

# P1NHxxx

Reflex Sensors with Background Suppression



## Operating Instructions

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# 1. General

## 1.1 Information Concerning these Instructions

- These instructions apply to the products with ID code P1NHxxx.
- 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](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 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](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 replacement 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

The product is based on the following functional principle:

#### Reflex Sensors with Background Suppression

Reflex sensors with background suppression analyze the light reflected from objects. As these sensors work according to the principle of angular measurement, the color, shape and surface characteristics of the object have almost no influence on the detection range. Even dark objects can be reliably detected against a bright background. The output is switched as soon as an object passes the selected range.

#### 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
- Plastics industry
- Woodworking industry
- Consumer goods industry
- Paper industry
- Electronics industry
- Glass industry
- Steel industry
- Aviation industry
- Chemicals 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](http://www.wenglor.com) on the product detail page.

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#### **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 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](http://www.wenglor.com) in the product's download area.
  - Read the operating instructions carefully before using the product.
  - Protect the sensor against contamination and mechanical influences.

## 2.6 Laser/LED Warnings

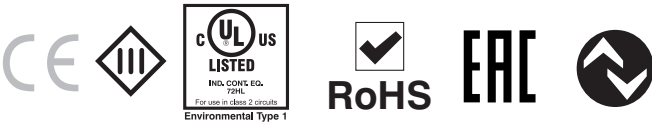
The respective laser class or LED group is listed in the product's technical data.



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

Applicable standards and safety regulations must be observed.  
 $P_p < 4\text{mW}$ ,  $t_p = 9,2\text{ }\mu\text{s}$ ,  $\lambda = 650\text{ nm}$

## 2.7 Approvals and protection class



## 3. Technical Data

### 3.1 Technical Data

Optical Data	
Service life (ambient temp. = +25 °C)	100000 h
Max. permissible ambient light	10000 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 $\mu$ A
Short-circuit protection	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
Lens cover	PMMA

Order Number		P1NH											
		102	104	201	202	203	206	207	208	701	706	707	708
Technical Data													
Principle		Mechanical Background Suppression											
Range		200 mm		300 mm									
Adjustable Range		45...200 mm		50...300 mm						65...300 mm			
Switching hysteresis		< 5 %								< 1 %			
Light Source		Red Light								Laser			
Laser Class (EN 60825-1)		—								1			
Risk Group (EN 62471)		—								—			
Spot Diameter		See Table 5		See Table 1						See Table 6			
Supply voltage		10...30 V DC											
Current consumption		< 25 mA								< 15 mA			
Temperature range		-40...60 °C								-25...60 °C			
Temperature drift		< 5 %								< 2 %			
Switching frequency		1000 Hz											
Response time		0,5 ms											
Switching frequency (Interference-free-Mode)		500 Hz											
Response time (Interference-free-Mode)		1 ms											
Setting Method		Single-turn											
Output function	PNP, antivalent	×		×	×					×			
	NPN, antivalent		×				×	×			×		
	PNP, NO					×						×	
	NPN, NO								×				×
Connection		Plug M12, 4-pin		Cable 2 m, 4-pin	Plug M12, 4-pin			Cable 2 m, 4-pin	Plug M12, 4-pin				
Connection diagram No.		215	213	214	215	1027	213	212	228	215	213	1027	228
Suitable mounting technology No.		2											



P1NH																				
801	802	803	804	805	301	302	303	306	401	402	601	602	703	705	304	307	309	310	501	503
Mechanical Background Suppression													Electronical Background Suppression							
400 mm					500 mm				700 mm		1200 mm		300 mm		500 mm		400 mm		800 mm	
65...400 mm					60...500 mm				80...700 mm		100...1200 mm		65...300 mm		60...500 mm		50...400 mm		80...800 mm	
< 1 %					< 5 %						< 10 %				< 3 %					
Laser					Red Light								Laser		Red Light		Blue Light		Red Light	
1					—								1		—					
—					—								—		—		1		—	
3 mm					See Table 2				See Tab. 3		See Tab. 4		—		See Tab. 2		See Tab. 7		See Tab. 8	
10...30 V DC													15...30 V DC							
< 15 mA					< 25 mA				< 30 mA				< 25 mA							
-25...60 °C					-40...60 °C				-40...60 °C				-25...60 °C		-40...60 °C					
< 2 %					< 5 %				< 5 % *		< 10 %				< 5 %		< 7,5 %		< 5 %	
600 Hz					1000 Hz				500 Hz				800 Hz							
0,8 ms					0,5 ms				1 ms				1,25 ms							
300 Hz					500 Hz				250 Hz				500 Hz							
1,6 ms					1 ms				2 ms				1,5 ms							
Single-turn													Potentiometer							
	x	x				x				x		x		x		x		x		
x					x					x		x		x		x		x		x
			x				x													
				x				x												

Plug M12, 4-pin

213	215	215	1027	228	213	215	1027	228	215	213	215	213	215	213	215	213	215	213	215	213
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2

\* For the sensors P1NH401–P1NH402 the Temperature drift is depending on the ambient temperature:  
Temperature drift (–20 °C < Tu < 60 °C): < 5 %  
Temperature drift (–40 °C < Tu < 60 °C): < 8 %

3.1.1 Spot Diameter

Range	50 mm	150 mm	300 mm
Spot diameter	10 mm	10 mm	10 mm

Table 1

Range	60 mm	250 mm	500 mm
Spot diameter	11 mm	13 mm	15 mm

Table 2

Range	80 mm	350 mm	700 mm
Spot diameter	12 mm	16 mm	18 mm

Table 3

Range	100 mm	600 mm	1200 mm
Spot diameter	14 mm	18 mm	30 mm

Table 4

Range	45 mm	100 mm	200 mm
Spot diameter	7 mm	6 mm	5 mm

Table 5

Range	65 mm	120 mm	300 mm
Spot diameter	3 mm	2,5 mm	1,5 mm

Table 6

Range	50 mm	200 mm	400 mm
Spot diameter	11 mm	13 mm	14 mm

Table 7

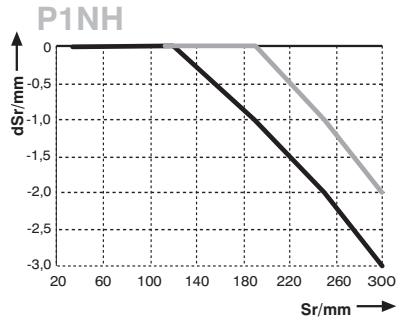
Range	160 mm	400 mm	800 mm
Spot diameter	16 mm	20 mm	23 mm

Table 8

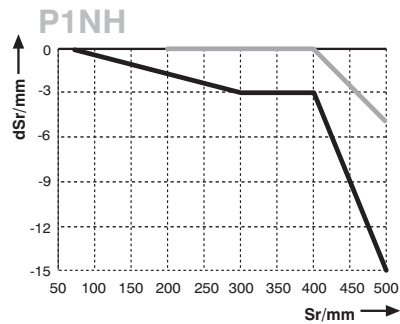
### 3.1.2 Switching Distance Deviation

Typical characteristic curve based on Kodak white (90 % remission).

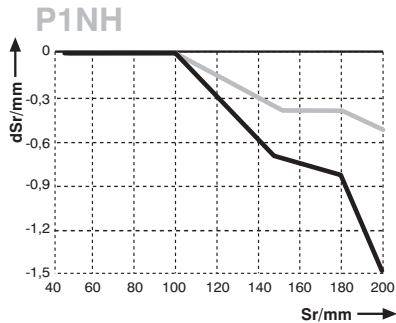
P1NH201–P1NH203, P1NH206–P1NH208



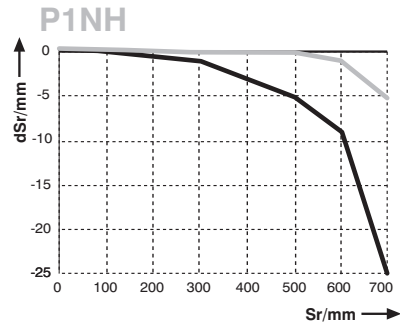
P1NH301–P1NH303, P1NH306



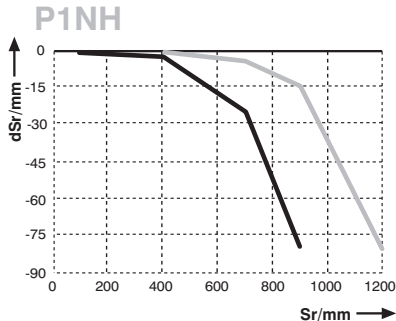
P1NH102, P1NH104



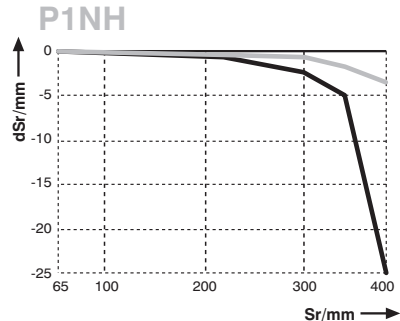
P1NH401, P1NH402



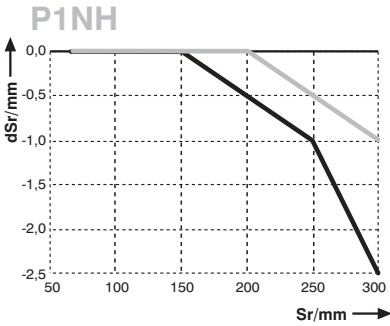
P1NH601, P1NH602



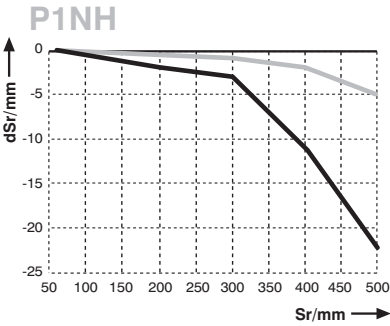
P1NH801–805



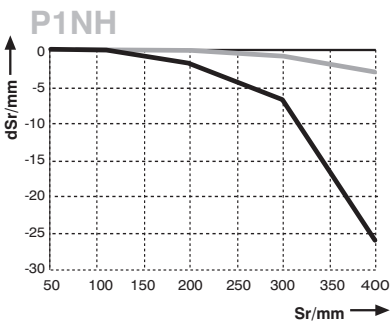
P1NH701, P1NH706-708



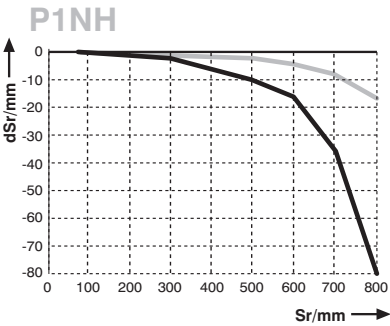
P1NH304, P1NH307



P1NH309, P1NH310



P1NH501, P1NH502



Sr = Switching Distance  
dSr = Switching Distance Change  
Black 6 % remission  
Grey 18 % remission

## 3.2 Complementary Products

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

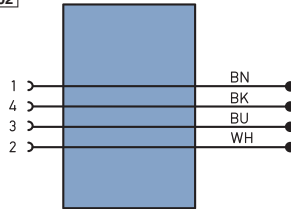
Suitable mounting technology no.

**350**

Suitable connection technology no.

**2**

**S02**



IO-Link master

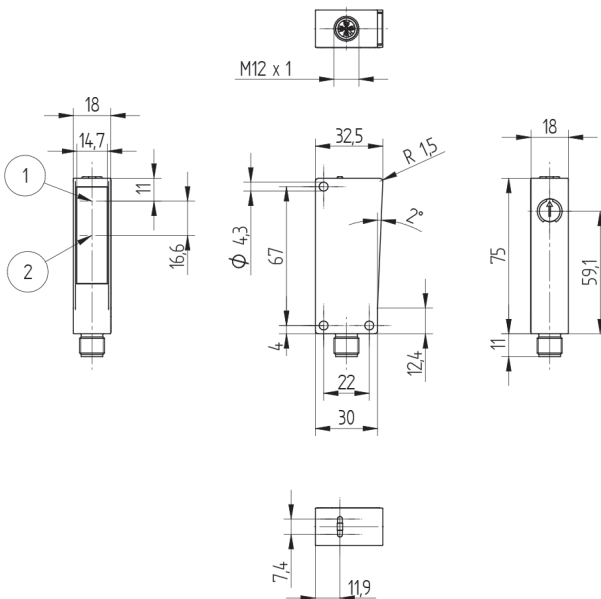
wTeach2 software DNNF005

Protection Housing Set Z1NS001

STAUBTUBUS-03

## 3.3 Layout

P1NH304, P1NH307, P1NH309, P1NH310

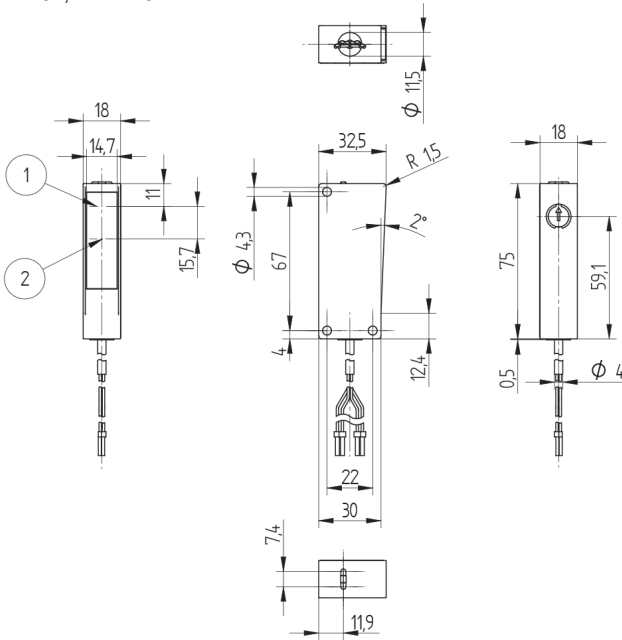


[illegible]

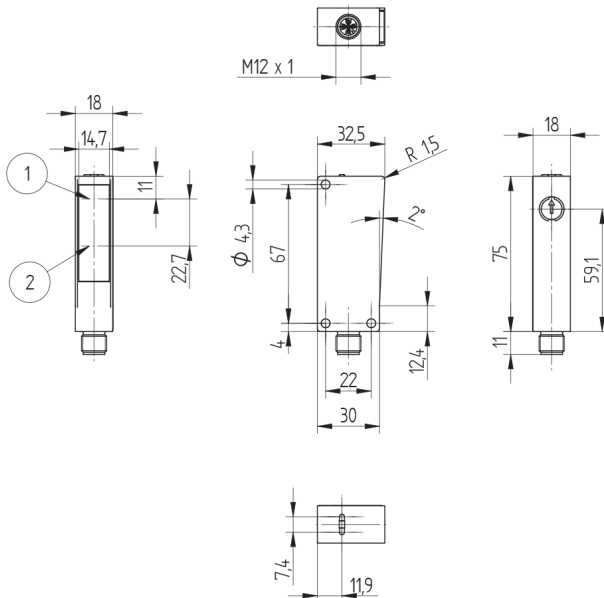
Technical drawing of a 1000mm long extruded aluminum profile. The drawing includes the following dimensions and features:

- Top View:** Shows a rectangular cross-section with a width of 18 mm and a height of 14.7 mm. A central slot is 11 mm wide. A mounting hole is located 15.7 mm from the bottom edge.
- Front View:** Shows the profile's length of 1000 mm. The top edge has a 32.5 mm horizontal segment followed by a 15 mm radius (R 15) and a 2° chamfer. The bottom edge has a 4 mm horizontal segment, a 67 mm vertical segment, a 22 mm horizontal segment, and a 30 mm base. A central slot is 4.3 mm wide. A mounting hole is located 12.4 mm from the bottom edge.
- Side View:** Shows the profile's height of 75 mm and a total length of 59.1 mm. A central slot is 11 mm wide. A mounting hole is located 11 mm from the bottom edge.
- Detail View:** A close-up of the mounting hole, showing a hole diameter of M12 x 1 and a hole diameter of 11.9 mm.

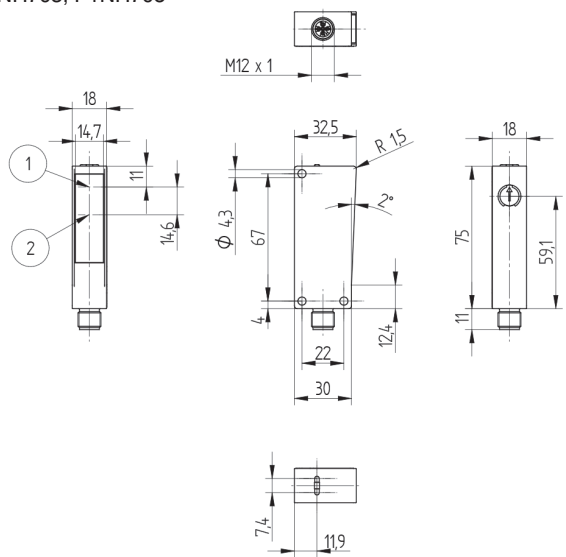
P1NH201, P1NH207



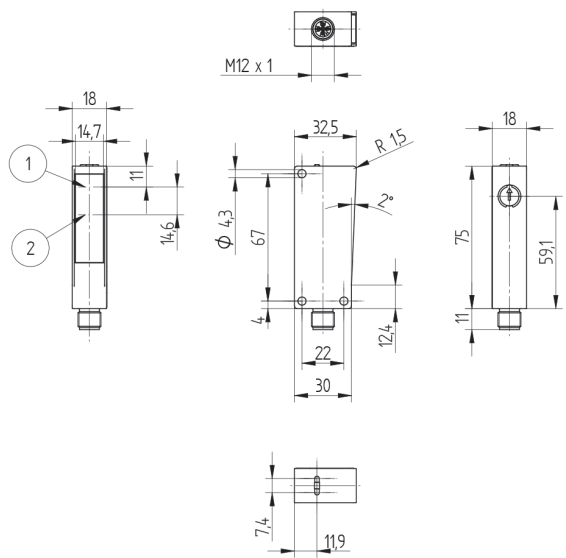
P1NH401, P1NH402, P1NH601, P1NH602



P1NH703, P1NH705



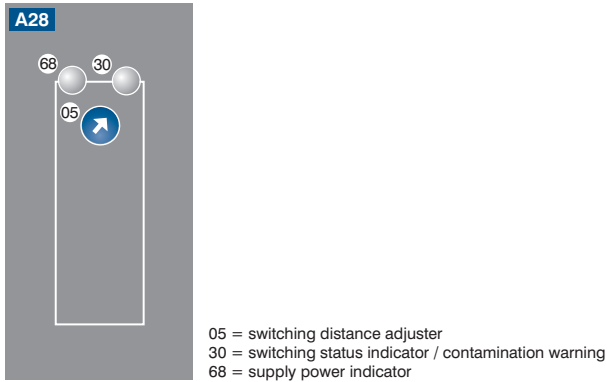
P1NH706, P1NH707, P1NH708, P1NH701, P1NH801, P1NH802, P1NH803, P1NH804, P1NH805



① = Emitter diode  
② = Receiving diode  
Screw M4 = 0,5 Nm  
Potentiometer = 40 Nmm  
Dimensions specified in mm (1 mm = 0,03937 Inch)



### 3.4 Control Panel



### 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 condition 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 section “3. Technical Data”, page 7](#)).

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#### **ATTENTION!**



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

The product may be damaged.

- Installation instructions must be complied with.

---

#### **CAUTION!**

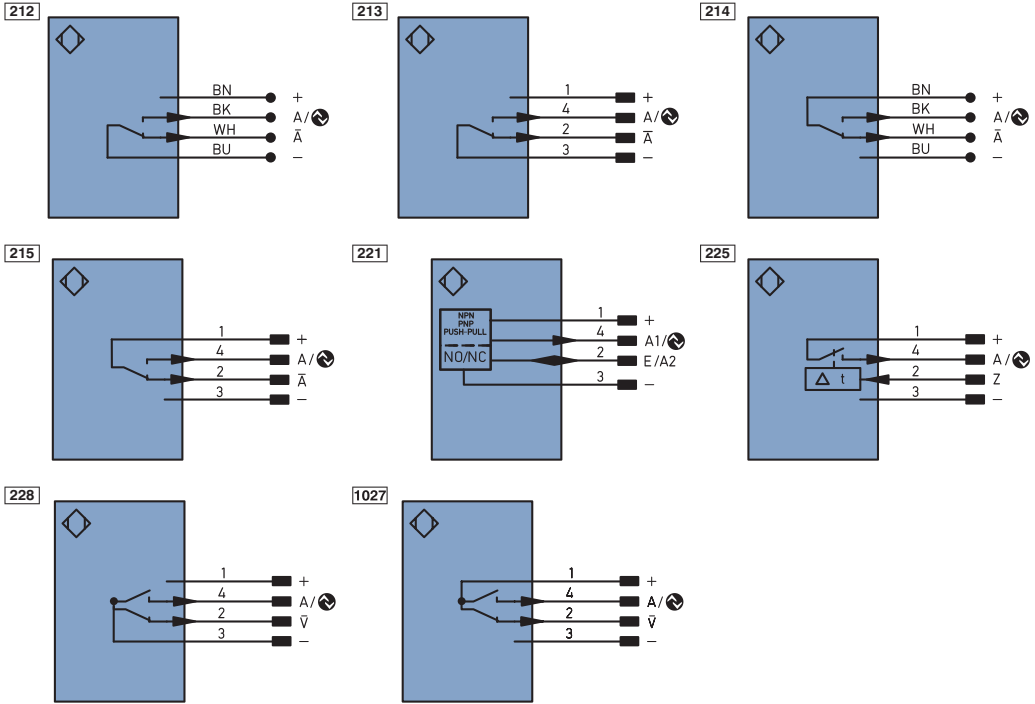


##### **Risk of personal injury or property damage during installation!**

Personal injury and damage to the product may occur.

- A safe installation environment must be assured.
-

## 5.2 Electrical Connection



### Legend

+	Supply Voltage +	PT	Platinum measuring resistor	ENaRS422	Encoder A/Ā (TTL)
-	Supply Voltage 0 V	nc	not connected	ENaRS422	Encoder B/B̄ (TTL)
~	Supply Voltage (AC Voltage)	U	Test Input	ENa	Encoder A
A	Switching Output (NO)	Ū	Test Input inverted	ENa	Encoder B
Ā	Switching Output (NC)	W	Trigger Input	AMIN	Digital output MIN
V	Contamination/Error Output (NO)	W-	Ground for the Trigger Input	AMAX	Digital output MAX
V̄	Contamination/Error Output (NC)	O	Analog Output	AOK	Digital output OK
E	Input (analog or digital)	O-	Ground for the Analog Output	SY In	Synchronization In
T	Teach Input	BZ	Block Discharge	SY OUT	Synchronization OUT
Z	Time Delay (activation)	AWV	Valve Output	Q.LT	Brightness output
S	Shielding	a	Valve Control Output +	M	Maintenance
RxD	Interface Receive Path	b	Valve Control Output 0 V	rsv	reserved
TxD	Interface Send Path	SY	Synchronization	Wire Colors according to IEC 60757	
RDY	Ready	SY-	Ground for the Synchronization	BK	Black
GND	Ground	E+	Receiver-Line	BN	Brown
CL	Clock	S+	Emitter-Line	RD	Red
E/A	Output/Input programmable	⊕	Grounding	OG	Orange
IO-Link		SnR	Switching Distance Reduction	YE	Yellow
PoE	Power over Ethernet	Rx+/-	Ethernet Receive Path	GN	Green
IN	Safety Input	Tx+/-	Ethernet Send Path	BU	Blue
OSSD	Safety Output	Bus	Interfaces-Bus A(+)/B(-)	VT	Violet
Signal	Signal Output	La	Emitted Light disengageable	GY	Grey
BI_D +/-	Ethernet Gigabit bidirect. data line (A-D)	Mag	Magnet activation	WH	White
ENaRS422	Encoder 0-pulse 0-0̄ (TTL)	RES	Input confirmation	PK	Pink
		EDM	Contacteur Monitoring	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 only be connected by appropriately qualified personnel.

## **5.3 Diagnostics**

Causes for Triggering the Contamination Warning (blinking LED):

Display LED	Diagnosis/Cause	Elimination
Continuous blinking 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 blinking at approx. 5 Hz	Short-circuit	Check electrical wiring and eliminate the short-circuit.
	Over-temperature	Disconnect the sensor from supply power and allow it to cool down.
	Hardware error	Replace the sensor.

## Contamination Warning Flowcharts

Reflex Mode			
no contamination			
			
Object	Object → not detected	Object → detected	Object → not detected
Switching Status Indicator	off ○	on ●	off ○
beginning contamination			
			
Object	Object → not detected	Object → detected	Object → not detected
Switching Status Indicator	off ○	blinking ●	off ○
advanced contamination			
			
Object	Object → not detected	Object → not detected	Object → not detected
Switching Status Indicator	off ○	off ○	off ○

### Required action in case of fault:

#### NOTE!

- Shut down the machine.
- Analyze and eliminate the cause of error with the help 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 unequivocally clarified or reliably 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.

- Required action as specified in case of fault.



## 6. Settings

### 6.1 Object Detection Directly in Front of a Background or an Undersurface

- Adjust and securely mount the sensor such that the spot strikes the object to be detected at a right angle.
- Turn the potentiometer all the way to the right.
- Remove the object and slowly turn the potentiometer back until the output is switched. The background or the undersurface is now suppressed.
- Put the object back under the spot and check to determine whether or not the sensor is activated again.

### 6.2 Detection of Objects Without Interfering Background

- Adjust and securely mount the sensor such that the spot strikes the object to be detected.
- Turn the potentiometer all the way to the left.
- Turn up the potentiometer up until activation occurs and, if required, turn it up a bit further for increased switching reliability.

## 7. IO-Link

Further settings are possible via the IO-Link interface. The IODD can be found at [www.wenglor.com](http://www.wenglor.com) in the product's download area.

## 8. 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 cleansers which could damage the product.
- The product must be protected against contamination during initial start-up.

## 9. 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.

## 10. Appendix

### 10.1 List of Abbreviations

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

### 10.2 Change Index, Operating Instructions

Version	Date	Description/Change
1.0.0	23.11.18	Initial version of the operating instructions
1.1.0	13.12.18	Updates of <a href="#">“3 Technical Data” on page 7 ff</a>
1.2.0	28.01.19	Updates of <a href="#">“3 Technical Data” on page 7 ff</a>
1.3.0	27.02.19	Updates of <a href="#">“3 Technical Data” on page 7 ff</a>
1.4.0	28.05.19	Updates of <a href="#">“3 Technical Data” on page 7 ff</a>
1.5.0	24.10.19	Updates of <a href="#">“3 Technical Data” on page 7 ff</a>
1.6.0	31.10.19	Updates of <a href="#">“3 Technical Data” on page 7 ff</a>
1.7.0	28.11.19	Updates of <a href="#">“3 Technical Data” on page 7 ff</a>
1.8.0	16.12.19	Updates of <a href="#">“3 Technical Data” on page 7 ff</a>

### 10.3 EU Declaration of Conformity

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