TURCK

LI…-Q25L…-IOLX3-…
Linear Position Sensors
with IO-Link Interface

Instructions for Use

Contents

Contents

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.
ℹ	**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
- IO-Link parameters manual
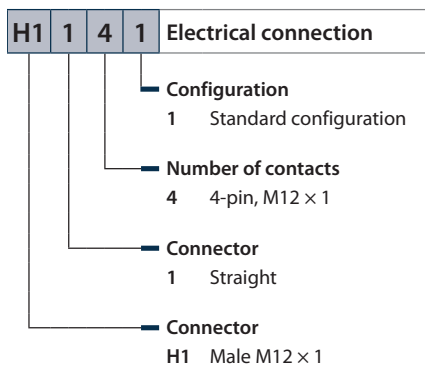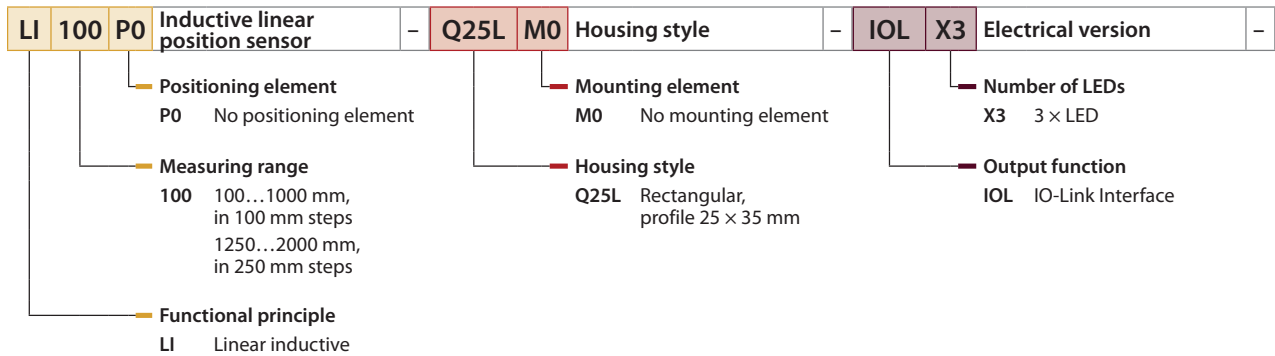- Commissioning manual IO-Link devices

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	P0	–	Q25L	M0	–	IOL	X3	–	H1	1	4	1

LI	100	P0	Inductive linear position sensor	–	Q25L	M0	Housing style	–	IOL	X3	Electrical version	–

Positioning element
P0   No positioning element

Measuring range
100   100…1000 mm, in 100 mm steps
         1250…2000 mm, in 250 mm steps

Functional principle
LI   Linear inductive

Mounting element
M0   No mounting element

Housing style
Q25L   Rectangular, profile 25 × 35 mm

Number of LEDs
X3   3 × LED

Output function
IOL   IO-Link Interface

H1	1	4	1	Electrical connection

Configuration
1   Standard configuration

Number of contacts
4   4-pin, M12 × 1

Connector
1   Straight

Connector
H1   Male M12 × 1

2.2 Scope of delivery

The scope of delivery includes:

- Linear position sensor
- Quick Start Guide

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: Variants are available in 100-mm increments for the 100…1000 mm range, or in 250-mm increments for the 1000…2000 mm range. The maximum measuring range of the sensor is determined by its length. However, the start point of the measuring range can be individually adjusted using a teach-in process. The gradient of the output curve stays the same even after the start point has been changed.

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.
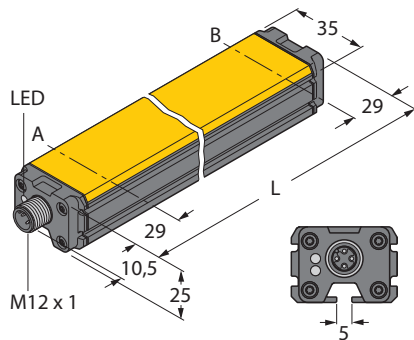
4.1 Device overview

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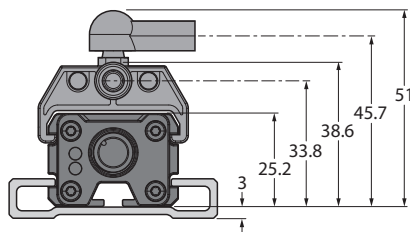

Fig. 2: Dimensions – device height

4.2   Properties and features

- Rectangular, aluminum/plastic
- Versatile mounting possibilities
- Measuring range indication via LED
- Immune to electromagnetic interference
- Short blind zones
- Process value in 32-bit IO-Link telegram
- 15…30 VDC
- Male connector, M12 × 1, 4-pin

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 output via the IO-Link interface.

4.4   Functions and operating modes

4.4.1   IO-Link mode

In order to operate in IO-Link mode, the device must be connected to an IO-Link master. When the port is configured in IO-Link mode, bidirectional IO-Link communication takes place between the IO-Link master and the device. To make this possible, the device is integrated via an IO-Link master at the control level. First the communication parameters are exchanged, and then the cyclic data exchange of process data (objects) starts.

4.4.2   Output curve

The gradient of the output characteristic also stays the same when the measuring range is changed. The end point of the measuring range stays the same.
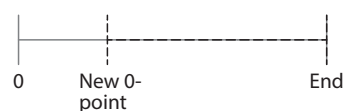

Fig. 3: Measuring range
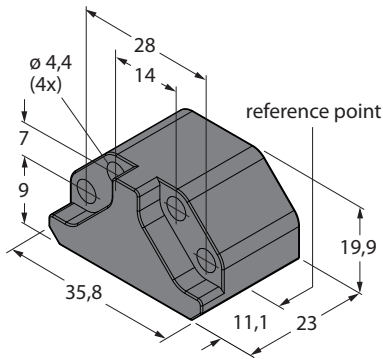
4.5 Technical accessories

4.5.1 Mounting accessories

Dimension drawing	Type	ID	Description
	P1-LI-Q25L	6901041	Guided positioning element for Li- Q25L linear position sensors, inserted in the groove of the sensor
	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 mis-alignment tolerance of up to 4 mm
	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

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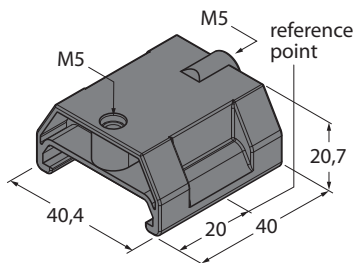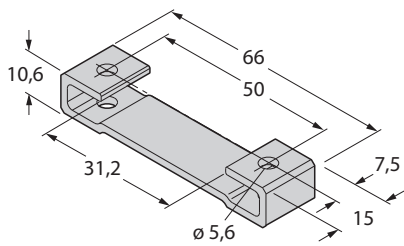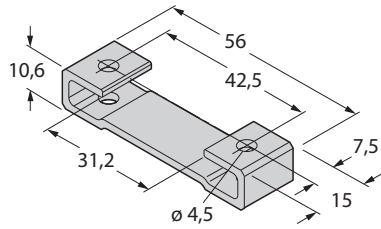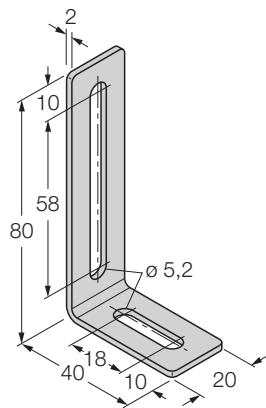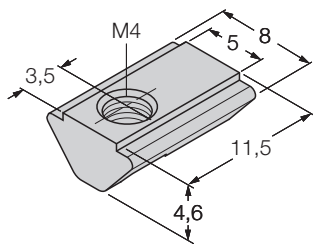| Dimension drawing	Type	ID	Description
	P6-LI-Q25L	6901069	Floating positioning element for LI-Q25L linear position sensors; the nominal distance to the sensor is 1.5 mm; pairing with the linear position sensor at a distance of up to 5 mm or a misalignment tolerance of up to 4 mm
	P7-LI-Q25L	6901087	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

Dimension drawing	Type	ID	Description
	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

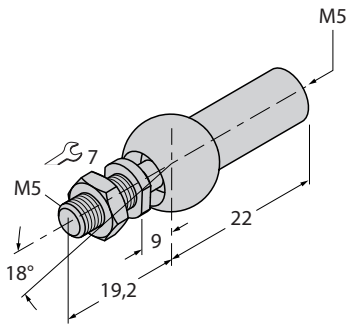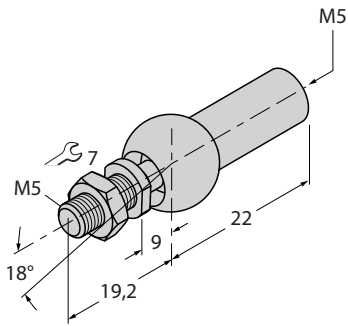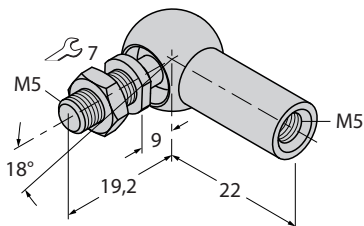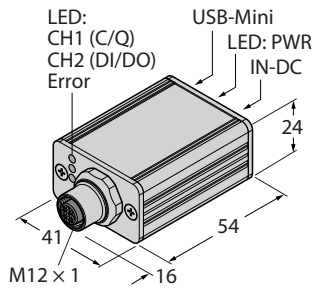| Dimension drawing	Type	ID	Description
	AB-M5	6901057	Axial joint for guided positioning element
	ABVA-M5	6901058	Axial joint for guided positioning elements; material: stainless steel
	RBVA-M5	6901059	Angle joint for guided positioning element; material: stainless steel

4.5.2 Connection accessories

Dimension drawing	Type	ID	Description
	TBEN-S2-4IOL	6814024	Compact multiprotocol I/O module for Ethernet, 4 IO-Link master channels, 4 universal digital PNP channels, 0.5 A, channel diagnostics
	TBEN-L4-8IOL	6814082	Compact multiprotocol I/O module for Ethernet, 8 IO-Link master channels, 4 universal digital PNP channels, 2 A, channel diagnostics, 4-pin 7/8″ male connector for the power supply
	TBEN-L5-8IOL	6814017	Compact multiprotocol I/O module for Ethernet, 8 IO-Link master channels, 4 universal digital PNP channels, 2 A, channel diagnostics, 5-pin 7/8″ male connector for the power supply
	TBEN-LL-8IOL	100003910	Compact multiprotocol I/O module for Ethernet, 8 IO-Link master channels, 4 universal digital PNP channels, 2 A, channel diagnostics, L-coded M12 male connector for the power supply
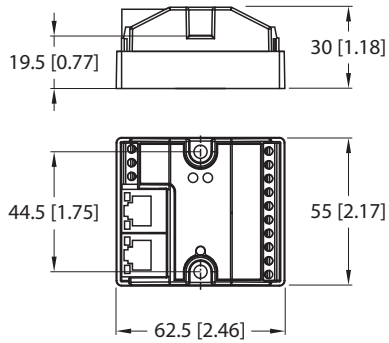
Dimension drawing	Type	ID	Description
	FEN20-4IOL	6814140	Compact IP20 multiprotocol Ethernet I/O station, 4 IO-Link master channels

19.5 [0.77] 30 [1.18]

44.5 [1.75] 55 [2.17]

62.5 [2.46]

| | USB-2-IOL-0002 | 6825482 | IO-Link adapter with integrated USB interface |

LED:
CH1 (C/Q)
CH2 (DI/DO)
Error

USB-Mini
LED: PWR
IN-DC

24
54
41
M12 × 1   16

| | RKC4T-2/TXL | 6625500 | Connection cable, M12 female, straight, 3-pin, cable length: 2 m, jacket material: PVC, black; cULus approval; other cable lengths and versions available, see www.turck.com |

M12 x 1 ø 15   14
11.5
42
L
5
50
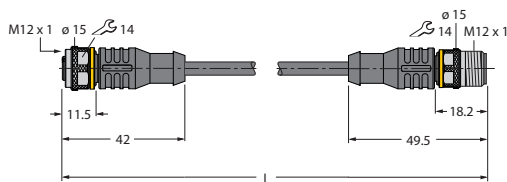
| | RKC4T-2-RSC4T/TXL | 6625604 | Connection cable, M12 female connector, straight, 3-pin, M12 male connector, straight, 3-pin, cable length: 2 m, jacket material: PUR, black; cULus approval; other cable lengths and versions available, see www.turck.com |

M12 x 1 ø 15   14   ø 15
11.5   14 M12 x 1
42   18.2
L   49.5

5   Installing

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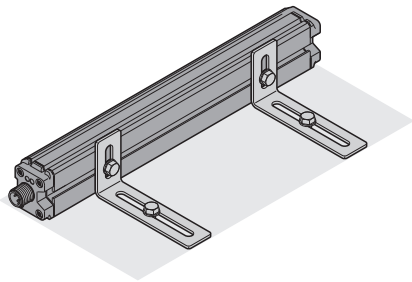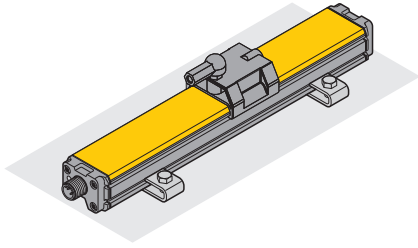
Fig. 4: Example — installation with mounting foot or mounting bracket

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.
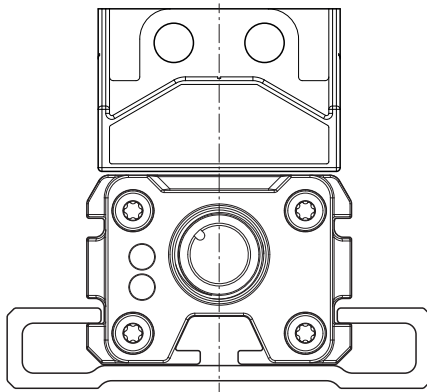
Fig. 5: Center the free positioning element

6 Connection

▶ Ensure that the entire plant is in a de-energized state during the electrical installation of the sensor.

▶ 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
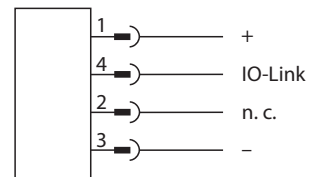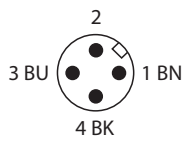
Fig. 6: M12 male connector — pin assignment   Fig. 7: M12 male connector — wiring diagram

7 Commissioning

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

8 Operation

8.1 LED indications
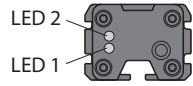
Fig. 8: LEDs 1 and 2

LED	Indication	Meaning
LED 1	Green	Positioning element in the measuring range
	Yellow	Positioning element in the measuring 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
	Green flashing	IO-Link communication active

9 Setting and parameterization

9.1 Settable functions and features

The following functions and properties can be set and used via the IO-Link interface:

- Set the start of the measuring range (zero point): The gradient of the output characteristic stays the same.
- Setting the process data
  - Normal mode: In Normal mode, 16-bit process data corresponds to 65535 increments. The measuring range is resolved in the increments. Three diagnostic bits are provided for the resonance coupling.
  - Compatibility mode: The measuring range is resolved in 1 µm increments. 32 bits are provided.

9.2 Setting via IO-Link

The device can be parameterized within the technical specifications (see data sheet) via the IO-Link communication interface – both offline, e.g. with the configuration tool as well as also online via the controller. An overview of the different functions and properties that can be set and used for IO-Link mode can be found in the chapter "Setting" and in the IO-Link parameter manual of the device. Detailed instructions on the parameterization of devices via the IO-Link interface are provided in the IO-Link commissioning manual.

All the parameters can changed in IO-Link mode via the controller during commissioning as well as during operation.

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

Device-specific technical data

| Technical data | | | | |
Type	ID	Measuring range	Linearity deviation (also when subject to shock and vibration)	Dimensions
LI100P0-Q25LM0-IOLX3-H1141	100012822	100 mm	≤ 0.12 % of full scale	158 × 35 × 25 mm
LI200P0-Q25LM0-IOLX3-H1141	100012823	200 mm	≤ 0.1 % of full scale	258 × 35 × 25 mm
LI300P0-Q25LM0-IOLX3-H1141	100012825	300 mm	≤ 0.07 % of full scale	358 × 35 × 25 mm
LI400P0-Q25LM0-IOLX3-H1141	100012827	400 mm	≤ 0.05 % of full scale	458 × 35 × 25 mm
LI500P0-Q25LM0-IOLX3-H1141	100012828	500 mm	≤ 0.05 % of full scale	558 × 35 × 25 mm
LI600P0-Q25LM0-IOLX3-H1141	100012829	600 mm	≤ 0.04% of full scale	658 × 35 × 25 mm
LI700P0-Q25LM0-IOLX3-H1141	100012830	700 mm	≤ 0.04% of full scale	758 × 35 × 25 mm
LI800P0-Q25LM0-IOLX3-H1141	100012831	800 mm	≤ 0.035 % of full scale	858 × 35 × 25 mm
LI900P0-Q25LM0-IOLX3-H1141	100012832	900 mm	≤ 0.035 % of full scale	958 × 35 × 25 mm
LI1000P0-Q25LM0-IOLX3-H1141	100012833	1000 mm	≤ 0.035 % of full scale	1058 × 35 × 25 mm
LI1250P0-Q25LM0-IOLX3-H1141	100012834	1250 mm	≤ 0.05 % of full scale	1308 × 35 × 25 mm
LI1750P0-Q25LM0-IOLX3-H1141	100012836	1750 mm	≤ 0.05 % of full scale	1808 × 35 × 25 mm
LI2000P0-Q25LM0-IOLX3-H1141	100012837	2000 mm	≤ 0.05 % of full scale	2058 × 35 × 25 mm

General technical data

Technical data	
Measuring principle	Inductive
Nominal distance	1.5 mm
Blind zone a	29 mm
Blind zone b	29 mm
Repetition accuracy	≤ 0.02 % of full scale
Temperature drift	≤ ± 0.0001 %/K
Hysteresis	Omitted as a matter of principle
Ambient temperature	-25…+70 °C
Operating voltage	15…30 VDC
Residual ripple	≤ 10 % U_{ss}
Insulation test voltage	≤ 0.5 kV
Short-circuit protection	Yes
Wire breakage/reverse polarity protection	Yes (voltage supply)
Communication protocol	IO-Link
Diagnostics	Positioning element not within detection range via diagnostic bit
Sampling rate	5000 Hz
Current consumption	< 50 mA
IO-Link specification	Specified according to version 1.1
Parameterization	FDT/DTM
Communication mode	COM 3 (230.4 kBaud)
Process data width	32 bit
Minimum cycle time	1 ms
Function of pin 4	IO-Link
Design	Profile, Q25L
Housing material	Aluminum/plastic, PA6-GF30, anodized
Material of active face	Plastic, PA6-GF30
Electrical connection	Male connector, M12 × 1
Vibration resistance	55 Hz (1 mm)
Vibration resistance (EN 60068-2-6)	20 g; 1.25 h/axis; 3 axes
Shock resistance	30 g (11 ms)
Shock resistance (EN 60068-2-27)	200 g; 4 ms ½ sine
Type of protection	IP67
MTTF	138 years acc. to SN 29500 (Ed. 99) 20 °C

15   Turck subsidiaries — contact information

Germany	Hans Turck GmbH & Co. KG Witzlebenstraße 7, 45472 Mülheim an der Ruhr www.turck.de
Australia	Turck Australia Pty Ltd Building 4, 19-25 Duerdin Street, Notting Hill, 3168 Victoria www.turck.com.au
Belgium	TURCK MULTIPROX Lion d'Orweg 12, B-9300 Aalst www.multiprox.be
Brazil	Turck do Brasil Automação Ltda. Rua Anjo Custódio Nr. 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 Tianjin 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
India	TURCK India Automation Pvt. Ltd. 401-403 Aurum Avenue, Survey. No 109 /4, Near Cummins Complex, Baner-Balewadi Link Rd., 411045 Pune - Maharashtra www.turck.co.in
Italy	TURCK BANNER S.R.L. Via San Domenico 5, IT-20008 Bareggio (MI) www.turckbanner.it
Japan	TURCK Japan Corporation Syuuhou Bldg. 6F, 2-13-12, Kanda-Sudacho, Chiyoda-ku, 101-0041 Tokyo www.turck.jp
Canada	Turck Canada Inc. 140 Duffield Drive, CDN-Markham, Ontario L6G 1B5 www.turck.ca
Korea	Turck Korea Co, Ltd. B-509 Gwangmyeong Technopark, 60 Haan-ro, Gwangmyeong-si, 14322 Gyeonggi-Do www.turck.kr
Malaysia	Turck Banner Malaysia Sdn Bhd Unit A-23A-08, Tower A, Pinnacle Petaling Jaya, Jalan Utara C, 46200 Petaling Jaya Selangor www.turckbanner.my

Mexico	Turck Comercial, S. de RL de CV Blvd. Campestre No. 100, Parque Industrial SERVER, C.P. 25350 Arteaga, Coahuila www.turck.com.mx
Netherlands	Turck B. V. Ruiterlaan 7, NL-8019 BN Zwolle www.turck.nl
Austria	Turck GmbH Graumanngasse 7/A5-1, A-1150 Wien www.turck.at
Poland	TURCK sp.z.o.o. Wroclawska 115, PL-45-836 Opole www.turck.pl
Romania	Turck Automation Romania SRL Str. Siriului nr. 6-8, Sector 1, RO-014354 Bucuresti www.turck.ro
Russian Federation	TURCK RUS OOO 2-nd Pryadilnaya Street, 1, 105037 Moscow www.turck.ru
Sweden	Turck Sweden Office Fabriksstråket 9, 433 76 Jonsered www.turck.se
Singapore	TURCK BANNER Singapore Pte. Ltd. 25 International Business Park, #04-75/77 (West Wing) German Centre, 609916 Singapore www.turckbanner.sg
South Africa	Turck Banner (Pty) Ltd Boeing Road East, Bedfordview, ZA-2007 Johannesburg www.turckbanner.co.za
Czech Republic	TURCK s.r.o. Na Brne 2065, CZ-500 06 Hradec Králové www.turck.cz
Turkey	Turck Otomasyon Ticaret Limited Sirketi Inönü mah. Kayisdagi c., Yesil Konak Evleri No: 178, A Blok D:4, 34755 Kadiköy/ Istanbul www.turck.com.tr
Hungary	TURCK Hungary kft. Árpád fejedelem útja 26-28., Óbuda Gate, 2. em., H-1023 Budapest www.turck.hu
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