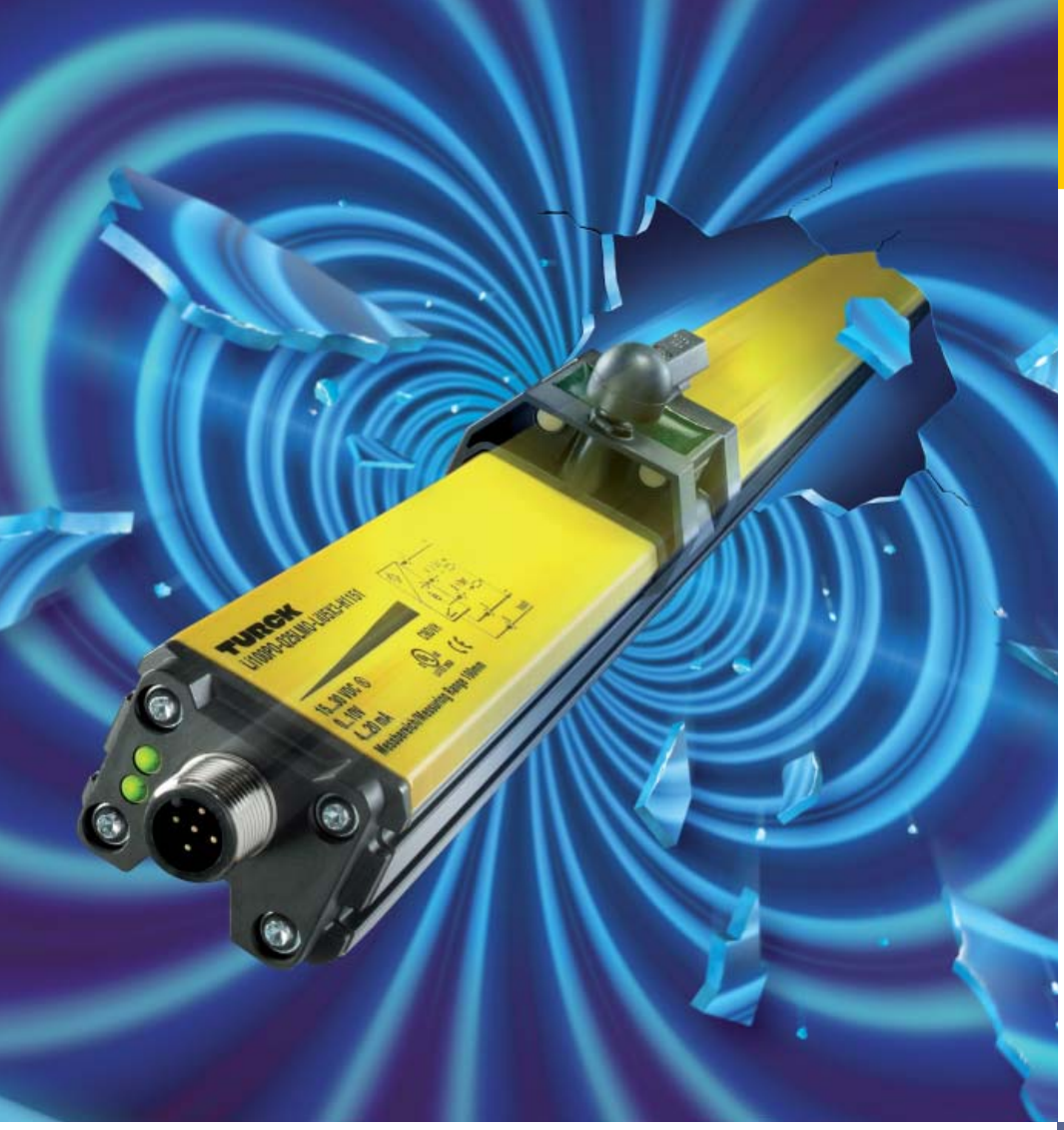

TURCK

Industrial
Automation

INDUCTIVE LINEAR POSITION SENSORS

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

The Company

TURCK is worldwide one of the leading companies in the field of industrial automation. With more than 2,800 employees in 27 countries as well as sales partners in further 60 countries, the sensor, fieldbus, connection and interface specialist is internationally well-placed.

With superior products and tailor-made solutions for factory and process automation TURCK has been setting new standards continuously for over 40 years.

The international orientation of the company started as early as 1975 with the foundation of TURCK Inc. in Minneapolis, USA. With state-of-the-art production facilities in Germany, Switzerland, the USA, Mexico and China, TURCK is able to adapt itself worldwide to local market conditions. Despite the company's international activities, the core competences and central production facilities stay in Germany and will remain here in the future.

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The Program

TURCK
Industrial Automation

With over 15,000 products covering the fields of sensor, interface, connection and fieldbus technology, TURCK offers the full range of solutions for factory and process automation.

Examples for the company's innovative leadership are the inductive factor 1 sensors *uprox®+*, the modular IP67 I/O system BL67 as well as *excom®*, the compact remote I/O system for the Ex-area.

Whether for machine & system engineering, the automotive sector, transport & handling, food & beverage or for chemical and pharmaceutical industries: TURCK products enhance the availability of your systems, using absolutely reliable technologies. Our products help you to lower the costs for purchase, storage, installation and operational safety through effective standardization.

Inductive linear position sensors – Breaking new grounds

Industrial applications increasingly use analog position sensing. The user is thus able to optimize production processes, simplify quality assurance and to reduce production costs and failure rates.

Position sensing systems are available in most varying designs and applications; from potentiometers, over magnetostrictive sensors up to high-resolution glass scales.

The new inductive linear position sensor by TURCK operates on the basis of a completely new, revolutionary measuring principle. The positive features of standard measuring systems are combined and systematically developed further. The position is not detected via a positioning magnet but via an inductive oscillating circuit. The sensor is thus completely immune to magnetic fields which are generated by large motors for example.

The inductive linear position sensor works wear-free, has extremely short blind zones and excellent EMC qualities. Available are devices with measuring ranges of 25 mm to 1000 mm. The measuring range is adjustable via teach adapter or teach line.

The two LEDs indicate the signal status, the position of the element as well as the operating voltage.

The choice between different outputs types (0…10 V, 4…20 mA, IO-Link, SSI) and fieldbus connections as well as the large range of available mounting accessories increase the versatility of the new inductive linear position sensors even more.

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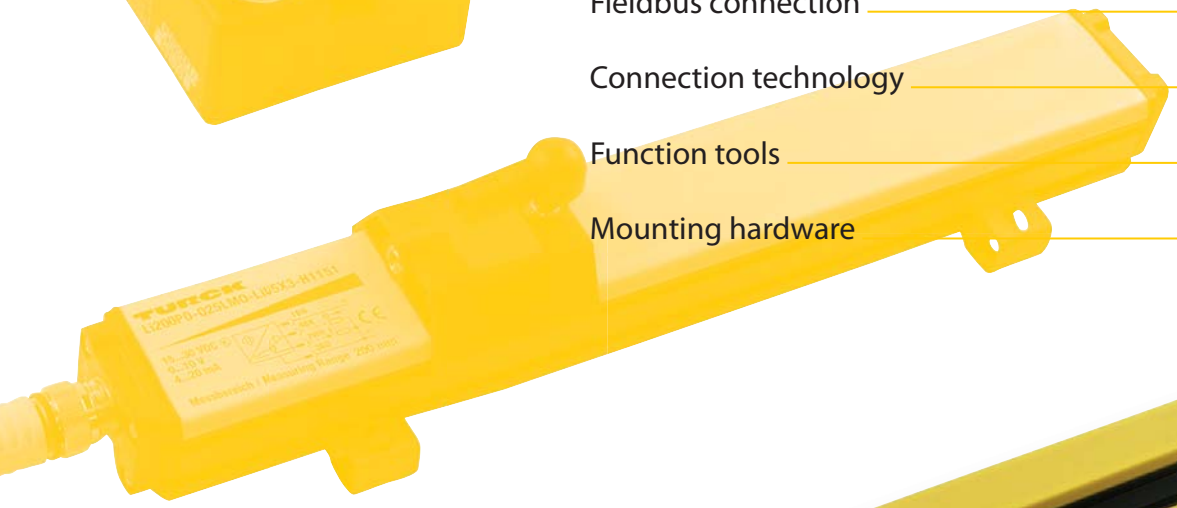
Content



The technology – from the measuring principle to the housing qualities

The measuring principle

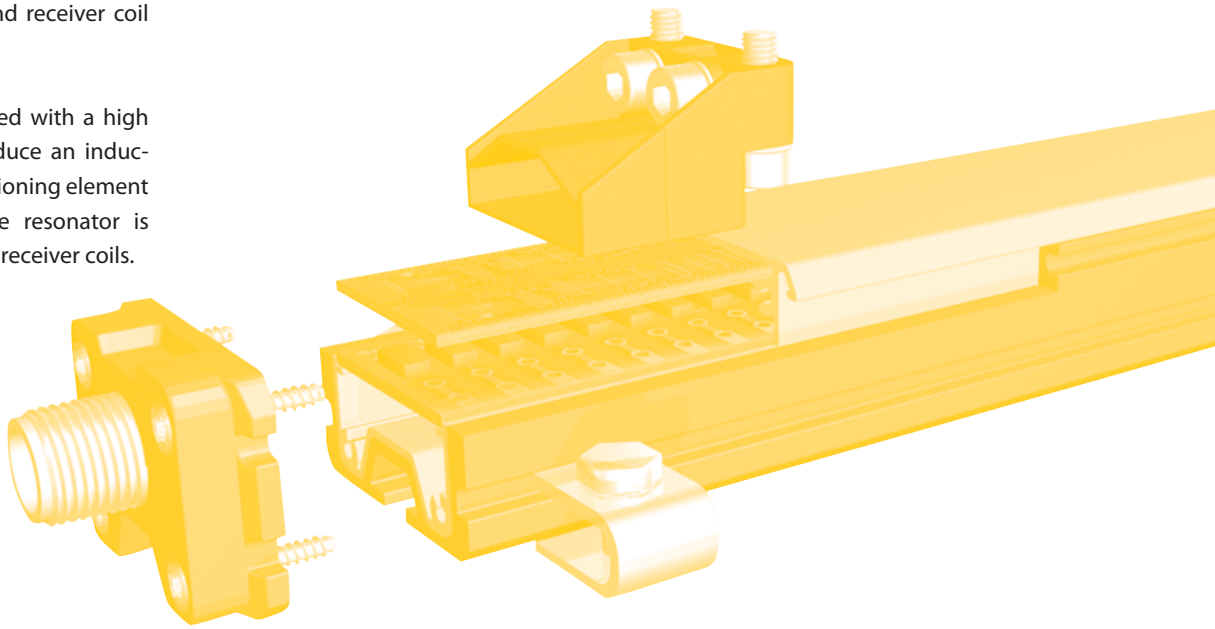
The measuring principle of the new linear position sensors is based on RLC coupling, a revolutionary inductive method. Unlike the potentiometric or the magnetostrictive measurement principle, this method provides considerable advantages.

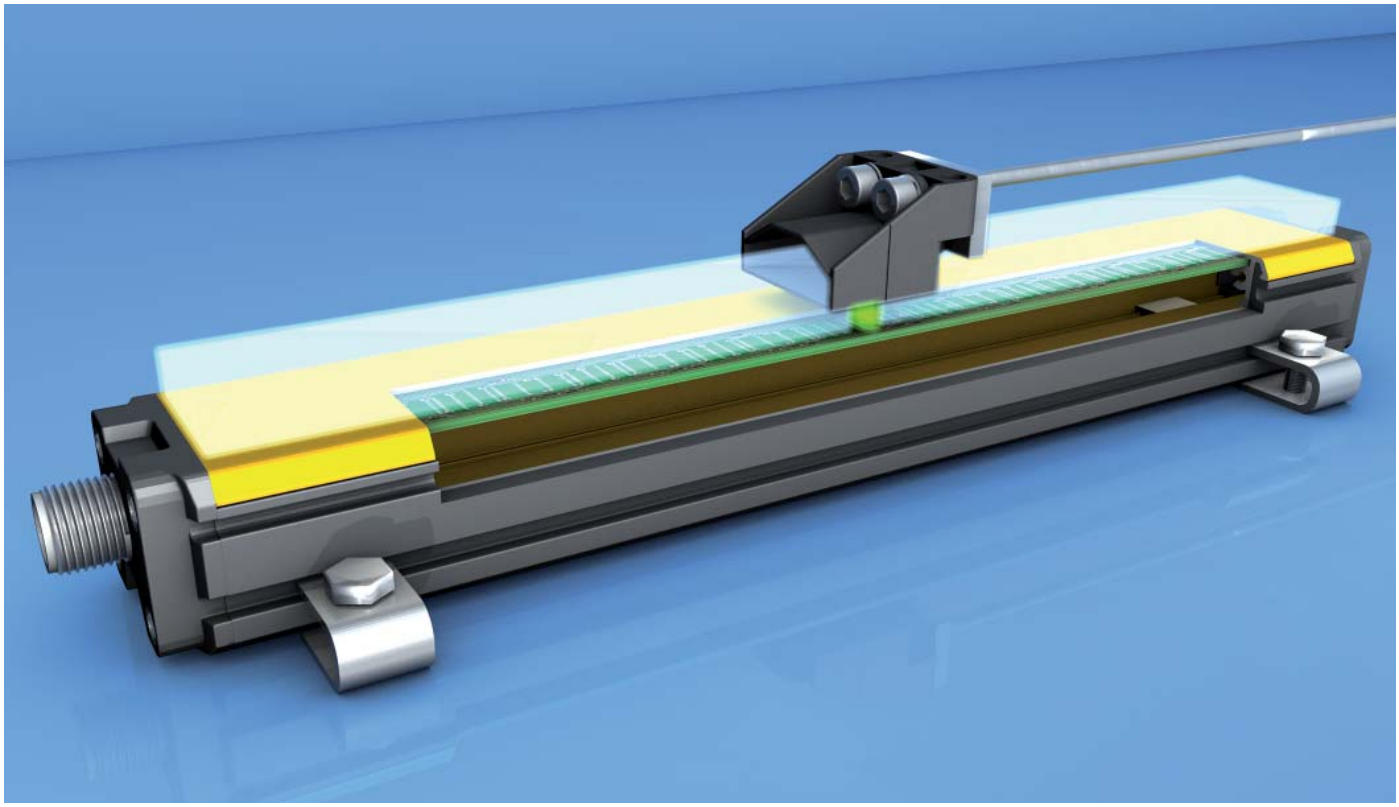
The sensor incorporates very precisely manufactured printed emitter and receiver coil systems.

The emitter coils are activated with a high frequency AC field and produce an inductive RLC circuit with the positioning element (resonator). As a result, the resonator is inductively coupled with the receiver coils.

The receiver coils are arranged such that different voltages are induced in the coils depending on the position of the resonator. These voltages serve as a measure for the sensor signal.

To increase the flexibility and speed of measurement, the sensor operates with two coil systems. One for rough and on for precise position detection of the resonator.





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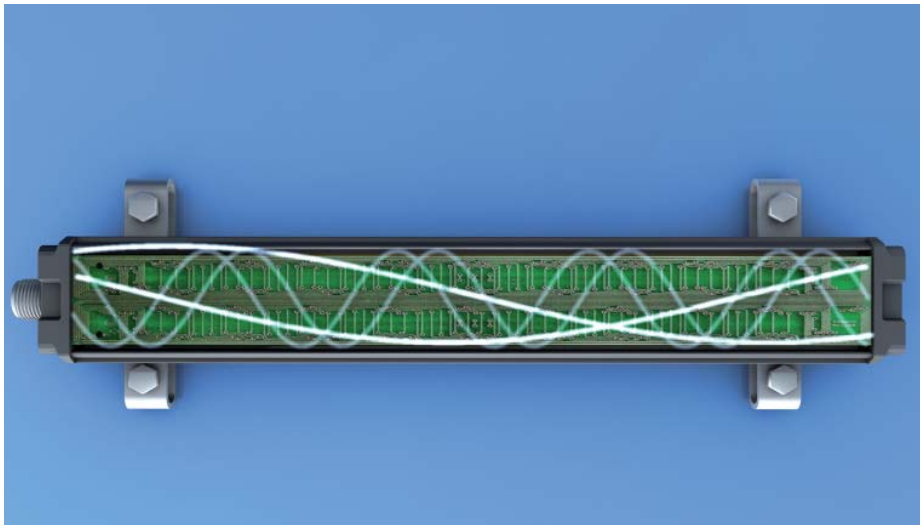
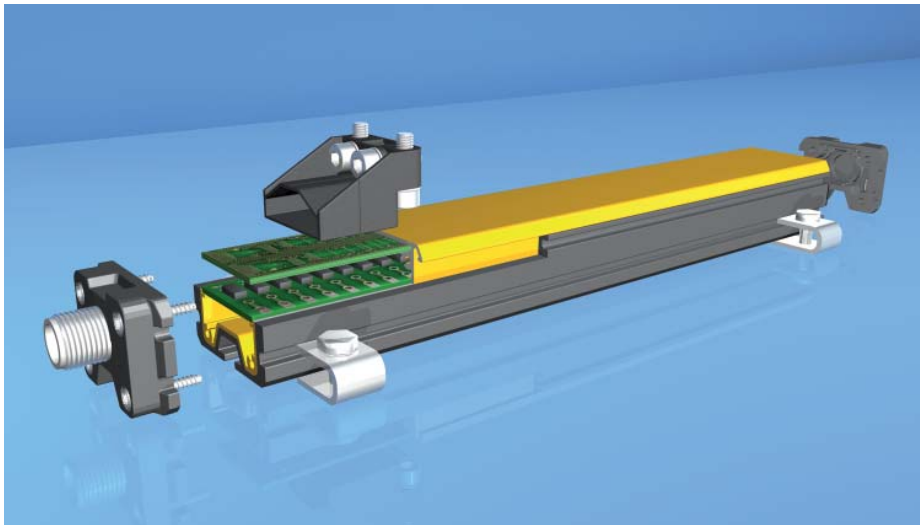
Electronics and coil geometry

The coils are especially arranged to ensure a stable RLC circuit at a defined distance (0…4 mm) and stable sensor signals even with vertical or lateral movements. The signals are processed and transmitted to the output in high resolution quality by the incorporated 16 bit processor.

The electronics is located on two circuit boards. The first circuit board carrying the sensor element is located directly below the active face. The second one with the electronics for signal processing instead is located below the first one. Thanks to this arrangement, extremely short blind zones are achieved.





Housing qualities

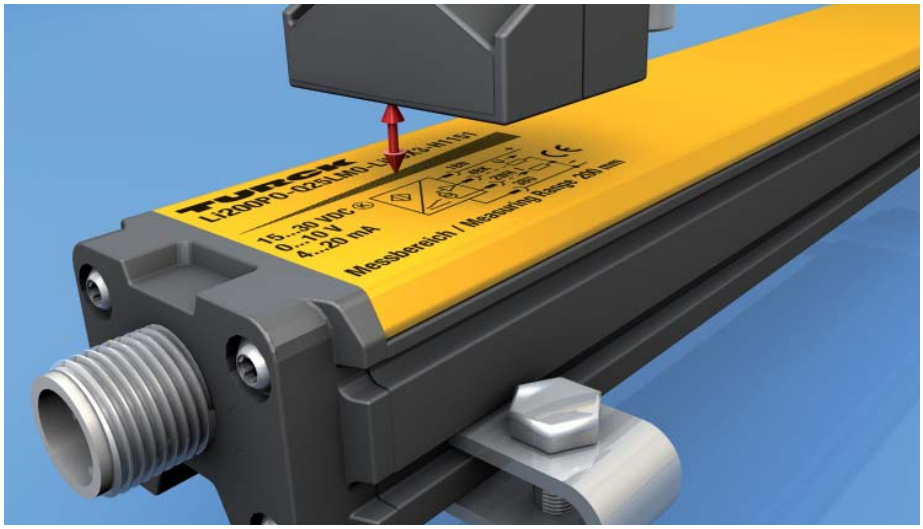
We provide linear position sensors in different housing qualities. Sensors of the Li-Q25L series are built in an aluminium cast housing with a high-quality plastic inlay. They are available in lengths from 100 mm to 1000 mm.

The compact Li-Q17L as well as the Li-QR14 series are built in a highly tight plastic housing, made for many aggressive ambient conditions. They are available in lengths of 50 mm to 200 mm (Li-Q17L series) resp. 25 mm (Li-QR14 series). Angled and straight mounting elements guarantee highest flexibility for mounting. The positioning element is moreover rotatable and can be oriented parallelly or crosswise to the sensor.

Technical features

Non-contact position detection

The new measuring system works non-contact and wear-free. Important features such as accuracy, linearity and tightness are conserved a lifetime and guarantee faultless operation at any time.



Robust and leak-proof housing

The aluminium cast housing is IP67 protected and provides high mechanical stability in combination with the high-quality plastic inlay. The sensor is moreover perfectly resistant to most chemicals and oils. The aluminium cast housing is robust and can be mounted in many ways. In combination with the extensive range of accessories, you can mount the sensor safely, flexibly and easily in your system. .

Short blind zones

Extremely short blind zones provide highest mounting flexibility for many different applications. Even when mounted in confined spaces, the entire measuring range is covered. The measuring range of the devices with analog output is set within seconds via teach line or optionally via teach adapter. The status LED at the sensor helps to control the teach-in process.

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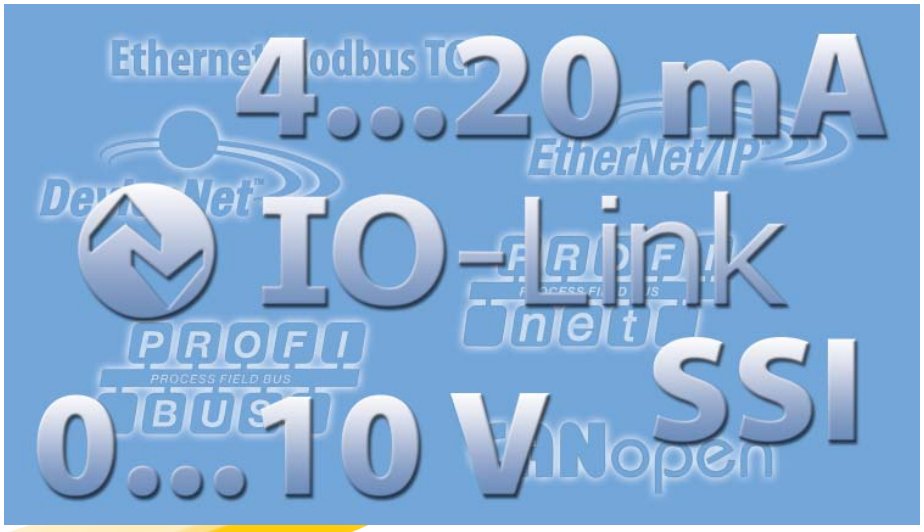
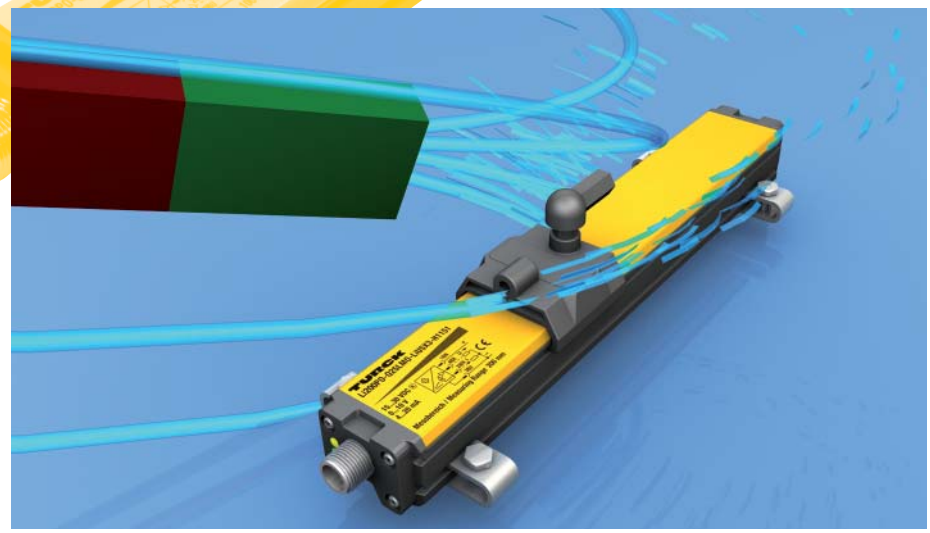
Flexible process connection

Adaption to the higher level control is enabled through analog current or voltage output as well as via SSI. The signal can thus be coupled easily to different bus systems, for example via the remote I/O systems from TURCK. The connection is established via M12 x 1 standard connectors, making the use of special connectors redundant. Some versions can also be operated in IO-Link mode.



Highest accuracy

The measuring principle and the system resolution of the new inductive linear position sensors made by TURCK provide highly precise measured signals. The standard versions already achieve a very high linearity and repeatability, sufficient for most applications. If the standard versions should not comply with the requirements in terms of linearity and repeatability, the high-end series does. Highest accuracy thanks to improved signal processing and communication are the core features of this series, perfect for highest demands.



High interference immunity

Frequency converters, large motors, ferritic metals or permanent magnets are no problem at all: The new inductive linear position sensor made by TURCK operates with an RLC circuit, is thus insensitive to interference caused by magnetic fields and features excellent EMC properties. Mechanical strains are hold off by the revolutionary work principle: The distance between sensor and positioning element has no influence on the output signal. Vibration and roughness in the guidance of the target have no influence on the output signal either.

Cost optimization achieved through...

Process reliability

The new linear position sensor works reliably even in demanding ambient conditions. The sensor features protection class IP67 and always provides exact results, even when exposed to dust or water.

Vibration, lateral or vertical shifts of the positioning element have no influence on the output signal at all. Magnetic fields such as produced by large electric motors for example, have no influence on the operability either. Thanks to the new resonance measuring principle, the sensor features excellent EMC properties. Consistently implemented, latest technology guarantees less down times.

Process flexibility

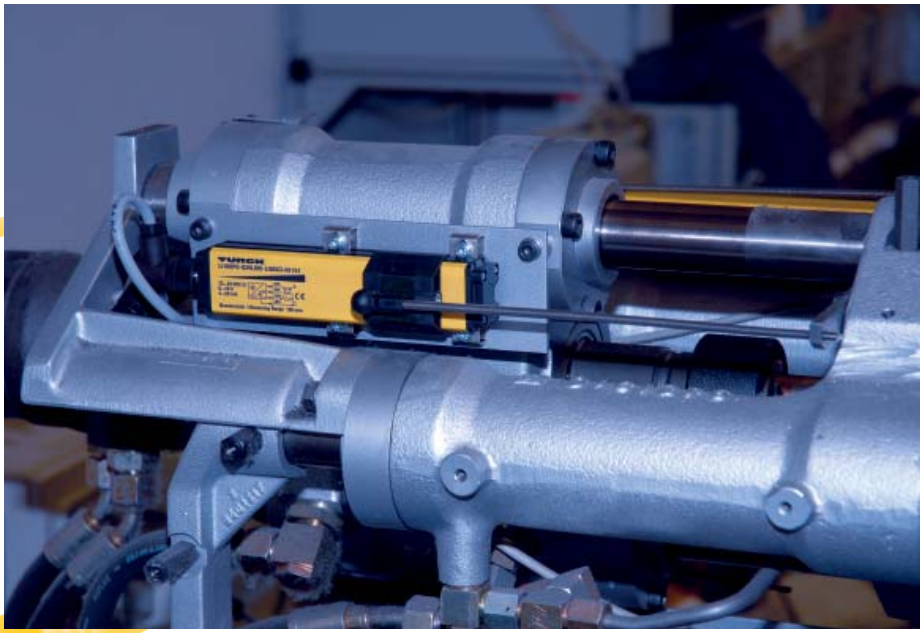
As a system provider TURCK not only offers the sensors but also the matching connection technology to the higher level control systems. The new inductive linear position sensors feature different output types and can be connected to all standard fieldbus systems, such as BL20, BL67, *piconet*® and *BL compact*.

Equally wide-ranging is the assortment of brackets. They perfectly complement the range of accessories and make mounting of the compact linear position sensors easier.

Standardization

Thanks to the new technology the measuring range is individually adjustable via teach line or optionally via teach adapter. Compared to conventional potentiometric or magnetostrictive measuring systems, less devices are needed and a higher degree of standardization is achieved.

TURCK reacts on demands within a few days, allowing the customer to reduce the stock to a minimum. This service is offered around the globe by our TURCK subsidiaries and agencies. The customer thus benefits from the TURCK expertise anywhere.



Service-friendliness

Unlike potentiometers which require readjustment when exposed to permanent mechanical strain, the new linear position sensors work on the non-contact principle and are wear and maintenance-free. LEDs indicate the system status clearly, even from a distance. The measuring range is easily adjusted to new tasks by teaching.

Inductive linear position sensors Li-QR14 – Miniature series with analog output (U/I)

Product features

- Standard resolution 12 bit
- Current and voltage output integrated in one device
- Cable with standard connector M12 x 1, 4-pole
- Cable, open end
- Extreme short blind zones
- Watertight polycarbonate insert

Measuring range indicated via LED

- **green:**
  The positioning element is in the measuring range
- **green flashing:**
  The positioning element is in the measuring range with a lower signal quality (e.g. distance too long)
- **off:**
  The positioning element is outside the measuring range

Li25P1	QR14	LU4X2	0,3-RS4	S97

Li	25	P1	Inductive linear position sensors	–	QR14	Housing style	–	LU4	X2	Electrical version	–

Positioning element
P1 P1-Li-QR14/Q17L

Measuring range
25 mm

Functional principle
Li linear inductive

Mounting element
QR14 rectangular, 53.5 x 49 x 14 mm

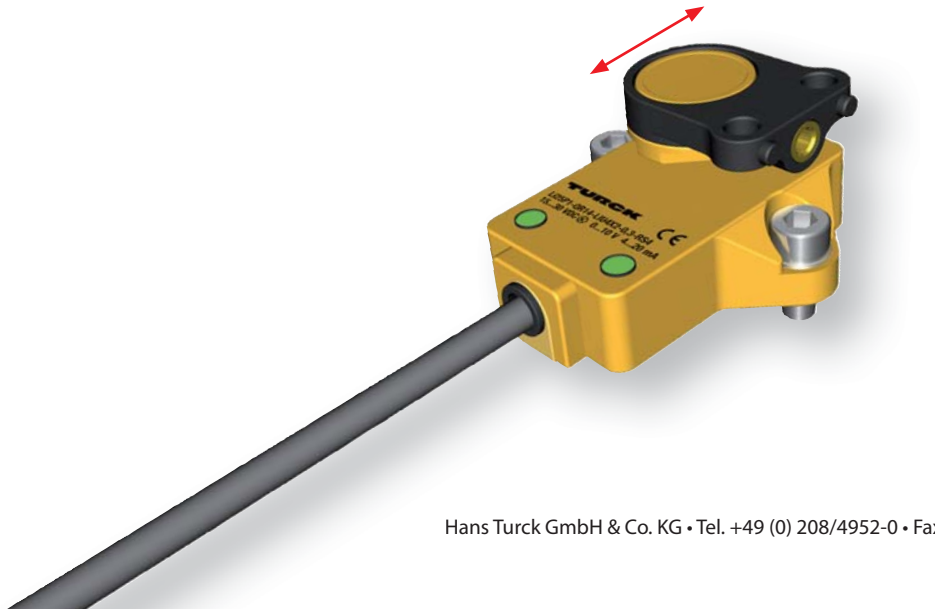
Number of LEDs
X2 2 x LED

Output mode
LiU5 analog output 4…20 mA/0…10 V
LU4 analog output 0.5…4.5 V

0,3-RS4	Electrical connection	/	S97	Special version

0,3-RS4 cable 0,3 m, with connector M12 x 1
– 2 m cable (with open end)

S97 extended temperature range -40…+70 °C, only with LU4



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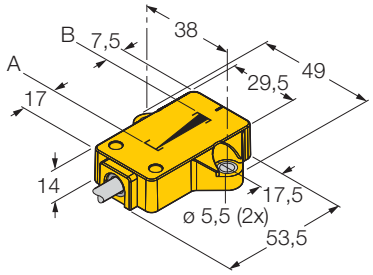
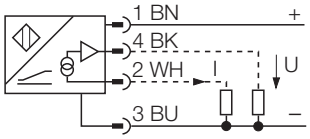
Inductive linear position sensors Li-QR14 – Technical data



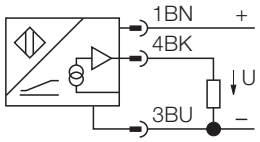
Measuring range specifications	
Measuring range [A…B]	25 mm
System	
Resolution	12 Bit
Linearity deviation	≤ 0.3 % v. E.
Temperature drift	≤ ± 0.01 %/K
Ambient temperature	-25…+ 70 °C -40…+ 70 °C (S97-Version)
Electrical data	
Operating voltage	15…30 VDC (LIU5) 8…30 VDC (LU4)
Residual ripple	≤ 10 % U_{PP}
No-load current	≤ 50 mA
Rated insulation voltage	≤ 0.5 kV
Short-circuit protection	yes
Wire breakage / reverse polarity protection	yes/fully
Output function	analog output
Voltage output	0…10 V (LIU5) 0.5…4.5 V (LU4)
Current output	4…20 mA (LIU5)
Load resistance of voltage output	≥ 4.7 kΩ
Load resistance of current output	≤ 0.4 kΩ
Sampling rate	700 Hz
Housing style	
Housing style	rectangular, QR14
Dimensions	53.5 x 49 x 14 mm
Housing material	plastic, PBT-GF30-V0
Connection	cable/cable with connector, M12 x 1
Cable quality	5.2 mm, LifYY, PVC (LIU5) 5.2 mm Lif 32432, TPE (LU4)
Vibration resistance	55 Hz (1 mm)
Shock resistance	30 g (11 ms)
Protection class (IEC 60529/EN 60529)	IP67
LEDs	
Power-on indication	LED green
Measuring range indication	green/green flashing (multifunctional LED)
Miscellaneous	
Included in delivery	P1-Li-QR14/Q17L

Wiring diagramms

Electrical version LiU5X2



Electrical version LU4X2



Ordering information

The positioning elements are individually available. For more information, please see chapter "Accessories".

Ordering example

Li	25	P1	-	QR14	-	LiU5	X2	-	0,3-RS4
inductive linear position sensor	measuring range 25 mm	pos. element P1-Li-QR14/Q17L		rectangular style QR14		analog output 4…20 mA und 0…10 V	2 LEDs		Connection 0.3 m cable with 12 x 1 connector, 4-pole

Inductive linear position sensors Li-Q17L – Compact series with analog output (U/I)

Product features

- Standard resolution 12 bit
- Current and voltage output integrated in one device
- Cable with standard connector M12 x 1, 5-pole
- Cable, open end
- Extreme short blind zones
- Programmable measuring range
- Watertight polycarbonate insert

Measuring range indicated via LED

- **green**:
  The positioning element is in the measuring range.
- **green/yellow:**
  The positioning element is in the measuring range with a lower signal quality (e.g. distance too long)
- **off**:
  The positioning element is outside the programmed range

Setting the measuring range

The initial and final value of the measuring range are set by means of a pushbutton, either via teach line (pin 5) or teach adapter. Furthermore, the output curve is invertible.

- Jumper pin 5 and pin 1 for 10 sec.:
  Factory setting (0 V/4 mA at the connector end)
- Jumper pin 5 and pin 3 for 10 sec.:
  Factory setting inverted
- Setting the initial value:
  Move positioning element to desired position and jumper pin 5 and pin 3 for 2 sec.
- Setting the final value:
  Move positioning element to desired position and jumper pin 5 and pin 1 for 2 sec.

Li50P1	Q17LM1	LU4X2	0,3-RS5	S97

Li	50	P1	Inductive linear position sensors	–	Q17L	M1	Housing style	–	LU4	X2	Electrical version	–

Positioning element
P1 P1-Li-Q17L

Measuring range (mm)
50 mm
100 mm
150 mm
200 mm

Functional principle
Li linear inductive

Mounting element
M1 M1.1-Q17L and M1.2-Q17L

Housing style
Q17L rectangular, profile 16.5 x 20 mm

Number of LEDs
X2 2 x LED

Output mode
LiU5 analog output 4…20 mA / 0…10 V
LU4 analog output 0.5…4.5 V

0,3-RS5	Electrical connection	/	S97	Special version

0,3-RS5 cable 0,3 m, with connector M12 x 1
– 2 m cable (with open end)

S97 only LU4 with extended temperature range

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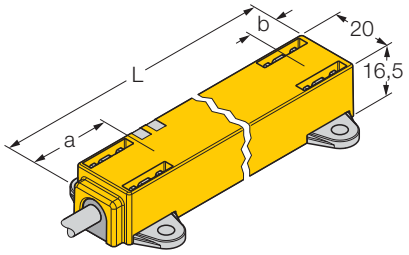
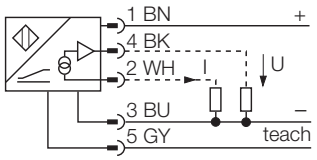
Compact series with analog output (U/I) – Technical data



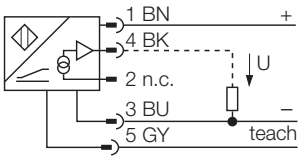
Measuring range specifications	
Max. measuring range	50, 100, 150, 200 mm
Blind zone a	22 mm
Blind zone b	10 mm (Li50 = 16 mm)
System	
Resolution	12 Bit
Repeatability/accuracy	0.025 %
Linearity deviation	≤ 0.3 % v. E.
Temperature drift	≤ ± 0.01 %/K
Ambient temperature	-25…+ 70 °C -40…+ 70 °C (S97-Version)
Electrical data	
Operating voltage	15…30 VDC
Residual ripple	≤ 10 % U_{PP}
No-load current	≤ 50 mA
Rated insulation voltage	≤ 0.5 kV
Short-circuit protection	yes
Wire breakage / reverse polarity protection	yes/fully
Output function	4-wire, analog output
Voltage output	0…10 V (LIU5)/0,5…4,5 V (LU4)
Current output	4…20 mA (LIU5)
Load resistance of voltage output	≥ 4.7 kΩ
Load resistance of current output	≤ 0.4 kΩ
Sampling rate	700 Hz
Housing style	
Housing style	rectangular, Q17L
Dimensions	20 x 16.5 mm, length L = measuring length + 32 mm, (Li50 + 38 mm)
Housing material	plastic, PC-GF10
Connection	cable/cable with connector, M12 x 1
Cable quality	5,2 mm, Li9YH-11YH, PUR (LiU5) 5,2 mm, Lif32Y32Y, TPE (LU4)
Vibration resistance	55 Hz (1 mm)
Shock resistance	30 g (11 ms)
Protection class (IEC 60529/EN 60529)	IP67
LEDs	
Power-on indication	LED green
Measuring range indication	green/green flashing (multifunctional LED)
Miscellaneous	
Included in delivery	P1-Li-QR14/Q17L, M1-Q17L, M1.1-Q17L, M1.2-Q17L

Wiring diagramms

Electrical version LiU5X2



Electrical version LU4X2



Ordering information

The linear position sensors are available with different measuring ranges of 50, 100, 150, 200 mm. The mounting aids and positioning elements are individually available or as a kit. For more information, please see chapter "Accessories".

Ordering example

Li	100	P1	-	Q17L	M1	-	LiU5	X2	-	0,3-RS5
inductive linear position sensor	measuring range 100 mm	pos. element P1-Li-QR14/ Q17L		rectangular style Q17L	with mounting element M1.1-Q17L, M1.2-Q17L		analog output 4…20 mA und 0…10 V	2 LEDs		Connection 0.3 m cable with 12 x 1 connector, 5-pole

Inductive linear position sensors Li-Q25L – Standard series with analog output (U/I)

Product features

- Standard resolution 12 bit
- Current and voltage output integrated in one device (4-wire, 15…30 VDC)
- Standard connector M12 x 1, 5-pole
- Extreme short blind zones
- Programmable measuring range
- Robust Al-continuous casting
- Watertight polycarbonate insert

Measuring range indicated via LED

- **green**:
  The positioning element is in the measuring range.
- **green/yellow:**
  The positioning element is in the measuring range with a lower signal quality (e.g. distance too long)
- **yellow flashing:**
  The positioning element is outside the measuring range (max. range)
- **off**:
  The positioning element is outside the programmed range but inside the total, non-programmed measuring length.

Setting the measuring range

The initial and final value of the measuring range are set by means of a pushbutton, either via teach line (pin 5) or teach adapter. Furthermore, the output curve is invertible.

- Jumper pin 5 and pin 1 for 10 sec.:
  Factory setting (0 V/4 mA at the connector end)
- Jumper pin 5 and pin 3 for 10 sec.:
  Factory setting inverted
- Setting the initial value:
  Move positioning element to desired position and jumper pin 5 and pin 3 for 2 sec.
- Setting the final value:
  Move positioning element to desired position and jumper pin 5 and pin 1 for 2 sec.

Li100P1	Q25LM1	LIU5X3	H1151

Li 100 P1 – Inductive linear position sensors

Positioning element

P0	no positioning element
P1	P1-Li-Q25L
P2	P2-Li-Q25L
P3	P3-Li-Q25L
P4	P4-Li-Q25L

Measuring range (mm)
from 100 mm up to 1000 mm, in 100 mm steps

Functional principle

Li	linear inductive

Q25L M1 – Housing style

Mounting element

M0	no mounting element
M1	M1-Q25L
M2	M2-Q25L
M4	M4-Q25L

Housing style

Q25L	rectangular, profile 25 x 35 mm

LiU5 X3 – Electrical version

Number of LEDs

X3	3 x LED

Output mode

LiU5	analog output 4…20 mA/0…10 V

H1 1 5 1 – Electrical connection

Configuration

1	standard configuration

Number of contacts

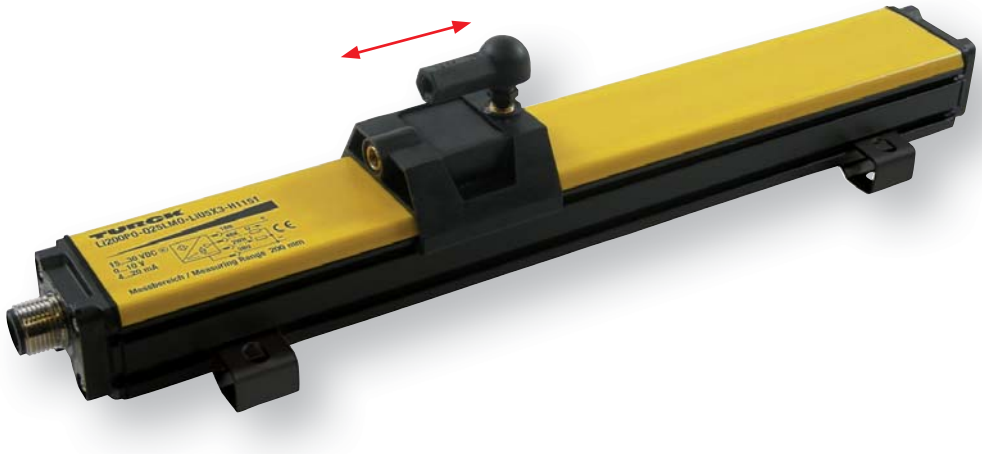
5	5-pole M 12 x 1

Connector

1	straight

Connector

H1	connector M12 x 1



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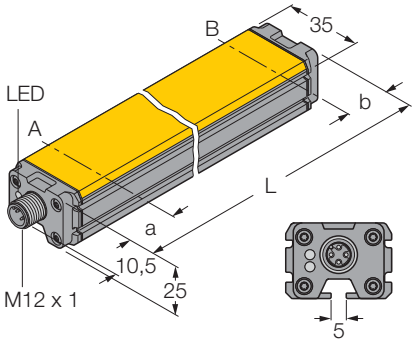
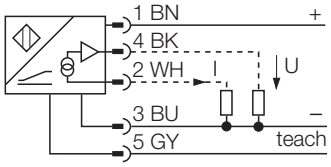
Standard series with analog output (U/I) – Technical data



Measuring range specifications	
Max. measuring range	100, 200, … 1000 mm
Blind zone a	29 mm
Blind zone b	29 mm
System	
Resolution	12 bit
Repeatability/accuracy	0.025 %
Linearity deviation	≤ 0.1 % of full scale
Temperature drift	≤ ± 0.002 %/K
Ambient temperature	-25…+ 70 °C
Electrical data	
Operating voltage	15…30 VDC
Residual ripple	≤ 10 % U_{PP}
No-load current	≤ 50 mA
Rated insulation voltage	≤ 0.5 kV
Short-circuit protection	yes
Wire breakage / reverse polarity protection	yes/fully
Output function	5-wire, analog output
Voltage output	0…10 V
Current output	4…20 mA
Load resistance of voltage output	≥ 4.7 kΩ
Load resistance of current output	≤ 0.4 kΩ
Sampling rate	500 Hz
Current consumption	≤ 100 mA
Housing style	
Housing style	rectangular, Q25L
Dimensions	profile 35 x 25 mm, length L = meas. length + 58mm
Housing material	aluminium
Material active face	plastic, PC-GF20
Connection	connector, M12 x 1
Vibration resistance	55 Hz (1 mm)
Shock resistance	30 g (11 ms)
Protection class (IEC 60529/EN 60529)	IP67
LEDs	
Power-on indication	LED, green
Measuring range indication	green, yellow, yellow flashing, (multifunctional LED)

Wiring diagrams



Ordering information

The linear position sensors are available with different measuring ranges of 100, 200, … 1000 mm. The sensors, mounting aids and positioning elementsare individually available or as a kit.

Ordering example

Li	100	P1	-	Q25L	M1	-	LiU5	X3	-	H1151
inductive linear position sensor	measuring range 100 mm	with guided pos. element P1-Li-Q25L		rectangular style Q25L	with mounting element M1-Q25L		analog output 4…20 mA and 0…10 V	3 LEDs		M12 x 1 connector, 5-pole

Inductive linear position sensors Li-Q25L – High-end E-series with enhanced resolution and SSI interface

Product features

- Enhanced resolution, up to 20 bit, depending on sensor length
- Excellent temperature stability and linearity through direct digital signal transmission
- Standardized SSI interface
- Standard connector M12 x 1, 8-pole
- Extreme short blind zones
- Robust Al-continuous casting
- Watertight polycarbonate insert

Measuring range indicated via LED

- **green**:
  The positioning element is in the measuring range.
- **green/yellow:**
  The positioning element is in the measuring range with a lower signal quality (e.g. distance too long)
- **yellow flashing:**
  The positioning element outside the measuring range (max. range)

High-precision digital SSI output

The high-precision SSI output is applied to transmit digital measured values to the control unit, either directly without transducing losses or via remote I/O fieldbus stations (see page 19). The preferred coding of the Li-Q25L sensor series is Gray 25 bit. The coding is adjusted in the control system or in the fieldbus module. Other codings for LiQ25 sensors on request.

Li100P1	Q25LM1	ESG25X3	H1181

Li	100	P1	Inductive linear position sensors	–	Q25L	M1	Housing style	–	E	S	G	25	X3	Electrical version	–

Positioning element

P0	no positioning element
P1	P1-Li-Q25L
P2	P2-Li-Q25L
P3	P3-Li-Q25L
P4	P4-Li-Q25L

Measuring range (mm)

from 100 mm up to 1000 mm, variable in 100 mm steps

Functional principle

Li	linear inductive

Mounting element

M0	no mounting element
M1	M1-Q25L
M2	M2-Q25L
M4	M4-Q25L

Housing style

Q25L	rectangular, profile 25 x 35 mm

Number of LEDs

X3	3 x LED

Number of bits

25	number of bits

Code

G	Gray
B	binary

SSI interface

SSI	interface

Resolution

E	higher resolution

H1	1	8	1	Electrical connection

Configuration

1	standard configuration

Number of contacts

8	8-pole M 12 x 1

Connector

1	straight

Connector

H1	connector M12 x 1

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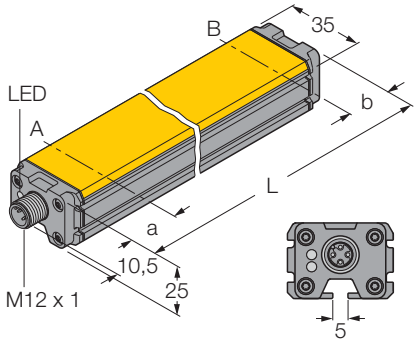
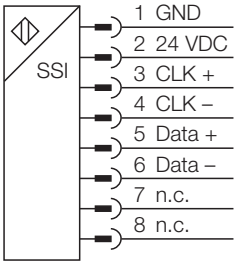
High-end E-series with enhanced resolution and SSI interface – Technical data



Measuring range specifications	
Max. measuring range	100, 200, … 1000 mm
Blind zone a	29 mm
Blind zone b	29 mm
System	
Resolution	0.001 mm
Repeatability/accuracy	10 µ
Linearity deviation	≤ 0.1 % of full scale
Temperature drift	≤ ± 0.0001 %/K
Ambient temperature	-25…+ 70 °C
Electrical data	
Operating voltage	15…30 VDC
Residual ripple	≤ 10 % U_{PP}
No-Load current	≤ 50 mA
Rated insulation voltage	≤ 0.5 kV
Short-circuit protection	yes
Wire breakage / reverse polarity protection	yes/yes (voltage supply)
Output function	8-wire, SSI, 25 bit Gray coding
Sampling rate	500 Hz
Current consumption	< 100 mA
Housing style	
Housing style	rectangular, Q25L
Dimensions	profile 35 x 25 mm, length L = meas. length + 58 mm
Housing material	aluminium
Material active face	plastic, PC-GF20
Connection	connector, M12 x 1
Vibration resistance	55 Hz (1 mm)
Shock resistance	30 g (11 ms)
Protection class (IEC 60529/EN 60529)	IP67
LEDs	
Power-on indication	LED green
Measuring range indication	green, yellow, yellow flashing, multifunctional LED

Wiring diagrams



Ordering information

The linear position sensors are available with different measuring ranges of 100, 200, … 1000 mm. The sensors, mounting aids and positioning elements are individually available or as a kit.

Ordering example

Li	100	P1	-	Q25L	M1	-	E	SG25	X3	-	H1181
inductive linear position sensor	measuring range 100 mm	with guided pos. element P1-Li-Q25L		rectangular style Q25L	with mounting element M1-Q25L		higher resolution	SSI output, Gray coding 25 bit	3 LEDs		M12 x 1 connector, 8-pole

Inductive linear position sensors – Li-Q25L
High-end E-series with enhanced resolution, IO-Link compatible

Product features

- Enhanced resolution 16 Bit
- Enhanced sample rate 1 kHz
- Improved linearity
- Two programmable outputs (analog output current or voltage, switching outputs, PWM, …) IO-Link compatible
- Standard connector M12 x 1, 5-pole
- Extreme short blind zones
- Robust Al-continuous casting
- Watertight polycarbonate insert

Measuring range indicated via LED

- **green**:
  The positioning element is in the measuring range.
- **green/yellow:**
  The positioning element is in the measuring range with a lower signal quality (e.g. distance too long)
- **yellow flashing:**
  The positioning element outside the measuring range (max. range)
- **off**:
  The positioning element is outside the programmed range but inside the total, non-programmed measuring length.

Programming and IO-Link

Output functions, measuring ranges and alarm outputs are set via teach adapter or teach line (pin 5). Alternatively, the sensor can also be operated in IO-Link mode. For this purpose connect the sensor to an IO-Link compatible module. A green flashing LED indicates the established connection. For more information, please see the corresponding instruction manual.

Li100P1	Q25LM1	ELiUPN8X3	H1151

Li	100	P1	Inductive linear position sensors	–	Q25L	M1	Housing style	–	E	LiUPN8	X3	Electrical version	–

Positioning element

P0	no positioning element
P1	P1-Li-Q25L
P2	P2-Li-Q25L
P3	P3-Li-Q25L
P4	P4-Li-Q25L

Measuring range (mm)

from 100 mm up to 1000 mm, variable in 100 mm steps

Functional principle

Li	linear inductive

Mounting element

M0	no mounting element
M1	M1-Q25L
M2	M2-Q25L
M4	M4-Q25L

Housing style

Q25L	rectangular, profile 25 x 35 mm

Number of LEDs

X3	3 x LED

Output mode

LiUPN8	IO-Link compatible analog output, switching output

Resolution

E	higher resolution

H1	1	5	1	Electrical connection

Configuration

1	standard configuration

Number of contacts

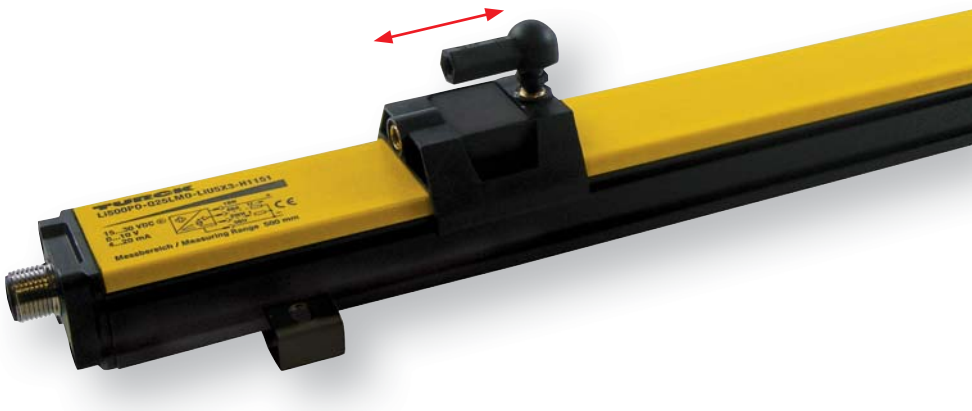
5	5-pole M 12 x 1

Connector

1	straight

Connector

H1	connector M12 x 1



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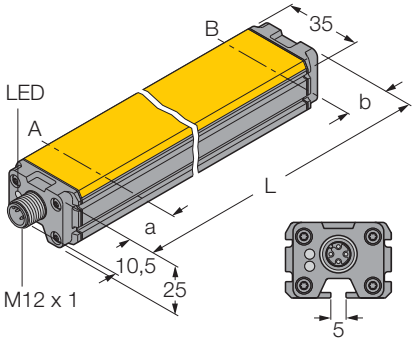
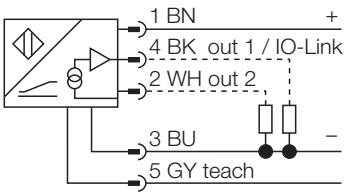
High-end E-series with enhanced resolution, IO-Link compatible – Technical data



Measuring range specifications	
Cable lengths:	100, 200,…1000 mm depending on sensor type
Blind zone a	29 mm
Blind zone b	29 mm
System	
Resolution	16 bit (D/A converter and IO-Link)
Repeatability/accurancy	0.0015 %
Linearity deviation	≤ 0.1 % of full scale
Temperature drift	≤ ± 0.001 % / K
Ambient temperature	-25…+ 70 °C
Electrical data	
Operating voltage	15…30 VDC
Residual ripple	≤ 10 % U_{PP}
No-load current	≤ 50 mA
Rated insulation voltage	≤ 0.5 kV
Short-circuit protection	yes
Wire breakage / reverse polarity protection	yes/yes (voltage supply)
Output function	two programmable outputs (analog output current or voltage, switching outputs, PWM, …) IO-Link compatible
Sampling rate	1 kHz
Current consumption	< 100 mA
Housing style	
Housing style	rectangular, Q25L
Dimensions	profile 35 x 25 mm, length L = length + 58 mm
Housing material	aluminium
Material active face	plastic, PC-GF20
Connection	connector, M12 x 1
Vibration resistance	55 Hz (1 mm)
Shock resistance	30 g (11 ms)
Protection class (IEC 60529/EN 60529)	IP67
Miscellaneous	
Power-on indication	LED green
Measuring range display	green, yellow, yellow flashing multifunctional LED

Wiring diagrams



Ordering information

The linear position sensors are available with different measuring ranges of 100, 200, … 1000 mm. The sensors, mounting aids and positioning elements are individually available or as a kit.

Ordering example

Li	100	P1	-	Q25L	M1	-	E	LiUPN8	X3	-	H1151
inductive linear position sensor	100 mm measuring range	with guided positioning element P1-Li-Q25L		rectangular style Q25L	with mounting element M1-Q25L		higher resolution	IO-Link compatible, analog output, switching output	3 LEDs		M12 x 1 connector, 5-pole

Accessories – Fieldbus connection

The linear position sensor with SSI interface is compatible with all fieldbus devices

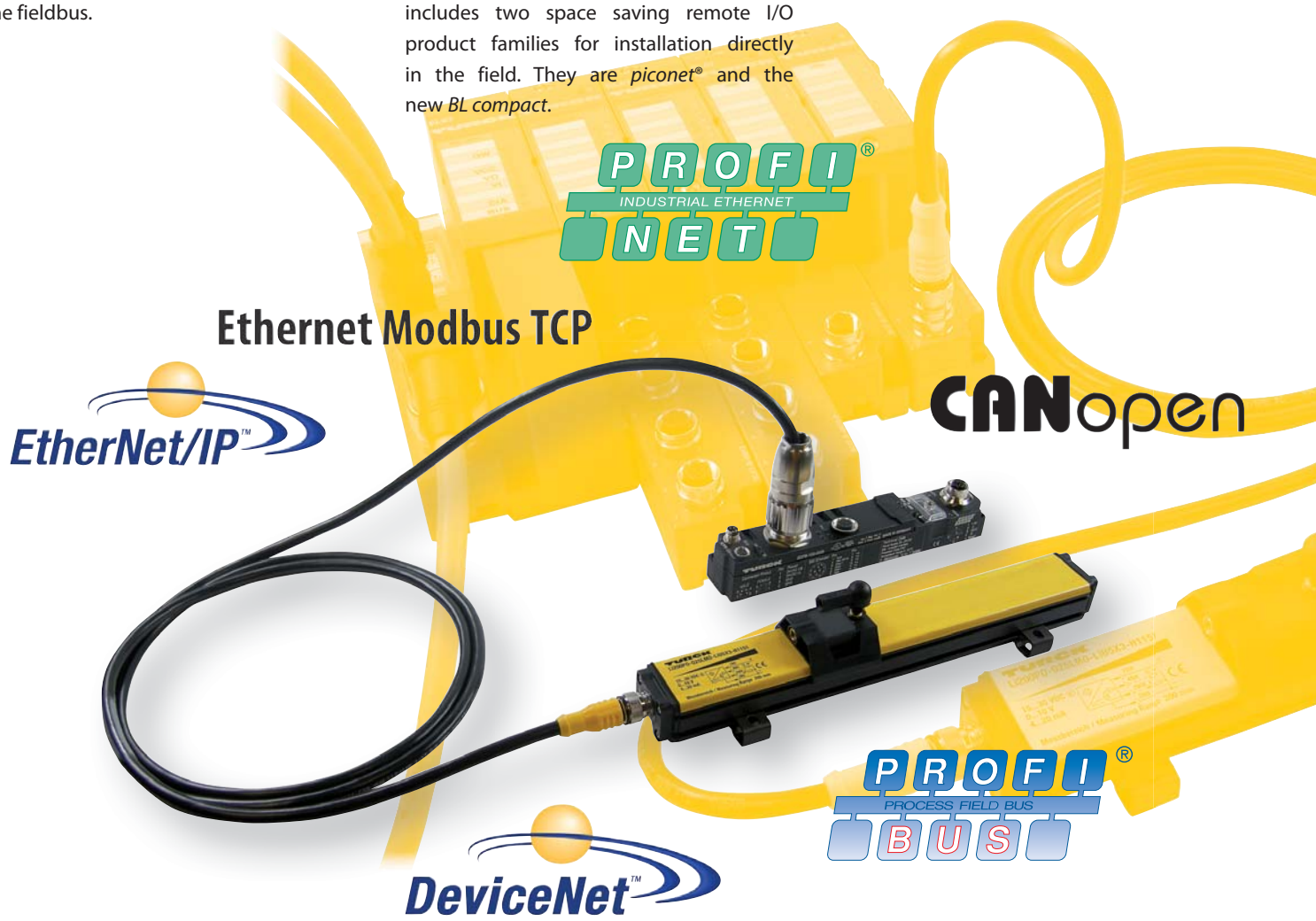
In many cases, linear position sensors have to be connected directly to a fieldbus which in turn communicates with the higher-level control. Position feedback is thus directly transmitted to the respective fieldbus system such as PROFIBUS-DP, DeviceNet™, CANopen or Ethernet based protocols. Analog input modules are no longer required.

A high level of flexibility is moreover achieved with modular solutions provided by TURCK. In other words, linear position sensors, connection cables and fieldbus modules are separately available. TURCK sensors are thus considerably more compact in contrast to big-sized sensors with integrated fieldbus connection. Problems of space are thus avoided right from the start. The user benefits not just through extremely short blind zones, but also through the distributed connection to the fieldbus.

TURCK fieldbus modules are available as remote I/O systems, for the control cabinet as BL20 version with protection class IP20 and for harsh environments as BL67 version with protection class IP67. The devices can be programmed compliant to CoDeSys (IEC 61131) for signal pre-processing as well as for self-sufficient control solutions to reduce the load on both the bus and the higher-level control.

For applications where space is at a premium, TURCK's broad product range includes two space saving remote I/O product families for installation directly in the field. They are *piconet*® and the new *BL compact*.

- Compatible with all standard fieldbus systems
- Fieldbus systems are easily replaced
- Modular principle
- High flexibility
- Sensor independent of fieldbus system
- Extremely space-saving
- Nearly the entire housing surface is used as measuring range.



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Type designation	Description
***piconet*® – protection class IP67 – extremely compact**	
SDPB-10S-0005	PROFIBUS-DP, M23, 12-pole
SDNB-10S-0005	DeviceNet™, M23, 12-pole
SCOB-10S-0005	CANopen, M23, 12-pole
E-RKS-8T-264-1-CSWM12/S3085	Connection cable M12, 8-pole, on M23 12-pole, 1m to connect linear position sensors with SSI output to BL67 and *piconet*® fieldbus stations.
***BL compact* – protection class IP67 – extremely robust**	
BLCDP-1M12MT-1SSI	PROFIBUS-DP, M12, 8-pole
BLCDN-1M12S-1SSI	DeviceNet™, M12, 8-pole
E-RKC-8T-264-2-RSC-8T	Connection cable M12, 8-pole, 2 m to connect linear position sensors with SSI output to BL67 and *BL compact* fieldbus stations.
BL67 – Remote I/O - protection class IP67	
BL67-GW-DPV1	Gateway PROFIBUS-DP
BL67-PG-DP	Gateway PROFIBUS-DP, programmable
BL67-GW-DN	Gateway DeviceNet™
BL67-GW-CO	Gateway CANopen
BL67-GW-EN	Gateway Ethernet Modbus TCP
BL67-PG-EN	Gateway Ethernet Modbus TCP, programmable
BL67-GW-EN-PN	Gateway Ethernet PROFInet IO
BL67-1SSI	Communication module
BL67-B-1M12-8	Connection module M12, 8-pole
BL67-B-1M23	Connection module M23, 12-pole
E-RKC-8T-264-2-RSC-8T	Connection cable M12, 8-pole, 2 m to connect linear position sensors with SSI output to BL67 and *BL compact* fieldbus stations.
E-RKS-8T-264-1-CSWM12/S3085	Connection cable M12, 8-pole, on M23 12-pole, 1m to connect linear position sensors with SSI output to BL67 and *piconet*® fieldbus stations.
BL20 – Remote I/O - protection class IP20	
BL20-GW-DPV1	Gateway PROFIBUS-DP
BL20-GWBR-DNET	Gateway DeviceNet™
BL20-GWBR-CANOPEN	Gateway CANopen
BL20-GW-EN	Gateway Ethernet Modbus TCP
BL20-PG-EN	Gateway Ethernet Modbus TCP, programmable
BL20-GW-PG-EN	Gateway Ethernet PROFInet IO
BL20-1SSI	Communication module
BL20-S4T-SBBS	Connection module, tension-spring connection
E-RKC-8T-264-2	Connection cable M12, 8-pole, 2 m cable (end open) to connect linear position sensors with SSI output to BL20 fieldbus stations.

Sample configuration – BL20

The following components are required to connect a linear position sensor to a PROFIBUS system via a BL20 station:

1 x PROFIBUS gateway	1 x communication module	1 x connection module	1 x connection cable
BL20-GW-DPV1	BL20-1SSI	BL20-S4T-SBBS	E-RKC-8T-264-2

Sample configuration – *piconet*®

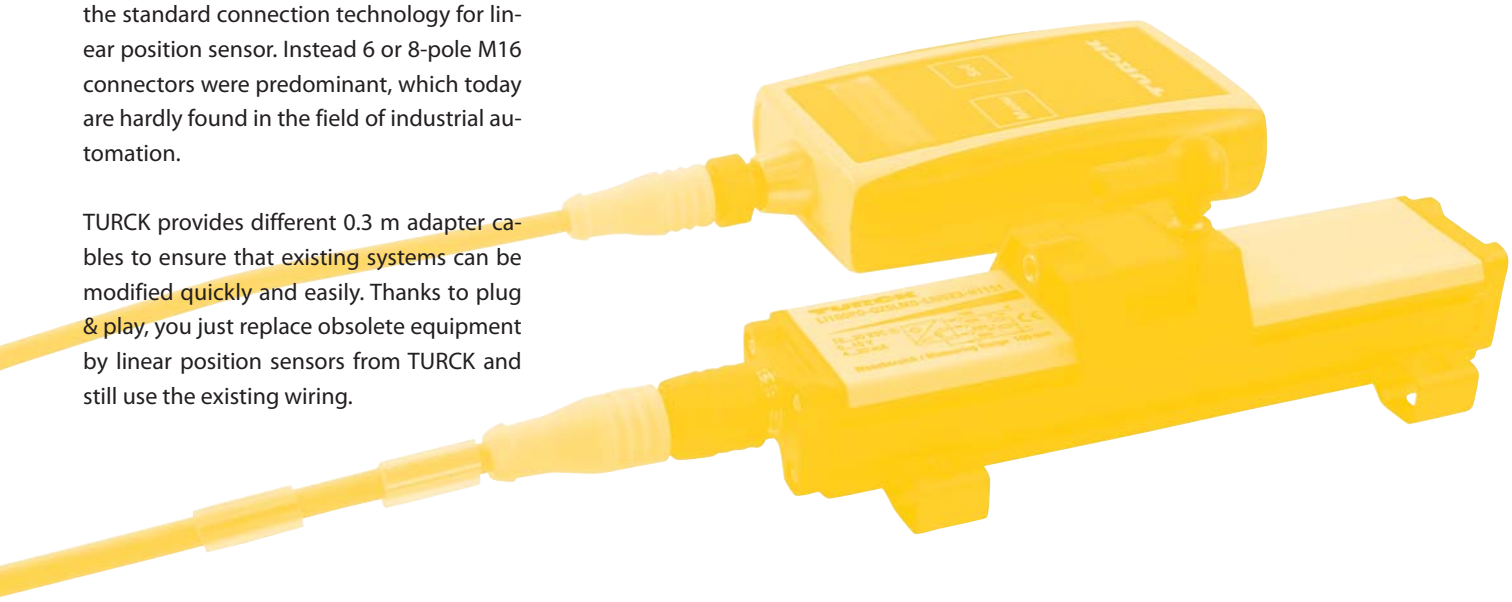
The following components are required to connect a linear position sensor to a PROFIBUS system via a *piconet*® module:

1 x PROFIBUS compact station	1 x connection cable
SDPB-10S-0005	E-RKS-8T-264-1-CSWM12/S3085

Connection technology

In the past, the M12 connector was not yet the standard connection technology for linear position sensor. Instead 6 or 8-pole M16 connectors were predominant, which today are hardly found in the field of industrial automation.

TURCK provides different 0.3 m adapter cables to ensure that existing systems can be modified quickly and easily. Thanks to plug & play, you just replace obsolete equipment by linear position sensors from TURCK and still use the existing wiring.



Adapter cable

Type	Description
WAKS4.5-0.3-B723M16/8	Adapter cable to convert an 8-pole M16 connector to a 5-pole M12 standard connector
WAKS4.5-0.3-B723M16/6I	Adapter cable to convert a 6-pole M16 connector (current) to a 5-pole M12 standard connector
WAKS4.5-0.3-B723M16/6U	Adapter cable to convert a 6-pole M16 connector (voltage) to a 5-pole M12 standard connector

Connection cable for standard series and high-end E-series with analog output

Type	Description
WAKS4.5-2/P00	Connection cable M12, 5-pole, shielded, 2 m (end open)

Connection cable for high-end E-series with SSI interface

Type	Description
E-RKC-8T-264-2-RSC-8T	Connection cable M12, 8-pole, 2 m to connect linear position sensors with SSI output to BL67 and *BL compact* fieldbus stations.
E-RKC-8T-264-2	Connection cable M12, 8-pole, 2 m cable (end open) to connect linear position sensors with SSI output to BL20 fieldbus stations.
E-RKS-8T-264-1-CSWM12/S3085	Connection cable M12, 8-pole, on M23, 12-pole, 1 m to connect linear position sensors with SSI output to BL67 and *piconet*® fieldbus stations.

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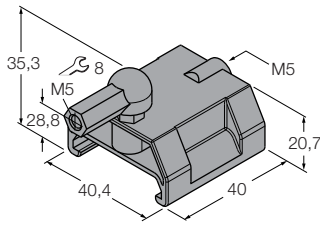
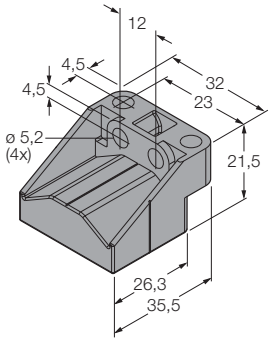
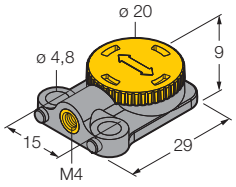
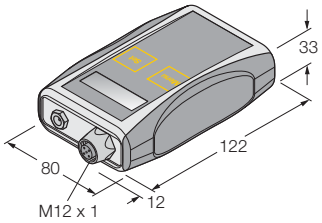
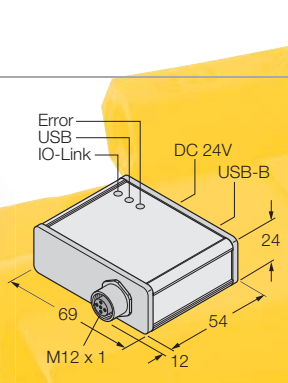
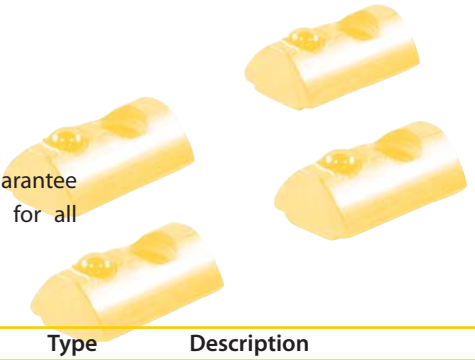
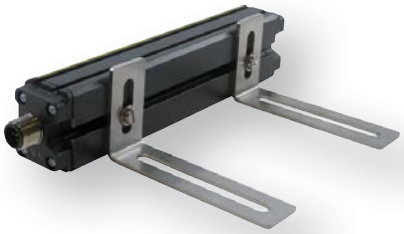
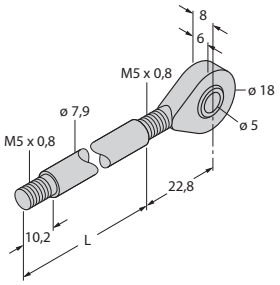
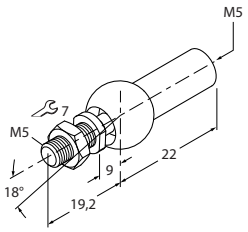
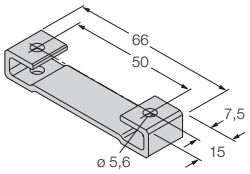
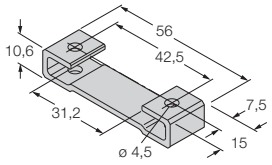
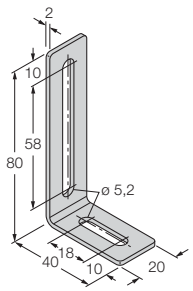
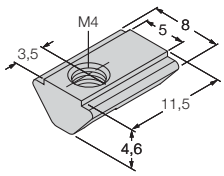
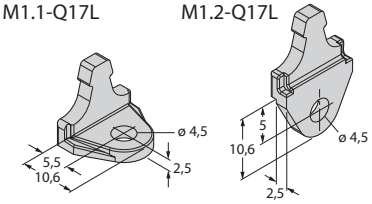
Dimension drawings	Type	Description
 	P1-Li-Q25L	Guided positioning element; laterally inserted in sensor groove; incl. rod-end bearing to mount M5 threaded rods
 	P2-Li-Q25LL P3-Li-Q25L	Floating positioning element, operates at a distance of 0…4 mm to the sensor surface Floating positioning element; right-angle mounting; operates at a distance of 0…4 mm to the sensor surface
 	P1-LiQR14/ Q17L	Floating positioning element for miniature and compact series QR14 and Q17L. Rotatable positioning element; parallel/crosswise orientation; operates at a distance of 0…4 mm to the sensor surface
 	TB4	Analog test box; test box for sensors with analog or switching output; incl. batteries
	TX1-Q20L60	Teach adapter to program the measuring range of inductive linear position sensors Q25
 	USB-2-IOL-0001	IO Link master with integrated USB interface for parameterization of IO Link compliant linear position sensors via PC

Product overview – Mounting accessories



You can choose from a comprehensive range of mounting aids. Sliding blocks, sensor grooves and different brackets provide many mounting possibilities. We guarantee highest flexibility with accessories for all borehole distances.



Dimension drawing	Type	Description
	CA-100; CA-200; CA-300; CA-400	Extension bar to connect the positioning element CA100, L =100 mm CA200, L =200 mm CA300, L =300 mm CA400, L =400 mm (more length on request)
	AB-M5	Axial joint, used in combination with positioning element P1-Li-Q25L
	M1-Q25L	Mounting foot for inductive linear position sensors Q25L; two mounting feet should be used for devices with a measuring range of up to 500 mm; 4 for 1000 mm; anodized aluminium; thickness 1 mm; 2 pcs. per bag
	M2-Q25L	Mounting foot for inductive linear position sensors Q25L; two mounting feet should be used for devices with a measuring range of up to 500 mm; 4 for 1000 mm; anodized aluminium; thickness 1 mm; 2 pcs. per bag
	M4-Q25L	Mounting bracket for inductive linear position sensors Q25L; two mounting feet should be used for devices with a measuring range of up to 500 mm; 4 for 1000 mm; stainless steel; 2 pcs. per bag and 2 sliding blocks
	MN-M4-Q25	Sliding blocks with M4 thread for back side groove of inductive linear position sensors Q25L; brass; 10 pcs. per bag Only available separately!
M1.1-Q17L M1.2-Q17L 	M1.1-Q17L M1.2-Q17L	Mounting foot for inductive linear position sensor Q17L, 3 pcs. for standard mounting 3 pcs. for lateral mounting

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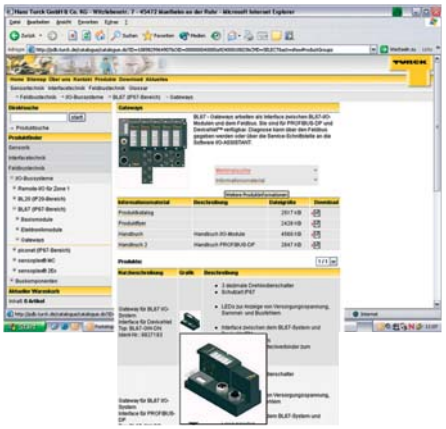

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Hans Turck GmbH & Co. KG
45472 Mülheim an der Ruhr
Germany
Witzlebenstraße 7
Tel. +49 (0) 208 4952-0
Fax +49 (0) 208 4952-264
E-Mail more@turck.com
Internet www.turck.com