EN

U1KT001

Ultrasonic Reflex Sensor



IO-Link

Operating instructions

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1. General

1.1 General Information Concerning these Instructions

- These instructions are valid for the product U1KT001.
- They make it possible to use the product safely and efficiently.
- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- Local accident prevention regulations and national work safety regulations must be complied with as well.
- The product is subject to further technical development, and thus the information contained in these operating instructions may also be subject to change. The current version can be found at www.wenglor.com in the product's separate download area.



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

1.2 Explanations of Symbols

- Safety precautions and warnings are emphasized by means of symbols and attention-getting 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:



ATTENTION-GETTING 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 attention-getting words, as well as the scope of the associated hazards, are listed below:



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



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



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



ATTENTION:
This 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 and 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 replacement parts
    - Unapproved modification of products
- These operating instructions do not imply any guarantee 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 to detect objects and measure distances.

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 the reflex mode, two sensors can also be operated in the through-beam mode.

This product can be used in the following industry sectors:

- Special machinery manufacturing
- Heavy machinery manufacturing
- Logistics
- Automotive industry
- Food industry
- Packaging industry
- Pharmaceuticals industry
- Clothing industry
- Plastics industry
- Woodworking industry
- Consumer goods industry
- Paper industry
- Electronics industry
- Glass industry
- Steel industry
- Aviation industry
- Construction industry
- Chemicals industry
- Agriculture industry
- Alternative energy
- 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 only be used with accessories supplied or approved by wenglor, or combined with approved products. A list of approved accessories and combination products can be accessed at www.wenglor.com on the product detail page.



DANGER!
Risk of personal injury or property damage in case of use for other than the intended purpose!
Use for other than the intended purpose may lead to hazardous situations.
- 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 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 marking and the guarantee may be rendered null and void.
- Modification of the product is impermissible.

2.5 General Safety Precautions



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

2.6 Approvals and protection class



3. Technical Data

Technical Data / Order No.	U1KT001
Ultrasound Data	
Working Range, Reflex Sensor	30...400 mm
Working Range, Through-Beam Sensor	1...800 mm
Resolution	0,5 mm
Ultrasonic Frequency	325 kHz
Aperture Angle	< 12 °
Service Life (ambient temp. = +25° C)	100000 h
Switching Hysteresis	1 %
Electrical Data	
Supply Power	18…30 V DC
Current Consumption (operating voltage = 24 V)	< 20 mA
Switching Frequency, Reflex Sensor	30 Hz
Switching Frequency, Through-Beam Sensor	70 Hz
Response Time, Reflex Sensor	17 ms
Response Time, Through-Beam Sensor	8 ms
Temperature Range	–30…60 °C
Number of Switching Outputs	2
Switching Output Voltage Drop	< 2,5 V
Switching Output Switching Current	100 mA
Synchronous Operation	Up to 40 Sensors
Short-Circuit Proof	yes
Reverse Polarity Protected	yes
Overload-Proof	yes
Lockable	yes
Interface	IO-Link
IO-Link Version	1.1
Data Storage	yes
Protection Class	III
Mechanical Data	
Setting Method	Teach-In
Housing Material	Plastic
Degree of Protection	IP68
Connector Type	M8 × 1; 4-pin
Technical Safety Data	
MTTFd (EN ISO 13849-1)	1106,71a
Programmable error output	yes
Configurable as PNP/NPN	yes
Programmable as NC/NO	yes
IO-Link	yes

* Referring to the switching distance, at least 2 mm.

Reflex Mode

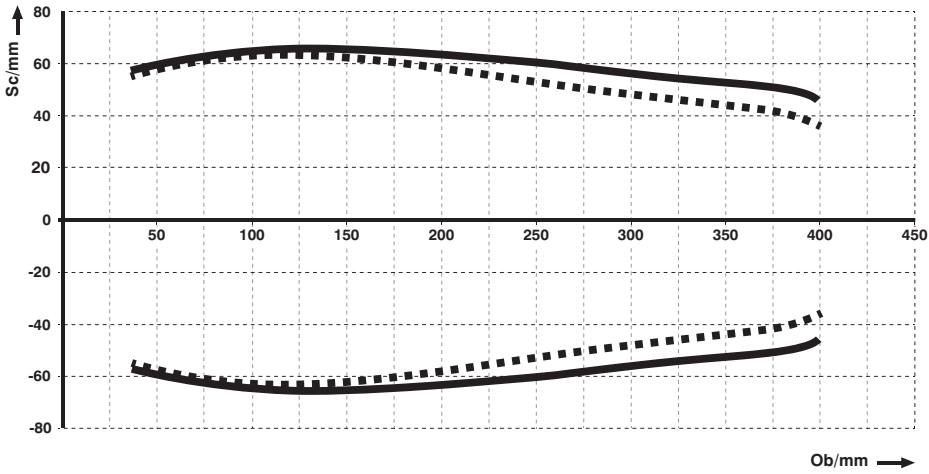
Filter value	Switching Frequency (Hz)	Response Time (ms)
0	30	17
1	24	20,4
2	21	23,8
3	18	27,2
4	16	30,6
5	14	34
6	13	37,4
7	12	40,8
8	11	44,2
9	10	47,6
10	9,5	51
11	9	54,4
12	8,5	57,8
13	8,5	57,8
14	8,5	57,8
15	8,8	57,8

Through-Beam Mode

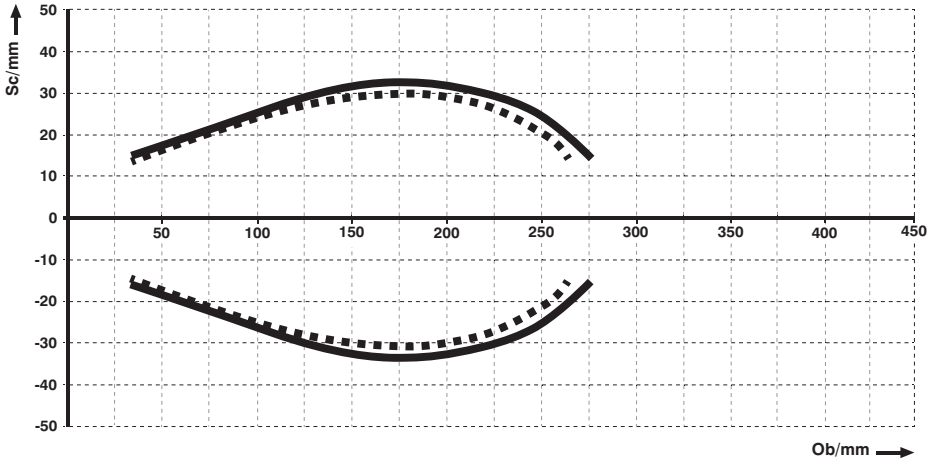
Filter value	Switching Frequency (Hz)	Response Time (ms)
0	70	7,1
1	47	10,7
2	38	13,3
3	31	16
4	27	18,7
5	23	21,3
6	20	24
7	18	26,7
8	17	29,3
9	15,5	32
10	14	34,7
11	13	37,3
12	12,5	40
13	11,5	42,7
14	11	45,3
15	11	45,3

3.1 Sonic Cone Diagrams

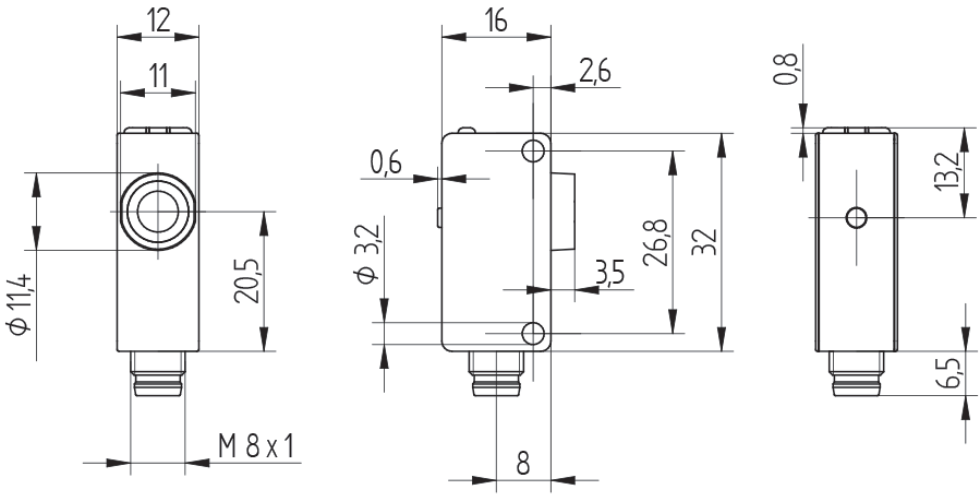
Measurement of the sonic cone on a 100 x 100 mm plate



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

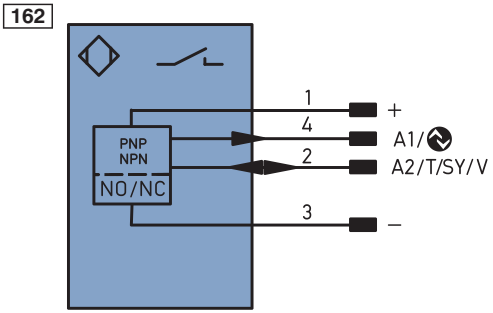


3.2 Housing Dimensions



All dimensions in mm
Screw M3 = 0,5 Nm

3.3 Connection Diagram



Legend

+	Supply Voltage +
–	Supply Voltage 0 V
~	Supply Voltage (AC Voltage)
A	Switching Output (NO)
Ā	Switching Output (NC)
V	Contamination/Error Output (NO)
V̄	Contamination/Error Output (NC)
E	Input (analog or digital)
T	Teach Input
Z	Time Delay (activation)
S	Shielding
RxD	Interface Receive Path
TxD	Interface Send Path
RDY	Ready
GND	Ground
CL	Clock
E/A	Output/Input programmable
	IO-Link
PoE	Power over Ethernet
IN	Safety Input
OSSD	Safety Output
Signal	Signal Output
BI_D+/-	Ethernet Gigabit bidirect. data line (A-D)
EN0 RS422	Encoder 0-pulse 0-0̄ (TTL)
PT	Platinum measuring resistor
nc	not connected
U	Test Input
Ū	Test Input inverted
W	Trigger Input
O	Analog Output
O–	Ground for the Analog Output
BZ	Block Discharge
AMV	Valve Output
a	Valve Control Output +
b	Valve Control Output 0 V
SY	Synchronization
E+	Receiver-Line
S+	Emitter-Line
⏚	Grounding
SnR	Switching Distance Reduction
Rx+/–	Ethernet Receive Path
Tx+/–	Ethernet Send Path
Bus	Interfaces-Bus A(+)/B(–)
La	Emitted Light disengageable
Mag	Magnet activation
RES	Input confirmation
EDM	Contactor Monitoring
ENA RS422	Encoder A/Ā (TTL)
ENB RS422	Encoder B/B̄ (TTL)
ENA	Encoder A
ENB	Encoder B
AMIN	Digital output MIN
AMAX	Digital output MAX
AOK	Digital output OK
SY In	Synchronization In
SY OUT	Synchronization OUT
OLT	Brightness output
M	Maintenance

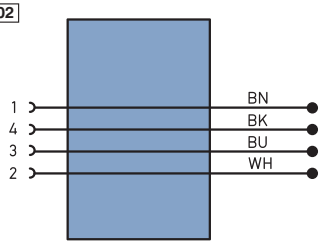
Wire Colors according to DIN IEC 757

BK	Black
BN	Brown
RD	Red
OG	Orange
YE	Yellow
GN	Green
BU	Blue
VT	Violet
GY	Grey
WH	White
PK	Pink
GNYE	Green/Yellow

3.4 Complementary Products (see catalog)

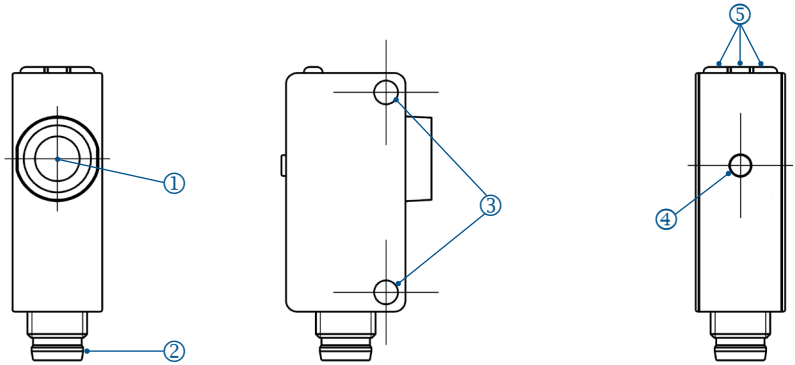
wenglor offers Connection Technology for field wiring.

Suitable Mounting Technology No.	400
Suitable Mounting Technology No.	7
	S02



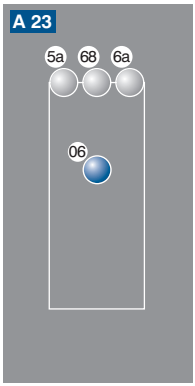
IO-Link-Master

3.5 Layout



① = Sensing Face
② = Plug Connector
③ = Mounting Holes
④ = Teach-In Key
⑤ = Indicator LEDs

3.6 Control panel



06 = Teach Button
5a = Switching Status Display, O1
68 = Supply Voltage Indicator
6a = Switching Status Display, O2

3.7 Scope of Delivery

- Product
- Quickstart
- Mounting-Set 01

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 condition with regard to storage:

- o 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.
- Comply with storage instructions.

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° ±3°. The angle can be considerably larger in the case of rough object surfaces.
- There must not be any objects underneath the working range.
- The sensor's sensing face must remain unobstructed.



ATTENTION!
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

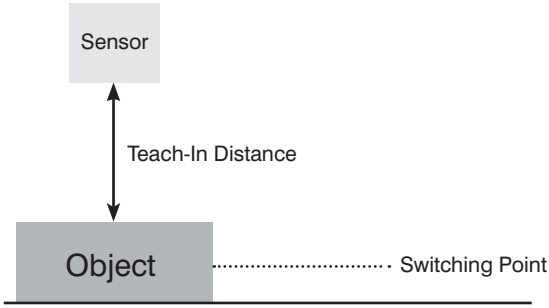
- Connect the sensor to 18 to 30 V DC (see section "3.3 Connection Diagram", page 11).

6. Delivery status

Technical Data	U1KT001
Sensor Mode	Normal
Filter	0
Sonic Cone	Standard
Processdatatype	Outputs and Measured Value
Temperature Mode	Intern
A2 Pin Function	Switching Output
A1 Teach Mode	Foreground
A1, A2 PNP/NPN	PNP
A1 NO/NC	NO
A1 Switch Point	400
A1 Hysteresis Additional	0
A2 Teach Mode	Foreground
A1, A2 PNP/NPN	PNP
A2 NO/NC	NO
A2 Switch Point	400
A2 Hysteresis Additional	0

7. Setup via the Teach-In Key

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. Mount the sensor in accordance with the mounting instructions.
2. Position the object in front of the sensor.
3. Press and hold the teach in key until the A1 switching status LED starts blinking.
4. Release the teach in key after 2 seconds.
5. The distance is taught in and the LED at output 1 lights up briefly in order to confirm successful teach-in.

Foreground Teach-In for Switching Output 2
1. Mount the sensor in accordance with the mounting instructions.
2. Position the object in front of the sensor.
3. Press and hold the teach in key until the A2 switching status LED starts blinking.
4. Release the teach in key after 5 seconds.
5. The distance is taught in and the LED for output 2 lights up briefly in order to confirm successful teach-in.

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

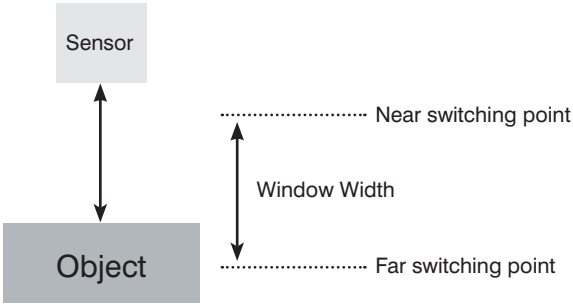
8. Settings via IO-Link

Further settings can be entered to the sensor via the IO-Link interface.

8.1 Window Teach-In

In addition to foreground teach-in (default setting), there's also a window teach-in option for both outputs:

1. Enter or teach in far switching point.
2. Enter or teach in nar switching point.
3. The sensor is switched when an object is located between the two switching points.



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

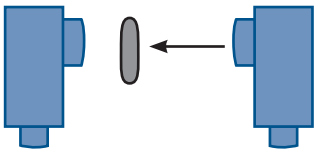
8.2 Through-Beam Sensor Operating Mode

In addition to the reflex mode (default setting), a through-beam operating mode is also available. Two sensors are required to this end.

1 Set up one sensor as an emitter.
2 Set up another sensor as a receiver.
3 If the receiver is operated as a normally closed contact, it's switched when an object is located between the emitter and the receiver.

Technical Data in the Through-Beam Mode:

Range:	1 to 800 mm
Switching Frequency:	70 Hz
Response Time:	8 ms



NOTE!
The sonic cone of the receiver determines the sensitivity of the through-beam mode.
- With the standard sonic cone the maximum working range is possible.
- Set the sonic cone to narrow at the receiver, in order to detect even small objects between the emitter and the receiver.

NOTE!
Sensors in reflex and through beam mode must not be used together.

Differentiation between one and two layers of thin material such a paper or foil is possible in the through-beam operating mode.
1. Position the emitter and the receiver a short distance from each other.
2. Adjust distance between the emitter and the receiver so that the receiver continues to switch for one layer but not for two.

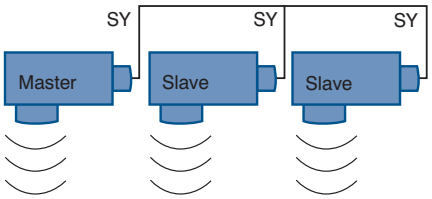
NOTE!
Teach-in via the teach-in key is not possible in the through-beam operating mode. Adjustments can be made by changing the distance between the emitter and the receiver and with the help of the sonic cone settings at the receiver.

8.3 Synchronous Operation

Several sensors can be used together in the synchronous operating mode in order to detect a large surface. The sensors emit ultrasonic pulses simultaneously (synchronously).

1. Connect all of the sensors' pin 2 terminals to each other.
2. Set up one sensor as the synchronous master.
3. Set up all other sensors as synchronous slaves.

NOTE!
In synchron master or synchron slave mode, the A2 pin function is automatically set to synchron output or synchron input. Changes in the A2 pin function are not possible in synchron mode.



NOTE!
Synchronous operation is only possible with the A1 output function set to PNP. Furthermore, only one digital output is available at sensors which are operated in the synchronous mode, because pin 2 is required for synchronization.

8.4 Locking

If 18 to 30 V DC is continuously applied to the teach-in input, the teach-in key is locked and protected against inadvertent changes.

1 Change the A2 pin function to external teach-in.
2 Permanently connect pin A2 to 18 to 30 V DC.
3 The sensor is protected against inadvertent changes caused by the teach-in key.

8.5 External Teach-In

Teach in input A1 via the teach-in input.

1 Set the A2 pin function to external teach-in.
2 Apply 24 V to pin 2 for at least 1 second, but for no more than 4 seconds.
3 As soon as voltage drops at the input, A1 is taught in.

8.6 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.

The temperature value in hundredths of a degree Celsius must be transmitted as a hexadecimal value to this end, for example:

- 20.34 °C transmit: +2034 signed short: 0000 0111 1111 0010
- −15.67 °C transmit: −1576 signed short: 1111 1001 1110 0001



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.

8.7 Error Output

The error output is switched in the following cases:

- Very small or poorly reflective (sound-absorbing) objects are located within the working range.
- Incorrect assembly.
- The object is located outside of the working range.
- Strong air turbulence.
- Excessively strong ultrasound sources are located within the measuring range.

9. IO-Link

Process and parameters data can be found at www.wenglor.com in the product's separate download area.

10. Maintenance Instructions



NOTE!

- This wenglor sensor is maintenance-free.
- It's advisable to clean and to check the plug connections at regular intervals.
- Do not clean the sensor with solvents or cleansers which 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 Change Index, Operating Instructions

Version	Date	Description/Change
1.0.0	21.12.16	Initial version of the operating instructions
1.1.0	17.05.17	Further information regarding the through-beam operating mode

12.2 EU Declaration of Conformity

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