TURCK

Your Global Automation Partner

B…N…-QR20-2L…
Inclinometers with Two Analog Outputs

Instructions for Use

Contents

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
- Declarations of conformity (current version)

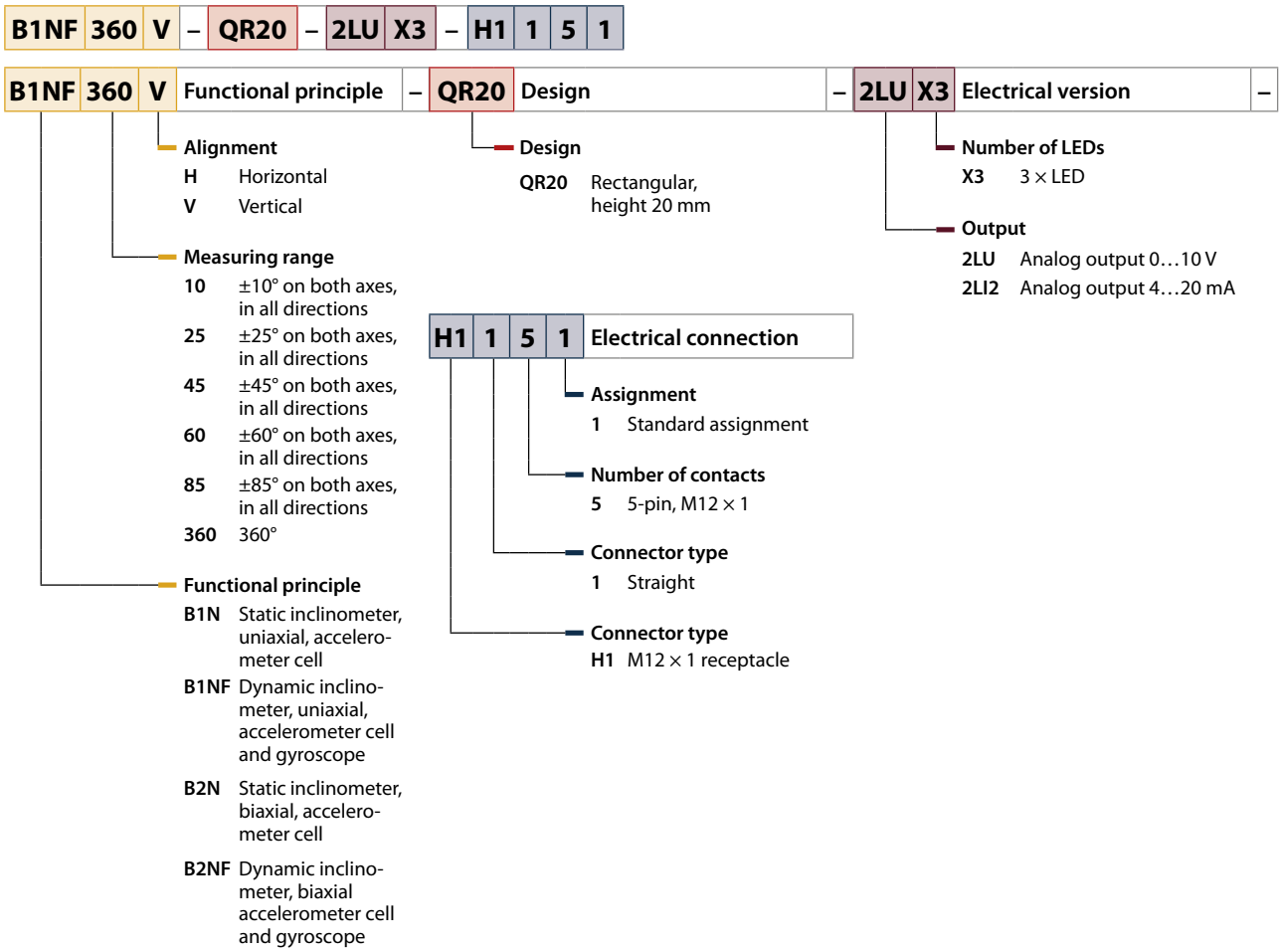
1.4 Feedback about these instructions

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 inclinometers:



2.2 Scope of delivery

The delivery consists of the following:

- Inclinometer
- Quick Start Guide

2.3 Turck service

Turck supports you in your projects — from the initial analysis right through to the commissioning of your application. The Turck product database at www.turck.com offers you several 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 [▶ 33].

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 inclinometers in the B…N…-QR20-2L… product series determine the inclination angle and give this as an analog output.

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 or property 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 inclinometers in the B…N…-QR20…2L…-H1151 product series have a 5-pin M12 connector for connecting the sensor cable. The housing is made from plastic and is a fully potted and sealed unit with protection to IP68/IP69K.

The device functions can be configured via the Turck Automation Suite (TAS) or an FDT frame (e.g. PACTware). The devices have an additional Easy-Teach function (manual bridging).

4.1 Device overview

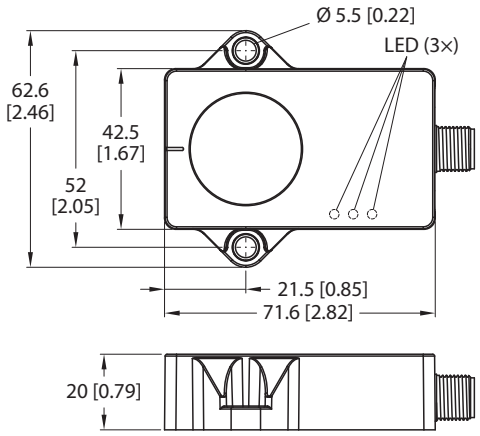


Fig. 1: Dimensions

4.1.1 Indication elements

The B1N… devices have one green and one yellow LED. The green LED indicates the operating voltage and the device status. The yellow LED is lit when the spirit level function is active.

The B2N… devices have one green and two yellow LEDs. The green LED indicates the operating voltage and the device status. The yellow LEDs are lit when the spirit level function is active.

4.2 Properties and features

- Angle measurement (1-axis devices): 0…359.9°, 16-bit resolution
- Angle measurement (2-axis devices): ±85°, 16-bit resolution
- Accelerometer cell
- Protection class IP68/IP69K
- 15…30 VDC
- Parameterization via TAS or PACTware
- Spirit level function (activated)
- Easy-Teach function

The dynamic inclinometers (B…NF…-QR20…) also have the following features:

- Gyroscope sensor

4.3 Operating principle

Static inclinometers

The inclinometers use an accelerometer cell for angle measurement and output angles according to the measurement axis or axes. The resolution is 16 bit. The earth's gravity is used as the reference. If the angle in relation to gravity changes, this is detected by the accelerometer cell. The signal is processed and linearized in order to output an angle.

Dynamic inclinometers

The dynamic inclinometers use an accelerometer cell and a gyroscope sensor for angle measurement. The devices output angles according to the measurement axis or axes. The resolution is 16 bit. A fusion algorithm calculates the inclination from the acceleration values and rotation rate values. The fusion algorithm minimizes the effects of vibration and interfering acceleration. The sensor can thus also output a stable signal in dynamic applications. The signal is processed and linearized in order to output an angle.

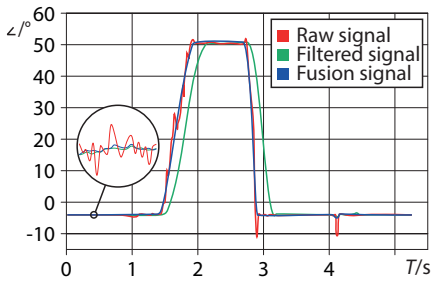


Fig. 2: Fusion algorithm — minimizing interfering acceleration

4.4 Functions and operating modes

The inclinometers have two analog outputs, both of which are preset as current or voltage outputs. The analog signal output is proportional to the inclination angle. With the default setting, the analog values of the sensors increase to indicate a clockwise rotation.

4.4.1 Setting options

The devices have an IO-Link interface and can be configured using the USB-2-IOL-0002 IO-Link adapter via TAS or an FDT frame (e.g. PACTware).

The devices also have an Easy-Teach function. The Easy-Teach function (manual bridging) offers the following settings:

- Center point teach
- Factory setting
- Teach-in of the start point of the measuring range (for 1-axis devices only)
- Teach-in of the end point of the measuring range (for 1-axis devices only)

4.4.2 Output behavior

The two analog outputs of the sensor can be set as current or voltage outputs, regardless of their factory setting. The set output configuration applies to both analog outputs. The measuring range can be configured as required. For 2-axis devices, the maximum values of ±85° apply. Smaller angle ranges can be configured.

Current outputs

The device supplies each of the two analog outputs with an analog current signal. For 1-axis devices, an inverted value of the inclination angle is also output via the second analog output. For 2-axis devices, one axis is transmitted for each analog output.

The following output configurations can be set:

- 0…20 mA
- 4…20 mA (factory setting, B…N…-QR20-2LI2…)

Voltage outputs

The device supplies each of the two analog outputs with an analog current signal. For 1-axis devices, an inverted value of the inclination angle is also output via the second analog output. For 2-axis devices, one axis is transmitted for each analog output.

The following output configurations can be set:

- 0.1…4.9 V
- 0.5…4.5 V
- 0…5 V
- 0…10 V (factory setting, B…N…-QR20-2LU…)

4.4.3 Measurement axes

The measurement axis of the 1-axis inclinometers covers the angle range from 0…359.9°.

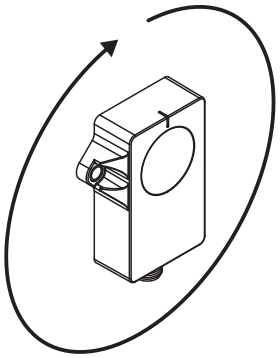


Fig. 3: One measurement axis

The 2-axis inclinometers cover the angle range of ±85° on two axes in all directions. This results in an unmeasurable angle of 10° per 180°. Angle ranges of ±85° are maximum values. Smaller angle ranges can be set depending on the parameterization.

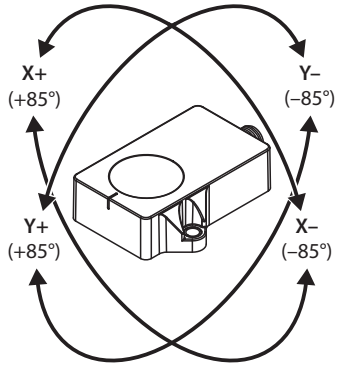
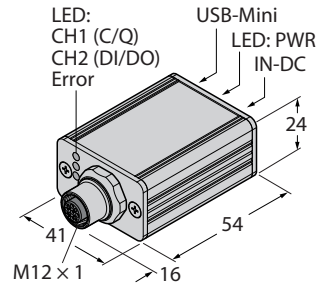
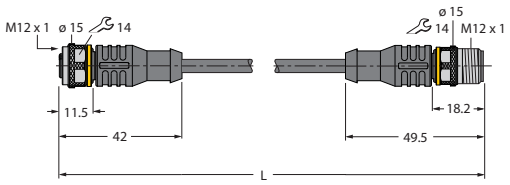
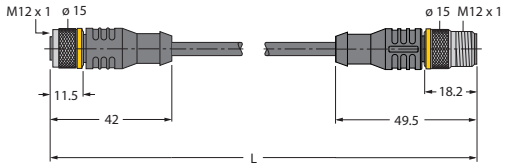
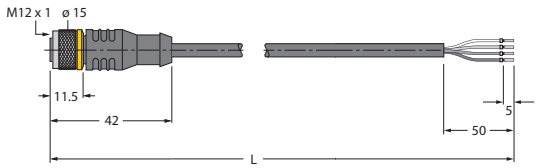
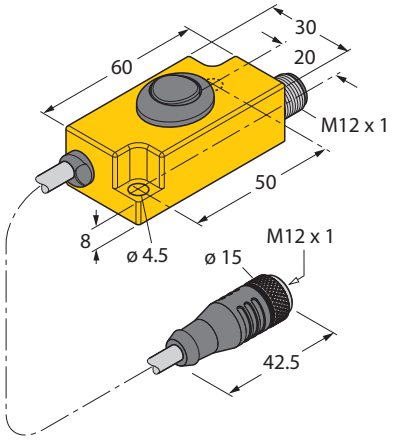


Fig. 4: Two measurement axes

4.5 Technical accessories

Dimension drawing	Type	ID	Description
	USB-2-IOL-0002	6825482	IO-Link adapter V1.1 with integrated USB interface
	RKC5.301T-1.5-RSC4T/TXL320	6625005	Adapter cable (for connecting the sensor to the USB-2-IOL-0002 IO-Link adapter and other devices), M12 female connector, straight, 5-pin, M12 male connector, straight, 3-pin, cable length: 1.5 m; jacket material: PUR, black; cULus approval, RoHS compliant, protection class IP67, see www.turck.com
	RKC4.4T-2-RSC4.4T/TXL	6625608	Connection cable, M12 female connector, straight, 4-pin, M12 male connector, straight, 4-pin, cable length: 2 m, jacket material: PUR, black; cULus approval; other cable lengths and versions available, see www.turck.com
	RKC4.4T-2/TXL	6625503	Connection cable, M12 female connector, straight, 4-pin, cable length: 2 m, jacket material: PVC, black; cULus approval; other cable lengths and versions available, see www.turck.com

Dimension drawing	Type	ID	Description
	TX1-Q20L60	6967114	Teach adapter

5 Installing

Depending on the sensor type, the sensors can be installed vertically (B1N…V…) or horizontally (B2N…H…).

In order to implement redundant measurement systems, several sensors can be installed next to each other without any gaps. Multiple sensors have no mutual effect on angle measurement. The maximum tightening torque of the screws is 3 Nm.

- Clean the installation surface and the surrounding area.
- Position the potted side of the device on an even surface so that the potting compound is covered.
- Fasten the device with two screws.
- After the overhead installation of 2-axis sensors: Carry out the center point teach function.

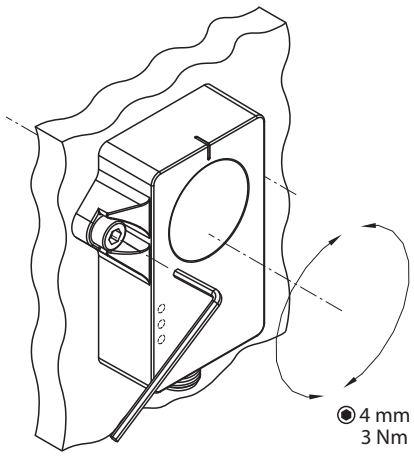


Fig. 5: B1N…V… — vertical installation

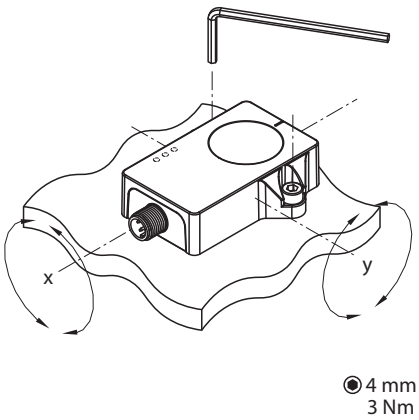


Fig. 6: B2N…H… — horizontal installation

6 Connection

- 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 diagrams

Wiring diagram B1N…-QR20-2L…

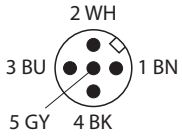


Fig. 7: Pin assignment B1N…-QR20-2L…

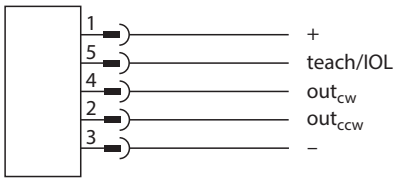


Fig. 8: Wiring diagram B1N…-QR20-2L…

Wiring diagram B2N…-QR20-2L…

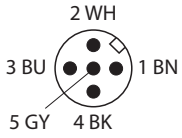


Fig. 9: Pin assignment B2N…-QR20-2L…

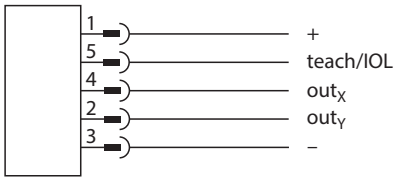


Fig. 10: Wiring diagram B2N…-QR20-2L…

7 Commissioning

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

NOTE
Voltage supply below 13.5 VDC
The device is not working properly
- For proper operation, the power supply must not fall below 13.5 VDC within the residual ripple.

7.1 Commissioning aid — spirit level

The LEDs act as a spirit level when the inclinometer is aligned. The two yellow LEDs are lit when the position of the inclinometer is within a window of ±0.5° around the center. The LEDs flash at an increasing frequency the closer the sensor approaches the center position.

One LED flashes with 1-axis movements. Both LEDs flash with 2-axis movements.

The spirit level function can be deactivated via IO-Link. The function is active by default.

8 Operation

8.1 LED indicators B1N…

LED	Color	Meaning
PWR/IOL	Green	Device is operational
	Green flashing	Communication via TAS or FDT/IODD active
Center	Yellow	Spirit level function — center point reached (±0.5°)
	Yellow flashing (increasing frequency)	Spirit level function — approaching center point
	Yellow flashing (decreasing frequency)	Spirit level function — moving away from center point

8.2 LED indicators B2N…

LED	Color	Meaning
PWR/IOL	Green	Device is operational
	Green flashing	Communication via TAS or FDT/IODD active
X-center	Yellow	Spirit level function — center point reached (±0.5°)
	Yellow flashing (increasing frequency)	Spirit level function — approaching center point
	Yellow flashing (decreasing frequency)	Spirit level function — moving away from center point
Y-center	Yellow	Spirit level function — center point reached (±0.5°)
	Yellow flashing (increasing frequency)	Spirit level function — approaching center point
	Yellow flashing (decreasing frequency)	Spirit level function — moving away from center point

9 Setting

9.1 Settable functions and features

Setting options via the Easy-Teach function, TAS and FDT/IODD

Parameter	Meaning
Restore factory settings	The function restores the device to the factory setting. The device is restarted after the restoration. Communication is interrupted.
Set center point	The function enables the current inclination to be defined as the new measuring range center point. On two-axis devices, the taught measuring range center point must not deviate from the physical zero point by more than 30°. The accuracy at the edges of the measuring edge decreases depending on the size of the zero point offset.
Set start point	On one-axis devices, the current inclination angle can be set as the start point for the output curve.
Set end point	On one-axis devices, the current inclination angle can be set as the end point for the output curve.

Additional setting options via TAS and FDT/IODD

Parameter	Meaning
Spirit level	The spirit level function can be deactivated or activated. The spirit level function is active by default.
Easy-Teach	The Easy-Teach function can be activated or deactivated via this parameter. The function is activated by default.
Rotation direction	The function can set the rotation direction of the axis or axes. With the factory setting, the analog values of the sensors increase to indicate a clockwise rotation. The parameter can be set so that the analog values increase to indicate a counterclockwise rotation.
Analog output	The devices can be set as current or voltage outputs, regardless of their factory setting. The following settings are available for the current outputs: ■ 0…20 mA ■ 4…20 mA (factory setting, B…N…-QR20-2LI2…) The following settings are available for the voltage outputs: ■ 0.1…4.9 V ■ 0.5…4.5 V ■ 0…5 V ■ 0…10 V (factory setting, B…N…-QR20-2LU…)
Start point	The start point for the output curve can be set by entering an angle. For two-axis devices, this function can be used to set a measuring range that differs from the factory setting.
End point	The end point for the output curve can be set by entering an angle. For two-axis devices, this function can be used to set a measuring range that differs from the factory setting.
Set start point	The current inclination angle can be set as the start point for the output curve.
Set end point	The current inclination angle can be set as the end point for the output curve.

Parameter	Meaning
Filter	Different filters can be set for static and dynamic inclinometers. A fusion algorithm calculates the inclination from the acceleration values and rotation rate values. The setting for the filter parameters changes significant areas of the fusion algorithm. The individual items of sensor data are weighted differently in the various filters. The different weighting of the sensor data can compensate for disadvantages in the measurement process. The slow filter can compensate for fast interfering acceleration in the application. The filter is suitable for applications with slow and precise movements where major external interference may occur. Repetitive, rapid movements can accumulate and distort the filter. Very fast and fast filters provide greater accuracy for rapid movements in the application. The filter can be more easily affected by fast interfering acceleration. Repetitive movements cannot accumulate and distort the filter. ■ **Static inclinometers:** ■ Balanced (factory setting) ■ Slow ■ **Dynamic sensors:** ■ Balanced ■ Slow ■ Fast ■ Very fast (factory setting)

9.2 Setting via the Turck Automation Suite (TAS)

The devices can be configured via a PC with TAS. The IODD can be read in via TAS such that all parameters of the IODD can be accessed.

An overview of the IO-Link parameters and descriptions can be found via the **IODDfinder**. An IO-Link master with integrated USB interface (ID 6825482) and an adapter cable (ID 6625005) are required to access the sensor parameters.

9.3 Setting via FDT/IODD

The devices can be set via a PC with an FDT frame application (e.g. PACTware). All the required Turck software components can be downloaded via the Turck Software Manager:

- PACTware
- IODD
- DTM for USB-2-IOL-002 IO-Link adaptor
- IODD DTM Configurator

The Turck software manager can be downloaded free of charge at www.turck.com.

The USB-2-IOL-002 USB IO-Link adapter (ID 6825482) is required for connecting to the PC.

An adapter cable (e.g. RKC5.301T-1.5-RSC4T/TXL320; ID 6625005) is required to connect the sensor to the USB-2-IOL-002 IO-Link adapter.

Further information on setting the devices via IODD with a configuration tool is provided in the IO-Link commissioning manual.

9.4 Setting via the Easy-Teach function

NOTE
During the teach-in process, the spirit level function is deactivated.

Activating the teach-in process

- ▶ Bridge pin 5 with pin 1 before switching on the supply voltage.
- ▶ Switch on the supply voltage and release the bridge immediately after starting the sensor.
- ⇨ The teach-in process is active when the green LED lights up with short interruptions (700 ms/100 ms).

The teach-in process is automatically deactivated after 30 s. The yellow CENTER LED and the green LED flash alternately and then return to normal operation.

Center point teach

- ▶ Short pin 5 to pin 1 for 2…8 s.
- ⇨ The green LED flashes at a frequency of 1 Hz.
- ▶ Position the sensor in the desired position to teach-in the center point.
- ▶ Short pin 5 to pin 1 for 2…8 s.
- ⇨ The yellow CENTER LED flashes at a frequency of 1 Hz. The green LED lights up for 2 s. The device then returns to the activated teach-in process.

Setting the start point of the measuring range (for 1-axis devices only)

- ▶ Short pin 5 to pin 1 for 2…8 s.
- ⇨ The green LED flashes at a frequency of 1 Hz.
- ▶ Position the sensor at the start point of the measuring range.
- ▶ Short pin 5 to pin 1 for 8…14 s.
- ⇨ The yellow CENTER LED flashes at a frequency of 2 Hz. The green LED lights up for 2 s. The device then returns to the activated teach-in process.

Setting the end point of the measuring range (for 1-axis devices only)

- ▶ Short pin 5 to pin 1 for 2…8 s.
- ⇨ The green LED flashes at a frequency of 1 Hz.
- ▶ Position the sensor at the end point of the measuring range.
- ▶ Short pin 5 to pin 1 for 14…20 s.
- ⇨ The yellow CENTER LED flashes at a frequency of 4 Hz. The green LED lights up for 2 s. The device then returns to the activated teach-in process.

Factory setting

- ▶ Short pin 5 to pin 1 for 8…14 s.
- ⇨ The green LED flashes at a frequency of 2 Hz.
- ▶ Short pin 5 to pin 1 for 2…8 s.
- ⇨ The yellow CENTER LED flashes at a frequency of 1 Hz. The green LED lights up for 2 s. The device then returns to the activated teach-in process.

10 Troubleshooting

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.

If the device does not work as expected, proceed as follows:

- Exclude environmental disturbances.
- Check the connections of the device for errors.
- Check device for parameterization errors.

If the malfunction persists, the device is faulty. In this case, decommission the device and replace it with a new device of the same type.

11 Maintenance

The device is maintenance-free. Clean with a damp cloth 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

14.1 Technical data B1N…-QR20-2L…

	B1N360V-QR20-2LI2X3-H1151	B1NF360V-QR20-2LI2X3-H1151	B1N360V-QR20-2LUX3-H1151	B1NF360V-QR20-2LUX3-H1151
ID	100030753	100030754	100030755	100030756
Measuring principle	Acceleration	Combination of gyroscopes and accelerometers	Acceleration	Combination of gyroscopes and accelerometers
General data				
Resolution	16 bit			
Measuring range	359.9°			
Number of measuring axes	1			
Repetition accuracy	≤ 0.05 % of full scale	≤ 0.03 % of full scale	≤ 0.05 % of full scale	≤ 0.03 % of full scale
Linearity deviation	≤ ± 0.2 %	≤ ± 0.15 %	≤ ± 0.2 %	≤ ± 0.15 %
Temperature drift	≤ ± 0.006 %/K			
Electrical data				
Operating voltage	15…30 VDC			
Initialization time	≤ 1 s			
Residual ripple	≤ 10 % U_{ss}			
Insulation test voltage	≤ 0.5 kV			
Short-circuit protection	Yes			
Wire breakage/ reverse polarity protection	Yes			
Output function	5-pin, analog output			
Analog output	4…20 mA, current output	4…20 mA, current output	0…10 V, voltage output	0…10 V, voltage output
Voltage output load resistance	-	-	≥ 4.7 kΩ	≥ 4.7 kΩ
Load resistance current output	≤ 0.4 kΩ	≤ 0.4 kΩ		
Current consumption	< 80 mA			
Mechanical data				
Design	Rectangular, QR20			
Dimensions	71.4 × 62.5 × 20 mm			
Housing material	Plastic, Ultem			
Electrical connection	M12 × 1 connector			
Ambient conditions				
Ambient temperature	-40…+85 °C			
Temperature changes (EN 60068-2-14)	-40…+85 °C; 20 cycles			
Vibration resistance (EN 600068-2-6)	20 g; 5 h/axis; 3 axes			
Shock resistance (EN 60068-2-27)	150 g; 4 ms ½ sine	200 g; 4 ms ½ sine	150 g; 4 ms ½ sine	200 g; 4 ms ½ sine
Protection class	IP68/IP69K			

	B1N360V-QR20-2LI2X3-H1151	B1NF360V-QR20-2LI2X3-H1151	B1N360V-QR20-2LUX3-H1151	B1NF360V-QR20-2LUX3-H1151
Altitude	Max. 5000 m			
MTTF	297 years acc. to SN 29500 (ed. 99) 40 °C			
Operating voltage indicator	1 × LED, green			
Measuring range indication	2 × LEDs, yellow			

The repetition accuracy, linearity deviation and temperature drift values apply to the inclination angles for each individual axis at an ambient temperature of 20 °C.

14.2 Technical data B2N…-QR20-2LI2X3-H1151

	B2N10H-QR20-2LI2X3-H1151	B2N25H-QR20-2LI2X3-H1151	B2N45H-QR20-2LI2X3-H1151	B2N60H-QR20-2LI2X3-H1151	B2N85H-QR20-2LI2X3-H1151
ID	100031451	100031452	100031453	100031454	100031455
Measuring principle	Acceleration				
General data					
Resolution	16 bit				
Measuring range	±10°	±25°	±45°	±60°	±85°
Number of measuring axes	2				
Repetition accuracy	≤ 0.9 % of full scale	≤ 0.4 % of full scale	≤ 0.2 % of full scale	≤ 0.15 % of full scale	≤ 0.1 % of full scale
Linearity deviation	≤ ± 0.6 %	≤ ± 0.6 %	≤ ± 0.5 %	≤ ± 0.35 %	≤ ± 0.3 %
Temperature drift	≤ ± 0.1 %/K	≤ ± 0.04 %/K	≤ ± 0.025 %/K	≤ ± 0.02 %/K	≤ ± 0.012 %/K
Electrical data					
Operating voltage	15…30 VDC				
Initialization time	≤ 1 s				
Residual ripple	≤ 10 % U_{ss}				
Insulation test voltage	≤ 0.5 kV				
Short-circuit protection	Yes				
Wire breakage/ reverse polarity protection	Yes				
Output function	5-pin, analog output				
Analog output	4…20 mA, current output				
Load resistance current output	≤ 0.4 kΩ				
Current consumption	< 80 mA				
Mechanical data					
Design	Rectangular, QR20				
Dimensions	71.4 × 62.5 × 20 mm				
Housing material	Plastic, Ultem				
Electrical connection	M12 × 1 connector				
Ambient conditions					
Ambient temperature	-40…+85 °C				
Temperature changes (EN 60068-2-14)	-40…+85 °C; 20 cycles				
Vibration resistance (EN 600068-2-6)	20 g; 5 h/axis; 3 axes				
Shock resistance (EN 60068-2-27)	150 g; 4 ms ½ sine				
Protection class	IP68/IP69K				

	B2N10H-QR20-2LI2X3-H1151	B2N25H-QR20-2LI2X3-H1151	B2N45H-QR20-2LI2X3-H1151	B2N60H-QR20-2LI2X3-H1151	B2N85H-QR20-2LI2X3-H1151
Altitude	Max. 5000 m				
MTTF	297 years acc. to SN 29500 (ed. 99) 40 °C				
Operating voltage indicator	1 × LED, green				
Measuring range indication	2 × LEDs, yellow				

The repetition accuracy, linearity deviation and temperature drift values apply to the inclination angles for each individual axis at an ambient temperature of 20 °C.

14.3 Technical data B2N…-QR20-2LUX3-H1151

	B2N10H-QR20-2LUX3-H1151	B2N25H-QR20-2LUX3-H1151	B2N45H-QR20-2LUX3-H1151	B2N60H-QR20-2LUX3-H1151	B2N85H-QR20-2LUX3-H1151
ID	100031457	100031458	100031460	100031461	100031462
Measuring principle	Acceleration				
General data					
Resolution	16 bit				
Measuring range	±10°	±25°	±45°	±60°	±85°
Number of measuring axes	2				
Repetition accuracy	≤ 0.9 % of full scale	≤ 0.4 % of full scale	≤ 0.2 % of full scale	≤ 0.15 % of full scale	≤ 0.1 % of full scale
Linearity deviation	≤ ± 0.6 %	≤ ± 0.6 %	≤ ± 0.5 %	≤ ± 0.35 %	≤ ± 0.3 %
Temperature drift	≤ ± 0.1 %/K	≤ ± 0.04 %/K	≤ ± 0.025 %/K	≤ ± 0.02 %/K	≤ ± 0.012 %/K
Electrical data					
Operating voltage	15…30 VDC				
Initialization time	≤ 1 s				
Residual ripple	≤ 10 % U_{ss}				
Insulation test voltage	≤ 0.5 kV				
Short-circuit protection	Yes				
Wire breakage/ reverse polarity protection	Yes				
Output function	5-pin, analog output				
Analog output	0…10 V, voltage output				
Voltage output load resistance	≥ 4.7 kΩ				
Current consumption	< 80 mA				
Mechanical data					
Design	Rectangular, QR20				
Dimensions	71.4 × 62.5 × 20 mm				
Housing material	Plastic, Ultem				
Electrical connection	M12 × 1 connector				
Ambient conditions					
Ambient temperature	-40…+85 °C				
Temperature changes (EN 60068-2-14)	-40…+85 °C; 20 cycles				
Vibration resistance (EN 600068-2-6)	20 g; 5 h/axis; 3 axes				
Shock resistance (EN 60068-2-27)	150 g; 4 ms ½ sine				
Protection class	IP68/IP69K				

	B2N10H-QR20-2LUX3-H1151	B2N25H-QR20-2LUX3-H1151	B2N45H-QR20-2LUX3-H1151	B2N60H-QR20-2LUX3-H1151	B2N85H-QR20-2LUX3-H1151
Altitude	Max. 5000 m				
MTTF	297 years acc. to SN 29500 (ed. 99) 40 °C				
Operating voltage indicator	1 × LED, green				
Measuring range indication	2 × LEDs, yellow				

The repetition accuracy, linearity deviation and temperature drift values apply to the inclination angles for each individual axis at an ambient temperature of 20 °C.

14.4 Technical data B2NF…-QR20-2LI2X3-H1151

	B2NF10H-QR20-2LI2X3-H1151	B2NF25H-QR20-2LI2X3-H1151	B2NF45H-QR20-2LI2X3-H1151	B2NF60H-QR20-2LI2X3-H1151	B2NF85H-QR20-2LI2X3-H1151
ID	100031515	100031516	100031517	100031518	100031519
Measuring principle	Combination of gyroscopes and accelerometers				
General data					
Resolution	16 bit				
Measuring range	±10°	±25°	±45°	±60°	±85°
Number of measuring axes	2				
Repetition accuracy	≤ 0.5 % of full scale	≤ 0.2 % of full scale	≤ 0.12 % of full scale	≤ 0.085 % of full scale	≤ 0.06 % of full scale
Linearity deviation	≤ ± 0.5 %	≤ ± 0.5 %	≤ ± 0.4 %	≤ ± 0.3 %	≤ ± 0.25 %
Temperature drift	≤ ± 0.1 %/K	≤ ± 0.04 %/K	≤ ± 0.025 %/K	≤ ± 0.02 %/K	≤ ± 0.012 %/K
Electrical data					
Operating voltage	15…30 VDC				
Initialization time	≤ 1 s				
Residual ripple	≤ 10 % U_{ss}				
Insulation test voltage	≤ 0.5 kV				
Short-circuit protection	Yes				
Wire breakage/ reverse polarity protection	Yes				
Output function	5-pin, analog output				
Analog output	4…20 mA, current output				
Load resistance current output	≤ 0.4 kΩ				
Current consumption	< 80 mA				
Mechanical data					
Design	Rectangular, QR20				
Dimensions	71.4 × 62.5 × 20 mm				
Housing material	Plastic, Ultem				
Electrical connection	M12 × 1 connector				
Ambient conditions					
Ambient temperature	-40…+85 °C				
Temperature changes (EN 60068-2-14)	-40…+85 °C; 20 cycles				
Vibration resistance (EN 600068-2-6)	20 g; 5 h/axis; 3 axes				
Shock resistance (EN 60068-2-27)	200 g; 4 ms ½ sine				
Protection class	IP68/IP69K				

	B2NF10H-QR20-2LI2X3-H1151	B2NF25H-QR20-2LI2X3-H1151	B2NF45H-QR20-2LI2X3-H1151	B2NF60H-QR20-2LI2X3-H1151	B2NF85H-QR20-2LI2X3-H1151
Altitude	Max. 5000 m				
MTTF	297 years acc. to SN 29500 (ed. 99) 40 °C				
Operating voltage indicator	1 × LED, green				
Measuring range indication	2 × LEDs, yellow				

The repetition accuracy, linearity deviation and temperature drift values apply to the inclination angles for each individual axis at an ambient temperature of 20 °C.

14.5 Technical data B2NF…-QR20-2LUX3-H1151

	B2NF10H-QR20-2LUX3-H1151	B2NF25H-QR20-2LUX3-H1151	B2NF45H-QR20-2LUX3-H1151	B2NF60H-QR20-2LUX3-H1151	B2NF85H-QR20-2LUX3-H1151
ID	100031520	100031521	100031522	100031523	100031524
Measuring principle	Combination of gyroscopes and accelerometers				
General data					
Resolution	16 bit				
Measuring range	±10°	±25°	±45°	±60°	±85°
Number of measuring axes	2				
Repetition accuracy	≤ 0.5 % of full scale	≤ 0.2 % of full scale	≤ 0.12 % of full scale	≤ 0.085 % of full scale	≤ 0.06 % of full scale
Linearity deviation	≤ ± 0.5 %	≤ ± 0.5 %	≤ ± 0.4 %	≤ ± 0.3 %	≤ ± 0.25 %
Temperature drift	≤ ± 0.1 %/K	≤ ± 0.04 %/K	≤ ± 0.025 %/K	≤ ± 0.02 %/K	≤ ± 0.012 %/K
Electrical data					
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				
Output function	5-pin, analog output				
Analog output	0…10 V, voltage output				
Load resistance voltage output	≥ 4.7 kΩ				
Current consumption	< 80 mA				
Mechanical data					
Design	Rectangular, QR20				
Dimensions	71.4 × 62.5 × 20 mm				
Housing material	Plastic, Ultem				
Electrical connection	Male connector, M12 × 1				
Ambient conditions					
Ambient temperature	-40…+85 °C				
Temperature changes (EN 60068-2-14)	-40…+85 °C; 20 cycles				
Vibration resistance (EN 600068-2-6)	20 g; 5 h/axis; 3 axes				
Shock resistance (EN 60068-2-27)	200 g; 4 ms ½ sine				
Type of protection	IP68/IP69K				
Altitude	Max. 5000 m				

	B2NF10H-QR20-2LUX3-H1151	B2NF25H-QR20-2LUX3-H1151	B2NF45H-QR20-2LUX3-H1151	B2NF60H-QR20-2LUX3-H1151	B2NF85H-QR20-2LUX3-H1151
MTTF	297 years acc. to SN 29500 (ed. 99) 40 °C				
Operating voltage indication	1 × LED, green				
Measuring range indication	2 × LED, yellow				

The repetition accuracy, linearity deviation and temperature drift values apply to the inclination angles for each individual axis at an ambient temperature of 20 °C.

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