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TURCK

LTE Embedded Linear Position Sensors with Analog Output

Operating Instructions

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1 About these Instructions

These operating instructions 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 personal injury, or damage to property or the device. Retain these 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 personnel and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of Symbols

The following symbols are used in these instructions:



DANGER

DANGER indicates an imminently hazardous situation with a high risk of death or serious injury if it is not prevented.



WARNING

WARNING indicates a potentially hazardous situation with a moderate risk of death or severe injury if not prevented.



CAUTION

CAUTION indicates a situation that may result in damage to property if it is not prevented.



NOTE

NOTE indicates tips, recommendations and important information. The notes make work easier, contain information on specific action steps and help prevent unnecessary work due to incorrect processes.



CALL TO ACTION

This symbol identifies steps that the user has to perform.



ACTION RESULT

This symbol identifies relevant results of actions and action sequences.

1.3 Additional Documents

In addition to this document, the following material can be found on the Internet at

www.turck.com:

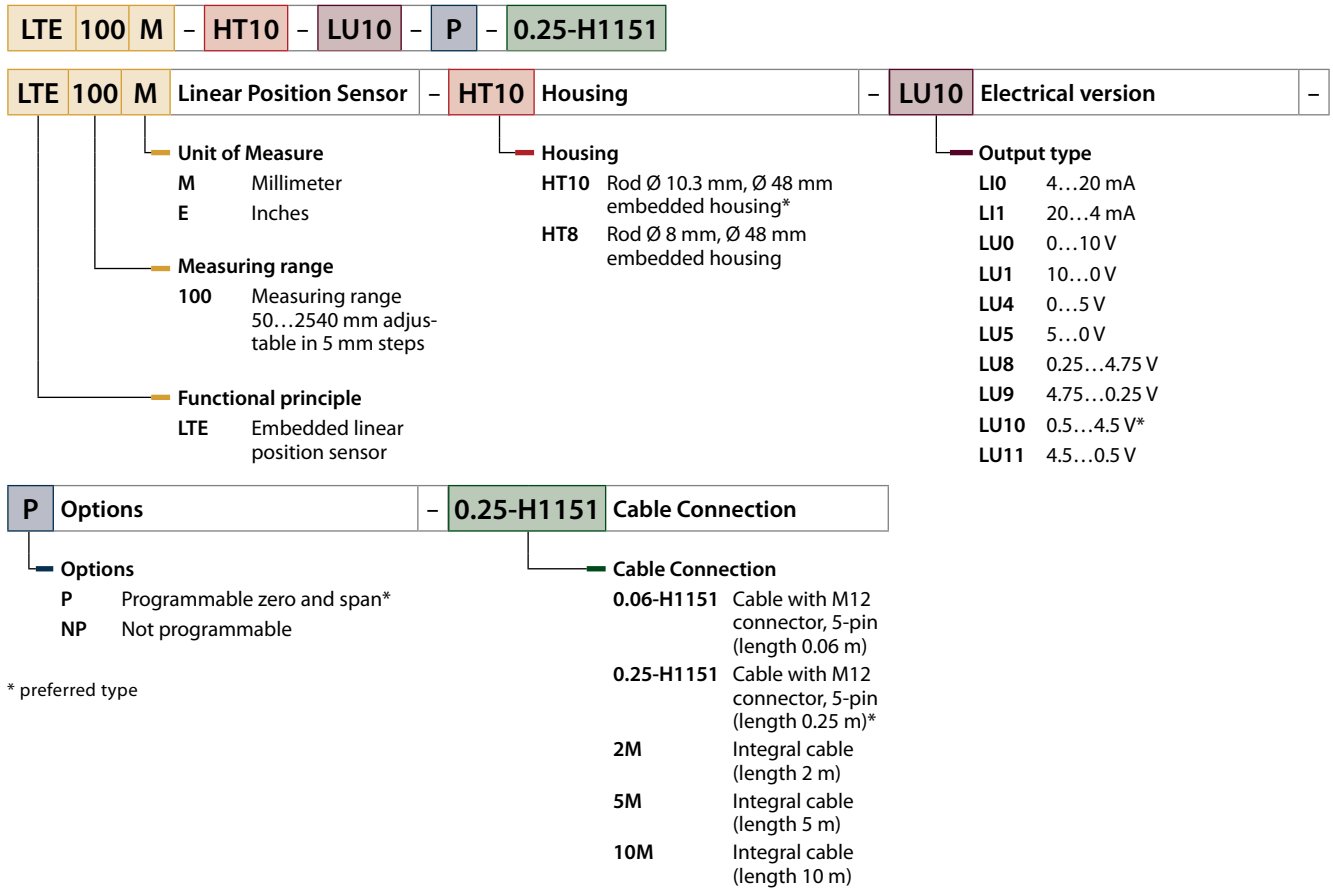
- Data sheet

1.4 Feedback on these Instructions

We are committed to always keeping these instructions 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



2.2 Scope of Delivery

Included in the scope of delivery:

- Linear position sensor (without positioning element)
- Quick start guide

2.3 Legal Requirements

The device is subject to the following EU directives:

- 2014/30/EU (electromagnetic compatibility)
- 2011/65/EU (RoHS 2)

2.4 Manufacturer and Service

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats. You can access the product database at the following address: <http://www.turck.de/products>

Should you have any further questions, please contact the sales and service team in Germany on the following telephone numbers:

Sales: +49 208 4952-380

Technology: +49 208 4952-390

Outside Germany, please contact your Turck representative.

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

3 For Your Safety

The product is designed to the latest standards. However, residual risks still exist. Observe the following warnings and safety information to prevent personal injury or damage to property. Turck accepts no liability for damage caused by failure to observe these warning and safety instructions.

3.1 Intended Use

These devices are designed solely for use in industrial areas and in mobile machines.

The LTE Embedded magnetostrictive linear position sensors are used for contactless and wear-free linear position detection. The devices are suitable for use in hydraulic cylinders and forked clevis-mounted cylinders in mobile machines. The measuring range is adjustable depending on the type of sensor.

The devices must be used only as described in these instructions. Any other use is considered improper use and Turck accepts no liability for any resulting damage.

3.2 General Safety Instructions

- The devices are not safety components and may not be used for personal or property protection.
- The device must be mounted, installed, operated, parameterized and maintained only by trained and qualified personnel.
- The device only meets the EMC requirements for industrial areas and is not suitable for use in residential areas.

4 Product Description

The LTE Embedded linear position sensors with analog output are available with a current or voltage output. A cable with M12 connector or an open-ended connection cable is available for connection, depending on the device type. All devices feature a rod design with IP68 protection. The devices operate without contact, which requires the use of a positioning element approved by Turck (see Accessories). The measuring range is adjustable depending on the type of sensor (see type key).

The devices operate on an absolute basis; voltage failures do not require renewed zero point adjustment or recalibration. All position values are determined as absolute values; reference runs after a voltage failure are unnecessary.

4.1 Device Overview

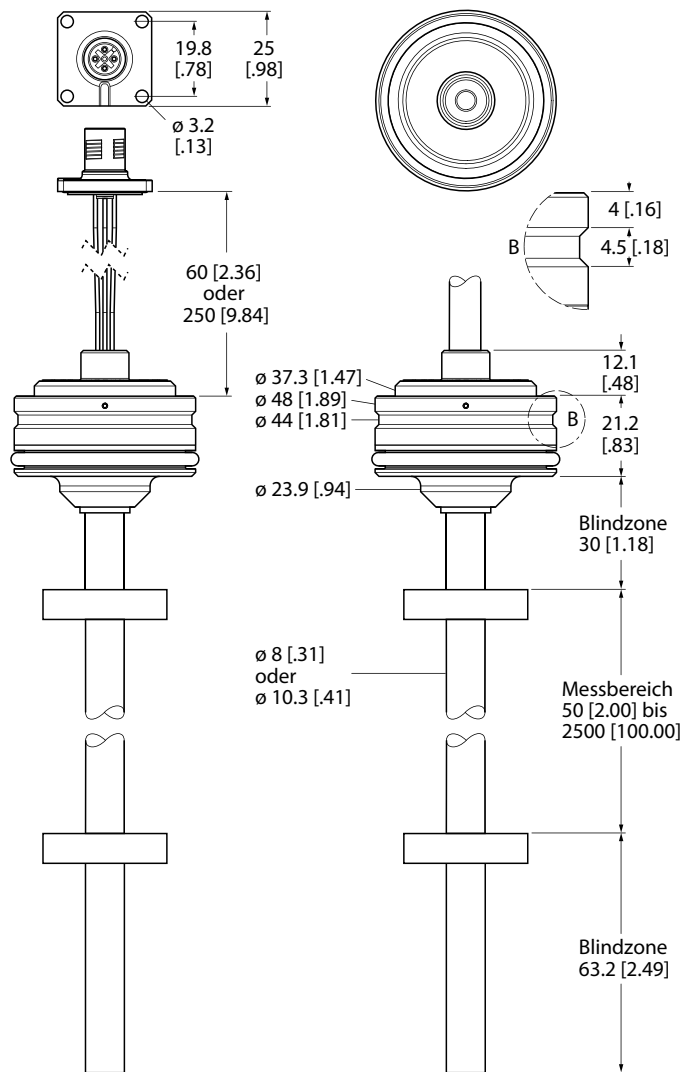


Fig. 1: Device dimensions of LTE-... with blind zones in mm [in]

4.2 Properties and Characteristics

- Analog output
- Adjustable measuring range with adjustment protection
- Automatic signal control
- 8...30 VDC supply voltage
- Low power consumption
- High shock and vibration resistance
- Protection class IP68
- Connection via M12 connector or open-ended connection cable depending on device design

4.3 Functional Principle

Turck LTE sensors utilize the magnetostrictive principle. A "waveguide" is located in the measuring probe of the linear position sensor. If a current signal generated at the waveguide encounters the externally applied magnetic field of the positioning element, mechanical feedback is produced in the waveguide. This feedback is evaluated in the sensor head and output as position information.

4.4 Functions and Operating Modes

The devices feature a current or voltage output. The device output provides a current or voltage signal proportional to the position of the positioning element (see output characteristics).

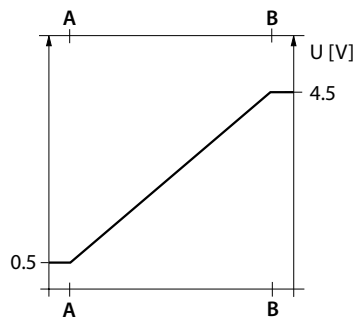


Fig. 2: Output characteristics – devices with 0.5...4.5 V voltage output

4.4.1 Automatic Signal Control

The device is automatically adjusted to the signal strength of the positioning element as soon as the sensor is supplied with power. The automatic signal control fully compensates for any tolerances.

4.4.2 Current Output (LI Only)

LTE...LI... devices feature a current output, which outputs a current signal in line with the position of the positioning element (e.g. 4...20 mA, depending on design). The measuring range is adjustable depending on the type of sensor.

4.4.3 Voltage Output (LU Only)

LTE...LU... devices feature a voltage output, which outputs a voltage signal in line with the position of the positioning element (e.g. 0.5...4.5 V, depending on design). The measuring range is adjustable depending on the type of sensor.

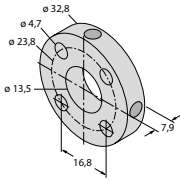
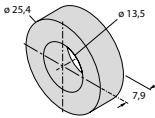
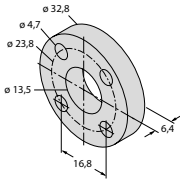
4.4.4 Measuring Ranges

On request, the devices can be ordered with a measuring length of 50...2540 mm (in 5-mm increments). Not all measuring lengths and versions are available as standard.

Measuring range	configured
50...500 mm	yes, in 50-mm increments
500...1000 mm	yes, in 100-mm increments
1000...1500 mm	yes, in 250-mm increments
2000 mm	yes

4.5 Technical Accessories

The following accessories are not included in the scope of delivery:

Dimension drawing	Type	Ident-No.	Description
Positioning element 	STM-AL-R10	6900409	Standard 4-hole positioning element, aluminum, suitable for installation in hydraulic cylinders
	CM-R10	6900416	Standard positioning element, suitable for installation in hydraulic cylinders
Spacer 	STS-R10	6900411	Standard spacer produced from non-ferritic material for separating the positioning element from the ferritic base of the hydraulic piston rod, suitable for installation in hydraulic cylinders

5 Mounting

The device can be mounted in hydraulic cylinders and forked clevis-mounted cylinders in mobile machines. The cylinder must be prepared prior to the sensor being mounted.

5.1 Preparing the Cylinder

- ▶ Create a bore of 11 mm, or 8 mm for a small tube diameter, in the cylinder piston rod.
- ▶ Prepare the cylinder head as shown below. For sensor dimensions, see fig. 1.

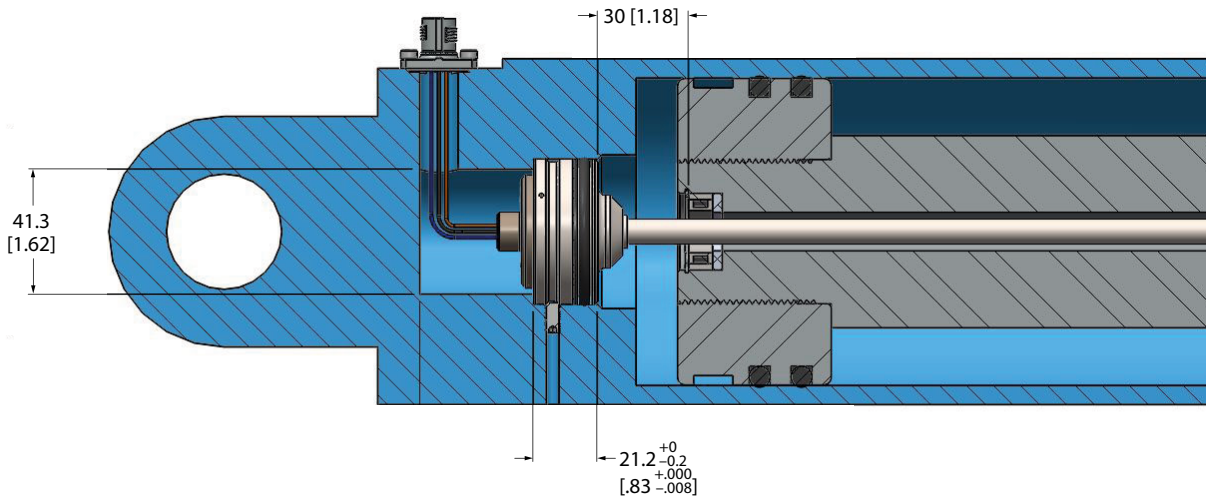


Fig. 3: Prepare the cylinder – Dimensions in mm [in]

- ▶ Turck recommends that the sensor is also secured with a M5 × 10 lock pin with flat point (DIN 913). Secure the lock pin above the screw channel.

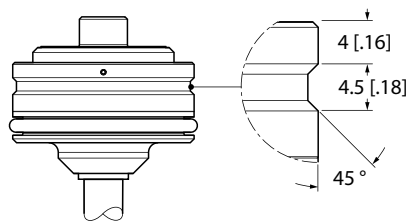


Fig. 4: Screw channel on the sensor head

5.2 Mounting the Sensor

- Feed the connection cable through the bores in the cylinder head (1).
- Insert the sensor head into the cylinder head (2).
- If necessary, secure the sensor head to the screw channel with a locking pin through the bores in the cylinder head (3). The maximum tightening torque is 0.5 Nm.
- Insert the contact carrier into the M12 flange until it clicks into place (4).
- Attach the M12 clip to the cylinder (5).

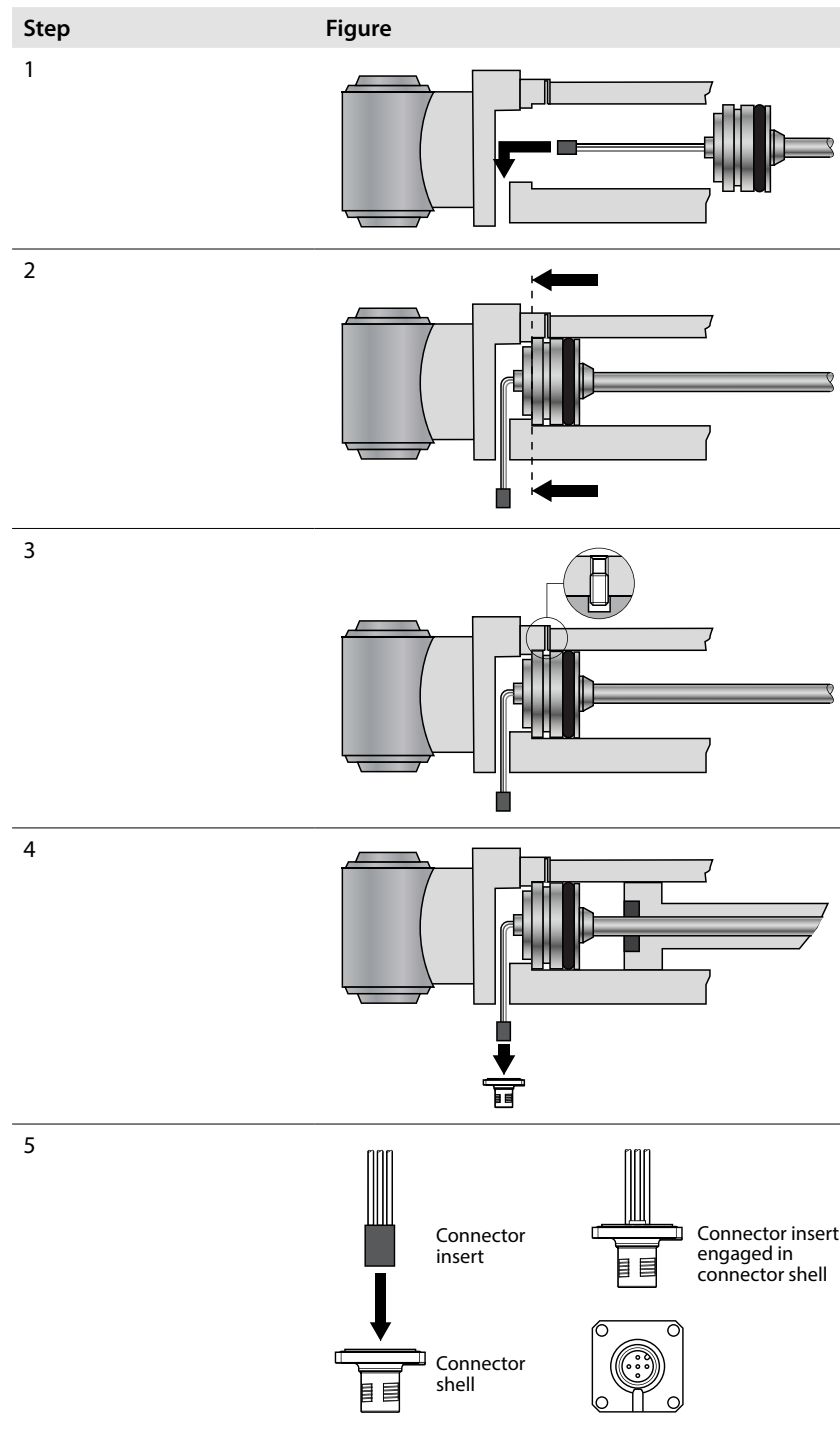


Fig. 5: Mounting the Sensor

5.3 Mounting the Positioning Element

- Mount the spacer in the piston.
- Mount the positioning element.

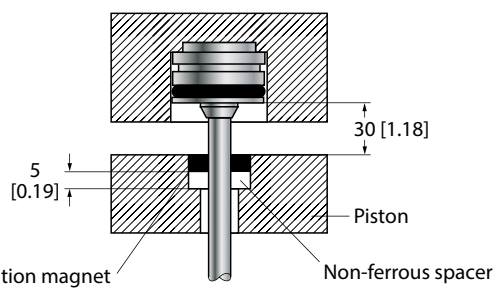


Fig. 6: Mounting the positioning element

6 Connection



NOTE

Turck recommends the use of shielded connector cables.

- Connect the coupling of the connection cable to the connector of the device.
- If the higher-level input is a differential (symmetrical) input, connect the sensor to the higher level as per Fig. 7.
- If the higher-level input is a common ground (asymmetrical) input, connect the sensor to the higher level as per Fig. 8.



NOTE

➤ Keep pin 2 potential-free during operation in order to prevent any accidental teach-in operations.

6.1 Wiring Diagram



NOTE

The following figures detail the usual wire colors. In exceptional cases, this color allocation may differ.

Pin	Pin assignment	Wiring diagram
Pin 1 (BN)	U_B	
Pin 2 (WH)	Teach	
Pin 3 (BU)	GND	
Pin 4 (BK)	I/U	
Pin 5 (GY)	Position common	

Fig. 7: Wiring diagram – higher-level input is differential (symmetrical)

Pin	Pin assignment	Wiring diagram
Pin 1 (BN)	U_B	
Pin 2 (WH)	Teach	
Pin 3 (BU)	GND	
Pin 4 (BK)	I/U	
Pin 5 (GY)	Position common	

Fig. 8: Wiring diagram – higher-level input is common ground (asymmetrical)

7 Commissioning

Once the cables and the supply voltage are connected, the device automatically goes into operation. To ensure the correct calibration of the automatic signal control, the positioning element must be located in the active measuring range of the sensor when the supply voltage is connected.

8 Operation

8.1 Diagnostics

The LTE with analog output features a diagnostic feedback function. The analog range makes it possible to locate the position of the positioning element in the set measuring range. If the positioning element is outside of the set measuring range, the analog output supplies the following values:

Design	Value	Meaning
0...10 V	10.2 V	Positioning element is located in the blind zone or no positioning element detected
10...0 V	-0.1 V or 10.1 V	Positioning element outside the set measuring range
0...5 V	5.2 V	Positioning element is located in the blind zone or no positioning element detected
5...0 V	-0.1 V or 5.1 V	Positioning element outside the set measuring range
0.25...4.75 V		
0.5...4.5 V		
4...20 mA	3.8 mA	Positioning element is located in the blind zone or no positioning element detected
20...4 mA	20.1 mA or 3.9 mA	Positioning element outside the set measuring range

9 Setting

The programmable devices feature an adjustable analog output. The measuring range can be set by manual bridging or with the RP-Q21 teach adapter. Zero point and end point of the measuring range can be set in succession or separately.



NOTE

- Keep pin 2 potential-free during operation in order to prevent any accidental teach-in operations.

9.1 Setting via Manual Bridging

- Supply device with voltage.
- Place positioning element at the zero point of the measuring range.
- Bridge pin 2 and pin 3 for 4 s.
- Interrupt bridge between pin 2 and pin 3 for 1 s.
- Sensor starts teach mode.
- Bridge pin 2 and pin 3 within 5 s.
- Zero point of measuring range is stored.

- Place positioning element at end point of the measuring range.
- Bridge pin 2 and pin 3 for 4 s.
- Sensor starts teach mode.
- Interrupt bridge between pin 2 and pin 3 for 1 s.
- Bridge pin 1 and pin 2 within 5 s.
- End point of measuring range is stored.

9.2 Setting via Teach Adapter RP-Q21

- Connect the sensor to the teach adapter.
- Place positioning element at the zero point of the measuring range.
- Press the Zero button of the teach adapter for 4 s.
- Release the Zero button of the teach adapter for 1 s.
- Sensor starts teach mode.
- Press the Zero button of the teach adapter again within 5 s.
- Zero point of measuring range is stored.

- Place positioning element at end point of the measuring range.
- Press the Zero button of the teach adapter for 4 s.
- Release the Zero button of the teach adapter for 1 s.
- Sensor starts teach mode.
- Press the Span button of the teach adapter again within 5 s.
- End point of measuring range is stored.

10 Eliminating Interference

If the device does not function as expected, first check whether there is any ambient interference. If there is no ambient interference, check the connections of the device for faults. If there are no errors, 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; if necessary clean dry.

12 Repair

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

12.1 Returning Devices

If a device has to be returned, please be aware that only devices with a decontamination declaration will be accepted. This is available for download at <http://www.turck.de/en/retoure-service-6079.php> and must be filled in completely and affixed to the outside of the packaging such that it is secure and cannot be impaired by adverse weather.

13 Disposal



Devices must be properly disposed of and must not be included in general household waste.

14 Technical Data

Measuring range specifications	
Measuring range	50...2540 mm in 5-mm increments
Linearity	≤ 0.04 % full scale
Hysteresis	≤ 0.026 mm
Repeatability	≤ 0.01 % full scale
Temperature drift	≤ 10 ppm/°C
Resolution	16 bit
Blind zones	
Connector end	30 mm from front face
End	63.2 mm
Construction	
Housing	Metal, stainless steel, AISI 303, 1.4305
Material, active face	Metal, stainless steel, AISI 316/316L, 1.4404
Pressure resistance (permanent)	10.3 mm – 340 bar
	8 mm – 300 bar
Pressure resistance (temporary)	10.3 mm – 680 bar
	8 mm – 400 bar
Protection class	IP68, EN 60529
Temperature	
Operating temperature, electronics	-40 °C ... +85 °C
Operating temperature, rod	-40 °C ... +105 °C
Shock and vibrations	
Shock resistance	100 g (11 ms), IEC 60068-2-2-7
Vibration resistance	30 g, 10 Hz...2 kHz, IEC 60068-2-6
Electrical data	
Current consumption	≤ 100 mA/15 VDC
Operating voltage	8...30 VDC
Reverse polarity protection	yes (voltage supply)
Output load	
Current	min. 2 kΩ
Voltage	max. 500 Ω
Connections	
Open-ended connection cable	PUR, shielded

14.1 Update Time

Measuring length	Update Time
50 mm	0.5 ms
300 mm	1 ms
750 mm	2 ms
1250 mm	3 ms
2500 mm	4 ms

14.2 Applied Standards

Requirement	Applied standard
Electromagnetic compatibility (EMC) - part 6-4: Generic standards - Emission standard for industrial environments	EN 61000-6-4
Electromagnetic compatibility (EMC) - part 6-2: Generic standards - Immunity standard for industrial environments	EN 61000-6-2
Agricultural and forestry machinery - Electromagnetic compatibility - Test methods and acceptance criteria	ISO 14982
Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy - Part 5: Stripline	ISO 11452-5
Road vehicles - Electrical disturbances from conduction and coupling	ISO 7637-1/2/3
Earth-moving machinery	ISO 13766
Industrial trucks	EN 12895
Railway applications	EN 50121-3-2

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