EN

P1PMxxx

Reflex Light Barrier

Operating Instructions

Translation of the original operating instructions
Subject to change without notice
Available as PDF file only
Version 1.0.0
As of: 10/24/2023
www.wenglor.com

Table of Contents

1. General

1.1 Information Concerning these Instructions

- These instructions apply to products designated P1PMxxx.
- 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 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 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 light barrier

The reflex light barriers work with red light and detect objects both via the intensity of the backscattered light and via the distance to a previously taught-in reference background. If the light beam between the sensor and the reference background is interrupted, the output is switched. Thanks to the combined detection principle, the sensors are suitable for contactless object detection without a reflector, regardless of color, shape, or surface.

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.

- 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 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 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.		P1PM			
		101	102	103	104
Teach-in mode		Teach-in on static background		Teach-in on moving background	
Range		1000 mm			
Reference background		white, 90% remission			
Switching hysteresis		< 5%			
Light source		Red light			
Risk group (EN 62471)		0			
Light spot diameter		See table 1			
Supply voltage		15...30 V DC			
Current consumption (operating voltage = 24 V)		≤ 30 mA			
Temperature range		–25...60 °C			
Temperature drift		< 10%			
Switching frequency		900 Hz			
Response time		0.6 ms			
Switching frequency (interference-free mode)		450 Hz			
Response time (interference-free mode)		1.1 ms			
Setting method		Teach-in			
Output function	PNP, NO	x		x	
	NPN, NO		x		x
Connection type		Plug: M12x1, 4-pin			
Connection diagram no.		865			
Suitable connection equipment no.		2			

3.1.1 Light spot diameter

Range	100 mm	500 mm	1000 mm
Light Spot Diameter	16 mm	22 mm	33 mm

Table 1

Switching Distance

Achievable switching distance depends on the reference background used. The nominal switching distance is achieved with the reference background white, 90% remission. The achievable ranges for other reference backgrounds can be found in the following table:

Permissible Background Distance

Background type, mounting distance

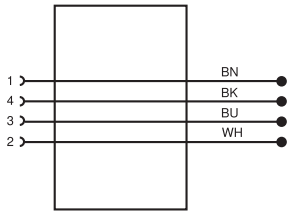
white (90%)	0.1...1 m	**black (6%)**	0.1...0.45 m
gray (18%)	0.1...0.7 m	**Stainless steel**	0.1...1 m

3.2 Complementary Products

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

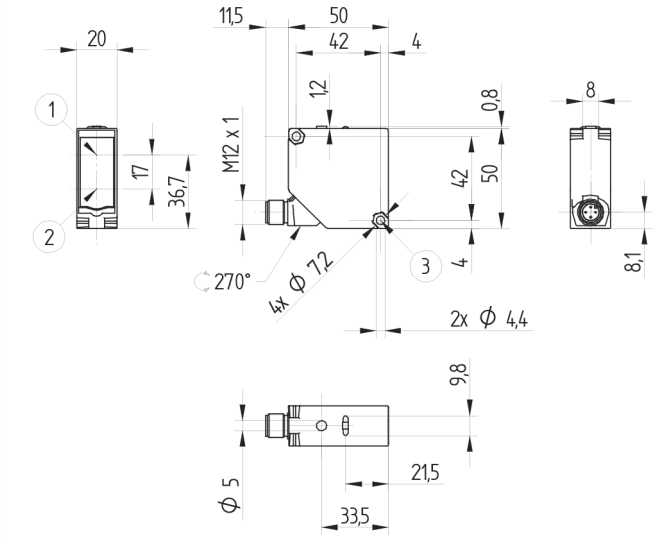
Suitable mounting technology no.	380
Suitable connection equipment no.	2

S02



IO-Link master
wTeach2 software DNNF005

3.3 Layout

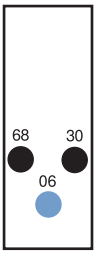


1 = emitter diode
2 = receiver diode
3 = wrench width 7
M4 screw = 0.5 Nm

Dimensions specified in mm (1 mm = 0.03937")

3.4 Control Panel

A34



06 = teach-in key
30 = switching status indicator / contamination warning
68 = supply voltage indicator

3.5 Scope of Delivery

- Sensor
- Safety precautions
- BEF-SET-14
- Z1PE002

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 7).

ATTENTION!

Risk of property damage in case of improper installation!

The product may be damaged.

- Installation instructions must be complied with.

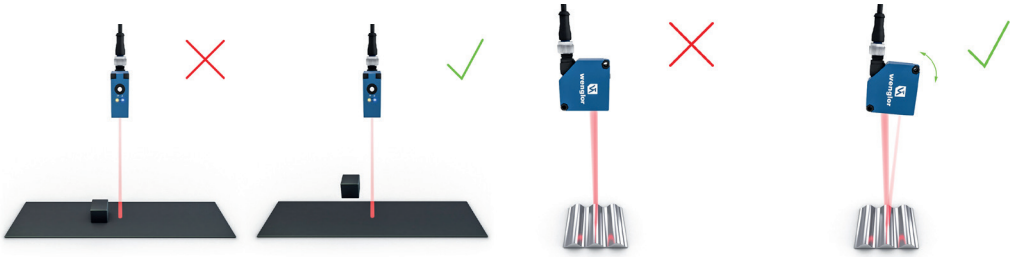
CAUTION!

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.

The following must be observed when installing reflex light barriers



Background Colors

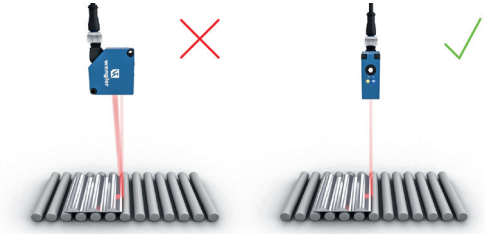
For reliable detection, there must be a clear contrast between the object and the taught-in reference background.

Tip: If there is a small difference in contrast, select a large distance between the object and the background!

Highly glossy, reflective and uneven backgrounds

In the case of highly reflective, glossy or uneven surfaces, it should be ensured that no direct reflections fall on the receiving optics, as they can impair object detection.

Tip: Place the sensor at a slightly tilted angle!



Steps, edges and recesses

To ensure reliable detection, the light spot must be aligned directly with the reference background.

Tip: Align the sensor to a specified background!

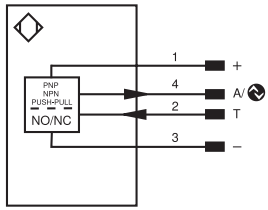
Moving background

For moving reference backgrounds such as conveyor belts, the movement should be perpendicular to the transmitter/receiver axis of the sensor to avoid direct reflections on the receiver.

Tip: Install the sensor orthogonally!

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)
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	
Bl_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
W–	Ground for the 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
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

EN A RS422	Encoder A/Ā (TTL)
EN B RS422	Encoder B/B̄ (TTL)
EN A	Encoder A
EN B	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.

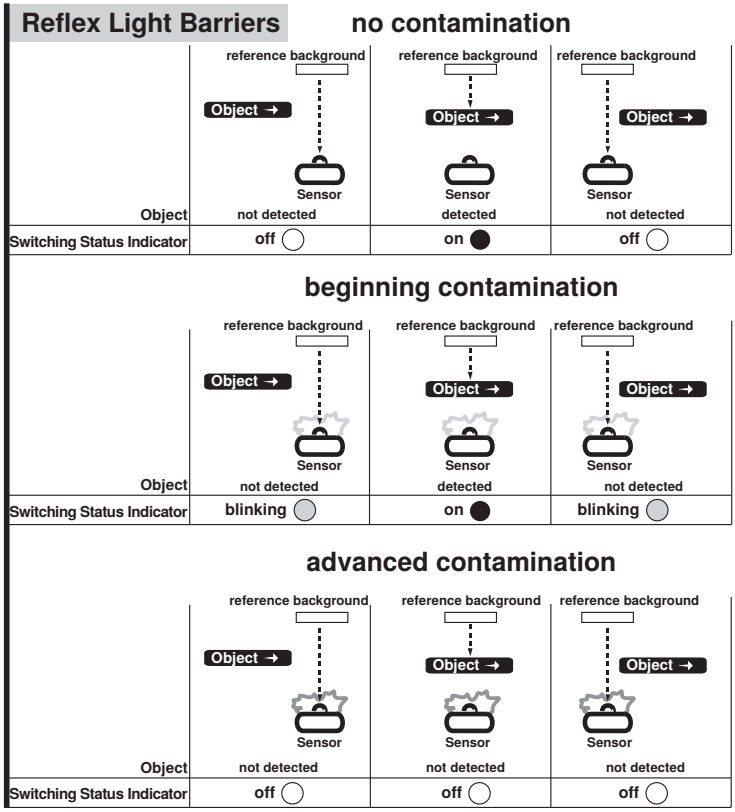
- The electric device may be connected by appropriately qualified personnel only.

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	• Increase the sensor's switching distance • Reduce distance between sensor and object
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

6.1 Teach-in on a static background (default P1PM101/P1PM102)

Object detection against a static reference background such as a stainless steel machine part
The sensor is taught in such that it demonstrates stable switching performance despite interference such as vibration.

- Install the sensor in accordance with the installation instructions.
- Align the sensor to the reference background.
- Press and hold the teach-in key until switching status indicator LED A1 starts flashing slowly (2 Hz) after 2 seconds.
- Release the teach-in key.
- The sensor first automatically adjusts the intensity of the red light to the chosen reference background.
- The sensor briefly analyzes the signals received and uses them to calculate the switching thresholds (light intensity and distance).
- The switching thresholds are taught in and the LED for A1 flashes twice in order to confirm successful teach-in. If teach-in has not been successful, LED A1 flashes 4 times. If this is the case, the procedure must be repeated.

6.2 Teach-in on a moving background (default P1PM103/P1PM104)

Object detection in front of moving reference background such as moving conveyors The sensor is taught in such that, depending on the application, minimal thresholds can be set in order to detect smallest possible parts by means of this process. With running conveyor belt, the sensor is set to a signal analysis phase which is started and stopped on an application-specific basis. The receive signals are analyzed during this time and the switching thresholds are calculated based on this analysis. And thus application-specific receive signals do not result in erroneous sensors switching.

- Install the sensor in accordance with the installation instructions.
- Align the sensor to the reference background (conveyor belt).
- Press and hold the teach-in key until switching status indicator A1 starts flashing rapidly (4 Hz) after 2 seconds.
- Release the teach-in key.
- The sensor automatically adjusts the intensity of the red light to the chosen reference background.
- The recording phase begins, while the red light of the sensor and the LED for A1 flash rapidly (4 Hz).
- The sensor analyzes the received signals and computes adapted switching thresholds based on these analyses.
- Pressing the button again ends the recording phase.
- The calculated switching thresholds are taught in and the LED for A1 flashes twice in order to confirm successful teach-in. If teach-in has not been successful, LED A1 flashes 4 times. If this is the case, the procedure must be repeated.

NOTE!

The max. recording phase is 1 minute (teach-in on moving background). If the recording phase is not ended by pressing the button a second time, an error message is displayed and the process must be repeated.

NOTE!

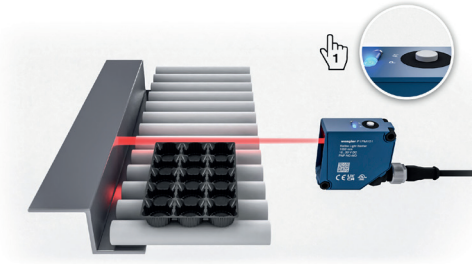
If the sensor is used above a conveyor belt, it's advisable to activate the belt during the recording phase. Height fluctuations, impacts, belt seams contamination, etc. are analyzed as a result and made use of when calculating the switching thresholds. Erroneous switching due to the conveyor belt can be avoided in this way.

7. Functions Overview

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

7.1 Teach-In Mode

Both operating modes can be set via IO-Link for reliable object detection against a static or moving background. This allows both modes to be tested to optimally adapt the sensor to the application. Setting two separate teach-in modes offers the advantage that extremely flexible and simple teach-in of reflex light barriers is possible. There is also the option of selecting a pre-set variant.

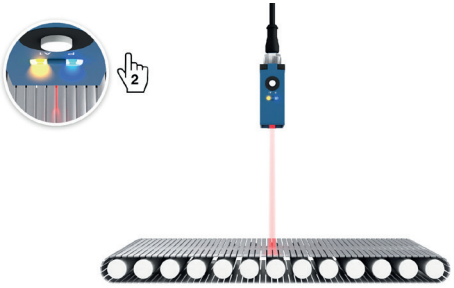


Teach-in on a static reference background

- Object detection against a static reference background such as a stainless steel machine part
- Teach-in on the background takes place at the touch of a button
- Visual confirmation via status LEDs when teach-in is successful

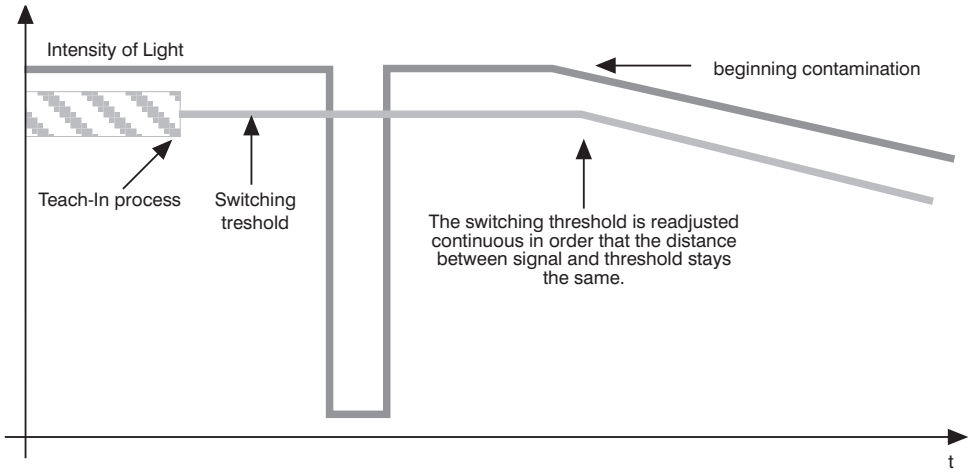
Teach-in on a Moving Reference Background

- Object detection in front of moving reference background such as moving conveyors
- Teach-in on moving background by pressing the button for application-specific teach-in sequence
- Compensation of vibrations, contamination and unevenness through automatic adjustment of the sensor during teach-in



Dynamic Readjustment

Continuous readjustment of the switching threshold of the sensor. The time interval for readjustment can be set on the interface. This function is activated upon shipment from the factory.



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

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 the voltage on the input drops, A1 is taught in (teach-in on static background) or the analysis phase is started (teach-in on moving background).
4. Teach-in on moving background: Please repeat steps 2 and 3 to complete the recording phase.

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 the voltage is applied to the input, A1 is taught in (teach-in on static background) or the recording phase is started (teach-in on moving background).
4. Teach-in on moving background: Please repeat steps 2 and 3 to complete the recording phase.

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
- Teach-In mode
- Dynamic readjustment
- Filter

8. IO-Link

Further settings are possible via the IO-Link interface. The IODD can be found at www.wenglor.com in the product's separate download area.

9. Maintenance Instructions

NOTE!

- This wenglor sensor is maintenance-free.
- Cleaning and inspection of the plug connections at regular intervals are advisable. After cleaning the sensor and/or reference background, the sensor may require a new teach-in process. This depends largely on the level of contamination in the application.
- Do not clean the sensor with solvents or cleaning agents that could damage the product.
- The product must be protected against contamination during initial start-up.

10. Proper Disposal

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

11. Appendix

11.1 List of Abbreviations

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

11.2 Change Index for the Operating Instructions

Version	Date	Description/Changes
1.0.0	10/24/2023	Initial version of the operating instructions

11.3 Declarations of Conformity

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