EN

P3PCxxx
P3ECxxx

Laser Distance Sensors Triangulation

Operating Instructions

Translation of the original operating instructions
Subject to change without notice
Available as PDF file only
Version 1.7.0
As of: 11/21/2023
www.wenglor.com

Table of Contents

1. General

1.1 Information Concerning these Instructions

- These instructions apply to products designated P3PCxxx / P3ECxxx.
- These instructions make it possible to use the product safely and efficiently.
- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- Local accident prevention regulations and national work safety regulations must be complied with as well.
- The product is subject to further technical development, and thus the information contained in these operating instructions may also be subject to change. The current version can be found at www.wenglor.com in the product's separate download area.

NOTE!
The operating instructions must be read carefully before using the product and must be kept on hand for later reference.

1.2 Explanations of Symbols

- Safety precautions and warnings are emphasized by means of symbols and signal words.
- Safe use of the product is only possible if these safety precautions and warnings are adhered to.

The safety precautions and warnings are laid out in accordance with the following principle:

SIGNAL WORD!
Type and source of danger!
Possible consequences in the event that the hazard is disregarded.
- Measures for averting the hazard.

The meanings of the signal words, as well as the scope of the associated hazards, are listed below:

DANGER!
This signal word indicates a hazard with a high degree of risk which, if not avoided, results in death or severe injury.

WARNING!
This signal word indicates a hazard with a medium degree of risk which, if not avoided, may result in death or severe injury.

CAUTION!
This signal word indicates a hazard with a low degree of risk which, if not avoided, may result in minor or moderate injury.

ATTENTION!
This signal word draws attention to a potentially hazardous situation which, if not avoided, may result in property damage.

NOTE!
A note draws attention to useful tips and suggestions, as well as information regarding efficient, error-free use.

1.3 Limitation of Liability

- The product has been developed in consideration of the current state-of-the-art technology, as well as applicable standards and guidelines. Subject to change without notice.
- A valid declaration of conformity can be accessed at www.wenglor.com in the product's separate download area.
- wenglor sensoric elektronische Geräte GmbH (hereinafter referred to as "wenglor") excludes all liability in the event of:
    - Non-compliance with the instructions,
    - Use of the product for purposes other than those intended,
    - Use by untrained personnel,
    - Use of unapproved spare parts,
    - Unapproved modification of products.
- These operating instructions do not include any guarantees from wenglor with regard to the described procedures or specific product characteristics.
- wenglor assumes no liability for printing errors or other inaccuracies contained in these operating instructions unless wenglor was verifiably aware of such errors at the point in time at which the operating instructions were prepared.

1.4 Copyrights

- The contents of these instructions are protected by copyright law.
- All rights are reserved by wenglor.
- Commercial reproduction or any other commercial use of the provided content and information, in particular graphics and images, is not permitted without previous written consent from wenglor.

2. For Your Safety

2.1 Use for Intended Purpose

This wenglor product is intended for use in accordance with the following functional principle:

Laser Distance Sensors Triangulation

Triangulation laser distance sensors work according to the principle of angle measurement, where the object's color, shape, and surface do not affect the measurement. Depending on the setting, they can be operated at very high speed or resolution. The measuring range can be selected individually within the sensor's working range.

This product can be used in the following industry sectors:

- Special-purpose mechanical engineering
- Heavy mechanical engineering
- Logistics
- Automotive industry
- Food industry
- Packaging industry
- Pharmaceuticals industry
- Plastics industry
- Woodworking industry
- Consumer goods industry
- Paper industry
- Electronics industry
- Glass industry
- Steel industry
- Aviation industry
- Chemicals industry
- Alternative energies
- Raw materials extraction

2.2 Use for Other than the Intended Purpose

- Not a safety component in accordance with 2006/42/EC (Machinery Directive).
- The product is not suitable for use in potentially explosive atmospheres.
- The product may be used only with accessories supplied or approved by wenglor, or in combination with approved products. A list of approved accessories and combination products can be found at www.wenglor.com on the product detail page.

DANGER!
Risk of personal injury or property damage in case of use for other than the intended purpose!

Use for other than the intended purpose may lead to hazardous situations.
- Instructions regarding use for intended purpose must be observed.

2.3 Personnel Qualifications

- Suitable technical training is a prerequisite.
- In-house electronics training is required.
- Trained personnel who use the product must have (uninterrupted) access to the operating instructions.

DANGER!
Risk of personal injury or property damage in case of incorrect initial start-up and maintenance!

Personal injury and damage to equipment may occur.
- Adequate training and qualification of personnel.

2.4 Modification of Products

DANGER!
Risk of personal injury or property damage if the product is modified!

Personal injury and damage to equipment may occur. Noncompliance may result in loss of CE and/or UKCA mark and voiding of warranty.
- Modification of the product is impermissible.

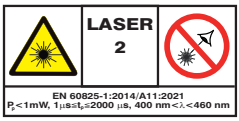
2.5 General Safety Precautions

NOTE!
- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- In the event of possible changes, the respectively current version of the operating instructions can be accessed at www.wenglor.com in the product's separate download area.
- Read the operating instructions carefully before using the product.
- The sensor must be protected against contamination and mechanical influences.

2.6 Laser/LED Warnings

The respective laser class is listed in the product's technical data.

Laser Class 1 (EN 60825-1)
Applicable standards and safety regulations must be observed.



Laser Class 2 (EN 60825-1)

Applicable standards and safety regulations must be observed. The accompanying laser warnings must be attached. Do not look into the laser beam.

2.7 Approvals and Protection Class

NOTE!
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

3. Technical Data

3.1 General Data

Optical Data	
Service life (ambient temp. = +25 °C)	100,000 h
Electrical Data	
Supply voltage	18…30 V DC
Switching output voltage drop	< 1.5 V
Switching output switching current	100 mA
Short-circuit protection	Yes
Reverse polarity protected	Yes
Overload-proof	Yes
Interface	IO-Link V1.1
Transmission speed	COM3
Protection class	III
Mechanical Data	
Housing material	Aluminum
Optic cover	PMMA
Degree of protection	IP67
Connection type	M12×1, 5-pin

Order No. / Tech. Data	P3PC												
	001	002	011	012	041	042	101	102	181	111	112	141	142
Working range	30…80 mm						40…240 mm						
Setting range	30…80 mm		—				40…240 mm			—			
Measuring range	—		30...80 mm				—		40…240 mm				
Light source	Laser (red)				Laser (blue)		Laser (red)					Laser (blue)	
Wavelength	660 nm				405 nm		660 nm					405 nm	
Laser Class (EN 60825-1)	1				2		1					2	
Configurable laser class	1/2				---		1/2					---	
Max. permitted ambient light	20.000 Lux				5.000 Lux		20.000 Lux					5.000 Lux	
Light spot diameter	See table 1						See table 2						
Maximum reproducibility	13 µm				20 µm		70 µm					40 µm	
Reproducibility 1 Sigma	0,8 µm				1,5		6 µm					4 µm	
Linearity deviation	40 µm				40 µm		200 µm					200 µm	
Temperature drift	<2,5 µm/K				<2,5 µm/K		<15 µm/K					<15 µm/K	
Temperature range	–30…60 °C				0…60 °C		–30…60 °C					0…60 °C	
Switching hysteresis	0,5 %		---				0,5 %			---			
Current consumption (Operating voltage = 24 V)	50 mA		60 mA		70 mA		50 mA		60 mA			70 mA	
Switching frequency	650 Hz		---				650 Hz			---			
Response time	0,5 ms						0,5 ms						
Measuring rate	—		2500/s				—		2500/s				
Setting method	Teach-In		Display / Bluetooth				Teach-in			Display/Bluetooth			
Contains FCC ID: 2A3OLDC1392	—		x				—			x			
Connection diagram no.	243		242	241	242	241	243		242		241	242	241
Output function	2x PNP NO	2x NPN NO	Analog 4…20 mA	Analog 0…10 V	Analog 4…20 mA	Analog 0…10 V	2x PNP NO	2x NPN NO	PNP NO + Analog 4...20 mA	Analog 4…20 mA	Analog 0…10 V	Analog 4…20 mA	Analog 0…10 V
MTTFd (EN ISO 13849-1)	720,35 a		408,4 a		398,5 a		720,35 a		621,06 a	408,4 a		398,5 a	

Order No. / Technical Data	P3EC					
	401	402	411	412	441	442
Working range	150…1,000 mm					
Setting range	150…1,000 mm		—			
Measuring range	—		150…1,000 mm			
Light source	Laser (red)				Laser (blue)	
Wavelength	660 nm				405 nm	
Laser class (EN 60825-1)	1				2	
Configurable laser class	1/2				---	
Max. permitted ambient light	20.000 Lux				10.000 Lux	
Light spot diameter	See table 5					
Maximum reproducibility	350 µm				250 µm	
Reproducibility 1 Sigma	35 µm				30 µm	
Linearity deviation	850 µm				850 µm	
Temperature drift	<75 µm/K				<75 µm/K	
Temperature range	–30…60 °C				0...60 °C	
Switching hysteresis	0,5 %		---			
Current consumption (operating voltage = 24 V)	50 mA		60 mA		70 mA	
Switching frequency	650 Hz		---			
Response time	0,5 ms					
Measuring rate	—		2500/s			
Setting method	Teach-in		Display/Bluetooth			
Contains FCC ID: 2A3OLDC1392	—		x			
Connection diagram number	243		242	241	242	241
Output function	2x PNP NO	2x NPN NO	Analog 4…20 mA	Analog 0…10 V	Analog 4…20 mA	Analog 0…10 V
MTTFd (EN ISO 13849-1)	720,35 a		408,4 a		398,5 a	

P3PC													
201	**202**	**211**	**212**	**241**	**242**	**301**	**302**	**311**	**312**	**341**	**342**	**361**	**362**
50…350 mm						60…660 mm							
50…350 mm		—				60…660 mm		—					
—		50...350 mm				—		60…660 mm					
Laser (red)				Laser (blue)		Laser (red)				Laser (blue)			
660 nm				405 nm		660 nm				405 nm			
1				2		1				2			
1/2				---		1/2				---			
20.000 Lux				5.000 Lux		20.000 Lux				5.000 Lux			
See table 3						See table 4							
100 µm				100 µm		550 µm				250 µm			
10 µm				10 µm		30 µm				25 µm			
300 µm				300 µm		900 µm				900 µm			
<20 µm/K				<20 µm/K		<50 µm/K				< 50 µm/K			
–30…60 °C				0…60 °C		–30…60 °C				0…60 °C			
0,5 %		---				0,5 %		---				0,5 %	
50 mA		60 mA		70 mA		50 mA		60 mA		70 mA		60 mA	
650 Hz		---				650 Hz		---				650 Hz	
0,5 ms						0,5 ms							
—		2500/s				—		2500/s				---	
Teach-In		Display / Bluetooth				Teach-In		Display / Bluetooth					
—		x				—		x					
243		242	241	242	241	243		242	241	242	241	243	
2x PNP NO	2x NPN NO	Analog 4…20 mA	Analog 0…10 V	Analog 4…20 mA	Analog 0…10 V	2x PNP NO	2x NPN NO	Analog 4…20 mA	Analog 0…10 V	Analog 4…20 mA	Analog 0…10 V	2 x PNP NO	2 x NPN NO
720,35 a		408,4 a		398,5 a		720,35 a		408,4 a		398,5 a		428,06 a	

3.2 Warm-Up Phase

The warm-up phase typically lasts 5 minutes. After this time, the sensor provides the values specified in the linearity deviation.

NOTE!

Specifications correspond to measured value without load. For all variants, specifications may differ due to the load on the output.

3.3 Light Spot Diameter

P3PC0xx

Working distance	30 mm	55 mm	80 mm
Light spot diameter	1,5 mm	1,5 mm	1,5 mm

Table 1

P3PC1xx

Working distance	40 mm	140 mm	240 mm
Light spot diameter	1,5 mm	1 mm	1 mm

Table 2

P3PC2xx

Working distance	50 mm	200 mm	350 mm
Light spot diameter	1,5 mm	1 mm	1 mm

Table 3

P3PC3xx

Working distance	60 mm	360 mm	660 mm
Light spot diameter	1,5 mm	1 mm	0,5 mm

Table 4

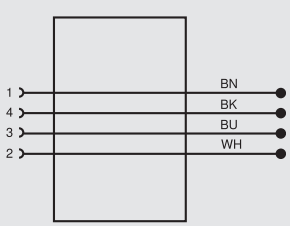
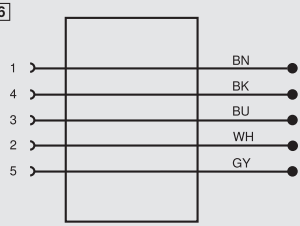
P3EC4xx

Working distance	150 mm	575 mm	1000 mm
Light spot diameter	1 mm	1 mm	1 mm

Table 5

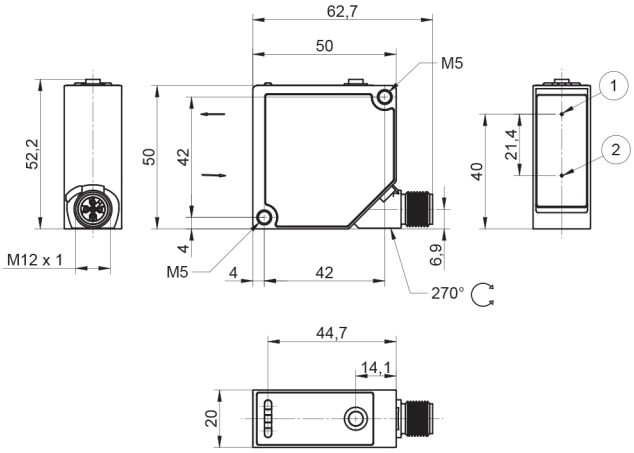
3.4 Complementary Products

wenglor can provide you with suitable connection equipment for your product.

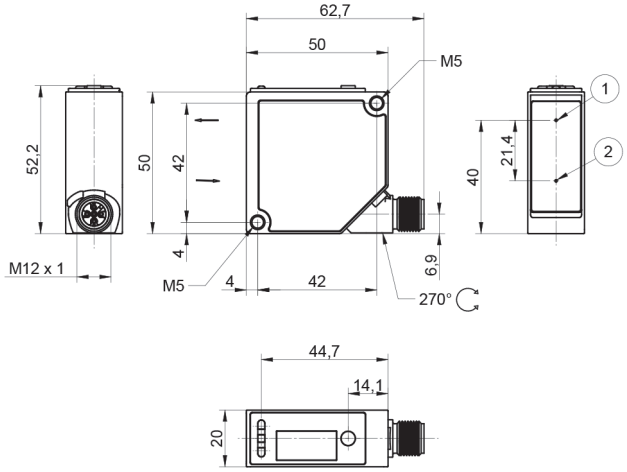
Suitable mounting technology no.	P3PCxxx: 380, P3ECxxx: 932
Suitable connection equipment no.	2 S02  35 S06 
IO-Link master; EFBL003, EP0L001	
wTeach2 software DNNF005	
Software for IO-Link Device Tool, DNNF019	
Protective screens	
ZC4G004 Connection Cable, T-splitter	

3.5 Layout

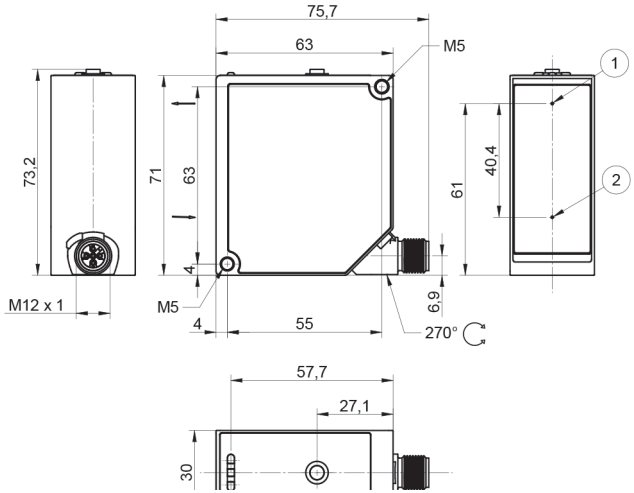
P3PCx0x, P3PCx8x



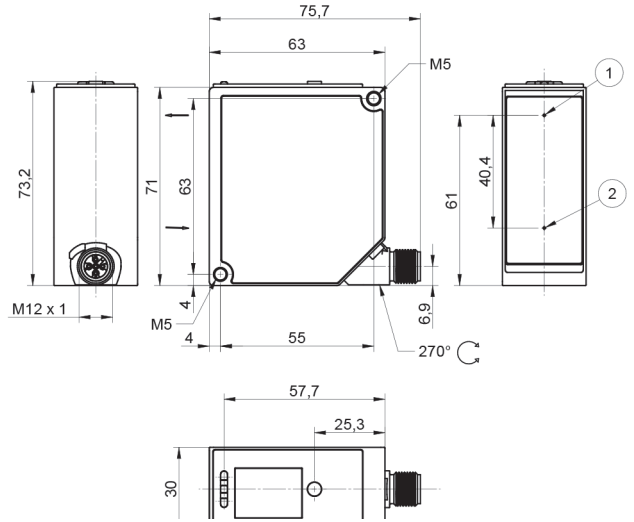
P3PCx1x, P3PCx4x, P3PCx6x



P3ECx0x



P3ECx1x, P3ECx4x

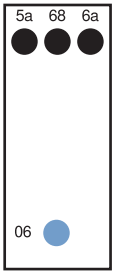


1 = emitter diode
2 = receiver diode
M4 screw = 1 Nm
M5 screw = 2 Nm
Dimensions specified in mm (1 mm = 0.03937″)

3.6 Control Panel

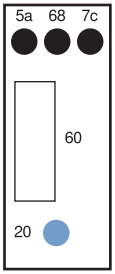
P3PCx0x, P3ECx0x

X5



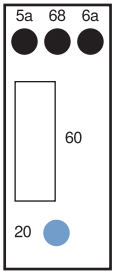
P3PCx1x, P3PCx4x
P3ECx1x, P3PCx4x

X6



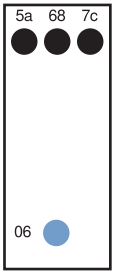
P3PCx6x

X7



P3PCx8x

X8



5a = switching status indicator O1
6a = switching status indicator, O2
06 = Teach-in key
7c = Analog output O display
20 = Enter key
60 = display
68 = supply voltage indicator

3.7 Scope of Delivery

- Sensor
- Initial start-up instructions
- Mounting material:
  - For P3PCxxx: BEF-SET-02
  - For P3ECxxx: BEF-SET-34

4. Transport and Storage

4.1 Transport

Upon receipt of shipment, the goods must be inspected for damage in transit. In the case of damage, conditionally accept the package and notify the manufacturer of the damage. Then return the device, making reference to damage in transit.

4.2 Storage

The following points must be taken into consideration with regard to storage:

- Do not store the product outdoors.
- Store the product in a dry, dust-free place.
- Protect the product against mechanical impacts.
- Protect the product against exposure to direct sunlight.

ATTENTION!

Risk of property damage in case of improper storage!

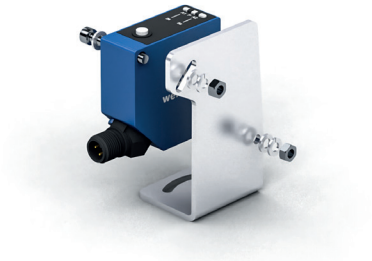
The product may be damaged.

- Storage instructions must be complied with.

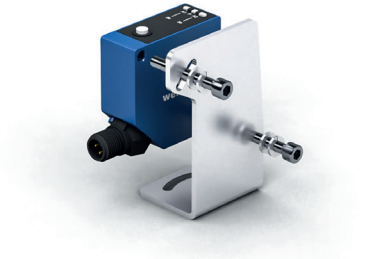
5. Installation and Electrical Connection

5.1 Installation

- Protect the product from contamination during installation.
- Observe all applicable electrical and mechanical regulations, standards and safety rules.
- Protect the product against mechanical influences.
- Install the sensor by means of the mounting hole with M4 screws (included in the scope of delivery).



- Make sure that the sensor is mounted in a mechanically secure fashion.
- Alternatively, the sensors can also be attached using M5 screws (not included in scope of delivery) via the thread built into the housing.



- Do not exceed max. tightening torque:
  - If using M4 screws: 1 Nm
  - If using M5 screws: 2 Nm

ATTENTION!

Risk of property damage in case of improper installation!

The product may be damaged.

- Installation instructions must be complied with.

CAUTION!

Risk of personal injury or property damage during installation!

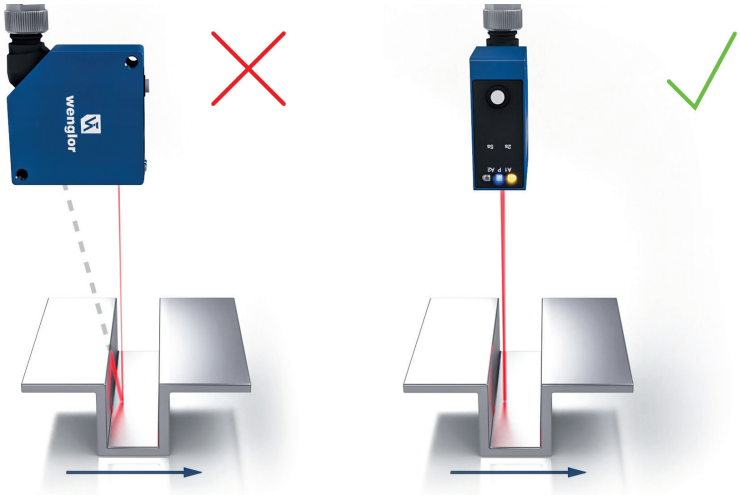
Personal injury and damage to the product may occur.

- A safe installation environment must be assured.

5.2 Adjustment

When adjusting sensors, note the following instructions so that the most stable object detection/measurement can be achieved:

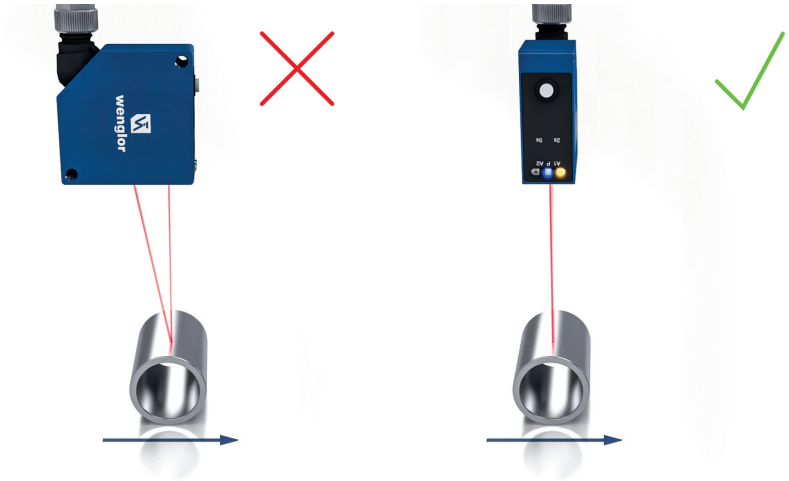
Steps/edges/depressions



If measuring directly next to steps/edges/depressions, make sure that the receiving beam is not covered by the step/edge. The same applies when measuring the depth of gaps and holes.

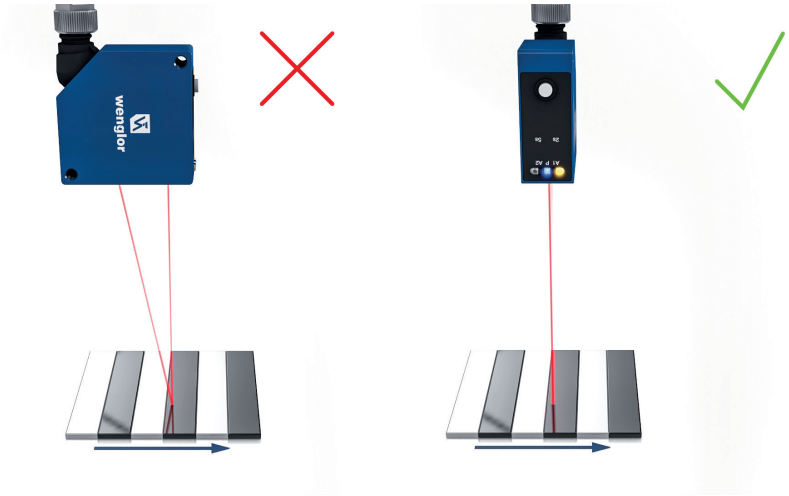
With holes, blind holes, and edges in the surface of moving parts, the sensor must be positioned so that the edge does not obscure the laser dot.

Round, glossy surfaces



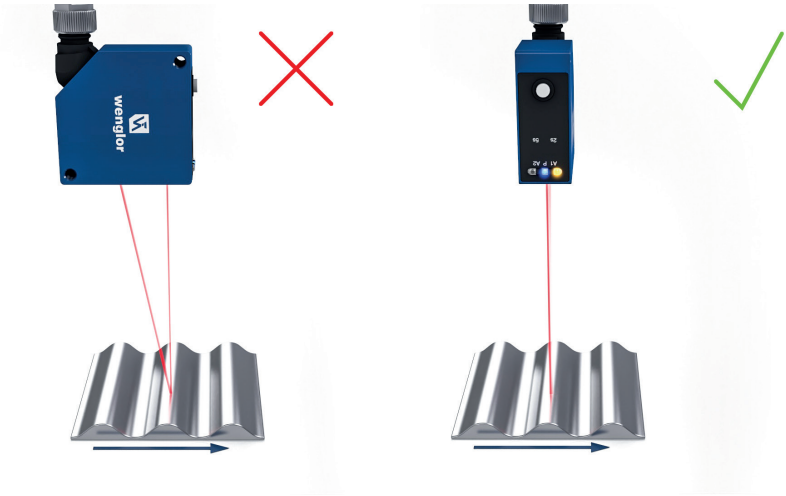
With round, glossy surfaces, the sensor should be positioned on an axis with the round object in order to avoid reflection.

Measuring objects with evenly positioned, colored edges



When oriented correctly, the influence on measuring accuracy is minimal. When oriented incorrectly, the different reflectivity of the various colors will result in deviations.

Moving measurement objects

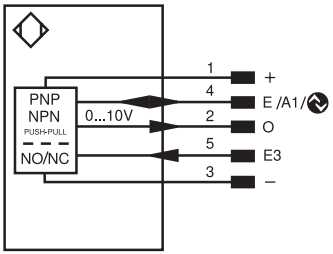


When measuring a moving object, the object must be able to move transversely to the sensor. This prevents shadows and direct reflection to the receiver.

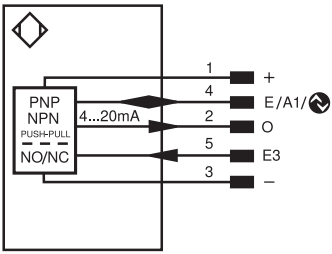
5.3 Electrical Connection

- Wire the sensor in accordance with the connection diagram.
- Switch on the supply voltage (see “3. Technical Data” on page 9).
- The blue supply voltage indicator lights up.
- Adjust the sensor so that the light spot strikes the object to be detected/measured.

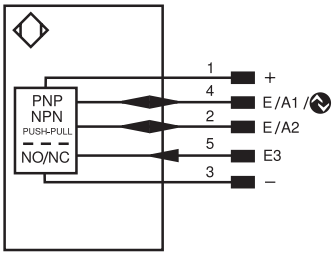
241



242



243



Wire colors:
1 = brown
2 = white
3 = blue
4 = black
5 = gray

–	= supply voltage 0 V
+	= supply voltage +
I/O1	= programmable input/output/IO-Link
I/O2	= programmable input/output
E3	= input
O	= analog output

DANGER!

Risk of personal injury or property damage due to electric current.

Voltage-conducting parts may cause personal injury or damage to equipment.

- The electric device may be connected by appropriately qualified personnel only.

5.4 Diagnosis

5.4.1 LED Indicators

Indicator	Status	Meaning
Supply voltage indicator P		Sensor ready for operation
		No voltage supply
		**Warning** LEDs for switching status indicators O1, O2 and analog display O are still working properly
		**Error** LEDs for switching status indicators O1, O2 and analog display O are not working properly
		Sensor ready for Bluetooth connection (Not for all versions)
Switching status indicator O1, O2		Switching outputs active
		Switching outputs not active
Analog indicator O		Object within set measuring range
		Object outside set measuring range
Localization		Localization function active

 = Not lit

 = Permanently lit

 = Flashing

5.4.2 Troubleshooting

Warning	Warning signal	• Reduce distance between sensor and object • Adjust angle of sensor to object • Remove any contamination
	Undervoltage	• Increase voltage supply to min. 18 V DC
	Ambient light	• Adjust sensor orientation to interfering light source
	Temperature too high	• Mount the mounting bracket as a heat sink • Reduce load on outputs
	Temperature too low	• Increase ambient temperature
Error	Short circuit	• Check the electrical wiring and eliminate the short circuit
	Temperature error	• Disconnect the sensor from the supply voltage and allow it to cool. • Mount the mounting bracket as a heat sink • Reduce load on outputs
	Device error	• Disconnect the sensor from the supply voltage and restart it • Replace the sensor

Required Action in Case of Fault:

NOTE!

- Shut down the machine.
- Analyze and eliminate the cause of error with the aid of the diagnostics information.
- If the error cannot be eliminated, please contact wenglor's support department.
- Do not operate in case of indeterminate malfunctioning.
- The machine must be shut down if the error cannot be definitively explained or properly eliminated.

DANGER!

Risk of personal injury or property damage in case of non-compliance!

The system's safety function is disabled. Personal injury and damage to equipment may occur.

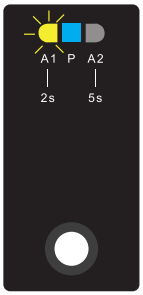
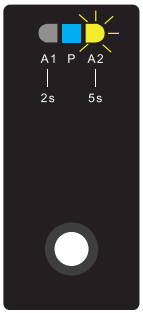
- Required action as specified in case of fault.

6. Settings

6.1 Configuration with Push of Button / Teach-In

This section describes the settings that can be configured directly on the sensor using the button.
For versions with teach-in, the settings are made with the teach-in key, for versions with display via the Enter key.
Sensors with display can be configured directly without entering the menu.

6.2 Versions with Switching Outputs

P3PCx0x, P3PCx6x, P3ECx0x, P1PCx8x	
	**Teach-In for O1** 1. Adjust the sensor so that the light spot strikes the object to be taught in. 2. Press and hold the Teach-in key for 2 seconds until LED O1 starts to flash. 3. Release the Teach-in key or Enter key. 4. The distance is taught in and LED O1 flashes twice briefly in order to confirm successful teach-in.
	**Teach-In for O2** 1. Adjust the sensor so that the light spot strikes the object to be taught in. 2. Press and hold the Teach-in key for 5 seconds until LED O2 starts to flash. 3. Release the Teach-in key or Enter key. 4. The distance is taught in and LED O2 flashes twice briefly in order to confirm successful teach-in. Not valid for P3PCx8x.
	**NOTE!** When teaching in, if there is no object or the object is too far from the sensor, the switching distance is set to the end of the setting range. The Power LED lights up yellow, and the switching status LEDs for the respective switching output flash twice. The same applies if the object is too close, but in this case, the switching distance is set to the beginning of the setting range. If there is an error during teach-in preventing it from being carried out, this is indicated by a red LED.

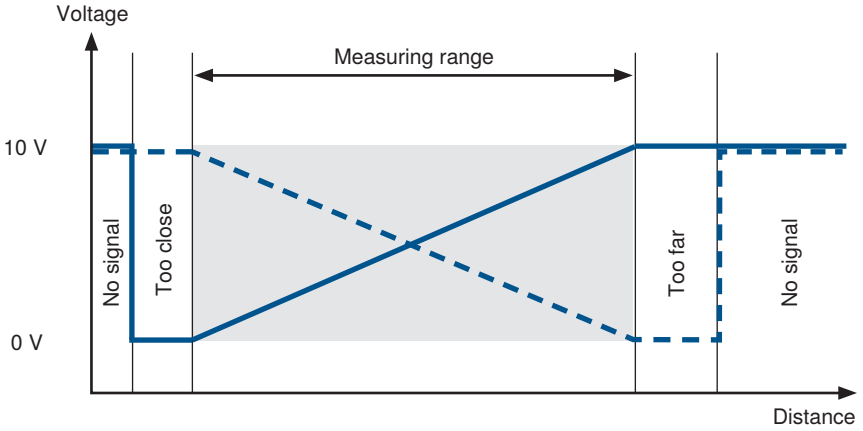
6.3 Versions with Analog Output

P3PCx1x, P3ECx1x, P3PCx4x, P3ECx4x

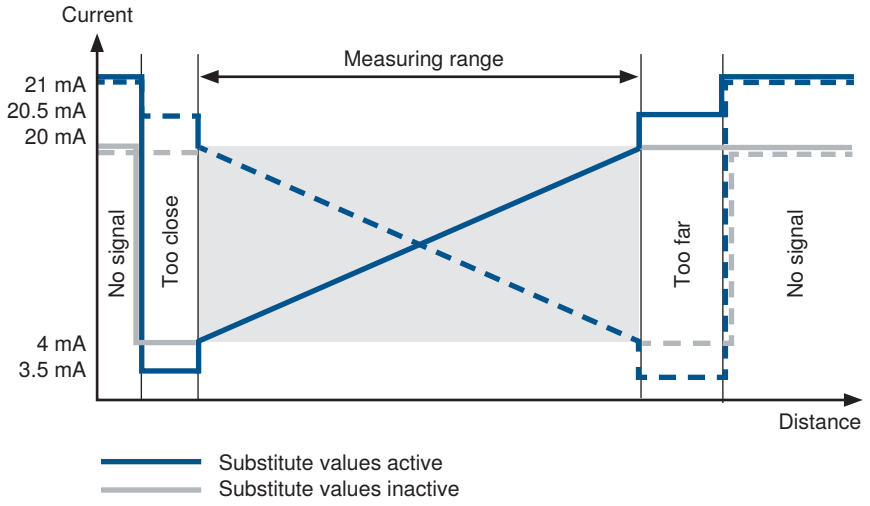
Analog Output Function

The sensor reads out its measured value as a linear proportional current or voltage value. The characteristic curve can be set within the entire measuring range by teaching in.

Voltage output



Current output



Substitute Values (Current Output Only)

By means of substitute values, the sensor is able to provide more precise diagnosis as to whether the analog signal corresponds to a valid measured value within the measuring range.
No signal: 21 mA

Rising Characteristic Curve

Object outside near measuring range: 3.5 mA
Object outside far measuring range: 20.5 mA

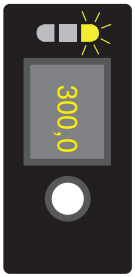
Falling Characteristic Curve

Object outside near measuring range: 20.5 mA
Object outside far measuring range: 3.5 mA

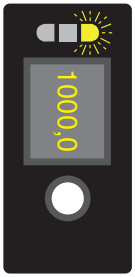
The substitute values function can be deactivated via the menu, Bluetooth or IO-Link.

Teach-In

The teach-in function can be used to scale the analog output and assign the min./max. values to measured distances. By default, 4 mA/0 V corresponds to the minimum measuring range, and 20 mA/10 V corresponds to the maximum measuring range.



Teach-in for 4 mA/0 V
1. Adjust the sensor so that the light spot strikes the object to be measured.
2. Press and hold the Teach-in key for 2 seconds until O starts to flash slowly.
3. Release the Teach-in key or Enter key.
4. The distance is taught in, and LED O flashes briefly twice in order to confirm successful teach-in.



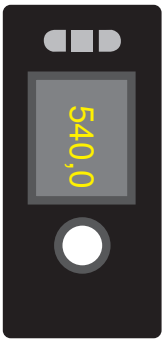
Teach-In for 20 mA/10 V
1. Adjust the sensor so that the light spot strikes the object to be measured.
2. Press and hold the Teach-in key or Enter key for 5 seconds until LED O starts to flash rapidly.
3. Release the Teach-in key or Enter key.
4. The distance is taught in, and LED O flashes briefly twice in order to confirm successful teach-in.

NOTE!

Depending on whether the smaller distance value is assigned to 4 mA/0 V or 20 mA/10 V, either a rising or a falling analog characteristic curve results.
If teach-in is conducted without an object or if an object is too far from the sensor, the analog value is set to the maximum value of 20 mA/10 V, and the Power LED lights up yellow. If an object that is too close is taught in, the analog value is set to the minimum value of 4 mA/0 V, and the Power LED also lights up yellow. If there is an error during teach-in preventing it from being carried out, this is indicated by a red LED.

7. Configuring Settings via Menu

This section describes the settings that can be configured using the built-in OLED display.
The menu is controlled by pressing the Enter key.



In Display mode, the current measured distance is shown.

Menu control

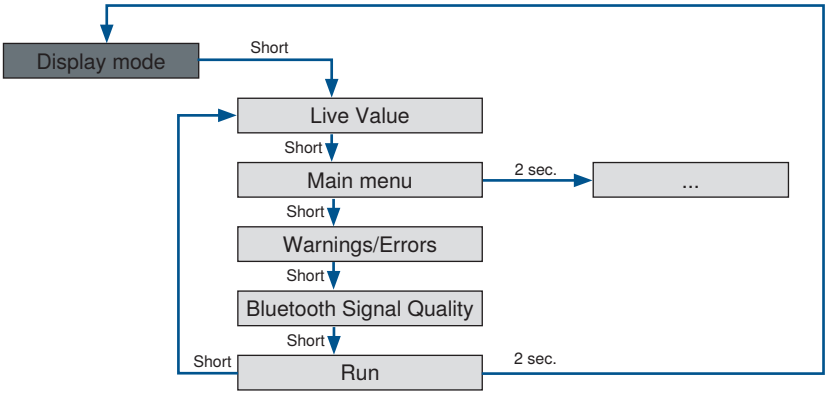
Pressing the Enter key navigates through the menu and applies settings.

Short-press in Display mode	Jump to menu
Short-press	Next menu item
Press button for 2 sec.	Selection
Press button 5 sec.	Exits the menu, Display mode.

Menu Structure

The menu is divided into two sections. The Info menu shows various status messages from the sensor. The Info menu also opens the main menu where the settings can be configured.

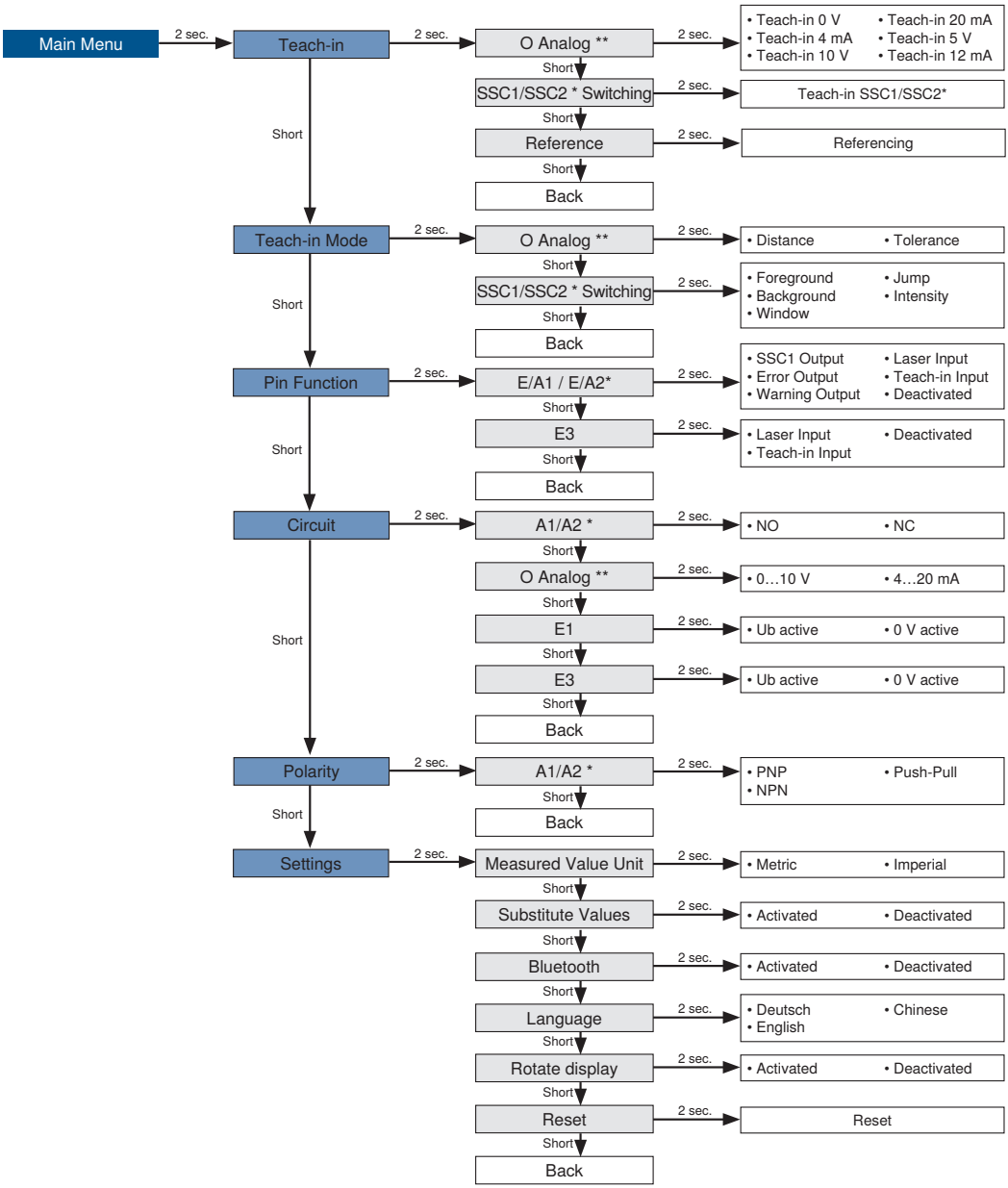
Info menu



Live Value		This view is displayed after jumping to the Info menu. The current measured distance is displayed in combination with the measured value's unit.
Main menu		Jumps to main menu to apply settings.
Warnings/Errors		This view shows warnings or errors.
Bluetooth Signal Quality		This view shows the Bluetooth signal quality.
Display mode		Returns to Display mode.

Main menu

The corresponding functions are described in section “10.1 Parameters” on page 58.



* Only for digital Versions P3PCx6x
** Only for analog Versions P3PCx1x, P3PCx4x, P3ECx1x, P3ECx4x

8. Function Descriptions

The functions described in the following section can be set via wTeach or IODD via IO-Link. For version with display, they can also be set via weCon app per Bluetooth; basic functions can be set via the display menu.

8.3.1 Sensor Functions

Function	Possible Settings	Default
Exposure mode	With black or glossy objects, it may be useful to increase the exposure time. Decreasing the exposure time can be useful if the sensor is aimed at very bright objects. The longer the exposure time, the lower the speed of the sensor. **Auto** With the Adaptive Autoexposure function, the sensor automatically sets its exposure time or light pulse duration, up to a maximum value, for the object to be detected. **Fix** The exposure time is set via the fixed exposure time parameter, i.e., not automatically adjusted by the sensor	Auto
Fixed exposure time	Used to manually set a fixed exposure time. **1…1,600 µs**	Sensors with laser (red): 400 μs Sensors with laser (blue): 1600 μs
Maximum exposure time	Maximum exposure time in Auto mode. **1…1,600 µs**	Sensors with laser (red): 400 μs Sensors with laser (blue): 1600 μs
Measured value filter	A bigger filter improves the sensor's reproducibility and smooths the signal waveform. The larger the filter selected, the longer the sensor's response time when the measured values change. **0 = off** **1…9**	3
Offset	The Offset function is used to change the momentary measured value to a specified value. In this case, the switching thresholds and analog measuring ranges are adjusted along with this value. The offset value is added to the current distance.	0 µm
Preset offset value	Value to which the current measured value is to be set by a corresponding offset. The offset is calculated automatically. P3PC0xx: 30,000…80,000 µm P3PC1xx: 40,000…240,000 µm P3PC2xx: 50,000…350,000 µm P3PC3xx: 60,000…660,000 µm P3EC4xx: 150,000…100,000 µm	0 µm

Function	Possible Settings	Default
Apply preset offset	The current measured value is changed to the preset offset value. **1= apply**	0
Distance range	A distance range in which signals are to be evaluated can be defined within the working range. Signals outside the set distance range are ignored and are not included in the signal evaluation. This means that ranges for which no usable signals are expected can be completely hidden. This function can be used to suppress interfering signals, such as those produced by a glass disk, for instance. **Min. Distance: Working range** **Max. Distance: Working range** **NOTE!** • Objects outside the set distance range are evaluated as “No signal". • If a distance range is set, a blind spot directly behind this range results. The sensor cannot detect any objects within the blind spot. The size of the blind spot depends on the reflectance of the interfering objects in the hidden area.	Setting range
Sensitivity	The sensor has a very high sensitivity and can detect objects, measuring the distance to them, even when the signal is very weak. In applications where the object to be detected yields even weaker signals, e.g., due to large inclinations, it can be helpful to further increase the sensitivity or to amplify the optical signal. The higher the sensitivity, the more susceptible the sensor is to interference. The speed of the sensor is not reduced by the setting. **Standard** Corresponds to the default setting **High** Amplification by factor 2 **Maximum** Amplification by factor 4	Standard

Function	Possible Settings	Default
Emitted light	The sensor's laser can be switched on or off. **On** Laser on **Off** Laser off The sensor no longer supplies a measured value. **NOTE!** • If an input is set as a laser-off input, the emitted light can also be switched on and off via the input. • If the laser is switched off, the sensor behavior corresponds to the status "No signal."	On
Localization	The supply voltage indicator of the sensor can be switched to flashing green. This allows the sensor to be easily located in a plant. **On** The LED supply voltage flashes green. **Off** LEDs function normally.	Off
Measured value unit	The measured distance can be output in micrometers or mils. **Micrometer** Distance values output in mm **Mil** Distance values output in 1/10 mil.	Micrometer
Bluetooth	The Bluetooth interface can be switched on/off. **On** **Off**	On
Bluetooth Password Function	The Bluetooth function can be password protected to prevent unauthorized access. **On** **Off** **NOTE!** Only the Bluetooth function is protected. Communication is possible via IO-Link or the OLED menu at any time.	Off
Bluetooth Password	Enter a Bluetooth password. To access the device using the Bluetooth app, enter this password in the app. **NOTE!** If the password has been forgotten, a new password can be assigned via IO-Link.	--

8.3.2 Display Functions

Function	Possible Settings	Default
Language	Selecting the Display Language **Deutsch** **English** **Chinese**	English
Rotate display	Rotates the display 180°. **On** **Off**	Off

8.3.3 Laser Class 2 Activation (only valid for versions with red laser)

Sensors with red lasers are classified as laser class 1, which is deemed safe for eye exposure. This enable the sensors to achieve excellent performance. When detecting very dark objects at fast speeds or in rough environments, it can be helpful to increase the laser output, which then means that the sensor is laser class 2. For security reasons, licensing is required for this.

In this case, the laser class 2 license for ZNN1005 must be ordered and a license request file can be sent via e-mail. The sensor's serial number must be provided when ordering. There are two ways to do this. A file containing the serial number can be created using wTeach.

The laser class license key will be sent via email after the license is ordered. It is then read in via wTeach. If licensing is successful, the parameter for setting the laser class is enabled.

In addition, a set of laser warning signs is included with delivery; they have to be installed before the laser class is switched.

NOTE!
This key cannot be transferred to other devices and only works for the device with the licensed serial number.

ATTENTION!
If the sensor is switched to laser class 2, the permissible ambient temperature changes to –30...50 °C.

WARNING!
Before switching to laser class 2, the warning signs provided must be installed in accordance with the standard! In addition, the marking of laser class 1 on the type plate of the sensor, which is no longer applicable, must be covered with the enclosed laser class 2 sticker.

WARNING!
After changing the laser class, the sensor must be restarted for the setting to become active.

Laser class license key	Enter the license key provided.	–
Laser class	Settings for laser class used **Laser Class 1** **Laser Class 2**	Laser class 1

8.3.4 Input/Output Functions (I/O)

8.3.4.1 Pin Function

The Pin function is used to define the function of pins I/O1, I/O2 (digital versions only) and I3, as these can be used for different functions.

Pin	Possible Settings	Default
I/O1	**Switching Output** Switching point SSC1 is assigned to the switching output. **Error Output** The error output switches if one of the assigned errors occurs; see table “Status Messages” on page 53. **Warning Output** The warning output switches if one of the assigned warnings occurs; see table “Status Messages” on page 53. **Laser-Off Input** See I3 for an explanation **Teach-In Input** See I3 for an explanation **Deactivated** The pin is deactivated.	Digital versions: Switching output Analog versions: Error output P3PCx8x: Switching output
I/O2	**Switching Output** Switching point SSC2 is assigned to the switching output. **Antivalent Switching Output** The switching output switches antivalently to switching output O1. **Error Output** The error output switches if one of the assigned errors occurs; see table “Status Messages” on page 53. **Warning Output** The warning output switches if one of the assigned warnings occurs; see table “Status Messages” on page 53. **Laser-Off Input** See I3 for an explanation **Teach-In Input** See I3 for an explanation **Deactivated** The pin is deactivated.	Digital versions: Switching output Analog versions: not available P3PCx8x: not available

I3	**Laser-Off Input** The sensor's emitted light is deactivated as long as the input is activated. Then the sensor does not send a measured value and sets the status to "No signal". **Teach-In Input** Teach-in The outputs (switching outputs/analog output) can be set by following the same procedure as with the Teach-in key (see section 6). An activated input corresponds to a depressed Teach-in key. Locking If 18…30 V DC is continuously applied to the teach-in input, the Teach-in key is locked and protected to prevent unintentional changes, like the input signal. **Deactivated** The pin is deactivated.	Laser-Off Input

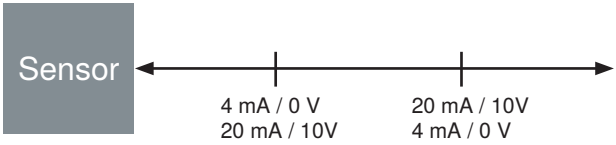
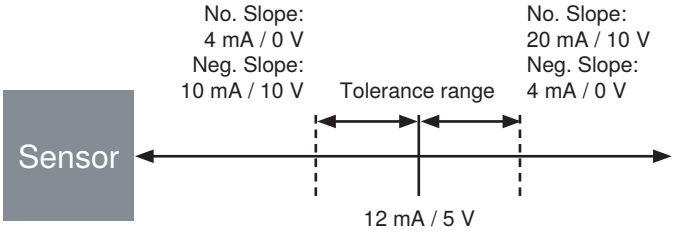
8.3.4.2 Output Functions

The output functions are used to set the physical outputs.

Digital Outputs

Function	Possible Settings	Default
Polarity	**PNP** **NPN** **Push-Pull**	PNP
Circuit	**NO** Light Switching (Normally Open) The output is high when the condition has been satisfied, depending on settings (switching point, warning, error). **NC** Dark switching (normally closed) The output is low when the condition has been satisfied, depending on settings (switching point, warning, error).	NO
On-delay	**0…10,000 ms**	0 ms
Off-delay	**0…10,000 ms**	0 ms

Analog Outputs

Function	Possible Settings	Default
Teach-in	Starts the teach-in process.	
Teach-in mode	**Distance** A distance is taught in to the analog limit values, and the distance is output as a linearly proportional current or voltage value.  **Tolerance** A distance is taught in to the measuring range, serving as the measurement reference, for 5 V or 12 mA. The tolerance range is set around this value. 	Distance
0 V / 4 mA	For Distance Teach-in mode In Distance Teach-in mode, the 0 V or 4 mA value is assigned to a distance within the measuring range. **Measuring range**	P3PC0xx: 30,000 µm P3PC1xx: 40,000 µm P3PC2xx: 50,000 µm P3PC3xx: 60,000 µm P3EC4xx 150,000 µm
10 V / 20 mA	For Distance Teach-in mode In Distance Teach-in mode, the 10 V or 20 mA value is assigned to a distance within the measuring range. **Measuring range**	P3PC0xx: 80,000 µm P3PC1xx: 240,000 µm P3PC2xx: 350,000 µm P3PC3xx: 660,000 µm P3EC4xx 1000,000 µm

Function	Possible Settings	Default
5 V / 12 mA	For Distance Teach-in mode In Tolerance Teach-in mode, the 5 V or 12 mA value is assigned to a distance within the measuring range. **Measuring range**	P3PC0xx: 55,000 µm P3PC1xx: 140,000 µm P3PC2xx: 200,000 µm P3PC3xx: 360,000 µm P3EC4xx: 575,000 µm
Tolerance range	For Distance Teach-in mode The tolerance range is symmetrical around the 5 V / 12 mA point and defines the range while the measurement is taken. **P3PC0xx: 1000...80.000 µm** **P3PC1xx: 1000…240.000 µm** **P3PC2xx: 1000…350.000 µm** **P3PC3xx: 1000…660.000 µm** **P3EC4xx: 1000…1000.000 µm** **NOTE!** If the tolerance range exceeds the limits of the measuring range, the corresponding analog values or substitute values outside the measuring range are output from that point.	P3PC0xx: 25,000 µm P3PC1xx: 100,000 µm P3PC2xx: 150,000 µm P3PC3xx: 300,000 µm P3EC4xx: 425,000 µm
Tolerance characteristic	For Distance Teach-in mode The characteristic indicates whether the analog value increases or decreases as the distance increases. **Positive slope** The analog value increases as the distance increases. **Negative slope** The analog value decreases as the distance increases.	Positive slope
Analog mode	Current output **4…20 mA** Voltage output **0…10 V**	P3xCx11, P3xCx41, P3PCx8x: 4…20 mA P3xCx12, P3xCx42: 0…10 V

Function	Possible Settings	Default
Analog substitute values	As described in section “6.3 Versions with Analog Output” on page 26, substitute values can be enabled or disabled. **Enabled** Sensor outputs substitute values. **Disabled** Sensor does not use substitute values. **NOTE!** Function can only be used for current output.	Enabled

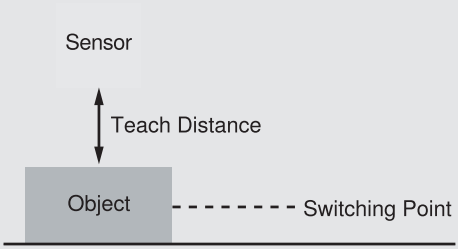
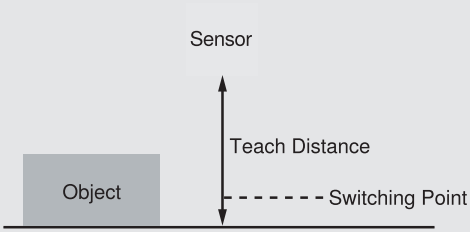
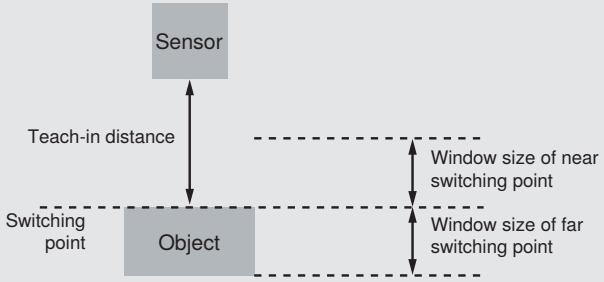
8.3.4.3 Input Functions

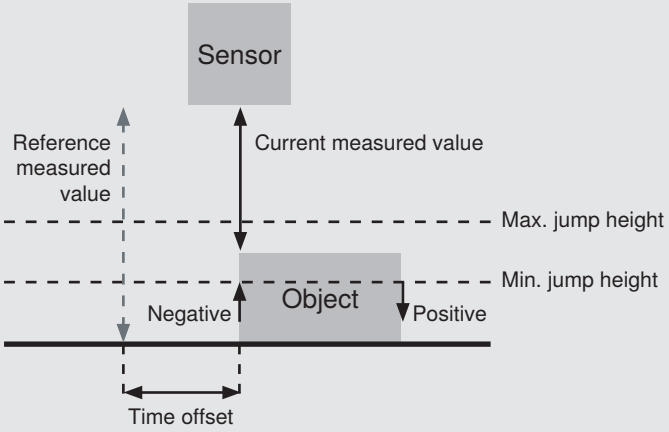
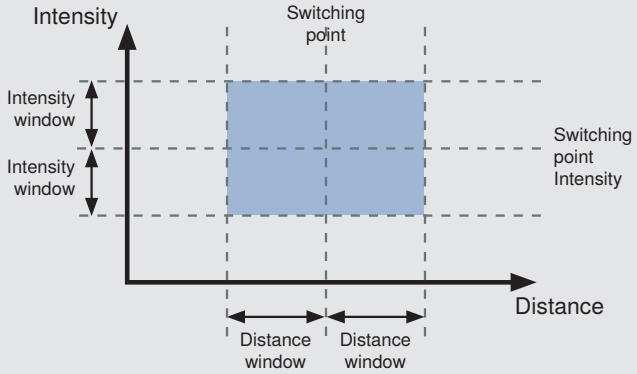
The input functions are used to set the physical inputs.

Function	Possible Settings	Default
Input mode	**Operating Voltage Active** Function is triggered as soon as operating voltage is applied to the input. **Operating Voltage Inactive** Function is triggered as soon as 0 V is applied to the input or the input is opened.	Operating voltage active

8.3.5 Switching Point Functions (SSC1/SSC2)

The switching point functions are used to set the two switching points, SSC1 and SSC2.
In the digital versions, SSC1 is assigned to output O1, and SSC2 is assigned to output O2.
In the analog versions, SSC1 and SSC2 are initially available via IO-Link only. If I/O1 is configured as a switching output, SSC1 is assigned to it.

Function	Possible Settings	Default
Teach-in	Starts the teach-in process.	
Teach-in mode	**Foreground Teach-In**  **Background Teach-In**  **Window Teach-In** 	Foreground teach-in

Function	Possible Settings	Default
	Jump Detection In this mode, there is no switch to an absolute measured value, but rather to a measured value jump occurring between two measurements.  **Distance and intensity** In this mode, the intensity of the received signal is also evaluated for distance. The sensor is taught in a reference that consists of a switching point for the distance and a switching point for the intensity. As soon as the sensor detects a deviation in distance or intensity, this is registered via the output.  **NOTE!** The Teach-in function is necessary to ensure that the sensor works properly.	

Function	Possible Settings	Default
Switching point	P3PC0xx: 30.000…80.000 µm P3PC1xx: 40.000…240.000 µm P3PC2xx: 50.000…350.000 µm P3PC3xx: 60.000…660.000 µm P3EC4xx: 150.000…1000.000 µm **NOTE!** If a distance range has been set, the switching point can be set within the set distance range only.	P3PC0xx: 80.000 µm P3PC1xx: 240.000 µm P3PC2xx: 350.000 µm P3PC3xx: 660.000 µm P3EC4xx: 1000.000 µm
Hysteresis mode	Hysteresis is the difference between the switch-on and switch-off point. **Auto** The hysteresis is automatically calculated by the sensor so that it can be adjusted to best suit the respective situation. After teaching in or changing the switching point, the hysteresis is recalculated and updated automatically under the Hysteresis parameter. The information given on the data sheet corresponds to the set switching point, e.g., switching point at 100 mm, hysteresis per data sheet < 0.5% → hysteresis < 0.5 mm **Fix** The hysteresis is set to a fixed value under the Hysteresis parameter. This value is not adjusted automatically when teaching in or changing the switching point. A small hysteresis is recommended so that flat objects can be detected against a background. A larger hysteresis is recommended to ensure stable detection when conditions are variable.	Auto
Hysteresis	Absolute value of the hysteresis in hysteresis mode Fix P3PC0xx: 2 µm…50.000 µm P3PC1xx: 3 µm…200.000 µm P3PC2xx: 4 µm…300.000 µm P3PC3xx: 5 µm…660.000 µm P3EC4xx: 5 µm…850.000 µm	P3PC0xx: 300 µm P3PC1xx: 700 µm P3PC2xx: 1000 µm P3PC3xx: 1800 µm P3EC4xx: 1800 µm
Near switching point window	In Teach-in mode, Window Teach-in Distance from the set center of the window to the window's switching point that is close to the sensor. The window can be set so that it extends from the sensor's minimum setting range to its maximum setting range. The possible minimum and maximum settings result from the center of the window set in a particular instance.	30 mm

Function	Possible Settings	Default
Far switching point window	In Teach-in mode, Window Teach-in Distance from the set center of the window to the window's switching point that is far away from the sensor. The window can be set so that it extends from the sensor's minimum setting range to its maximum setting range. The possible minimum and maximum settings result from the center of the window set in a particular instance.	30 mm
Min. jump height	In Teach-in mode, Jump detection The min. jump height specifies the measured value jump from which a jump event should be detected. In the "Automatic" setting, the sensor calculates the smallest possible jump independently. 0 = Automatic, P3PC0xx: 3 µm…50.000 µm P3PC1xx: 5 µm…200.000 µm P3PC2xx: 6 µm…300.000 µm P3PC3xx: 8 µm…660.000 µm P3EC4xx: 8 µm…850.000 µm	Automatic
Max. jump height	In Teach-in mode, Jump detection The max. jump height specifies the measured value jump up to which a jump event should be detected. In the "No restriction" setting, there is no restriction on the maximum jump height. A change from a valid measured value to "No measured value" is evaluated as a negative jump. 4294967295 = No restriction P3PC0xx: 3 µm…50.000 µm P3PC1xx: 5 µm…200.000 µm P3PC2xx: 6 µm…300.000 µm P3PC3xx: 8 µm…660.000 µm P3EC4xx: 8 µm…850.000 µm	No restriction
Jump direction	In Teach-in mode, Jump detection **Positive** A jump is detected when a measured value jumps to a higher value which is further away from the sensor. **Negative** A jump is detected when a measured value jumps to a lower value which is closer to the sensor. **Both** A jump is detected for both positive and negative.	Negative

Function	Possible Settings	Default
Cycle offset	In Teach-in mode, Jump detection The cycle offset indicates which time-shifted reference measured value to use for comparison with the current measured value in order to detect the jump. **1…256 cycles**	50
Jump pulse duration	In Teach-in mode, Jump detection **0 = hold** The output remains active until the next jump in the opposite direction has been detected. **1…10,000 ms** If a jump is detected, the output is activated with the corresponding pulse length.	0
Distance window	In Teach-in mode, Distance + Intensity Distance from set switching point (center of window) to window limits. The distance window is symmetrical around the switching point. **P3PC0xx: 2 µm…10.000 µm** **P3PC1xx: 3 µm…10.000 µm** **P3PC2xx: 4 µm…10.000 µm** **P3PC3xx: 5 µm…10.000 µm** **P3EC4xx: 5 µm…10.000 µm**	P3PC0xx: 300 µm P3PC1xx: 700 µm P3PC2xx: 1000 µm P3PC3xx: 1800 µm P3EC4xx: 1800 µm
Intensity switching point	In Teach-in mode, Distance + Intensity Intensity switching point in digits **1…1,000,000**	30,000
Intensity window	In Teach-in mode, Distance + Intensity From set intensity switching point (center of window) to window limits. The intensity window is symmetrical around the switching point. **1…50 %**	4 %

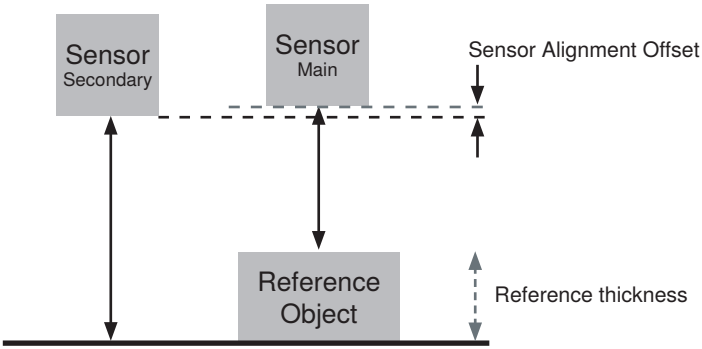
8.3.6 Differential and Thickness Measurement

In this operating mode, two sensors work together to calculate a difference or thickness from the individual measurement results.

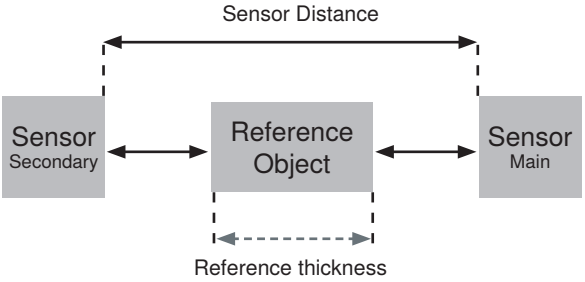
This saves time by eliminating the need to program the control unit, and enables the system to immediately calculate and provide a value. This value can then be used for the switching function, or output via analog output. In addition, the calculated difference or thickness is output as an absolute value via IO-Link.

Mechanical layout

Differential measurement



Thickness measurement



We recommend positioning the sensors in such a way that there is no area between the sensors which is not covered by the sensors' measuring range (Fig. 1 and 2).

If this is the case, the object to be measured must be wider than the area not covered (Fig. 3).

The sensors must be aligned so that the transmission beams hit the front screen of the opposite sensor. Make sure that they do not hit the transmitter or receiver directly.

Fig. 1

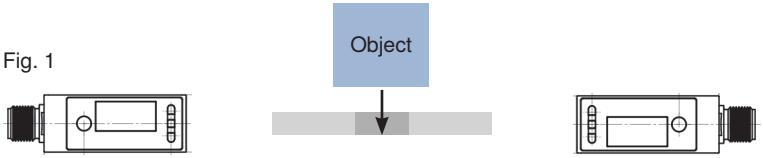


Fig. 2

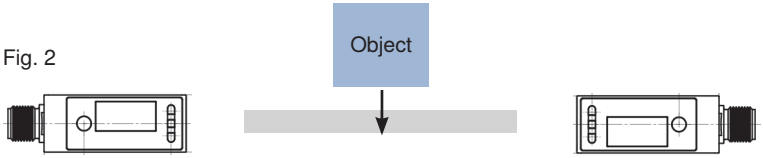
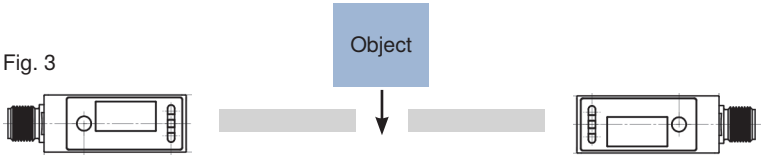


Fig. 3

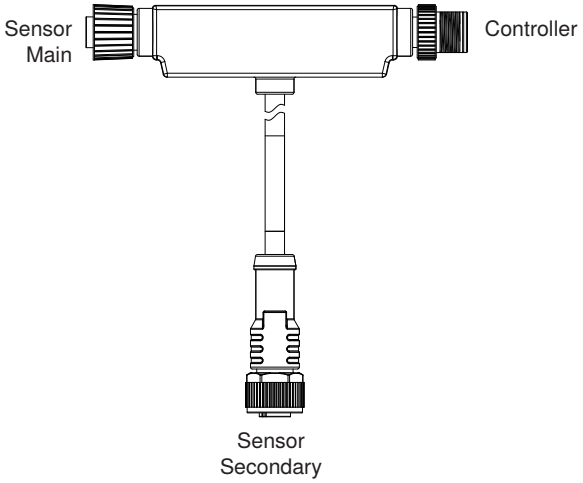


Working range

Wiring

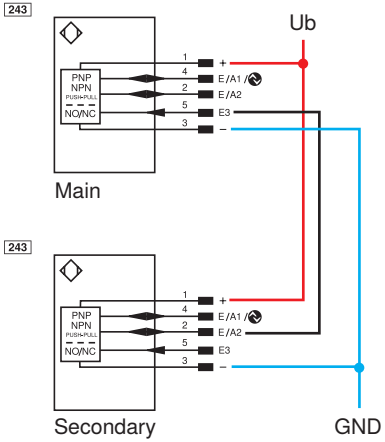
With adapter

The ZC4G004 adapter can be used for simple wiring. Here, only the sensors need to be connected as shown. The sensors are automatically parameterized for the respective operating mode as soon as the sensors are connected. In this case, the main sensor is set to the “Thickness Measurement” operating mode. The operating mode must be changed accordingly when performing a differential measurement.



The connections of the adapter can be extended by connection cables. It should be noted that 5-pole connection cables are used for the connectors of the sensors.

Direct wiring
As an alternative to using the adapter, the sensors can also be wired directly, via the connection terminals, or to a control unit. To do so, the sensors must be connected according to the following connection diagram. Here, the sensor operating mode must be set manually.



The example shows an application using two digital sensors. In this case, pins 2 and 4 on the main can be used to set the switching points in relation to the calculated difference or thickness. Two analog sensors or a combination of digital and analog sensors can also be used. In this case, the calculated thickness can then be tapped on the main sensor's analog output as an analog signal.

NOTE!

- Sensors with different measuring ranges can also be combined with each other. In this case, the respective working ranges must be observed during installation.
- A combination of versions with red and blue laser is also possible. This combination is recommended if the sensors interfere with each other without object inbetween due to the mounting situation.

Referencing

To perform the thickness/differential measurement, the system must be referenced for the mechanical layout and the wiring.
The sensors automatically calibrate the distance to one another so that measurement results can be calculated for the respective setup.

Referencing can be performed via the Teach-in or Enter key, via the OLED menu, via Bluetooth or via IO-Link.

The reference object must be placed in the measuring system, depending on the mechanical layout.

To reference using the Teach-in key, press and hold this key for 10 seconds until both LEDs, O1/O2 or O/O1, begin to flash. Then release the button. The LEDs flash twice briefly for confirmation. The sensors are now referenced.

Outputs

If a sensor is in the main thickness/difference operating mode, the calculated thickness or difference is used for output at the outputs from now on.

SSC1/SSC2
All settings can be carried out identically to stand-alone operation. However, the switching points do not correspond to a distance, but to the thickness/difference. The switching points are set via separate parameters. All other settings are carried out with the general parameters of SSC1/SSC2.

Analog output
In this operating mode, the analog output only works with the tolerance mode. The reference value corresponds to 12 mA or 5 V on the analog output. The tolerance range and characteristics can be set via separate parameters.

Settings

Function	Possible Settings	Default
Mode of operation	**Stand Alone** The device functions as a stand-alone device. **Secondary** The sensor provides measurement data for a main device. **Main Thickness** The sensor performs a thickness measurement using the connected secondary. **Main Difference** The sensor performs a differential measurement using the connected secondary. **Automatic** This setting is used to enable automatic detection of adapter ZC4G004, when in use, and to preset the operating mode according to the connection. The main sensor is set to Thickness mode.	Automatic
Referencing	Starts the referencing process. To do so, the reference object must be placed in the measuring system, depending on the mechanical layout, and referencing started. With an analog sensor, 5 V / 12 mA is applied automatically to the analog output after referencing. Changes, in comparison to the reference thickness, are now output accordingly.	
Sensor alignment offset (Difference)	When referencing, the offset is calculated using the specified reference thickness.	0 µm
Sensor distance (Thickness)	When referencing, the sensor distance is calculated using the specified reference thickness.	P3PC0xx: 160.000 µm P3PC1xx: 480.000 µm P3PC2xx: 700.000 µm P3PC3xx: 1.320.000 µm P3EC4xx: 2.000.000 µm
Reference thickness	The reference thickness corresponds to the true thickness of the reference object. This thickness is used by the sensor to calculate the absolute value that is output by the main sensor via IO-Link. For analog main sensors, the analog value 12 mA or 5 V is assigned to the reference thickness	0 µm
Switching point	Switching point in relation to a thickness or difference used for the function of SSC1 and SSC2.	

Function	Possible Settings	Default
Tolerance range	The tolerance range is symmetrical around the 12 mA / 5 V value and defines the range while the analog value changes linearly to the measured value. P3PC0xx: 50.000 µm P3PC1xx: 200.000 µm P3PC2xx: 300.000 µm P3PC3xx: 600.000 µm P3EC4xx: 850.000 µm	P3PC0xx: 1000 µm…50.000 µm P3PC1xx: 1000 µm…200.000 µm P3PC2xx: 1000 µm…300.000 µm P3PC3xx: 1000 µm…600.000 µm P3EC4xx: 1000 µm…850.000 µm
Tolerance characteristic	**Positive slope** The analog value increases with increasing thickness. **Negative slope** The analog value decreases with increasing thickness.	Positive slope

8.3.7 Condition Monitoring Functions

8.3.7.1 Status Message Function

The sensor provides a large number of different status messages. Due to the process data structure, four status messages can be transmitted as individual process data.
These parameters can be used to set the status messages that are transmitted via the process data.

Function	Possible Settings	Default
Message 1	See table “Status Messages” on page 53	Warning signal
Message 2		Ambient light
Message 3		Temperature too high
Message 4		Short circuit

8.3.7.2 Warning/Error Output Function

The status messages used to trigger the collective message can be defined for the warning output and the error output respectively. The status messages are OR-linked so that the output is activated when one of the defined status messages is activated.

Function	Possible Settings	Default
Warning output	See table “Status Messages” on page 53	Signal warning, ambient light, temperature too high, temperature too low, undervoltage
Error output		Object too close, object too far, no signal, device error, over-temperature, short circuit

Status Messages

Warnings	
Warning signal	The object reflects little light.
Ambient light	Object detection is impeded by much ambient light.
Overexposure	The sensor signal is overexposed.
Temperature too high	The sensor's internal temperature is high.
Temperature too low	The sensor's internal temperature is low.
Undervoltage	The supply voltage is low.
Emitted light off	The sensor's emitted light is switched off.
Errors	
No signal	The sensor is not receiving a signal.
Object too close	The object is below the setting range or the set measuring range.
Object too far	The object is above the setting range or the set measuring range.
Short circuit	A short circuit has occurred on at least one pin.
Temperature error	Temperature is outside permissible range. To protect the emitting unit, the laser is switched off.
Device error	A hardware error has occurred. For safety reasons, the laser is switched off.
Laser error	There is an error in the laser module. For safety reasons, the laser is switched off.

8.3.7.3 Simulation Functions

This function simulates the behavior of the sensor regardless of the current status and measured value. This can be used to check whether a plant in which the sensor is integrated reacts correctly to the data supplied by the sensor and processes them accordingly.

If a measured value is specified, the sensor behaves as if the specified measured value corresponds to the actual measured value. This means that the behavior of the outputs and status messages is simulated according to the specified measured value.

In addition, the individual outputs and status messages can be simulated separately from the measured value.

Function	Possible Settings	Default
Simulation mode	On Off	Off
Measured value test	Current measured value Min. to max. measuring range	Current measured value
Output O Test	According to the measured value P3xCx11/P3xCx41/P3xCx81: 4...20 mA P3xCx12/P3xCx42: 0...10 V	According to the measured value
SSC1 Test	According to the measured value On Off	According to the measured value
SSC2 Test	According to the measured value On Off	According to the measured value
Status messages test	Tests the individual status messages According to the measured value On Off	According to the measured value

NOTE!

- Output O1 is used for IO-Link communication in this function and cannot be simulated.
- Simulation mode ends automatically as soon as the power supply is interrupted.

9. Bluetooth

The P3PC/P3EC series variants with OLED displays also feature a built-in Bluetooth interface. This interface can be used to configure and parameterize devices using a smartphone and the wenglor “weCon” app.
In addition, process data is sent to the app, where it is displayed in a clear, concise manner.

9.1 weCon Installation

The wenglor app can be downloaded free of charge from the Google Play Store and Apple App Store. Download the app and follow the installation instructions.

GET IT ON Google Play

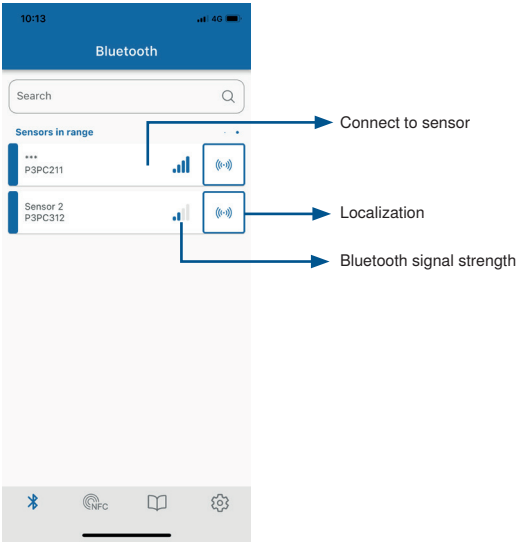
Download on the App Store

Scan the code below to access the wenglor app directly.

9.2 Establishing Connection with Sensor

Open the weCon app on your smartphone.
When the app is opened, all wenglor sensors with Bluetooth interface and within range are set to Pairing mode.
This mode is indicated by the flashing blue LED on the sensors.
Pairing mode is used to pair the app with a corresponding sensor.

Once the app is opened, a list of all sensors within range is shown.



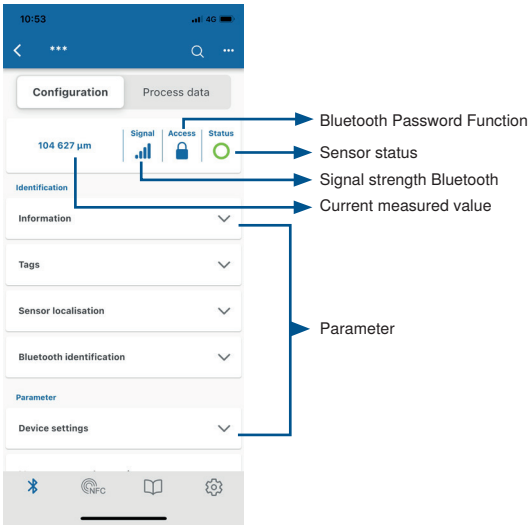
If too many sensors of the same type are fitted within the Bluetooth range, the sensor's supply voltage LEDs can be switched to flashing green by pressing the "Localization" button. This simplifies identification.

Press the "Back" button to open the sensor list again.
Pressing the ">" button establishes a connection to the sensor and opens the user interface.

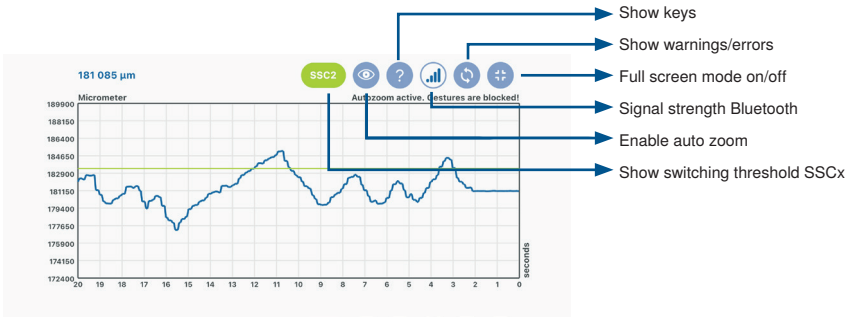
The blue LED will continuously illuminate from now on, indicating that the sensor is paired, and Pairing mode will deactivate.

9.3 Using the weCon App

The sensor parameters are configured using the “Configuration” tab. A detailed description of the individual parameters can be found in section “Function overview".



The “Process Data” tab shows the current measured value, visualizing this value over time in a diagram. The axis scaling can be adjusted in the diagram settings.



NOTE!
The Bluetooth range is approx. 10 m. If the sensor is encapsulated in a system or set up close to obstacles, the range may decrease accordingly.

10. IO-Link

The sensors can exchange parameters and process data via IO-Link. The parameters can be used to make many additional settings on the device. The process data transmit cyclical data and condition monitoring. To this end, the sensor is connected to a suitable IO-Link master (see product detail page/complementary products).

The interface protocol and the IODD can be found at www.wenglor.com in the download area for the respective product.

10.1 Parameters

The parameters that can be configured via IO-Link are given in the functional description in “8. Function Descriptions” on page 31.

10.2 Condition Monitoring & Process Data

The data described in the following section can be read or written cyclically via IO-Link/process data.

10.2.1 Process Data In

Data	Meaning
Measured value	Measured distance in micrometers or mils. As the sensor cannot determine a measured value in the following error cases, substitute values are read out: No signal: 0x7FFFFFFC / 2147483644 Object too close: 0x80000008 / –2147483640 Object too far: 0x7FFFFFF8 / 2147483640
Scale	Scaling of the measured value to the base length unit; –6 corresponds to µm.
SSC1	Switching point 1
SSC2	Switching point 2
Warning	Collective warning in the event of one of the warning status messages (see table “Status Messages” on page 53)
Error	Collective warning in the event of one of the error status messages (see table “Status Messages” on page 53)
Message 1	Status message 1 read out (see 8.3.7.1)
Message 2	Status message 2 read out (see 8.3.7.1)
Message 3	Status message 3 read out (see 8.3.7.1)
Message 4	Status message 4 read out (see 8.3.7.1)

10.2.2 Process Data Out

Data	Meaning
Emitted light	Emitted light on/off
Localization	Sensor flashes for easy sensor location
Teach-in SSC1	Starts the teach-in process for SSC1
Teach-in SSC2	Starts the teach-in process for SSC2

10.3 Events

Events are diagnostic information that is standardized by IO-Link and exchanged between the IO-Link master and the device. The following events are supported:

Name	Event code	Type	Specification
Maintenance necessary: Clean	0x8C40	Notification	IO-Link
Device error: Unknown error	0x1000	Error	IO-Link
Short circuit: Check installation	0x7710	Error	IO-Link
Device temperature too high: Remove heat source	0x4210	Warning	IO-Link
Device temperature too low: Isolate device	0x4220	Warning	IO-Link
Temperature error: Overload	0x4000	Error	IO-Link
Supply voltage too low: Check tolerances	0x5111	Warning	IO-Link

11. wTeach2 Configuration Software

11.1 General

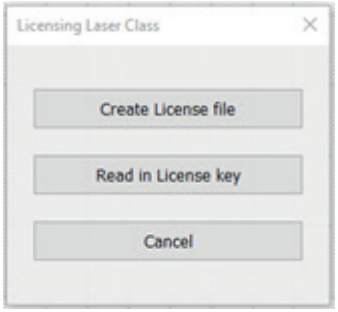
For information on installing and connecting the software and its structure, as well as information on the general functions, see the wTeach operating instructions. They can be found online at www.wenglor.com in the download area under order number DNNF005.

11.2 wTeach Functions

The wTeach operating software can be used to configure all functions, in accordance with the function description, and read out the IO-Link process data. There are also functions that are only available with wTeach. These functions are described in the following sections.

11.2.1 Laser class 2 Licensing

Clicking on the corresponding icon in the menu bar opens a dialog window.



The “Create License file” button is first pressed in the dialog window. Another window opens to select the location for saving the license file. After selection and confirmation, the corresponding file with the extension .3pk is saved.

This file must be sent when ordering the license.

wenglor will then provide the license key. This is sent in the form of a corresponding file with the extension .p3l.

To carry out the licensing, the “Read in License key” button must be pressed in the dialog window. The .p3l file is now selected and uploaded.

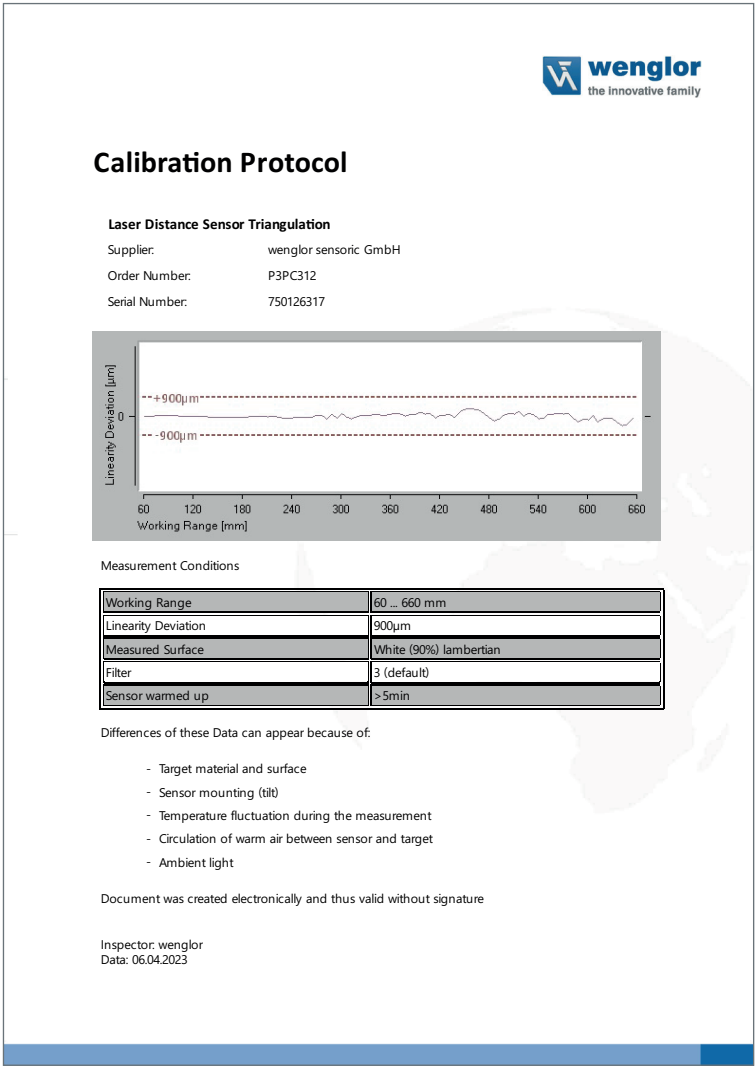
If licensing is successful, the “Laser class” parameter is enabled and this can be set accordingly.

The sensor must be restarted for the setting to become active.

WARNING!
Before switching to laser class 2, the warning signs provided must be installed in accordance with the standard! In addition, the marking of laser class 1 on the type plate of the sensor, which is no longer applicable, must be covered with the enclosed laser class 2 sticker.

11.2.2 Calling up the calibration report

To access the sensor-specific calibration report, click on the corresponding icon in the menu bar.



wenglor
the innovative family

Calibration Protocol

Laser Distance Sensor Triangulation

Supplier: wenglor sensoric GmbH
Order Number: P3PC312
Serial Number: 750126317

Measurement Conditions

Working Range	60 ... 660 mm
Linearity Deviation	900µm
Measured Surface	White (90%) lambertian
Filter	3 (default)
Sensor warmed up	> 5min

Differences of these Data can appear because of:

- Target material and surface
- Sensor mounting (tilt)
- Temperature fluctuation during the measurement
- Circulation of warm air between sensor and target
- Ambient light

Document was created electronically and thus valid without signature

Inspector: wenglor
Data: 06.04.2023

A window opens to select the location for saving the PDF document. After selection and confirmation, the document is saved accordingly.

12. Maintenance Instructions

NOTE!

- This wenglor sensor is maintenance-free.
- Cleaning and inspection of the plug connections at regular intervals are advisable.
- Do not clean the sensor with solvents or cleaning agents that could damage the product.
- The product must be protected against contamination during initial start-up.

13. Proper Disposal

wenglor sensoric GmbH does not accept the return of unusable or irreparable products. The national waste disposal regulations currently in force apply to product disposal.

14. Appendix

14.1 List of Abbreviations

Abbreviation	Meaning
IODD	IO Device Description
MTTFd	Mean Time To Dangerous Failure
SSC	Switching Signal Channel / Switching Point
Ub	Supply voltage
Tu	Ambient temperature

14.2 Change Index for Operating Instructions

Version	Date	Description/Changes
1.0.0	04/18/2023	Initial version of the operating instructions
1.1.0	05/24/2023	Updated Bluetooth password, various corrections
1.2.0	07/10/2023	Addition of technical data (“3. Technical Data” on page 9)
1.3.0	07/18/2023	Addition of other types
1.4.0	08/17/2023	Addition of technical data (“3. Technical Data” on page 9)
1.5.0	09/01/2023	Addition of other types
1.6.0	09/28/2023	Addition of technical data (“3. Technical Data” on page 9)
1.7.0	11/21/2023	Addition of technical data (“3. Technical Data” on page 9)

14.3 Declarations of Conformity

Declarations of conformity can be found on our website at www.wenglor.com in the product’s separate download area.