wenglor
the innovative family

Operating Instructions
U1KM002
Distance Sensor

EN

Translation of the original operating instructions
Subject to change without notice
Available as PDF file only
Version 1.0
www.wenglor.com

Table of Contents

1 General

1.1 Information Concerning these Instructions

- These instructions ensure the safe and efficient use of the product.
- These instructions are part of the product and must be retained for its entire service life.
- In addition, local accident prevention regulations and national occupational safety regulations must be observed.
- The product is subject to technical improvements, so the instructions and information in these operating instructions may also be subject to change. You can find the current version at www.wenglor.com in the product's download section.

INFORMATION

The operating instructions must be read carefully before use and kept for future reference.

1.2 Explanation 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.

NOTICE

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

INFORMATION

Information draws attention to useful tips and suggestions, as well as information on efficient, error-free use.

1.3 Limitation of Liability

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

1.4 Copyrights

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

2 For Your Safety

2.1 Use for Intended Purpose

Ultrasonic sensors emit pulsed ultrasonic waves of a specific frequency through the transmission medium —air. The system then performs the evaluation of the transit time of the ultrasonic waves reflected by the object.

This Product Can Be Used in the Following Industry Sectors:

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

2.2 Use for Other than the Intended Purpose

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

⚠ DANGER

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

Use for other than the intended purpose may lead to hazardous situations.

→ Observe instructions regarding use for intended purpose.

2.3 Personnel Qualifications

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

⚠ DANGER

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

Personal injury and damage to equipment may occur.

→ Adequate training and qualification of personnel

2.4 Modification of Products

⚠ DANGER

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

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

→ Modification of the product is not permitted

2.5 General Safety Precautions

INFORMATION

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 current version of the operating instructions can be found at www.wenglor.com in the product's separate download area.

Read the operating instructions carefully before using the product.

Protect the sensor against contamination and mechanical influences.

2.6 Approvals and protection classes

CE

c UL us LISTED
IND. CONT. EQ
72HL / E189727
For use in class 2 circuits

RoHS

UK CA

3 Technical Data

3.1 General Data

Ultrasonic Data	
Working range, reflex sensor	50...3000 mm
Setting Range	250...3000 mm
Reproducibility maximum	6 mm
Linearity Deviation	15 mm
Ultrasonic frequency range	70...95 kHz
Switching Hysteresis	2 %
Electrical Data	
Supply Voltage	10...30 V DC
Supply Voltage with IO-Link	18...30 V DC
Current Consumption (Ub = 24 V)	< 20 mA
Switching Frequency	8 Hz
Response Time	70 ms
Temperature Drift	< 1 %
Temperature Range	-30...50 °C
Number of Switching Outputs	2
Switching Output Voltage Drop	< 1.5 V
Switching Output/Switching Current	100 mA
Synchronous Mode	Up to 32 sensors
Multiplex Mode	up to 16 sensors
Short Circuit Protection	yes
Reverse Polarity Protection	yes
Overload Protection	yes
Lockable	yes
Interface	IO-Link
Data Storage	yes
Protection Class	III
Mechanical Data	
Setting Method	IO-Link Teach-In
Housing Material	Plastic, ABS/PC
Sensing face	Stainless steel, V4A (1.4404/316L)
Degree of Protection	IP62*
Connection	M8 × 1; 4-pin
Safety-relevant Data	
MTTFd (EN ISO 13849-1)	1417.85 a
General Data	
Scope of delivery	1 × initial start-up instructions 1 × sensor

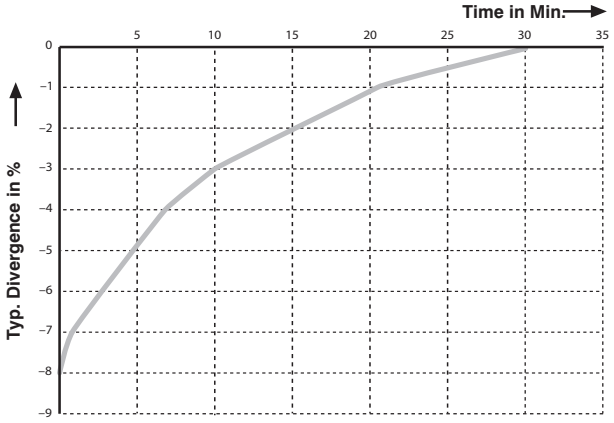
* Hopper facing down

3.2 Default Settings

Technical Specifications	U1KM002
Sensor operating mode	Normal
Filter Mode	Median Filter
Filter Level	Weak
Sonic cone	Standard
Temperature mode	Internal
Object detection mode	First object
Near range	No restriction
Long-range range	No restrictions
On-delay (O1, O2)	0 ms
Off-delay (O1, O2)	0 ms
O1 Pin Function	Switching output
O2 Pin Function	Switching output
O1 Teach mode	Foreground
O1 PNP/NPN	NPN
O1 NO/NC	NO
O1 Switching point	3000 mm
O1 Additional hysteresis	0 mm
O2 teach-in mode	Foreground
O2 PNP/NPN	NPN
O2 NO/NC	NO
O2 Switching point	3000 mm
O2 Additional Hysteresis	0 mm

3.3 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 warm-up phase, the values improve in the form of 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.



3.4 Mode-Dependent Data

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

Response Times for the Median Filter

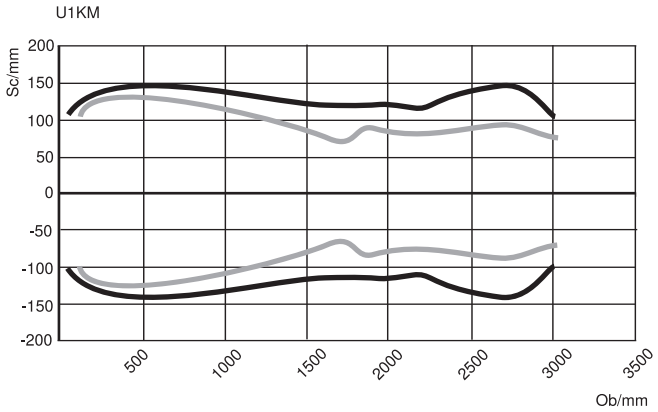
Filter level	Switching frequency in Hz	Response time in ms
Low	7	71
Medium	1.4	357
High	0.4	1,119

The specified switching frequency and response time correspond to the maximum duration including the interference filter. A detailed description of the filter function can be found in section Filter.

3.5 Sonic Cone Diagrams

Measurement of the sonic cone on a 200 × 200 mm plate

Characteristic curves show the position of the center of the test object (200 × 200 mm plate) at the moment of switching.



Ob = object

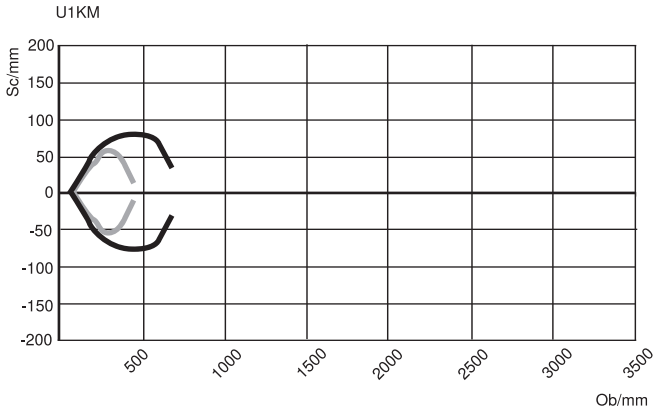
Sc = sonic cone

Standard sonic cone (center of the test object)

Narrow sonic cone (center of the test object)

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

Characteristic curves show the position of the center of the test object (rod Ø 25 mm) at the time of switching.



Ob = object

Sc = sonic cone

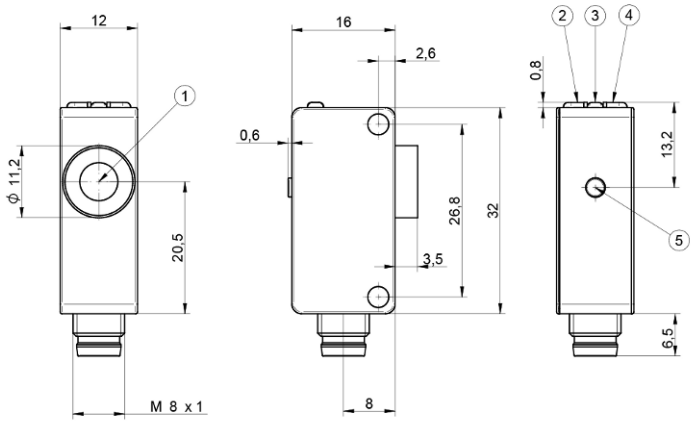
Standard sonic cone (center of the test object)

Narrow sonic cone (center of the test object)

INFORMATION

Please note that when using multiple ultrasonic sensors, mutual interference may occur. Recommendation: Use synchronous or multiplex mode to minimize interference.

3.6 Housing Dimensions



(1) Active Surface
(2) O1 switching status indicator
(3) Power LED
(4) O2 switching status indicator
(5) teach-in key

Dimensions in mm (1 mm = 0.03937 inch)

3.7 Complementary Products

wenglor offers you the right connection and mounting technology as well as other accessories for your product. You can find this at www.wenglor.com on the product details page at the bottom.

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.

NOTICE

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 the applicable electrical and mechanical regulations, standards, and safety rules.
- Protect the product from mechanical impact.
- Ensure that the sensor is mechanically secure during installation.
- Torque specifications must be observed (see the section “ Technical Data [▶ 8] ”).
- If the object has smooth surfaces, the angle between the axis of the sound waves and the surface of the object should be 90° ±3°. The angle can be considerably larger in the case of rough object surfaces.
- The active surface of the sensor may not contact any other machine parts.

	Object Position			switching output / Switching LED	error output / Error LED	measured value IO-Link
working range (250...3000 mm)		x		defined	defined	defined
blind spot (0...250 mm)	x			undefined	undefined	undefined
Above working range (> 3000 mm)			x	defined	defined	defined

NOTICE

Risk of property damage in case of improper installation!

The product may be damaged!

→ Comply with installation instructions.

⚠ CAUTION

Risk of personal injury or property damage during installation!

Personal injury and damage to the product may occur.

→ Ensure a safe installation environment.

5.2 Electrical Connection

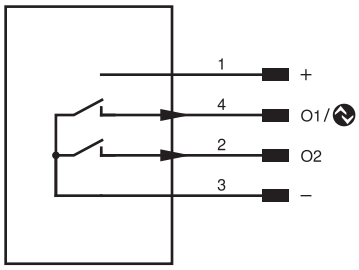
- Wire the sensor according to the connection diagram.
- Switch on the supply voltage (see section Technical Data [▶ 8]).
- If using IO-Link, connect the sensor to 18...30 V DC.

⚠ DANGER

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

Live parts may cause damage to persons and equipment.

→ The electrical device may only be connected by qualified personnel.



pin	Pin Function	Polarity	Circuit
1	Supply Voltage +		
2	Switching output 2	NPN	NO
3	Supply voltage 0 V		
4	Switching output 1 IO-Link	NPN	NO

5.3 Diagnosis

display	Condition	Meaning
Power LED P		Sensor ready for operation
		No voltage supply available
		Warning The O1 and O2 switching status indicator LEDs remain on during operation
		Critical teach-in Teach-in outside the setting range
		Error The O1 and O2 switching status indicator LEDs are not functioning
		Localization Localization function active
Switching status indicator O1, O2		Switching outputs active
		Switching outputs not active

= Not lit
= Lit continuously
= Flashing

NOTICE

Required action in case of fault:

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

⚠ DANGER

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

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

→ Required action as specified in case of fault.

6 Settings

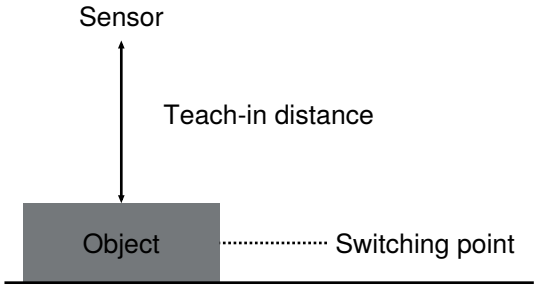
The sensor can be set via external teach-in, IO-Link and wTeach2. The different setting options are outlined below.

6.1 Sensor Settings

This section describes the settings that can be adjusted directly on the sensor using the button.

6.1.1 Foreground Teach-In

The switching distance to the object can be taught in for both outputs by pressing the teach-in key on the sensor (foreground teach-in).



Foreground teach-in for Switching Output 1

1. Install the sensor according to the mounting instructions.
2. Place the object in front of the sensor.
3. Press and hold the teach-in key for 2 seconds until the O1 switching status indicator begins to flash.
4. The distance is programmed, and the LED at O1 lights up to confirm successful programming.

Foreground teach-in for Switching Output 2

1. Install the sensor according to the installation instructions.
2. Place the object in front of the sensor.
3. Press and hold the teach-in key for 5 seconds until the O2 switching status indicator begins to flash.
4. The distance is programmed, and the LED for O2 lights up to confirm successful programming.

INFORMATION

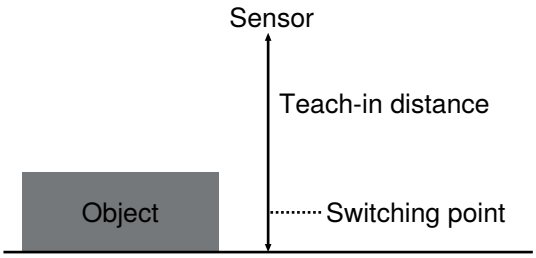
If the measured value is outside the setting range, a critical teach-in has occurred. The sensor indicates this by flashing orange on LED P.

The following replacement values are programmed:

For measured value "out of range (-)" → start of measuring range (250 mm)

For measured value "out of range (+)" and "no measurement data" → end of measuring range (3000 mm)

6.1.2 Background Teach-In



Background teach-in for Switching Output 1

1. Select teach-in mode via IO-Link.
2. Install the sensor according to the installation instructions.
3. Align the sensor with the background.
4. Press and hold the teach-in key for 2 seconds until the O1 switching status indicator begins to flash.
5. The distance is programmed, and the LED at O1 lights up to confirm successful programming.

Background teach-in for Switching Output 2

1. Select teach-in mode via IO-Link.
2. Install the sensor according to the mounting instructions.
3. Align the sensor with the background.
4. Press and hold the teach-in key for 5 seconds until the O2 switching status indicator begins to flash.
5. The distance is taught in, and the LED at O2 lights up to confirm successful teaching.

INFORMATION

If the measured value is outside the setting range, a critical teach-in has occurred. The sensor indicates this by flashing orange on LED P.

The following replacement values are programmed:

For measured value "out of range (-)" → start of measuring range (250 mm)

For measured value "out of range (+)" and "no measurement data" → end of measuring range (3000 mm)

6.2 Setting via IO-Link and wTeach2

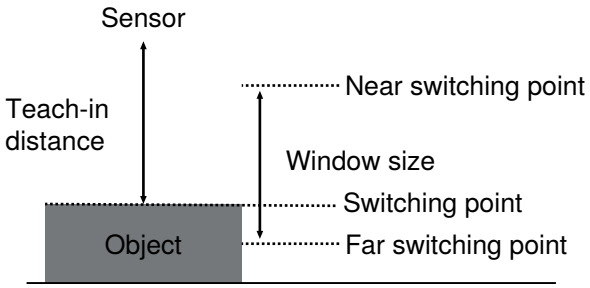
The sensors can exchange parameters and process data via IO-Link. The parameters can be used to make many additional settings on the device. The process data transmit cyclical data and condition monitoring.

To this end, the sensor is connected to a suitable IO-Link master (see product detail page/complementary products). The interface protocol and the IODD can be found at www.wenglor.com in the download area for the respective product.

For information on installing and connecting the wTeach2 software and its structure, as well as information on the general functions, see the wTeach2 operating instructions. They can be found online in the download area at www.wenglor.com under order number DNNF005.

6.2.1 Window teach-in

In addition to foreground teach-in (default setting), there is also a window teach-in option for the switching output:



1. Select teach-in mode via IO-Link.
2. Enter or teach the far switching point.
3. Enter or teach the near switching point.
4. The sensor switches when an object is located between the two switching points.

INFORMATION

The far switching point must be greater than the near switching point.

6.2.2 Synchronous Mode of Operation

Up to 32 sensors can be used together in synchronous mode in order to detect a larger surface area. The sensors emit ultrasonic pulses simultaneously (synchronously).

1. Connect pin 2 of all sensors to each other.
2. Set the sensor mode to "Synchronous" for all sensors.

INFORMATION

In Synchronous mode, the O2 pin function is automatically set to Synchronous Output or Input.

You cannot change the O2 pin function in synchronous mode.

The response time of the sensors increases to 1.2 times the response time in normal operation when in synchronous mode.

6.2.3 Multiplex Mode

A maximum of 16 sensors can be used together in multiplex mode in order to detect a larger surface area. The sensors emit pulsed ultrasonic pulses alternately.

1. Configure a sensor as a "Multiplex Master" via IO-Link and specify the number of "Multiplex Sub Units" involved.
2. Configure all other sensors as "Multiplex Sub Units." Each sub unit must be assigned an address between 1 and 15.
3. Connect pin 2 of all sensors to each other.

INFORMATION

The O2 pin function is automatically adjusted when multiplex mode is selected. Other functions on this pin, such as External Teach or SSC2 output, are automatically overridden in the sensor and are not available.

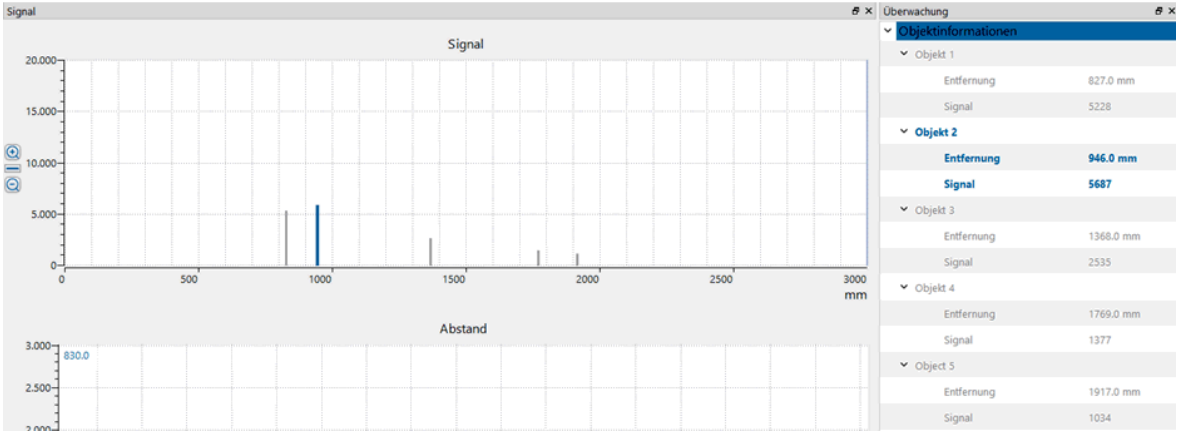
To prevent mutual interference, in multiplex mode each sensor is assigned a time slot during which it is activated individually (emitting sound and receiving echoes). The other sensors remain inactive during this time.

- Sensor 1 emits sound, waits for the echo, and processes it.
- Short wait.
- Sensor 2 emits sound, waits for the echo, and processes it.
- Short wait.
- etc.

The response time is calculated by multiplying the response time of a single sensor in normal mode by the total number of sensors (1 master + x subs)

6.2.4 object detection

The sensor can detect up to five objects simultaneously and output the data via IO-Link and wTeach2. In addition, wTeach2 allows for a visual representation of the signals by activating signal monitoring.



INFORMATION

Compared to distance, the amplitude value is subject to greater fluctuations because it is more sensitive to external influences (e.g., drafts, temperature changes). Even small changes in the object's orientation can cause a significant change in amplitude. Large, flat reflectors generally produce higher signal amplitudes than small or irregularly shaped objects. Echo signals from nearby objects are naturally higher than those from distant objects. Temperature and humidity play a significant role in the propagation of ultrasound and thus affect the signal level. Deviations between individual sensors are to be expected.

6.2.5 Pin Functions I/O2

The I/O2 function can be configured as either an output or an input.

External Teach-In Input

Teach the O1 output via the teach-in input.

1. Set pin I/O2 to function as an external teach-in input.
2. Apply operating voltage to pin I/O2:
   - 2–4 seconds: Switching point O1
   - 5–7 seconds: Program switching point O2

error output

The error output can be configured via IO-Link.

By default, the error output activates in the following cases:

- Device error (e.g., interrupted communication with the ultrasonic sensor element, preventing further measurements)
- "No signal" (Possible causes include an object that is too small or reflects poorly, as well as disruptive environmental factors such as strong drafts)
- Short circuit

Other options for configuring the error output are:

- Signal Warning (weak signal)
- Object too close
- Object too far
- Emitted Signal Off

6.2.6 External Temperature Compensation

As a standard feature, temperature is compensated with the help of the internal temperature sensor. Continuous transmission of external temperature values to the sensor is also possible.

1. Set the temperature mode to external.
2. Enter a fixed temperature or transmit the temperature value from another measuring instrument.

INFORMATION

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.

6.2.7 Additional Functions and Settings

INFORMATION

The technical specifications for the various modes are detailed at .

<table>
<tr><th>Function</th><th colspan="2">Possible Settings</th><th>Default setting</th></tr>
<tr><td>filters</td><td colspan="2">Various filters are available that smooth out fluctuations in the output signal, thereby enabling a more stable measured value display (IO-Link) or more stable switching behavior. The selected filter affects the response time (see the “General Data” section) and the number of measured values skipped when the sensor temporarily does not receive a signal.</td><td>0</td></tr>
<tr><td></td><td>filters</td><td>Description</td><td></td></tr>
<tr><td></td><td>Median Filter</td><td>Median filter based on the specified number of measured values. If the signal is missing or invalid, “no signal” is output.
This filter can provide additional signal smoothing in applications involving objects with a homogeneous surface in a stable environment.
Filter Level:
Weak
Median filter based on 3 measured values
Medium</td><td></td></tr>
</table>

Function	Possible Settings		Default setting
		Median filter based on 15 measured values **Strong** Median filter based on 47 measured values	
	Acceptance window	Acceptance window that detects and suppresses individual outliers in the measurement signal. A new measured value is accepted only if it does not differ too greatly from the last valid value—that is, if it falls within the acceptance window. The permitted acceptance window is not a fixed distance value, but rather a percentage of the current measured value. Bypass in Case of Persistent Deviation: To prevent the sensor from permanently “freezing” when the distance actually changes significantly and rapidly, the following exception rule applies: If the error counter exceeds a number of permitted measured values outside the acceptance window—which depends on the filter level—the sensor forcibly accepts the new value. This allows the sensor to resynchronize after a genuine change in distance. **Filter level:** **Low** 1× distance value (only very rough outliers are discarded) and bypass of 5 values outside the window (125 ms) **Medium** 0.5× distance value and skipping of 20 values outside the window (500 ms) **Strong** 0.1× distance value and filtering out 100 values outside the window (2500 ms)	
	Foreground filter	The foreground filter functions similarly to a weighted moving average filter. Asymmetric behavior: The filtering reacts at different speeds depending on whether an object is approaching or moving away: • Object approaching: The sensor reacts faster (e.g., to reliably detect safety-critical approaches). • Object moving away: The sensor reacts more slowly (e.g., to suppress short-term outliers and measurement noise). For each measurement, the new measured value is not output directly but is averaged with the previous filtered value. The proportion of the result contributed by the new measured value determines the sensor’s response speed. This proportion can be adjusted in three levels using the “Filter Level” parameter. The higher the level, the smoother the output signal becomes. **Filter Level:** **Low** Fast response when approaching Medium response when moving away	

Function	Possible Settings		Default setting
		Medium Moderate response when approaching Slow reaction at a distance **Strong** Slow reaction when approaching Very slow reaction when moving away	
	NOTE! When the device is first turned on or after a reset, the filter value is set directly to the current measured value. There is no slow “settling in” from an incorrect initial value. If the filter level is changed during operation, the filter value is also reinitialized to prevent unwanted transient behavior.		
	Background filter	See the foreground filters, but with the following asymmetric behavior: • Object approaching: The sensor reacts more slowly (objects close to the sensor are) • Object moving away: The sensor reacts faster (objects farther from the sensor are detected first)	
	Special filter for weak signals	A special filter based on a specified number of measured values—with missing values interpolated—increases the stability of the distance measurement. The sensor maintains an internal list of the most recently measured distance values. Depending on the set filter level, the average value is calculated from a measurement series of varying length. Only measured values that fall within the valid measuring range are included in the calculation. Values outside the range (e.g., “no object”) are not taken into account. As the filter level increases, the stability of the measurement result improves; however, the response speed to actual changes in distance decreases at the same time. The filter level should therefore be selected according to the dynamics of the application. **Filter level:** **Low** Filters based on 20 measured values and skipping 10 missing measured values **Medium** Filters based on 40 measured values and interpolation of 20 missing measured values **Strong** Filters based on 100 measured values and interpolation of 60 missing measured values	
Transmission Signal	The sensor’s transmission signal can be turned off. This allows the sensor to be deactivated when not in use, thereby preventing potential interference. **On** Transmit signal is on. **Off**		On

Function	Possible Settings	Default setting
	The transmission signal is off. No measurement is taking place. The sensor is in listening mode.	
sonic cone	This setting allows you to adjust the shape and range of the sonic cone. The diagrams for the individual sonic cones on standardized objects can be found in sonic cone diagrams. Narrow cones can be used to suppress constant interference in the measurement path (e.g., tank walls). **Standard** **Narrow**	Standard
Localization	The sensor's status indicator can be set to flash. This makes it easy to locate the sensor within a system. **On** The status indicator flashes green. Unless the user turns it off, the flashing automatically stops after 10 minutes. **Off** Status indicator in normal operation	Off
Temperature mode	The sensor features internal temperature compensation. Alternatively, the temperature can be measured externally and the parameters sent to the sensor. **Internal** The sensor operates using internal temperature compensation. **External** The sensor operates with external temperature compensation and uses the transmitted parameters.	Internal
External Temperature	Temperature values can be transmitted to the sensor with a resolution of 1 °C for temperature compensation. This parameter is used when the "External" temperature mode is selected. –30...+50 °C **NOTE!** Regular updating of the external temperature data is recommended to prevent temperature spikes and resulting fluctuations in the measurement result. If no temperature value is transmitted when the sensor starts up in external temperature mode, the default value of 23 °C is used.	23 °C
detection mode	The sensor is capable of detecting up to 5 objects simultaneously. The detection mode determines which of these objects is used for further processing and output: **First Object** The object closest to the sensor is output. **Last Object** The farthest object is output. **Strongest Signal** The object with the strongest signal amplitude is output. **NOTE!** The detection mode only considers objects within the detection range.	First Object
Distance Range	A distance range can be defined within the working range, within which objects are considered for output. Objects outside the set distance range are detected and displayed via IO-Link in the "Observation" section, but are not included in the output. This allows areas where no usable signals are expected to be completely hidden.	No limit

Function	Possible Settings	Default setting
	This function can be used to suppress interfering signals, such as a cable that cannot be moved. **NOTE!** Objects outside the set distance range are evaluated as “no signal.”	
Detection Threshold	The Detection Threshold determines the minimum signal strength that an object newly entering the measuring range must reach in order to be detected by the sensor for the first time and marked as valid. The higher the set value, the higher the threshold applied to the signal amplitude. Objects that are already known or valid benefit from hysteresis relative to this threshold and remain stable in the measurement result, even if their signal strength subsequently decreases slightly. The detection threshold can be adjusted to the application with values between 10 and 50. This value determines the ratio of the thresholds for initial detection and for maintaining detection of the object. The threshold for maintaining detection is fixed, while only the threshold that must be exceeded for initial detection is raised. High value: stable switching behavior • Prevents objects from constantly appearing and disappearing at the detection threshold (reduces flickering detection results) • Better suppression of interference signals • Small, distant, or poorly reflective objects may be overlooked or detected later Lower value: higher sensitivity • Better detection of small, distant, or weakly reflective objects • Increased likelihood of unstable detections • Greater sensitivity to environmental interference Changing the detection threshold during operation immediately affects the evaluation of new measurements. This parameter primarily influences the initial detection of new objects. • Objects already known from a previous measurement generally remain visible and do not necessarily disappear from the measurement. • Newly appearing objects are evaluated using the currently set detection threshold and must exceed the corresponding minimum signal strength to be detected. To ensure that the increased threshold is also applied to already known objects, the internal object tracking must be reset. This is done by restarting the sensor, for example by turning the power off and on or by performing an IO-Link device reset	30
Button Lock	Operation via the button can be locked to protect the sensor from unintentional adjustment. **Not locked** Button operation is possible. **Locked** Button operation is not possible.	Unlocked
Reset	**Restore factory settings**	

Function	Possible Settings	Default setting
	The sensor is reset to its factory settings. The stored tags are also deleted. **Application reset** The sensor is reset to its factory settings. The stored tags are retained. **Restore Factory Settings** The sensor is reset to its factory settings. The stored tags are deleted, IO-Link communication is interrupted, and both outputs are deactivated until the sensor is restarted. The sensor must then be reconnected to the IO-Link master. **Device Reset** Soft start of the sensor: The sensor settings, including tags, are retained.	

6.2.8 Condition Monitoring Functions

6.2.8.1 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	Device error
Message 2	See Status Messages Table	Short Circuit
Message 3	See Status Messages Table	Signal warning
Message 4	See Status Messages Table	No Signal

6.2.8.2 Warning and Error Output Function

The status messages used to trigger the collective message can be defined for the warning and 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 setting
Warning output	See table: Status Messages	Signal warning
error output	See table: Status Messages	No measurement data Serious device error Short circuit

Status Messages

Warning and error	
Signal warning	The object reflects too little sound (weak signal).
Emitter Off	The sensor's emitter is turned off.
No Signal	The sensor is not receiving a signal. This error can occur, for example, due to:

Warning and error	
	• Strong air turbulence • Ultrasonic sources that are too strong within the measuring range • There are very small or poorly reflecting (sound-absorbing) objects in the working range • Incorrect installation
Object too close	The object is located below the set or selected measuring range.
Object too far away	The object is above the set or selected measuring range.
Short circuit	There is a short circuit on at least one pin.
Device error	A hardware error has occurred.

6.2.8.3 Simulation Functions

This function simulates the behavior of the sensor regardless of its current status and measured value. This allows you to check whether a system in which the sensor is integrated responds correctly to the data supplied by the sensor and processes it 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.

INFORMATION

The O1 output is used for IO-Link communication in this function and cannot be simulated.

Simulation mode is automatically terminated as soon as the voltage supply is interrupted.

6.2.9 Condition Monitoring/Process Data

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

6.2.9.1 Process Data In

Data	Meaning
measured value	Measured distance in mm Since the sensor cannot determine a measured value in the following error cases, substitute values are output: No signal: 0x7FFC / 32764 mm Object too close: 0x8008 / –32760 mm Object too far away: 0x7FF8 / 32760 mm
Scale	Scaling of the measured value to the base unit of length; –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”) in the error output function)
Error	Collective warning in the event of one of the error status messages (see table “Status messages”) in error output function.
Message 1	Status message 1 read out see Status Message Function [▶ 25]
Message 2	Status message 2 read out see Status Message Function [▶ 25]
Message 3	Status message 3 read out see Status Message Function [▶ 25]
Message 4	Status message 4 read out see Status Message Function [▶ 25]

6.2.9.2 Process Data Out

Data	Meaning
Transmission signal	Transmit signal on/off
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
Localization	Sensor flashes for easy sensor location

6.3 Pin Functions

The most important pin functions are shown below.

pin	Possible settings	Default setting
I/O1	**switching output** The switching output is assigned to switching point SSC1. **error output** The error output activates when one of the assigned errors occurs; see the "Status Messages" table. **Warning output** The warning output activates when one of the assigned warnings occurs; see the "Status Messages" table. **Transmitter Signal Off Input** The sensor's output signal is deactivated as long as the input is active. The sensor does not provide a measured value and sets the status to "No Signal" **Disabled** The pin is deactivated	switching output
I/O2	**switching output** The switching output is assigned to switching point SSC2. **Antivalent switching output** The switching output operates in antivalent mode with switching output O1. **error output** The error output activates when one of the assigned faults occurs; see the "Status Messages" table. **Warning output** The warning output activates when one of the assigned warnings occurs; see the "Status Messages" table. **teach-in input** Pin 2 can be used to teach the switching output. **Disabled** The pin is disabled.	Switching output

6.3.1 Input Functions

Function	Possible settings	Default setting
External Teach-in	**Ub active** The function is triggered as soon as Ub is applied to the input (pin 2).	Ub active

Function	Possible settings	Default setting
	NOTE! The required time intervals for this are: Active for 2 sec. = teach-in O1 Active for 5 seconds = teach-in O2	
Transmit signal can be disabled	**Ub active** Transmit signal off as soon as Ub is applied to the input (pin 4)	Ub active

6.3.2 Output Functions

The output functions are used to set the physical outputs.

Function	Available Settings and Functions	Default setting
PNP/NPN/ push-pull	**PNP** **NPN** **push-pull**	NPN
NC/ NO	**Normally Open (NO)** The output is high when the condition is met, depending on the setting (switching point, warning, error). **Normally Closed (NC)** The output is low when the condition is met, depending on the setting (switching point, warning, error).	NO

Warning and Error Output

The error and warning output activates as soon as an error or warning type has been assigned to it and the condition is met.

7 Maintenance Instructions

NOTICE

This wenglor product is maintenance-free.

Cleaning and inspection of the plug connections at regular intervals are advisable.

Do not clean the product with solvents or cleaning agents that could damage the product.

The product must be protected against contamination during initial start-up.

8 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.

9 Declarations of Conformity

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