TURCK

Your Global Automation Partner

BI...R-W20-IOL6X-H1141 Inductive ring sensor with IO-Link interface

Instructions for Use

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1 About these instructions

These instructions describe the setup, functions and use of the product and help you to operate the product according to its intended purpose. Read these instructions carefully before 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 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

The following symbols are used in these instructions:

	**DANGER** DANGER indicates a hazardous situation with a high level of risk, which, if not avoided, will result in death or serious injury.
	**WARNING** WARNING indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in death or serious injury.
	**CAUTION** CAUTION indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in moderate or minor injury.
	**NOTICE** CAUTION indicates a situation which, if not avoided, may cause damage to property.
	**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
- Commissioning manual IO-Link devices
- EU Declaration of Conformity (current version)

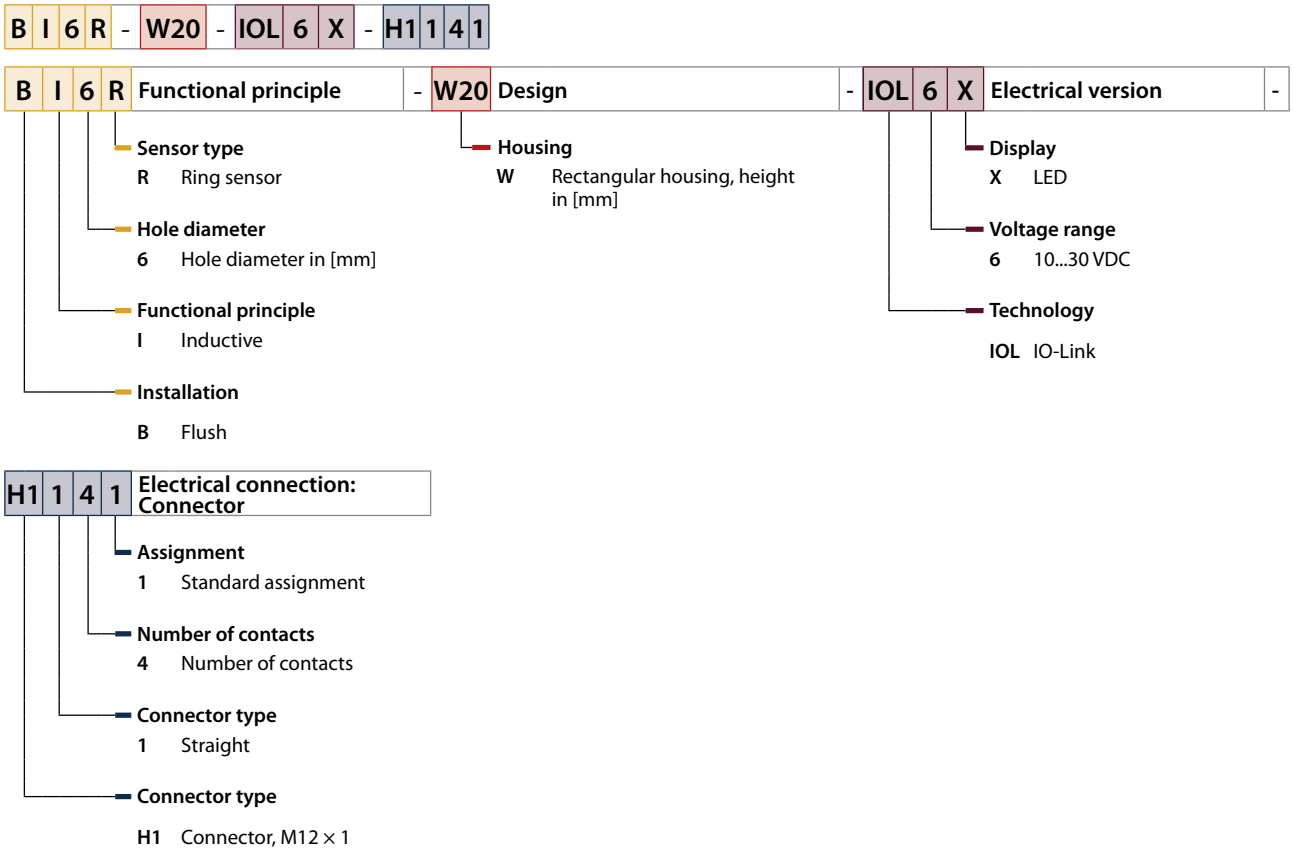
1.4 Feedback about these instructions

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

These instructions apply to the following devices:



2.2 Scope of delivery

The scope of delivery includes:

- BI…R-W20-IOL6X-H1141 ring sensor

2.3 TURCK service

TURCK supports you in your projects — from the initial analysis right through to the commissioning of your application. At www.turck.com, you will find software tools for programming, configuring or commissioning, as well as data sheets and CAD files in many export formats.

For the contact details of our branches worldwide, please see page [▶ 27].

3 For your safety

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

3.1 Intended use

The inductive ring sensors in the BI…R-W20-IOL6X-H1141 product series detect metallic objects contactlessly and wear-free.

The devices can be operated and configured with IO-Link masters conforming to specification 1.1 via an IO-Link interface. During operation, process and diagnostic data can be exchanged between the sensors and the higher-level control system via IO-Link.

The ring sensors operate statically or dynamically.

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 Obvious misuse

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

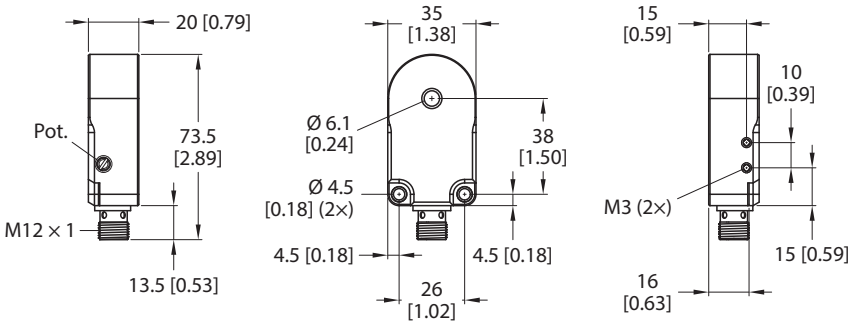
3.3 General safety instructions

- The device meets the EMC requirements for the industrial areas. When used in residential areas, take measures to prevent radio frequency interference.
- The device must only be fitted, installed, operated, parameterized and maintained by trained and qualified personnel.
- Only use the device in compliance with the applicable national and international regulations, standards and laws.
- Only operate the device within the limits stated in the technical specifications.

4 Product description

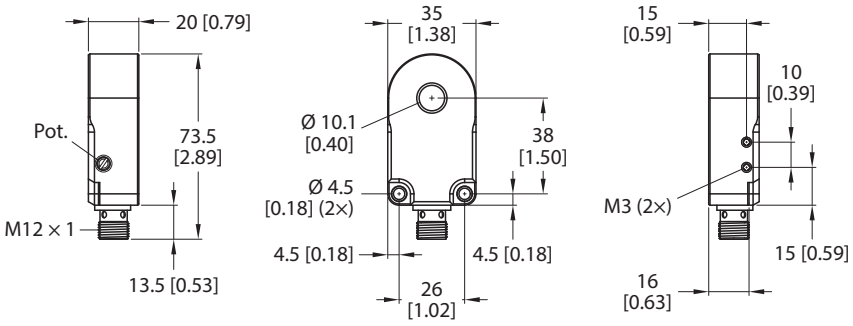
The devices are housed in a rectangular plastic housing with a height of 20 mm. The sensor versions with different ring sizes detect objects made of metal that are fed into automated production by hoses or pipes. The devices are connected to the sensor cable via an M12 connector. The sensors can be configured via a teach adapter and an IO-Link interface. A digital potentiometer (DIGIPOT) is also available for setting the device sensitivity.

4.1 Device overview



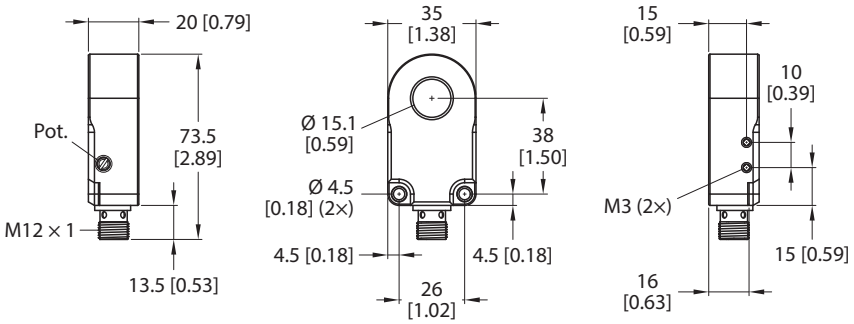
mm [Inch]

Fig. 1: Dimensions BI6R-W20-IOL6X-H1141



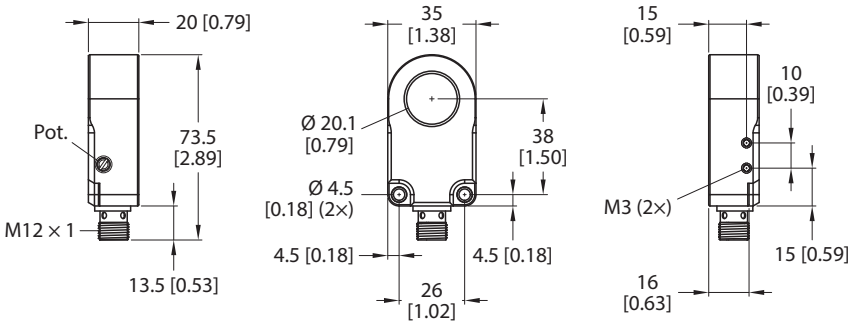
mm [Inch]

Fig. 2: Dimensions BI10R-W20-IOL6X-H1141



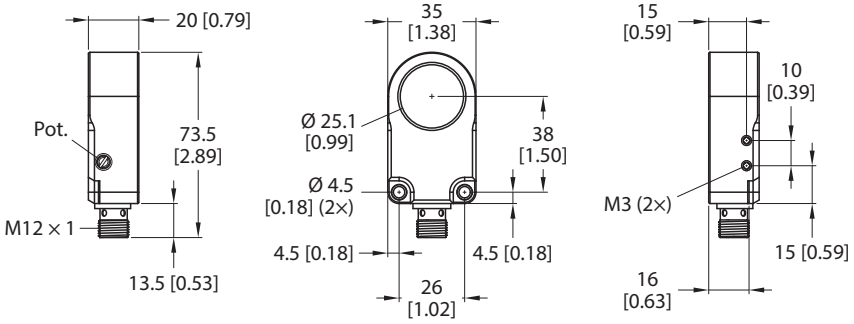
mm [Inch]

Fig. 3: Dimensions BI15R-W20-IOL6X-H1141



mm [Inch]

Fig. 4: Dimensions BI20R-W20-IOL6X-H1141



mm [Inch]

Fig. 5: Dimensions BI25R-W20-IOL6X-H1141

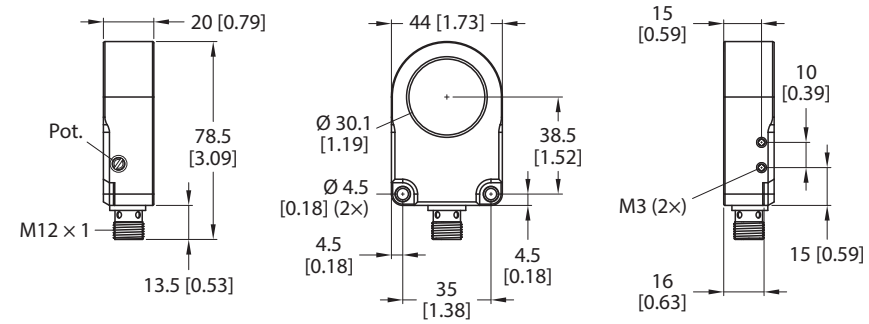


Fig. 6: Dimensions BI30R-W20-IOL6X-H1141

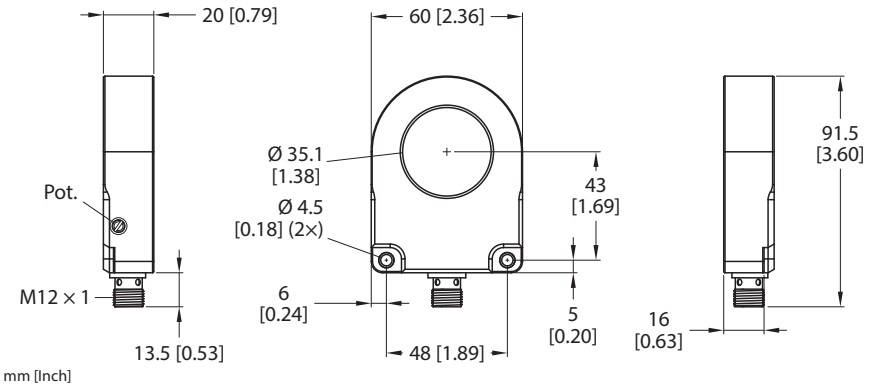


Fig. 7: Dimensions BI35R-W20-IOL6X-H1141

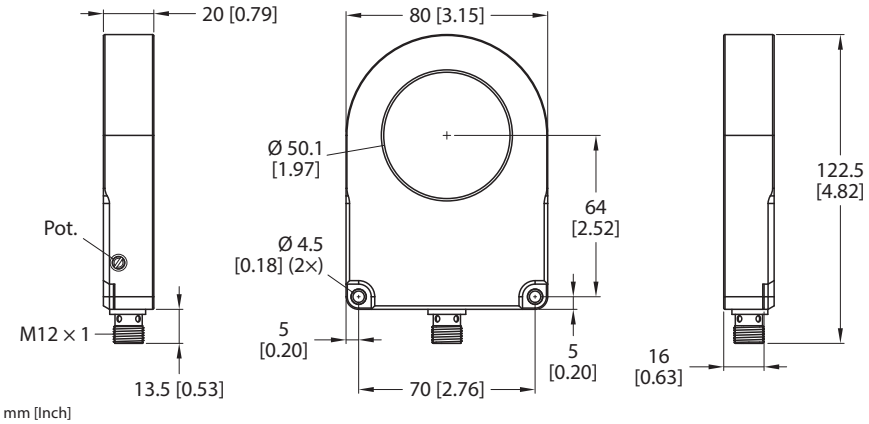


Fig. 8: Dimensions BI50R-W20-IOL6X-H1141

4.1.1 Indicators

The device has a single-color LED, which is visible via four display points.

4.2 Properties and features

- Rectangular design
- Protection class IP67
- DC 4-wire, 10…30 VDC
- M12 × 1 connector
- Configurable via digital potentiometer on the device
- Communication via TAS, IO-Link V1.1 or standard I/O
- Static or dynamic operating principle
- Device can be configured as an NC or NO contact
- Configurable switching points (IO-Link or teach input, pin 2)
- Diagnostic data via IO-Link

4.3 Operating principle

Inductive sensors detect metal objects contactless and wear-free by creating an electromagnetic field that interacts with the detected object.

Static operating principle

The switching output of the sensor remains active as long as an object is within the detection range. The static operating principle is suitable for e.g. jam control in feed processes, part detection, and part counting.

Dynamic operating principle

The sensor switches for a defined period of time when a metallic object moves. The high resolution reliably detects very small and fast objects. (Standard pulse length 20 ms). The dynamic operating principle compensates for impurities in the feed hose using the switching principle.

4.4 Functions and operating modes

4.4.1 Output functions — switching output

The switching logic can be inverted via IO-Link. The following examples apply to the **HIGH** (0 → 1) switching logic.

Single point mode

In single point mode, the switching behavior is defined via a SP1 limit value and a hysteresis. The output changes its switching state at limit value SP1. The hysteresis can via IO-Link be set and must be within the detection range.

If an object is moved away from the sensor, the switching output is active as long as the object is located between the start of the detection range and the limit value SP1 plus the set hysteresis (SP1+Hyst). If the object passes the limit value (SP1+Hyst), the switching output becomes inactive.

If an object is moved toward the sensor, the switching output is inactive as long as the object is located between the end of the detection range and the limit value SP1. If the object passes the limit value SP1, the switching output becomes active.

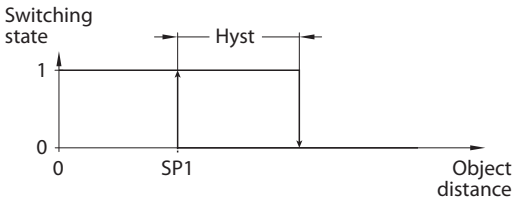


Fig. 9: Single point mode

Two point mode

In two point mode, the switching behavior is defined via a switch-off point SP2 and a switch-on point SP1. This mode can also be used as a freely adjustable hysteresis.

If an object is moved away from the sensor, the switching output is active for as long as the object is located between the start of the detection range and the switch-off point SP2. If the object passes the switch-off point SP2, the switching output becomes inactive.

If an object is moved toward the sensor, the switching output is inactive as long as the object is located between the end of the detection range and the switch-on point SP1. If the object passes the switch-on point SP1, the switching output becomes active.

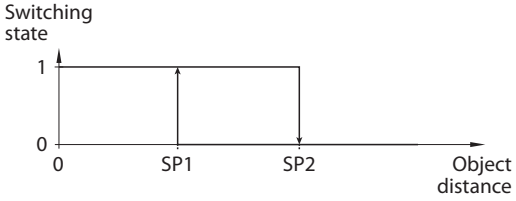


Fig. 10: Two point mode

Window mode

In window mode, an upper and a lower window limit are set for the switching output. A hysteresis can be set for the window limits SP1 and SP2. The switching window must be within the detection range. The hysteresis can be set via IO-Link and must be within the detection range.

If the process value increases, the switching output is inactive as long as the process value is between the start of the detection range and the window limit SP2. The switching output remains active until the process value increases above the window limit SP1 plus the hysteresis (SP1+Hyst). If the process value increases above (SP1+Hyst), the switching output becomes inactive again.

If the process value decreases, the switching output is inactive as long as the process value is between the end of the detection range and the window limit SP1. The switching output remains active until the process value decreases below the window limit SP2 minus the hysteresis (SP2-Hyst). If the process value decreases below (SP2-Hyst), the switching output becomes inactive again.

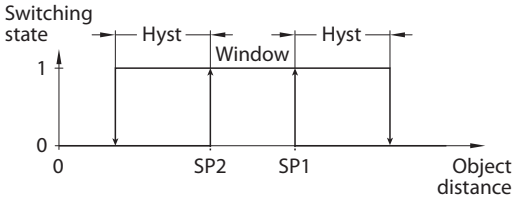


Fig. 11: Window mode

4.4.2 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.

4.4.3 SIO mode (standard I/O mode)

In standard I/O mode no IO-Link communication takes place between the device and the master. The device only transfers the switching state of its binary outputs and can also be run via a fieldbus device or controller with digital PNP or NPN inputs. An IO-Link master is not required for operation.

The device parameters can be set via IO-Link and then operated at the digital inputs with the appropriate settings in SIO mode. Not all functions and properties of the device can be used in SIO mode.

5 Installing

The sensors may be mounted in any position. The maximum tightening torque when installing the sensor corresponds to 0.5 Nm for M3 mounting screws and 1.4 Nm for M4 mounting screws.

The sensors can be used directly next to each other without any distance in between the sensors (D = 0 mm).

The minimum distance W between two sensors can be reduced by setting different operating frequencies via IO-Link. In configuration AA, both sensors work with the same operating frequency; in configuration AB, both work with different operating frequencies.

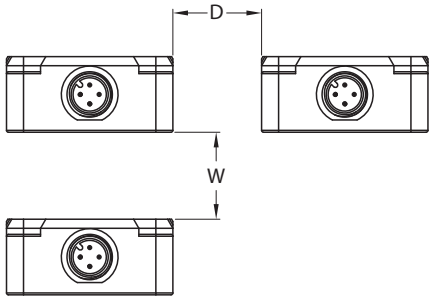


Fig. 12: Minimum spacing when mounting multiple BI…R-W20-… devices

The following table shows the minimum distance at the operating frequencies of the sensors in configurations AA and AB:

Distance	**W**			
Operating principle	**Static**		**Dynamic**	
Operating frequency	**AA**	**AB**	**AA**	**AB**
BI6R-…	0 mm	0 mm	0 mm	0 mm
BI10R-…	0 mm	0 mm	0 mm	0 mm
BI15R-…	3 mm	0 mm	0 mm	0 mm
BI20R-…	5 mm	3 mm	3 mm	0 mm
BI25R-…	10 mm	4 mm	7 mm	3 mm
BI30R-…	13 mm	8 mm	12 mm	5 mm
BI35R-…	18 mm	10 mm	14 mm	8 mm
BI50R-…	50 mm	40 mm	40 mm	15 mm

5.1 Minimum distance between the sensor and metal

Dynamic operation

The sensor can be mounted directly onto metal surfaces.

Static operation

The following minimum distances must be maintained, depending on the sensor type:

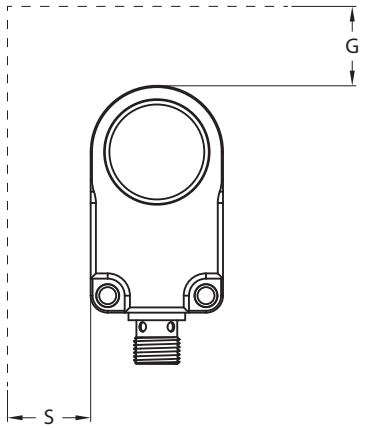


Fig. 13: Minimum distance from sensor to metal — BI…R-W20-…

Distance	S	G
BI6R-…	0 mm	0 mm
BI10R-…	0 mm	0 mm
BI15R-…	2 mm	0 mm
BI20R-…	4 mm	2 mm
BI25R-…	5 mm	2 mm
BI30R-…	6 mm	4 mm
BI35R-…	7 mm	9 mm
BI50R-…	22 mm	17 mm

5.2 Installing on metal

For direct mounting on a metal plate, the through-holes must have bores with the following minimum diameters:

Operating principle	Static	Dynamic
	Diameter	
BI6R-…	6 mm	6 mm
BI10R-…	10 mm	10 mm
BI15R-…	18 mm	15 mm
BI20R-…	27 mm	20 mm
BI25R-…	34 mm	25 mm
BI30R-…	40 mm	30 mm
BI35R-…	50 mm	35 mm
BI50R-…	70 mm	50 mm

6 Connection

- Connect the female connector to the male connector of the sensor as shown in "Wiring diagram."
- Connect the connection cable to the power source and/or signal processors.

6.1 Wiring diagram

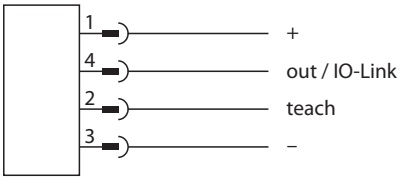


Fig. 14: Wiring diagram

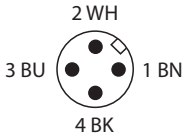


Fig. 15: Pin assignment

7 Commissioning

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

8 Operation

8.1 LED displays

In normal operation the LEDs have the following display functions:

LEDs		Meaning
Off	NO contact	No object in detection range
	NC contact	Object within detection range
On	NO contact	Object within detection range
	NC contact	No object in detection range

The LED display functions in teach-in mode are described in the chapter "Setting" [▶ 17].

9 Setting

9.1 Settable functions and features

Parameter	Meaning
Device description	Firmware version, application-specific identifier, function identifier and location identifier can be described in tags.
Locator	Wink function via LOCATOR START and LOCATOR STOP
Parameter (write) access lock	Access to the device parameters is locked or unlocked.
Reset application	The function resets application-specific parameters. Communication is not interrupted and the sensor is switched to a predefined operating state. Identification parameters and non-resettable diagnostic values are not affected by this command.
Restore factory settings	The function restores the device to the factory setting. The device is restarted after the restoration. Communication is interrupted.
Diagnostics — resettable diagnostic data	■ Display of the number of switching operations for SSC1.1, SSC1.2, the min. and max. measured value ■ **Reset information**
Device operation	The device can be operated **locally** or **remotely**.
Operating principle	The operating principle can be set to **static** or **dynamic**.
Sensor mode	The function can be used to select application-specific requirements: ■ **Standard**: balanced for general-purpose applications ■ **Precision**: for maximum repeatability ■ **Speed**: for applications with high part frequency
Operating frequency	The operating frequency can be changed from **A** to the offset frequency **B**.
Pin 2 status	■ **Inactive (locked)**: Pin 2 is connected to ground ■ **Active (unlocked)**: Pin 2 is connected to the supply voltage ■ **Open (unlocked)**: Pin 2 is not connected In IO-Link mode, the function displays an **inactive** status, local teach-in is not possible.
Pin 2 polarity	The function can be used to change the polarity of the teach-in input signal from **NO contact** (default) to **NC contact**. ■ **NO contact**: Teach-in via + (BN) ■ **NC contact**: Teach-in via - (BU)
Pin 2 setting	This function can be used to set whether teach-in via pin 2 is **activated** (default) or **deactivated**.
Switching cycles: SSC… counter; min. and max. measured value	Indicates how many switching cycles have been executed at output … as well as the min. and max. measured value. The system command **RESET INFORMATION** resets the saved data.
Switching signal channel 1.1 (local)	When the device is set to local operation, the switching output behavior can be set using the following parameters: ■ Switching points ■ Switching logic (default: NO contact) ■ Hysteresis (0…20 %): – Default for internal diameter 6…30 mm: 5 % – Default for internal diameter 35…50 mm: 3 % ■ Switch-off delay ■ Switch-on delay

Parameter	Meaning
Switching signal channel 1.1 and 1.2 (remote)	When the device is set to operate remotely, the switching output behavior can be set in accordance with the Smart Sensor Profile using the following parameters: ■ SP1 ■ SP2 ■ Switching logic (NO contact, NC contact) ■ Mode: – Deactivated – Single value (single point mode) – Two values (two point mode) – Window mode ■ Hysteresis (0…20 %): – Default for internal diameter 6…30 mm: 5 % – Default for internal diameter 35…50 mm: 3 % ■ Switch-off delay ■ Switch-on delay
Static teach-in for single point mode and two point mode (remote)	✓ Device operation is set to **remote**. ▶ Set static teach-in. ■ Select SSC1.1 or SSC1.2 ■ System command for teaching in SP1 ■ System command for teaching in SP2 **Teach Result: State** indicates whether the current teach-in process was successful. After the teach-in, the **teach-in quality** is displayed.
Dynamic teach-in for two point mode and window mode (remote)	✓ Device operation is set to **remote**. ▶ Set remote teach-in. All objects that pass the sensor are measured. The highest and lowest value of the object is determined. The arithmetic average value is derived from the two values. The LEDs flash at a frequency of 10 Hz during the operation. The teach-in process continues via **TEACH SP… START** until teach-in is stopped via **TEACH SP…STOP**. ■ Select SSC1.1 or SSC1.2 ■ System command to start the teach-in process for SP1 ■ System command to end the teach-in process for SP1 ■ System command to start the teach-in process for SP2 ■ System command to end the teach-in process for SP2 ■ System command to cancel the teach-in process **Teach Result: State** indicates whether the current teach-in process was successful. After the teach-in, the **teach-in quality** is displayed.

9.2 Setting via digital potentiometer

NOTE
The factory setting for the digital potentiometer is 800.

The sensor sensitivity can be adjusted via the digital potentiometer. The switching point is adapted to the distance of an object. In the factory setting, the device is set to **local** operation and the sensor can be used without IO-Link parameterization. The potentiometer can only be used when the device is set to local operation.

Operation as NO contact:

- ▶ Place the object in the opening in the ring.
- ▶ Turn the digital potentiometer until the sensor switches.
- ⇨ The LED lights up yellow when the object is detected.
- ▶ Turn the potentiometer clockwise by one to two degrees.
- ⇨ The sensor switches reliably as soon as the object falls through the sensor.

After configuring with a metallic object using the digital potentiometer, the device exhibits the following switching behavior:

- Metallic object in detection range: The switching output is active.
- No object in detection range: The switching output is inactive.

If the potentiometer is set to its maximum setting, the sensor can switch permanently even without an object. This hypersensitivity often occurs in fluctuating climatic conditions and causes, for example, a drift in high humidity. Correct the potentiometer setting:

- ▶ Turn the potentiometer counterclockwise until the LED is no longer constantly lit up yellow.

The set switching point can be checked and corrected via the IO-Link interface (permissible value range: 490…4000).

9.3 Adjustable functions via teach-in with Pin 2

The following functions can be set via teach-in (bridging):

Changing between dynamic and static operating principle

- ▶ Bridge pin 2 (WH) to pin 1 (BN) for 2…4 s.
- ⇨ The LED lights up as soon as pin 2 is bridged.
- ⇨ The LED goes out after 2 s.
- ▶ Stop bridging between 2…4 s.
- ⇨ The LED flashes 2 × to confirm that the functional principle has been switched.

Switching from NO contact to NC contact

- ✓ The LED is off because the device is set as an NO contact.
- ▶ Bridge pin 2 (WH) to pin 1 (BN) for 4 s.
- ⇨ The LED lights up as soon as pin 2 is bridged.
- ⇨ The LED goes out after 2 s.
- ⇨ The LED lights up again after 4 s.
- ▶ Stop bridging after 4 s.
- ⇨ The LED flashes 2 × to confirm.
- ⇨ The LED is continuously illuminated: The device is set as an NC contact.
- ⇨ If an object is within the detection range, the LED goes out.

Switching from NC contact to NO contact

- ✓ The LED lights up continuously because the device is set as an NC contact.
- ▶ Bridge pin 2 (WH) to pin 1 (BN) for 4 s.
- ⇨ The LED goes out as soon as pin 2 is bridged.
- ⇨ The LED lights up after 2 s.
- ⇨ The LED goes out again after 4 s.
- ▶ Stop bridging after 4 s.
- ⇨ The LED flashes 2 × to confirm.
- ⇨ The LED is off: The device is set as an NO contact.
- ⇨ If an object is within the detection range, the LED lights up.

9.4 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, and online via the controller. Detailed instructions on the parameterization of devices via the IO-Link interface are provided in the IO-Link commissioning manual.

All parameters can be changed in IO-Link mode via the controller, both during commissioning and during operation. In SIO mode, the device operates in accordance with the most recent setting configured in IO-Link mode.

9.4.1 Static teach-in

In static teach-in, the teach-in process is carried out without an object. A switching point (SP1) can be taught in during static teach-in.
The device sets the switching point = teach-in point + 200. The value 200 acts as a sufficient functional reserve.

Setting a switching point:

✓ There is no object in the opening in the ring.
▶ Under **Single Value Teach — Teach Select**, select the channel (SSC1.1 or SSC1.2).
▶ Click the **Teach SP1** system command.
⇨ Switching point 1 is set in the sensor. The value is displayed via the **SSC1.1/SSC1.2 Param SP1** parameter.
⇨ The parameter **Teach Result: State** shows the result of the teach-in process.
⇨ The **teach-in quality** parameter evaluates the teach-in result.
▶ Manually adjust the switching point via IO-Link if objects are not reliably detected.

9.4.2 Dynamic teach-in

During dynamic teach-in, switching points are taught in from multiple metal objects falling in succession. The teach-in operation can be set during the process.

▶ Select the channel (SSC1.1 or SSC1.2) under **Dynamic Teach — Teach Select**.
▶ Select the **Teach SP1 START** parameter in order to start the teach-in operation.
⇨ LED flashes quickly, the teach-in process starts.
▶ Move objects at least 10 × through the opening in the ring.
▶ Select the **Teach SP1 STOP** parameter if all objects were detected multiple times.
⇨ The LED display flashes 2 × if the teach-in process is successful.
⇨ The parameter **SSC 1.1 (or SSC 1.2) Param: SP1** is set in the sensor.
▶ Select the channel (SSC1.1 or SSC1.2) under **Dynamic Teach — Teach Select**.
▶ Select the **Teach SP2 START** parameter in order to start the teach-in operation.
⇨ LED flashes quickly, the teach-in process starts.
▶ Move objects at least 10 × through the opening in the ring.
▶ Select the **Teach SP2 STOP** parameter if all objects were detected multiple times.
⇨ The LED display flashes 2 × if the teach-in process is successful.
⇨ The parameter **SSC 1.1 (or SSC 1.2) Param: SP2** is set in the sensor.

10 Troubleshooting

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 no faults are identified, this indicates that the device is faulty. 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 is not intended for repair 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/return-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 properly and do not belong in the domestic waste.

14 Technical data

Technical data		BI6R…	BI10R…	BI15R…	BI20R…	BI25R…	BI30R…	BI35R…	BI50R…
Resolution of steel ball (high functional reliability)	Dynamic	0.7 mm	0.9 mm	1.2 mm	1.7 mm	1.8 mm	2.5 mm	3.5 mm	5 mm
	Static	1.3 mm	2 mm	2.5 mm	3.5 mm	4 mm	5 mm	6.5 mm	9 mm
Resolution of steel ball (smallest object size)	Dynamic	0.5 mm	0.6 mm	0.8 mm	1 mm	1.2 mm	1.8 mm	2 mm	2.5 mm
	Static	1 mm	1.5 mm	2 mm	2.5 mm	3 mm	4 mm	4.5 mm	6 mm
Internal diameter		6.1 mm	10 mm	15 mm	20 mm	25 mm	30 mm	35 mm	50 mm
Sensitivity adjustment		IO-Link, potentiometer							
Max. part speed		35 m/s							
Min. part speed		0.1 m/s (dynamic)							
Startup delay		300 ms							
Ambient temperature		-25…+70 °C							
Permissible relative humidity		< 95 % (+25 °C) or < 90 % (+40 °C), non-condensing (increased humidity affects the rated sensor resolution)							
Electrical data									
Operating voltage U_B		10…30 VDC							
DC rated operating current I_e		≤ 100 mA							
No-load current		≤ 30 mA							
Insulation test voltage		≤ 0.5 kV							
Short-circuit protection		Yes							
Voltage drop at I_e		≤ 2.0 V							
Reverse polarity protection		Yes/complete							
Electrical connection		Connector, M12 × 1, 4-pin, A-coded							
Switching output		Push-pull/PNP/NPN, 100 mA, NO/NC, switchable							
Hysteresis		0…20 % (default 5 %)						0…20 % (default 3 %)	
Communication protocol		IO-Link							
IO-Link									
IO-Link specification		V1.1.4, Smart Sensor Profile 4.1.1							
Transmission rate		COM 2 (38.4 kBaud)							
Process data width		32 bit							
Measured value information		16 bit							
Resolution		12 bit							

Technical data	BI6R…	BI10R…	BI15R…	BI20R…	BI25R…	BI30R…	BI35R…	BI50R…
Mechanical data								
Housing material	Plastic PA							
Ring material	Plastic, POM							
Max. tightening torque of housing nut	M3 max. 0.5 Nm, M4 max. 1.4 Nm							
Vibration resistance	55 Hz (1 mm)							
Shock resistance	30 g (11 ms)							
Type of protection	IP67							
Protection class	III, operation at safety extra-low voltage							
MTTF	658 years acc. to SN 29500 (Ed. 99) 40 °C							

15 TURCK branches — contact data

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Belgium	Turck Multiprox N. V. 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
Canada	Turck Canada Inc. 140 Duffield Drive, CDN-Markham, Ontario L6G 1B5 www.turck.ca
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