC 61508 in order to determine the SIL classification of a device.

The EU Directive 96/82/EU (Seveso II Directive) of the European Union lays down the legal basis for the operation of installations with major accident hazards. The Directive 96/82/EU is implemented in the Hazardous Incident Ordinance in the Federal Immission Control Act (12th BImSchV) of April 1 2000.

For the design of safety-related process control systems, a previous version of the Hazardous Incident Ordinance refers to DIN 19250 and 19251, which describe the requirements classes AK 1 - 8. In the newer version, the Hazardous Incident Ordinance refers to DIN EN 61508 and DIN EN 61511, which have similar content to the IEC 61508/ IEC61511 standards. These standards define four safety levels (SIL1 to SIL4) which describe the measures required for the mitigation of risk in installation sections and according to which field devices and actuators must be designed.

In order to estimate whether a device is suitable for a safety system with a specific SIL requirement, the field devices are analyzed and tested jointly by the manufacturer and an independent test authority.

The FMEDA analysis (Failure Mode, Effect and Diagnostics Analysis) is carried out in order to evaluate the hardware structure of the electronics. Together with the assessment of the (electro) mechanical components, the failure rates of the device, such as temperature transducers, can be determined. For this three parameters are primarily used that are calculated from the FMEDA: The hardware fault tolerance (HFT), the safe failure fraction (SFF) and the probability of failure on demand (PFD). The field devices are also subjected to other general safety assessments. The specified classification in the declaration of SIL conformity refers to the lowest SIL level.

For the safe operation of an installation, all safety circuits consisting of sensor/transducer, control system and actuator are examined and assessed in a further step according to IEC regulations and assigned an SIL classification. Prior to designing and calculating the safety circuit, a so-called SIL assessment is carried out which determines the safety standard (e.g. SIL2) with which the safety circuit must comply. For this purpose, software products are available on the market which document and record all aspects of plant certification from SIL assessment right through to the design and calculation of the safety circuits in accordance with IEC 61508.

During the permanent operation of a plant the safety functions of all safety circuits must be tested and documented on a regular basis. For this purpose individual test routines have to be defined, executed and documented accordingly. This is a time consuming process that is ultimately for the benefit of people and the environment.

Devices with SIL assessment

Ident no.	Type	Function	SIL assessment
7541226	IM1-12Ex-R	Isolating switching amplifier	2
7541227	IM1-12Ex-T	Isolating switching amplifier	2
7541231	IM1-22Ex-R	Isolating switching amplifier	2
7541232	IM1-22Ex-T	Isolating switching amplifier	2
7541229	IM1-121Ex-R	Isolating switching amplifier	2
7541230	IM1-121Ex-T	Isolating switching amplifier	2
7506440	IM33-11Ex-Hi/24VDC	Isolating transducer	2
7506446	IM33-12Ex-Hi/24VDC	Isolating transducer	2
7506441	IM33-22Ex-Hi/24VDC	Isolating transducer	2
7506516	IM35-11Ex-Hi/24VDC	Analog data transmitter	2
7506515	IM35-22Ex-Hi/24VDC	Analog data transmitter	2
7570004	IM35-11Ex-Hi/24VDC	Analog data transmitter	3
7520703	IM72-11Ex/L	Valve control module	3
7520702	IM72-22Ex/L	Valve control module	3
7520511	IM73-12-R/230VAC	Relay coupler	3
7520712	IM73-12-R/24VUC	Relay coupler	3
7570005	IMB-AO-22EX-HI/24VDC	Analog data transmitter	3
7570006	IMB-AIA-22EX-HI/24VDC	Isolating transducer	2
7570002	IMB-DI-451EX-P/24VDC	Isolating switching amplifier	2
7570003	IMB-DO-44EX-N/24VDC	Valve control module	3
7570018	IMB-DO-44EX-P/24VDC	Valve control module	3

Glossary

Actuator

An actuator is a device that acts as a controlling element and converts electrical control signals into mechanical movement, such as for a control valve.

Alarm output (Interface technology)

The electrical output of an interface device that switches in the event of a wire break or short-circuit in the input circuit (see also "Alarm output").

Alarm output

A detected wire break or short-circuit in the input circuit (e.g. of an isolating switching amplifier) causes the disconnection of the respective output. The alarm output remains on as long as the input circuit monitoring does not detect any faults. If a fault occurs in a circuit, the alarm output switches off (see also "Common alarm output").

Analog output

The analog output signal of a device is used for the continuous output of a measured variable. The format of an analog signal is for example 0/4…20 mA or 0/2…10 V.

Analog signal

An analog signal is an electrical signal that can continuously take on any infinitely variable value between a minimum and maximum value (see also "Digital signal").

Application area (Ex devices)

The application areas for Ex devices are:
a) The hazardous areas themselves
b) The areas outside of the hazardous areas

Associated equipment

Associated equipment is equipment that incorporates non-intrinsically safe circuits as well as intrinsically safe circuits. Intrinsically safe equipment may be connected to associated equipment, provided that all essential conditions for this kind of interconnected assembly are fulfilled. For example, an isolating switching amplifier is classed as associated equipment and the connected NAMUR sensor as intrinsically safe equipment.

ATEX

The abbreviation for "Atmosphère explosible" stands for the framework directive 94/9/EC which refers to the "harmonized European standard" under Article 100a. The relevant national regulations for explosion protection were derived from the ATEX 100a standard.

Backplane

A backplane is a mounting plate which provides slots for taking module cards.

Burden

The burden defines the maximum value of the resistance on an analog output. This values consists of the load of the connected device and the cable resistance.

Cable compensation

With temperature measurements a so-called cable compensation may be required, depending on the measuring process (e.g. Pt100 in 2-wire circuits). With resistance thermometers, the resistance value of the incoming cable must be taken into account with 2-wire circuits; This resistance value is determined with cable compensation and can thus be compensated. Otherwise unwanted corruptions of the measuring result may occur.

Cable resistance

The cable resistance is the resistance value of a complete cable (feed and return cables).

Category (Ex devices)

1: Category ia: Very high level of safety; Two of the faults described in the standard may occur and the device should remain safe.
2: Category ib: High level of safety; One of the faults described in the standard may occur and the device should remain safe.
3: Category ic: Normal safety; The device ensures (retains) the requisite level of protection during normal operation (see also "Device category")

Cold junction compensation

Thermocouples require a reference temperature in order to compensate the effect of the terminals of the measuring amplifier on the actual temperature measurement. As the terminals of the measuring amplifier are made from a different material to the wires of the thermocouple, a temperature is generated at the junctions (also called cold junctions) which then corrupts the voltage output by the thermocouple. In order to compensate for this distortion, the temperature at the cold junction is also measured (e.g. via a Pt100 resistor), fed to the amplifier and deducted from the measured value.

Common alarm output

A detected wire break or short-circuit in the input circuit (e.g. of a multi-channel isolating switching amplifier) causes the disconnection of the respective output. The alarm output remains on as long as the input circuit monitoring does not detect any faults. If a fault occurs in a circuit, the alarm output switches off (see also "Alarm output").

Current consumption

The current consumption defines the current that is used for the power supply of the device. For devices with a switch output, the current consumption is stated that is present in a switched no-load state.

Damping element

Damping elements are normally cog wheels or screws that repeatedly damp a sensor and thus enable the measuring of speed, for example on a drive.

Device group (Ex devices)

The device groups define and describe the place of use of a device in the explosion hazardous area:

- Device group I: For mining underground with a potential hazard due to firedamp and/or combustible dusts
- Device group II: For all other locations in which a potentially explosive atmosphere exists

Degree of protection (Interface devices)

Protection against direct contact and solid bodies and water:

- IP20: Protection against solid bodies from 12.5 mm in diameter and larger; No protection against water
- IP67: Full protection against dust and protection against immersion in water at a depth of 1 m for 30 minutes at a constant temperature

Digital output

A digital output provides on/off signals depending on the values that are determined during a continuous measuring process. Digital outputs are normally implemented with PNP or NPN transistors or with an electromechanical relay.

Drop-off time

The drop-off time defines the time required for a signal to change its signal level from 90% to 10 % (see also "Rise time").

DTM

DTM is an abbreviation for "Device Type Manager". DTMs are normally drivers for devices that are parameterized by computer, which for example can be parameterized via FDT (see also "FDT" and "PACTware™").

EC conformity declaration

The EC conformity declaration is used by the manufacturer to legally certify that the device complies with the relevant European Directives. This must be ensured by the manufacturer by means of appropriate manufacturing and testing.

EC type examination certificate

The EC type examination certificate is issued by a certified testing laboratory and contains the technical data of a device or values at which the device may be operated. The EC type examination certificate also states any "special conditions" for the use of the device as well as the basic safety and health regulations.

Efficiency

The efficiency is generally the ratio of the output power (effective power) to the input power.

ElexV

Ordinance on electrical installations in explosion hazardous locations (see also "Ordinance on Industrial Safety and Health")

EMC (electromagnetic compatibility)

The electromagnetic compatibility (EMC) denotes the normally desired state in which technical devices do not cause or suffer undesired electrical or electromagnetic interference to or from other devices in the same environment. It covers technical and legal issues of undesired mutual interference between equipment in electrical engineering.

Equipment category (Ex devices)

The equipment category describes the achieved safety level of a device for the explosion hazardous area:
1: Very high level of safety; Two of the faults described in the standard may occur and the device should remain safe.
2: High level of safety; One of the faults described in the standard may occur and the device should remain safe.
3: Normal safety; The device ensures (retains) the requisite level of protection during normal operation (see also "Device category")

Explosion

By an explosion is meant an exothermic reaction of material (gas, vapor, fumes or dust) that takes place at a very high speed of reaction.

Explosive atmosphere

An explosive atmosphere contains gases, vapors, fumes or dusts mixed with air as well as the usual filler materials that can explode spontaneously under atmospheric conditions (see also "Explosive mixture").

Explosive atmosphere (hazardous)

A hazardous explosive atmosphere is a mixture containing concentrations of flammable gases or vapors that, when ignited, can cause damage to persons directly or indirectly through an explosion (see also "Hazardous explosive atmosphere")

Explosive limits

A mixture is only explosive if the concentration is within certain material specific limits. These limits are called the upper and lower explosion limits and are listed in appropriate tables.

Explosive mixture

An explosive mixture is a mixture of gases or vapors, fumes or dusts, capable of propagating a reaction after ignition.
A mixture is only explosive if the concentration is within certain material specific limits. These limits are called the upper and lower explosion limits and are listed in appropriate tables.

Explosion hazards

Explosion hazards only exist in locations
- in which ignitable concentrations of flammable substances can exist under normal operating conditions or in the event of faults, and when these conditions provide the probability that a dangerous substance to air mixture is enough to form an explosive mixture;
- the explosive mixture can come in contact with a source of ignition and continue to burn after ignition.

External inductance

By external inductance is meant those inductances that have an effect outside of an Ex device, such as in a cable.

ExVO

German explosion protection ordinance.

Fault current

Output current in the event of a wire break or short-circuit in the input circuit, selectable between 0 mA or > 22 mA

FDT

An FDT/DTM configuration tool is a modular software concept and is structured in a manufacturer-independent configuration tool as a frame application, the FDT (Field Device Tool) and manufacturer-specific device drivers, the DTMs (Device Type Manager) (see also "DTM / PACTware™").

Field device

In automation, devices that are installed outside of the control cabinet, e.g. a NAMUR sensor, are called field devices.

Flash-point

The flash-point is the lowest temperature at which a liquid releases sufficient vapors that can be ignited when close to an energy source and extinguished when the energy source is removed.

FM (Approval)

Certification and testing laboratory for North American approvals for the Ex and non-Ex area (see also UL)

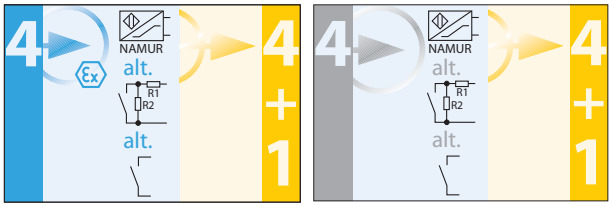
Frequency

The frequency f defines the number of oscillations per second and can also be calculated as the reciprocal value of the period duration (T = 1/f). The SI unit of frequency is the Hertz (1/s). However, other units are also used, such as 1/min.

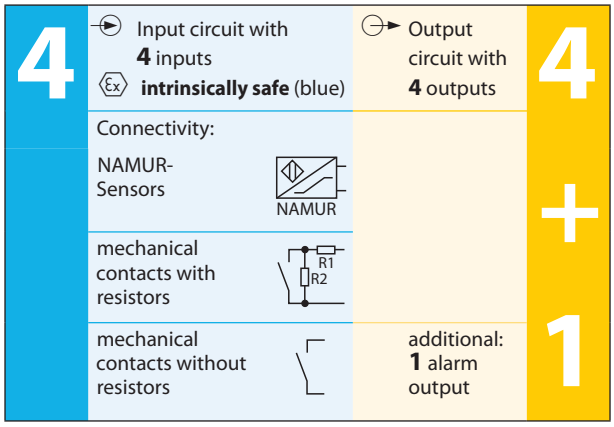
Function diagrams – Layout and content

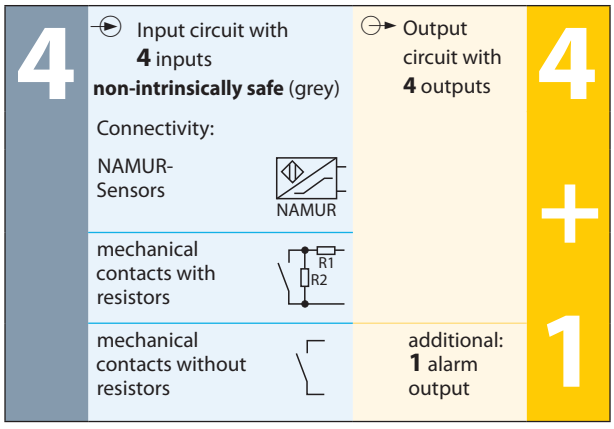
The wiring diagrams listed in the selection tables, inform compactly about the application area, function and IO-configuration of the different product groups.

Example: Function diagrams of isolating switching amplifiers IM1-451



Explanations:





Function diagrams – Symbols

Application area, functions and IO-configuration are represented by the following symbols:

Symbol	Meaning
	Input
	Output
	Application in Ex-areas
NAMUR	Sensor, NAMUR
pnp	Sensor, 3-wire, pnp
5...30 VDC	Pulse (external signal source)
	Mechanical contact
R1 R2	Mechanical contact with resistor
	Voltage source
	Current source
mV	Low voltage, millivolt signals
	Actuator
	Thermocouple
	RTD
	Potentiometer
	SPDT contact

Galvanic isolation

Galvanic isolation provides the isolation of electrical circuits by means of transformers such as optocoupler.

HART®

HART® stands for "Highway Addressable Remote Transducer" and consists of digital communication via a common data bus. The data transfer is implemented according to the Bell 202 standard by means Frequency Shift Keying (FSK). The low-frequency analog signal is superimposed with a high frequency oscillation (± 0.5 mA). A digital "1" is represented with a frequency of 1.2 kHz (1200 Hz) and a "0" with the frequency 2.2 kHz (2200 Hz).

Hazardous area

A hazardous area is an area in which there is a risk of explosion, i.e. a hazardous explosive atmosphere can occur due to local operating conditions.

Hysteresis

With switching outputs: The difference between the switch-on and the switch-off point. The two switch points can be set to different values in order to prevent the fluttering of an output. If the switch-off point is higher than the switch-on point, this monitors the overshooting of a limit value. If the switch-on point is higher than the switch-off point, this monitors the undershooting of a limit value. The difference between the values depends on the application and should allow for regular deviations of the measured value

IECEx

International Electrotechnical Commission System for Certification to Standards Relating to Equipment for use in Explosive Atmospheres.

Inductance

Inductance is the electrical property of a current-carrying conductor or other component to form on account of a change in electrical current a magnetic field which works against the change in current.

Input frequency

The input frequency is the maximum frequency that may be present at the device input.

Input circuit monitoring

The input circuit monitoring monitors the connected loop. The 4…20 mA signal is normally used for analog signals (example: Wire break at I < 3.6 mA).
The NAMUR working group provides recommended thresholds. NAMUR sensors offer line monitoring for digital signals. Sensors compliant with EN 60947-5-6 (NAMUR) have an impedance of < 400 Ω in a non operational state and otherwise have a maximum impedance that ensures a minimum current of > 0.05 mA. These limit values can be used for detecting wire breaks and/or short-circuits in the control circuit of switching amplifiers.

Input delay

The input delay specifies the time required by a device (e.g. a valve control module) to provide the output signal after a signal is present at the input.

Input lock-out time

During the input lock-out time pulses at the sensor input of the interface device are suppressed for the set time.

Input resistance

The input resistance is present at the input of a device and loads the voltage source present at the input.

Internal inductance

The value of the internal inductance must be taken into account when verifying intrinsic safety. The internal inductance of associated equipment reduces the connectable value. The internal inductance of an intrinsically safe apparatus reduces the usable cable length. The 50 % rule should be applied if the intrinsically safe equipment also has an internal capacitance in addition to the internal inductance. This rule is applicable as soon as both reactances are more than 1 % of the connectable reactances. If this is the case, the connectable reactances are reduced by 50 %, i.e. the usable cable length is reduced.

Intrinsic safety

"Intrinsic safety i" is a protection type for the hazardous area that is described by the EN 60079-11:2007 standard. This limits the electrical energy of an apparatus so that an explosive atmosphere cannot be ignited (see also section "Basic Explosion Protection Principles").

Intrinsically safe equipment

Intrinsically safe equipment denotes devices that comply with protection type "i" (intrinsically safe).

I/P converter

An I/P converter converts a current signal on the input side (0/4…20 mA) to a pressure on (e.g. 0.5…4 bar) on the output side.

Insulation resistance

By insulation resistance is meant the ohmic resistance between electrical conductors or to ground potential.

Line monitoring

TURCK interface devices with line monitoring are used to monitor the input circuit for short-circuits and wire-breaks (see also „input circuit monitoring“)

Linearity tolerance

On devices with an analog output, the linearity tolerance defines the maximum permissible deviation of the output signal from an ideal linear output characteristic (stated in % of the full scale of the output signal).

Limit frequency

The limit frequency defines the maximum or minimum value of the frequency that can or should be processed. To ensure interference immunity, an upstream filter is installed in the pulse inputs of rotational speed monitors. Input frequencies that are above the limit frequency of this filter can no longer be processed by the speed monitoring device.

Load resistance

The load resistance defines the maximum value of the resistance on an analog output. This consists of the load of the connected device and the cable resistance (see also “Burden”).

Loop-powered

Loop-powered devices are fed from the signal and do not require a separate power supply.

Measuring accuracy

The measuring accuracy denotes the degree of closeness of the measuring result to the true value of the measured variable (see also “Measuring error”).

Measuring error

A measuring error (according to DIN 1319-1:1995) is the deviation of a value obtained from measurements from the true value of the measured variable.

Measuring range

The measuring range of a device with an analog output in accordance with DIN 1319 is the range of a measured variable in which the measuring errors remain with defined limits.

Millivolt signals

One thousandth of a volt

NAMUR

International association of users of automation in the process industry.

Ni100

Temperature-dependent resistor to DIN 43760, consisting of nickel; less expensive than Pt100 resistors. The temperature coefficient of a nickel resistance thermometer is virtually 2 x greater than that of a platinum resistance thermometer.

Normally closed operation

Normally closed operation is present when the output (e.g. of an isolating switching amplifier) is active when the contact is open or with an activated NAMUR sensor.

Normally open operation

Normally open operation is present when the output (such as of a isolating switching amplifier) is active when the contact is closed or with a non-activated inductive NAMUR sensor.

On signal (1 signal)

The On signal defines the signal level (e.g. in Volts) required by a device to detect the input pulse (e.g. 5…30 V – see also “Zero signal”).

Open circuit voltage

The open circuit voltage is the voltage on the output side if no load is connected.

Ordinance on Industrial Safety and Health (BetrSichV)

The Ordinance on Industrial Safety and Health (BetrSichV) is the German implementation of the Work Equipment Directive 89/655/EC[1], later replaced by Directive 2009/104/EC[2], and regulates in Germany the provision of equipment by the employer, the use of equipment by employees during work, and the operation of systems subject to monitoring for occupational safety.

Output current

The output current is the current that a device can provide at the output circuit.

Output functions

Typical output functions are:
NAMUR: Normalized output signal in accordance with EN 60947-5-6 NO contact (N.O.): The output is open in the non-activated state and is closed when activated.
NC contact: The output is closed in the non-activated state and is open when actuated.

Complementary (two-way contact): One of the two outputs is closed in the non-activated state and the other output is closed in the activated state.
Analog output: The output supplies a normalized output signal (0/4...20 mA or 0/2...10 V).

Output power

The output power is the power that a device can provide at the output circuit, such as a valve control module for the associated valve controlled (see also "Switching capacity").

Output voltage

The output voltage is the voltage that a device can provide at the output circuit.

PACTware™

PACTware™ stands for "Process Automation Configuration Tool" and is an open and manufacturer-independent operator interface for the plant-wide operation of devices, systems and communication components. PACTware™ has the FDT interface integrated. FDT (Field Device Tool) is the standard for the standardization of the interface between the device and the operator interface. The FDT enables the operation of devices between the PACTware™ frame software and the individual software modules (DTM = Device Type Manager) to be integrated simply and quickly. PACTware™ enables the devices of an installation to be configured and operated simply, quickly and efficiently, as well as diagnosed if required.

Period duration measuring process

With the rotational speed monitors, the time between two successive input pulses is measured directly and compared with the internally defined reference time. This measuring principle also enables acceptable reaction times in applications with relatively large pulse intervals.

Power consumption

The power consumption defines the value that the device itself converts.

Primary explosion protection

Primary explosion protection consists of measures with which the formation of a hazardous atmosphere can be prevented:
- Avoidance of flammable liquids
- Increasing the flash point
- Concentration limits
- Natural and technical ventilation
- Monitoring of the concentration…

(see also "Secondary explosion protection")

Protection type

The EN 60079 (IEC 60079) standard stipulates general requirements for the design and testing of electrical equipment required for the hazardous area:
- Oil immersion "o" (EN / IEC 60079-6)
- Pressurized enclosure "p" (EN /IEC 60079-2)
- Sand filling "q" (EN / IEC 60079-5)
- Flameproof enclosure "d" (EN / IEC 60079-1)
- Increased safety "e" (EN / IEC 60079-7)
- Intrinsic safety "i" (EN / IEC 60079-11)
- Non sparking equipment "nA" (EN / IEC 60079-15)
- Sparking equipment "nC" "nR" (EN / IEC 60079-15)
- Encapsulation "m" (EN / IEC 60079-18)
- Optical radiation "o" (EN / IEC 60079-28)
- Intrinsically safe electrical systems "i-SYST" (EN / IEC 60079-25)

(see also the section "Basics of explosion protection")

Pt100

Pt100 resistors are used for industrial temperature measuring. IEC 751 contains the reference tables for platinum resistors. The measuring range is from -200 °C to +850 °C; the range -100 °C to +600 °C is the usual range for standard resistors. A Pt100 can be connected to a transducer in 2, 3 or 4-wire circuits.

Pulse

Pulses are voltages or currents that exist over a "short" period. For monitoring rotational speed, the signals of a NAMUR sensor are used as input pulses for the rotational speed monitor.

Pulse time

The pulse time is the period in which a pulse is present.

Pulse output

The pulse output (transistor output) provides the input pulse signal (e.g. with a rotational speed monitor) for other processing units.

Rated voltage

The rated voltage is the highest permissible supply voltage (in normal operation).

Ripple

Irregularities in the DC voltage may occur after the VAC mains voltage is rectified to a VDC voltage (due to the original sinusoidal wave of the mains voltage). The remaining wave troughs can be compensated ("smoothed") by means of a capacitor connected in parallel to the load or a coil connected in series to the load. The remaining AC component after smoothing is called the ripple or hum voltage. A 10 % ripple (peak-peak) of the supply voltage is normally tolerated.

Ring memory

A ring memory stores data continuously over a specific period and overwrites the data after a specific time has elapsed in order to release memory for new data. This process is inevitably best illustrated graphically in a ring form, thus the name of this technology.

Rise time

The rise time defines the time required for a signal to change its signal level from 10% to 90 % (see also "Drop-off time").

Secondary explosion protection

Secondary explosion protection consists of measures with which the ignition of a hazardous atmosphere is prevented. For this purpose the electrical equipment is designed so that

- it can not form any effective ignition source and the contact of the ignition source with an explosive atmosphere is prevented.
- the propagation of combustion to the surrounding explosive atmosphere is impeded.

(see also "Primary explosion protection")

SIL

SIL stands for Safety Integrity Level. The IEC 61508 and IEC 61511 standards offer methods of making probabilistic risk assessments of safety circuits. These standards define four safety levels (SIL level) which describe the measures required for the mitigation of risk in installation sections.

Short-circuit current

The short-circuit current defines the value of the current present in the event of a short-circuit.

Short-circuit detection

Several TURCK interface devices, such as isolating switching amplifiers, are provided with short-circuit monitoring in the input circuit (see also "Input circuit monitoring" and "Short-circuit threshold").

Short-circuit threshold

The short-circuit threshold is the value at which a device, such as an isolating switching amplifier, detects a short-circuit in the input circuit.

Simple electrical equipment

Simple components and simple equipment that do not generate or store more than 1.5 V, 0.1 A and 25 mW, and do not require a test certificate are classified as "simple electrical equipment" (e.g. thermocouples). This equipment is defined in the standard EN 60079-14.

Start-up time delay

Adjustable time for bridging the startup phase, e.g. of a drive in which an underspeed is not indicated. Only after the delay time has elapsed are the set parameters checked for underspeed.

Substance group (Ex devices)

The substance group for the Ex area indicates the use of a device in specific atmospheres:
G: Explosion protection in explosive atmospheres due to gases, vapor or fumes (G: gas)
D: Explosion protection in explosive atmospheres due to dusts (D: dust)

Supply voltage

The supply voltage is the voltage that is fed to a device.

Supply voltage

The supply voltage is the voltage that a device requires for trouble-free operation.

Switch current

The switch current is the current that an electrical device can switch safely.
The supply voltage range is the range between the minimum and maximum value that a device requires for a safe power supply (see also "Supply voltage").

Switch-off delay

Adjustable time by which the switching of the output can be delayed after the set limit value has been reached (see also "Switch-on delay").

Switch-off threshold / switch-off point

The switch-off point when the actual value is above or below a set measured value

Switch-on threshold

The switch-on threshold defines the signal level at which a switch-on is initiated, e.g. by means of a limit value relay.

Switching capacity

The switching capacity is the power that an electrical device can switch safely.

Switching frequency (Interface devices)

The switching frequency is the number of switch-on and switch-off operations of an output per second. The higher the switching frequency, the more frequently the switch operation can be executed per second, i.e. the switch operation is faster.

Switching frequency (max.)

The max. switching frequency of a device indicates how many status changes of the switch output are possible per second.

Switch voltage

The switch voltage is the voltage that an electrical device can switch safely.

Terminal cross-section

The cross-section of the connection cables of a device

Temperature classes

Equipment for the hazardous area is classified into temperature classes. This specifies the maximum permissible surface temperature of an apparatus. The explosion protected apparatus can also be approved for several temperature classes – depending on technical and financial considerations.

Test voltage

The test voltage is the voltage used for testing the insulation resistance (see also "Insulation resistance").

Thermocouples

Thermocouples are used for industrial temperature measuring. The most common types are type B, E, J, K, L, N, R, S and T thermocouples. Depending on type, thermocouples can be used for temperature ranges from -270…1800 °C.

Transmitter

Transmitters are devices that convert signals into a different, mostly normalized signal (e.g. transducer).

Trigger event

A trigger event is normally the triggering of an event, such as the exceeding of a limit value, on account of which, for example, the write process to a ring memory is stopped.

UL

Certification and test laboratory for North America approvals for the Ex and non-Ex area (see also "FM").

Voltage drop

In electrical engineering the voltage drop is a potential difference present between two terminal points of a current carrying resistance, e.g. the voltage across the switched output of a device.

Wire break

A wire break occurs when a cable is interrupted in a closed electrical circuit (see also "Input circuit monitoring").

Wire-break threshold

Sensors in accordance with EN 60947-5-6 ensure a minimum current flow of 0.05 mA. This current is used for detecting wire breaks and represents the wire-break threshold.

Window function

The window function is used to implement a range in which the sensor takes on a defined switching state. The user defines the switch range by means of an upper and lower window limit.

Zone 0, Zone 1, Zone 2, Zone 20, Zone 21, Zone 22

In accordance with EN 60079-10 and EN 1127-1, hazardous areas are classified into zones for flammable gases, vapors, fumes and combustible dusts. The classification is based on the likelihood that a hazardous explosive atmosphere can occur. The ATEX Directive has re-defined the zone divisions. Classification according to

- Zone 0, 1 and 2 for gases
- Zone 20, 21 and 22 for dusts

(see also the section "Basics of explosion protection").

Zero signal (0 signal)

A "zero signal" is the signal level (e.g. in Volts) that a device requires to detect the input pulse as a zero signal (e.g. 0…3 V) (see also "On signal").

Index of types

TURCK

Industrial Automation

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