



► PSEN in-A-A-N, PSEN in-B-A-N and PSEN in-C-A-N

PILZ
THE SPIRIT OF SAFETY

Operating Manual-1006697-EN-03
- PSEN sensor technology



This document is the original document.

Where unavoidable, for reasons of readability, the masculine form has been selected when formulating this document. We do assure you that all persons are regarded without discrimination and on an equal basis.

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SD means Secure Digital

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1 Introduction

1.1 Validity of documentation

This documentation is valid for the product PSEN in-A-A-N/PSEN in-B-A-N/PSEN in-C-A-N. It is valid until new documentation is published.

This operating manual explains the function and operation, describes the installation and provides guidelines on how to connect the product.

1.2 Using the documentation

This document is intended for instruction. Only install and commission the product if you have read and understood this document. The document should be retained for future reference.

1.3 Definition of symbols

Information that is particularly important is identified as follows:



DANGER!

This warning must be heeded! It warns of a hazardous situation that poses an immediate threat of serious injury and death and indicates preventive measures that can be taken.



WARNING!

This warning must be heeded! It warns of a hazardous situation that could lead to serious injury and death and indicates preventive measures that can be taken.



CAUTION!

This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.



NOTICE

This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken. It also highlights areas within the text that are of particular importance.



INFORMATION

This gives advice on applications and provides information on special features.

2 Safety

2.1 Intended use

The safety functions of the safe inductive proximity switch are:

- ▶ The inductive proximity switch signals the safe state when the damping material (electrically conductive object) is outside the assured release distance S_{ar} .
- ▶ The safe state of the inductive proximity switch is the high impedance state (off-state).
- ▶ Safety functions on which the low impedance state (on-state) is the safe state were not evaluated.
- ▶ A dangerous failure is present when the inductive proximity switch does not signal the safe state.

The safe inductive proximity switch meets the requirements in accordance with:

- ▶ EN ISO 13849-1:2023 (up to Cat. 4 PL e)
- ▶ EN IEC 61508-1:2010 (up to SIL 3)
- ▶ EN IEC 62061:2021 (max. SIL 3)
- ▶ EN IEC 60947-5-3:2013

Improper use

The following is deemed improper use in particular:

- ▶ Any component, technical or electrical modification to the product,
- ▶ Use of the product outside the areas described in this operating manual,
- ▶ Use of the product outside the technical details (see chapter entitled [Technical Details](#) [ 28]).



NOTICE

EMC-compliant electrical installation

The product is designed for use in an industrial environment. The product may cause interference if installed in other environments. If installed in other environments, measures should be taken to comply with the applicable standards and directives for the respective installation site with regard to interference.

2.2 Safety regulations

2.2.1 Safety assessment

Before using a product, a risk assessment in accordance with the Machinery Directive is required.

The product as an individual component fulfils the functional safety requirements in accordance with EN/IEC 61508, EN ISO 13849-1/2 and EN IEC 62061. However, this does not guarantee the functional safety of the overall plant/machine. To achieve the relevant safety level of the overall plant/machine's required safety functions, each safety function needs to be considered separately.

It is the responsibility of the user/operator to carry out a risk assessment for their application, in which they consider the impact of assumed errors in the wiring and take appropriate measures to control or avoid these errors.

2.2.2 Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, decommissioned and maintained by persons who are competent to do so.

A competent person is a qualified and knowledgeable person who, because of their training, experience and current professional activity, has the specialist knowledge required. In order to inspect, assess and handle products, devices, systems, plant and machinery, this person must be familiar with the state of the art and the applicable national, European and international laws, directives and standards.

It is the company's responsibility only to employ personnel who

- ▶ Are familiar with the basic regulations concerning health and safety / accident prevention,
- ▶ Have read and understood the information provided in the section entitled Safety
- ▶ Have a good knowledge of the generic and specialist standards applicable to the specific application.

2.2.3 Warranty and liability

All claims to warranty and liability will be rendered invalid if

- ▶ The product was used contrary to the purpose for which it is intended,
- ▶ Damage can be attributed to not having followed the guidelines in the manual,
- ▶ Operating personnel are not suitably qualified,
- ▶ Any type of modification has been made (e.g. exchanging components on the PCB boards, soldering work etc.).

2.2.4 Disposal

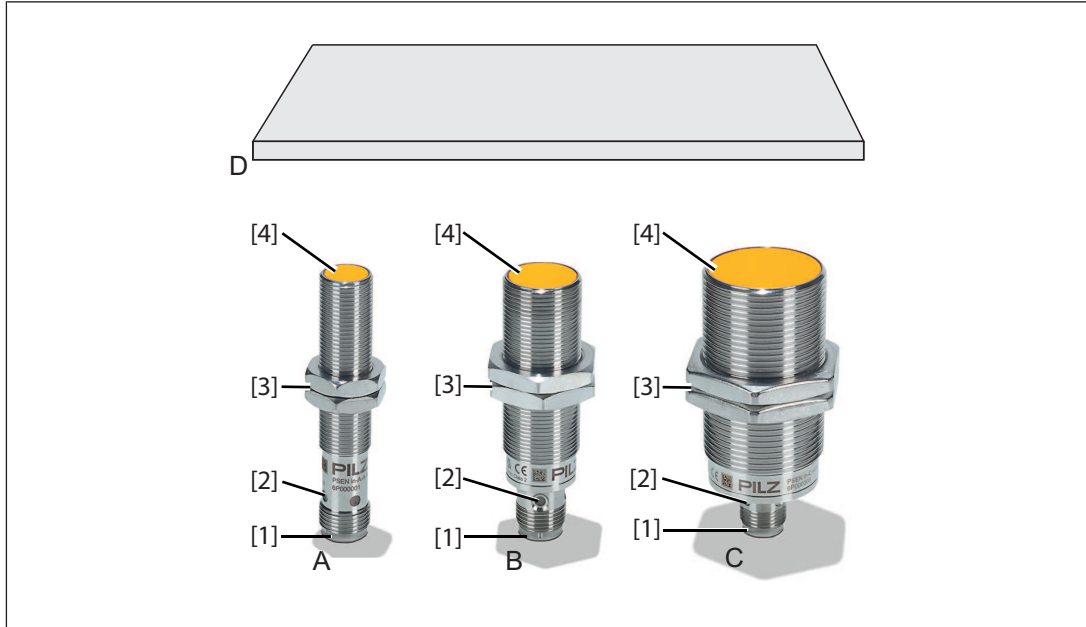
- ▶ In safety-related applications, please comply with the mission time T_M stated in the safety-related characteristic data.
- ▶ When decommissioning, please comply with local regulations regarding the disposal of electronic devices (e.g. Electrical and Electronic Equipment Act).

3 **Product features**

- ▶ Operation Inductive
- ▶ Cylindrical design
 - M12 thread for PSEN in-A-A-N
 - M18 thread for PSEN in-B-A-N
 - M30 thread for PSEN in-C-A-N
- ▶ 4-pin M12 male connector
- ▶ 2 OSSD safety outputs
- ▶ LED status and error display

4 Function description

4.1 Overview



Legend

A PSEN in-A-A-N

C PSEN in-C-A-N

[1] 4-pin M12 male connector

[3] Nuts

B PSEN in-B-A-N

D Damping material (electrically conductive object)

[2] LED status and error display

[4] Sensing face

4.2 Function

If damping material (electrically conductive object) is within the response range of the coil on the safe inductive proximity switch, the coil's magnetic field is influenced. This change of the magnetic field generates an electrical switch signal and transmits it to the connected evaluation device.

The safe inductive proximity switch has 2 OSSD safety outputs. A high signal (on-state) or low signal (off-state) is present at the OSSD safety outputs, depending on the state of the magnetic field of the coil within the response range. The OSSD safety outputs switch to the off-state (low signal) in accordance with their defined behaviour under fault conditions (PDDB).

If there is no damping material (electrically conductive object) within the response range of the coil, the OSSD safety outputs are in the off-state (LOW signal). The OSSD safety outputs are compatible with inputs of type 1, 2 or 3 in accordance with EN 61131-2.

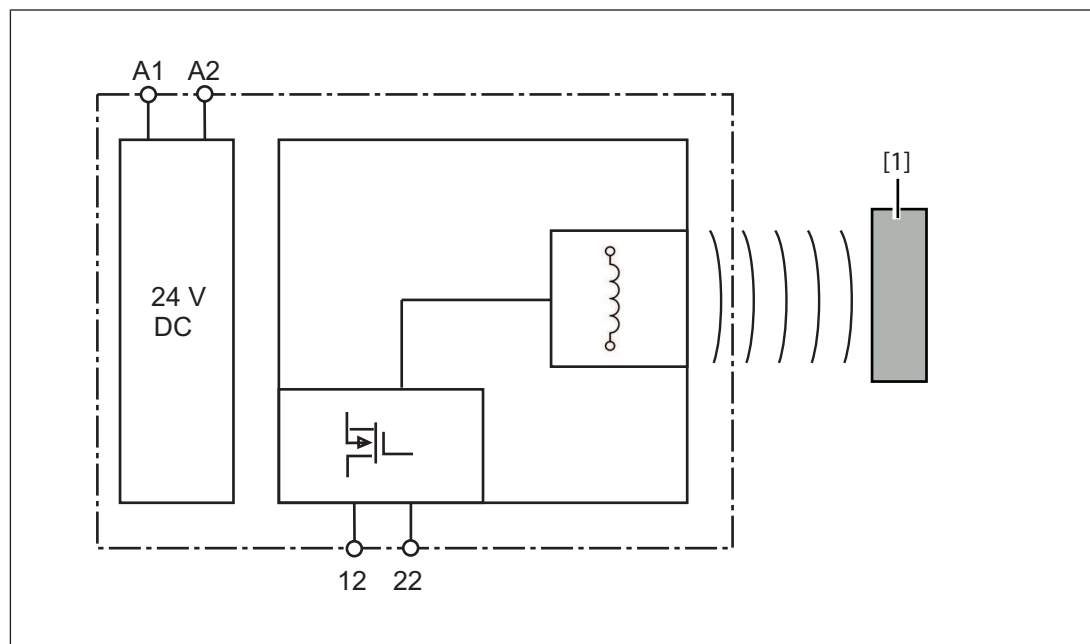
State of OSSD safety outputs

Damping material (electrically conductive object) within the response range of the coil	Safety output OSSD 1	Safety output OSSD 2
Yes	High signal (on-state)	High signal (on-state)
No	Low signal (off-state)	Low signal (off-state)

4.3 LED status and error display

The safe inductive proximity switch has a dual-colour LED status and error display. It lights up

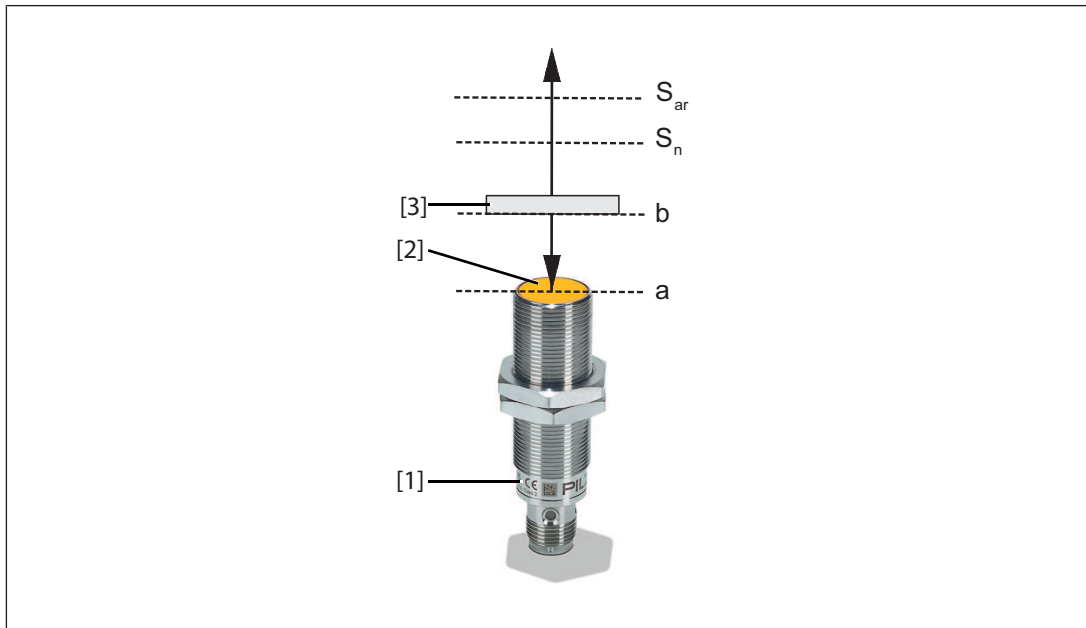
- ▶ yellow when the safety outputs are in the on-state
- ▶ red in the event of an error.

4.4 Block diagram**Legend**

[1] Damping material (electrically conductive object)

Connection designation	Function
A1	+24 V
A2	0 V
12	Safety output OSSD 1
22	Safety output OSSD 2

4.5 Operating distances



Legend

[1] Safe inductive proximity switch,
PSEN in-B-A-N as example

[2] Sensing face

[3] Damping material (electrically con-
ductive object)

a Base = 0 mm

b Current distance to damping material

s_n Rated operating distance

s_{ar} Assured release distance

The following operating distances were determined using a standard measuring plate (material FE 360) in accordance with EN IEC 60947-5-2.

Type	PSEN in-A-A-N	PSEN in-B-A-N	PSEN in-C-A-N
Installation conditions	Flush	Flush	Flush
Dimensions of the standard measuring plate in accordance with EN IEC 60947-5-2 (a x b x c)	12 mm x 12 mm x 1 mm	18 mm x 18 mm x 1 mm	30 mm x 30 mm x 1 mm
Rated operating distance s_n	2 mm	5 mm	10 mm
Assured release distance s_{ar}	3 mm	7.5 mm	15 mm
Safety reaction time ^[1]	≤ 20 ms	≤ 20 ms	≤ 20 ms
Reduction factor r_{Al} ^[2]	0.60	0.50	0.50
Reduction factor r_{Cu} ^[2]	0.45	0.40	0.45
Reduction factor r_{V2A} (1.4301) ^[2]	0.90	0.85	0.80
Reduction factor r_{Ms} ^[2]	0.60	0.55	0.55

- [1] The safety reaction time is the maximum time, without error, that is needed from removal of the standard measuring plate to the reaction of the OSSD safety outputs in normal operation.
- [2] If a material other than FE 360 is used, the specified switching distances may change by one factor.

4.6 Type code

The type code of the safe inductive proximity switch "PSEN in-X-X-X" is composed as follows:

Product area (PSEN)	Product group (in-)	Housing (X-)	Installation condition (X-)	Connection (X)
Pilz SENsor	Inductive proximity switch	A M12	A Flush	N 4-pin M12 male connector, A coded
		B M18		
		C M30		

5 Wiring

5.1 Important information

- ▶ Information given in the [Technical details \[28\]](#) must be followed.
- ▶ Calculation of the max. cable length $l_{\max}$ in the input circuit:

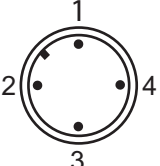
$$l_{\max} = \frac{R_{l\max}}{R_l / \text{km}}$$

$R_{l\max}$ = max. overall cable resistance (see under "[Technical details \[28\]](#)")

R_l / km = cable resistance/km

- ▶ The power supply must meet the regulations for extra low voltages with protective electrical separation (SELV, PELV).
- ▶ The power supply must have an overvoltage protection of $\leq 35 \text{ V DC}$.
- ▶ The OSSD safety outputs of the safe inductive proximity switch must have protective separation from voltages over 35 VDC.
- ▶ The supply voltage of the safety inductive proximity switch must be protected with a 2 A to 4 A quick-acting fuse.
- ▶ Ensure the wiring and EMC requirements of EN 60204-1 are met.

5.2 Pin assignment, connector and connection cable

	4-pin M12 male connector
---	--------------------------

PIN	Connection designation	Function	Wire colour
1	A1	+24 V	Brown
2	22	Safety output OSSD 2	White
3	A2	0 V	Blue
4	12	Safety output OSSD 1	Black

The wire colour applies for the connection cables available from PILZ as an accessory.

6 Connection to evaluation devices

The safe inductive proximity switch can be connected to suitable evaluation devices and evaluated.

6.1 Suitable Pilz evaluation devices

Suitable Pilz evaluation devices are, for example:

- ▶ myPNOZ
- ▶ PNOZmulti
- ▶ PSS 4000

These Pilz evaluation devices have a partial operation lock and need less than 30 mA in the input circuit.

The correct connection to the respective Pilz evaluation device is described in the corresponding operating manual. Ensure that the connection is made in accordance with these specifications.

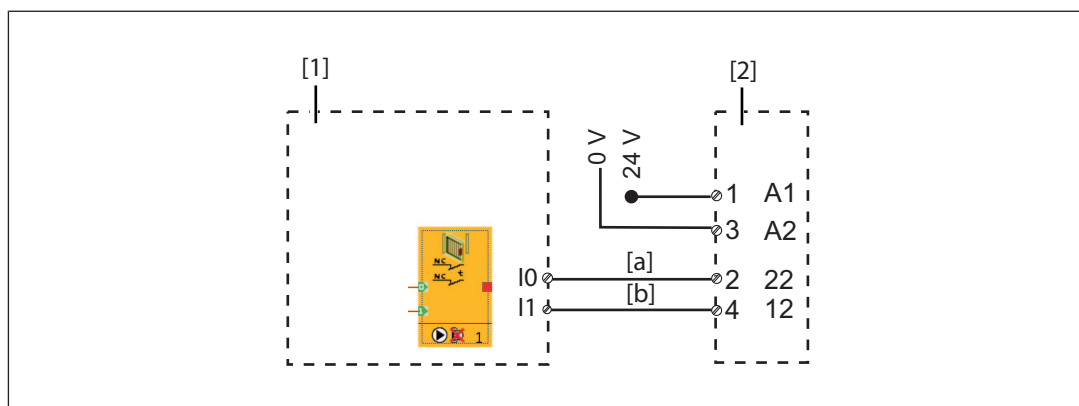


Fig.: Example illustration with PNOZmulti

Legend

[1] PNOZmulti

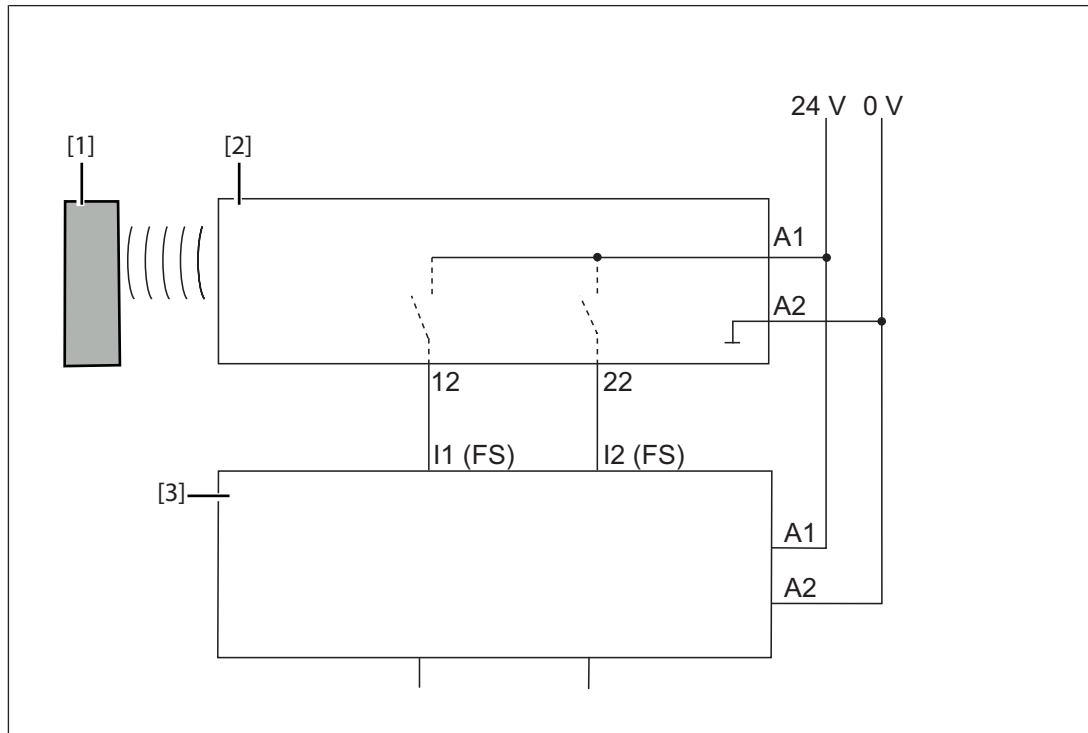
[2] PSEN in-A-A-N, PSEN in-B-A-N,
PSEN in-C-A-N

[a] White connection cable

[b] Black connection cable

Connection designation	Function
A1	+24 V
A2	0 V
12	Safety output OSSD 1
22	Safety output OSSD 2

6.2 Evaluation of an inductive proximity switch, dual-channel



Legend

[1] Damping material

[2] PSEN in-A-A-N, PSEN-B-A-N or
PSEN in C-A-N

[3] Evaluation device

(FS) Failsafe

Ensure that the selected evaluation device has the following properties:

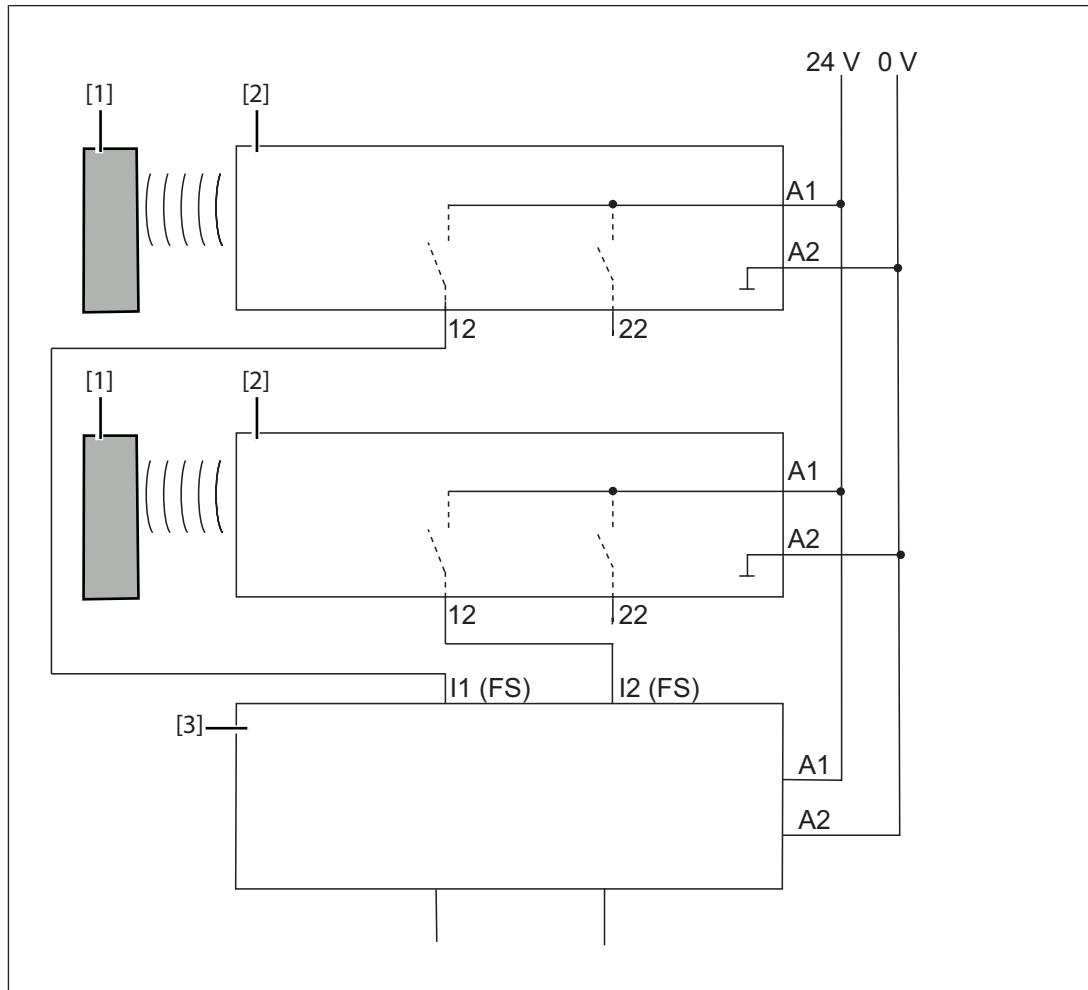
- dual-channel with plausibility check (partial operation lock):

In an input circuit it is necessary to check, when outputs (12, 22) are evaluated, whether both outputs (12, 22) actually switch off in compliance with the discrepancy time. If this is not the case, a partial operation lock of the evaluation device must be activated.

- Maximum achievable performance level of the safety circuit:

PL d, Cat. 2, SIL 2

6.3 Evaluation of two inductive proximity switches, dual-channel



Legend

[1] Damping material

[2] PSEN in-A-A-N, PSEN-B-A-N or
PSEN in C-A-N

[3] Evaluation device

(FS) Failsafe

Ensure that the selected evaluation device has the following properties:

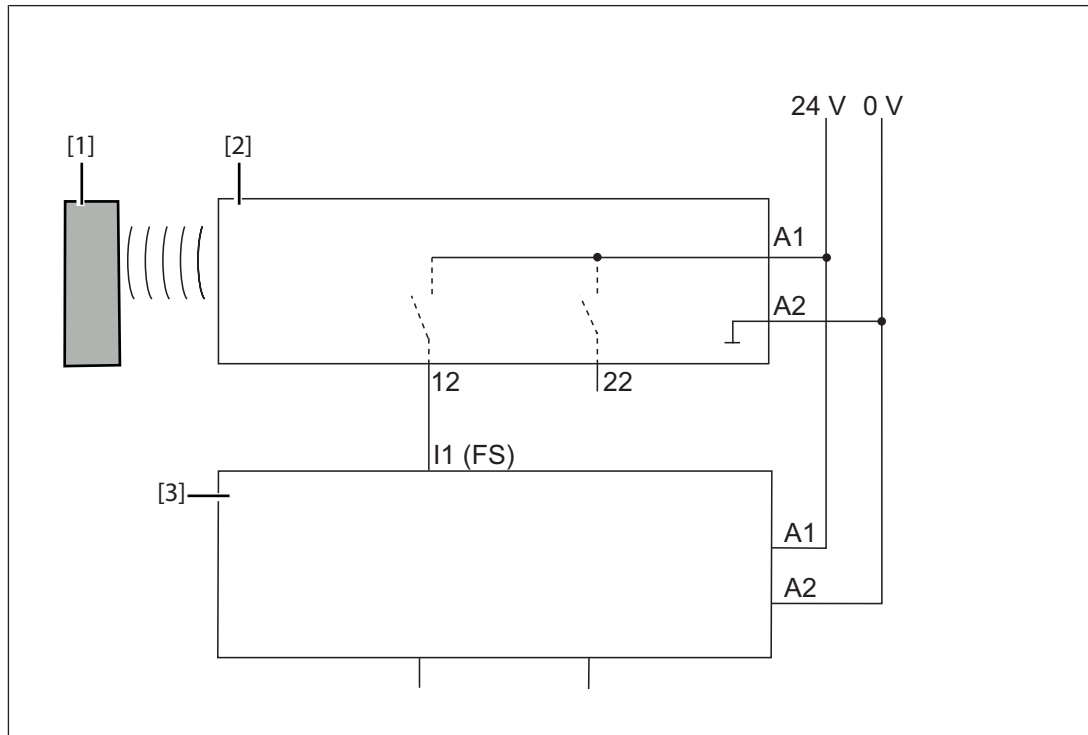
- dual-channel with plausibility check (partial operation lock):

In an input circuit it is necessary to check, when outputs (12) are evaluated, whether both outputs (12) actually switch off in compliance with the discrepancy time. If this is not the case, a partial operation lock of the evaluation device must be activated.

- Maximum achievable performance level of the safety circuit:

PL e, Cat. 4, SIL 3

6.4 Evaluation of one inductive proximity switch, single-channel



Legend

[1] Damping material

[2] PSEN in-A-A-N, PSEN-B-A-N or
PSEN in C-A-N

[3] Evaluation device

(FS) Failsafe

Ensure that the selected evaluation device has the maximum achievable performance level of the safety circuit, SIL 2.

7 Installation

7.1 Important information



WARNING!

If the supply voltage to the safe inductive proximity switch exceeds 35 VDC in the case of an error, the safety function is no longer guaranteed.

People can access a machine's danger zone. There is an increased risk of injury or even a threat to life!

- Ensure that the supply voltage of 35 VDC is not exceeded.



WARNING!

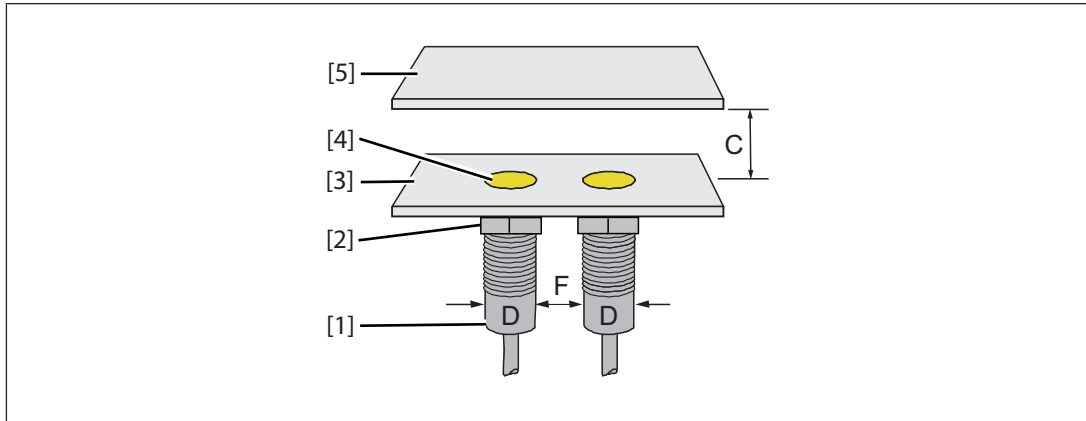
If damping material (electrically conductive object) unintentionally reaches the response range of the coil on the safe inductive proximity switch, the safety function is no longer guaranteed.

People can access a machine's danger zone. There is an increased risk of injury or even a threat to life!

- Ensure that only the intended damping material (electrically conductive object) reaches the response range of the coil on the safe inductive proximity switch. Only then is the safety function guaranteed.
- Check the assured operating distance s_a and the assured release distance s_{ar} .

- ▶ Be aware of the installation and environmental conditions.
- ▶ Use appropriate design measures to ensure that no damping material (electrically conductive object), such as metals in the form of swarf, screws, plates, etc., can reach the vicinity of the safe inductive proximity switch.
- ▶ When installing, ensure you comply with the requirements of EN ISO 14119.
- ▶ Check the operating distances under real conditions.
- ▶ Check the operating distances regularly, see "[Regular checks](#)  26".
- ▶ Check the operating distances each time the application is changed.
- ▶ Ensure that the safe inductive proximity switch cannot be used as a limit stop.
- ▶ Attach the safe inductive proximity switch as described below. Please note the stated torque settings.

7.2 Installation conditions (minimum distances in mm)



Legend

- [1] Safe inductive proximity switch
- [2] Nut
- [3] Mounting plate
- [4] Sensing face
- [5] Damping material (electrically conductive object)

	PSEN in-A-A-N	PSEN in-B-A-N	PSEN in-C-A-N
Installation conditions	Flush	Flush	Flush
$C \geq 3 \times s_n$	$\geq 6 \text{ mm}$	$\geq 15 \text{ mm}$	$\geq 30 \text{ mm}$
$D = \text{Diameter}$	12 mm	18 mm	30 mm
$F \geq D$	$\geq 12 \text{ mm}$	$\geq 18 \text{ mm}$	$\geq 30 \text{ mm}$

7.3 Installation without fastening element

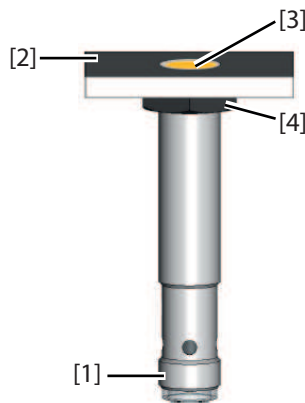


WARNING!

If the sensor is not installed correctly on the mounting plate, the sensor may slip. Then the safety function is no longer guaranteed.

People can access a machine's danger zone. There is an increased risk of injury or even a threat to life!

- Ensure that the sensor is installed correctly on the mounting plate.



1. Screw the safe inductive proximity switch [1] into the prepared thread in the mounting plate [2] until the sensing face [3] is flush with the face of the mounting plate [2].
2. Screw the nut [4] on to the safe inductive proximity switch [1].
3. Tighten the nut [4]. Please note the torque setting of the nut [4]:
 - PSEN in-A-A-N: Torque setting 15 Nm
 - PSEN in-B-A-N: Torque setting 30 Nm
 - PSEN in-C-A-N: Torque setting 30 Nm



INFORMATION

A second nut for locking is supplied with the product, for installation in a mounting plate with screw hole.

7.4 Installation with fastening element



WARNING!

If the sensor is not installed correctly in the fastening elements and on the mounting plate, the sensor may slip. Then the safety function is no longer guaranteed.

People can access a machine's danger zone. There is an increased risk of injury or even a threat to life!

- Ensure that the sensor is installed correctly and that it is held by the fastening elements.

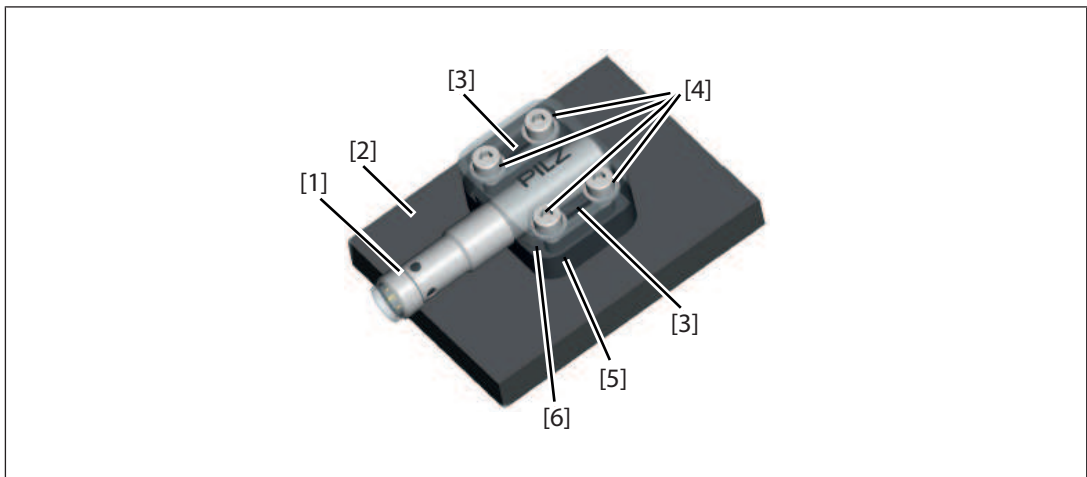


Fig.: Example representation PSEN in-A-A-N

1. Make two threads in a suitable mounting plate [2], corresponding to the slots [3] on the lower fastening element [5].
2. Position the safe inductive proximity switch [1] on the lower fastening element [5].
3. Place the upper fastening element [6] on to the lower fastening element [5].
4. Align the safe inductive proximity switch [1] with the fastening elements [5, 6].
5. Set the screws [4].
6. Tighten the screws [4] evenly crosswise. Please note the torque setting of the screws [4]:
 - PSEN in-A-A-N: Torque setting 1.0 Nm
 - PSEN in-B-A-N: Torque setting 1.2 Nm
 - PSEN in-C-A-N: Torque setting 1.2 Nm

The two fastening elements [6, 5] must engage when the screws are fastened.

7.5 Installation of manipulation protection

You can also attach manipulation protection to guard against unauthorised loosening/removal of the threaded connector on the connection cable. For order details see accessories "Manipulation protection".

8 Operation



WARNING!

If you do not check the safety function of the safe inductive proximity switch after the initial commissioning or after making a change, it is possible that the safety function will not work properly.

People can access a machine's danger zone. There is an increased risk of injury or even a threat to life!

- Ensure that the safety function of the safe inductive proximity switch is checked by a qualified professional after the initial commissioning and after each change.



WARNING!

If the safety circuit of the safe, inductive proximity switch is taken out of service, the safety function will be without function.

People can access a machine's danger zone. There is an increased risk of injury or even a threat to life!

- Do not deactivate the safe inductive proximity switch.
- Do not defeat the safety function of the safe inductive proximity switch.
- Do not repair, modify or manipulate the safe inductive proximity switch.



WARNING!

If damping material (electrically conductive object) unintentionally reaches the response range of the coil on the safe inductive proximity switch, the safety function is no longer guaranteed.

People can access a machine's danger zone. There is an increased risk of injury or even a threat to life!

- Ensure that only the intended damping material (electrically conductive object) reaches the response range of the coil on the safe inductive proximity switch. Only then is the safety function guaranteed.
- Check the assured operating distance s_a and the assured release distance s_{ar} .

The safe inductive proximity switch has no blind spot in which the function is unsafe. Any failures are displayed via the OSSD safety outputs and via the LED status and error display.

8.1 LED status and error display

The safe inductive proximity switch has a dual-colour LED status and error display, which shows the following operating states:

Operating state	OSSD 1/2	LED
Damping material (electrically conductive object) within the assured operating distance s_a	On	Yellow
Damping material (electrically conductive object) within the assured release distance s_{ar}	Off	Off
No power supply	Off	Off
Switching on after applying power	Off	Flashes red ^[1]
Undervoltage/overvoltage	Off	Red
Short between contacts ^[2]	At least one OSSD safety output is switched off ^[3]	Red
Internal error detected	At least one OSSD safety output is switched off ^[3]	Red

^[1] The LED flashes only once.

^[2] A short between contacts is a short circuit between the outputs or between an output and the supply. The error is detected and displayed immediately or at the next switching operation, depending on the short between contacts.

The error means that at least one output is switched permanently to the safe state (off-state). The safe state is cancelled when the error state is exited and the voltage supply is switched off and then on again.

^[3] The error means that at least one OSSD safety output is switched permanently to the safe state (off-state). The safe state is displayed via the LED status indicator. The safe state is cancelled when the error state is exited and the voltage supply is switched off and then on again.

8.2 Prior to commissioning

Check the function of the safe inductive proximity switch prior to commissioning:

1. Bring the damping material (electrically conductive object) up to the sensing face of the safe inductive proximity switch (see [Operating distances](#) [ 12]), until the LED status and error display light up yellow.
2. Move the damping material (electrically conductive object) at least as far as the assured release distance s_{ar} . The LED status and error display must go out in the process.
3. If the LED status and error display do not go out:
Check that the safe inductive proximity switch is installed correctly.

9

Regular checks

Regular checks can bring to light changes to the plant/machine, safeguards and ambient conditions.



INFORMATION

Checks may only be performed by qualified personnel.



NOTICE

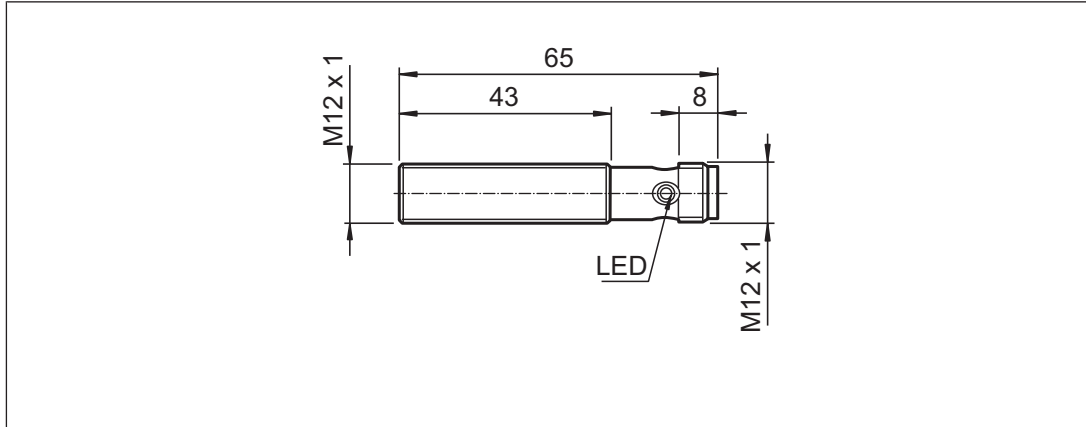
Only Pilz may repair the product.

Any guarantee is rendered invalid if the housing is opened or unauthorised modifications are carried out.

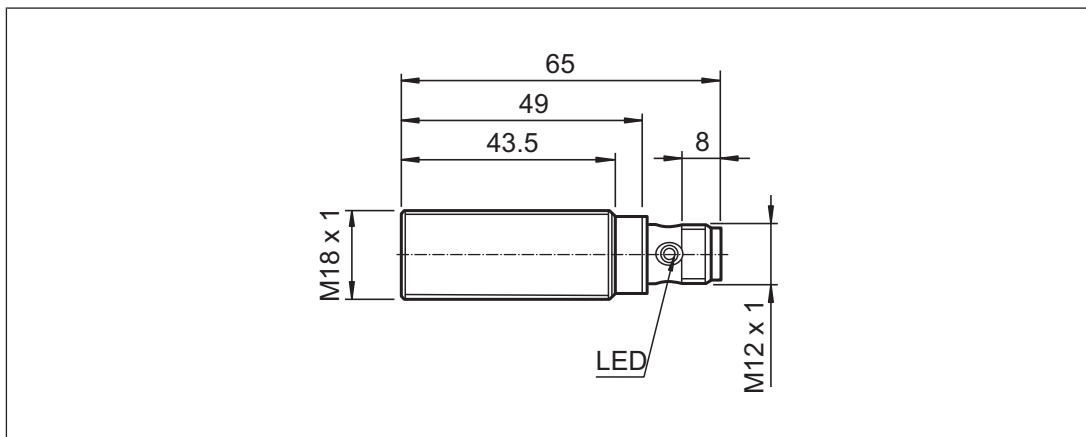
- ▶ Test intervals (in accordance with EN ISO 14119)
 - At least monthly for PL e
 - At least every 12 months for PL d
- ▶ Check that the safe inductive proximity switch is seated firmly.
Tighten the nuts using the appropriate torque setting.
- ▶ Remove any dirt from the safe inductive proximity switch and damping material (electrically conductive object).
- ▶ Check the safe inductive proximity switch for any damage.
Swap any safe inductive proximity switch that is damaged.
- ▶ Check that the safe inductive proximity switch is working correctly.
If the safe inductive proximity switch is not working correctly, swap it.

10 Dimensions in mm

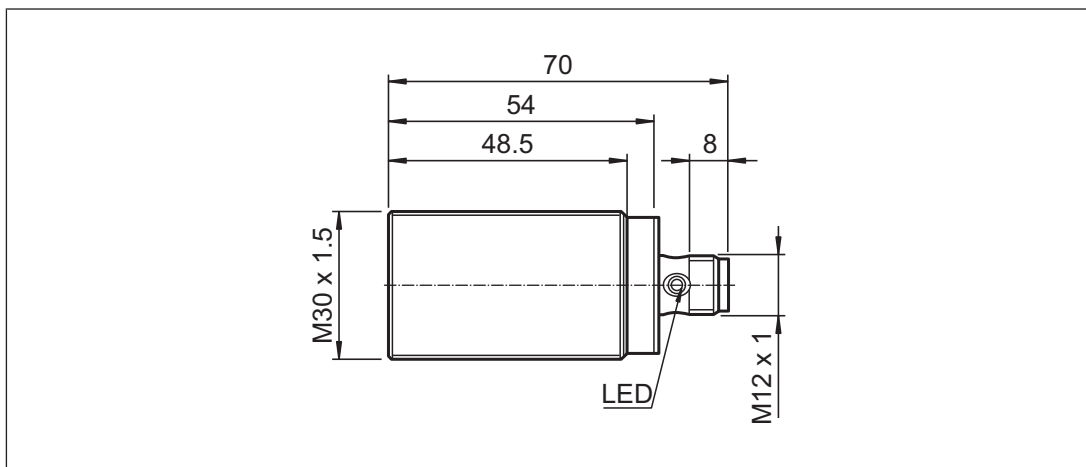
10.1 PSEN in-A-A-N



10.2 PSEN in-B-A-N



10.3 PSEN in-C-A-N



11 Technical details

Where standards are undated, the 2019-11 valid editions apply.

General	6P000001	6P000002	6P000003
Certifications	CE, TÜV, UKCA, cULus Listed	CE, TÜV, UKCA, cULus Listed	CE, TÜV, UKCA, cULus Listed
Sensor's mode of operation	Inductive	Inductive	Inductive
Electrical data	6P000001	6P000002	6P000003
Supply voltage			
Voltage	24 V	24 V	24 V
Kind	DC	DC	DC
Voltage tolerance	-25 %/+25 %	-25 %/+25 %	-25 %/+25 %
Max. switching frequency	30 Hz	30 Hz	30 Hz
Max. cable capacitance at the safety outputs			
No-load, PNOZ with relay contacts	20 nF	20 nF	20 nF
PNOZmulti, PNOZelog, PSS	20 nF	20 nF	20 nF
Max. overall cable resistance R _{lmax}	10 Ohm	10 Ohm	10 Ohm
Rated operating voltage	24 V DC	24 V DC	24 V DC
No-load current	15 mA	15 mA	15 mA
Semiconductor outputs	6P000001	6P000002	6P000003
OSSD safety outputs	2	2	2
Switching current per output	30 mA	30 mA	30 mA
Short circuit-proof	Yes	Yes	Yes
Residual current at outputs	500 µA	500 µA	500 µA
Times	6P000001	6P000002	6P000003
Switch-on delay			
after UB is applied	0,3 s	0,3 s	0,3 s
Environmental data	6P000001	6P000002	6P000003
Ambient temperature			
Temperature range	-25 - 70 °C	-25 - 70 °C	-25 - 70 °C
Storage temperature			
Temperature range	-40 - 85 °C	-40 - 85 °C	-40 - 85 °C
Max. operating height above SL	2000 m	2000 m	2000 m
Rated insulation voltage	30 V	30 V	30 V
Protection type			
Housing	IP68, IP69	IP68, IP69	IP68, IP69

Operating distances	6P000001	6P000002	6P000003
Assured operating distance Sa	1,62 mm	4,05 mm	8,1 mm
Assured release distance Sar	3 mm	7,5 mm	15 mm
Rated operating distance Sn	2 mm	5 mm	10 mm
Typ. hysteresis in relation to the rated operating distance Sn	5 %	5 %	5 %
Mechanical data	6P000001	6P000002	6P000003
Sensor flush installation in accordance with EN 60947-5-2	Yes	Yes	Yes
Connection type	M12, 4-pin	M12, 4-pin	M12, 4-pin
Material			
Housing	Stainless steel 1.4401/ AISI 316L (V4A)	Stainless steel 1.4401/ AISI 316L (V4A)	Stainless steel 1.4401/ AISI 316L (V4A)
Front	PBT	PBT	PBT
Top	Stainless steel	Stainless steel	Stainless steel
Dimensions			
Height	12 mm	18 mm	30 mm
Width	65 mm	65 mm	65 mm
Weight	18 g	42 g	118 g

12 Safety characteristic data



NOTICE

You must comply with the safety characteristic data in order to achieve the required safety level for your plant/machine.

Parameter	Characteristic data		
Assessment type and documentation	Full assessment		
Operating mode	Low demand mode, high demand mode or continuous mode		
HFT	0	1	0
Safety function	Safety circuit via the OSSD1 and OSSD2 outputs of one sensor (1oo2)	Safety circuit via the OSSD1 outputs of two sensors (1oo2)	Safety circuit via the OSSD1 outputs of one sensor (1oo1)
SIL	2	3	2
SIL _{CL}	2	3	2
SC	3	3	3
Category	2	3/4^[1]	-
PL	d	e	-
Function test interval	Maximum 1 year	-	-
$\lambda_s^{[2]}$	36.8 FIT	74 FIT	36.8 FIT
λ_{dd}	25.7 FIT	79 FIT	21.3 FIT
λ_{du}	14.9 FIT	1.93 FIT	19.3 FIT
SFF ^[2]	80%	98.7%	75%
DC	63% (low)	97.6% (average)	52%
MTBF ^[3]	557 Years	278 Years	557 Years
MTTF _D	7600 Years	59000 Years	5900 Years
PFH	1.49×10^{-8} 1/h	1.93×10^{-9} 1/h	1.93×10^{-8} 1/h
PFD _{avg} for T ₁ = 1 year	6.51×10^{-5}	8.44×10^{-6}	8.44×10^{-5}
PFD _{avg} for T ₁ = 20 years	1.30×10^{-3}	1.69×10^{-4}	1.69×10^{-3}
Error reaction time ^[4]	< 200 ms	< 5 ms	< 5 ms
T _M ^[5]	Maximum 20 years		

^[1] Ensure that both sensors switch if called upon. The safety circuit can achieve Category 3 or 4, depending on the structure of the following circuit. The safe evaluation device must be able to activate the partial operation lock function.

^[2] "No impact failures" do not affect the safety function and so are not included in SFF, nor in the safety function's failure rate.

^[3] in accordance with SN29500.

This value contains failures that are not part of the safety function/MTTR = 24 h. This value is calculated for one safety function on the product.

^[4] Time between error occurring and error reaction, including detection of shorts across contacts.

^[5] T_M is the maximum mission time in accordance with EN ISO 13849-1. The value also applies as the retest interval in accordance with EN IEC 61508-6 and EN IEC 61511 and as the proof test interval and mission time in accordance with EN IEC 62061.

All the units used within a safety function must be considered when calculating the safety characteristic data.



INFORMATION

A safety function's SIL/PL values are **not** identical to the SIL/PL values of the products used and may differ from these.

13 Order reference

13.1 Product

Product type	Features	Order no.
PSEN in-A-A-N	Safe inductive proximity switch, 2 OSSD safety outputs, cylindrical design M12, operating distance 2 mm flush, 4-pin M12 male connector	6P000001
PSEN in-B-A-N	Safe inductive proximity switch, 2 OSSD safety outputs, cylindrical design M18, operating distance 5 mm flush, 4-pin M12 male connector	6P000002
PSEN in-C-A-N	Safe inductive proximity switch, 2 OSSD safety outputs, cylindrical design M30, operating distance 10 mm flush, 4-pin M12 male connector	6P000003

13.2 Accessories

13.2.1 Fastening elements

Product type	Features	Order no.
PSEN Bracket kit M12	Fastening elements, two-part, for M12	6P000005
PSEN Bracket kit M18	Fastening element, two-part, for M18	6P000006
PSEN Bracket kit M30	Fastening element, two-part, for M30	6P000007

13.2.2 Connection cable, 5-pin

You can use 5-pin connection cables if you wish to connect the evaluation device using an M12 connector. The extra pin is not used.

Product type	Features	Order no.
PDP67 cable M12-5sf M12-5sm, 1m	Connection cable, PUR, yellow RAL1003, 5-pin, straight M12 socket, on straight M12 connector, A-coded, cable length: 1 m	380711
PDP67 cable M12-5sf M12-5sm, 1.5m	Connection cable, PUR, yellow RAL1003, 5-pin, straight M12 socket, on straight M12 connector, A-coded, cable length: 1.5 m	380712
PDP67 cable M12-5sf M12-5sm, 2m	Connection cable, PUR, yellow RAL1003, 5-pin, straight M12 socket, on straight M12 connector, A-coded, cable length: 2 m	380713
PSS67 cable M12sf M12sm, 3m	Connection cable, PUR, yellow RAL1003, 5-pin, straight M12 socket, on straight M12 connector, A-coded, cable length: 3 m	380208
PSS67 cable M12sf M12sm, 5m	Connection cable, PUR, yellow RAL1003, 5-pin, straight M12 socket, on straight M12 connector, A-coded, cable length: 5 m	380209
PSS67 cable M12sf M12sm, 10m	Connection cable, PUR, yellow RAL1003, 5-pin, straight M12 socket, on straight M12 connector, A-coded, cable length: 10 m	380210

Product type	Features	Order no.
PSS67 cable M12-5sf, M12-5sm, 20m	Connection cable, PUR, yellow RAL1003, 5-pin, straight M12 socket, on straight M12 connector, A-coded, cable length: 20 m	380220
PSS67 cable M12sf M12sm, 30m	Connection cable, PUR, yellow RAL1003, 5-pin, straight M12 socket, on straight M12 connector, A-coded, cable length: 30 m	380211
PSS67 cable M12af M12am, 3m	Connection cable, PUR, yellow RAL1003, 5-pin, angled M12 socket, on angled M12 connector, A-coded, cable length: 3 m	380212
PSS67 cable M12af M12am, 5m	Connection cable, PUR, yellow RAL1003, 5-pin, angled M12 socket, on angled M12 connector, A-coded, cable length: 5 m	380213
PSS67 cable M12af M12am, 10m	Connection cable, PUR, yellow RAL1003, 5-pin, angled M12 socket, on angled M12 connector, A-coded, cable length: 10 m	380214
PSS67 cable M12af M12am, 30m	Connection cable, PUR, yellow RAL1003, 5-pin, angled M12 socket, on angled M12 connector, A-coded, cable length: 30 m	380215

13.2.3 Connection cable, 4-pin

If you are using the 4-pin connection cable, the evaluation device must be connected to the open cable ends.

Product type	Features	Order no.
PSEN op cable axial M12 4-pole 3m	Connection cable, PUR, yellow RAL1003, 4-pin, straight M12 socket, on open cable end, A-coded, cable length: 3 m	630300
PSEN op cable axial M12 4-pole 5m	Connection cable, PUR, yellow RAL1003, 4-pin, straight M12 socket, on open cable end, A-coded, cable length: 5 m	630301
PSEN op cable axial M12 4-pole 10m	Connection cable, PUR, yellow RAL1003, 4-pin, straight M12 socket, on open cable end, A-coded, cable length: 10 m	630302
PSEN op cable axial M12 4-pole 30m	Connection cable, PUR, yellow RAL1003, 4-pin, straight M12 socket, on open cable end, A-coded, cable length: 30 m	630296
PSEN op cable axial M12 4-pole 50m	Connection cable, PUR, yellow RAL1003, 4-pin, straight M12 socket, on open cable end, A-coded, cable length: 50 m	630362
PSEN op cable angle M12 4-pole 3m	Connection cable, PUR, yellow RAL1003, 4-pin, angled M12 socket, on open cable end, A-coded, cable length: 3 m	630341
PSEN op cable angle M12 4-pole 5m	Connection cable, PUR, yellow RAL1003, 4-pin, angled M12 socket, on open cable end, A-coded, cable length: 5 m	630342
PSEN op cable angle M12 4-pole 10m	Connection cable, PUR, yellow RAL1003, 4-pin, angled M12 socket, on open cable end, A-coded, cable length: 10 m	630343
PSEN op cable angle M12 4-pole 30m	Connection cable, PUR, yellow RAL1003, 4-pin, angled M12 socket, on open cable end, A-coded, cable length: 30 m	630344
PSEN op cable angle M12 4-pole 50m	Connection cable, PUR, yellow RAL1003, 4-pin, angled M12 socket, on open cable end, A-coded, cable length: 50 m	630363

13.2.4 Manipulation protection

Product type	Features	Order no.
CABLE/M12/CLIP	Manipulation protection for plug-in connector and protection against unintended disconnection, for single use, 4 pieces for securing 4 M12 plug-in connectors	C1000079

14 **EC declaration of conformity**

This product/these products meet the requirements of the directive 2006/42/EC on machinery of the European Parliament and of the Council. The complete EC Declaration of Conformity is available on the Internet at www.pilz.com/downloads.

Representative: Pilz GmbH & Co. KG, Felix-Wankel-Str. 2, 73760 Ostfildern, Germany

15 UKCA-Declaration of Conformity

This product(s) complies with following UK legislation: Supply of Machinery (Safety) Regulation 2008.

The complete UKCA Declaration of Conformity is available on the Internet at www.pilz.com/downloads.

Representative: Pilz Automation Technology, Pilz House, Little Colliers Field, Corby, Northamptonshire, NN18 8TJ United Kingdom, eMail: mail@pilz.co.uk

Support

Technical support is available from Pilz round the clock.

Americas

Brazil

+55 11 97569-2804

Canada

+1 888 315 7459

Mexico

+52 55 5572 1300

USA (toll-free)

+1 877-PILZUSA (745-9872)

Asia

China

+86 400-088-3566

Japan

+81 45 471-2281

South Korea

+82 31 778 3300

Australia and Oceania

Australia

+61 3 95600621

New Zealand

+64 9 6345350

Europe

Austria

+43 1 7986263-444

Belgium, Luxembourg

+32 9 3217570

France

+33 3 88104003

Germany

+49 711 3409-444

Ireland

+353 21 4804983

Italy, Malta

+39 0362 1826711

Scandinavia

+45 74436332

Spain

+34 938497433

Switzerland

+41 62 88979-32

The Netherlands

+31 347 320477

Türkiye

+90 216 5775552

United Kingdom

+44 1536 462203

**You can reach our
international hotline on:**

+49 711 3409-222

support@pilz.com

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Headquarters: Pilz GmbH & Co. KG, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, E-Mail: info@pilz.com, Internet: www.pilz.com

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