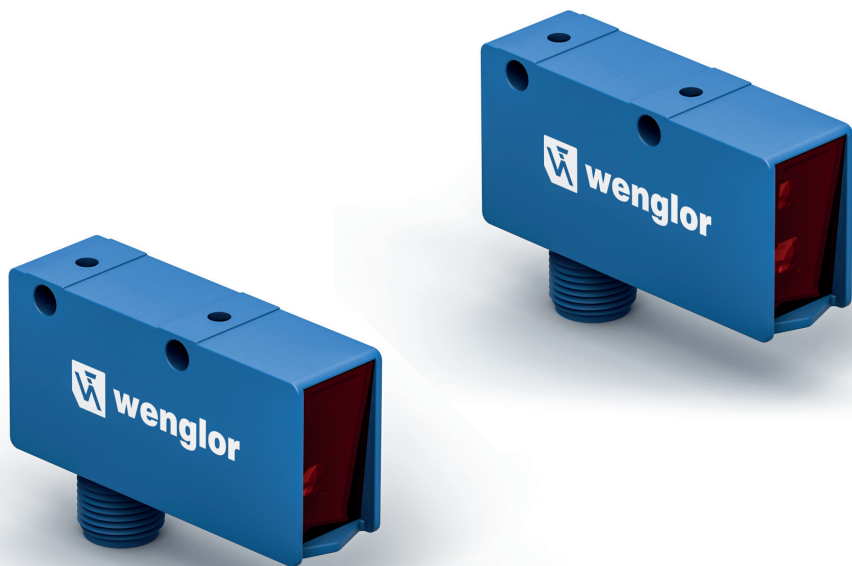


# P1MHxxx

Reflex Sensors with Background Suppression  
High-End with Teach-In



## Operating Instructions

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# 1. General

## 1.1 Information Concerning these Instructions

- These instructions apply to products designated P1MHxxx.
- These instructions make it possible to use the product safely and efficiently.
- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- Local accident prevention regulations and national work safety regulations must be complied with as well.
- The product is subject to further technical development, and thus the information contained in these operating instructions may also be subject to change. The current version can be found at [www.wenglor.com](http://www.wenglor.com) in the product's separate download area.



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

## 1.2 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.



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



**NOTE!**  
A note draws attention to useful tips and suggestions, as well as information regarding efficient, error-free use.

### 1.3 Limitation of Liability

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

### 1.4 Copyrights

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

## 2. For Your Safety

### 2.1 Use for Intended Purpose

This wenglor product is intended for use in accordance with the following functional principle:

#### Reflex Sensors with Background Suppression

Reflex sensors with background suppression evaluate the light reflected by objects. As they operate according to the angle measurement principle, the object's color, shape, and surface finish have practically no influence on the detection range. Even dark objects are reliably recognized against bright backgrounds. When the object reaches the selected detection range, the sensor's output is switched.

#### 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](http://www.wenglor.com) on the product detail page.



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

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

- Instructions regarding use for intended purpose must be observed.

### 2.3 Personnel Qualifications

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

**DANGER!**

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

Personal injury and damage to equipment may occur.

- Adequate training and qualification of personnel.

## 2.4 Modification of Products

**DANGER!**

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

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

- Modification of the product is impermissible.

## 2.5 General Safety Precautions

**NOTE!**

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

## 2.6 Laser/LED Warnings

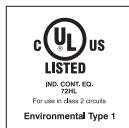
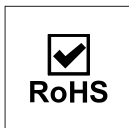
The respective laser class or LED risk group is listed in the product's technical data.



**Laser Class 1 (EN 60825-1)**

Applicable standards and safety regulations must be observed.

## 2.7 Approvals and Protection Class



# 3. Technical Data

## 3.1 Technical Data

Optical Data	
Service life (ambient temp. = 25 °C)	100,000 h
Max. permitted ambient light	10,000 lux
Electrical Data	
IO-Link supply voltage	18...30 V DC
Switching output voltage drop	< 2 V
Switching output switching current	100 mA
Switching output residual current	< 50 µA
Short-circuit proof	Yes
Reverse polarity protected	Yes
Overload-proof	Yes
Lockable	Yes
Interface	IO-Link
IO-Link version	1.1
Protection class	III
Mechanical Data	
Housing material	Plastic
Degree of protection	IP67/IP68
Optic cover	PMMA



Technical Data		Order No.	P1MH				
		102	104		203	206	
Principle		Electronic background suppression					
Detection range		200 mm					
Setting range		40...200 mm			30...200 mm		
Switching hysteresis		< 5%			< 10%		
Light source		Red light			Laser (red)		
Laser class (EN 60825-1)		—			1		
Risk group (EN 62471)		0			—		
Light spot diameter		See table 1			See table 2		
Supply voltage		15...30 V DC					
Current consumption (operating voltage = 24 V)		< 20 mA					
Temperature range		−40...60 °C			−25...60 °C		
Temperature drift		< 5%					
Switching frequency		1,000 Hz			1,600 Hz		
Response time		0.5 ms			0.31 ms		
Switching frequency (2 switching outputs)		100 Hz					
Response time (2 switching outputs)		5 ms					
Setting method		Teach-in/NFC					
Output function	PNP NO	x			x		
	NPN NO		x			x	
Connection type		Plug: M12x1, 4-pin					
Connection diagram no.		865					
Suitable connection equipment no.		360					

3.1.1 Light Spot Diameter

Range	40 mm	100 mm	200 mm
Light spot diameter	9 mm	8 mm	7 mm

Table 1

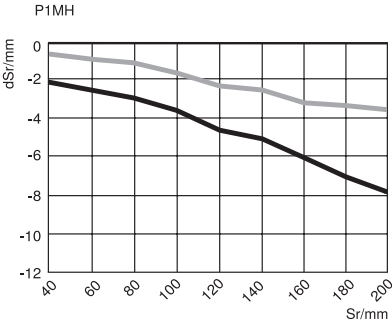
Range	30 mm	100 mm	200 mm
Light spot diameter	2 mm	1.5 mm	1.5 mm

Table 2

3.1.2 Switching Distance Deviation

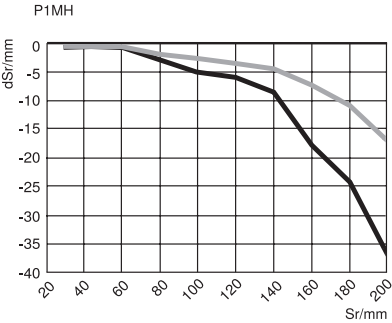
Typical characteristic curve based on white (90% remission)

P1MH102, P1MH104:



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

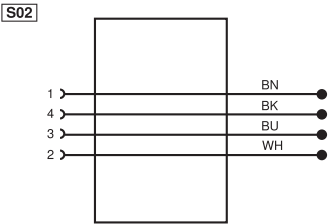
P1MH203, P1MH206:



### 3.2 Complementary Products

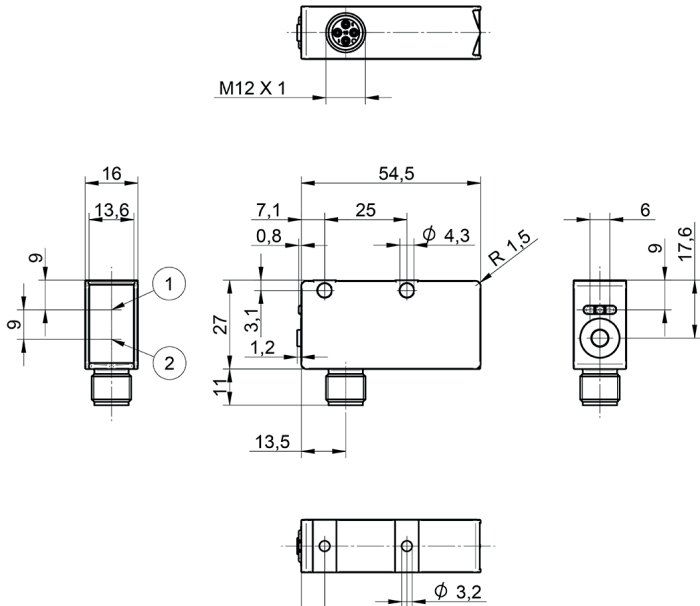
wenglor can provide you with suitable connection equipment for your product.

Suitable mounting technology no.	360
Suitable connection equipment no.	2



IO-Link master
wTeach2 software DNNF005

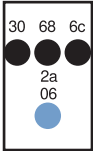
### 3.3 Layout



① = emitter diode  
② = receiver diode  
M4 screw = 0.5 Nm  
Dimensions specified in mm (1 mm = 0.03937")

## 3.4 Control Panel

A 54



2a = NFC interface  
6c = configurable  
06 = teach-in key  
30 = switching status indicator / contamination warning  
68 = supply voltage indicator

## 3.5 Scope of Delivery

- Sensor
- Safety precautions
- Mounting set 02

## 4. Transport and Storage

### 4.1 Transport

Upon receipt of shipment, the goods must be inspected for damage in transit. In the case of damage, conditionally accept the package and notify the manufacturer of the damage. Then return the device, making reference to damage in transit.

### 4.2 Storage

**The following points must be taken into consideration with regard to storage:**

- Do not store the product outdoors.
- Store the product in a dry, dust-free place.
- Protect the product against mechanical impacts.
- Protect the product against exposure to direct sunlight.



#### **ATTENTION!**

##### **Risk of property damage in case of improper storage!**

The product may be damaged.

- Storage instructions must be complied with.
- 

## 5. Installation and Electrical Connection

### 5.1 Installation

- Protect the product from contamination during installation.
- Observe all applicable electrical and mechanical regulations, standards, and safety rules.
- Protect the product against mechanical influences.
- Make sure that the sensor is mounted in a mechanically secure fashion.
- Specified torque values must be complied with ([see “3. Technical Data” on page 8](#)).



#### **ATTENTION!**

##### **Risk of property damage in case of improper installation!**

The product may be damaged.

- Installation instructions must be complied with.
- 



#### **CAUTION!**

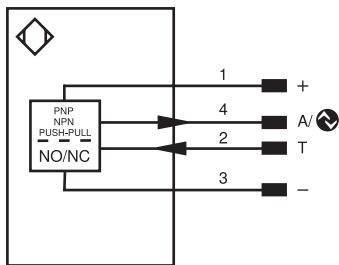
##### **Risk of personal injury or property damage during installation!**

Personal injury and damage to the product may occur.

- A safe installation environment must be assured.
-

5.2 Electrical Connection

865



Legend

+	Supply Voltage +
-	Supply Voltage 0 V
~	Supply Voltage (AC Voltage)
A	Switching Output (NO)
Ā	Switching Output (NC)
V	Contamination/Error Output (NO)
Ȳ	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
QSSD	Safety Output
Signal	Signal Output
BL_D +/-	Ethernet Gigabit bidirect. data line (A-D)
ENoRS422	Encoder 0-pulse 0-0̇ (TTL)

PT	Platinum measuring resistor
nc	not connected
U	Test Input
Ū	Test Input inverted
W	Trigger Input
W-	Ground for the Trigger Input
O	Analog Output
O-	Ground for the Analog Output
BZ	Block Discharge
AWV	Valve Output
a	Valve Control Output +
b	Valve Control Output 0 V
SY	Synchronization
SY-	Ground for the 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

ENaRS422	Encoder A/Ā (TTL)
ENbRS422	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
rSV	reserved
Wire Colors according to IEC 60757	
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

DANGER!



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

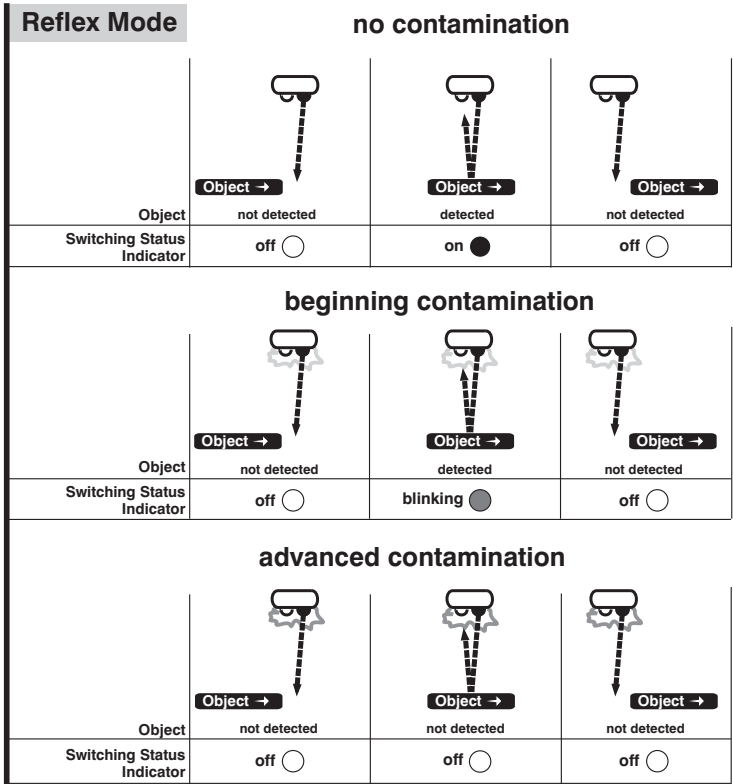
- Voltage-conducting parts may cause personal injury or damage to equipment.
- The electric device may be connected by appropriately qualified personnel only.

### 5.3 Diagnosis

Causes triggering the contamination warning (flashing LED):

Display LED	Diagnosis/Cause	Elimination
Continuous flashing at approx. 2.5 Hz	Contamination	Carefully clean the optic cover with a cloth
	Aged emitter diode	Replace the sensor
	Unreliable working range	<ul style="list-style-type: none"><li>• Increase the sensor's switching distance</li><li>• Reduce distance between sensor and object</li></ul>
Continuous flashing at approx. 5 Hz	Short circuit	Check electrical wiring and eliminate the short circuit
	Over-temperature	Disconnect the sensor from the supply voltage and allow it to cool
	Hardware error	Replace the sensor

#### Contamination Warning Flowcharts



## 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. Settings

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

### **Teach-In for Switching Output 1 (default setting)**

1. Install the sensor in accordance with the installation instructions.
2. Press and hold the teach-in key until switching status indicator LED A1 starts to flash.
3. Release the teach-in key after 2 seconds.
4. The distance is taught in, and LED A1 lights up in order to confirm successful teach-in.

### **Teach-In for Switching Output 2 (two independent switching outputs can be set via IO-Link or NFC)**

1. Install the sensor in accordance with the installation instructions.
2. Press and hold the teach-in key until switching status indicator LED A2 starts to flash.
3. Release the teach-in key after 5 seconds.
4. The distance is taught in, and LED A2 lights up in order to confirm successful teach-in.



### NOTE!

If teach-in is conducted without an object or if the object is too far from the sensor, the switching distance is set to the end of the setting range.



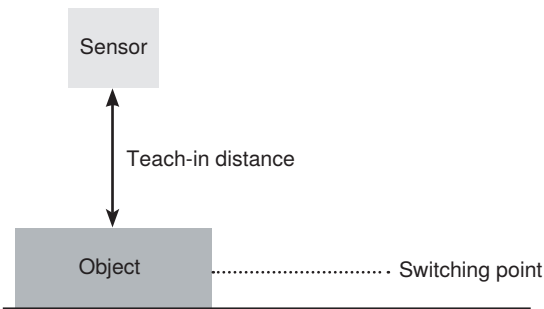
# 7. Functions Overview

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

## 7.1 Teach-In Mode

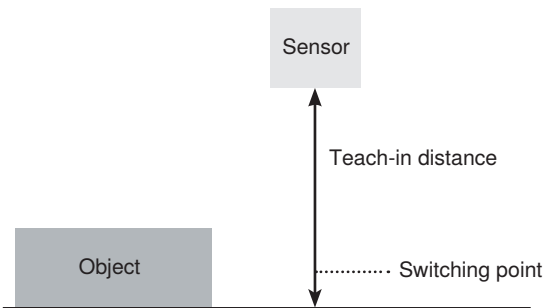
### 7.1.1 Foreground Teach-In

Teach-in is performed while the sensor is aligned to the object. The switching distance is then automatically set to a distance which is slightly greater than the clearance between the sensor and the object. The sensor is thus switched for all objects whose distance to the sensor is equal to or less than the distance to the object used for the teach-in procedure.



### 7.1.2 Background Teach-In

Teach-in is performed while the sensor's light spot is aligned to the background. The switching distance is then automatically set to a distance which is slightly less than the clearance between the sensor and the background. The sensor is thus switched whenever an object is located between the background and the sensor.



## 7.2 Pin E/A2 Function

The function of E/A2 can be configured either as an output or an input.

### 7.2.1 External Teach-In Input (Default Setting)

Teach in output A1 via the teach-in input.

1. Set the function pin E/A2 to external teach-in input.

With Ub setting active (default):

2. Apply 18...30 V to pin E/A2 for at least 1 second, but no more than 4 seconds.
3. As soon as voltage drops at the input, A1 is taught in.

With Ub setting inactive:

2. Disconnect pin E/A2 or apply 0 V to it for at least 1 second, but no more than 4 seconds.
3. As soon as voltage is applied to the input, A1 is taught in.

### Locking

If the teach-in input is continuously activated, the teach-in key is locked and protected against inadvertent changes.

1. Set the function pin E/A2 to external teach-in input.

With Ub setting active (default):

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

With Ub setting inactive:

2. Permanently disconnect pin E/A2 or connect it to 0 V.
3. The sensor is protected against inadvertent changes caused by the teach-in key.

### 7.2.2 Error Output

The error output is switched in the following cases:

- Contamination
- Aged emitter diode
- Unreliable working range
- Short circuit
- Over-temperature
- Hardware error

## 7.3 Additional Functions and Settings

- PNP/NPN/push-pull
- NC/NO
- Switching hysteresis
- On/off-delay
- Mode of operation
- Switch emitted light off
- Test mode
- Data storage (IO-Link)

## 8. IO-Link

Process and parameters data, as well as the IODD, can be found at [www.wenglor.com](http://www.wenglor.com) in the product's separate download area.

## 9. NFC

The devices can be set up and their parameters can be configured via the NFC interface with the aid of an Android smartphone and wenglor's Sensor Configurator 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 Google Play and the 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 surface.



### NOTE!

- The position of the NFC antenna 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 active surface until connection is successful.

The sensor does not necessarily have to be connected to the supply voltage for data transmission; that is to say, transmission is also possible in a de-energized state.

# 10. Maintenance Instructions



**NOTE!**

- This wenglor sensor is maintenance-free.
- Cleaning and inspection of the plug connections at regular intervals are advisable.
- Do not clean the sensor with solvents or cleaning agents that could damage the product.
- The product must be protected against contamination during initial start-up.

# 11. Proper Disposal

wenglor sensoric GmbH does not accept the return of unusable or irreparable products. The national waste disposal regulations currently in force apply to product disposal.

# 12. Appendix

## 12.1 List of Abbreviations

Abbreviation	Meaning
Tu	Ambient temperature
Ub	Supply voltage
IODD	IO Device Description
MTTFd	Mean Time To Dangerous Failure

## 12.2 Change Index for the Operating Instructions

Version	Date	Description/Changes
1.0.0	10/19/23	Initial version of the operating instructions

## 12.3 Declarations of Conformity

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

