

► PSEN cs5.13 M12/8 EX

PILZ

THE SPIRIT OF SAFETY

Operating Manual-22218-EN-07
- 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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Introduction

Validity of documentation

This documentation is valid for the product PSEN cs5.13 M12/8 EX from Version 2.0.

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 switch is approved for use in potentially explosive atmospheres in accordance with EN 60079-0, EN 60079-7, EN 60079-18, EN 60079-31.

Ex area Group II, Category 3G, Zone 2 (Gas): II 3G Ex ec mc IIC T6 Gc and Category 3D, Zone 22 (dust): II 3D Ex mc tc IIIC T80 °C Dc.

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 IEC 60947-5-3: PDDb with the actuator PSEN cs5.13 M12 ATEX
- ▶ EN IEC 62061: SIL CL 3
- ▶ EN ISO 13849-1: PL e (Cat. 4)
- ▶ EN ISO 14119: Coding level Low, design 4

The safety switch may only be used with the corresponding actuator PSEN cs5.13 M12 ATEX.

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


- ▶ the safety outputs use 2-channel processing.

The actuator PSEN cs5.13 M12 ATEX may **not** be used in environments with high electromagnetic fields with effective values > 1 A/m or 3 V/m (e.g. high power electrolysis plants).

The safety switch is suitable for use with a low risk mechanical hazard.

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](#) [ 34]).

**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 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.

Additional documents that apply

Please read and take note of the following documents.

Only for use of the Safety Device Diagnostics (SDD):

- ▶ Fieldbus module operating manual, for example SDD ES PROFINET
- ▶ System description "Safety Device Diagnostics"

For the use of passive junctions:

- ▶ Operating manual of a passive junction, for example:
 - PSEN ix2 F4 code
 - PSEN ix2 F8 code
 - PDP67 F 4 code
 - PSEN Y junction M12 sensor
 - PSEN Y junction M12 cable

You will need to be conversant with the information in these documents in order to fully understand this operating manual.

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. 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.

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](#) [ 27].
- If the original actuators are replaced with substitute actuators, the original actuators must be destroyed before disposal.

**WARNING!****Ignition spark from cable separator/connector within the potentially explosive area can trigger an explosion**


When the cable separators/connectors are used within the potentially explosive area, sparks can be caused and lead to an explosion.

- Make sure that the cable separators/connectors are used only outside the potentially explosive area.

- ▶ Do not remove the connector's protective cap until you are just about to connect the unit. This will prevent potential contamination.
- ▶ 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 connector should be protected from accidental loosening (e.g. using a cable tie).
- ▶ The IP protection type (see [Technical details](#) [ 34]) has been determined in accordance with DIN EN 60529 with a safety switch that is as new.

Unit features

- ▶ Transponder technology for presence detection
- ▶ Pilz coding type: coded
- ▶ Dual-channel operation
- ▶ 2 safety inputs for series connection of multiple safety switches
- ▶ 2 safety outputs
- ▶ Safety Device Diagnostics (SDD)
 - Safety Device Diagnostics can be used to retrieve sensor information on one or more sensors, to perform actions and to read and write configuration parameters.
 - Manipulation protection in accordance with ISO 14119 is possible by verifying the short name of the actuator through the controller via SDD communication
- ▶ Diagnostic input for Y1 for Safety Device Diagnostics (SDD)
- ▶ Signal output/diagnostic output Y32 for Safety Device Diagnostics
- ▶ LED display for:
 - State of actuator detection
 - State of the inputs
 - Supply voltage/fault

- ▶ 4 actuation directions, each with 3 approach directions (see [Explanation of markings](#) [ 12])
 - Square marking for normal operating distance
 - Triangle marking for short operating distance
 - 2 semicircle markings for a lateral approach. Please note the Lateral and vertical offset with the lateral approach to the semicircle marking.

The guaranteed safe operating distances for the specified selections only apply when the actuator approaches the switch vertically. With the other approach directions, the operating distances may sometimes be considerably larger (particularly when approaching the semicircle).

Function description

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


Electrical states of the safety inputs and outputs (when switch is ready for operation: DEVICE LED is green):

| Actuator in the re- sponse range | Safety input S11 | Safety input S21 | Safety out- put 12 | Safety out- put 22 | Signal out- put Y32 (without use of the SDD) |
|--|---------------------|---------------------|-----------------------|-----------------------|---|
| Yes | High | High | High | High | High |
| Yes | Low | Low | Low | Low | High |
| No | x | x | Low | Low | Low |
| Yes | High | Low | High | Low | High |
| Yes | Low | High | Low | High | High |

x: High or low signal

Feasibility monitoring for safety inputs S11 and S21

- ▶ If one safety input switches from high to low, while the other safety input remains high, an unequal status is displayed: **Input LED has quick yellow flashes and Device LED flashes red**
- ▶ If this safety input switches back from low to high, while the other safety input remains high, a feasibility error is displayed and a partial operation lock is triggered: **Input LED flashes yellow and Device LED flashes red**

A switch to a high signal will only lead to normal switch operation if both inputs had a low signal. From this moment on, the switch to high may occur (partial operation lock see [Error display](#) [ 32]).

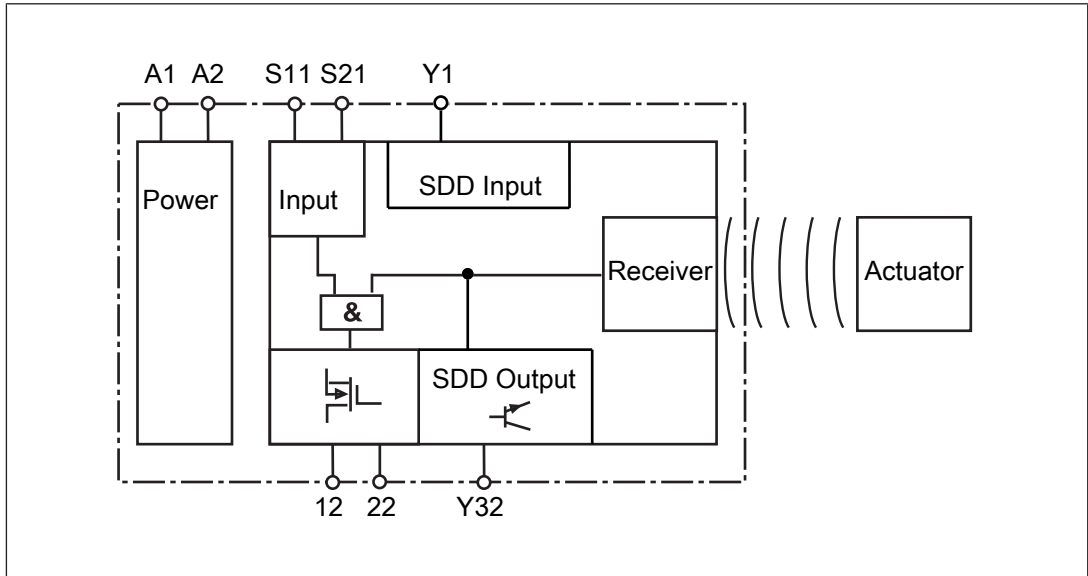
▶ Diagnostic input Y1

If an SDD fieldbus module is used, the diagnostic input Y1 is automatically activated and data is read.

If no SDD fieldbus module is used, the diagnostic input Y1 is not used.

► Signal output/diagnostic output Y32 in SDD mode

If an SDD fieldbus module is used, the signal output/diagnostic output Y32 is activated for writing data.



Safety Device Diagnostics

Safety Device Diagnostics is an option that can be selected independently of the safety-related wiring.

When using the Safety Device Diagnostics, up to 16 sensors connected in series can be connected as a subscriber to a fieldbus module.

The communication of the sensors with the fieldbus module is automatically built up again with each new supply of the supply voltage. As a result, a sensor can be exchanged, e.g. when servicing, without the need for special measures.

An exchange can be detected via the fieldbus module e.g. through the serial number.

► With Safety Device Diagnostics there are the following diagnostic options for the fieldbus module:

- Poll information of the sensors (examples: what sensor in the series has switched, at what point could there be an open circuit in the series connection)
- Read configuration parameters of the sensor (examples: Number of teach-in processes remaining, serial number of the sensor)
- Perform actions (example: poll updated actuator name)

The results of the sensor diagnostics can be checked already during the installation phase via the display in the fieldbus module, without the need to connect the fieldbus module to the network.

► With Safety Device Diagnostics there are the following diagnostic options for the fieldbus module for simple wiring:

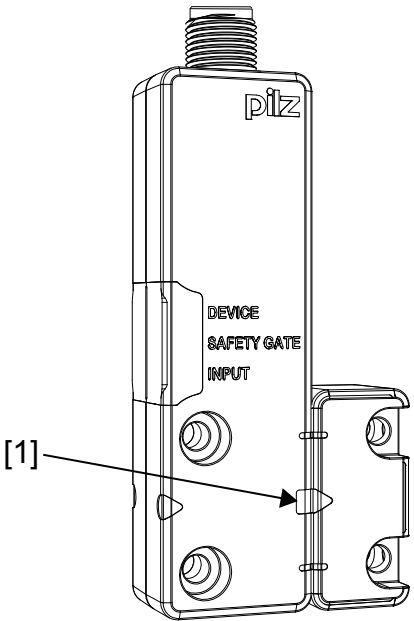
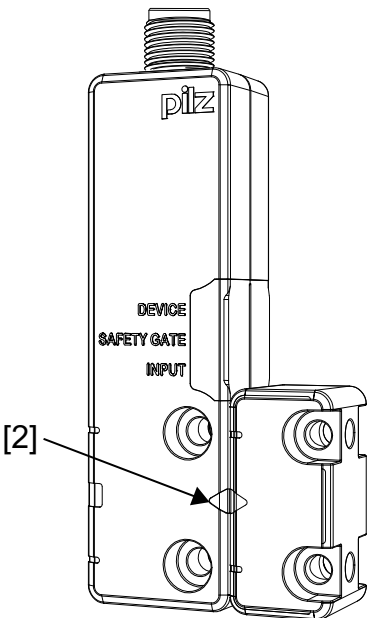
- Information is passed on via the fieldbus module directly to the network
- Mappings of the signal outputs to the sensor are automated by the SDD.

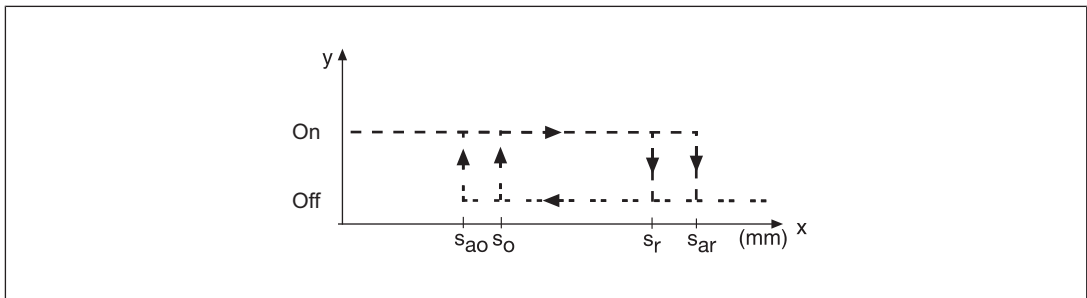
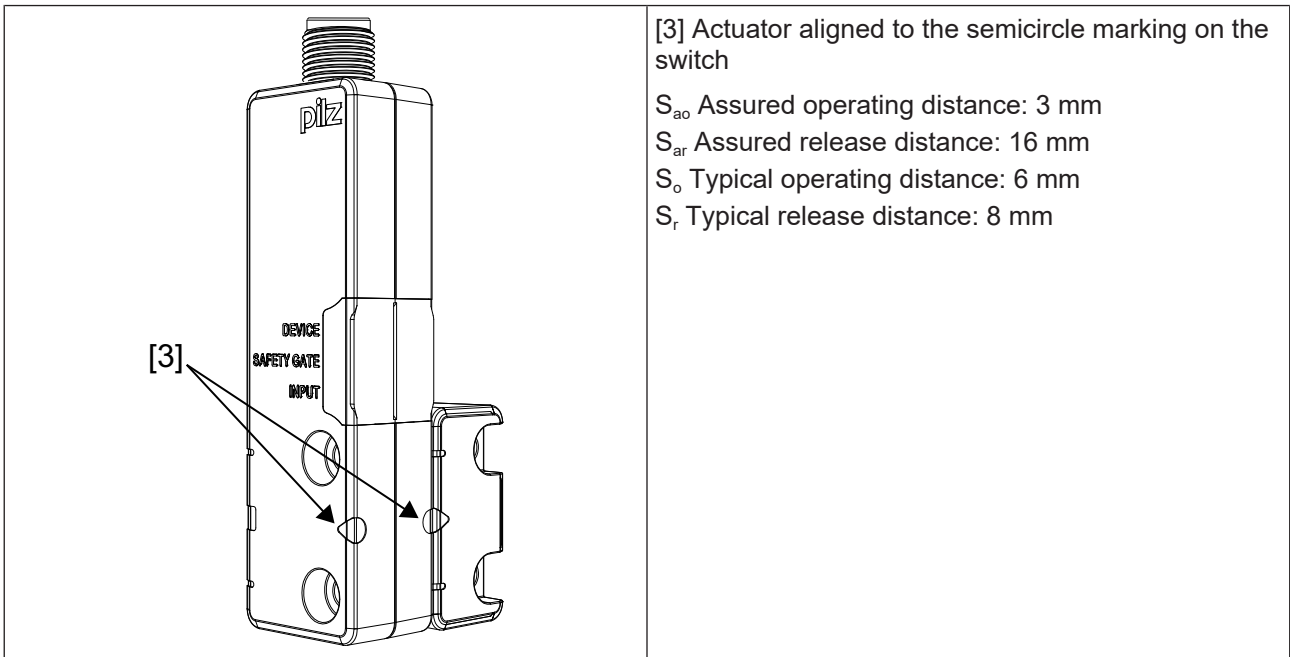
This prevents wiring errors and an expansion or reduction of the sensors is possible without the need to change existing wiring.

- Wiring in accordance with IP20: Rapid installation in the control cabinet is enabled.
- Wiring in accordance with IP67: Various passive junctions can be used (see [Order references for accessories \[38\]](#)) to connect several sensors with only one cable from the field in the control cabinet.

Further information on Safety Device Diagnostics can be found in [Additional documents that apply \[7\]](#).

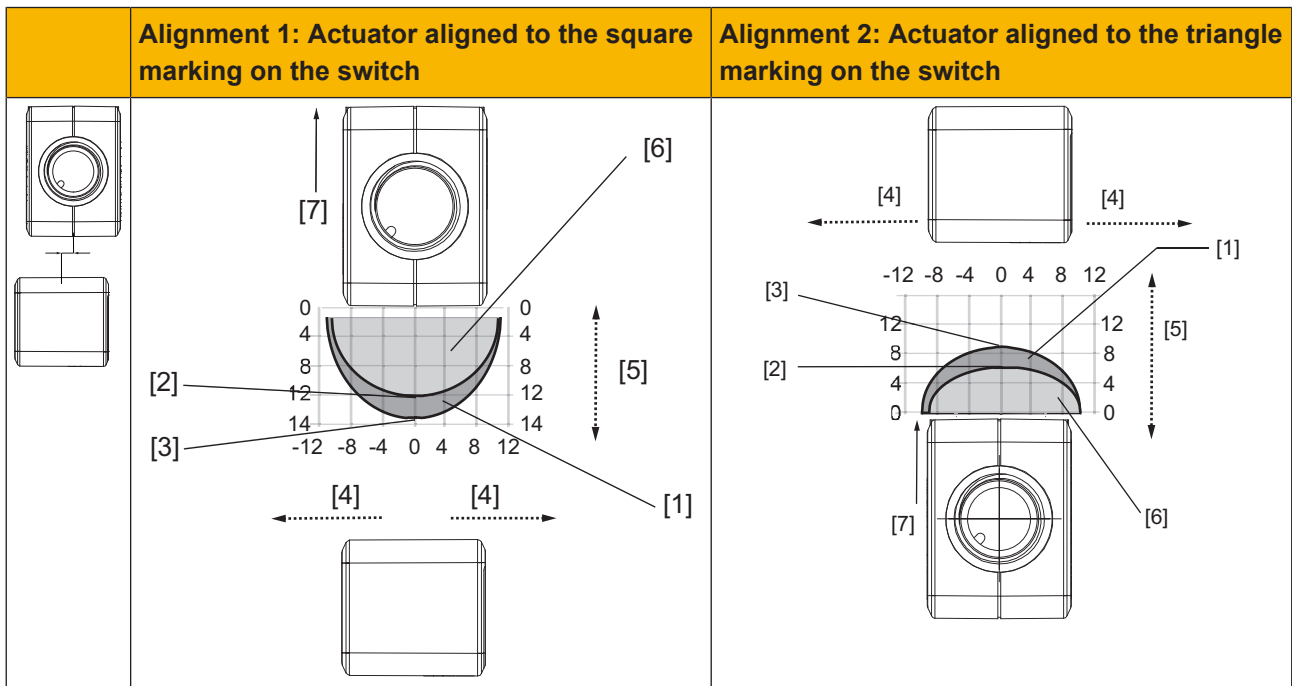
Operating distances

| Alignment of the actuator | Operating distances |
|---|--|
|  | <p>[1] Actuator aligned to the square marking on the switch</p> <p>S_{ao} Assured operating distance: 8 mm S_{ar} Assured release distance: 20 mm S_o Typical operating distance: 11 mm S_r Typical release distance: 14 mm</p> |
|  | <p>[2] Actuator aligned to the triangle marking on the switch</p> <p>S_{ao} Assured operating distance: 4 mm S_{ar} Assured release distance: 12 mm S_o Typical operating distance: 5 mm S_r Typical release distance: 8 mm</p> |



Lateral and vertical offset

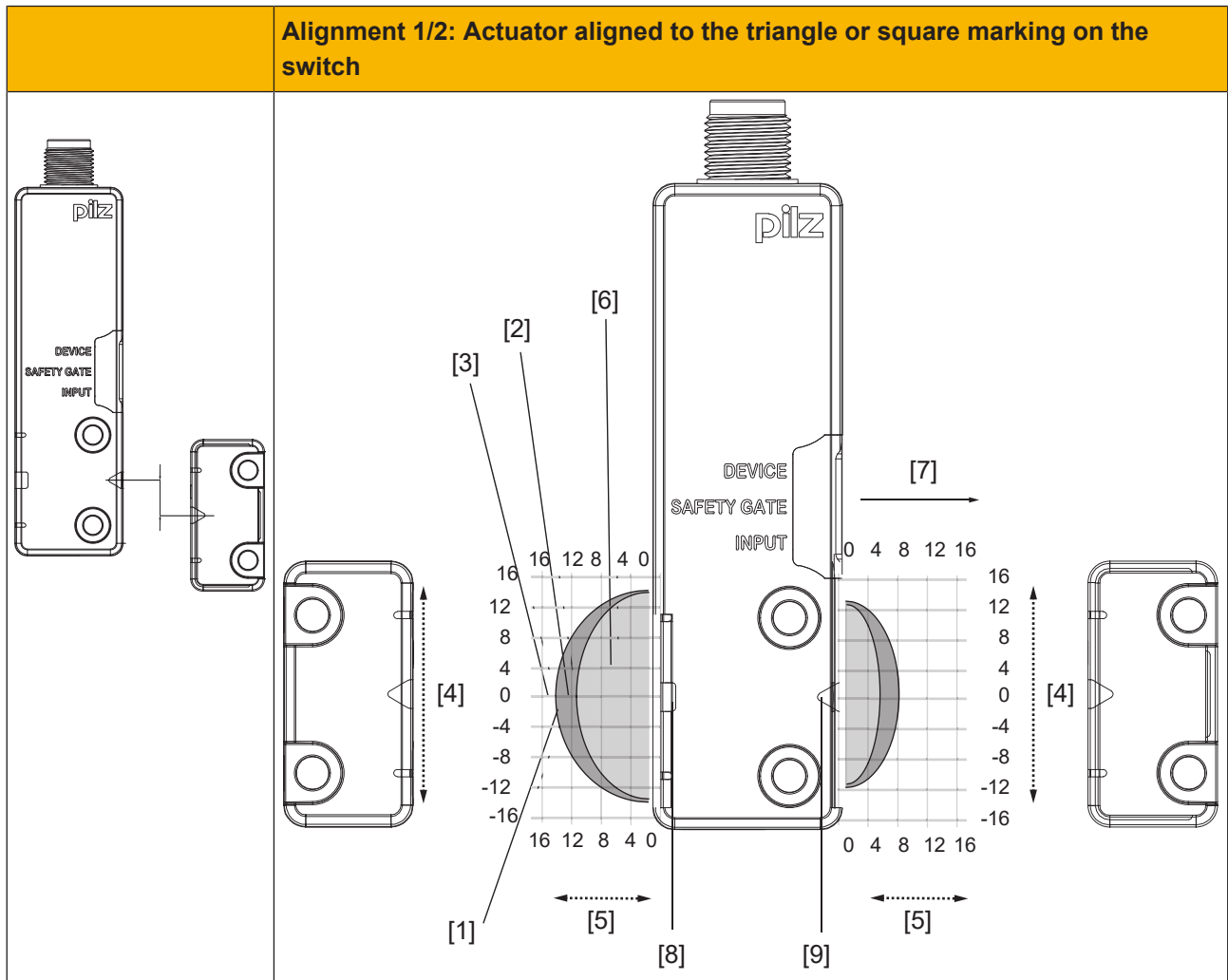
Lateral offset when aligning to the triangle or square marking



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
- [7] Status of LED

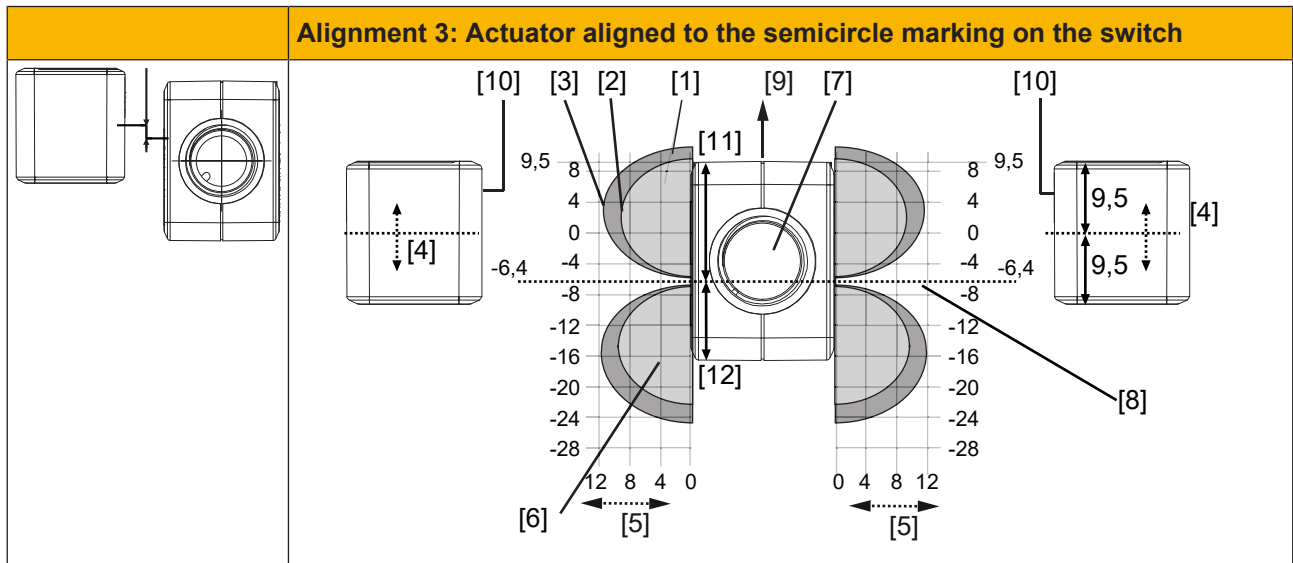
Vertical offset when aligning to the triangle or square marking



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
- [7] Status of LED
- [8] Square marking
- [9] Triangle marking

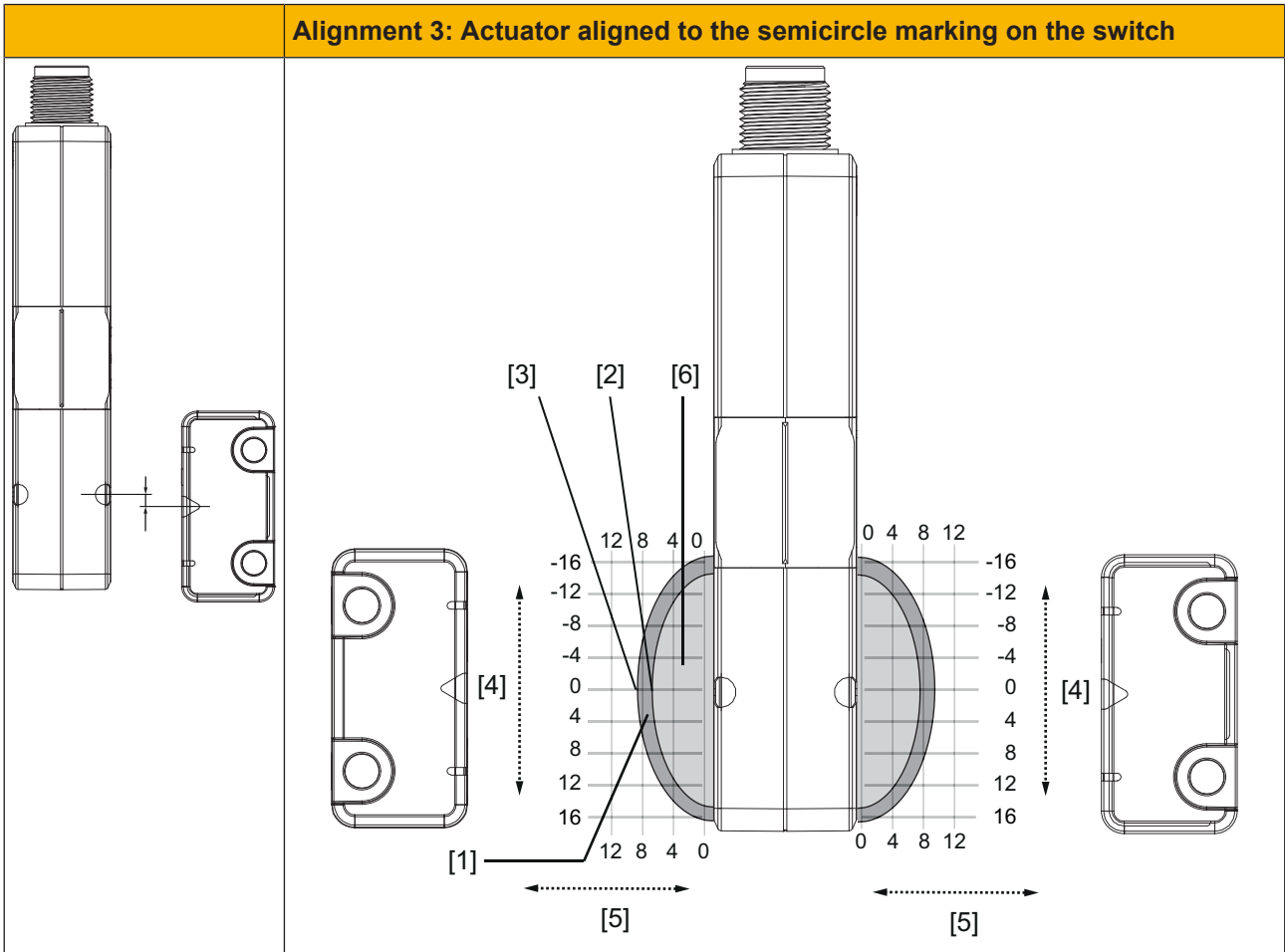
Lateral offset when aligning to the semicircle marking



Legend

- [1] Hysteresis
- [2] Typical operating distance S_o
- [3] Typical release distance S_r
- [4] Offset in mm (distance of the middle of the actuator to the zero line in the grid)
- [5] Operating distance in mm
- [6] Response range
- [7] Connector on the safety switch
- [8] Limit of response range, position of gate hinge
- [9] Status of LED
- [10] Sensing face of the actuator, labelled with Pilz logo
- [11] Distance from the front edge of the safety switch to the limit of the response range (position of the gate end stop) = 15.9 mm
- [12] Distance from the rear edge of the safety switch to the limit of the response range (position of the gate end stop) = 10.5 mm

Vertical offset when aligning to the semicircle marking



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 \[34\]](#) must be followed.
- ▶ The max. cable length l_{\max} in the input circuit is calculated from
 - the max. cable capacitance at the safety outputs (see [Technical data \[34\]](#)).
 - the minimum permitted supply voltage at the safety switch (19.2 V).
- ▶ The power supply must meet the regulations for extra low voltages with protective electrical separation (SELV, PELV).
- ▶ The inputs and outputs of the safety switch must have protective separation from voltages over 60 VDC.

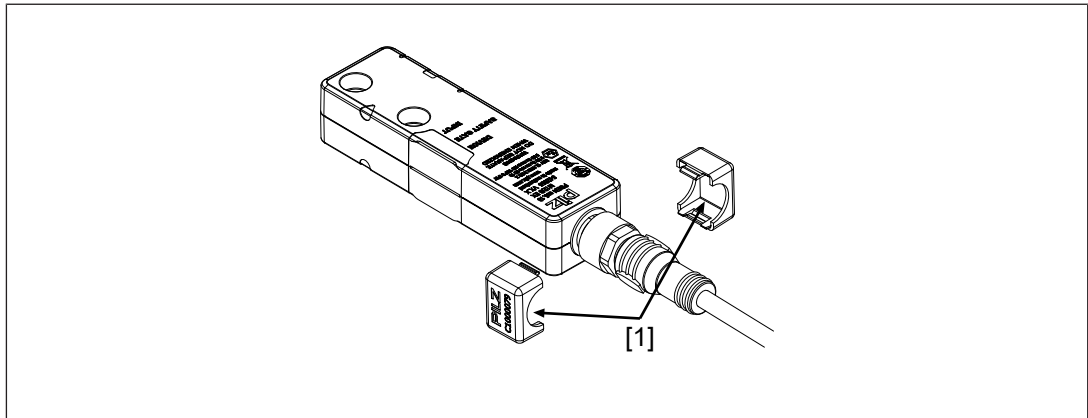


INFORMATION

Only use safety relays with a 24 VDC supply voltage. Safety relays with a wide-range power supply or in AC device versions have internal potential isolation and are not suitable as evaluation devices.

- ▶ 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.
- ▶ When connecting in series, consider the requirements of manipulation protection and the protection against bypassing or from overriding the safety switch (EN ISO 14119).
- ▶ When the safety inputs of the safety switch are controlled by an upstream device, and they are not wired with 24 V,
 - They must be monitored for shorts across contacts (e.g. by PSEN cs, PSEN ml, PSEN sg or PSEN sl) **or**
 - The faults at the safety inputs that can occur by shorts across contact will have to be excluded by suitable measures (e.g. wiring in accordance with EN 602041).
- ▶ Refer to the notes on wiring in EN 60079-14.
- ▶ Any metallic parts (also accessories) must be connected to the equipotential bonding in case of a risk of charging.
- ▶ Ensure that the connector of the safety switch in the EX area is not removed or inserted.
- ▶ The inputs and outputs of the safety switch must have a protective separation to voltages over 60 VDC.
- ▶ The power supply must meet the regulations for extra low voltages with protective electrical separation (SELV, PELV).
- ▶ Information given in the [Technical details \[34\]](#) must be followed.

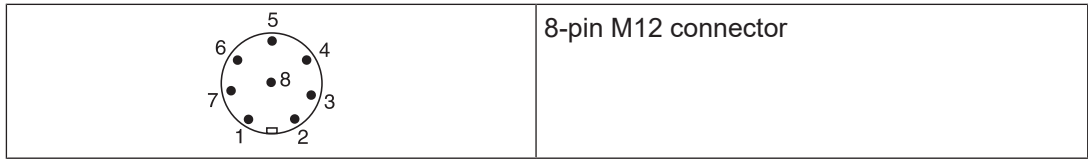
- ▶ As shown in the diagram, combine the clips supplied above the screw connection of the cable and press both parts firmly onto each other. The clips must audibly lock into position and they must not be manually detachable.



Legend

[1] Manipulation protection CABLE/M12/CLIP

Pin assignment, connector and cable



| PIN | Connection designation | Function | Wire colour |
|-----|------------------------|---------------------------------|-------------|
| 1 | S21 | Input, channel 2 | white |
| 2 | A1 | +24 VUB | brown |
| 3 | 12 | Output, channel1 | green |
| 4 | 22 | Output, channel2 | yellow |
| 5 | Y32 | Signal output/diagnostic output | grey |
| 6 | S11 | Input, channel 1 | pink |
| 7 | A2 | 0 V UB | blue |
| 8 | Y1 | Diagnostics input | red |

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



NOTICE

The inputs S11 and S21 may only be used for the series connection with Pilz sensors.

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:

- ▶ The use of Safety Device Diagnostics is described in the System Description "Safety Device Diagnostics".

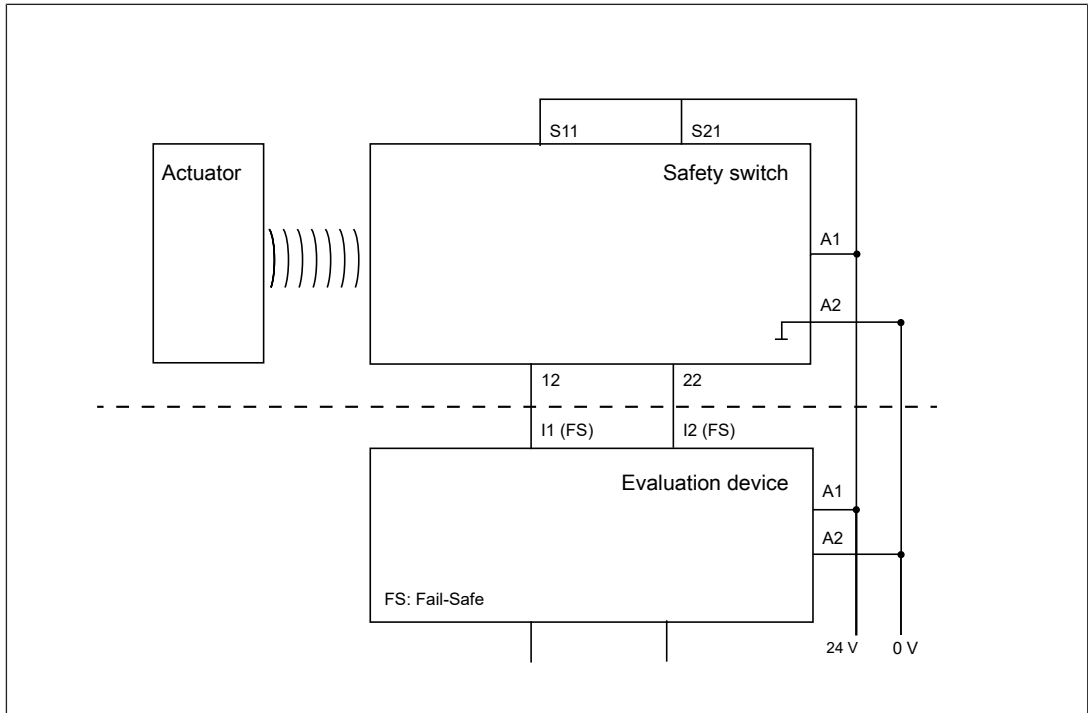


CAUTION!

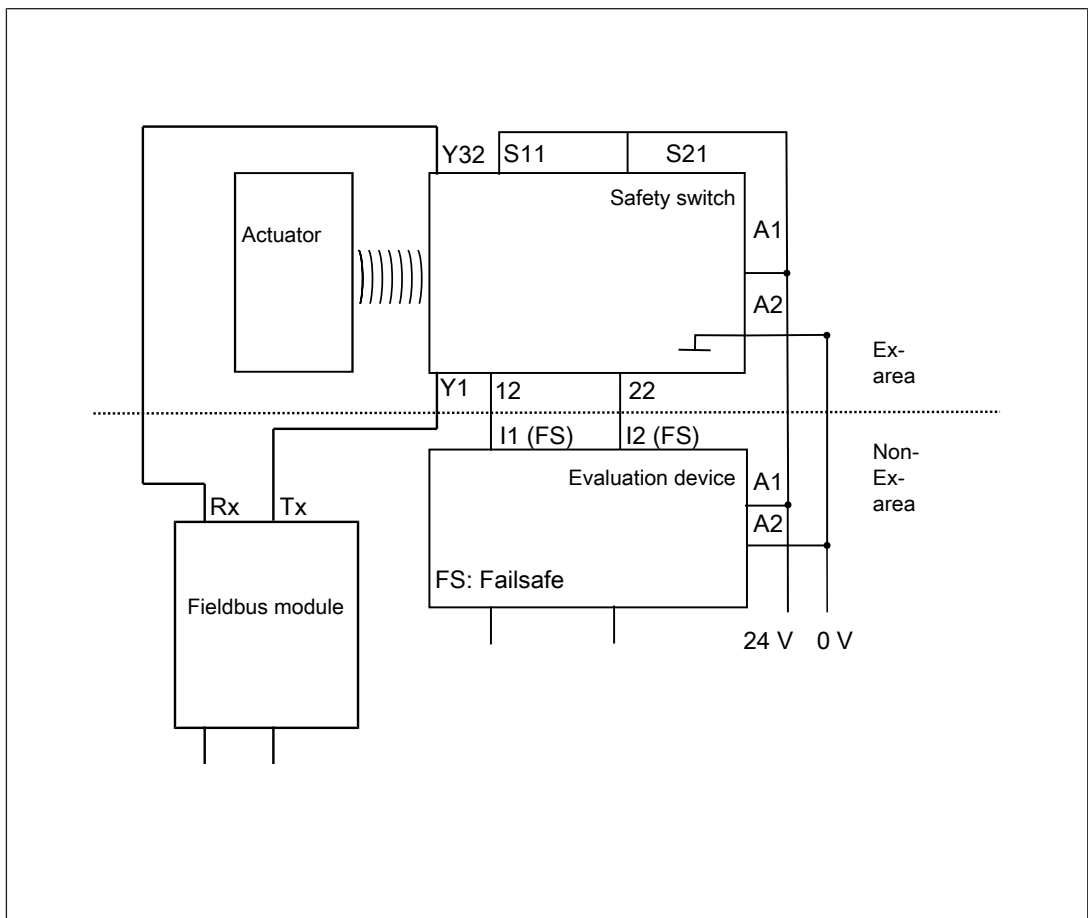
Do not connect the signal output to 0 V!

If the signal output Y32 is connected to 0 V, the safety switch may be damaged as a result. Connect the signal output Y32 to a consumer, e.g. to the input on a control system, or leave the signal output unconnected. Also note the max. current (see [Technical details \[34\]](#)).

Connection diagram, single connection without SDD



Connection diagram, single connection with SDD



Series connection

The safety sensors PSENcode are also suitable for series connection with other sensors.

The series connection of maximum 32 sensors PSENcs 5.x and PSENcs 6.x is approved for SIL CL 3 without using the SDD.

In practice, the maximum possible number will be limited by the following parameters, among others:

- ▶ The required SIL level (e.g. SIL CL 3),
- ▶ the required performance level (e.g. PL e (Cat. 4)),
- ▶ the maximum delay or risk time permitted by the application.

Ensure there is sufficient supply voltage, taking inrush currents and fusing into consideration.



CAUTION!

Extension of delay-on de-energisation

When several (n) devices are connected in series, the delay-on de-energisation time adds with the number of interconnected safety switches.

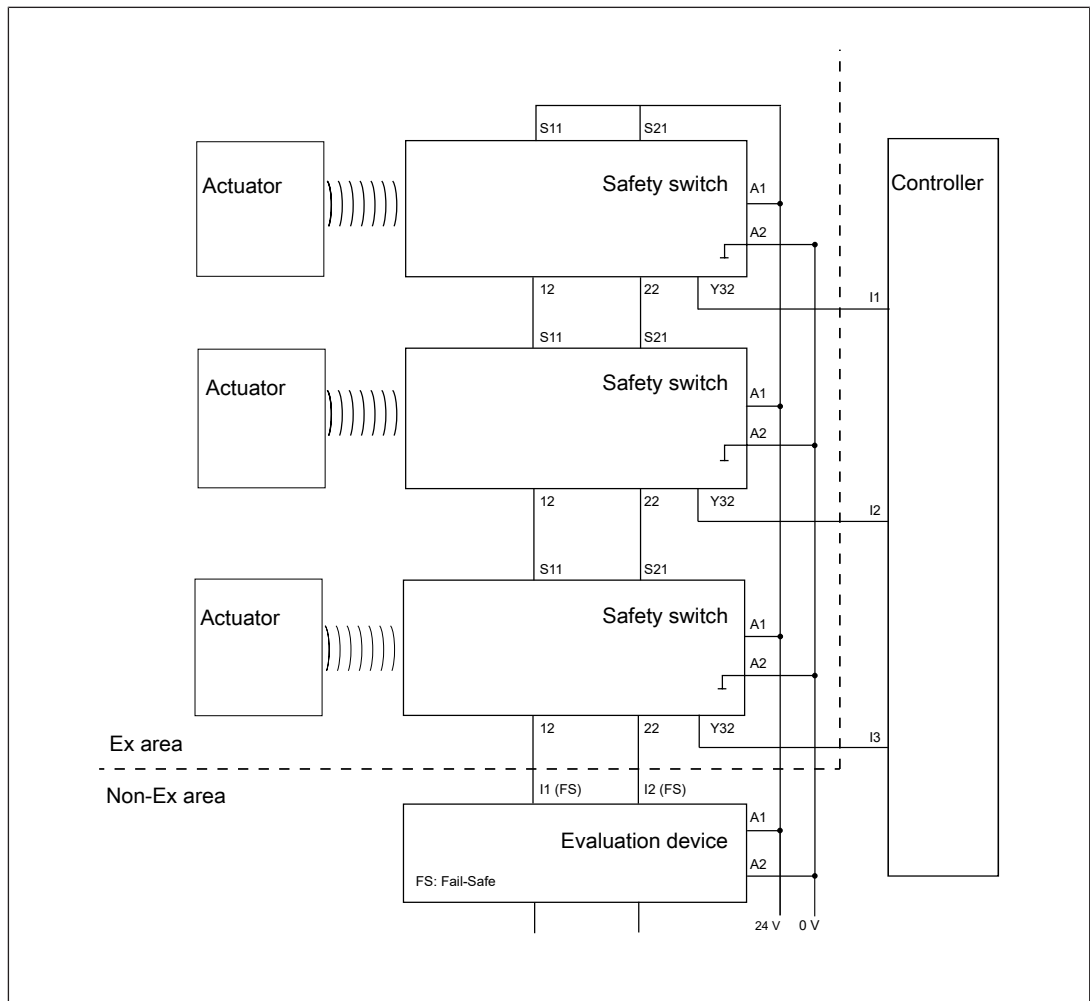
The max. delay-on de-energisation is made up of the risk time (see [Technical details \[34\]](#))

+ (n-1) x max. delay-on de-energisation of the inputs

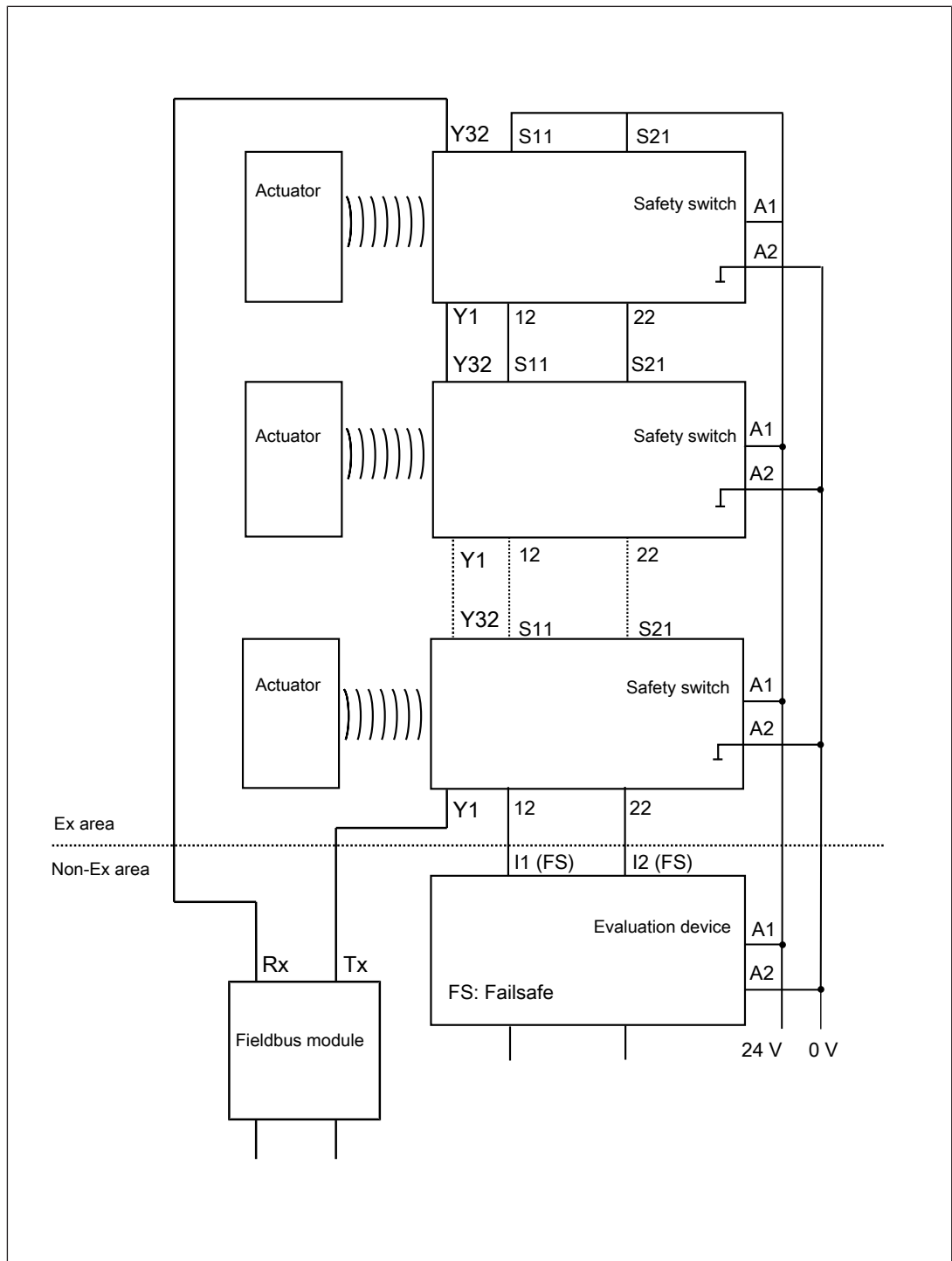
+ max. delay-on de-energisation of the evaluation device

- ▶ When making series connections using SDD, only use the following passive junctions.
 - PSEN ix2 F4 code
 - PSEN ix2 F8 code
 - PSEN Y junction M8-M12/M12 PIGTAIL
 - PSEN Y junction M12-M12/M12 PIGTAIL
 - PSEN Y junction M12 SENSOR
 - PSEN Y junction M12 cable channel

Connection diagram, series connection without SDD



Connection diagram, series connection with SDD



Connection to Pilz evaluation devices

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

The safety switch PSEN cs5.13 M12/8 EX can be connected to Pilz evaluation devices, for example.

Suitable Pilz evaluation devices are, for example:

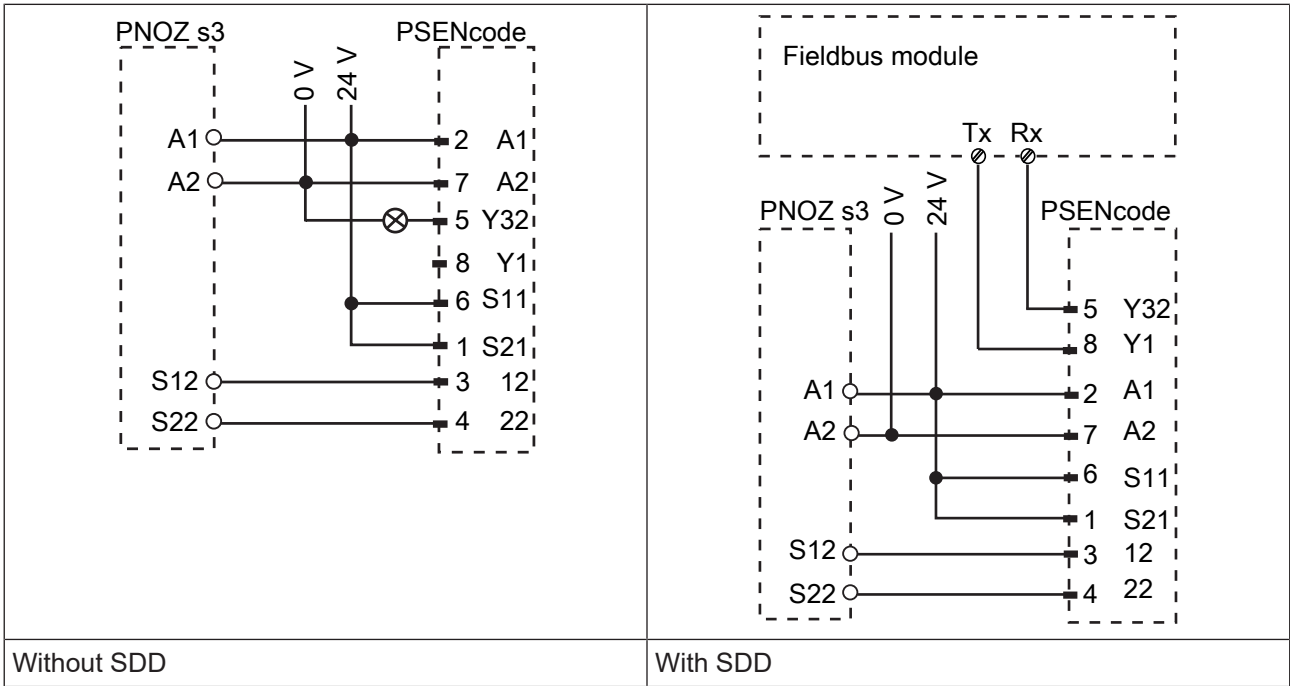
- ▶ PNOZelog for safety gate monitoring
- ▶ PNOZpower for safety gate monitoring
- ▶ PNOZsigma for safety gate monitoring
- ▶ PNOZ X for safety gate monitoring
- ▶ PNOZmulti for safety gate monitoring
Configure the safety switch in the PNOZmulti Configurator with switch type 3.
- ▶ PSS for safety gate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

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.

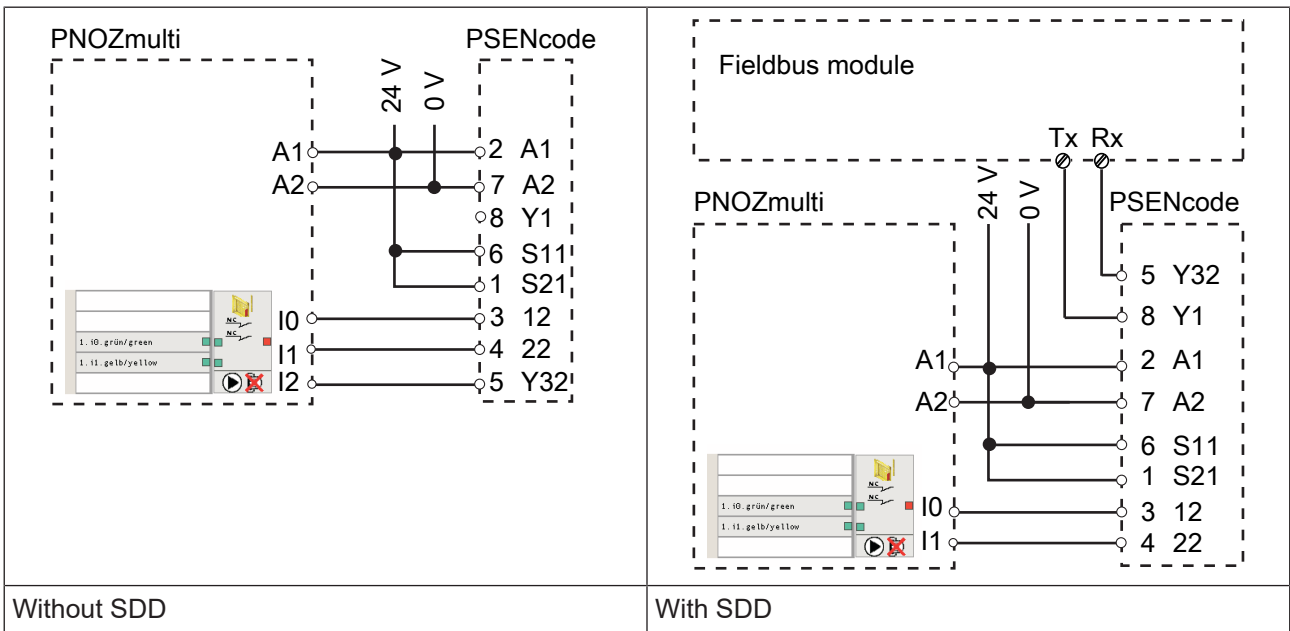
The connections to two evaluation devices are shown on the following pages, by way of example:

- ▶ PNOZ s3 and
- ▶ PNOZmulti

PNOZ s3



PNOZmulti



Teaching in the actuator

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

Installation



DANGER!

Risk of sparking due to electrostatic charging of the safety switch in the potentially explosive area


To prevent electrostatic charging, only clean the safety switch with a damp cloth.


Do not expose the safety switch to high charge-generating processes.



DANGER!

Risk of damage due to mechanical load. Live components on the safety switch in the potentially explosive area may become exposed

Protect the plug-in connector on the safety switch from shock (e.g by using the PSEN cs1/2 bracket cable fix, see [Order references for accessories](#)  38).

Please note the information provided in [Installation](#)  27].

- ▶ Make sure that the earthing is in accordance with the specifications in EN 60079-14.
- ▶ Any metallic parts (also accessories) must be connected to the equipotential bonding in case of a risk of charging.






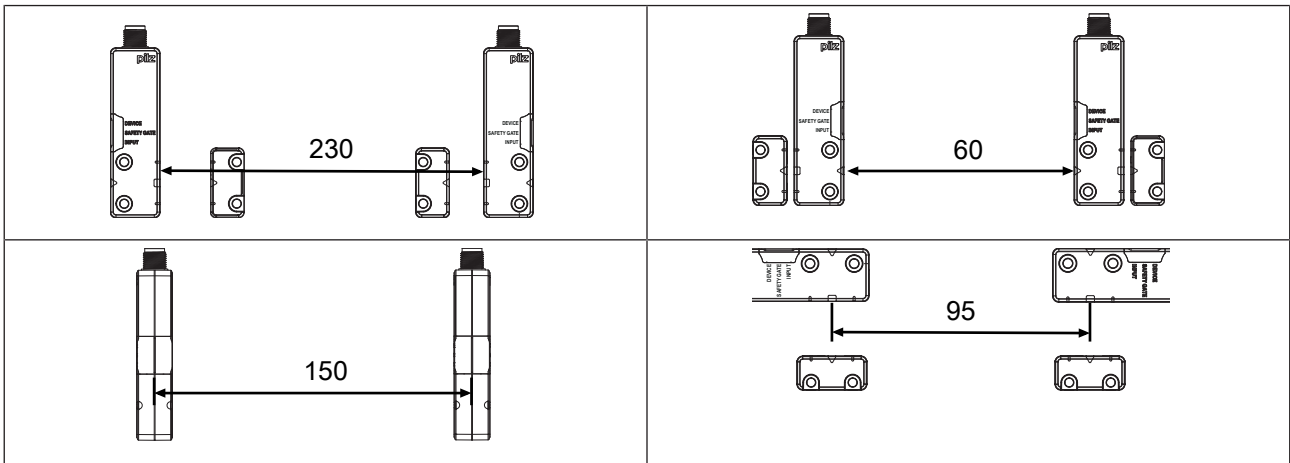
CAUTION!

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 safety switch that guarantees the operating distance required by the plant design (see [Operating distances](#)  12]).
- ▶ Safety switches and actuators should only be secured using M4 screws with a flat head (e.g. M4 cheese-head or pan head screws).
- ▶ Torque setting: Please note the information provided under [Technical details](#)  34].
- ▶ The distance between two safety switches must be maintained (see [Technical details](#)  34]).
The distance can be undershot in certain application cases (see diagrams).



- ▶ If using angled connector plugs, note the defined angle of the cable routing.
- ▶ When installing make sure you comply with the requirements of EN ISO 14119.
- ▶ Make sure that the safety switch and actuator cannot be used as an end stop.
- ▶ Protect the safety switch and actuator from UV light or direct sunlight.
- ▶ For simpler installation, the mounting brackets (see [Order reference for Accessories \[38\]](#)) can be used.
- ▶ The actuator should be protected from unauthorised removal and from contamination. Close the mounting holes using the seals provided (see diagrams). The use of seals should be regarded as equivalent to using permanent fastenings in accordance with EN ISO 14119.

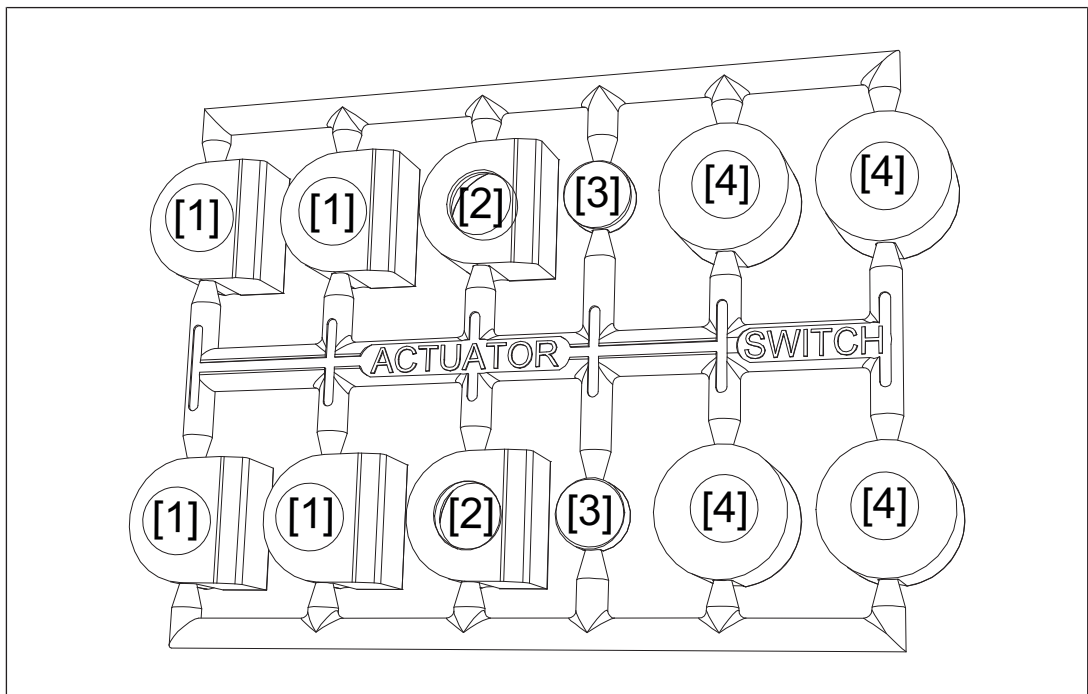


Fig.: Seals

[1]: 4 seals for actuators

[2]: 2 seals for actuators

[3]: 2 seals for actuators

[4]: 2 seals for switches and 2 seals for actuators

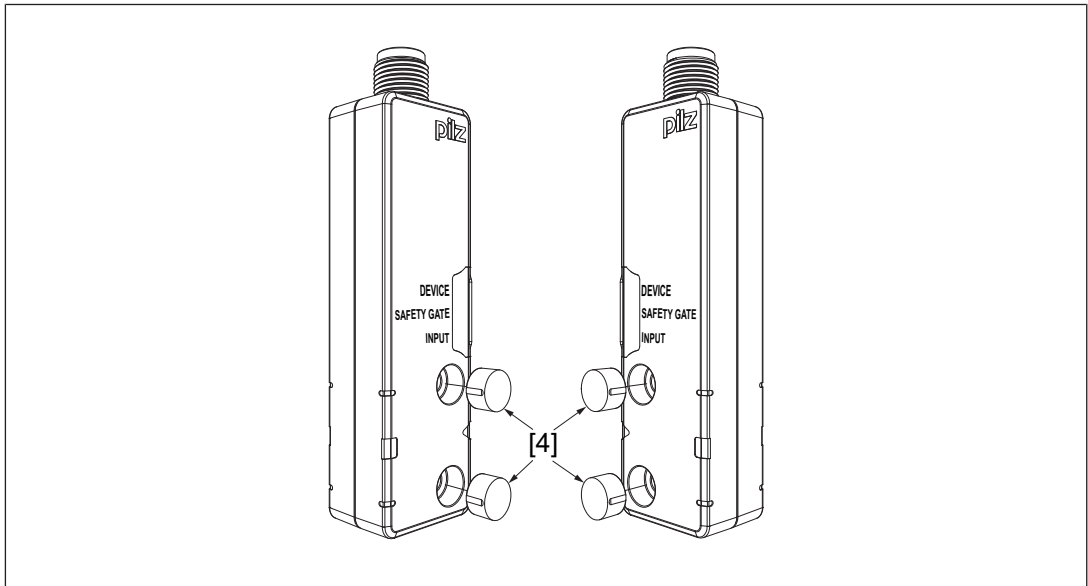


Fig.: Applying the screw cover [4] on the switch

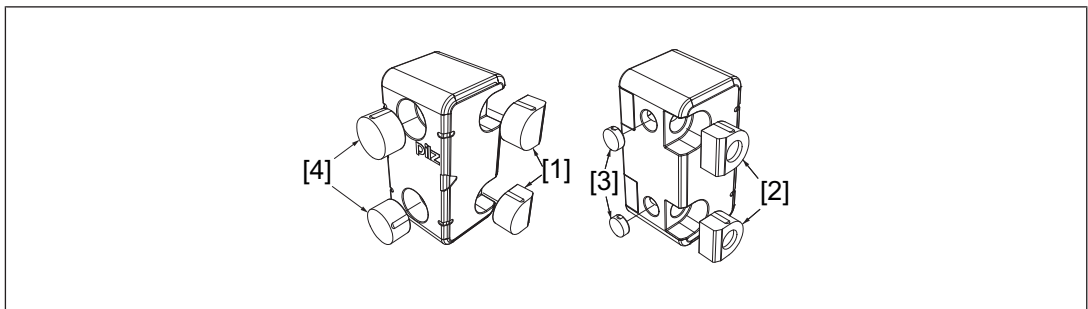


Fig.: Applying the screw covers [1] and [3] on the actuator

- ▶ Please note the installation measures in accordance with EN ISO 14119 for a safety switch design 4 and with level of coding Low.

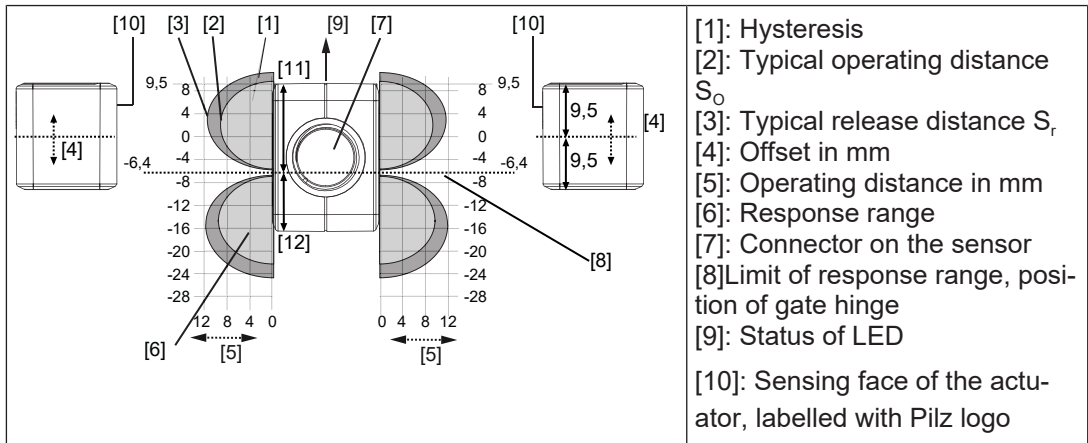


WARNING!

Loss of safety function due to non-permitted enlargement of the assured release distance when using both switching lobes (aligned at semicircle marking)

Depending on the application, serious injury or death may result.

- Install a mechanical stop when using the response range at the semi-circle marking, to avoid unintended switching off at the limit of the response range and to prevent the maximum release distance from enlarging impermissibly by using both switching lobes.



Procedure:

1. Drill holes (for M4 screws) in the mounting surface to secure the actuator and sensor (see [Dimensions in mm](#) 33).
2. Use a screw to fix the safety switch to the mounting surface.
 Make sure that the safety switch marking that is to 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 marking (triangle) points towards the marking on the safety switch.
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.

Periodic test

- ▶ Make sure that the work is **not** performed in an explosive atmosphere.
- ▶ Carry out a monthly function test on the safety switch and actuator.
- ▶ Always test the function with a connected evaluation device.
- ▶ The safety function may only be checked by qualified personnel.
- ▶ Refer to the notes on checking the safety switch in EN 60079-17 and EN 60079-19.

Adjustment

- ▶ The stated operating distances (see [Technical details](#) 34) 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](#) 12 and [Lateral and vertical offset](#) 14).

Operation



NOTICE

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

Status indicators:











Legend

- LED off
- ☀ LED on
- /☀ LED flashes (500 ms on, 500 ms off)
- /⚡ LED flashes quickly (50 ms on, 950 ms off)

Normal mode

| LED status | | Switch status |
|-------------|----------|--|
| Device | ☀ Green | Ready for operation |
| Safety Gate | ☀ yellow | Actuator is within the response range |
| | ● Off | Actuator is outside the response range |
| Input | ☀ yellow | Both safety inputs are high |
| | ● Off | Both safety inputs are low |

Error display

| LED status | | | Switch status | Remedy / measure |
|---|---|---|---|---|
| Device | Safety Gate | Input | | |
|  Red | ● off | ● off | Internal error on switch | Change the switch. |
|  Red |  Yellow |  Yellow | Supply voltage is outside the tolerance range | Ensure the voltage supply corresponds to the Technical details [34] . |
|  Yellow | Display not definitive | Display not definitive | Supply voltage is at the limit of the tolerance range | Ensure the voltage supply corresponds to the Technical details [34] . |
|  Red | Display of last status | Display of last status | Outputs in fault condition | Check the outputs and switch the voltage off and then on again. |
|  Green |  Yellow | Display not definitive | Wrong actuator | Only use an appropriate actuator from Pilz. |
| ● off |  Yellow |  Yellow | Switch doesn't start | Change the switch. |

Dimensions in mm

| Safety switch | |
|---|---|
| <p>Front view of the safety switch. Dimensions: total height 90, mounting height 11.6, width 26.4, distance from bottom to top LED [3] 7.5, distance between LEDs [2] 22, distance from bottom to bottom LED [2] 7.4, and distance from left edge to LED [1] 7.4. Labels include 'piz', 'DEVICE SAFETY GATE INPUT', and callouts [1], [2], [3].</p> | <p>Side view of the safety switch. Dimensions: total height 101.6 and width 19. Callouts [4] point to the mounting holes.</p> |
| Actuator | |
| <p>Front view of the actuator. Dimensions: total height 22, width 18, distance from bottom to top hole 7.5, distance from bottom to bottom hole 8.3, and hole diameter $\text{Ø } 4,5$. Callout [2] points to the triangle marking.</p> | <p>Side view of the actuator. Dimensions: total height 37, width 19, distance from bottom to top hole 8.3, distance from bottom to bottom hole 7.5, and hole diameter $\text{Ø } 4,5$. Callouts [2] and [4] are present.</p> |

Legend:

- [1] Square marking
- [2] Triangle marking
- [3] LEDs
- [4] Semicircle marking

Technical details

| General | |
|--|---|
| Certifications | ATEX, CE, EAC, ECOLAB, FCC, IC, TÜV, UKCA, cULus Listed, electrosuisse |
| Sensor's mode of operation | Transponders |
| 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 |
| Transponders | |
| 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) | 1 W |
| Max. switching frequency | 3 Hz |
| Max. cable capacitance at the safety outputs | |
| No-load, PNOZ with relay contacts | 40 nF |
| PNOZmulti, PNOZelog, PSS | 40 nF |
| Max. inrush current impulse | |
| Current pulse, A1 | 0,5 A |
| No-load current | 25 mA |
| Inputs | |
| Quantity | 2 |
| Voltage at inputs | 24 V DC |
| Input current range | 1,6 - 3 mA |
| Semiconductor outputs | |
| OSSD safety outputs | 2 |
| Signal outputs | 1 |
| Switching current per output | 100 mA |
| Breaking capacity per output | 2,4 W |
| Potential isolation from system voltage | No |
| Short circuit-proof | Yes |
| Residual current at outputs | 400 µA |
| Voltage drop at OSSDs | 1 V |
| Conditional rated short circuit current | 100 A |
| Lowest operating current | 2 mA |
| Utilisation category in accordance with EN 60947-1 | DC-12 |
| Times | |
| Max. test pulse duration, safety outputs | 150 µs |

Times

| | |
|---------------------|--------------|
| Switch-on delay | |
| after UB is applied | 1 s |
| Inputs typ. | 1 ms |
| Inputs max. | 3 ms |
| Actuator typ. | 30 ms |
| Actuator max. | 50 ms |

| | |
|--------------------------|--------------|
| Delay-on de-energisation | |
| Inputs typ. | 2 ms |
| Inputs max. | 4 ms |
| Actuator typ. | 30 ms |
| Actuator max. | 40 ms |

| | |
|---|---------------|
| Risk time in accordance with EN 60947-5-3 | 150 ms |
|---|---------------|

| | |
|--|--------------|
| Supply interruption before de-energisation | 20 ms |
|--|--------------|

| | |
|------------------------------------|----------|
| Simultaneity, channel 1 and 2 max. | ∞ |
|------------------------------------|----------|

Environmental data

| | |
|--------------------|---------------------------|
| ATEX certification | SEV 16 ATEX 0162 X |
|--------------------|---------------------------|

| | |
|--------------------|---------------------------------|
| ATEX category, gas | II 3G Ex ec mc IIC T6 Gc |
|--------------------|---------------------------------|

| | |
|---------------------|--------------------------------------|
| ATEX category, dust | II 3D Ex mc tc IIIC T80 °C Dc |
|---------------------|--------------------------------------|

| | |
|------------------|------------------------------|
| Application area | X: -25°C ≤ ta ≤ +55°C |
|------------------|------------------------------|

| | |
|-----------------------------------|----------------------|
| Ambient temperature | |
| in accordance with the standard | EN 60068-2-14 |
| Temperature range | -25 - 55 °C |
| Max. at max. operating height | +55 °C |
| Max. at operating height < 2000 m | +55 °C |

| | |
|---------------------------------|------------------------|
| Storage temperature | |
| in accordance with the standard | EN 60068-2-1/-2 |
| Temperature range | -40 - 85 °C |

| | |
|---------------------------------|----------------------------|
| Climatic suitability | |
| in accordance with the standard | EN 60068-2-30 |
| Humidity | 93 % r. h. at 40 °C |

| | |
|--------------------------------|---------------|
| Max. operating height above SL | 4000 m |
|--------------------------------|---------------|

| | |
|-----|---------------------|
| 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 | 1 kV |

| Environmental data | |
|--|--|
| Protection type | |
| Housing | IP67 |
| Operating distances | |
| Repetition accuracy switching distances | 3 % |
| Change of operating distance with temperature changes | +0,02mm/°C |
| Operating distances when the actuator approaches square marking | |
| Assured operating distance S_{ao} | 8 mm |
| Assured release distance S_{ar} | 20 mm |
| Typical operating distance S_o | 11 mm |
| Typical release distance S_r | 14 mm |
| Typical hysteresis | 2 mm |
| Operating distances when the actuator approaches triangle marking | |
| Assured operating distance S_{ao} | 4 mm |
| Assured release distance S_{ar} | 12 mm |
| Typical operating distance S_o | 5 mm |
| Typical release distance S_r | 8 mm |
| Typical hysteresis | 2 mm |
| Operating distances when the actuator approaches semicircle marking | |
| Assured operating distance S_{ao} | 3 mm |
| Assured release distance S_{ar} | 16 mm |
| Typical operating distance S_o | 6 mm |
| Typical release distance S_r | 8 mm |
| Typical hysteresis | 2 mm |
| Mechanical data | |
| Actuator 1 | PSEN cs5.13 M12 ATEX |
| Min. distance between safety switches | 250 mm |
| Sensor flush installation in accordance with EN 60947-5-2 | yes, follow installation guidelines |
| Connection type | M12, 8-pin male connector |
| Material | PA+GF, PBT, polycarbonate |
| Max. fixing screws torque settings | 1 Nm |
| Dimensions | |
| Height | 26,4 mm |
| Width | 101,6 mm |
| Depth | 19 mm |
| Actuator dimensions | |
| Height | 18 mm |
| Width | 37 mm |
| Depth | 19 mm |
| Weight of safety switch | 68 g |

Mechanical data

| | |
|--------------------|-------------|
| Weight of actuator | 15 g |
| Weight | 83 g |

Where standards are undated, the 2015-11 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 IEC 62061 SIL CL/ maximum SIL | EN IEC 62061 PFH _D [1/h] | EN/IEC 61511 SIL | EN/IEC 61511 PFD | EN ISO 13849-1: 2015 T _M [year] |
|----------------|-------------------------|-------------------------------|----------------------------------|-------------------------------------|------------------|------------------|--|
| 2-ch. OSSD | PL e | Cat. 4 | SIL CL 3 | 9,56E-10 | – | 8,51E-06 | 20 |

Explanatory notes for the safety-related characteristic data:

- ▶ Safety characteristic data in accordance with EN IEC 62061 and EN/IEC 61511 was calculated based on EN/IEC 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/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 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-PSENCSS5 IC: 7482A-PSENCSS5 |
| <p><u>FCC/IC-Requirements:</u> 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.</p> <p>Changes or modifications made to this product not expressly approved by Pilz may void the FCC authorization to operate this equipment.</p> <p>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.</p> <p>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.</p> |

Order reference

System

| Product type | Features | Order no. |
|--|--|-----------|
| PSEN cs5.13 M12/8/ PSEN cs5.13 M12 EX 1u | Coded safety switch PSENcode, with safety switch and actuator, ATEX certificate, 8-pin M12 male connector, series connection, large design, incl. 1 pair CABLE/M12/CLIP for securing 1 M12 plug-in connector | 542005 |
| PSEN cs5.13 M12/8 EX 1switch | Safety switch, coded, for coded safety switch PSENcode, ATEX certificate, 8-pin M12 male connector, series connection, large design | 542055 |
| PSEN cs5.13 M12 EX 1actuator | Actuator, coded, for coded safety switch PSENcode, ATEX certificate | 542085 |

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 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. |
|-------------------------------|------------------------------|---------------------------|--------|-----------|
| PSEN cable M12-8sf | straight, M12, 8-pin, socket | Open cable | 3 m | 540319 |
| | | | 5 m | 540320 |
| | | | 10 m | 540321 |
| | | | 20 m | 540333 |
| | | | 30 m | 540326 |
| PSEN cable M12-8af | Angled, M12, 8-pin, socket | Open cable | 3 m | 540322 |
| | | | 5 m | 540323 |
| | | | 10 m | 540324 |
| | | | 30 m | 540325 |
| PSEN cable M12-8sf M12-8sm | straight, M12, 8-pin, socket | straight, M12, 8-pin, pin | 2 m | 540340 |
| | | | 5 m | 540341 |
| | | | 10 m | 540342 |
| | | | 20 m | 540343 |
| | | | 30 m | 540344 |

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

Series connection

| Product type | Connection X1 | Connection X2 | Connec- tion X3 | Order no. |
|---|--------------------|--------------------|---------------------------|-----------|
| PSEN Y junction M12 SENSOR | M12, 8-pin, pin | M12, 8-pin, socket | M12, 8- pin, socket | 540315 |
| PSEN Y junction M12 cable channel | M12, 8-pin, pin | M12, 8-pin, socket | M12, 8- pin, socket | 540316 |
| PSEN T junction M12 | M12, 8-pin, socket | M12, 8-pin, pin | M8, 4-pin, pin | 540331 |
| PSEN Y junction M8-M12/ M12 PIGTAIL | M12, 8-pin, socket | M12, 8-pin, pin | M8, 8-pin, socket | 540337 |
| PSEN Y junction M12-M12/ M12 PIGTAIL | M12, 8-pin, socket | M12, 8-pin, pin | M12, 8- pin, socket | 540338 |

| Product type | Features | Order no. |
|-------------------|--|-----------|
| PDP67 F 4 code | Decentralised passive junction | 773603 |
| PDP67 F 4 code VA | Decentralised passive junction, V2A ring nut | 773613 |

Safety Device Diagnostics

| Product type | Features | Connection type | Order no. |
|------------------|--|------------------------|-----------|
| PSEN ix2 F4 code | Interface for connecting max. 4 PSEN safety sensors | Spring-loaded terminal | 535111 |
| PSEN ix2 F8 code | Interface for connecting max. 8 PSEN safety sensors | Spring-loaded terminal | 535112 |
| SDD ES ETH | Modbus/TCP fieldbus module for Safety Device Diagnostics | Spring-loaded terminal | 540130 |
| SDD ES Profibus | Profibus fieldbus module for Safety Device Diagnostics | Spring-loaded terminal | 540132 |
| SDD ES Profinet | Profinet fieldbus module for Safety Device Diagnostics | Spring-loaded terminal | 540138 |

EC declaration of conformity

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

- ▶ 2006/42/EC on machines
- ▶ 2014/34/EU (ATEX)
- ▶ 2014/53/EU on radio equipment

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

UKCA-Declaration of Conformity

This product(s) complies with following UK legislation:

- ▶ Supply of Machinery (Safety) Regulations 2008
- ▶ Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 2016
- ▶ Radio Equipment Regulations 2017

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

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► Support

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Pilz develops environmentally-friendly products using ecological materials and energy-saving technologies. Offices and production facilities are ecologically designed, environmentally-aware and energy-saving. So Pilz offers sustainability, plus the security of using energy-efficient products and environmentally-friendly solutions.



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

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