

# P2PY1xx

Long-Range Laser Distance Sensors



**der wintec.**

## Operating Instructions

# Table of Contents

- 1. General .....4**
  - 1.1 Information Concerning These Instructions .....4
  - 1.2 Explanations of Symbols .....4
  - 1.3 Limitation of Liability.....5
  - 1.4 Copyrights .....5
- 2. For Your Safety .....6**
  - 2.1 Use for Intended Purpose .....6
  - 2.2 Use for Other than the Intended Purpose.....6
  - 2.3 Personnel Qualifications .....7
  - 2.4 Modification of Products .....7
  - 2.5 General Safety Precautions .....7
  - 2.6 Laser/LED Warnings.....7
  - 2.7 Approvals and Protection Class.....7
- 3. Technical Data .....8**
  - 3.1 General Data .....8
  - 3.2 Warm-up phase .....9
  - 3.3 Working Range.....10
  - 3.4 Mode-Dependent Data.....10
    - 3.4.1 Switching Distance Deviation.....11
  - 3.5 Light Spot Diameter .....12
  - 3.6 Complementary Products .....12
  - 3.7 Layout.....13
  - 3.8 Control Panel.....14
  - 3.9 Scope of Delivery .....14
- 4. Transport and Storage .....15**
  - 4.1 Transport .....15
  - 4.2 Storage .....15
- 5. Installation and Electrical Connection .....16**
  - 5.1 Installation .....16
  - 5.3 Electrical Connection .....18
  - 5.4 Diagnosis.....19
    - 5.4.1 LED Indicators .....19
    - 5.4.2 Troubleshooting .....20
- 6. Sensor Settings.....21**
  - 6.1 Versions with Switching Outputs .....21
  - 6.2 Versions with Analog Output.....22
- 7. IO-Link .....24**
  - 7.1 Settings via IO-Link/Parameters.....24
    - 7.1.1 Sensor Functions .....24
    - 7.1.2 Input/Output Functions (I/O) .....27
      - 7.1.2.1 Pin Function .....27
      - 7.1.2.2 Output Functions.....28
      - 7.1.2.3 Input Functions .....29
    - 7.1.3 Switching Point Functions (SSC1/SSC2).....29

7.1.4 Condition Monitoring Functions.....	31
7.1.4.1 Status Message Function .....	31
7.1.4.2 Warning/Error Output Function.....	31
7.1.4.3 Acceleration Sensor.....	33
7.1.4.4 Signal Observation.....	33
7.1.5 Simulation Functions.....	34
7.2 Condition Monitoring/Process Data.....	35
7.2.1 Process Data In .....	35
7.2.2 Process Data Out .....	35
7.3 Events.....	36
<b>8. wTeach2 Configuration Software .....</b>	<b>36</b>
8.1 General.....	36
<b>9. Maintenance Instructions .....</b>	<b>37</b>
<b>10. Proper Disposal .....</b>	<b>37</b>
<b>11. Appendix.....</b>	<b>37</b>
11.1 List of Abbreviations.....	37
11.2 Change Index for the Operating Instructions .....	37
11.3 EU Declaration of Conformity .....	37

# 1. General

## 1.1 Information Concerning These Instructions

- These instructions apply to products designated P2PY1xx.
- 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](http://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](http://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](http://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](http://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.

## 2.7 Approvals and Protection Class



**RoHS**



**ECOLAB®**

## 3. Technical Data

### 3.1 General Data

Optical Data	
Working range	0 – 10,000 mm
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
Beam divergence	< 2 mrad
Max. permitted ambient light	100,000 lux
Light spot diameter	See table 1
Electrical Data	
Supply voltage	18 – 30 V DC
Temperature drift	< 0,4 mm/K
Temperature range	–40 ... 55° 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	Stainless steel 316L
Optic cover	PMMA
Degree of protection	IP68/IP69K

\* Depends on mode, see chapter [“3.4 Mode-Dependent Data”](#) on page 10



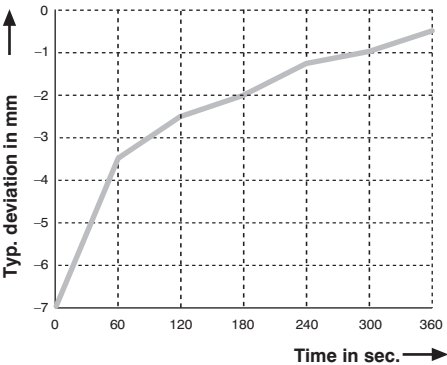
Order No. Technical Data	P2PY						
	101	109	105	103	106	107	108
Setting range	50...10.000 mm					—	
Measuring range	—					50...10.000 mm	
Switching hysteresis	< 15 mm					—	
Current consumption (operating voltage = 24 V)	< 35 mA					< 40 mA	
Switching frequency	50 Hz *					—	
Response time	15 ms *					—	
Measuring rate	—					100/s *	
Acceleration Sensor	Yes					Yes	
Connection diagram no.	243					241	242
Connection type	M12×1; 4/5-pin					M12×1; 4/5-pin	
Interchangeable optical lens	—		Yes	—	Yes	—	
ECOLAB	Yes		—	Yes	—	Yes	
FDA compliant	Yes		—	Yes	—	Yes	
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)	543,71 a					502,44 a	511,24 a

\* Depends on mode, see chapter “3.4 Mode-Dependent Data” on page 10

### 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!**

Specifications 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 typically be reached in Precision mode (default):

	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

### 3.4 Mode-Dependent Data

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

P2PY101, P2PY103, P2PY105, P2PY106

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	+++

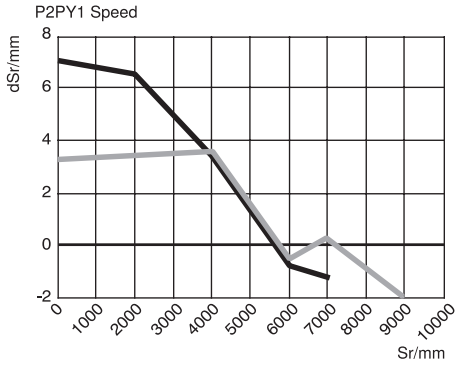
P2PY107, P2PY108

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	+++

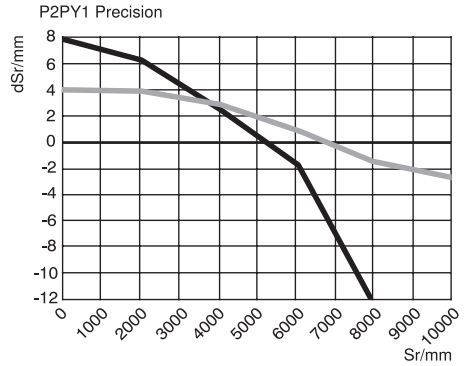
### 3.4.1 Switching Distance Deviation

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

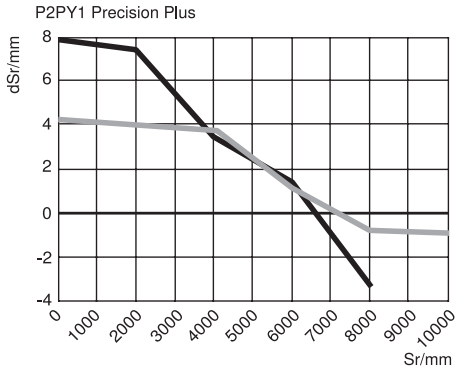
#### Modus Speed



#### Modus Precision



#### Modus 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

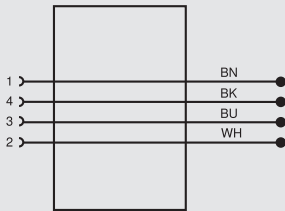
### 3.6 Complementary Products

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

Suitable mounting technology no. **380**

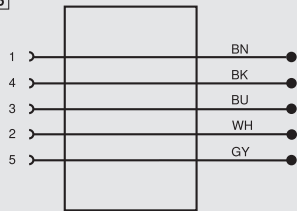
Suitable connection equipment no. **2**

**S02**



**35**

**S06**



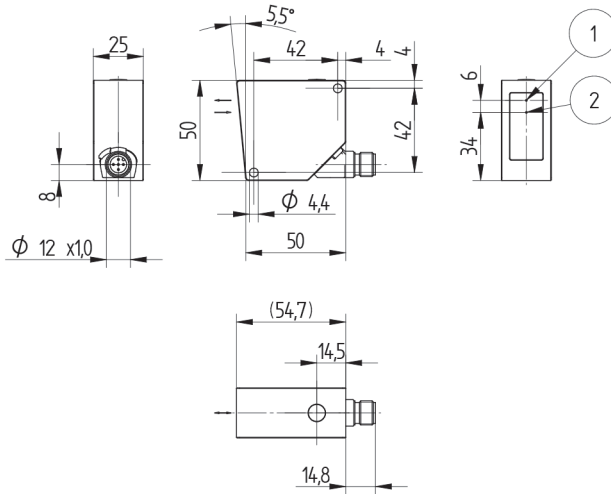
IO-Link master EFBL001, EFBL003, EP0L001, ZAI72AN01

wTeach2 software DNNF005

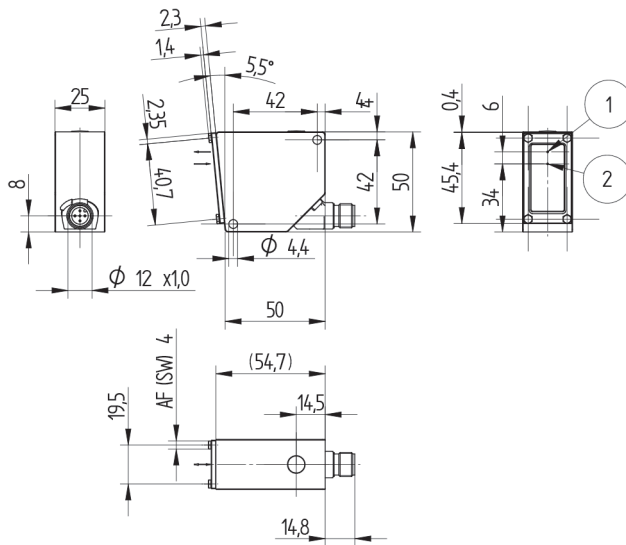
IO-Link Device Tool software DNNF019

### 3.7 Layout

P2PY101, P2PY103, P2PY107, P2PY108, P2PY109



P2PY105, P2PY106



1 = emitter diode

2 = receiver diode

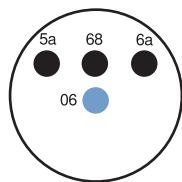
M4 screw = 1 Nm

Dimensions specified in mm (1 mm = 0.03937")

### 3.8 Control Panel

P2PY101, P2PY103, P2PY105,  
P2PY106, P2PY109

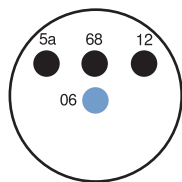
II6



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

P2PY107

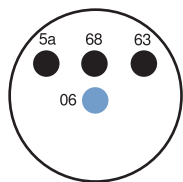
II7



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

P2PY108

II8



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 45

## 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).
- Do not exceed the maximum tightening torque of 1 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 13](#)).

---

#### **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!**

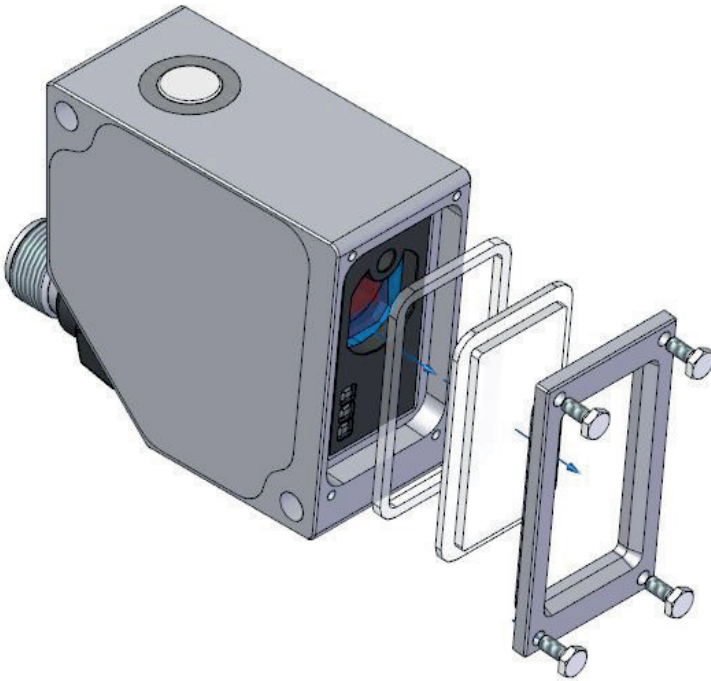
Personal injury and damage to the product may occur.

- A safe installation environment must be assured.
-



## 5.2 Changing the Optical Lens (P2PY105, P2PY106)

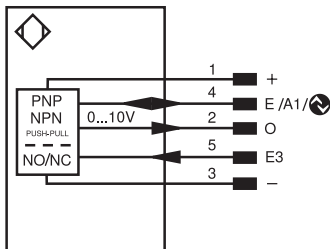
- In order to change the optical lens, the sensor has to be removed from operation.
- No dirt or foreign objects may get into the sensor.
- Only change the optical lenses in dry ambient conditions.
- Do not pollute the lens of the sensor or the optical lens.
- Do not exceed the maximum tightening torque of 0.4 Nm.



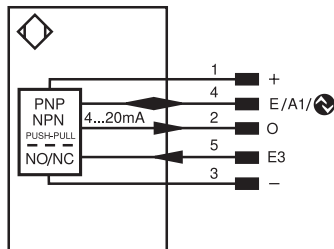
### 5.3 Electrical Connection

- 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.

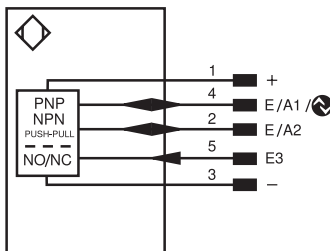
241



242



243



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.

## 5.4 Diagnosis

### 5.4.1 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

5.4.2 Troubleshooting

Error	Possible Cause	Elimination
Warning	Warning signal	<ul style="list-style-type: none"><li>• Reduce the distance between the sensor and the object</li><li>• Adjust the angle to the object</li></ul>
	Undervoltage	<ul style="list-style-type: none"><li>• Increase the voltage supply to at least 18 V DC</li></ul>
Error	Short circuit	<ul style="list-style-type: none"><li>• Check the electrical wiring and eliminate the short circuit</li></ul>
	Over-temperature	<ul style="list-style-type: none"><li>• Disconnect the sensor from the supply voltage and allow it to cool</li></ul>
	Device error	<ul style="list-style-type: none"><li>• Disconnect the sensor from the supply voltage and restart it</li><li>• Replace the sensor</li></ul>

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 35 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, P2PY109, P1PY111, P1PY113**

#### 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 24). 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.

P2PY109: 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.

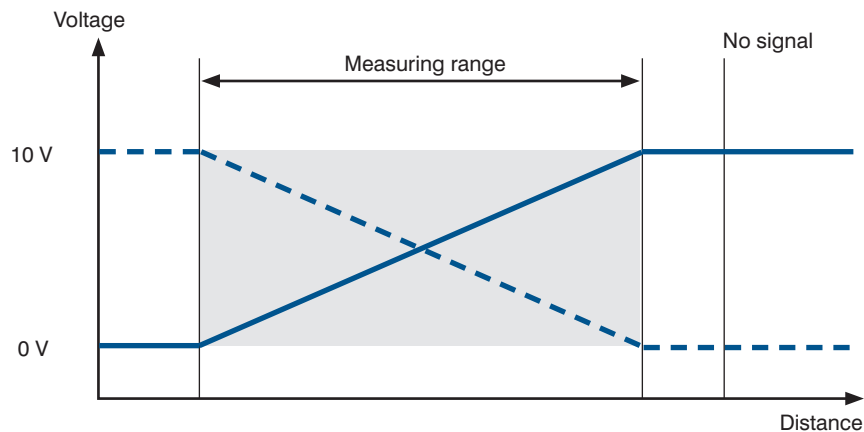
## 6.2 Versions with Analog Output

### P1PY107, P1PY108

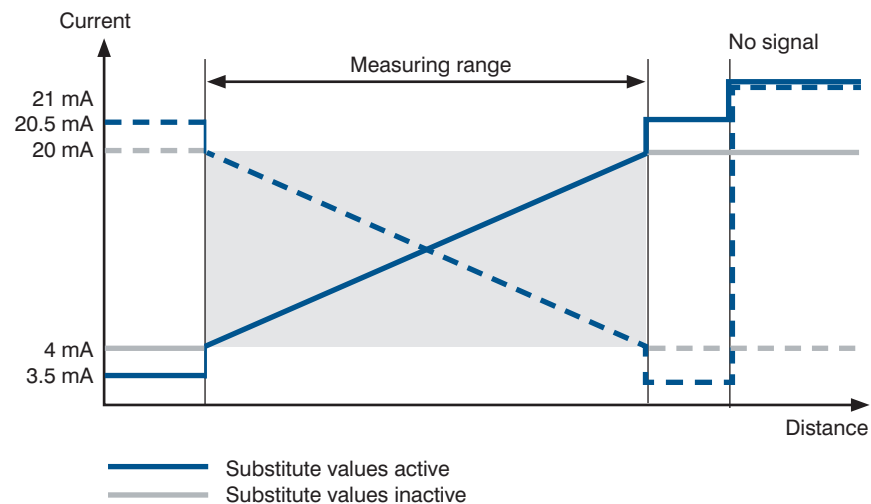
#### Analog Output Function

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: P2PY107



Current output: P2PY108



### 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

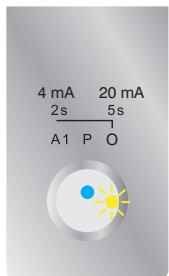
Object outside the near measuring range: 20.5 mA

Object outside the far measuring range: 3.5 mA

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

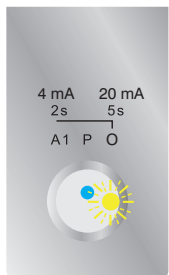
### Teach-In

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](http://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	<p><b>Speed</b> The sensor is optimized for fast applications.</p> <p><b>Precision</b> The sensor is optimized for high-accuracy applications.</p> <p><b>Precision Plus</b> The sensor is optimized for high-accuracy applications and even higher sensitivity to low signals.</p> <div><b>NOTE!</b> The technical data resulting from the various modes are specified in <a href="#">“3.4 Mode-Dependent Data” on page 10</a>.</div>	Precision
Detection mode	<p><b>First Object</b> The signal reflected by an object that is within the working range and closest to the sensor is used.</p> <p><b>Last Object</b> The signal reflected by an object that is within the working range and farthest from the sensor is used.</p> <p><b>Highest Intensity</b> The signal with the highest signal strength is used.</p> <div><b>NOTE!</b> 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.</div>	First object



Function	Possible Settings	Default
Distance range	<p>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.</p> <p>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.</p> <p><b>Min. Distance: Working Range</b>  <b>Max. Distance: Working Range</b></p> <p><b>NOTE!</b></p> <ul style="list-style-type: none"> <li>• Objects outside the set distance range are evaluated as “No signal”</li> <li>• 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.</li> </ul> 	Setting range
Sensitivity	<p>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.</p> <p><b>Maximum</b></p> <p>In this setting, the working range corresponds to the values specified in the data sheet.</p> <p><b>Medium</b></p> <p>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</p> <p><b>Low</b></p> <p>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</p> <p><b>Minimum</b></p> <p>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  The technical data relating to reproducibility and linearity correspond to the typical data sheet values in the various settings.</p>	Maximum

Function	Possible Settings	Default																																																
Interference filter	<p>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.</p> <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>		Mode			Filter	Speed	Precision	Precision Plus	Off	—	—	—	1	2 ms	10 ms	20 ms	2	4 ms	20 ms	40 ms	3	6 ms	30 ms	60 ms	4	10 ms	50 ms	100 ms	5	20 ms	100 ms	200 ms	6	40 ms	200 ms	400 ms	7	60 ms	300 ms	600 ms	8	100 ms	500 ms	1,000 ms	9	200 ms	1,000 ms	2,000 ms	Off
	Mode																																																	
Filter	Speed	Precision	Precision Plus																																															
Off	—	—	—																																															
1	2 ms	10 ms	20 ms																																															
2	4 ms	20 ms	40 ms																																															
3	6 ms	30 ms	60 ms																																															
4	10 ms	50 ms	100 ms																																															
5	20 ms	100 ms	200 ms																																															
6	40 ms	200 ms	400 ms																																															
7	60 ms	300 ms	600 ms																																															
8	100 ms	500 ms	1,000 ms																																															
9	200 ms	1,000 ms	2,000 ms																																															
Emitted light	<p>The sensor's laser can be switched on or off.</p> <p><b>On</b> Laser on</p> <p><b>Off</b> Laser off</p> <p>The sensor no longer supplies a measured value.</p> <p><b>NOTE!</b></p> <div><ul style="list-style-type: none"><li>• If an input is set as a laser-off input, the emitted light can also be switched on and off via the input.</li><li>• If the laser is switched off, the sensor behavior corresponds to the status "No signal."</li></ul></div>	On																																																
Localization	<p>The switching status indicators of the sensor can be switched to flashing. This allows the sensor to be easily located in a plant.</p> <p><b>On</b> LEDs flash</p> <p><b>Off</b> LEDs function normally</p>	Off																																																
Measured value unit	<p>The measured distance can be read out in millimeters or inches.</p> <p><b>Millimeter</b> Distance values read out in mm</p> <p><b>Inch</b> Distance values read out in 1/10 inch</p>	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	<p><b>Switching Output</b> Switching point SSC1 is assigned to the switching output.</p> <p><b>Error Output</b> The error output switches if one of the assigned errors occurs; see table <a href="#">“Status Messages” on page 32.</a></p> <p><b>Warning Output</b> The warning output switches if one of the assigned warnings occurs; see table <a href="#">“Status Messages” on page 32.</a></p> <p><b>Laser-Off Input</b> See I3 for an explanation</p> <p><b>Teach-In Input</b> See I3 for an explanation</p> <p><b>Acceleration Sensor Reset Input</b> See I3 for an explanation</p> <p><b>Deactivated</b> The pin is deactivated.</p>	<p>Digital versions: switching output</p> <p>Analog versions: error output</p>
I/O2	<p><b>Switching Output</b> Switching point SSC2 is assigned to the switching output.</p> <p><b>Antivalent Switching Output</b> The switching output switches antivalently to switching output O1.</p> <p><b>Error Output</b> The error output switches if one of the assigned errors occurs; see table <a href="#">“Status Messages” on page 32.</a></p> <p><b>Warning Output</b> The warning output switches if one of the assigned warnings occurs; see table <a href="#">“Status Messages” on page 32.</a></p> <p><b>Laser-Off Input</b> See I3 for an explanation</p> <p><b>Teach-In Input</b> See I3 for an explanation</p> <p><b>Acceleration Sensor Reset Input</b> See I3 for an explanation</p> <p><b>Deactivated</b> The pin is deactivated.</p>	<p>Digital versions: switching output</p> <p>P2PY109: Antivalent switching output</p> <p>Analog versions: not available</p>

I3	<p><b>Laser-Off Input</b> 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."</p> <p><b>Teach-In Input</b> 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.</p> <p>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.</p> <p><b>Acceleration Sensor Reset Input</b> The status message for the acceleration sensor is reset.</p> <p><b>Deactivated</b> The pin is deactivated.</p>	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	<b>PNP</b> <b>NPN</b> <b>Push-Pull</b>	PNP
NC/NO	<b>NO</b> Light switching The output is high when the condition has been fulfilled depending on the setting (switching point, warning, error).  <b>NC</b> Dark switching The output is low when the condition has been fulfilled depending on the setting (switching point, warning, error).	NO
On-delay	<b>0 – 10,000 ms</b>	0 ms
Off-delay	<b>0 – 10,000 ms</b>	0 ms

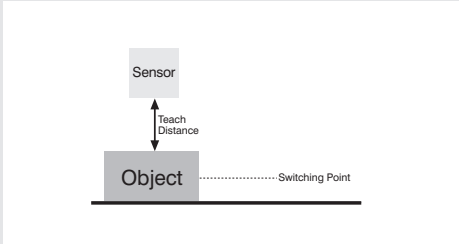
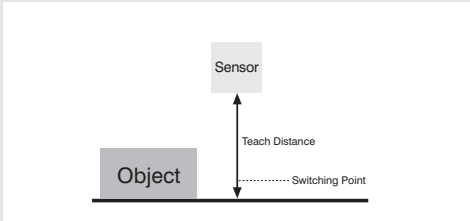
7.1.2.3 Input Functions


The input functions are used to set the physical inputs.

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

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	<b>Foreground Teach-In</b> 	Foreground teach-in
	<b>Background Teach-In</b> 	

	<p><b>Window Teach-In</b></p>	
Switching point	<p><b>50 – 10,000 mm</b></p> <div>  <p><b>NOTE!</b> If a distance range has been set, the switching point can be set within the set distance range only.</p> </div>	5,000 mm
Window's near switching point	<p>Distance from the set center of the window to the window's switching point that is close to the sensor.</p> <p>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.</p>	30 mm
Window's far switching point	<p>Distance from the set center of the window to the window's switching point that is far away from the sensor.</p> <p>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.</p>	30 mm
Hysteresis	<p>Hysteresis is the difference between the switch-on and switch-off point.</p> <p><b>5 – 1,000 mm</b></p>	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 <a href="#">“Status Messages” on page 32</a>	Warning signal
Message 2	See table <a href="#">“Status Messages” on page 32</a>	Optics dirty
Message 3	See table <a href="#">“Status Messages” on page 32</a>	Ambient light
Message 4	See table <a href="#">“Status Messages” on page 32</a>	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 <a href="#">“Status Messages” on page 32</a>	Signal warning, optics dirty, ambient light, temperature too high, temperature too low, undervoltage, interference in the working range
Error output	See table <a href="#">“Status Messages” on page 32</a>	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	
Acceleration detected	The sensor has detected acceleration above the set threshold via the internal acceleration sensor.



#### 7.1.4.3 Acceleration Sensor

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

Function	Possible Settings	Default
<b>Acceleration Sensor</b>	<b>On</b> Acceleration sensor activated <b>Off</b> 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
<b>Acceleration Threshold</b>	The threshold defines how sensitive the acceleration sensor reacts. <b>0 – 100 %</b>	50
<b>Counter</b>	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
<b>Signal Observation</b>	<b>On</b> Signal observation activated <b>Off</b> Signal observation deactivated	Off
<b>Object Detection Status</b>	Indicates the object used for signal evaluation. <b>Object 1–4</b>	---
<b>Object Distance</b>	Indicates the respective distance from a maximum of four objects. <b>50 – 10,000 mm</b>	---
<b>Object Signal</b>	Indicates the respective signal strength of a maximum of four objects. <b>1 – 1,000</b>	---

### 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 P1PY107: 0 – 10 V P1PY108: 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 interrupted.

## 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
<b>Measured Value</b>	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
<b>Scale</b>	Scaling of the measured value to the base length unit; -3 corresponds to mm.
<b>SSC1</b>	Switching point 1
<b>SSC2</b>	Switching point 2
<b>Warning</b>	Collective warning in the event of one of the warning status messages (see table “ <a href="#">Status Messages</a> ” on page 32)
<b>Error</b>	Collective warning in the event of one of the error status messages (see table “ <a href="#">Status Messages</a> ” on page 32)
<b>Message 1</b>	Status message 1 read out (see 7.1.4.1)
<b>Message 2</b>	Status message 2 read out (see 7.1.4.1)
<b>Message 3</b>	Status message 3 read out (see 7.1.4.1)
<b>Message 4</b>	Status message 4 read out (see 7.1.4.1)

### 7.2.2 Process Data Out

Data	Meaning
<b>Emitted Light</b>	Emitted light on/off
<b>Localization</b>	Sensor flashes for easy sensor location
<b>Teach-In SSC1</b>	Starts the teach-in process for SSC1
<b>Teach-In SSC2</b>	Starts the teach-in process for SSC2
<b>Reset Acceleration Sensor</b>	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
FDA	U.S. Food and Drug Administration
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	05/10/2021	Initial version of the operating instructions
1.1.0	09/23/2021	New sensor type P2PY109
1.2.0	04/05/2022	Update <a href="#">“2.7 Approvals and Protection Class”</a> on page 7

### 11.3 EU Declaration of Conformity

The EU declaration of conformity can be found on our website at [www.wenglor.com](http://www.wenglor.com) in the product's separate download area.