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TURCK

Li-Q25L...E

Linear Position Sensor with Analog Output

Operating Instructions

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1 About These Instructions

This manual describes the setup, the functions and use of the product and helps you to operate the product for its intended use. Read the instructions carefully prior to using the product. This will prevent the risk of personal injury and damage to property. Keep these instructions safe 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 written for suitably qualified and trained personnel and must be read by anyone entrusted with the mounting, commissioning, operation, maintenance, disassembly or disposal of the device.

1.2 Explanation of symbols

The following symbols are used in these instructions:



DANGER

DANGER indicates a hazardous situation, which, if not avoided, will result in death or serious injury.



WARNING

WARNING indicates a hazardous situation with the risk of death or serious injury if it is not prevented.



NOTICE

NOTICE indicates a situation that may cause damage to property if it is not prevented.



NOTE

NOTE indicates tips, recommendations and important information about special action steps and issues. The notes simplify your work and help you to avoid additional work.



MANDATORY ACTION

This symbol denotes actions that the user must carry out.



RESULT OF ACTION

This symbol denotes the relevant results of an action.

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

Li	100	P1	Q25L	M1	E	LiU5	X3	H1151
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Li	100	P1	Inductive linear position sensor	-	Q25L	M1	Housing style	-	E	LiU5	X3	Electrical version	-
			Positioning element				Mounting element				Number of LEDs		
			P0				M0				X3	3 x LED	
			P1				M1						
			P2				M2						
			P3				M4						
			Measuring range				Housing style				Series		
			100				Q25L				E	Extended generation	

2.4 Manufacturer and service

Turck supports you in your projects – from the initial analysis right through to the commissioning of your application. The Turck product database offers you several software tools for programming, configuring or commissioning, as well as data sheets and CAD files in different export formats.

You can access the Product Database directly via the following address:

www.turck.de/products

For further inquiries in Germany contact the Sales and Service Team on:

Sales: +49 208 4952-380

Technical: +49 208 4952-390

For overseas inquiries contact your national Turck representative.

Hans Turck GmbH & Co. KG
Witzlebenstraße 7
45472 Mülheim an der Ruhr
Germany

3 For Your Safety

The product is designed according to state of the art technology. Residual hazards, however, still exist. Observe the following warnings and safety regulations in order to prevent danger to persons and property. Turck accepts no liability for damage caused by failure to observe these warnings and safety instructions.

3.1 Intended use

The devices are designed only for use in industrial areas.

The Li-Q25...E inductive linear position sensors with an analog output are used for contactless and wear-free linear position measuring.

The device must 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 General safety notes

- The devices are not safety components and must not be used for the protection of persons and property.
- The device must only be fitted, installed, operated, maintained and parameterized by trained and qualified personnel.
- The device only fulfills the EMC requirements for industrial applications and is not suitable for use in residential areas.

4 Product Description

The inductive linear position sensors of the Li-Q25L series with an analog output consist of a sensor and a positioning element. The two components form a measuring system for measuring and converting the measured variable for **Length** and **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 steps, in the 1000...2000 mm range, variants are available in 250 mm steps. The maximum measuring range of the sensor is defined by its length. However, the measuring range can be individually adapted with a teach operation.

The sensor is housed in a rectangular aluminum profile.

The positioning element is available in different designs in a plastic housing (cf. Accessories list in chapter 4.5). Sensor and positioning element comply with degree of protection IP67 and can withstand the vibrations of moving machine parts as well as being resistant to a number of environmental media.

Sensor and positioning element together enable contactless and wear-free measuring. The sensors operate in absolute mode. Voltage failures do not require renewed homing or recalibration. All position values are determined as absolute values. Homing movements after a voltage failure are unnecessary.

4.1 Device overview

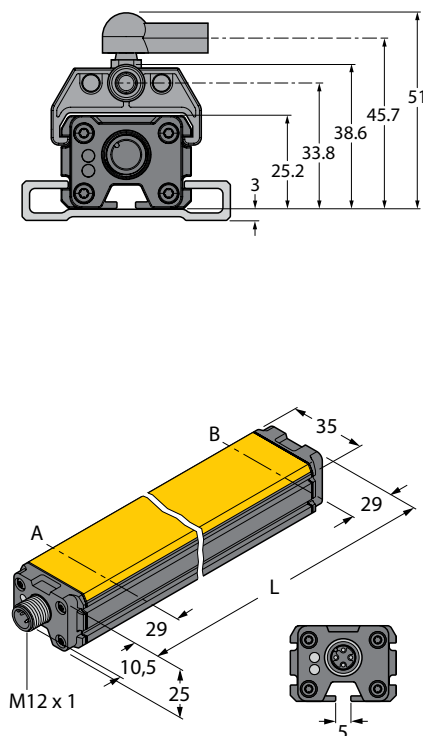


Fig. 1: Dimensions of Li-Q25L...E in mm – $L = 29 \text{ mm} + \text{measuring length} + 29 \text{ mm}$

4.2 Properties and features

- Measuring lengths of 100...2000 mm
- Shock-proof up to 200 g
- Keeps linearity under shock stress
- Magnetic field immunity
- 5 kHz scan 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 insensitive 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 position 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 are provided with a current and voltage output. The device output provides a current and voltage signal that is proportional to the position of the positioning element.

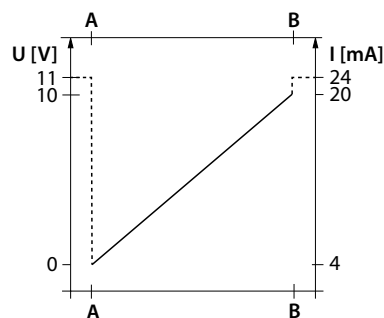


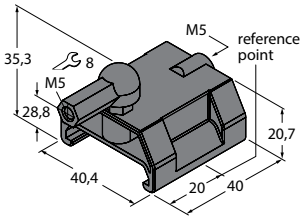
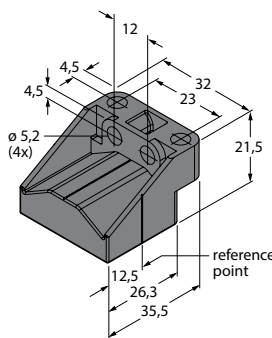
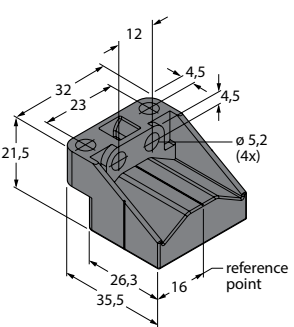
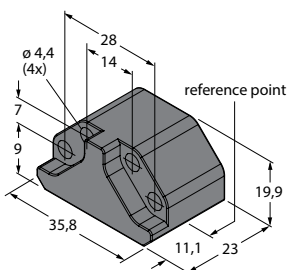
Fig. 2: Output characteristics – Device with 0...10 V voltage output and 4...20 mA current output

4.4.1 Output function

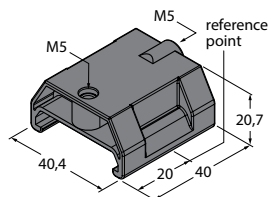
The measuring range of the sensor starts at 4 mA or 0 V and ends at 20 mA or 10 V. Current and voltage outputs can be used simultaneously. The simultaneous use of current and voltage output can be used for redundant signal evaluation. A display device can also receive a signal while the second signal is further processed by a PLC.

Besides the LEDs the sensor provides an additional control function. If the positioning element is outside of the detection range and the coupling between the sensor and the positioning element is thus broken, the analog output of the sensor is 24 mA or 11 V. This error can thus be evaluated directly via the higher-level controller.

4.5 Technical accessories

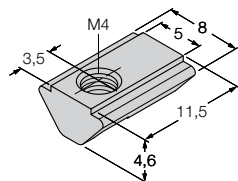
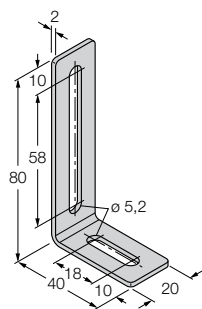
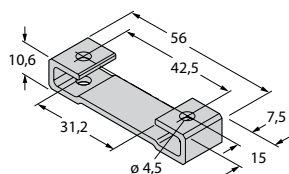
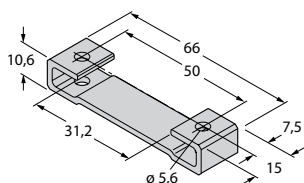
Dimension drawing Positioning element	Type	Ident No.	Description
	P1-Li-Q25L	6901041	Guided positioning element for Li-Q25L, is guided in the groove of the sensor
	P2-Li-Q25L	6901042	– Free positioning element for Li-Q25L – The nominal distance to the sensor is 1.5 mm. – Coupling with the linear position sensor possible at a distance of up to 5 mm or a lateral offset of up to 4 mm possible
	P3-Li-Q25L	6901044	– Free positioning element for Li-Q25L, operational at 90° offset – The nominal distance to the sensor is 1.5 mm. – Coupling with the linear position sensor possible at a distance up to 5 mm or a misalignment tolerance of up to 4 mm possible
	P6-Li-Q25L	6901069	– Free positioning element for Li-Q25L – The nominal distance to the sensor is 1.5 mm. – Coupling with the linear position sensor possible at a distance up to 5 mm or a misalignment tolerance of up to 4 mm possible

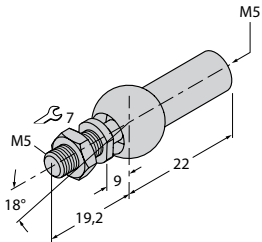
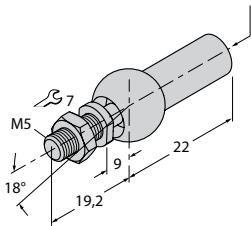
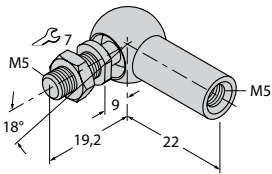
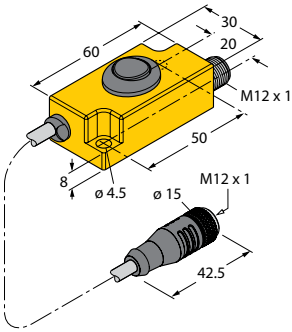
Dimension drawing	Type	Ident No.	Description
	P7-Li-Q25L	6901087	Guided positioning element for Li-Q25L without ball joint is guided in the groove of the sensor



Mounting accessories

	M1-Q25L	6901045	– Mounting foot for Q25L linear position sensor – Material: Aluminum – Recommended tightening torque: 3 Nm – 2 per bag
	M2-Q25L	6901046	– Mounting foot for Q25L linear position sensor – Material: Aluminum – Recommended tightening torque: 3 Nm – 2 per bag
	M4-Q25L	6901048	– Mounting bracket and MN-M4-Q25 sliding block for Q25L linear position sensor – Material: Stainless steel – 2 per bag
	MN-M4-Q25	6901025	– Sliding block with M4 thread for Q25L linear position sensor – Material: Galvanized steel – Recommended tightening torque: 2.2 Nm – 10 per bag



Dimension drawing	Type	Ident No.	Description
	AB-M5	6901057	Axial joint for guided positioning elements
	ABVA-M5	6901058	– Axial joint for guided positioning elements – Material: Stainless steel
	RBVA-M5	6901059	– Angle joint for guided positioning elements – Material: Stainless steel
Teach adapter			
	TX1-Q20L60	6967114	Teach adapter for easy adaption of the measuring range
Connection accessories			
	RKS4.5T-2/TXL	6626373	– Connection cable – M12 female connector – Straight – 5-pin – Shielded – Cable length: 2 m – Sheathing material: PUR, black – cULus approval; other cable lengths and types available, see www.turck.com

5 Mounting

Different mounting accessories are available for the various mounting possibilities of the linear position sensor in the plant.

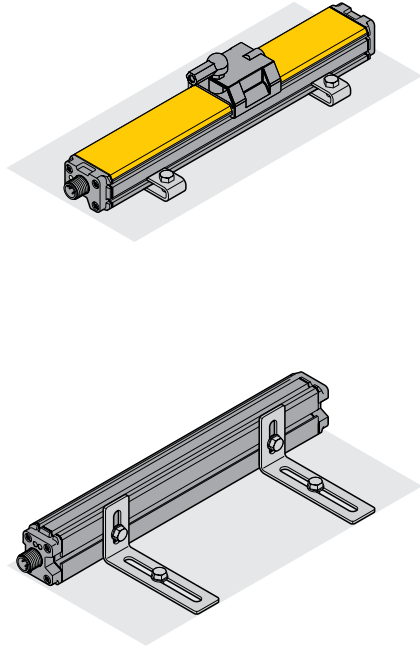


Fig. 3: Mounting with mounting foot or mounting bracket

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

6 Connection



CAUTION

Faulty connection

Damage to device

- Ensure that the connection is correct.



NOTE

Turck recommends the use of shielded connection cables.

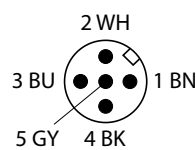
- During the electrical installation of the sensor, keep the entire system de-energized.
- Connect the female connector of the connection cable to the male connector of the device.
- If required, connect the TX1-Q20L60 teach adapter between the female connector of the connection cable and the plug connector of the device.
- Connect the sensor as per Figure 4.



NOTE

- Keep pin 5 potential-free during operation in order to prevent any accidental teach operations, or activate Teach Lock (see chapter 9.1.4/9.2.4).

Pin layout



Wiring diagram

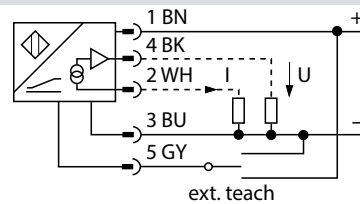


Fig. 4: Pin layout and wiring diagram

7 Commissioning

The device is operational automatically once the cables are connected and the power supply is switched on.

8 Operation

8.1 LEDs

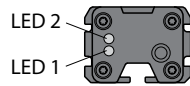


Fig. 5: LEDs 1 and 2

LED	Display	Meaning
LED 1	Green	Positioning element within measuring range
	Yellow	Positioning element in detection range with reduced signal quality (e.g. distance to sensor too large)
	Yellow flashing	Positioning element not in detection range
	Off	Positioning element outside of 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 measuring range (end point)
- Reset measuring range to factory settings: maximum measuring range
- Reset measuring range to inverted factory settings: maximum measuring range, inverted output characteristic
- Activate/deactivate Teach Lock

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



NOTE

- Keep pin 5 potential-free during operation in order to prevent any accidental teach operations, or activate Teach Lock (see chapter 9.1.4/9.2.4).

9.1 Setting by manual bridging

9.1.1 Manual bridging – Setting the measuring range

- Switch on the power supply of the device.
- Place the positioning element at the required 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.

- Switch on the device power supply.
- Place the positioning element at the required 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 Manual bridging – Resetting the sensor to factory settings

- Switch on the device power supply.
- Bridge pin 5 and pin 1 for 10 s.
- ➔ LED 2 flashes green for 2 s,
then shows a continuous green light for 8 s
and flashes green again (after 10 s).
- ➔ The sensor is reset to its factory settings.

9.1.3 Manual bridging – Resetting the sensor to inverted factory settings

- Switch on the device power supply.
- Bridge pin 5 and pin 3 for 10 s.
- ➔ LED 2 flashes green for 2 s,
then shows a continuous green light for 8 s
and flashes green again (after 10 s).
- ➔ The sensor is reset to its inverted factory settings.

9.1.4 Manual bridging – Activating the Teach Lock



NOTE

The Teach Lock function is deactivated by default.

- Switch on the device power supply.
- Bridge pin 5 and pin 1 for 30 s.
- ➔ LED 2 first flashes green for 2 s,
then shows a continuous green light for 8 s
and flashes green again (after 10 s)
and then flashes green (after 30 s) at a higher frequency.
- ➔ The Teach Lock function of the sensor is activated.

9.1.5 Manual bridging – Deactivating the Teach Lock

- Switch on the device power supply.
- Bridge pin 5 and pin 1 for 30 s.
- ➔ LED 2 shows a continuous green light for 30 s (Teach Lock is still activated)
and flashes green after 30 s at a higher frequency.
- ➔ The Teach Lock function of the sensor is deactivated.

9.2 Setting via TX1-Q20L60 teach adapter

9.2.1 Teach adapter – Setting the measuring range

- Switch on the device power supply.
- Place positioning element at the zero point of the measuring range.
- Hold down the pushbutton on the adapter to **Teach-Gnd** for 2 s.
- ➔ LED 2 flashes green for 2 s and then shows a continuous green light.
- ➔ The zero point of the measuring range is stored.

- Switch on the device power supply.
- Place the positioning element at the end point of the measuring range.
- Hold down the pushbutton on the adapter to **Teach-UB** for 2 s.
- ➔ LED 2 flashes green for 2 s and then shows a continuous green light.
- ➔ The end point of the measuring range is stored.

9.2.2 Teach adapter – Resetting the sensor to factory settings

- Switch on the device power supply.
- Hold down the pushbutton on the adapter to **Teach-UB** for 10 s.
- ➔ LED 2 flashes green for 2 s,
then shows a continuous green light for 8 s
and flashes green again (after 10 s).
- ➔ The sensor is reset to its factory settings.

9.2.3 Teach adapter – Resetting the sensor to inverted factory settings

- Switch on the device power supply.
- Hold down the pushbutton on the adapter to **Teach-Gnd** for 10 s.
- ➔ LED 2 flashes green for 2 s,
then shows a continuous green light for 8 s
and flashes green again (after 10 s).
- ➔ The sensor is reset to its inverted factory settings.

9.2.4 Teach adapter – Activating the Teach Lock



NOTE

The Teach Lock function is deactivated by default.

- Switch on the device power supply.
- Hold down the pushbutton on the adapter to **Teach-UB** for 30 s.
- ➔ LED 2 first flashes green for 2 s,
then shows a continuous green light for 8 s
and flashes green again (after 10 s)
and then flashes green (after 30 s) at a higher frequency.
- ➔ The Teach Lock function of the sensor is activated.

9.2.5 Teach adapter – Deactivating the Teach Lock

- Switch on the device power supply.
- Hold down the pushbutton on the adapter to **Teach-UB** for 30 s.
- ➔ LED 2 shows a continuous green light for 30 s (Teach Lock is still activated)
and flashes green after 30 s at a higher frequency.
- ➔ The Teach Lock function of the sensor is deactivated.

10 Troubleshooting

Malfunctions of the resonance coupling are indicated on LED 1.

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 regularly that the plug connections and cables are 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

If a device has to be returned, bear in mind that only devices with a decontamination declaration will be accepted. This is available for download at

<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 normal household garbage.

14 Technical Data

Measuring range	
Measuring range	100...1000 mm in 100 mm steps; 1250...2000 mm in 250 mm steps;
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 measuring length (see data sheet)
Temperature drift	≤ ± 0.003 %/K
Hysteresis	not applicable due to operating 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	(measuring 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 per axis; 3 axes
Shock resistance (EN 60068-2-27)	200 g, 4 ms 1/2 sine
Degree of protection	IP67
	IP66
MTTF	138 years to SN 29500 (Ed. 99) 40 °C
Packed quantity	1
Operating voltage indication	
LED: Green	
Measuring range indication	Multifunction LED: Green, yellow, yellow flashing

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60 representations worldwide!

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