TURCK LI-Q25L…E Linear Position Sensors with Analog Output Instruction Manual

Your Global Automation Partner

Contents

LI-Q25L…E

Linear Position Sensors with Analog Output

Instructions for Use

1 About these instructions

These instructions for use describe the structure, functions and the use of the product and will help you to operate the product as intended. Read these instructions carefully before using the product. This is to avoid possible damage to persons, property or the device. Retain the instructions for future use during the service life of the

product. If the product is passed on, pass on these instructions as well.

1.1 Target groups

These instructions are aimed at qualified personal and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of symbols used

The following symbols are used in these instructions:

DANGER
DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.

WARNING
WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.

CAUTION
CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.

NOTICE
NOTICE indicates a situation which may lead to property damage if not avoided.

NOTE
NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.

▶ **CALL TO ACTION**
This symbol denotes actions that the user must carry out.

⇨ **RESULTS OF ACTION**
This symbol denotes relevant results of actions.

1.3 Other documents

Besides this document, the following material can be found on the Internet at www.turck.com:

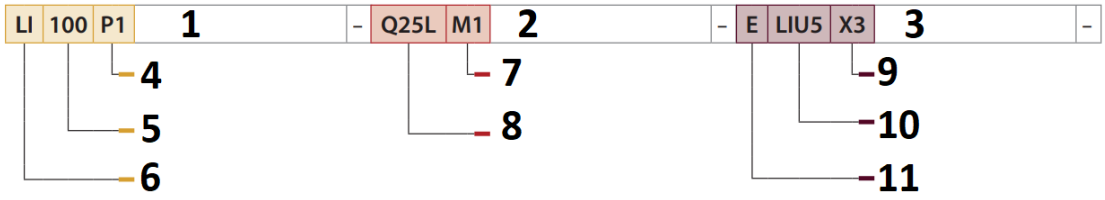
- Data sheet

1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to techdoc@turck.com.

2 Notes on the product

2.1 Product identification



1. **Inductive linear position sensor**
2. **Housing style**
3. **Electrical version**
4. **Positioning element**

   P0 No positioning element

   P1 P1-LI-Q25L

   P2 P2-LI-Q25L

   P3 P3-LI-Q25L
5. **Measuring range**

   100 100…1000 mm, in 100 mm steps

   1250…2000 mm, in 250 mm steps
6. **Functional principle**

   LI Linear inductive
7. **Mounting element**

   M0 No mounting element

   M1 M1-Q25L

   M2 M2-Q25L

   M4 M4-Q25L
8. **Housing style**

   Q25L Rectangular, profile 25 × 35 mm
9. **Number of LEDs**

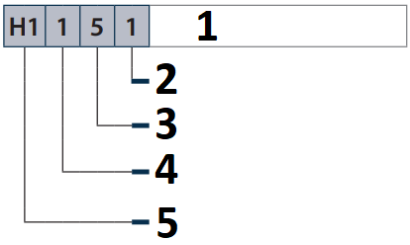
   X3 3 × LED
10. **Output mode**

    LIU5 Analog output

4…20 mA/0…10 V

11. **Series**

    E Extended generation



1. **Electrical connection**
2. **Configuration**

    1 Standard configuration
3. **Number of contacts**

    5 5 pin, M12 × 1
4. **Connector**

    1 Straight
5. **Connector**

    H1 Male M12 × 1

2.2 Scope of delivery

The scope of delivery includes:

- Linear position sensor (without positioning element)
- Optional: Positioning element and mounting element

2.3 Turck service

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database under **www.turck.com** contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats.

The contact details of Turck subsidiaries worldwide can be found on p. [26].

3 For your safety

The product is designed according to state-of-the-art technology. However, residual risks still exist. Observe the following warnings and safety notices to prevent damage to persons and property. Turck accepts no liability for damage caused by failure to observe these warning and safety notices.

3.1 Intended use

The inductive linear position sensors are used for contactless and wear-free linear position measuring.

The devices may only be used as described in these instructions. Any other use is not in accordance with the intended use. Turck accepts no liability for any resulting damage.

3.2 Obvious misuse

- The devices are not safety components and must not be used for personal or property protection.

3.3 General safety notes

- The device may only be assembled, installed, operated, parameterized and maintained by professionally-trained personnel.
- The device may only be used in accordance with applicable national and international regulations, standards and laws.
- The device meets the EMC requirements for industrial areas. When used in residential areas, take measures to avoid radio interference.

4 Product description

The inductive linear position sensors of the Li-Q25L product series consist of a sensor and a positioning element. The two components form a measuring system for measuring for converting the measured variable, length or position.

The sensors are supplied with a measuring length of 100…2000 mm: In the 100…1000-mm range, variants are available in 100-mm increments, in the 1000…2000-mm range in 250-mm increments. The maximum measuring range of the sensor is determined by its length. However, the start point of the measuring range can be individually adapted using a teach-in process.

The sensor is housed in a rectangular aluminum profile. The positioning element is available in different variants in a plastic housing (cf. accessories list in chapter 4.5). The sensor and positioning element fulfill the requirements of protection class IP67 and can withstand vibrations of moving machine parts as well as a range of other aggressive ambient conditions for long periods of time. The sensor and positioning element together enable contactless and wear-free measuring. The sensors operate in absolute mode. Power outages do not require renewed zero offset adjustment or recalibration. All position values are determined as absolute values. Homing movements after a voltage drop are unnecessary.

4.1 Device overview

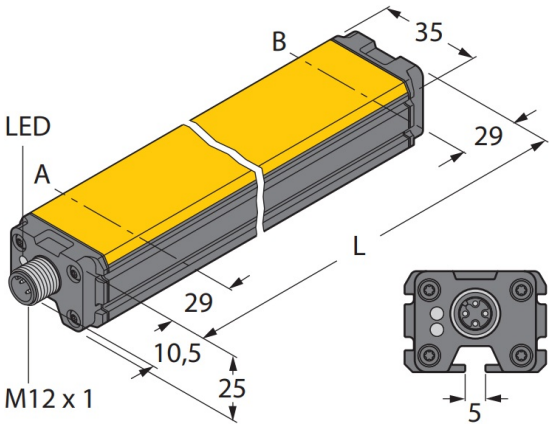


Fig. 1: Dimensions in mm – L = 29 mm + measuring length + 29 mm

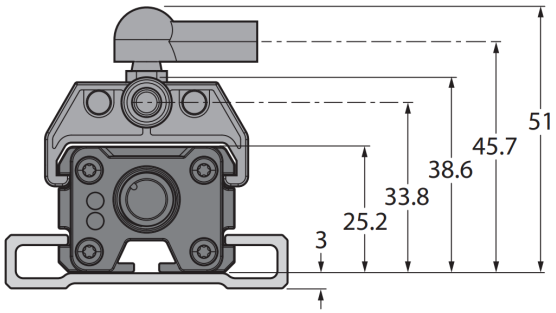


Fig. 2: Dimensions – device height

4.2 Properties and features

- Measurement lengths from 100…2000 mm
- Shock-proof up to 200 g
- Maintains linearity under shock load
- Immune to electromagnetic interference
- 5-kHz sampling rate
- 16-bit resolution

4.3 Operating principle

The Li-Q25L linear position sensors have contactless operation based on the inductive resonant circuit measuring principle. Measuring is immune to magnetic fields as the positioning element is not based on a magnet but on a coil system. Sensor and positioning element form an inductive measuring system. An induced voltage generates appropriate signals in the receiver coils of the sensor, depending on the location of the positioning element. The signals are evaluated in the internal 16-bit processor of the sensor and output as analog signals.

4.4 Functions and operating modes

The devices feature a current and voltage output. The device provides a current and voltage signal at the output proportional to the position of the positioning element.

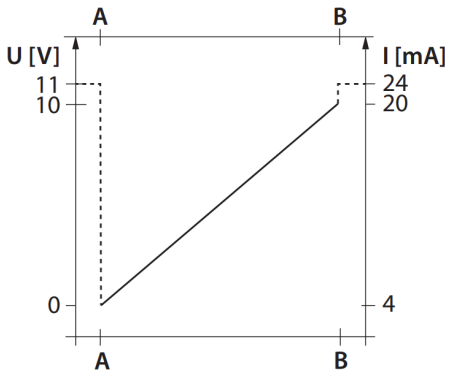


Fig. 3: Output characteristics

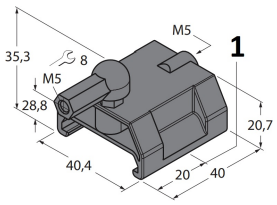
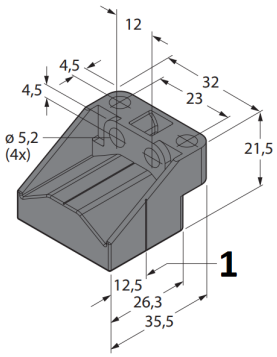
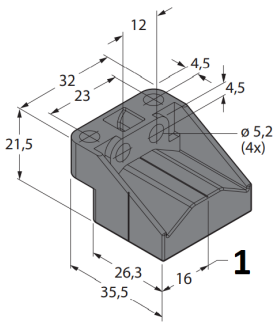
4.4.1 Output function

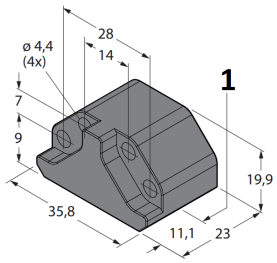
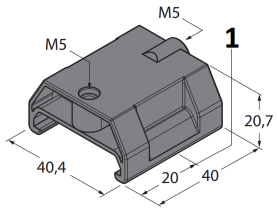
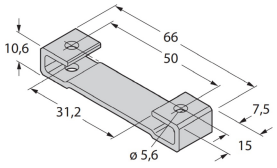
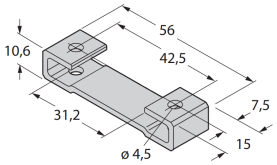
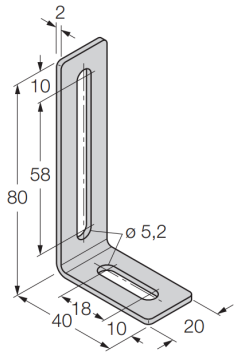
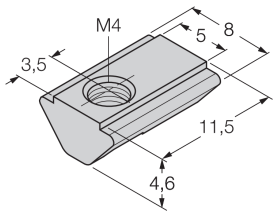
The measuring range of the sensor starts at 4 mA or 0 V and ends at 20 mA or 10 V. Current and voltage output can be used simultaneously. Current and voltage outputs can be used simultaneously for functions such as redundant signal evaluation. In addition, one display unit can receive a signal while the second signal is processed by a PLC.

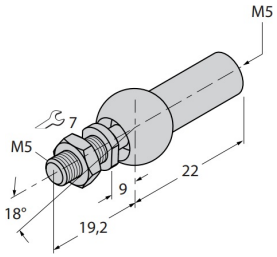
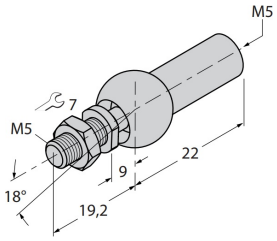
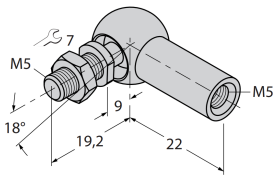
In addition to the LEDs, the sensor offers an additional control function. If the positioning element is outside the detection range and the coupling between the sensor and the positioning element is interrupted, the analog output of the sensor outputs 24 mA or 11 V as a fault signal. This error can therefore be evaluated directly via the higher-level control.

4.5 Technical accessories

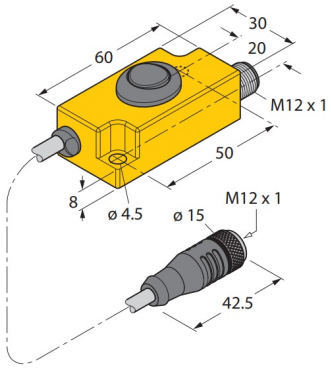
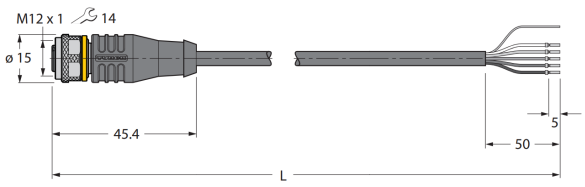
4.5.1 Mounting accessories

Dimension drawing	Type	ID	Description
 1. reference point	P1-LI-Q25L	6901041	Guided positioning element for LI- Q25L linear position sensors, inserted in the groove of the sensor
 1. reference point	P2-LI-Q25L	6901042	Floating positioning element for LI-Q25L linear position sensors; the nominal distance to the sensor is 1.5 mm; pairing with the linear position sensor at a distance of up to 5 mm or a misalignment tolerance of up to 4 mm
 1. reference point	P3-LI-Q25L	6901044	Floating positioning element for LI-Q25L linear position sensors; operational at an offset of 90°; the nominal distance to the sensor is 1.5 mm; pairing with the linear position sensor at a distance of up to 5 mm or a misalignment tolerance of up to 4 mm

 1. reference point	P6-LI-Q25L	6901069	Floating positioning element for LI-Q25L linear position sensors; the nominal distance to the sensor is 1.5 mm; pairing with the linear position sensor at a distance of up to 5 mm or a misalignment tolerance of up to 4 mm
 1. reference point	P7-LI-Q25L	6901087	Guided positioning element for LI- Q25L linear position sensors, without ball joint
	M1-Q25L	6901045	Mounting foot for LI-Q25L linear position sensors; material: aluminum; 2 pcs. per bag
	M2-Q25L	6901046	Mounting foot for LI-Q25L linear position sensors; material: aluminum; 2 pcs. per bag
	M4-Q25L	6901048	Mounting bracket and sliding block for LI-Q25L linear position sensors; material: stainless steel; 2 pcs. per bag
	MN-M4-Q25	6901025	Sliding block with M4 thread for the backside profile of the LI-Q25L linear position sensor; material: galvanized metal; 10 pcs. per bag

	ABM5	6901057	Axial joint for guided positioning element
	ABVA-M5	6901058	Axial joint for guided positioning elements; material: stainless steel
	RBVA-M5	6901059	Angle joint for guided positioning element; material: stainless steel

4.5.2 Connection accessories

Dimension drawing	Type	ID	Description
	TX1-Q20L60	6967114	Teach adapter
	RKS4.5T-2/TXL	6626373	Connection cable, M12 female connector, straight, 5-pin, shielded: 2 m, jacket material: PUR, black; cULus approval; other cable lengths and versions available, see www.turck.com

NOTE
Install positioning elements centrally above the sensor. Observe LED behavior (see chapter “Operation”).

▶ Install the linear position sensor in the system using the required mounting accessories.

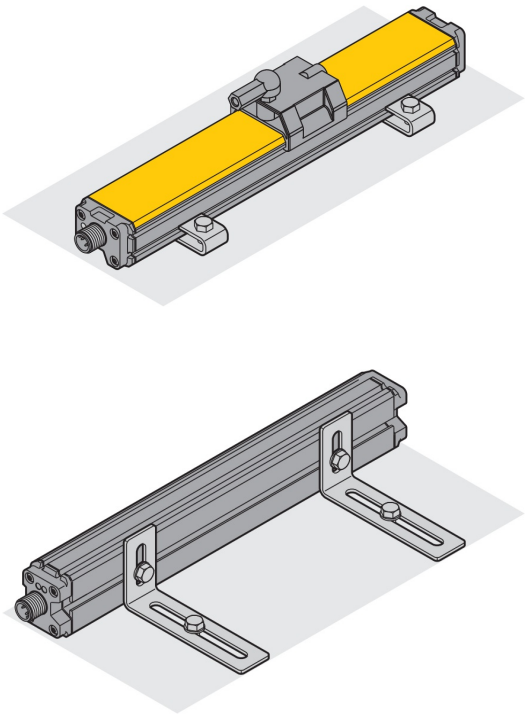


Fig. 4: Example — installation with mounting foot or mounting bracket

Mounting element	Recommended tightening torque
M1-Q25L	3 Nm
M2-Q25L	3 Nm
MN-M4-Q25L	2.2 Nm

Sensor type	Recommended number of fixings
LI100…LI500	2
LI600…LI1000	4
LI1250…LI1500	6
LI1750…LI2000	8

5.1 Mounting free positioning elements

▶ Center the free positioning element above the sensor.
▶ If LED 1 lights up yellow, the positioning element is in the measuring range. Signal quality is degraded.

Correct the alignment of the positioning element until LED 1 lights up green.

▶ If LED 1 flashes yellow, the positioning element is not in the measuring range. Correct the alignment of the positioning element until LED 1 lights up green.

⇨ LED 1 lights up green when the positioning element is in the measuring range.

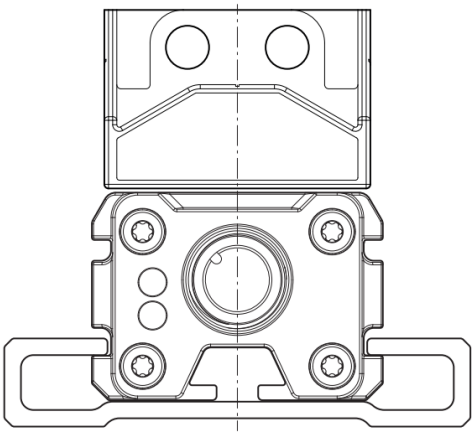


Fig. 5: Center the free positioning element

6 Connection

NOTICE
Incorrect female connector
Damage to the M12 male connector possible

▶ Ensure correct connection.

NOTE
Turck recommends the use of shielded connection cables.

▶ During the electrical installation of the sensor, keep the entire system de-energized.
▶ Connect the female connector of the connection cable to the male connector of the sensor.
▶ Connect the open end of the connection cable to the power supply and/or processing units.

6.1 Wiring diagram

NOTE
To prevent unintentional teaching, keep pin 5 potential-free or activate the teach lock.

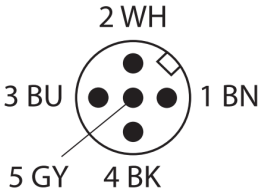


Fig. 6: M12 male connector — pin assignment

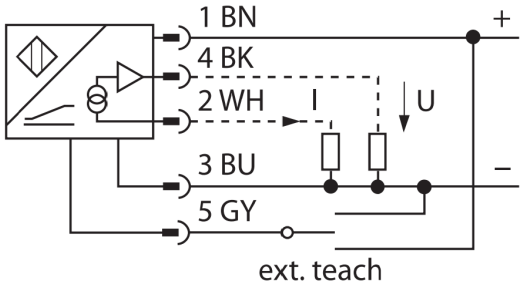


Fig. 7: M12 male connector — wiring diagram

7 Commissioning

After connecting and switching on the power supply, the device is automatically ready for operation.

8 Operation

8.1 LED indications

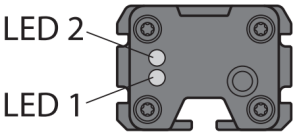


Fig. 8: LEDs 1 and 2

LED	Display	Meaning
LED 1	Green	Positioning element within the measuring range
	Yellow	Positioning element within the measuring range with a reduced signal quality (e.g. distance to sensor too large)
	Yellow flas hing	Positioning element not in detection range
	Off	Positioning element outside the set measuring range
LED 2	Green	Power supply error-free

9 Setting

The sensor offers the following setting options:

- Set the start of the measuring range (zero point)

- Set the end of the measuring range (end point)
- Reset measuring range to factory setting: largest possible measuring range
- Reset measuring range to inverted factory setting: largest possible measuring range, output curve inverted
- Activate/deactivate teach lock

The measuring range can be set by manual bridging or with the TX1-Q20L60 teach adapter. The zero point and end point of the measuring range can be set in succession or separately.

NOTE
To prevent unintentional teaching, keep pin 5 potential-free or activate the teach lock.

9.1 Setting via manual bridging

9.1.1 Setting the measuring range

▶ Supply the device with voltage.
▶ Place the positioning element at the desired zero point of the measuring range.
▶ Bridge pin 5 and pin 3 for 2 s.
⇨ LED 2 flashes green for 2 s during bridging.
⇨ The zero point of the measuring range is stored.

▶ Supply the device with voltage.
▶ Place the positioning element at the desired end point of the measuring range.
▶ Bridge pin 5 and pin 1 for 2 s.
⇨ LED 2 flashes green for 2 s during bridging.
⇨ The end point of the measuring range is stored

9.1.2 Reset the sensor to the factory settings

▶ Supply the device with voltage.
▶ Bridge pin 5 and pin 1 for 10 s.
⇨ LED 2 initially flashes green for 2 s, then lights up green continuously for 8 s and flashes green again (after a total of 10 s).
⇨ The sensor is reset to its factory setting.

9.1.3 Reset the sensor to the inverted factory settings

▶ Supply the device with voltage.
▶ Bridge pin 5 and pin 3 for 10 s.
⇨ LED 2 initially flashes green for 2 s, then lights up green continuously for 8 s and flashes green again (after a total of 10 s).
⇨ The sensor is reset to its inverted factory setting.

9.1.4 Activating the teach lock

NOTE
The teach lock function is deactivated on delivery.

▶ Supply the device with voltage.
▶ Bridge pin 5 and pin 1 for 30 s.
⇨ LED 2 initially flashes green for 2 s, then lights up green continuously for 8 s, flashes green again (after a total of 10 s) and flashes green (after a total of 30 s) at a higher frequency.
⇨ The teach lock function of the sensor is activated.

9.1.5 Deactivating teach lock

▶ Supply the device with voltage.
▶ Bridge pin 5 and pin 1 for 30 s.
⇨ LED 2 lights up green continuously for 30 s (teach lock is still activated) and after 30 s flashes green at a higher frequency.
⇨ The teach lock function of the sensor is deactivated.

9.2 Setting via teach adapter

9.2.1 Setting the measuring range

▶ Supply the device with voltage.
▶ Place the positioning element at the zero point of the measuring range.
▶ Teach-in the pushbutton on the adapter for 2 s against GND.
⇨ LED 2 flashes green for 2 s and then lights up green continuously.
⇨ The zero point of the measuring range is stored.

▶ Supply the device with voltage.
▶ Place the positioning element at the end point of the measuring range.
▶ Teach-in the pushbutton on the adapter for 2 s against U_B.
⇨ LED 2 flashes green for 2 s and then lights up green continuously.
⇨ The zero point of the measuring range is stored.

9.2.2 Reset the sensor to the factory settings

▶ Supply the device with voltage.
▶ Teach-in the pushbutton on the adapter for 10 s against U_B.
⇨ LED 2 initially flashes green for 2 s, then lights up green continuously for 8 s and flashes green again (after a total of 10 s).
⇨ The sensor is reset to the factory setting.

9.2.3 Reset the sensor to the inverted factory settings

▶ Supply the device with voltage.
▶ Teach-in the pushbutton on the adapter for 10 s against GND.
⇨ LED 2 initially flashes green for 2 s, then lights up green continuously for 8 s and flashes green again (after a total of 10 s).
⇨ The sensor is reset to the inverted factory setting.

9.2.4 Activating the teach lock

NOTE
The teach lock function is deactivated on delivery.

▶ Supply the device with voltage.
▶ Teach-in the pushbutton on the adapter for 30 s against U_B.
⇨ LED 2 initially flashes green for 2 s, then lights up green continuously for 8 s, flashes green again (after a total of 10 s) and flashes green (after a total of 30 s) at a higher frequency.
⇨ The teach lock function of the sensor is activated.

9.2.5 Deactivating teach lock

▶ Supply the device with voltage.
▶ Teach-in the pushbutton on the adapter for 30 s against U_B.
⇨ LED 2 lights up green continuously for 30 s (teach lock is still activated) and after 30 s flashes green at a higher frequency.
⇨ The teach lock function of the sensor is deactivated.

10 Troubleshooting

The strength of the resonance coupling is indicated by an LED. Any faults are indicated via the LEDs.

If the device does not function as expected, first check whether ambient interference is present. If there is no ambient interference present, check the connections of the device for faults.

If there are no faults, there is a device malfunction. In this case, decommission the device and replace it with a new device of the same type.

11 Maintenance

Ensure that the plug connections and cables are always in good condition.

The devices are maintenance-free, clean dry if required.

12 Repair

The device must not be repaired by the user. The device must be decommissioned if it is faulty. Observe our return acceptance conditions when returning the device to Turck.

12.1 Returning devices

Returns to Turck can only be accepted if the device has been equipped with a Decontamination declaration enclosed. The decontamination declaration can be downloaded from **https://www.turck.de/en/retoure-service-6079.php** and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

13 Disposal

The devices must be disposed of correctly and must not be included in general household garbage.

14 Technical data

Technical data	
Measuring range specifications	
Measuring range	100…1000 mm in 100-mm increments; 1250…2000 mm in 250-mm increments
Resolution	16 bit
Nominal distance	1.5 mm
Blind zone a	29 mm
Blind zone b	29 mm
Repetition accuracy	≤ 0.02 % of full scale
Linearity tolerance	Depending on the measuring length (see data sheet)
Temperature drift	≤ ± 0.003 %/K
Hysteresis	Omitted as a matter of principle
Ambient temperature	-25…+70 °C
Operating voltage	15… 30 VDC
Ripple	≤10 % U_{ss}
Insulation test voltage	≤ 0.5 kV
Short-circuit protection	Yes
Wire breakage/reverse polarity protection	Yes/yes (power supply)
Output function	5-pin, analog output
Voltage output	0…10 V
Current output	4…20 mA
Load resistance, voltage output	≥ 4.7 kΩ
Load resistance, current output	≤ 0.4 kΩ
Sampling rate	5 kHz
Current consumption	< 50 mA
Design	Rectangular, Q25L

Dimensions	(Measurement length + 58) × 35 × 25 mm
Housing material	Anodized aluminum
Material of active face	Plastic, PA6-GF30
Electrical connection	Male connector, M12 × 1
Vibration resistance (EN 60068-2-6)	20 g; 1.25 h/axis; 3 axes
Shock resistance (EN 60068-2-27)	200 g; 4 ms ½ sine
Type of protection	IP67/IP66
MTTF	138 years acc. to SN 29500 (Ed. 99) 40 °C
Packed quantity	1
Operating voltage indication	LED: green
Measuring range display	Multifunction LED: green, yellow, yellow flashing

15 Turck subsidiaries — contact information

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Witzlebenstraße 7, 45472 Mülheim an der Ruhr
www.turck.de

Australia Turck Australia Pty Ltd
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www.turck.com.au

Belgium TURCK MULTIPROX
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www.multiprox.be

Brazil Turck do Brasil Automação Ltda.
Rua Anjo Custódio Nº 42, Jardim Anália Franco, CEP 03358-040 São Paulo
www.turck.com.br

China Turck (Tianjin) Sensor Co. Ltd.
18,4th Xinghuazhi Road, Xiqing Economic Development Area, 300381
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www.turck.com.cn

France TURCK BANNER S.A.S.
11 rue de Courtalin Bat C, Magny Le Hongre, F-77703 MARNE LA VALLEE
Cedex 4
www.turckbanner.fr

Great Britain TURCK BANNER LIMITED
Blenheim House, Hurricane Way, GB-SS11 8YT Wickford, Essex
www.turckbanner.co.uk

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Baner-Balewadi Link Rd., 411045 Pune – Maharashtra
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Italy TURCK BANNER S.R.L.
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www.turckbanner.it

Japan TURCK Japan Corporation
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www.turckbanner.my

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Blvd. Campestre No. 100, Parque Industrial SERVER, C.P. 25350 Arteaga,
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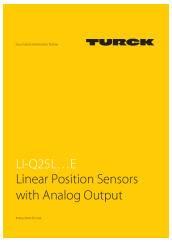	TURCK LI-Q25L…E Linear Position Sensors with Analog Output [pdf] Instruction Manual LI-Q25L E Linear Position Sensors with Analog Output, LI-Q25L E, Linear Position Sensors wit h Analog Output, Linear Position Sensors, Analog Output Sensors, Sensors

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