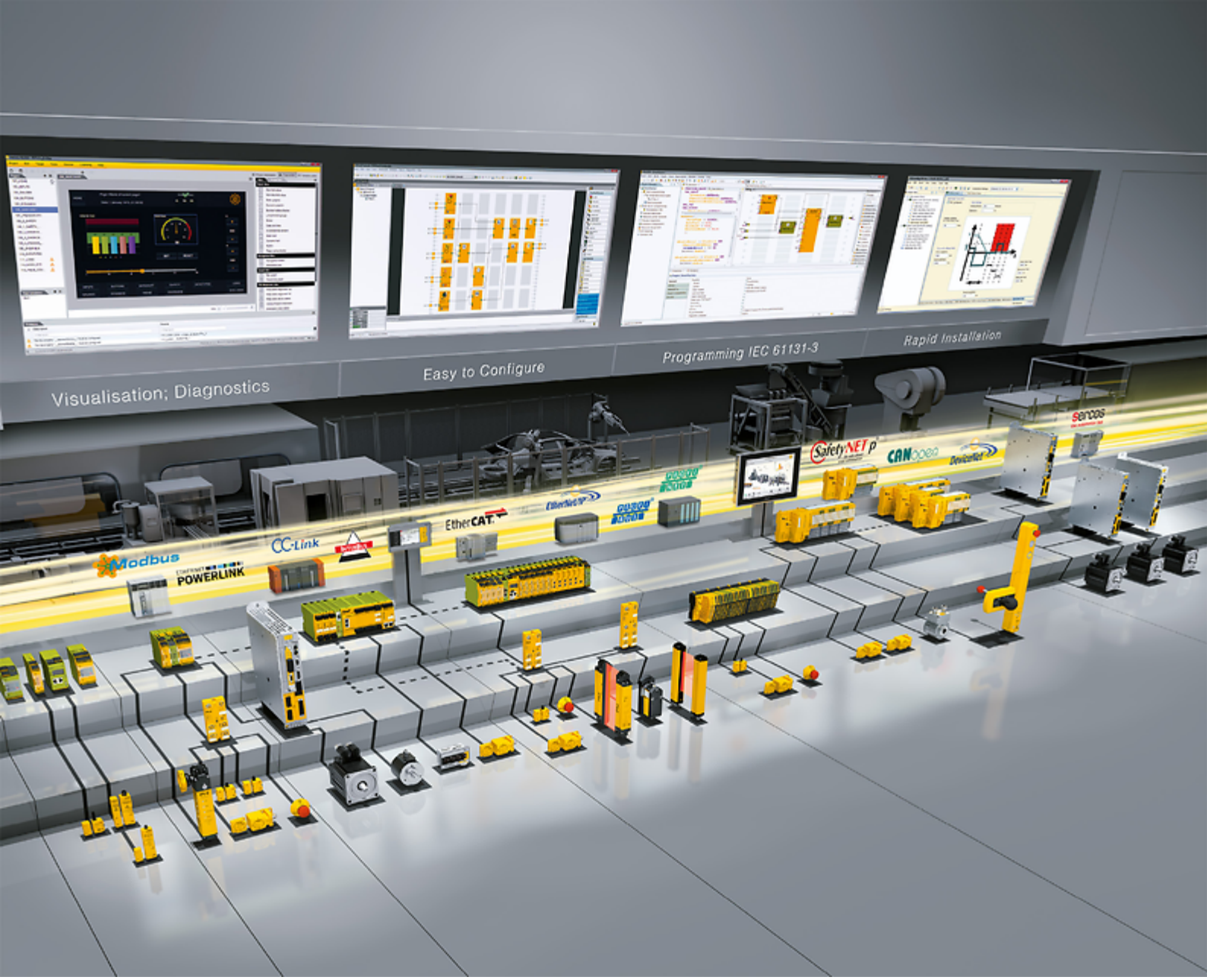



# PSEN cs1.1n

PILZ
THE SPIRIT OF SAFETY

- PSEN sensor technology

**Operating Manual-22178-EN-06**

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.

# Introduction

## Validity of documentation

This documentation is valid for the product PSEN cs1.1n. 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.

## 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.

## 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.

## Safety

### Intended use

The safety functions of the safety switch are:

- Safe shutdown of safety outputs when the actuator is removed beyond the assured release distance $s_{ar}$ or when the actuator is not detected
- Remain shut down safely after the actuator has been removed

The safety switch meets the requirements in accordance with:

- EN 60947-5-3: PDDB with the actuator PSEN cs1.1
- EN 62061: SIL CL 3
- EN ISO 13849-1: PL e (Cat. 4)
- EN ISO 14119: Coding level Low, type 4

The safety switch may only be used with the corresponding actuator PSEN cs1.1.

The safety level PL e (Cat. 4)/SIL CL 3 is only achieved if

- the safety outputs use 2-channel processing.

### 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 Technical details [16]).

**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.

## Safety regulations

### Safety assessment

Before using a device, a safety assessment in accordance with the Machinery Directive is required.

The product as an individual component fulfils the functional safety requirements in accordance with EN ISO 13849 and EN 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.

### Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, maintained and decommissioned 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. To be able to inspect, assess and operate devices, systems and machines, the person has to be informed of 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.

### 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.).

### Disposal

- In safety-related applications, please comply with the mission time $T_M$ 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).

**For your safety**

**WARNING!**

**Loss of safety function due to manipulation of the interlocking device**

Manipulation of the interlocking device may lead to serious injury and death.

- You should prevent any possibility of the interlocking device being manipulated through the use of a spare actuator.
- Keep the substitute actuator in a safe place and protect it from unauthorised access.
- If substitute actuators are used, these must be installed as described under Installation [📖 13].
- If the original actuators are replaced with substitute actuators, the original actuators must be destroyed before disposal.

- Do not remove the connector's protective cap until you are just about to connect the unit. This will prevent potential contamination.

## Unit features

- Transponder technology for presence detection
- Pilz coding type: Coded
- Dual-channel operation
- 2 safety outputs
- LED display for:
  - State of the actuator
  - Supply voltage/fault
- 4 directions of actuation

## Function description

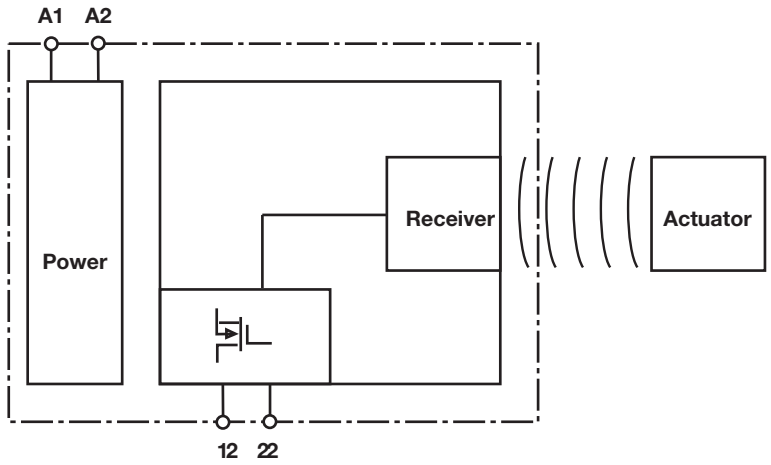
The safety outputs may have a high or low signal, depending on the position of the actuator.

In a safe condition the safety outputs are in the OFF state.

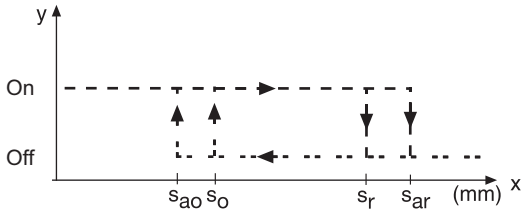
State of the outputs:

| Actuator in the response range | Safety output 12 | Safety output 22 |
|---|---|---|
| Yes | High | High |
| No | Low | Low |

### Block diagram



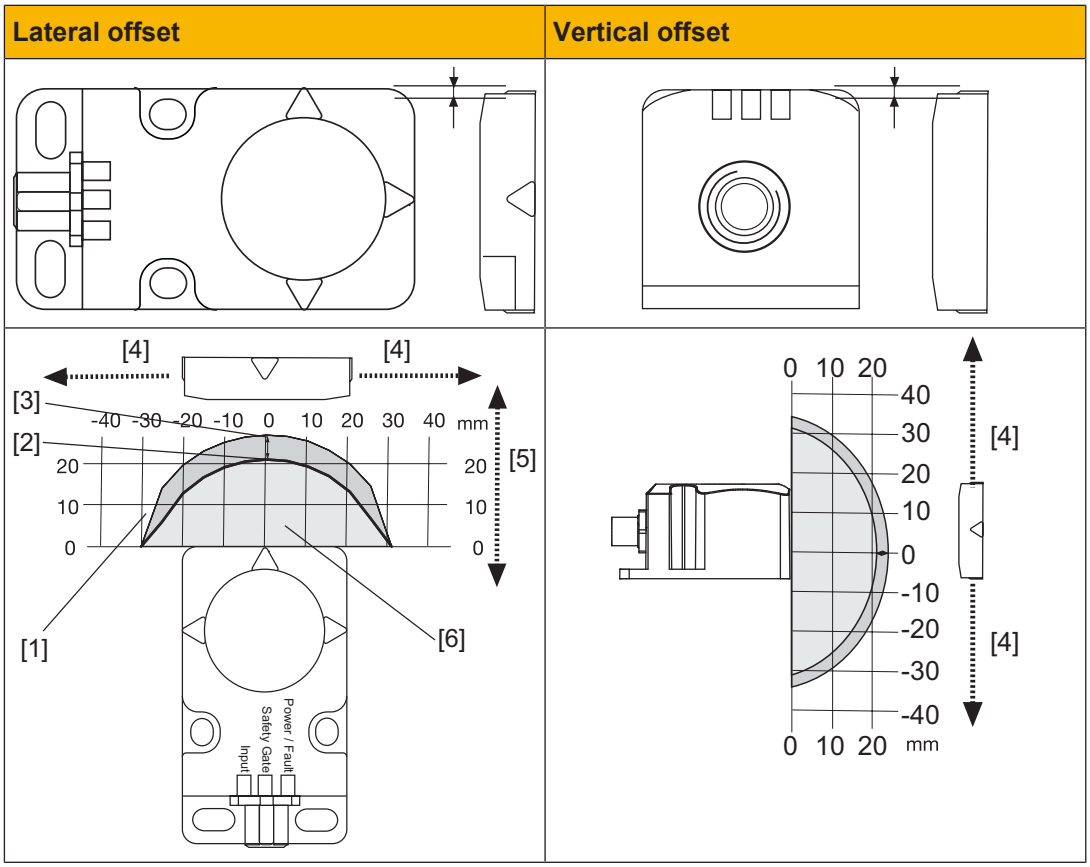

### Operating distances




**Legend:**

- $S_{ao}$ Assured operating distance: 15 mm
- $S_o$ Typical operating distance: 21 mm
- $S_r$ Typical release distance: 32 mm
- $S_{ar}$ Assured release distance: 40 mm

**Lateral and vertical offset**




**Legend**

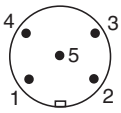
[1] Hysteresis
[2] Typical operating distance $S_O$
[3] Typical release distance $S_r$
[4] Offset in mm
[5] Operating distance in mm
[6] Response range

## Wiring

Please note:

- Information given in the "Technical details" must be followed.
- Switch off the supply voltage before disconnecting the plug-in connection.
- Make sure that when connecting or separating the connector the pollution degree 1 or 2 is maintained.
- The power supply must meet the regulations for extra low voltages with protective electrical separation (SELV, PELV).
- The outputs of the safety switch must have a protective separation to voltages over 60 V AC.
- The supply voltage to the safety 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.

**Pin assignment, connector and cable**

| | |
|---|---|
|  | 5-pin M12 male connector |

| PIN | Pin designation | Function | Wire colour |
|---|---|---|---|
| 1 | A1 | +24 UB | Brown |
| 2 | 12 | Output, channel1 | White |
| 3 | A2 | 0 V UB | Blue |
| 4 | 22 | Output, channel2 | Black |
| 5 | - | Do not connect | Grey |

The wire colour also applies for the cable available from Pilz as an accessory.

## Connection to evaluation devices

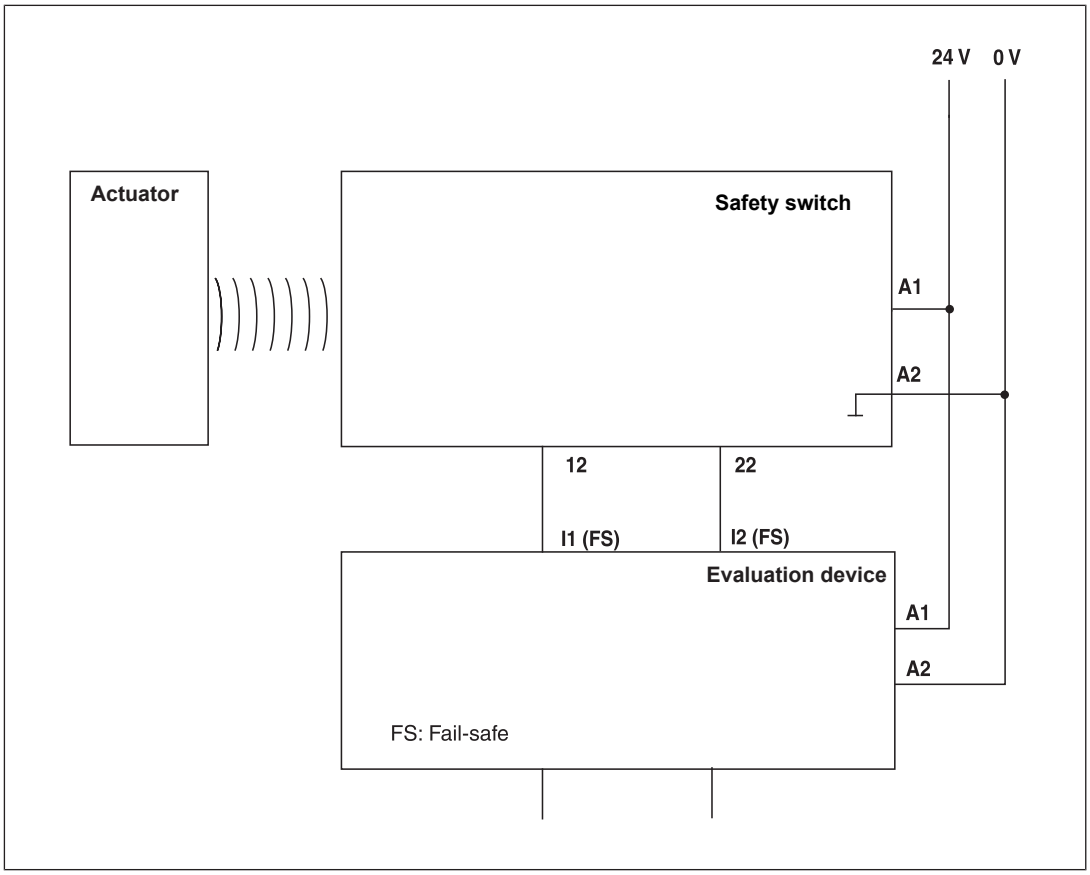
Make sure that the selected evaluation device has the following property:

- OSSD signals are evaluated through 2 channels with plausibility monitoring

Note:

- Information given in the Technical details [16] must be followed.

**Connection diagram, single connection**



Suitable Pilz evaluation devices are, for example:

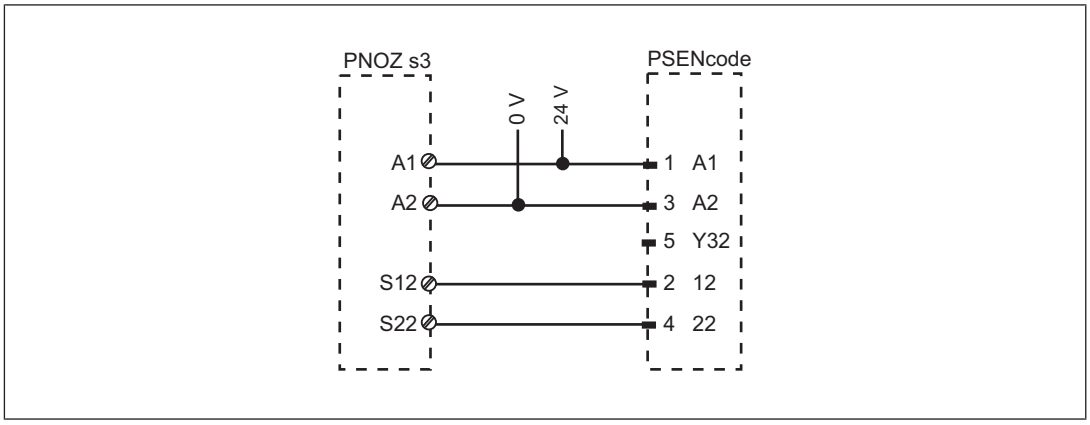
- PNOZelog for safety gate monitoring
- PNOZpower for safety gate monitoring
- PNOZsigma for safety gate monitoring
- PNOZ X for safety gate monitoring
- PNOZmulti for safety gate monitoring
  Configure the switch in the PNOZmulti Configurator with switch type 3.
- PSS for safety gate monitoring with standard function block SB064, SB066 or FS_Safety Gate
- PSSuniversal PLC for safety gate monitoring with function block FS_SafetyGate

The correct connection to the respective evaluation device is described in the operating manual for the evaluation device. Make sure that the connection is made in accordance with the specifications in the operating manual for the selected evaluation device.

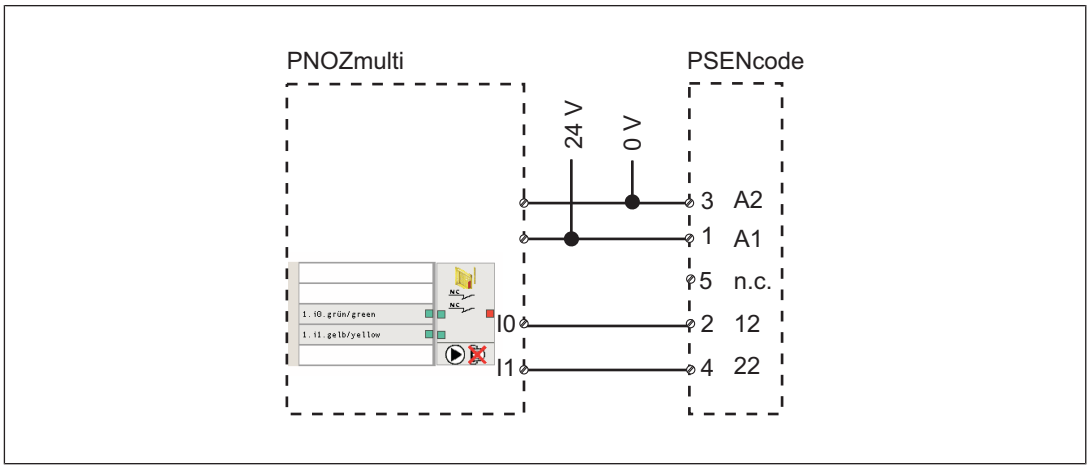
The connections to two evaluation devices are shown on the following pages, by way of example:

- PNOZ s3 and
- PNOZmulti

**PNOZ s3**




**PNOZmulti**



## Teaching in the actuator

Any approved Pilz actuator (see Intended use [📖 6]) is detected as soon as it is brought into the response range.

## Installation

**CAUTION!**

**Potential loss of safety function due to changed device properties**

The unit's properties may be affected if installed in an environment containing electrically or magnetically conductive material.

– Please check the operating distances and the assured release distance.

- The safety switch and actuator should be installed opposite each other in parallel.
  – Make sure that the actuator is aligned to the marking on the sensor that guarantees the operating distance required by the plant design (see Operating distances [📖 9]).
- Safety switches and actuators should be permanently secured using M5 safety screws with a flat head (e.g. M5 cheese-head or pan head screws).
- Protect the actuator from contamination.
- Torque setting: Please note the information provided under Technical details [📖 16].
- The distance between two safety switches must be maintained (see Technical details [📖 16]).
- Make sure that the safety switch and actuator cannot be used as an end stop.
- Please note the installation measures in accordance with EN ISO 14119 for a safety switch design 4 and with level of coding Low.
- For simpler installation, the mounting brackets (see Order reference for Accessories [📖 19]) can be used.
- If using angled connector plugs, note the defined angle of the cable routing.

**CAUTION!**

**Possible loss of the safety function by changing the release distance $S_{ar}$ with non-flush installation**

Installing the safety switch non-flush within electrically or magnetically conductive material, the value for the assured release distance $S_{ar}$ can change.

– Check the assured release distance $S_{ar.}$

**Procedure:**

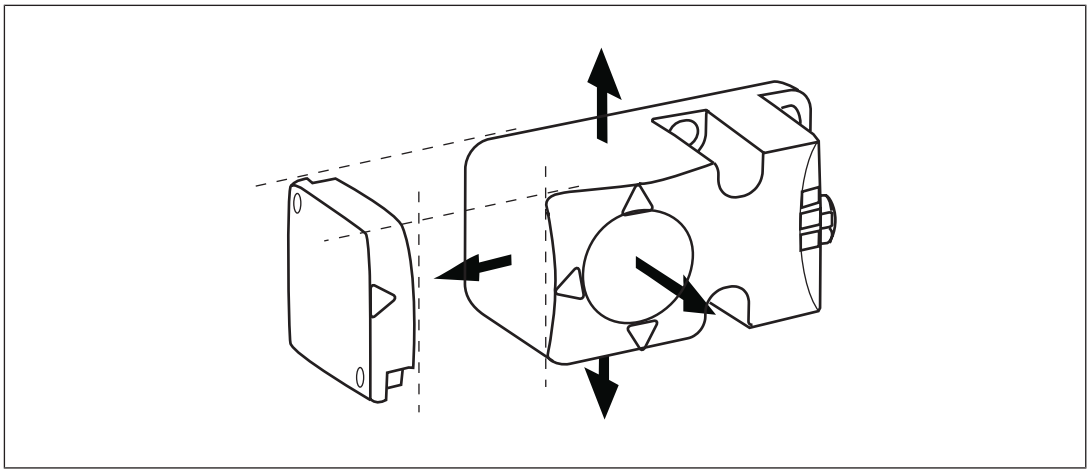


Fig.: Sensing faces on the sensor

1. Drill holes (for M5 screws) in the mounting surface to secure the actuator and sensor (see Dimensions in mm [15]).
2. Use a screw to fix the sensor to the mounting surface.

   Make sure that the sensor marking that is be used for operation can be operated using the actuator from the right side.
3. Do not fully tighten the second screw on the safety switch.
4. Use a screw to fix the actuator to the mounting surface.

   Make sure that the actuator with the printed side points towards the marking on the sensor.
5. Do not fully tighten the second screw on the actuator.
6. Align the safety switch and tighten the screws.
7. Align the actuator and tighten the screws.

## Adjustment

- The stated operating distances (see Technical details [16]) only apply when the safety switch and actuator are installed facing each other in parallel. Operating distances may deviate if other arrangements are used.
- Note the maximum permitted lateral and vertical offset (see Operating distances [9] and Lateral and vertical offset [10]).

## Operation

**NOTICE**

The safety function should be checked after initial commissioning and each time the plant/machine is changed. The safety functions may only be checked by qualified personnel.

Check the function of the safety switch before commissioning.

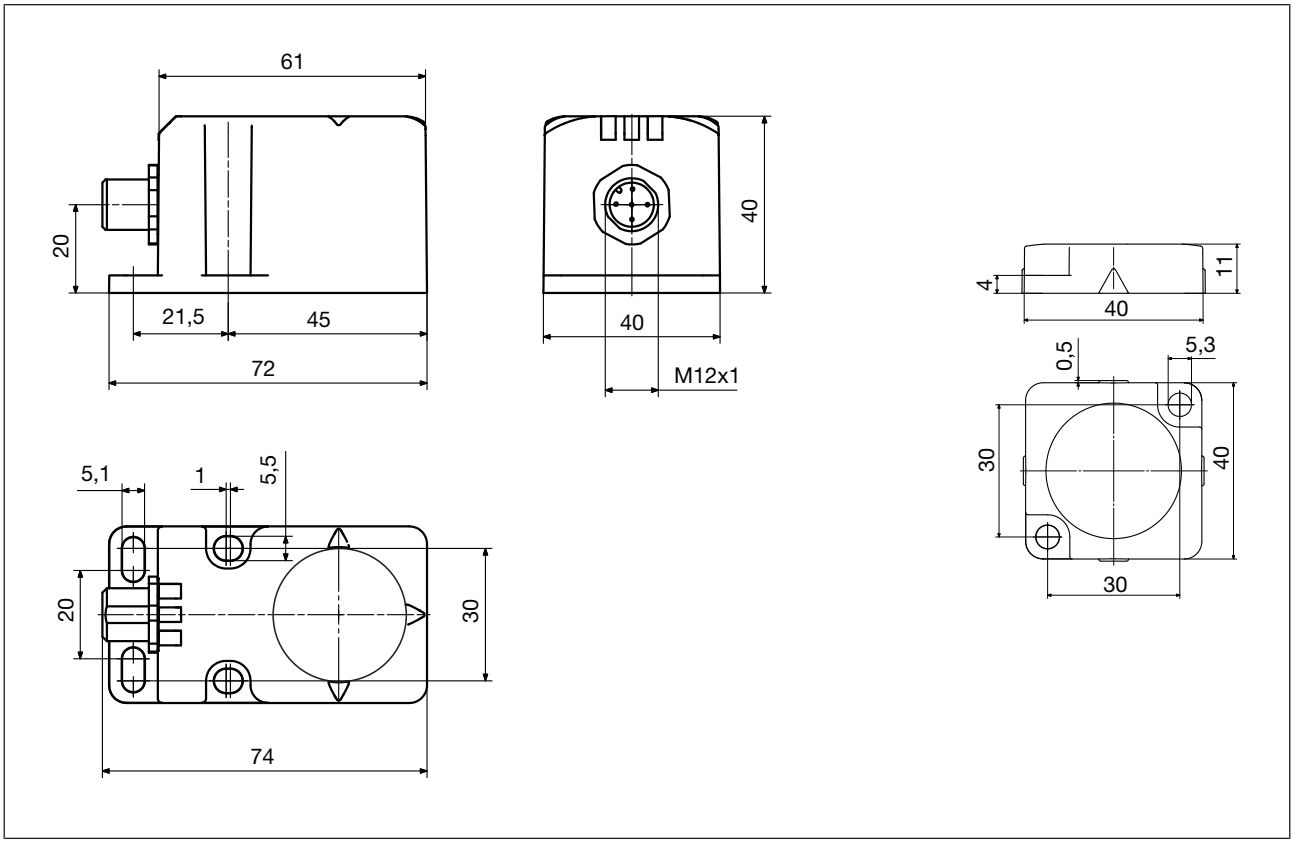
**Status indicators:**

- "POWER/Fault" LED lights up green: The unit is ready for operation
- "Safety Gate" LED lights up yellow: Actuator is within the response range

**Fault indicator:**

- "POWER/Fault" LED lights up red: Error message.
  Remedy: Rectify fault and interrupt power supply.

## Dimensions in mm



## Technical details

| | |
|---|---|
| **General** | |
| Certifications | **CE, EAC, FCC, IC, TÜV, UKCA, cULus Listed** |
| Sensor's mode of operation | **Transponder** |
| Coding level in accordance with EN ISO 14119 | **Low** |
| Design in accordance with EN ISO 14119 | **4** |
| Classification in accordance with EN 60947-5-3 | **PDDB** |
| Pilz coding type | **Coded** |
| **Transponder** | |
| Frequency band | **122 kHz - 128 kHz** |
| Max. transmitter output | **15 mW** |
| **Electrical data** | |
| Supply voltage | |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+20 %** |
| Output of external power supply (DC) | **2 W** |
| Max. inrush current at UB | **0,12 A** |
| Max. switching frequency | **3 Hz** |
| Max. cable capacitance at the safety outputs | |
| No-load, PNOZ with relay contacts | **40 nF** |
| PNOZmulti, PNOZelog, PSS | **70 nF** |
| No-load current | **50 mA** |
| **Semiconductor outputs** | |
| Number of OSSD safety outputs | **2** |
| Switching current per output | **500 mA** |
| Breaking capacity per output | **12 W** |
| Potential isolation from system voltage | **No** |
| Short circuit-proof | **yes** |
| Residual current at outputs | **10 µA** |
| Voltage drop at OSSDs | **3,5 V** |
| Lowest operating current | **0 mA** |
| Utilisation category in accordance with EN 60947-1 | **DC-12** |
| **Times** | |
| Test pulse duration, safety outputs | **450 µs** |
| Switch-on delay | |
| after UB is applied | **1 s** |
| Actuator typ. | **80 ms** |
| Actuator max. | **150 ms** |
| Delay-on de-energisation | |
| Actuator typ. | **40 ms** |
| Actuator max. | **260 ms** |
| Risk time in accordance with EN 60947-5-3 | **260 ms** |
| Supply interruption before de-energisation | **20 ms** |

| | |
|---|---|
| **Times** | |
| Simultaneity, channel 1 and 2 max. | ∞ |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **-25 - 70 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| EMC | **EN 60947-5-3** |
| Vibration | |
| In accordance with the standard | **EN 60947-5-2** |
| Frequency | **10 - 55 Hz** |
| Amplitude | **1 mm** |
| Shock stress | |
| In accordance with the standard | **EN 60947-5-2** |
| Acceleration | **30g** |
| Duration | **11 ms** |
| Airgap creepage | |
| Overvoltage category | **III** |
| Pollution degree | **3** |
| Rated insulation voltage | **75 V** |
| Rated impulse withstand voltage | **0,8 kV** |
| Protection type | |
| Housing | **IP67** |
| **Operating distances** | |
| Assured operating distance Sao | **15 mm** |
| Typical operating distance So | **21 mm** |
| Assured release distance Sar | **40 mm** |
| Typical release distance Sr | **32 mm** |
| Repetition accuracy switching distances | **10 %** |
| Change of operating distance with temperature changes | **+-0,01mm/°C** |
| Typ. Hysteresis | **3 mm** |
| **Mechanical data** | |
| Actuator 1 | **PSEN cs1.1** |
| Min. distance between safety switches | **400 mm** |
| Sensor flush installation in accordance with EN 60947-5-2 | **yes, follow installation guidelines** |
| Connection type | **M12, 5-pin male connector** |
| Material | |
| Top | **PBT** |
| Max. torque setting for fixing screws | **1 Nm** |

| Mechanical data | |
|---|---|
| Dimensions | |
| Height | **75 mm** |
| Width | **40 mm** |
| Depth | **40 mm** |
| Actuator dimensions | |
| Height | **11 mm** |
| Width | **40 mm** |
| Depth | **40 mm** |
| Weight of safety switch | **130 g** |
| Weight of actuator | **20 g** |
| Weight | **150 g** |

Where standards are undated, the 2016-10 latest editions shall apply.

### Safety characteristic data

**NOTICE**

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

| Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| 2-ch. OSSD | **PL e** | **Cat. 4** | **SIL CL 3** | **4,10E-09** | – | **1,10E-04** | **20** |

Explanatory notes for the safety-related characteristic data:

- The SIL CL value in accordance with EN 62061 corresponds to the SIL value in accordance with EN 61508.
- $T_M$ is the maximum mission time in accordance with EN ISO 13849-1. The value also applies as the retest interval in accordance with EN 61508-6 and IEC 61511 and as the proof test interval and mission time in accordance with EN 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 units that are used and may be different. We recommend that you use the PAScal software tool to calculate the safety function's SIL/PL values.

# Supplementary data

## Radio approval

*USA/Canada*

**FCC ID: VT8-PSENCS1**
**IC: 7482A-PSENCS1**

FCC/IC-Requirements:
This product complies with Part 15 of the FCC Rules and with Industry Canada licence-exempt RSS standards.
Operation is subject to the following two conditions:
1) this product may not cause harmful interference, and
2) this product must accept any interference received, including interference that may cause undesired operation.

Changes or modifications made to this product not expressly approved by Pilz may void the FCC authorization to operate this equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Le présent produit est conforme aux CNR d'Industrie Canada applicables aux appareils radio
exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:
(1) le produit ne doit pas produire de brouillage, et
(2) l'utilisateur de le produit doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

# Order reference

## System

| Product type | Features | Connection type | Order no. |
|---|---|---|---|
| PSEN cs1.1n/PSEN cs1.1 | Safety gate system, coded | 5-pin M12 male connector | 540003 |
| PSEN cs1.1n (switch) | Safety switch, coded | 5-pin M12 male connector | 540053 |
| PSEN cs1.1 | Actuator, coded | | 540080 |

## Accessories

## Installation material

| Product type | Features | Order no. |
|---|---|---|
| PSEN bracket | Mounting bracket | 532110 |
| PSEN mag/cs bracket straight | Mounting aid | 532111 |
| PSEN screw M4x20 10pcs | Safety screws made from stainless steel with one-way slot | 540313 |
| PSEN screw M4x26 10pcs | Safety screws made from stainless steel with one-way slot | 540314 |
| PSEN screw M5x10 10pcs | Safety screws made from stainless steel with one-way slot | 540311 |
| PSEN screw M5x20 10pcs | Safety screws made from stainless steel with one-way slot | 540312 |
| PSEN cs1/2 bracket cable fix | Mechanical protection against defeat, protecting against unauthorised cable disconnection or damage for safety switches PSENcode cs1/2, PSENcode cs5/6 M12, PSENslock | 532112 |

**Cable**

| Product type | Connection 1 | Connection 2 | Length | Order No. |
|---|---|---|---|---|
| PSS67/PDP67 cable M12-5sf | straight, M12, 5-pin, socket | straight, M12, 5-pin, connector | 3 m | 380208 |
| | | | 5 m | 380209 |
| | | | 10 m | 380210 |
| | | | 20 m | 380220 |
| | | | 30 m | 380211 |
| PSS67/PDP67 cable M12-5af | Angled, M12, 5-pin, socket | Angled, M12, 5-pin, connector | 3 m | 380212 |
| | | | 5 m | 380213 |
| | | | 10 m | 380214 |
| | | | 30 m | 380215 |
| PSEN cable M12-5sf | straight, M12, 5-pin, socket | Open cable | 3 m | 630310 |
| | | | 5 m | 630311 |
| | | | 10 m | 630312 |
| | | | 20 m | 630298 |
| | | | 30 m | 630297 |
| PSEN cable M12-5af | Angled, M12, 5-pin, socket | Open cable | 3 m | 630347 |
| | | | 5 m | 630348 |
| | | | 10 m | 630349 |
| | | | 30 m | 630350 |

| | | |
|---|---|---|
| PDP67 F 8DI ION | Decentralised input module IP67 for PNOZmulti | 773600 |

## EC declaration of conformity

This product/these products meet the requirements of the following directives of the European Parliament and of the Council.

- 2006/42/EC on machines
- 2014/53/EC on radio equipment

The complete EC Declaration of Conformity is available on the Internet at www.pilz.com/downloads.
Representative: Norbert Fröhlich, Pilz GmbH & Co. KG, Felix-Wankel-Str. 2, 73760 Ostfildern, Germany

## UKCA-Declaration of Conformity

This product(s) complies with following UK legislation:

- Supply of Machinery (Safety) Regulations 2008
- Radio Equipment Regulations 2017

The complete UKCA Declaration of Conformity is available on the Internet at www.pilz.com/support/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.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BLUEcoMPETENCE Alliance Member
Partner of the Engineering Industry Sustainability Initiative

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Quality Management ISO 9001:2015 REG. NO. 2462
Environmental Management ISO 14001 REG. NO. 2462
Energy Management ISO 50001 REG. NO. 2462


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We are represented internationally. Please refer to our homepage www.pilz.com for further details or contact our headquarters.


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PILZ
THE SPIRIT OF SAFETY