EN

P1PY1xx

Long-Range Laser Distance Sensors

wintec

Operating Instructions

Translation of the original operating instructions
Subject to change without notice
Available as PDF file only
Version 1.7.0
Status: 20/04/2026
www.wenglor.com

Table of Contents

1. General

1.1 Information Concerning These Instructions

- These instructions apply to products designated P1PY1xx.
- They 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:

Long-Range Laser Distance Sensors

Long-Range Laser Distance Sensors, which function in accordance with the transit time measurement principle, determine the distance between the sensor and the object by measuring the elapsed time from emission to return of the light beam. These sensors have a large working range and thus detect objects over considerable distances.
Special sensors are distinguished by wintec (wenglor interference-free technology). This technology reliably detects black or shiny surfaces even at extreme angles. Several sensors can be installed directly next to or opposite each other without the sensors influencing each other.

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 accessed 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. Non-observance may result in loss of the CE mark, and the guarantee may be rendered null and void.
- 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 60825-1:2014

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

2.7 Approvals and Protection Class

c UL us LISTED
IND. CONT. EQ. 72HL
For use in class 2 circuits
Environmental Type 1

RoHS

3. Technical Data

3.1 General Data

Optical Data	
Maximum reproducibility	3 mm*
Linearity deviation	10 mm*
Light source	Laser (red)
Wavelength	660 nm
Service life (ambient temp. = +25 °C)	100,000 h
Laser class (EN 60825-1)	1
Max. permitted ambient light	100,000 lux
Electrical Data	
Supply voltage	18 – 30 V DC
Temperature drift	< 0,4 mm/K
Temperature range	–40 … –50° C
Switching output voltage drop	< 2.5 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	
Setting method	Teach-in
Housing material	Plastic
Optic cover	PMMA
Degree of protection	IP67/IP68

Depends on mode, see chapter “3.4 Mode-Dependent Data” on page 11

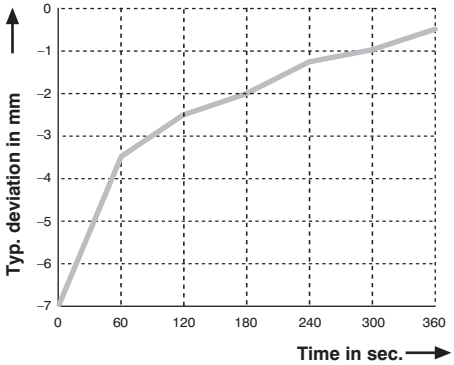
Order No. / Tech. Data	P1PY 101	P1PY 131	P1PY 109 / 109S01	P1PY 111	P1PY 102	P1PY 103	P1PY 131	P1PY 113	P1PY 104	P1PY 107 / 107S02	P1PY 137	P1PY 108	P1PY 138
Working range	0… 10.000 mm	0… 5000 mm	0…10.000 mm				0… 5000 mm	0… 10.000 mm		0… 10.000 mm	0… 5000 mm	0… 10.000 mm	0… 5000 mm
Setting range	50… 10.000 mm	50… 5000 mm	50… 10.000 mm				50… 5000 mm	50…10.000 mm		—			
Measuring range	—									50… 10.000 mm	50… 5000 mm	50… 10.000 mm	50… 5000 mm
Switching hysteresis	< 15 mm									—			
Current consumption (operating voltage = 24 V)	< 35 mA									< 40 mA			
Switching frequency	50 Hz*									—			
Response time	15 ms*									—			
Measuring rate	—									100/s*			
Light Spot Diameter	see Table 1	see Table 2	see Table 1				see Table 2	see Table 1		see Table 1	see Table 2	see Table 1	see Table 2
Acceleration sensor	—			Yes	—			Yes	—	—			
Connection diagram no.	243									241		242	
Connection type	M12×1; 5-pin				Cable with 1×M12 5-pin plug	M12×1; 5-pin			Cable with 1×M12 5-pin plug	M12×1; 5-pin			
Cable length (L)	—				500 mm	—			500 mm	—			
Output function	2× PNP NO		PNP NC, PNP NO	2× PNP NO		2× NPN NO				Analog 0–10 V		Analog 4–20 mA	
MTTFd (EN ISO 13849-1)	574,59 a			543,26 a	574,59 a			543,26 a	574,59 a	508,83 a		512,61 a	

Depends on mode, see chapter “3.4 Mode-Dependent Data” on page 11

3.2 Warm-up phase

The warm-up phase lasts 6 minutes. The switching on drift during that time can be seen in the following diagram.

Switching On Drift



NOTE!

Specifiations related to the measured value without load. For the analog versions this specification can deviate due to the load on the analog output.

3.3 Working Range

The sensor's working range is influenced by two parameters:
- Object remission
- Ambient light

The following values can typicially be reached in Precision mode (default):

P1PY10x, P1PY11x

	Ambient Light			
Remission	100 lux	5,000 lux	20,000 lux	100,000 lux
White (90 % remission)	50…10,000 mm	50…10,000 mm	50…10,000 mm	50…10,000 mm
Gray (18 % remission)	50…10,000 mm	50…10,000 mm	50…10,000 mm	50…5,000 mm
Black (6 % remission)	50…8,000 mm	50…6,500 mm	50…5,500 mm	50…3,000 mm

P1PY13x

	Ambient Light			
Remission	100 lux	5,000 lux	20,000 lux	100,000 lux
White (90 % remission)	50…5,000 mm	50…5,000 mm	50…5,000 mm	50…5,000 mm
Gray (18 % remission)	50…5,000 mm	50…5,000 mm	50…5,000 mm	50…5,000 mm
Black (6 % remission)	50…5,000 mm	50…5,000 mm	50…5,000 mm	50…3,000 mm

3.4 Mode-Dependent Data

Some technical data depend on the mode set. Depending on the setting, the following data are obtained:

P1PY101, P1PY102, P1PY103, P1PY104, P1PY111, P1PY113

Mode	White Working Range (90% Remission)	Gray Working Range (18% Remission)	Black Working Range (6% Remission)	Switching Frequency	Response Time	Maximum Reproducibility	Linearity Deviation	Low Signal Detection
Speed	0 – 10,000 mm	0 – 9,000 mm	0 – 7,000 mm	250 Hz	4,7 ms	5 mm	15 mm	+
Precision (default)	0 – 10,000 mm	0 – 10,000 mm	0 – 8,000 mm	50 Hz	15 ms	3 mm	10 mm	++
Precision Plus	0 – 10,000 mm	0 – 10,000 mm	0 – 8,000 mm	25 Hz	28,7 ms	3 mm	10 mm	+++

P1PY131, P1PY133

Mode	White Working Range (90% Remission)	Gray Working Range (18% Remission)	Black Working Range (6% Remission)	Switching Frequency	Response Time	Maximum Reproducibility	Linearity Deviation	Low Signal Detection
Speed	0...5,000 mm	0...5,000 mm	0...5,000 mm	250 Hz	4,7 ms	5 mm	15 mm	+
Precision (default)	0...5,000 mm	0...5,000 mm	0...5,000 mm	50 Hz	15 ms	3 mm	10 mm	++
Precision Plus	0...5,000 mm	0...5,000 mm	0...5,000 mm	25 Hz	28,7 ms	3 mm	10 mm	+++

P1PY107, P1PY107S02, P1PY108

Mode	White Working Range (90% Remission)	Gray Working Range (18% Remission)	Black Working Range (6% Remission)	Measuring Rate	Maximum Reproducibility	Linearity Deviation	Low Signal Detection
Speed	0 – 10,000 mm	0 – 9,000 mm	0 – 7,000 mm	500/s	5 mm	15 mm	+
Precision (default)	0 – 10,000 mm	0 – 10,000 mm	0 – 8,000 mm	100/s	3 mm	10 mm	++
Precision Plus	0 – 10,000 mm	0 – 10,000 mm	0 – 8,000 mm	50/s	3 mm	10 mm	+++

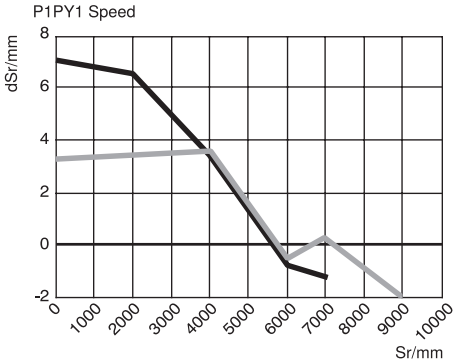
P1PY137, P1PY138

Mode	White Working Range (90% Remission)	Gray Working Range (18% Remission)	Black Working Range (6% Remission)	Measuring Rate	Maximum Reproducibility	Linearity Deviation	Low Signal Detection
Speed	0 – 5,000 mm	0 – 5,000 mm	0 – 5,000 mm	500/s	5 mm	15 mm	+
Precision (default)	0 – 5,000 mm	0 – 5,000 mm	0 – 5,000 mm	100/s	3 mm	10 mm	++
Precision Plus	0 – 5,000 mm	0 – 5,000 mm	0 – 5,000 mm	50/s	3 mm	10 mm	+++

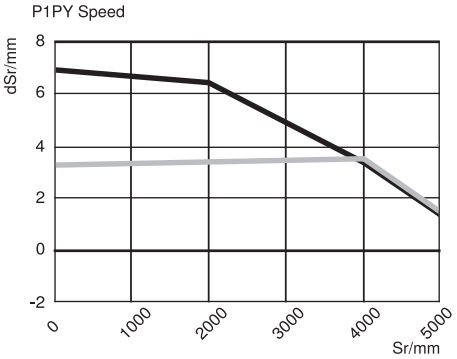
3.4.1 Switching Distance Deviation

Typical characteristic curve based on Kodak white (90% remission).

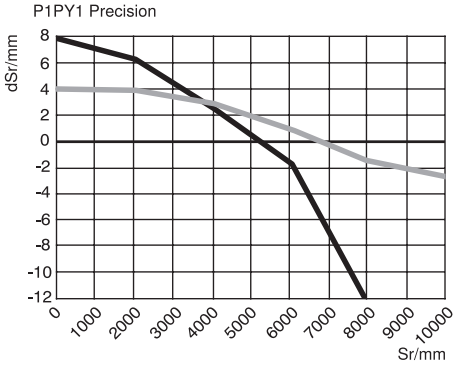
Speed Mode
P1PY10x, P1PY11x Speed



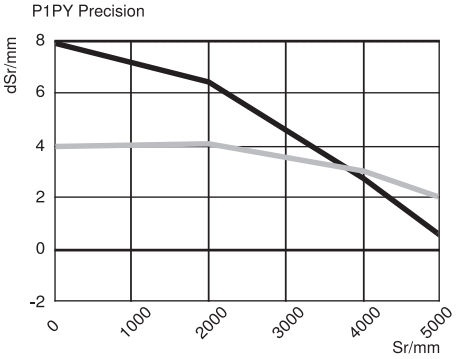
Precision Mode
P1PY13x Speed



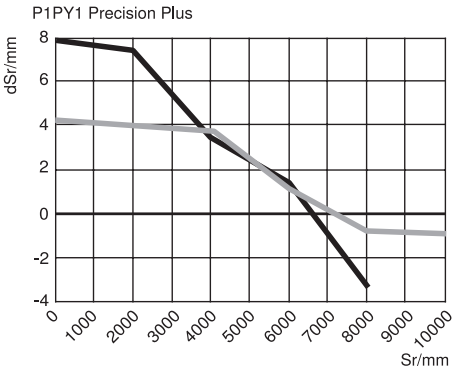
P1PY10x, P1PY11x Precision



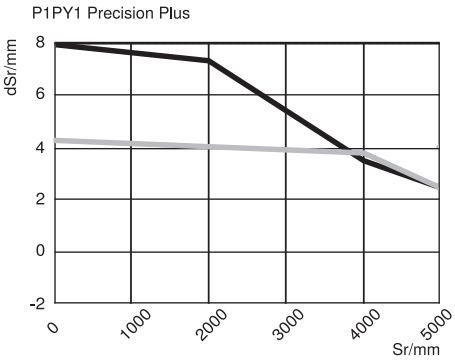
P1PY13x Precision



P1PY10x, P1PY11x Precision Plus



P1PY13x Precision Plus



Sr = switching distance
dSr = change in switching distance
Black, 6 % remission
Gray, 18 % remission

3.5 Light Spot Diameter

Working distance	0 m	5 m	10 m
Light spot diameter	5 mm	10 mm	15 mm

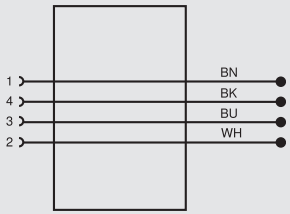
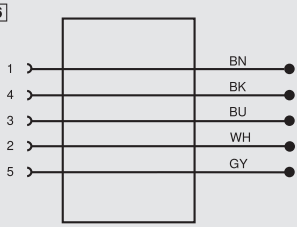
Table 1

Working distance	0 m	2 m	5 m
Light spot diameter	5 mm	30 mm	65 mm

Table 2

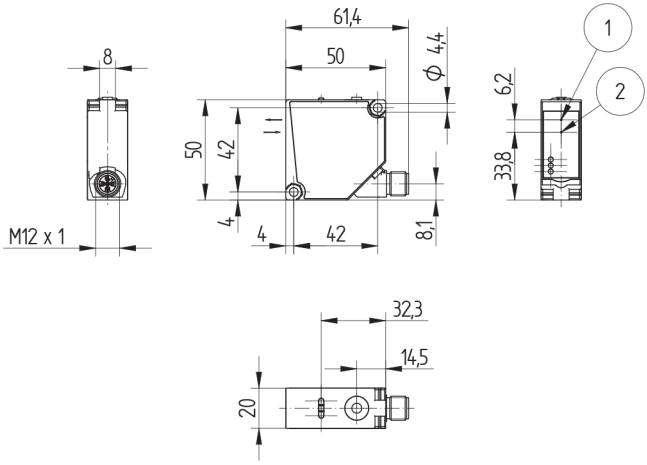
3.6 Complementary Products

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

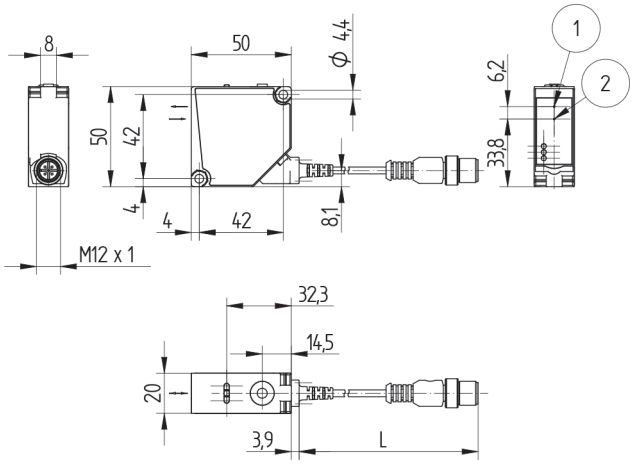
Suitable mounting technology no.	380
Suitable connection equipment no.	2 S02  35 S06 
IO-Link master EFBL001, EFBL003, EP0L001	
wTeach2 software DNNF005	
IO-Link Device Tool software DNNF019	

3.7 Layout

P1PY101, P1PY103, P1PY107, P1PY107S02, P1PY108, P1PY109, P1PY109S01, P1PY111, P1PY113, P1PY131, P1PY133, P1PY137, P1PY138



P1PY102, P1PY104



1 = emitter diode
2 = receiver diode
L = Cable length
M4 screw = 0.5 Nm
Dimensions specified in mm (1 mm = 0.03937″)

3.8 Control Panel

P1PY101, P1PY102, P1PY103, P1PY104, P1PY109, P1PY109S01, P1PY111, P1PY113, P1PY131, P1PY133

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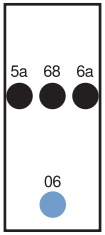

06 = teach-in key
5a = switching status indicator A1
6a = switching status indicator A2
68 = supply voltage indicator

P1PY107, P1PY107S02, P1PY137

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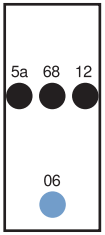
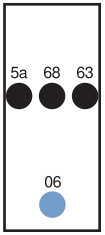


06 = teach-in key
5a = switching status indicator A1
12 = analog output voltage indicator
68 = supply voltage indicator

P1PY108, P1PY138

A 44



06 = teach-in key
5a = switching status indicator A1
63 = analog output current indicator
68 = supply voltage indicator

3.9 Scope of Delivery

- Sensor
- Initial start-up instructions
- Mounting set 14
- Spacer sleeves Z1PE002

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!

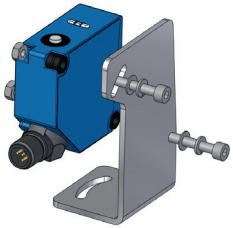
The product may be damaged.

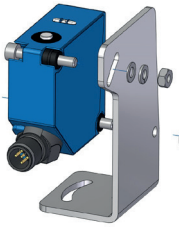
- Storage instructions must be complied with.

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.
- Insert the supplied spacer sleeves into the designated recesses on the side facing the mounting surface.
- Install the sensor by means of the mounting hole with M4 screws (included in the scope of delivery).
- Do not exceed the maximum tightening torque of 0.5 Nm.





- Make sure that the sensor is mounted in a mechanically secure fashion.
- Specified torque values must be complied with (see “3.7 Layout” on page 15).

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 Electrical Connection

- Wire the sensor in accordance with the connection diagram.
- Switch on the supply voltage (see ““3. Technical Data” on page 8).
- The blue supply voltage indicator lights up.
- Adjust the sensor so that the light spot strikes the object to be detected/measured.

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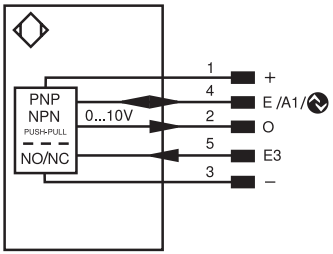

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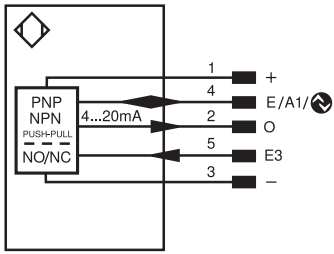

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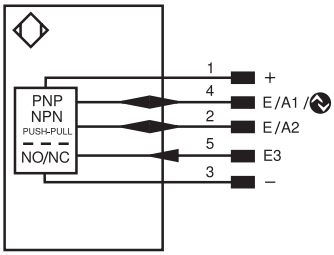


Wire Colors:
1 = Brown
2 = White
3 = Blue
4 = Black
5 = Grey

– = supply voltage 0 V
+ = supply voltage +
I/O1 = programmable input/output/IO-Link
I/O2 = programmable input/output
I3 = input
O = analog output

DANGER!

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

Live parts may cause personal injury or damage to equipment.

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

5.3 Diagnosis

5.3.1 LED Indicators

Indicator	Status	Meaning
Supply voltage indicator P		Sensor ready for operation
	○	No voltage supply
Switching status indicator A1, A2		Switching output active
	 2.5 Hz	Warning
	 5 Hz	Error
	○	Switching output inactive
Analog indicator O		Object within the set measuring range
	○	Object outside the set measuring range
	 2.5 Hz	Warning
	 5 Hz	Error

○ Not lit up

 Flashing

 Permanently lit up

5.3.2 Troubleshooting

Error	Possible Cause	Elimination
Warning	Warning signal	• Reduce the distance between the sensor and the object • Adjust the angle to the object
	Undervoltage	• Increase the voltage supply to at least 18 V DC
Error	Short circuit	• Check the electrical wiring and eliminate the short circuit
	Over-temperature	• Disconnect the sensor from the supply voltage and allow it to cool
	Device error	• Disconnect the sensor from the supply voltage and restart it • Replace the sensor

Via IO-Link, it is possible to identify the respective causes precisely by means of condition monitoring. Further diagnosis functions and status messages are also possible. See section “7.2 Condition Monitoring/Process Data” on page 38 on this subject.

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. Sensor Settings

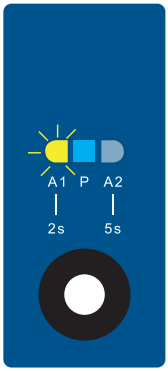
This section describes the settings that can be made directly on the sensor via the control panel. These settings differ between the versions with digital switching outputs and those with analog output.

6.1 Versions with Switching Outputs

P1PY101, P1PY102, P1PY103, P1PY104, P1PY109, P1PY109S01, P1PY111, P1PY113, P1PY131, P1PY133

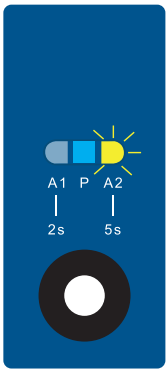
6.1.1 Teach-In

Three different teach-in modes are available. They can be set via IO-Link (see section “7.1 Settings via IO-Link/Parameters” on page 26). Foreground teach-in is used by default.



Teach-In for A1

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 A1 starts to flash.
3. Release the teach-in key.
4. The distance is taught in, and LED A1 flashes in order to confirm successful teach-in.



Teach-In for A2

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 A2 starts to flash.
3. Release the teach-in key.
4. The distance is taught in, and LED A2 flashes in order to confirm successful teach-in.

P1PY109: in default setting A2 can’t be set

NOTE!

If teach-in is conducted without an object or if the object is too far from the sensor, the switching distance is set to the end of the setting range, and LED A1/A2 flashes at a rate of 8 Hz. 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.

6.1.2 Switching Output/Antivalent Switchover

Using an extended menu, it is possible to switch the switching outputs A1 and A2 from 2 × NO contacts to antivalent:

1. Press and hold the teach-in key for 8 seconds until LEDs A1 and A2 start to flash
2. Release the teach-in key.
3. The sensor can now be seen in the exit menu
    a. LEDs flash once: 2 × switching output NO contact
    b. LEDs flash twice: Antivalent
4. Press the teach-in key briefly to switch between the settings
5. Press the teach-in key again for 8 seconds to save the setting and exit the menu.
   If no button is pressed at all for 10 seconds, the menu is exited and the setting is saved.

NOTE!

This functionality is available from firmware version V 01.02.00.

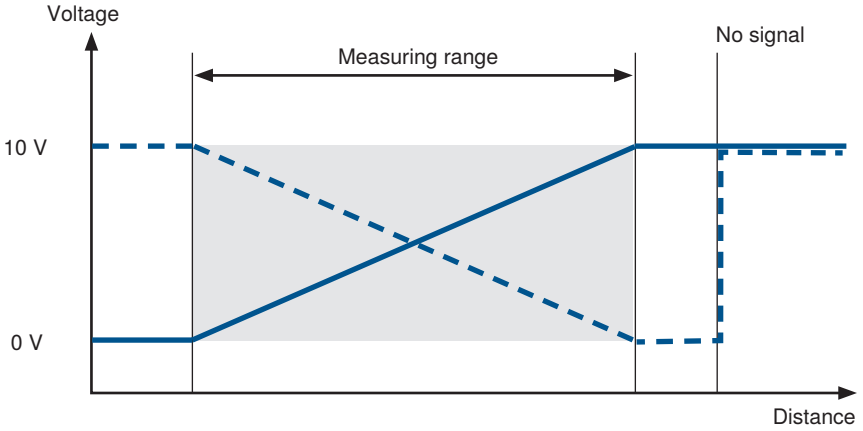
6.2 Versions with Analog Output

P1PY107, P1PY107S02, P1PY108, P1PY137, P1PY138

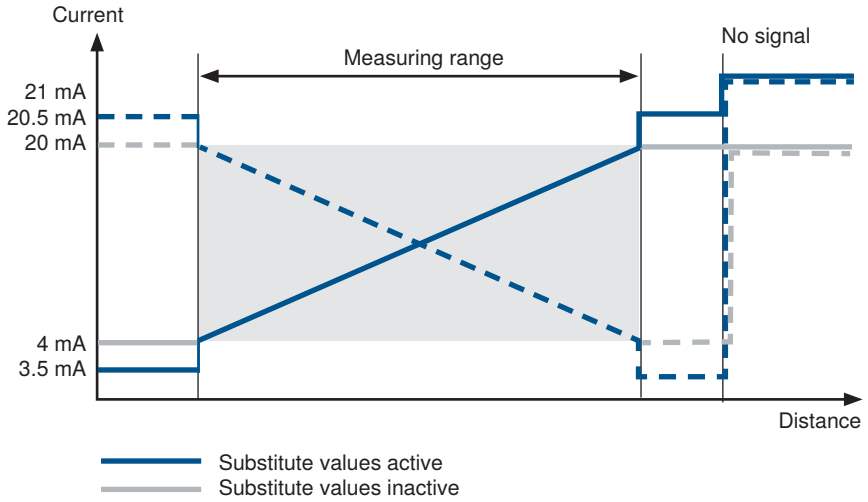
Analog Output Function

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: P1PY1x7



Current output: P1PY1x8



Substitute Values (Current Output Only)

By means of substitute values, the sensor is able to provide more precise information 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 the near measuring range: 3.5 mA
Object outside the far measuring range: 20.5 mA

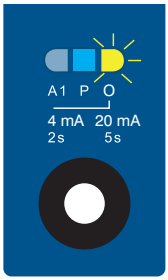
Falling Characteristic Curve

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

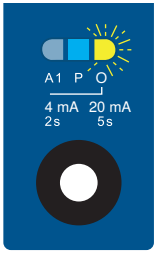
The substitute values function can be deactivated via IO-Link.

Teach-In

The analog output can be scaled by means of the teach-in function, and the min./max. values can be assigned 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.
4. The distance is taught in, and LED O lights up 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 for 5 seconds until LED O starts to flash rapidly.
3. Release the teach-in key.
4. The distance is taught in, and LED O lights up 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 LED O flashes at a rate of 8 Hz. 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 LED O flashes at a rate of 8 Hz.

7. 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.

7.1 Settings via IO-Link/Parameters

The functions described in the following section can be set acyclically via IO-Link/parameters.

7.1.1 Sensor Functions

Function	Possible Settings	Default
Measuring mode	**Speed** The sensor is optimized for fast applications. **Precision** The sensor is optimized for high-accuracy applications. **Precision Plus** The sensor is optimized for high-accuracy applications and even higher sensitivity to low signals. **NOTE!** The technical data resulting from the various modes are specified in “3.4 Mode-Dependent Data” on page 11.	Precision
Detection mode	**First Object** The signal reflected by an object that is within the working range and closest to the sensor is used. **Last Object** The signal reflected by an object that is within the working range and farthest from the sensor is used. **Highest Intensity** The signal with the highest signal strength is used. **NOTE!** If an object is hidden by this function, a blind spot directly behind the object results. The sensor cannot detect any objects within this blind spot. The size of the blind spot depends on the reflectance of the interfering object.	First Object

Function	Possible Settings	Default
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 in which no usable signals are to be expected can be completely hidden. This function can be used to suppress interfering signals, such as those produced by a glass disk, for instance. Depending on the set mode and the resulting working range, the distance range can be set within it. **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 very high sensitivity and can detect objects with very weak signals and measure distances to them. Constant interferences in the measured section, e.g., due to fog or dust, can result in incorrect measurements. Such interfering influences can be suppressed by reducing the sensitivity. Reducing the sensitivity also reduces the working range. **Maximum** In this setting, the working range corresponds to the values specified in the data sheet. **Medium** P1PY10x, P1PY11x: In this setting, the working range changes to: white (90 % remission): 10,000 mm; gray (18 % remission): 8,000 mm; black (6 % remission): 5,000 mm P1PY13x: white (90 % Remission): 5,000 mm, gray (18 % Remission): 5,000 mm, black (6 % Remission): 3,000 mm **Low** P1PY10x, P1PY11x: In this setting, the working range changes to: white (90 % remission): 9,000 mm; gray (18 % remission): 5,000 mm; black (6 % remission): 3,000 mm P1PY13x: white (90 % Remission): 5,000 mm, gray (18 % Remission): 5,000 mm, black (6 % Remission): 3,000 mm	Maximum

<table>
<tr><th>Function</th><th>Possible Settings</th><th>Default</th></tr>
<tr><td></td><td>Minimum
P1PY10x, P1PY11x:
In this setting, the working range changes to:
white (90 % remission): 6,000 mm; gray (18% remission): 3,000 mm; black (6 % remission): 1,800 mm
P1PY13x:
white (90 % Remission): 5,000 mm, gray (18 % Remission): 3,000 mm, black (6 % Remission): 1,800 mm

The technical data relating to reproducibility and linearity correspond to the typical data sheet values in the various settings.</td><td></td></tr>
<tr><td>Interference filter</td><td>The interference filter can be used to increase measurement reliability in the case of brief interferences in the measured section. Interferences such as rain, snow or chips in the air generate brief signals, which can result in incorrect measurements. A higher filter level allows the interfering signals to be ignored for a defined period. If the distance changes suddenly, the response time is extended. This extension of the response time depends on the filter level and the mode used. If the distance changes continuously, the response time remains unchanged when the filter is activated.
<table>
<tr><th></th><th colspan="3">Mode</th></tr>
<tr><th>Filter</th><th>Speed</th><th>Precision</th><th>Precision Plus</th></tr>
<tr><td>Off</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>1</td><td>2 ms</td><td>10 ms</td><td>20 ms</td></tr>
<tr><td>2</td><td>4 ms</td><td>20 ms</td><td>40 ms</td></tr>
<tr><td>3</td><td>6 ms</td><td>30 ms</td><td>60 ms</td></tr>
<tr><td>4</td><td>10 ms</td><td>50 ms</td><td>100 ms</td></tr>
<tr><td>5</td><td>20 ms</td><td>100 ms</td><td>200 ms</td></tr>
<tr><td>6</td><td>40 ms</td><td>200 ms</td><td>400 ms</td></tr>
<tr><td>7</td><td>60 ms</td><td>300 ms</td><td>600 ms</td></tr>
<tr><td>8</td><td>100 ms</td><td>500 ms</td><td>1,000 ms</td></tr>
<tr><td>9</td><td>200 ms</td><td>1,000 ms</td><td>2,000 ms</td></tr>
</table></td><td>Off</td></tr>
<tr><td>Emitted light</td><td>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.”</td><td>On</td></tr>
</table>

Function	Possible Settings	Default
Localization	The switching status indicators and the key illumination of the sensor can be switched to flashing. This allows the sensor to be easily located in a plant. **On** LEDs and key illumination flash **Off** LEDs and key illumination function normally	Off
Key illumination	The teach-in key has internal illumination, which enables optimal visibility and operability even in dark environments. **On** Teach-in key illuminated **Off** Teach-in key not illuminated	On
Measured value unit	The measured distance can be read out in millimeters or inches. **Millimeter** Distance values read out in mm **Inch** Distance values read out in 1/10 inch	Millimeter

7.1.2 Input/Output Functions (I/O)

7.1.2.1 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 35. **Warning Output** The warning output switches if one of the assigned warnings occurs; see table “Status Messages” on page 35. **Laser-Off Input** See I3 for an explanation **Teach-In Input** See I3 for an explanation **Acceleration Sensor Reset Input** See I3 for an explanation **Deactivated** The pin is deactivated.	Digital versions: switching output Analog versions: error 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 35. **Warning Output** The warning output switches if one of the assigned warnings occurs; see table “Status Messages” on page 35. **Laser-Off Input** See I3 for an explanation **Teach-In Input** See I3 for an explanation **Acceleration Sensor Reset Input** See I3 for an explanation **Deactivated** The pin is deactivated.	Digital versions: switching output P1PY109, P1PY109S01: Antivalent Switching Output Analog versions: not available

I3	**Laser-Off Input** The sensor's emitted light is deactivated as long as the input is activated. The sensor does not supply 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 against inadvertent changes, like the input signal. **Acceleration Sensor Reset Input** The status message for the acceleration sensor is reset. **Deactivated** The pin is deactivated.	Laser-off input

7.1.2.2 Output Functions

The output functions are used to set the physical outputs.

Function	Possible Settings	Default
PNP/NPN/ push-pull	**PNP** **NPN** **Push-Pull**	PNP
NC/NO	**NO** Light switching The output is high when the condition has been fulfilled depending on the setting (switching point, warning, error). **NC** Dark switching The output is low when the condition has been fulfilled depending on the setting (switching point, warning, error).	P1PY109S01: NC Rest: NO
On-delay	**0 – 10,000 ms**	0 ms
Off-delay	**0 – 10,000 ms**	0 ms

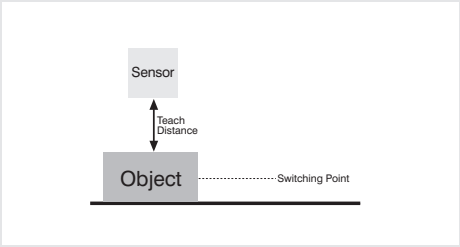
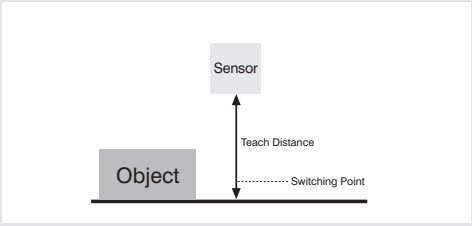
7.1.2.3 Input Functions

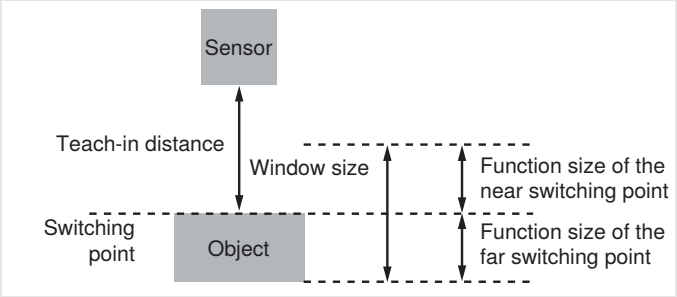
The input functions are used to set the physical inputs.

Function	Possible Settings	Default
Input mode	**Operating Voltage Active** The function is triggered as soon as operating voltage is applied to the input. **Operating Voltage Inactive** The function is triggered as soon as 0 V is applied to the input or the input is not connected.	Operating voltage active

7.1.3 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**  	Foreground teach-in

	Window Teach-In  	
Switching point	**P1PY10x, P1PY11x: 50...10,000 mm** **P1PY13x: 50...5,000 mm** **NOTE!** If a distance range has been set, the switching point can be set within the set distance range only.	5,000 mm
Window's near switching point	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
Window's far switching point	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
Hysteresis	Hysteresis is the difference between the switch-on and switch-off point. **5 – 1,000 mm**	15 mm

7.1.4 Condition Monitoring Functions

7.1.4.1 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 35	Warning signal
Message 2	See table “Status Messages” on page 35	Optics dirty
Message 3	See table “Status Messages” on page 35	Ambient light
Message 4	See table “Status Messages” on page 35	Versions without an acceleration sensor: Temperature too high Versions with an acceleration sensor: Acceleration sensor

7.1.4.2 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 35	Signal warning, optics dirty, ambient light, temperature too high, temperature too low, undervoltage, interference in the working range
Error output	See table “Status Messages” on page 35	Object too close, object too far, no signal, device error, over-temperature, short circuit

Status Messages

Warnings	
Warning signal	The object reflects too little light.
Optics dirty	The sensor detects when the optic cover is dirty, and the signal deteriorates as a result.
Ambient light	Object detection is impeded by too much ambient light.
Interference in the working range	When using the interference filter, the sensor detects whether a brief interfering event has occurred in the measuring range. This could be chips, water droplets, etc., for instance.
Temperature too high	The sensor's internal temperature is too high.
Temperature too low	The sensor's internal temperature is too low.
Undervoltage	The supply voltage is too low.
Device warning	An internal device error has occurred.
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.
Over-temperature	The over-temperature has been exceeded. 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.
Acceleration Sensor (P1PY111, P1PY113)	
Acceleration detected	The sensor has detected acceleration above the set threshold via the internal acceleration sensor.

7.1.4.3 Acceleration Sensor (P1PY111, P1PY113)

The sensor has an integrated acceleration sensor. It detects accelerations and can thereby detect impacts or shock loads.

Function	Possible Settings	Default
Acceleration Sensor	**On** Acceleration sensor activated **Off** Acceleration sensor deactivated The status message remains active until it is acknowledged. This makes it possible to reliably detect even those messages that occur for a shorter duration than the cycle time.	On
Acceleration Threshold	The threshold defines how sensitive the acceleration sensor reacts. **0 – 100 %**	50
Counter	The counter counts the number of exceedances of the set threshold.	0

7.1.4.4 Signal Observation

The sensor can detect up to four objects in its working range. A distance and object strength are determined for each of these signals.

Function	Possible Settings	Default
Signal Observation	**On** Signal observation activated **Off** Signal observation deactivated	Off
Object Detection Status	Indicates the object used for signal evaluation. **Object 1–4**	---
Object Distance	Indicates the respective distance from a maximum of four objects. **P1PY10x, P1PY11x: 50...10,000 mm** **P1PY13x: 50...5,000 mm**	---
Object Signal	Indicates the respective signal strength of a maximum of four objects. **1 – 1,000**	---

7.1.5 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 Minimum to maximum measuring range	Current measured value
Output O Test	According to the measured value P1PY1x7: 0 – 10 V P1PY1x8: 4 – 20 mA	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.
- The simulation mode ends automatically as soon as the supply voltage is intrrupted.

7.2 Condition Monitoring/Process Data

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

7.2.1 Process Data In

Data	Meaning
Measured Value	Measured distance in mm respectively 1/10 Inch. As the sensor cannot determine a measured value in the following error cases, substitute values are read out: No signal: 0x7FFC / 32764 mm Object too close: 0x8008 / –32760 mm Object too far: 0x7FF8 / 32760 mm
Scale	Scaling of the measured value to the base length unit; –3 corresponds to mm.
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 35)
Error	Collective warning in the event of one of the error status messages (see table “Status Messages” on page 35)
Message 1	Status message 1 read out (see 7.1.4.1)
Message 2	Status message 2 read out (see 7.1.4.1)
Message 3	Status message 3 read out (see 7.1.4.1)
Message 4	Status message 4 read out (see 7.1.4.1)

7.2.2 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
Reset Acceleration Sensor	Resets the status message for the acceleration sensor

7.3 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 required – Cleaning	0x8C40	Notification	IO-Link
General malfunction – Unknown error	0x1000	Error	IO-Link
Short circuit – Check installation	0x7710	Error	IO-Link
Device temperature over-run – Clear source of heat	0x4210	Warning	IO-Link
Device temperature under-run – Insulate device	0x4220	Warning	IO-Link
Temperature fault – Overload	0x4000	Error	IO-Link
Primary supply voltage under-run – Check tolerance	0x5111	Warning	IO-Link
Acceleration sensor	0x1801	Warning	wenglor-specific

8. wTeach2 Configuration Software

8.1 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 in the download area under order number DNNF005.

9. 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.

10. 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.

11. Appendix

11.1 List of Abbreviations

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

11.2 Change Index for the Operating Instructions

Version	Date	Description/Changes
1.0.0	01/14/2021	Initial version of the operating instructions
1.0.1	02/11/2021	Update of technical data, see “Sensitivity” in chapter “7.1.1 Sensor Functions” on page 26
1.0.2	02/18/2021	Update of technical data, see “Hysteresis” in chapter “7.1.3 Switching Point Functions (SSC1/SSC2)” on page 32
1.1.0	03/01/2021	New chapter “3.2 Warm-up phase” on page 10
1.1.1	06/07/2021	Update of technical data, see “Sensitivity” in chapter “7.1.1 Sensor Functions” on page 26
1.2.0	09/23/2021	New sensor type P1PY109
1.3.0	01/25/2022	New sensor type P1PY109S01
1.4.0	08/11/2022	New sensor type P1PY13x
1.5.0	12/05/2022	Update of graphics “6.2 Versions with Analog Output” on page 24

11.3 EU Declaration of Conformity

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