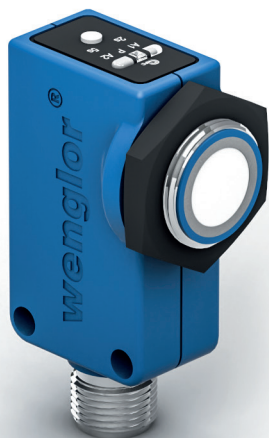


OPT2203, OPT2204, OPT2206, OPT2207, OPT2208

Ultrasonic Distance Sensor / Ultrasonic Through-Beam Sensor



Operating Instructions

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1. General

1.1 Information Concerning these Instructions

- These instructions apply to products OPT2203, OPT2204, OPT2206, OPT2207 and OPT2208.
- 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.



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.
- 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 sensor is used for object detection and distance determination.

Ultrasonic sensors emit pulsed ultrasonic waves at a certain frequency using air as a transmitting medium. The sensors evaluate the transit time of the ultrasound reflected from the object. Parameters can be taught into the sensors using the teach-in key, via an input or via IO-Link. The output is switched when the preselected switching point is reached. Two independent switching outputs can be set up. Furthermore, the measured value can be read out via IO-Link 1.1. In addition to reflex mode, two sensors can also be used in through-beam mode.

The product may only be used in the specified ambient conditions ([see technical data on the product detail page at \[www.automationdirect.com\]\(http://www.automationdirect.com\)](#)). The guidelines, safety data and approvals specified in the technical data must also be taken into account.

This product can be used for object detection or distance measurement in the following industries:

- Special machinery manufacturing
- Heavy machinery manufacturing
- Logistics
- Automotive industry
- Packaging industry
- Pharmaceuticals industry
- Clothing industry
- Plastics industry
- Woodworking industry
- Consumer goods industry
- Paper industry
- Electronics industry
- Glass industry
- Steel industry
- Printing industry
- Aviation industry
- Construction industry
- Chemicals industry
- Agriculture industry
- Alternative energies
- Raw materials extraction

2.2 Use for Other than the Intended Purpose

- No safety components in accordance with 2006/42/EC (Machinery Directive).
- The product is not suitable for use in potentially explosive atmospheres.
- The product may be used only with accessories supplied or approved by wenglor, or in combination with approved products. A list of approved accessories and combination products can be found at www.automationdirect.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.
-

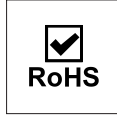
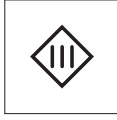
2.5 General Safety Precautions



NOTE!

- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
 - Read the operating instructions carefully before using the product.
 - Protect the sensor against contamination and mechanical influences.
-

2.6 Approvals and Protection Class



3. Technical Data

3.1 General Data

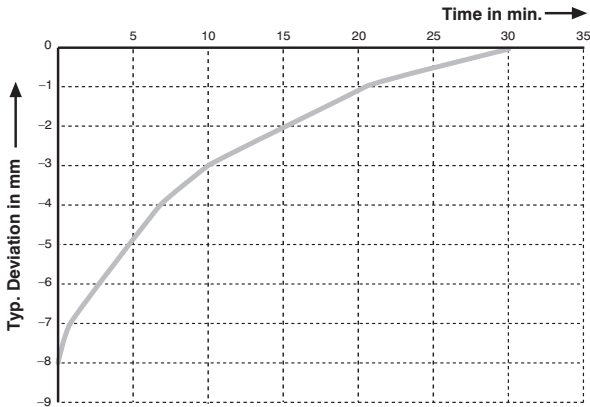
| Technical Data \ Order number | OPT2203/2207 | OPT2204/2208 | OPT2206 |
|--|--|--------------|------------------------|
| Ultrasound Data | | | |
| Working range, Reflex Sensor | 100...1,200 mm | | - |
| Working range, Through-Beam Sensor | 1...2,000 mm | | 1...2,000 mm |
| Setting range | 100...1,200 mm | | - |
| Reproducibility | 5 mm | | - |
| Linearity deviation | 2 mm | | - |
| Resolution | 1 mm | | - |
| Ultrasonic frequency | 240 kHz | | 240 kHz |
| Aperture angle | < 12° | | < 12° |
| Service life (ambient temp. = +25° C) | 100,000 h | | 100,000 h |
| Switching hysteresis | 1 % of the switching distance, at least 2 mm | | - |
| Electrical Data | | | |
| Supply voltage * | 18...30 V DC | | 18...30 V DC |
| Current consumption (operating voltage = 24 V) | ≤ 30 mA | | ≤ 30 mA |
| Switching frequency, Reflex Sensor | 7 Hz | | - |
| Switching frequency, Through-Beam Sensor | 7 Hz | | - |
| Response time, Reflex Sensor | 72 ms | | - |
| Response time, Through-Beam Sensor | 72 ms | | - |
| Temperature range (during operation) | -30...60 °C | | -30...60 °C |
| Number of switching outputs | 2 | | - |
| Switching output voltage drop | < 2.5 V | | - |
| Switching output switching current | 100 mA | | - |
| Short-circuit protection | Yes | | Yes |
| Reverse polarity and overload-proof | Yes | | Yes |
| Lockable | Yes | | Yes |
| Interface | IO-Link | | IO-Link |
| IO-Link version | 1.1 | | 1.1 |
| Smart Sensor Profile | Yes | | Yes |
| Data Storage | Yes | | yes |
| Protection class | III | | III |
| Mechanical Data | | | |
| Setting method | Teach-in, IO-Link, NFC | | Teach-in, IO-Link, NFC |
| Housing material | Plastic, PBT, ABS | | Plastic, PBT, ABS |
| Sleeve material | Nickel-plated brass | | Nickel-plated brass |
| Nut material | Plastic, PA | | Plastic, PA |
| Degree of protection | IP67, IP68 | | IP67, IP68 |
| Connection type | M12×1; 4/5-pin | | M12×1; 4/5-pin |
| Technical Safety Data | | | |
| MTTFd (EN ISO 13849-1) | 1.558, 40 a | | 1.558, 40 a |

* Start-up time: 650 ms

| Technical Data | Order number | OPT2203/2207 | OPT2204/2208 | OPT2206 |
|---------------------|--------------|------------------------------|--------------------------|-----------------------------|
| Functions | | | | |
| Reflex sensor mode | | Yes | Yes | No |
| Through-Beam Sensor | Yes | Yes (receiver in default) | Yes | Yes (Only emitter possible) |
| PNP NO | | Yes (default setting) | Yes | - |
| NPN NO | | Yes | Yes (default setting) | - |
| Error output | | Yes | Yes | - |
| IO-Link | | Yes | Yes | Yes |

3.2 Warm-Up Phase

The warm-up phase lasts roughly 30 minutes. At the beginning of the warm-up phase, linearity deviation and reproducibility may deviate from the specified values. During the course of the warm-up phase, values improve as an exponential function until the values in the technical data are reached. The switch-on drift during this time is shown in the following diagram.



3.3 Mode-Dependent Data

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

Reflex and Through-beam Mode

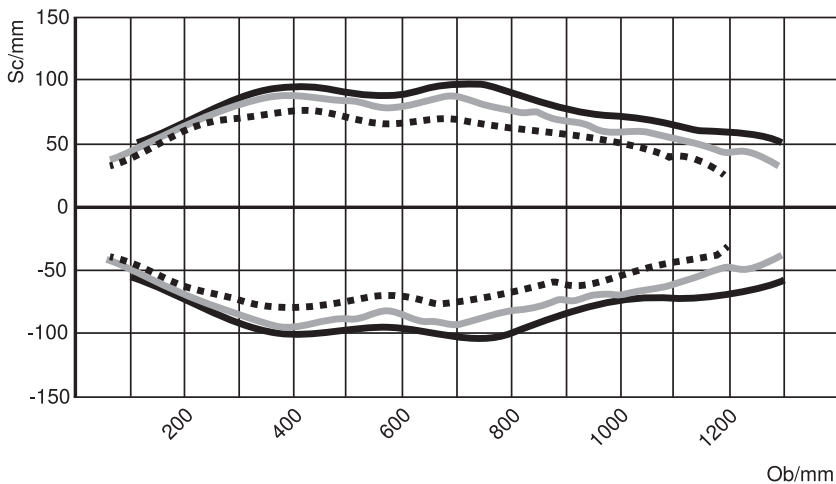
| Filter value | Switching frequency in Hz | Response time in ms |
|--------------|---------------------------|---------------------|
| 0 | 7.0 | 72 |
| 1 | 5.0 | 100 |
| 2 | 4.0 | 125 |
| 3 | 3.5 | 142 |
| 4 | 3.0 | 167 |
| 5 | 2.5 | 200 |
| 6 | 2.3 | 218 |
| 7 | 2.1 | 238 |
| 8 | 1.9 | 263 |
| 9 | 1.7 | 295 |
| 10 | 1.6 | 310 |
| 11 | 1.5 | 333 |
| 12 | 1.4 | 357 |
| 13 | 1.3 | 381 |
| 14 | 1.2 | 417 |
| 15 | 1.1 | 429 |
| 16* | 1.1 | 429 |
| 17* | 1.0 | 500 |
| 18* | 0.9 | 572 |
| 19* | 0.8 | 650 |
| 20* | 0.5 | 2,000 |

* The specified switching frequency and response time correspond to the maximum duration including interference filter.

A detailed description of the filter function can be found in section [“8.1.1 Sensor Functions”](#) on page 22.

3.4 Sonic Cone Diagrams for Reflex Sensor Mode

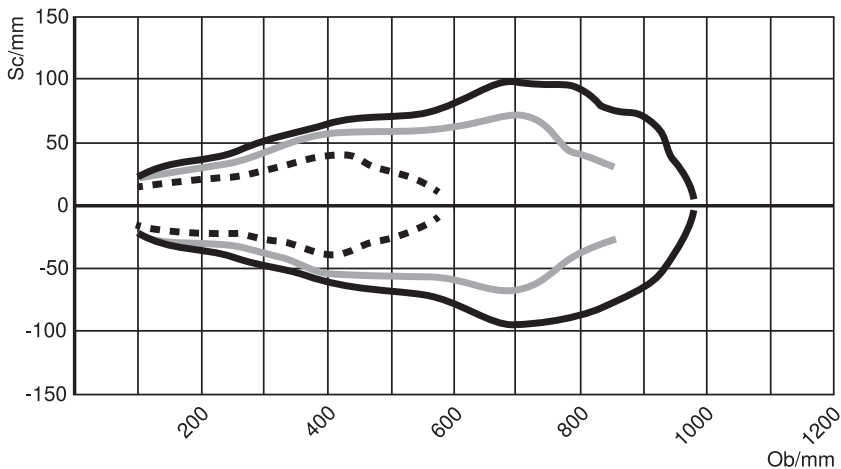
Measurement of sonic cone on plate 100×100 mm



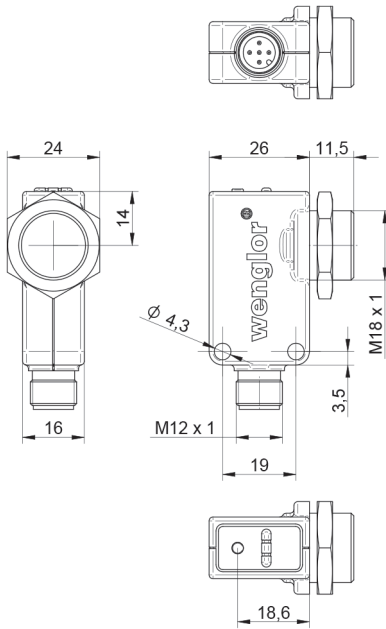
Ob = object
Sc = sonic cone width

— Standard - - - - - Narrow ····· Extra Narrow

Measurement of the sonic cone on a rod with a diameter of 25 mm



3.5 Housing Dimensions



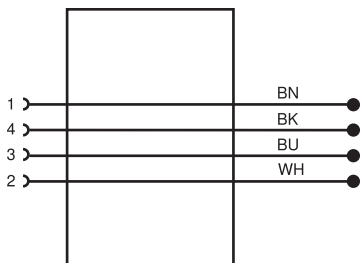
Dimensions in mm
M3 screw = 0.5 Nm

3.6 Complementary Products

Suitable connection equipment no.

2 **35**

S02



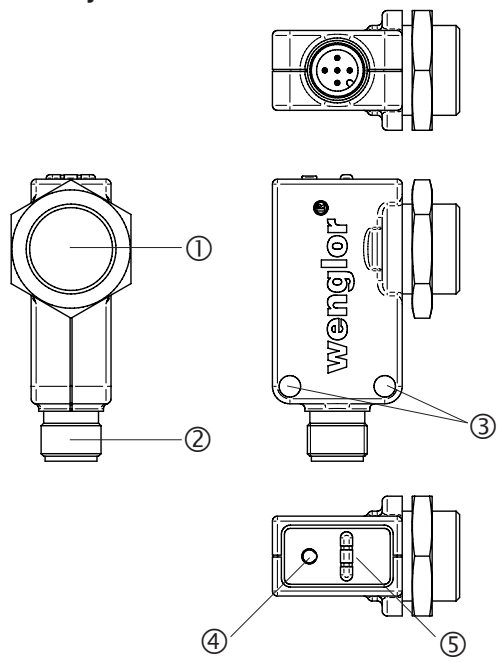
S06



IO-Link masters

Baffle plate

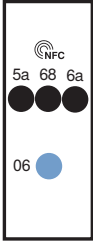
3.7 Layout



- 1 = sensing face
- 2 = connector plug
- 3 = mounting holes
- 4 = teach-in key
- 5 = indicator LEDs

3.8 Control Panel

A 49



06 = teach-in key

5a = switching status indicator O1

68 = supply voltage

6a = switching status display, O2

3.9 Scope of Delivery

- 1 ultrasonic distance sensor OPT22xx
- 1 plastic nut (NUT-M18-E012)
- 1 instruction leaflet

4. Transport and Storage

4.1 Transport

Upon receipt of shipment, inspect the goods 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.
- Make sure that the sensor is mounted in a mechanically secure fashion.
- If the object has smooth surfaces, the angle between the axis of the sound waves and the surface of the object should be $90^\circ \pm 3^\circ$. The angle can be considerably larger in the case of rough object surfaces.
- The sensor's sensing face must remain unobstructed.

NOTE!

Observe the blind spot.

In the area between the sensor's active surface and the beginning of its working range, correct functioning of the sensor is not assured. No objects may be located in this area.



| | Object position | | | Switching position / switching LED | Error output / error LED | Measured value, IO-Link |
|-------------------------|-----------------|---|---|------------------------------------|--------------------------|-------------------------|
| Working range | | x | | Defined | Defined | Defined |
| Blind spot | x | | | Undefined | Undefined | Undefined |
| Above the working range | | | x | Defined | Defined | Defined |

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.

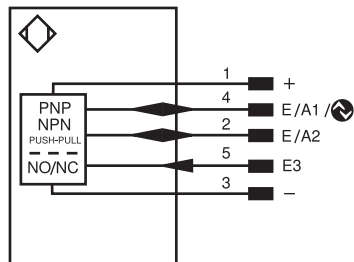
- A safe installation environment must be assured.



5.2 Electrical Connection

- Wire the sensor in accordance with the connection diagram.
- Switch on the supply voltage (see "3. Technical Data" on page 9).
- The blue supply voltage indicator lights up.
- Please consider the different product variants mentioned in chapter "3. Technical Data" on page 9.

243



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

+ supply voltage "+"
- supply voltage "0 V"

O1 switching output 1 normally open (NO)

O2 switching output 2 normally open (NO)

I input (analog or digital)

IO-Link



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 O1, O2 |  | Switching output active |
| |  2.5 Hz | Warning |
| |  5 Hz | Error |
| |  | Switching output inactive |

-  Not lit up
-  Flashing
-  Permanently lit up

5.3.2 Troubleshooting

| Error | Possible Cause | Elimination |
|---------|------------------|--|
| Warning | Warning signal | <ul style="list-style-type: none"> • Reduce the distance between the sensor and the object • Adjust the angle to the object |
| | Undervoltage | <ul style="list-style-type: none"> • Increase the voltage supply to at least 18 V DC |
| Error | No signal | <ul style="list-style-type: none"> • Adjust sensor object distance • Minimize environmental influences (air circulation, ultrasonic sources) • Check installation |
| | Object too close | <ul style="list-style-type: none"> • Increase sensor object distance |
| | Object too far | <ul style="list-style-type: none"> • Decrease sensor object distance |
| | Short circuit | <ul style="list-style-type: none"> • Check the electrical wiring and eliminate the short circuit |
| | Over-temperature | <ul style="list-style-type: none"> • Disconnect the sensor from the supply voltage and allow it to cool |
| | Device error | <ul style="list-style-type: none"> • 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 [“8.2 Condition Monitoring/Process Data” on page 33](#).

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. Default Settings

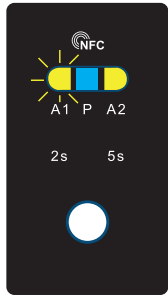
| Technical Data | OPT2203 | OPT2207 | OPT2204 | OPT2208 | OPT2206 |
|--------------------------|----------------------------|------------------|----------------------------|------------------|-----------------|
| Sensor operating mode | Normal (reflex sensor) | Barrier Receiver | Normal (reflex sensor) | Barrier Receiver | Barrier Emitter |
| Filter | 0 | | 0 | | - |
| Sonic cone | Standard | -- | Standard | -- | Standard |
| Process date | Outputs and measured value | | Outputs and measured value | | - |
| Temperature mode | Internal | | Internal | | - |
| O1 pin function | Switching output | | Switching output | | - |
| O1 teach-in mode | Foreground | | Foreground | | - |
| O1 PNP/NPN | PNP | | NPN | | - |
| O1 NO/NC | NO | | NO | | - |
| O1 switching point | 1200 mm | | 1200 mm | | - |
| O1 additional hysteresis | 0 | | 0 | | - |
| O2 pin function | Switching output | | Switching output | | - |
| O2 teach-in mode | Foreground | | Foreground | | - |
| O2 PNP/NPN | PNP | | NPN | | - |
| O2 NO/NC | NO | | NO | | - |
| O2 switching point | 1200 mm | | 1200 mm | | - |
| O2 additional hysteresis | 0 mm | | 0 mm | | - |
| I3 function | Teach-in input | | Teach-in input | | - |

7. Sensor Settings

This section describes the settings that can be made directly on the sensor via the control panel.

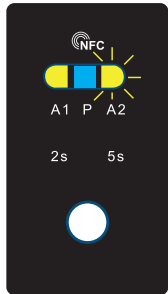
Teach-In for sensors in reflex sensor mode or receiver mode.

The three different teach-in modes foreground teach-in, background teach-in and window teach-in are available. These can be set via IO-Link (see section “8.1 Settings via IO-Link/Parameters” on page 22) or via the teach-in keys on the sensor. It should be noted here that the window teach-in must not take place via the keys, but exclusively via IO-Link. Foreground teach-in is used by default.



Teach-In for O1

1. Install the sensor in accordance with the installation instructions.
2. Position the object in front of the sensor.
3. Press and hold the teach-in key for 2 seconds until LED O1 starts to flash.
4. Release the teach-in key.
5. The distance is taught in, and LED O1 lights up in order to confirm successful teach-in.



Teach-In for O2

1. Install the sensor in accordance with the installation instructions.
2. Position the object in front of the sensor.
3. Press and hold the teach-in key for 5 seconds until LED O2 starts to flash.
4. Release the teach-in key.
5. The distance is taught in, and LED O2 lights up in order to confirm successful teach-in.



NOTE!

If there is no object within the measuring range, the switching distance is set to the end of the setting range.

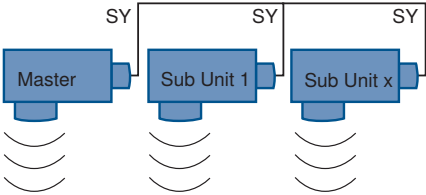
8. Setup via IO-Link

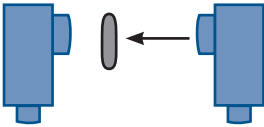
The sensors can exchange parameters and process data via IO-Link. The parameters can be used to make many additional settings on the device. The process data transmit cyclical data and condition monitoring. To this end, the sensor is connected to a suitable IO-Link master (see product detail page/complementary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

The interface protocol and the IO-Link can be found at www.automationdirect.com in the download area for the respective product.


8.1 Settings via IO-Link/Parameters


8.1.1 Sensor Functions

| Function | Possible Settings | Default |
|--------------|--|---------|
| 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>On LEDs and key illumination flash</p> <p>Off LEDs and key illumination function normally</p> | Off |
| Sensor mode | <p>Normal The sensor works as a reflex sensor.</p> <p>Synchronous Master Unit Synchronous Sub Unit A maximum of 40 sensors can be used together in the synchronous mode in order to detect a large surface. The sensors emit ultrasonic pulses simultaneously (synchronously).</p> <ol style="list-style-type: none"> 1. Connect I3/pin 5 of all sensors to each other. 2. Set up one sensor as the "Synchronous Master". 3. Set all other sensors as "Synchronous Sub Unit".  <p>NOTE!</p> <ul style="list-style-type: none"> • Synchronous mode is only possible with the PNP output function. • In synchronous mode, both outputs O1, O2 can still be used, as the synchronization runs exclusively via I3. | Normal |

| Function | Possible Settings | Default |
|----------|---|---------|
| | <p>NOTE!</p> <ul style="list-style-type: none"> • Sensors in synchronous mode should have the same sonic cone settings for optimal measurement results. • The response time of the sensors in synchronous mode increases to $1.43 \times$ the response time in normal mode (e.g. filter 0: response time in normal mode = 72 ms; response time in synchronous mode = 103 ms). <p>NOTE! Synchronous mode is designed for direct connection.</p> <p>Through-Beam Sensor Emitter Through-Beam Sensor Receiver</p> <p>In addition to the reflex mode, a through-beam mode is also available. Two sensors are required to this end.</p> <ol style="list-style-type: none"> 1. Set a sensor as a "through-beam sensor emitter". 2. Set up another sensor as a "through-beam sensor receiver". 3. If the receiver is operated as a normally closed contact, it is switched when an object is located between the emitter and the receiver.  <p>Technical Data in Through-Beam Mode:</p> <p>Range: 1...2000 mm Switching frequency: 7 Hz Response time: 72 ms</p> <p>Differentiation between one and two layers of thin material such as paper or foil is possible in the through-beam operating mode.</p> <ol style="list-style-type: none"> 1. Position the emitter and the receiver a short distance from each other. 2. Adjust the distance between the emitter and the receiver so that the receiver continues to switch for one layer but not for two. <p>NOTE!</p> <ul style="list-style-type: none"> • Teach-in via the teach-in key is not possible in the through-beam operating mode. • Adjustments can be made by changing the distance between the emitter and the receiver and with the help of the sonic cone settings at the emitter. • With distances of 1...100 mm, the sonic cone must be set to "extra narrow" • The influence of reflections from the environment (e.g. when detecting gaps) can be minimized to "narrow" or "extra narrow" by the sonic cone setting. | |

| Function | Possible Settings | Default | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|---|---------|-------------|------|---|---|------------------------------------|---|------------------------------------|---|------------------------------------|---|------------------------------------|---|------------------------------------|---|------------------------------------|---|------------------------------------|---|------------------------------------|---|-------------------------------------|---|-------------------------------------|----|-------------------------------------|----|-------------------------------------|----|-------------------------------------|----|-------------------------------------|----|-------------------------------------|----|-------------------------------------|---------|--|----|--|----|--|---|
| Filter | <p>Filters are available for sensors in reflex sensor mode or receiver mode.</p> <p>The selected filter has an influence on the response time (see response time in section “3. Technical Data” on page 9) and the number of distance values to be evaluated.</p> <table border="1"> <thead> <tr> <th>Filter</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0-15</td> <td>Median filter Median filter from the specified number of measured values. If the signal is missing or invalid, an error is issued. This filter can provide additional smoothing of the signal in applications with objects with a homogeneous surface in a stable environment.</td> </tr> <tr> <td>0</td> <td>Median filter of 2 measured values</td> </tr> <tr> <td>1</td> <td>Median filter of 3 measured values</td> </tr> <tr> <td>2</td> <td>Median filter of 4 measured values</td> </tr> <tr> <td>3</td> <td>Median filter of 5 measured values</td> </tr> <tr> <td>4</td> <td>Median filter of 6 measured values</td> </tr> <tr> <td>5</td> <td>Median filter of 7 measured values</td> </tr> <tr> <td>6</td> <td>Median filter of 8 measured values</td> </tr> <tr> <td>7</td> <td>Median filter of 9 measured values</td> </tr> <tr> <td>8</td> <td>Median filter of 10 measured values</td> </tr> <tr> <td>9</td> <td>Median filter of 11 measured values</td> </tr> <tr> <td>10</td> <td>Median filter of 12 measured values</td> </tr> <tr> <td>11</td> <td>Median filter of 13 measured values</td> </tr> <tr> <td>12</td> <td>Median filter of 14 measured values</td> </tr> <tr> <td>13</td> <td>Median filter of 15 measured values</td> </tr> <tr> <td>14</td> <td>Median filter of 16 measured values</td> </tr> <tr> <td>15</td> <td>Median filter of 17 measured values</td> </tr> <tr> <td>16 – 20</td> <td>Median filter and interference filter Median filter from the specified number of measured values. The additional interference filter can be used to increase measurement reliability in the case of brief interferences in the measured section. Disturbances such as waves, air vortices, sound-absorbing areas or bulk solids generate temporarily invalid signals that can lead to incorrect measurements. A higher filter level allows the interfering signals to be ignored for a defined period. If the distance changes continuously, the response time remains unchanged when the filter is activated.</td> </tr> <tr> <td>16</td> <td>Median filter of 18 measured values and bridging of 4 missing measured values (112 ms)</td> </tr> <tr> <td>17</td> <td>Median filter of 21 measured values and bridging of 7 missing measured values (196 ms)</td> </tr> </tbody> </table> | Filter | Description | 0-15 | Median filter Median filter from the specified number of measured values. If the signal is missing or invalid, an error is issued. This filter can provide additional smoothing of the signal in applications with objects with a homogeneous surface in a stable environment. | 0 | Median filter of 2 measured values | 1 | Median filter of 3 measured values | 2 | Median filter of 4 measured values | 3 | Median filter of 5 measured values | 4 | Median filter of 6 measured values | 5 | Median filter of 7 measured values | 6 | Median filter of 8 measured values | 7 | Median filter of 9 measured values | 8 | Median filter of 10 measured values | 9 | Median filter of 11 measured values | 10 | Median filter of 12 measured values | 11 | Median filter of 13 measured values | 12 | Median filter of 14 measured values | 13 | Median filter of 15 measured values | 14 | Median filter of 16 measured values | 15 | Median filter of 17 measured values | 16 – 20 | Median filter and interference filter Median filter from the specified number of measured values. The additional interference filter can be used to increase measurement reliability in the case of brief interferences in the measured section. Disturbances such as waves, air vortices, sound-absorbing areas or bulk solids generate temporarily invalid signals that can lead to incorrect measurements. A higher filter level allows the interfering signals to be ignored for a defined period. If the distance changes continuously, the response time remains unchanged when the filter is activated. | 16 | Median filter of 18 measured values and bridging of 4 missing measured values (112 ms) | 17 | Median filter of 21 measured values and bridging of 7 missing measured values (196 ms) | 0 |
| Filter | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0-15 | Median filter Median filter from the specified number of measured values. If the signal is missing or invalid, an error is issued. This filter can provide additional smoothing of the signal in applications with objects with a homogeneous surface in a stable environment. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Median filter of 2 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Median filter of 3 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Median filter of 4 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Median filter of 5 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Median filter of 6 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Median filter of 7 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Median filter of 8 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Median filter of 9 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Median filter of 10 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Median filter of 11 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Median filter of 12 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | Median filter of 13 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Median filter of 14 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Median filter of 15 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Median filter of 16 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | Median filter of 17 measured values | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 – 20 | Median filter and interference filter Median filter from the specified number of measured values. The additional interference filter can be used to increase measurement reliability in the case of brief interferences in the measured section. Disturbances such as waves, air vortices, sound-absorbing areas or bulk solids generate temporarily invalid signals that can lead to incorrect measurements. A higher filter level allows the interfering signals to be ignored for a defined period. If the distance changes continuously, the response time remains unchanged when the filter is activated. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | Median filter of 18 measured values and bridging of 4 missing measured values (112 ms) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | Median filter of 21 measured values and bridging of 7 missing measured values (196 ms) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Function | Possible Settings | Default | |
|---|--|---|---|
| Filter | 18 | Median filter of 24 measured values and bridging from 15 missing measured values (420 ms) | 0 |
| | 19 | Median filter of 27 measured values and bridging from 31 missing measured values (868 ms) | |
| | 20 | Median filter of 36 measured values and bridging from 62 missing measured values (1.7 s) | |
| |  <p>NOTE! The technical data resulting from the various modes are specified in “3. Technical Data” on page 9.</p> | | |
| Transmit signal | <p>The transmit signal of the sensor can be switched off. This allows the sensor to be deactivated when not in use and, if necessary, interference can be avoided.</p> <p>On Transmit signal is on.</p> <p>Off Transmit signal is off. No measurements are taken. The switching behavior is identical to when no signal is received in reflective operation or as a through-beam sensor.</p> | On | |
| Sonic cone | <p>This setting can be used to adjust the shape and range of the sonic cone. The diagrams for the individual sonic cones on standardized objects can be found in “3.4 Sonic Cone Diagrams” on page 12. Narrow cones can be used to block out constant disturbances in the measuring section (e.g. tank walls).</p> <p>Standard Narrow Extra narrow</p> | Standard | |
| Measured value unit (process data type) | <p>The measured distance can be read out in millimeters or inches.</p> <p>Millimeter Read-out of distance values in mm for internal temperature compensation or external temperature compensation via the parameters</p> <p>Inch Read-out of distance values in 1/10 inch for internal temperature compensation or external temperature compensation via the parameters</p> <p>Millimeter (with external temperature) Output of distance values in mm and input of external temperature via Process Data Out</p> <p>Inches (with external temperature) Output of distance values in 1/10 inch and input of external temperature via Process Data Out</p> | Millimeter | |

| Function | Possible Settings | Default |
|----------------------|--|----------|
| Temperature mode | <p>The sensor has internal temperature compensation. Alternatively, the temperature can be measured externally and sent to the sensor as a process or parameter.</p> <p>Internal Sensor operates with internal temperature compensation</p> <p>External Sensor works with external temperature compensation and uses the transmitted process or parameters (see section “8.2 Condition Monitoring/Process Data”). Whether process or parameter data is to be used is specified via the setting under "Measured value unit "Process data type".</p> | Internal |
| External temperature | <p>Temperature values can be transmitted to the sensor at a resolution of 1 °C for temperature compensation. Parameter is used if the external temperature compensation is to work via the parameters.</p> <p>-30...+60 °C</p> <p> NOTE! Regular updating of external temperature data is recommended, in order to prevent abrupt temperature changes and jumps in measurement results resulting therefrom. If no temperature value is transmitted when the sensor is started up in the external temperature mode, the standard value of 23 °C is used.</p> | 23 °C |

8.1.2 Input/Output Functions (I/O)

8.1.2.1 Pin Functions for sensors in reflex sensor mode or receiver mode

The pin function is used to define the function of pins I/O1, I/O2, and I3, as these can be used for different functions.

| Pin | Possible Settings | Default |
|------|--|------------------|
| I/O1 | <p>Switching Output Switching point SSC1 is assigned to the switching output.</p> <p>Error Output The error output switches if one of the assigned errors occurs; see table “Status Messages” on page 31.</p> <p>Warning Output The warning output switches if one of the assigned warnings occurs; see table “Status Messages” on page 31.</p> <p>Transmit Signal Off Input See I3 for an explanation</p> <p>Teach-In Input See I3 for an explanation</p> <p>Deactivated The pin is deactivated.</p> | Switching output |
| I/O2 | <p>Switching Output Switching point SSC2 is assigned to the switching output.</p> <p>Antivalent Switching Output The switching output switches antivalently to switching output O1.</p> <p>Error Output The error output switches if one of the assigned errors occurs; see table “Status Messages” on page 31.</p> <p>Warning Output The warning output switches if one of the assigned warnings occurs; see table “Status Messages” on page 31.</p> <p>Transmit Signal Off Input See I3 for an explanation</p> <p>Teach-In Input See I3 for an explanation</p> <p>Deactivated The pin is deactivated.</p> | Switching output |

| | | |
|----|---|---------------------------|
| 13 | <p>Transmit Signal Off Input The sensor's transmit signal is deactivated as long as the input is activated. The sensor does not send a measured value and sets the status to "No signal".</p> <p>Teach-In Input Teach-in The outputs (switching outputs) can be set using 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>Synchronous Input/Output The input is used for communication between the Synchronous Master Unit and the Synchronous Sub Unit.</p> <p>Deactivated The pin is deactivated.</p> | Transmit signal off input |
|----|---|---------------------------|

8.1.2.2 Output functions for sensors in reflex sensor mode or receiver mode

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 (normally open) The output is high when the condition has been fulfilled depending on the setting (switching point, warning, error). NC Dark switching (normally closed) The output is low when the condition has been fulfilled depending on the setting (switching point, warning, error). | NO |
| On-delay | 0...10,000 ms | 0 ms |
| Off-delay | 0...10,000 ms | 0 ms |

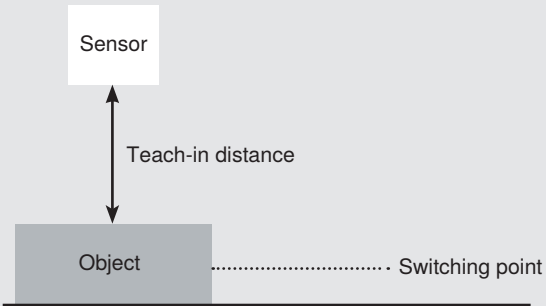
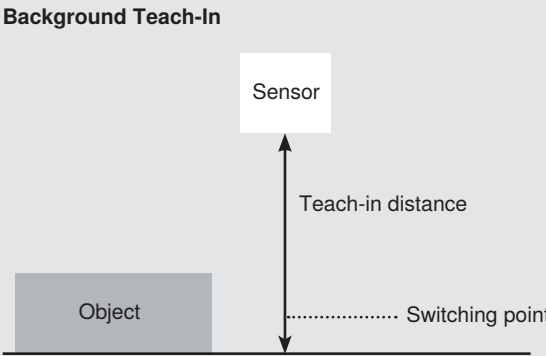
8.1.2.3 Input Functions

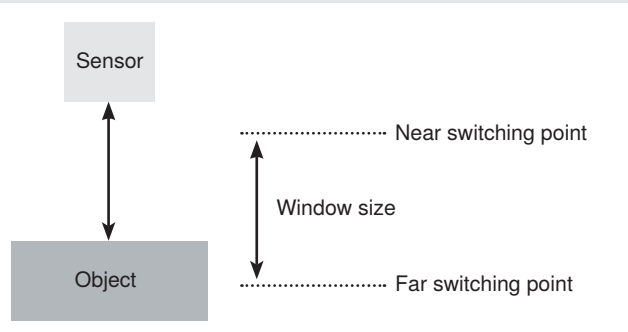
The input functions are used to set the physical inputs.

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

8.1.3 Switching Point Functions (SSC1/ SSC2) for sensors in reflex sensor mode or receiver mode

The switching point functions are used to set the two switching points, SSC1 and SSC2. SSC1 is assigned to output O1 and SSC2 is assigned to output O2.

| Function | Possible Settings | Default |
|---------------|--|---------------------|
| Teach-in | Starts the teach-in process | |
| Teach-in mode | <p>Foreground Teach-In</p>  <p>Background Teach-In</p>  | Foreground teach-in |

| Function | Possible Settings | Default |
|-----------------------------|---|---------|
| | <p>Window Teach-In</p>  <p>NOTE! The far switching point must be greater than the near switching point.</p> | |
| Switching point | 100...1200 mm | 1200 mm |
| Near switching point window | 100...1200 mm | 100 mm |
| Far switching point window | 100...1200 mm | 100 mm |
| Additional hysteresis | <p>0...500 mm</p> <p>The hysteresis is the difference between the switch-on and switch-off point.</p> <p>The sensor has a minimum hysteresis of 1% of the switching distance, but at least 2 mm. This cannot be changed. An additional hysteresis in mm can be set for each switching point.</p> <p>The total hysteresis is calculated from internal switching hysteresis (1%) + additional hysteresis.</p> <p>The sum of the switching point, hysteresis and additional hysteresis must not exceed the maximum measuring range of the sensor.</p> | 0 mm |

8.1.4 Condition Monitoring Functions

8.1.4.1 Status Message Function

The sensor provides various 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 31 | Warning signal |
| Message 2 | See table “Status Messages” on page 31 | Short circuit |
| Message 3 | See table “Status Messages” on page 31 | Undervoltage |
| Message 4 | See table “Status Messages” on page 31 | No signal |

8.1.4.2 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 31 | Signal warning, undervoltage |
| Error output | See table “Status Messages” on page 31 | No signal, object too close, object too wide, short circuit, device error |

Status Messages

| Warnings | |
|----------------|---|
| Warning signal | The object reflects too little sound (weak signal). |
| Undervoltage | The supply voltage is too low. |
| Emitter off | The emitter of the sensor is switched off. |

| Error | |
|------------------|--|
| No signal | The sensor is not receiving a signal. The error can occur, for example, due to: <ul style="list-style-type: none"> • Strong air turbulence • Ultrasonic sources too strong in the measuring range • Very small or poorly reflective (sound-absorbing) objects are located within the working range. • Incorrect installation |
| 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. |

| Error | |
|---------------|---|
| Short circuit | A short circuit has occurred on at least one pin. |
| Device error | A hardware error has occurred. |

8.1.5 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 |
| Simulation measured value | Current measured value min...max. measuring range | Current measured value |
| Simulation SSC1 | According to the measured value On Off | According to the measured value |
| Simulation SSC2 | According to the measured value On Off | According to the measured value |
| Simulation status messages | Tests the individual status messages According to the measured value On Off | According to the measured value |



NOTE!

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


8.2 Condition Monitoring/Process Data

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

8.2.1 Process Data In

| Data | Meaning |
|----------------|---|
| Measured value | Measured distance in mm or 1/10 inch As the sensor cannot determine a measured value in the following error cases, substitute values are read out: No signal: 0x7FFC / – 32760 mm Object too close: 0x8008 / 32760 mm Object too far: 0x7FF8 / 32764 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 31) |
| Error | Collective warning in the event of one of the error status messages (see table “Status Messages” on page 31) |
| Message 1 | Status message 1 read out (see “8.1.4.1 Status Message Function”) |
| Message 2 | Status message 2 read out (see “8.1.4.1 Status Message Function”) |
| Message 3 | Status message 3 read out (see “8.1.4.1 Status Message Function”) |
| Message 4 | Status message 4 read out (see “8.1.4.1 Status Message Function”) |

8.2.2 Process Data Out

| Data | Meaning |
|----------------------------|--|
| Transmit signal | Transmit signal on/off  <p>NOTE! This parameter can be used to configure multiplex operation of the sensors. In the multiplex mode, ultrasonic sensors emit their pulses alternately. This operating mode prevents sensors located in direct proximity to each other from interfering with one another.</p> |
| 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 |
| External temperature value | Enter the external temperature in °C for temperature compensation |

8.3 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 | Eventcode | Type | Specification |
|---|-----------|---------|---------------|
| Device error – unknown error | 0x1000 | Error | IO-Link |
| Short circuit – check installation | 0x7710 | Error | IO-Link |
| Supply voltage too low – check tolerances | 0x5111 | Warning | IO-Link |

9. NFC

The devices can be set up and their parameters can be configured via the NFC interface with the help of a smartphone and wenglor's "weCon" app. Process data cannot be read out via NFC but they're available via IO-Link.

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

Scan the code below to access the wenglor app directly.



The settings are selected via the app and are then transmitted to the sensor.

With the "Read" or "Write" mode activated, hold the smartphone's antenna just above the sensor's active NFC sensing face.



NOTE!

- NFC antenna position varies from one smartphone to the next.
- Refer to the smartphone's operating instructions in order to determine the antenna's exact position

If a connection isn't established immediately, move the smartphone across the sensing face until connection is successful.

The sensor doesn't necessarily have to be connected to supply voltage for data transmission, i.e. transmission is also possible in the de-energized state. The only exception is the "Reset" function. This requires a connection to the supply voltage.

10. Maintenance Instructions



NOTE!

- This 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.

11. Proper Disposal

wenglor sensoric GmbH does not accept the return of unusable or irreparable products. Respectively valid national waste disposal regulations apply to product disposal.

12. Appendix

12.1 Index of Changes for the Operating Instructions

| Version | Date | Description/Changes |
|---------|------------|-------------------------|
| 1.0.0 | 11/17/2022 | Initial version for ADC |
| | | |
| | | |

12.2 EU/UKCA Declaration of Conformity

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