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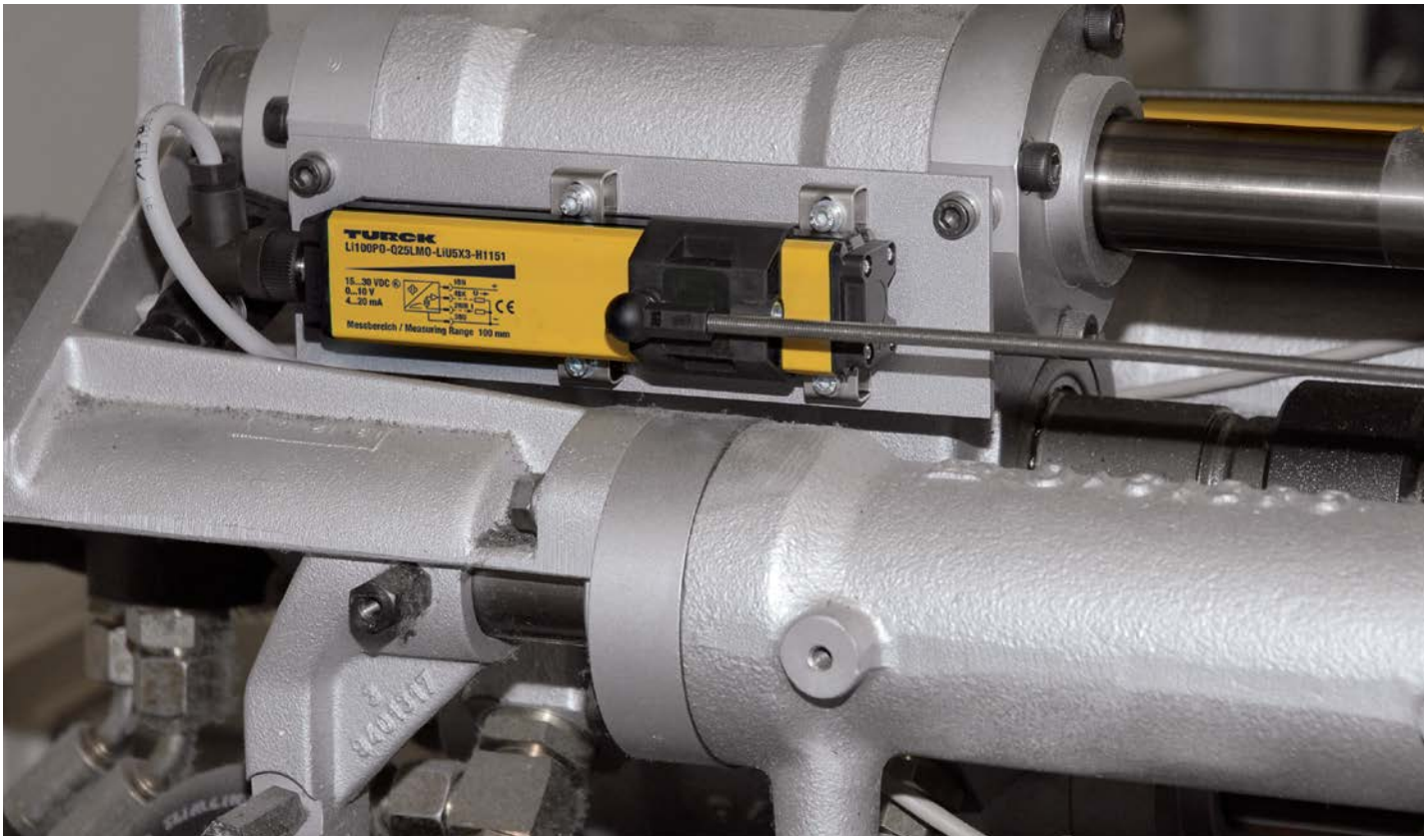
TURCK

Li-Q25L | Li-Q17L | Li-QR14
Inductive Linear Position Sensors

Inductive Linear Position Sensors



Industrial applications increasingly use linear 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 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.

Contents

Technology

The measuring principle

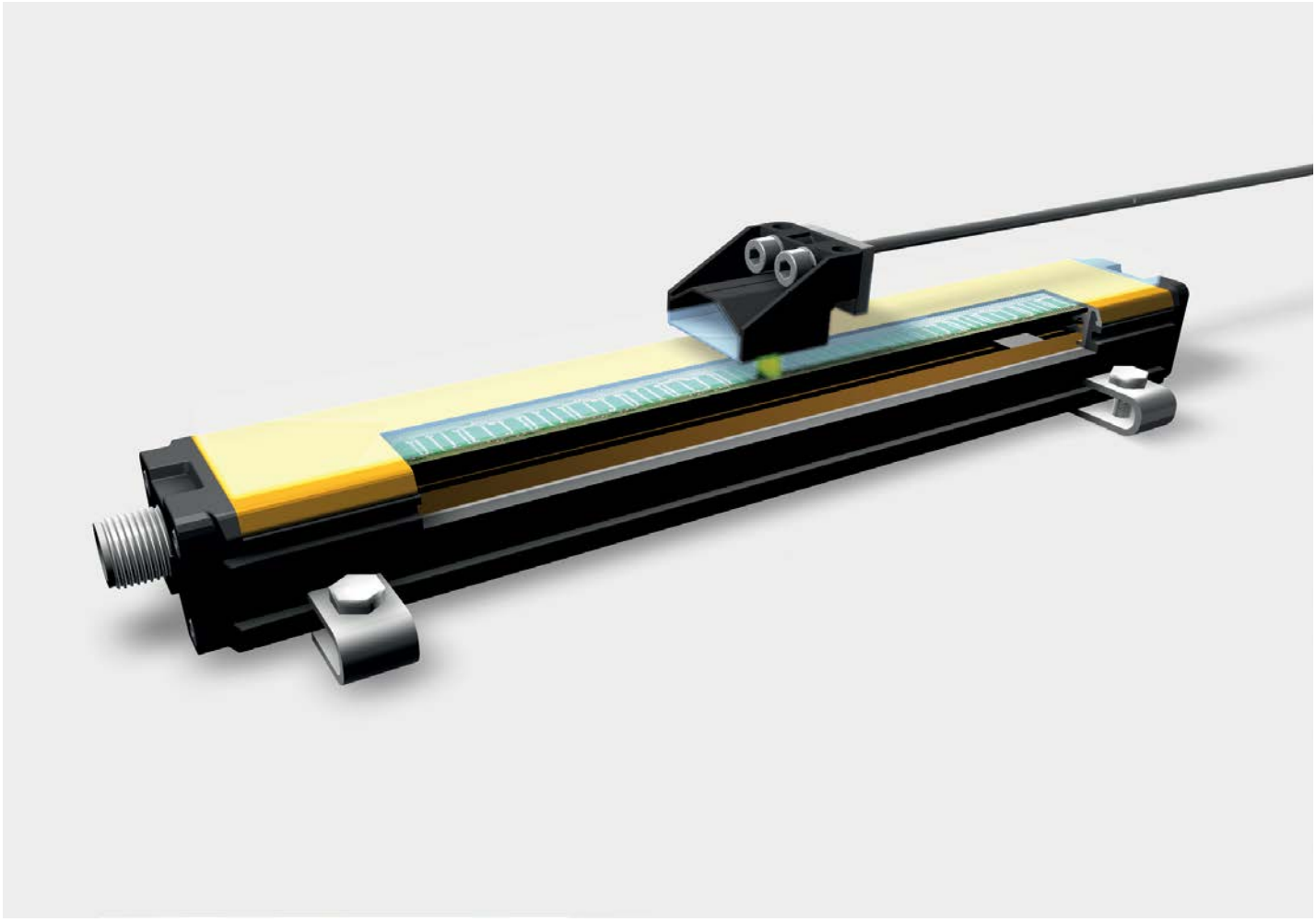
The measuring principle of the new linear position sensors is based on RLC coupling, a revolutionary inductive method. Unlike the potentiometric or the magnetostrictive measurement principle, this method provides considerable advantages.

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.

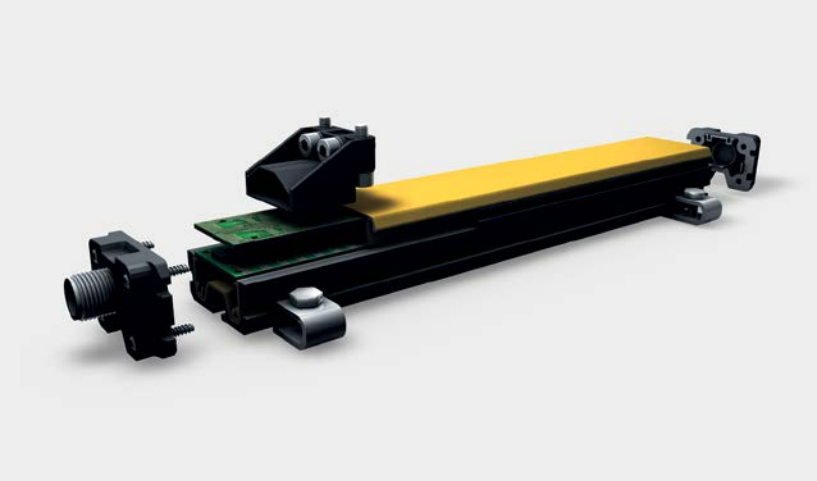
To increase the flexibility and speed of measurement, the sensor operates with two coil systems. One for rough and on for precise position detection of the resonator.



Electronics and coil geometry

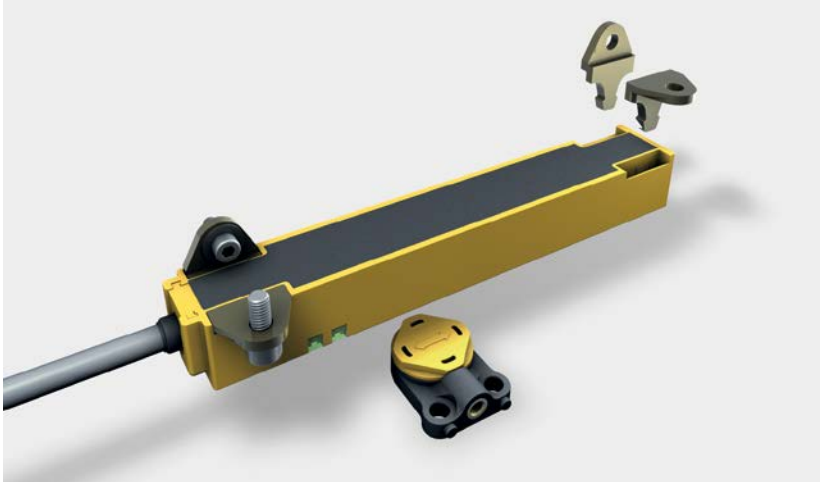
The coils are especially arranged to ensure a stable RLC circuit at a defined distance (0…4 mm) and doesn't tear off even with vertical or lateral movements. The signals are processed and transmitted to the output in high resolution quality by the incorporated 16 bit processor.

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.

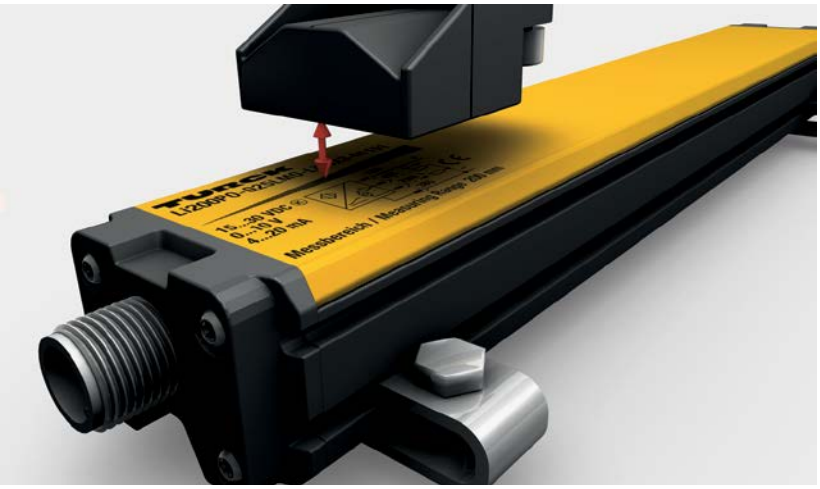


The compact Li-Q17L as well as the Li-QR14 series are built in a highly tight plastic housing, made for many aggressive ambient conditions. They are available in lengths of 50 mm to 300 mm (Li-Q17L series) resp. 25 mm (Li-QR14 series). Angled and straight mounting elements guarantee highest flexibility 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 contactless 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.

Flexible process connection

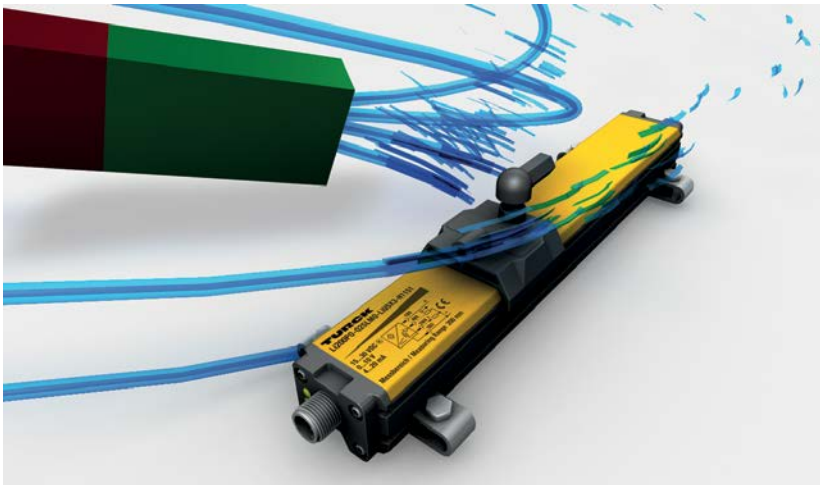
Adaption to the higher level control is enabled through analog current or voltage output as well as via SSI. The signal can thus be coupled easily to different bus systems, for example via the remote I/O systems from TURCK. The connection is established via M12 x 1 standard connectors, making the use 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. 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

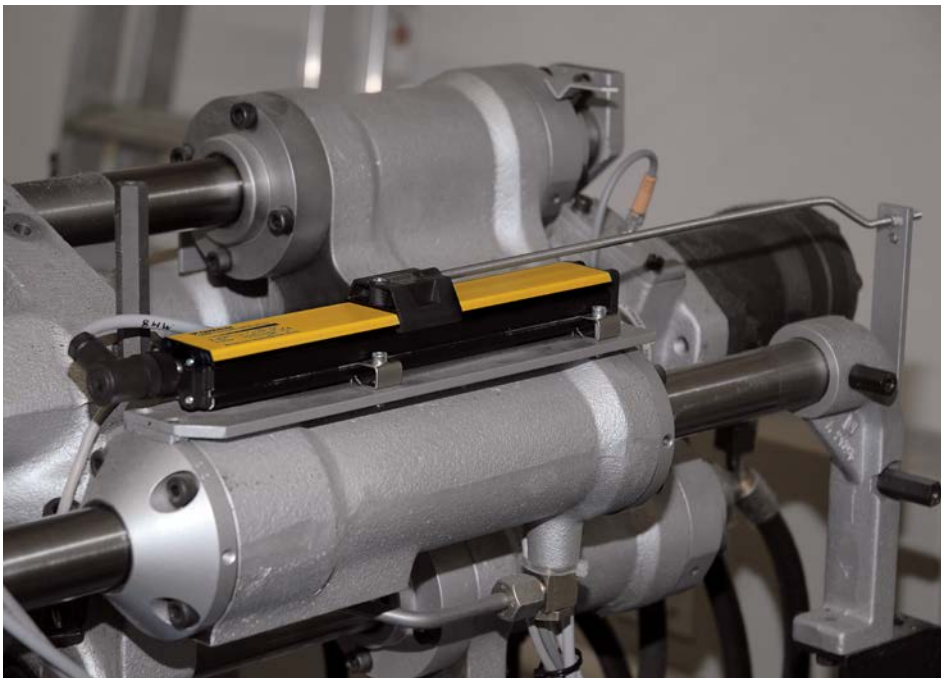
The new linear position sensor works reliably under difficult application conditions. It features protection class IP67 and always provides exact results, even when exposed to dust or water.

Vibration, lateral or vertical shifts of the positioning element have no influence on the inductive coupling at all. 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 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 contactless, 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 male end M12 x 1, 4-pin
- Cable, open end
- Extremely 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

Li	25	P1	QR14	LU4	X2	0,3-RS4	S97

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

Positioning element
P1 P1-Li-QR14/Q17L

Measuring range
25 25 mm

Functional principle
Li linear inductive

Housing style
QR14 rectangular, 53.5 x 49 x 14 mm

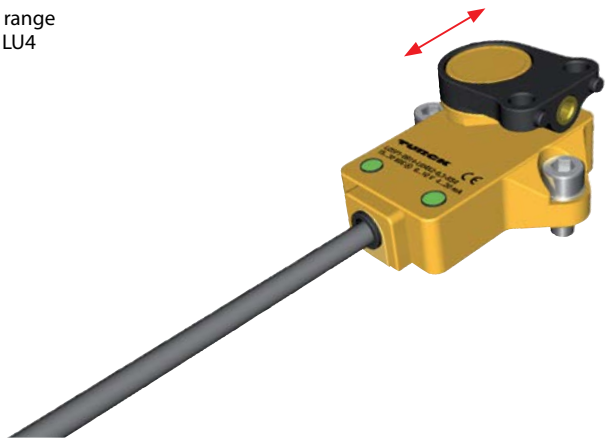
Number of LEDs
X2 2 x LED

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

Electrical connection
0,3-RS4 cable 0.3 m with male end M12 x 1
– 2 m cable (with open end)

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



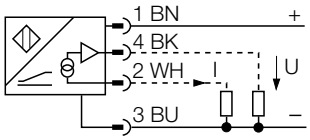
Measuring range specifications	
Measuring range [A…B]	25 mm
System	
Resolution	12 bit
Linearity deviation	≤ 1 % v. E.
Temperature drift	≤ ± 0.01 %/K
Ambient temperature	-25…+ 70 °C -40…+ 70 °C (S97-Version)
Electrical data	
Operating voltage	15…30 VDC (LIU5) 8…30 VDC (LU4)
Residual ripple	≤ 10 % U_{PP}
Current consumption	≤ 50 mA
Rated insulation voltage	≤ 0.5 kV
Short-circuit protection	yes
Wire breakage / reverse polarity protection	yes/voltage supply
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 male end 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

Ordering information

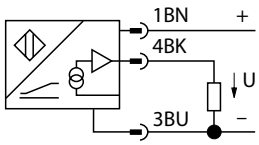
The positioning elements are individually available. For more information, please see chapter "Accessories".

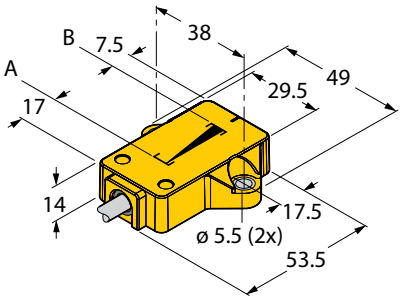
Wiring diagrams

Electrical version LiU5X2



Electrical version LU4X2





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 male end M12 x 1, 5-pin
- Cable, open end
- Extremely 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.

Li	50	P1	Q17L	M1	LU4	X2	0,3-RS5	S97

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

Positioning element
P1 P1-Li-QR14/Q17L

Measuring range
50 50 mm
100 100 mm
150 150 mm
200 200 mm
300 300 mm

Functional principle
Li linear inductive

Mounting element
M1 M1.1-Q17L und 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

Electrical connection
0,3-RS5 cable 0.3 m with male end M12 x 1
– 2 m cable (with open end)

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

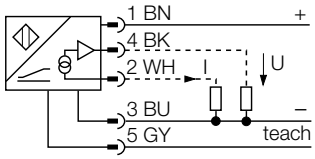
Measuring range specifications	
Max. measuring range	50, 100, 150, 200 mm, 300 mm
Blind zone a	22 mm
Blind zone b	10 mm (Li50 = 16 mm)
System	
Resolution	12 bit
Repeatability/accuracy	0.025 %
Linearity deviation	≤ 0.3 % v. E.
Temperature drift	≤ ± 0.01 %/K
Ambient temperature	-25…+ 70 °C -40…+ 70 °C (S97-Version)
Electrical data	
Operating voltage	15…30 VDC (LiU5)/8…30 VDC (LU4)
Residual ripple	≤ 10 % U_{PP}
Current consumption	≤ 50 mA
Rated insulation voltage	≤ 0.5 kV
Short-circuit protection	yes
Wire breakage / reverse polarity protection	yes/voltage supply
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 male end 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

Ordering information

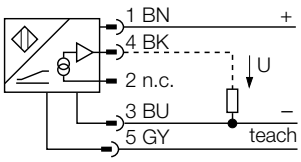
The linear position sensors can be ordered with meauring ranges of 50, 100, 150, 200, 300 mm. The mounting aids and positioning elements are individually available or as a kit. For more information, please see chapter "Accessories".

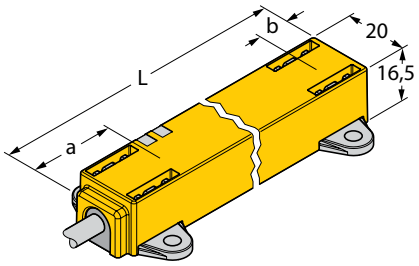
Wiring diagrams

electrical version LiU5X2



electrical version LU4X2





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 male M12 x 1, 5-pin
- Extremely 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.

Li	100	P1	Q25L	M1	LiU5	X3	H1141

Li	100	P1	Inductive linear position sensor	–	Q25L	M1	Housing style	–	LiU5	X3	Electrical version	–

Positioning element

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

Measuring range

100	from 100 mm up to 1000 mm, 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

X2	2 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

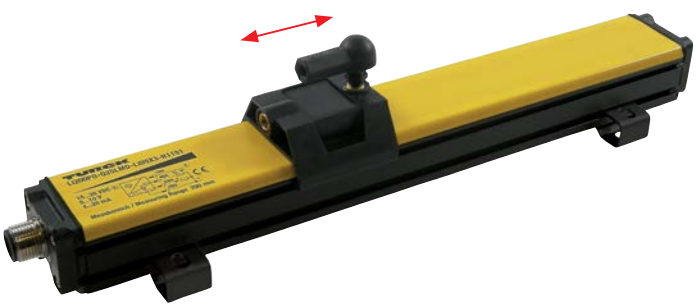
5	5 pin

Connector

1	straight

Connector

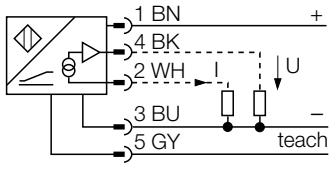
H1	male M12 x 1

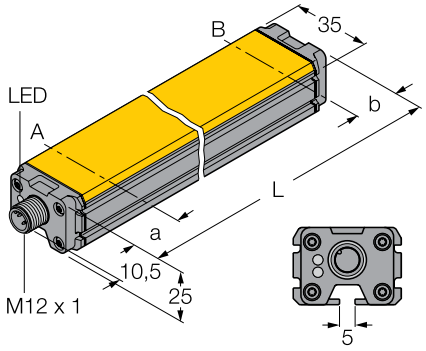


Measuring range specifications	
Max. measuring range	100, 200, … 1000 mm
Blind zone a	29 mm
Blind zone b	29 mm
System	
Resolution	12 bit
Repeatability/accuracy	0.025 %
Linearity deviation	≤ 0.1 % of full scale
Temperature drift	≤ ± 0.003 %/K
Ambient temperature	-25…+ 70 °C
Electrical data	
Operating voltage	15…30 VDC
Residual ripple	≤ 10 % U_{PP}
Rated insulation voltage	≤ 0.5 kV
Short-circuit protection	yes
Wire breakage / reverse polarity protection	yes/voltage supply
Output function	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 kHz
Current consumption	≤ 50 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, PA6-GF30
Connection	male 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)

Ordering information
The linear position sensors can be ordered with meauring ranges of 100, 200, up to… 1000 mm.
The sensors, mounting aids and positioning elements are individually available or as a kit.

Wiring diagrams





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 male M12 x 1, 8-pin
- Extremely 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 23). 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.

Li	100	P1	Q25L	M1	E	S	G	25	X3	H1181

Li	100	P1	Inductive linear position sensor	–	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

Measuring range
- **100** from 100 mm up to 1000 mm, 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
- **S** SSI interface

Resolution
- **E** higher resolution

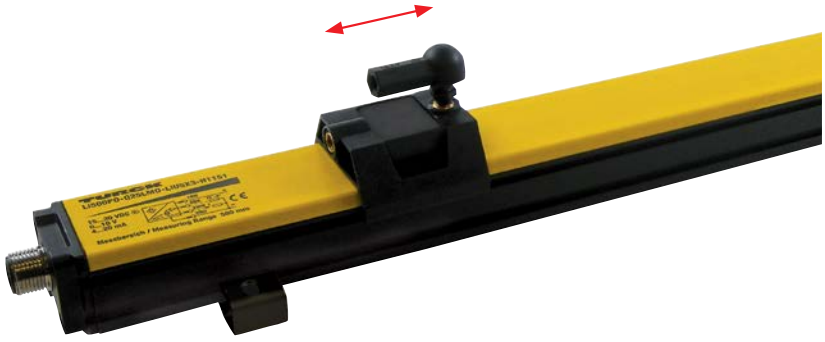
H1	1	8	1	Electrical connection

Configuration
- **1** standard configuration

Number of contacts
- **8** 8 pin

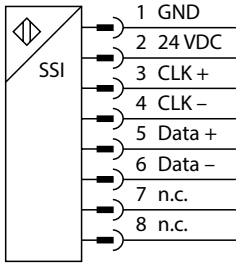
Connector
- **1** straight

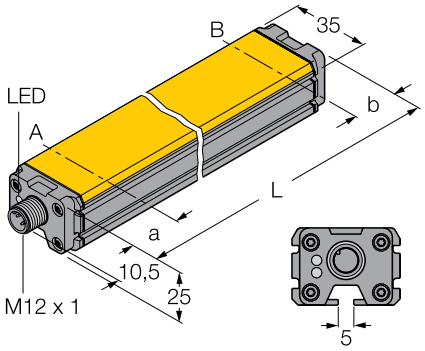
Connector
- **H1** male M12 x 1



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	18 µ (Li100…Li500), 36 µ (Li600…Li1000)
Linearity deviation	≤ 0.035 % 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}
Rated insulation voltage	≤ 0.5 kV
Short-circuit protection	yes
Wire breakage / reverse polarity protection	yes/yes (voltage supply)
Output function	SSI, 25 bit Gray coding
Sampling rate	1 kHz
Current consumption	< 50 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, PA6-GF30
Connection	male 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 can be ordered with meauring ranges of 100, 200, up to… 1000 mm.
The sensors, mounting aids and positioning elements are individually available or as a kit.

Inductive Linear Position Sensors Li-Q25L

High-speed H-series with high sampling rate and SSI interface

Product features

- Sampling rate of 5 kHz
- Increased resolution of up to 20 bit, depending on the measuring length
- Optimum temperature stability and linearity thanks to direct digital signal transmission
- Standardized SSI interface
- Standard male connector, M12 x 1, 8-pin
- Extremely short blind zones
- Robust housing made from continuously cast aluminum
- Watertight plastic insert made from polycarbonate
- <5µs jitter required on the master side when in synchronous mode

LED indicates measuring range

- Green:
  The positioning element is located within the measuring range
- Yellow:
  The positioning element is located within the measuring range with limited signal quality (e.g. distance too great), see status bit 22
- Yellow flashing:
  The positioning element is out of range, see status bit 23
- LED OFF:
  Positioning element is outside the programmed range (only with teachable versions)

Note: Pin 8 must be kept potential-free

High sampling rate for highly dynamic position detection

Turck's high-speed linear position sensors with an SSI interface are designed for highly dynamic position detection and control. The sensors also combine a high sampling rate with low, constant signal propagation delays and a high-resolution SSI output. An SSI clock rate of 1 MHz enables the sensors to operate with a sampling rate of 5 kHz. This high sampling rate does not depend on the measuring length, which is the same for all devices in the high-speed series.

Li	100	P1	Q25L	M1	H	E	S	G	25	X3	H1181

Li 100 P1 Inductive linear position sensor

Positioning element
- **P0** no positioning element
- **P1** P1-Li-Q25L
- **P2** P2-Li-Q25L
- **P3** P3-Li-Q25L

Measuring range
- **100** 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

–

H E S G 25 X3 Electrical version

Number of LEDs
- **X3** 3 x LED

Number of bits
- **25** number of bits

Code
- **G** gray
- **B** binary

SSI interface
- **S** SSI interface

Resolution
- **E** higher resolution

Sampling rate
- **H** higher sampling rate

–

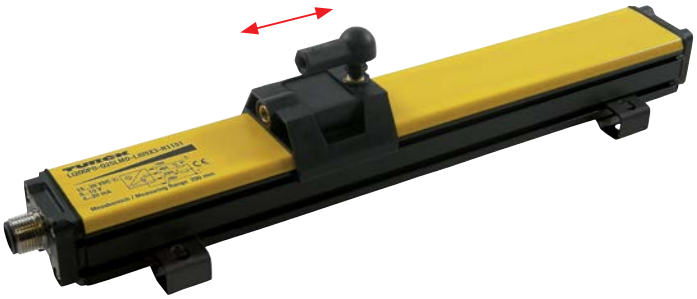
H1 1 8 1 Electrical connection

Configuration
- **1** standard configuration

Number of contacts
- **8** 8 pin

Connector
- **1** straight

Connector
- **H1** male M12 x 1

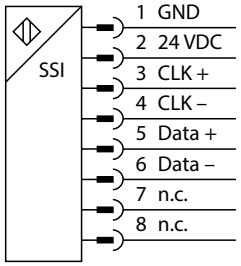


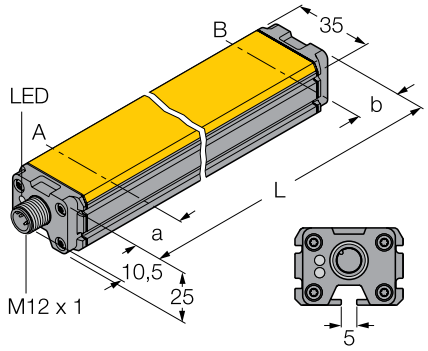
Measuring range specifications	
Max. measuring range	100, 200, … 1000 mm
Blind zone a	29 mm
Blind zone b	29 mm
System	
Resolution	0.001 mm
Repeatability	18 µ (Li100…Li500), 36 µ (Li600…Li1000)
Linearity deviation	≤ 0.035 % of full scale
Temperature drift	≤ ± 0.0001 %/K
Ambient temperature	-25…+ 70 °C
Electrical data	
Operating voltage	15…30 VDC
Residual ripple	≤ 10 % U_{PP}
Rated insulation voltage	≤ 0.5 kV
Short-circuit protection	yes
Wire breakage / reverse polarity protection	yes/yes (voltage supply)
Output function	SSI, 25 bit Gray coding
Sampling rate	5 kHz (synchronized)
Current consumption	< 50mA
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, PA6-GF30
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

Ordering information

The linear position sensors can be ordered with meauring ranges of 100, 200, up to… 1000 mm.
The sensors, mounting aids and positioning elements are individually available or as a kit.

Wiring diagrams





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 male M12 x 1, 5-pin
- Extremely 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.

Li	100	P1	Q25L	M1	E	LiUPN8	X3	H1181

Li 100 P1 Inductive linear position sensor – **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

Measuring range
- **100** from 100 mm up to 1000 mm, 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

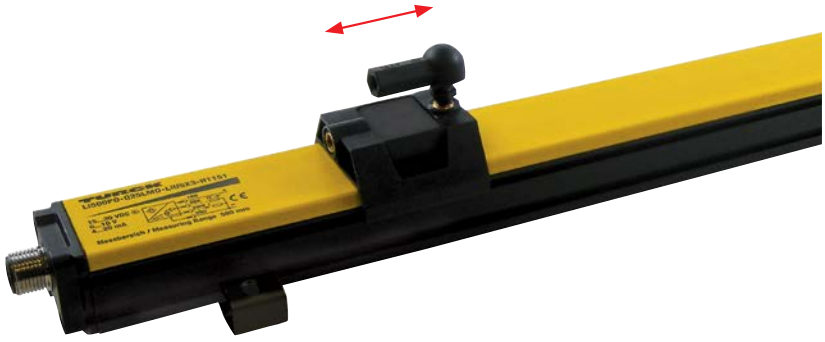
H1	1	5	1	Electrical connection

Configuration
- **1** standard configuration

Number of contacts
- **5** 5 pin

Connector
- **1** straight

Connector
- **H1** male M12 x 1



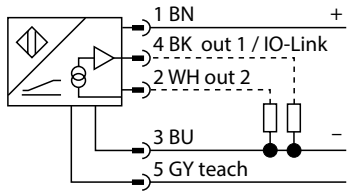
Measuring range specifications	
Max. measuring range	100, 200, …1000 mm depending on sensor type
Blind zone a	29 mm
Blind zone b	29 mm
System	
Resolution	16 bit (D/A converter and IO-Link)
Repeatability	18 µ (Li100…Li500), 36 µ (Li600…Li1000)
Linearity deviation	≤ 0.035 % of full scale
Temperature drift	≤ ± 0.003 % / 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,…) IO-Link compatible
Sampling rate	1 kHz
Current consumption	< 50 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, PA6-GF30
Connection	male 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

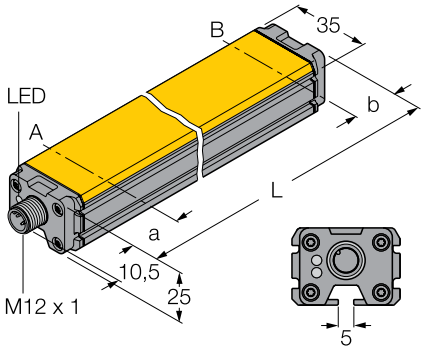
Ordering information

The linear position sensors can be ordered with meauring ranges of 100, 200, up to… 1000 mm

The sensors, mounting aids and positioning elements are individually available or as a kit.

Wiring diagrams





Accessories for Fieldbus Connections

The IO-Link-compatible execution is perfectly suited as a linear position sensor for connecting different fieldbus systems

It is often necessary to connect position sensors directly to the fieldbus that communicates with the higher-level control system. To do this, the position confirmation of the sensors can be transmitted directly to the fieldbus system (e. g. to PROFIBUS-DP, DeviceNet™, CANopen or Ethernet-based protocols) – this means that there is no need for analogous input modules.

To ensure the maximum flexibility possible when connecting sensors, Turck also provides modularly structured solutions. For example, linear position sensors, connection cables and fieldbus modules are available as separate components. This means that Turck sensors are significantly more compact than the large scale sensors with integrated fieldbus connections. As a result, any issues relating to space are avoided from the beginning. The user not only benefits from the extremely short blind zones, but also from the decentralized fieldbus connection.

TURCK provides the fieldbus modules as remote I/O systems in IP20 for the control cabinet (BL20) and in IP67 for tough environmental conditions (BL67). For signal preprocessing and autonomous control solutions (for relieving the bus and higher-level control), the device can be programmed using the CODESYS environment (IEC 61131).

If the modular remote I/O systems are too large, the space-saving TBEN compact modules offer the best solution with extremely robust modules that can be directly installed in the field. The IO-Link is the best communications interface between the sensor and fieldbus connections. The path information is transferred to the relevant fieldbus module in a 16 bit IO-Link telegram via a simple, unshielded 3-pin cable and is therefore available to all current fieldbuses. This means that the process values can be supplied to the relevant fieldbus in a cost-efficient, digital and space-saving way, preventing convertor losses in the process.

CODESYS

- All current fieldbus systems
- Simple IO-Link communication with standard 3-pin, unshielded cables
- Modular principle
- High level of flexibility
- Sensor independent of fieldbus system
- Extremely space-saving
- Nearly the entire housing surface is used as measuring range

IO-Link

EtherNet/IP™ DeviceNet™ PROFINET® PROFIBUS®

CANopen Ethernet Modbus TCP

Hans Turck GmbH & Co. KG | 45466 Mülheim an der Ruhr, Germany | T +49 208 4952-0 | F +49 208 4952-264 | more@turck.com | www.turck.com

Label	Description
TBEN – compact remote I/O with protection class IP67	
TBEN-S2-4IOL	Multiprotocol I/O module for Ethernet (Ethernet/IP, Modbus TCP, PROFINET) with 4 IO-Link master channels, 4 additional universal and digital PNP outputs
RKC4T-x-RSC4T/TXL M12	Connection cable, M12 male connector to M12 female connector, x=cable length
BL67 – modular remote I/O with protection class IP67	
BL67-GW-DPV1	Gateway for PROFIBUS-DP
BL67-PG-DP	Programmable gateway for PROFIBUS-DP
BL67-GW-DN	Gateway for DeviceNet™
BL67-GW-CO	Gateway for CANopen
BL67-GW-EN	Multiprotocol gateway for Ethernet (Ethernet/IP, Modbus TCP, PROFINET)
BL67-PG-EN	Multiprotocol gateway for Ethernet (EtherNet/IP, Modbus TCP, PROFINET), programmable in CODESYS 2
BL67-PG-EN-V3	Gateway for Ethernet Modbus TCP, programmable in CODESYS 3
BL67-4IOL	Electronic module, 4 IO-Link master channels, 4 additional configurable and digital channels
BL67-B-4M12	Connection module, 4 x M12, 5-pin
RKC4T-x-RSC4T/TXL	Connection cable, M12 male connector to M12 female connector, x = cable length
BL20 – modular remote I/O with protection class IP20	
BL20-GW-DPV1	Gateway for PROFIBUS-DP
BL20-GWBR-DNET	Gateway for DeviceNet™
BL20-GWBR-CANOPEN	Gateway for CANopen
BL20-E-GW-EN	Multiprotocol gateway for Ethernet (Ethernet/IP, Modbus TCP, PROFINET)
BL20-PG-EN	Gateway for Ethernet Modbus TCP, programmable
BL20-E-4IOL	Electronic module, 4 IO-Link master channels, 4 additional configurable and digital channels
RKC4T-x/TXL	Connection cable, M12 female connector, x = cable length

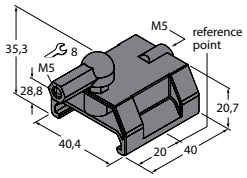
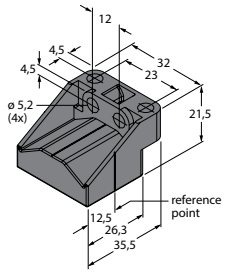
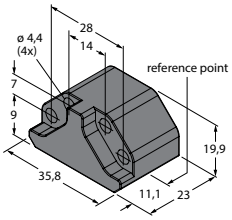
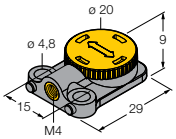
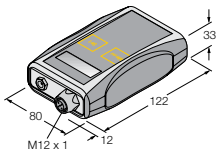
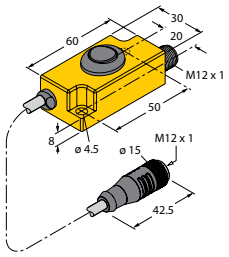
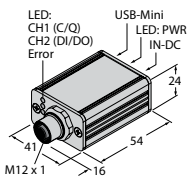
Connection Technology

In the past, the M12 connector was not yet the standard connection technology for linear position sensor. Instead 6 or 8-pin 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.

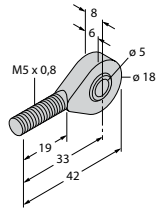
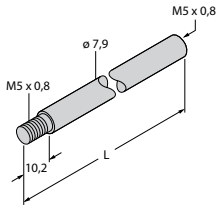
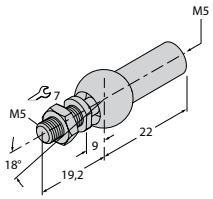
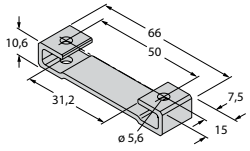
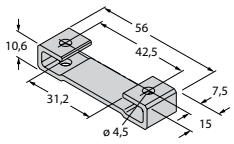
Adapter cable	
WAKS4.5-0,3-B723M16/8	Adapter cable for converting an 8-pin M16 male connector to a 5-pin M12 standard male connector
WAKS4.5-0,3-B723M16/6I	Adapter cable for converting a 6-pin M16 male connector (current) to a 5-pin M12 standard male connector
WAKS4.5-0,3-B723M16/6U	Adapter cable for converting a 6-pin M16 male connector (current) to a 5-pin M12 standard male connector
Connection cable for standard series and high-end "E" series with analog output	
RKS4,5T-2/TXL	M12 connection cable, 5-pin, shielded, 2 m with open end
Connection cable for high-end "E" series with SSI interface	
E-RKC-8T-264-2-RSC8T	M12 connection cable, 8-pin, 2 m connection from linear position sensors with SSI output to BL67 and *BL compact* fieldbus stations
E-RKC-8T-264-2	M12 connection cable, 8-pin, 2 m with open cable end for connecting linear position sensors with SSI output to BL20 fieldbus stations
E-RKS-8T-264-1-CSWM12/S3085	M12 connection cable, 8-pin, from M23, 12-pin, 1 m long, for connecting linear position sensors with SSI output to BL67 and piconet® fieldbus stations
Connection cable for high-end-"E" series with IO-Link interface	
RKC4T-x-RSC4T/TXL	Connection cable, M12 male connector to M12 female connector, x = cable length
RKC4T-x/TXL	Connection cable, M12 female connector, x = cable length

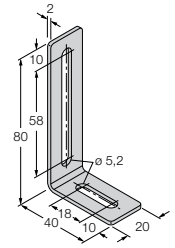
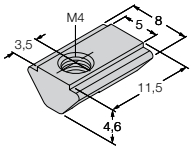
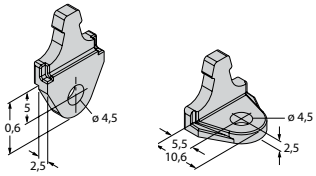
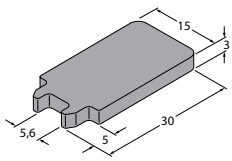
Functions Tools

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-Q25L P3-Li-Q25L	Floating positioning element, operates at a distance of 0…5 mm to the sensor surface Floating positioning element; right-angle mounting; operates at a distance of 0…5 mm to the sensor surface
	P6-Li-Q25L	Floating positioning element for Q25L series
	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
	USB-2-IOL-0002	IO Link master with integrated USB interface for parametrization 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 mounting flexibility with accessories for all borehole distances.

Dimension drawings	Type	Description
	RE-Q21	Joint head for positioning element
	CA-100	Extension bar for positioning element; L = 100 mm
	CA-200	Extension bar for positioning element; L = 200 mm
	CA-300	Extension bar for positioning element; L = 300 mm
	CA-400	Extension bar for positioning element; L = 400 mm
	CA-500	Extension bar for positioning element; L = 500 mm
	AB-M5 ABVA-M5	Axial joint, used in combination with positioning element P1-Li-Q25L, steel Axial joint for guided positioning element of P1-Li-Q25L devices; stainless steel
	M1-Q25L	Mounting foot for inductive linear position sensors Q25L; two mounting feet should be used for 500 mm devices; 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 500 mm devices; 4 for 1000 mm; anodized aluminium; thickness 1 mm; 2 pcs. per bag

Dimension drawings	Type	Description
	M4-Q25L	Mounting bracket for inductive linear position sensors Q25L; two mounting feet should be used for 500 mm devices; 4 for 1000 mm; stainless steel; 2 pcs. per bag and 2 sliding blocks
	MN-M4-Q25	Sliding block with M4 thread for back side groove of inductive linear position sensors Q25L; brass; 10 pcs. per bag. To be purchased separately!
	M1.1-Q17L M1.2-Q17L	Mounting foot for inductive linear position sensor Q17L, 3 pcs. for standard mounting 3 pcs. for lateral mounting
	RMT-Q17L	Extraction tool for Q17L mounting aids

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