PSEN cs6.2 M12/8

▶ PSEN sensor technology

PILZ
THE SPIRIT OF SAFETY

SD means Secure Digital

Contents

Contents

Introduction

Validity of documentation

This documentation is valid for the product PSEN cs6.2 M12/8 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 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 one of the approved actuators

▸ EN 62061: SIL CL 3

▸ EN ISO 13849-1: PL e (Cat. 4)

▸ EN ISO 14119: Coding level High, type 4

The safety switch may only be used with one of the approved actuators.

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

▸ the safety outputs use 2-channel processing.

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 manual,

▸ Use of the product outside the technical details (see Technical details [📖 39]).

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.

Approved actuators:

▸ PSEN cs6.1

▸ PSEN cs6.1 low profile glue

▸ PSEN cs6.1 low profile screw

Safety regulations

Safety assessment

Before using a device it is necessary to perform a safety assessment in accordance with the Machinery Directive.

Functional safety is guaranteed for the product as a single component. However, this does not guarantee the functional safety of the overall plant/machine. In order to achieve the required safety level for the overall plant/machine, define the safety requirements for the plant/machine and then define how these must be implemented from a technical and organisational standpoint.

Additional documents that apply

Please read and take note of the following documents.

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

▸ Operating manual for the fieldbus module, for example SDD ES ETH or SDD ES PROFIBUS

▸ 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 competent persons.

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 spare actuators are used, these must be installed as described in Installation [📖 27].
>
> – 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: uniquely 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 poll sensor information, to perform actions and to read 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 [📖 11])

   – 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 off-set 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

Basic function

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 response range	Safety input S11	Safety input S21	Safety output 12	Safety output 22	Signal output 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 [📖 36]).

▸ Diagnostic input Y1

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

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

▸ Signal output/diagnostic output Y32

The status of the actuator is output. If a fieldbus module of the SDD is used, the signal output/diagnostic output for the writing of data is activated.

Block diagram
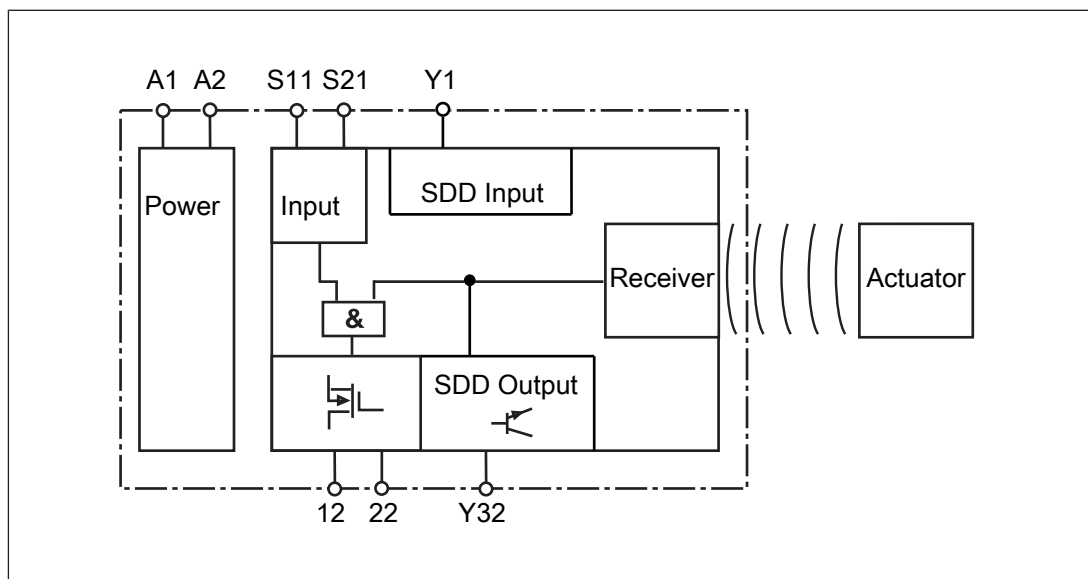
Safety Device Diagnostics

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:
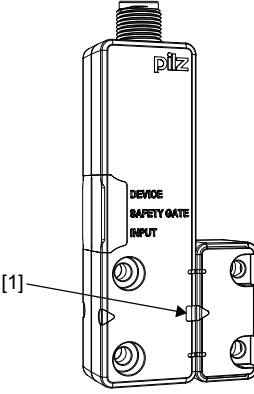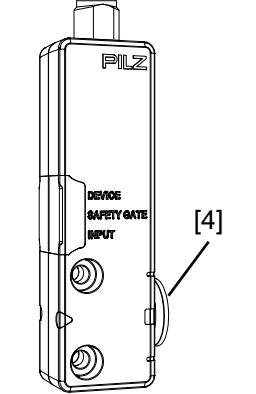
– Information is passed on via the fieldbus module directly to the network

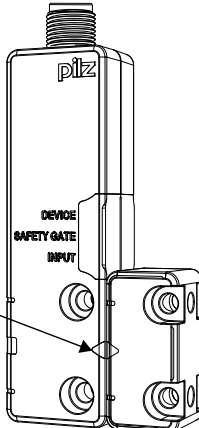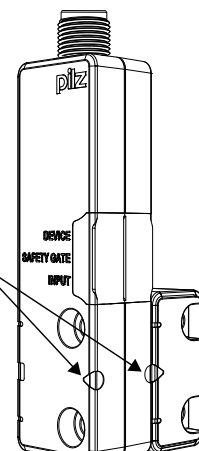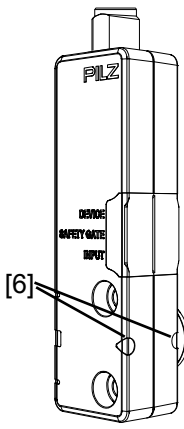– Mappings of the signal outputs to the sensor are automated by the SDD.

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 cabined is enabled.

– Wiring in accordance with IP67: Various passive junctions can be used (see Order references for accessories [📖 48]) 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

Actuator PSEN cs6.1	Actuator PSEN cs6.1 low profile glue or PSEN cs6.1 low profile screw	Operating distances
[1]	[4]	[1] Actuator PSEN cs6.1 aligned to the square marking on the switch 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 [4] Actuator PSEN cs6.1 low profile glue or PSEN cs6.1 low profile screw aligned to the square marking on the switch S_{ao} Assured operating distance: 5 mm S_{ar} Assured release distance: 20 mm S_o Typical operating distance: 10 mm S_r Typical release distance: 12 mm

		[2] Actuator PSEN cs6.1 aligned to the triangle marking on the switch 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 The alignment of the actuators PSEN cs6.1 low profile glue or PSEN cs6.1 low profile screw to the triangle marking is not provided for
		[3] Actuator PSEN cs6.1 aligned to the semicircle marking on the switch S_{ao} Assured operating distance: 3 mm S_{ar} Assured release distance: 16 mm S_o Typical operating distance: 6 mm S_r Typical release distance: 8 mm [6] Actuator PSEN cs6.1 low profile glue or PSEN cs6.1 low profile screw aligned to the semicircle marking on the switch S_{ao} Assured operating distance: 2 mm S_{ar} Assured release distance: 14 mm S_o Typical operating distance: 5 mm S_r Typical release distance: 7 mm
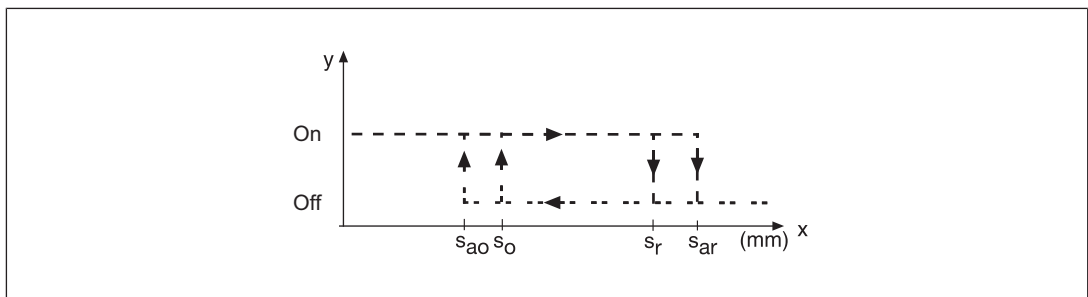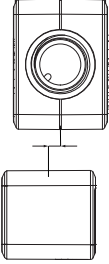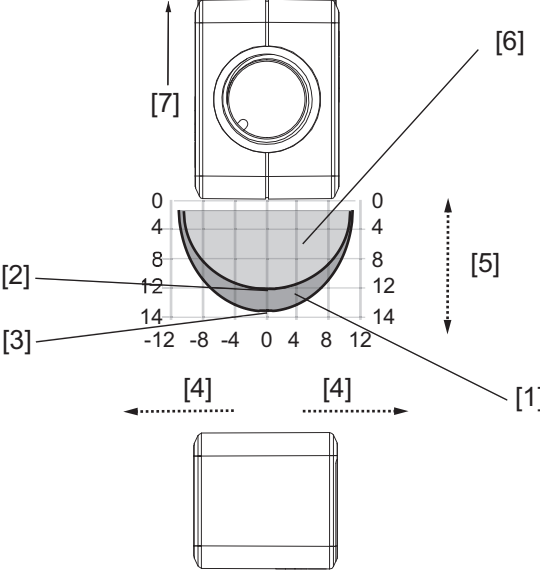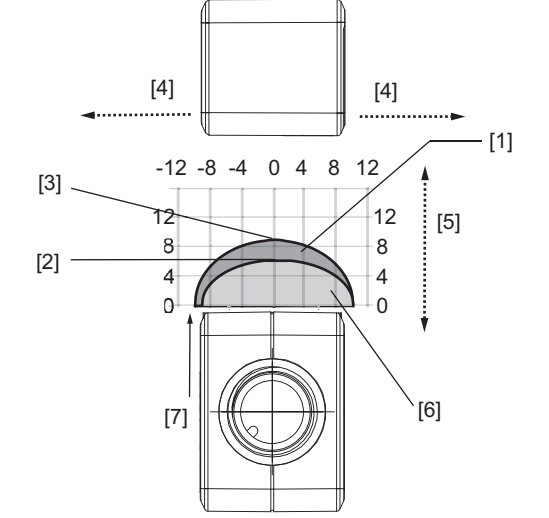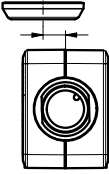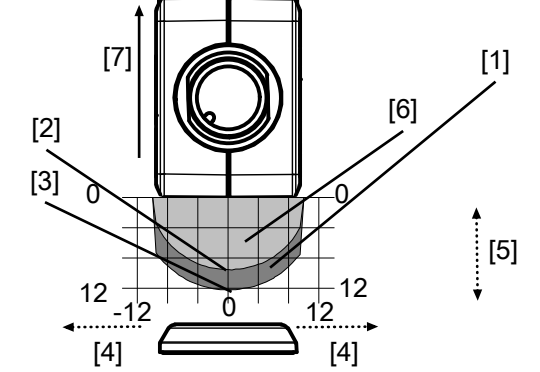
The switching distances of the actuators PSEN cs6.1 low profile glue and PSEN cs6.1 low profile screw were determined under the following conditions:

▸ Assured operating distance S_{ao} and assured release distance S_{ar}

– Measurement over the entire temperature range

– Installed on various base materials

– Taking into account product tolerances

▸ Typical operating distance S_o and typical release distance S_r

– Measured at room temperature

– Installed on plastic

Lateral and vertical offset

Lateral offset when aligning to the triangle or square marking

Alignment 1: Actuator PSEN cs6.1 aligned to the square marking on the switch	Alignment 2: Actuator PSEN cs6.1 aligned to the triangle marking on the switch

Alignment 1: Actuator PSEN cs6.1 low profile glue or PSEN cs6.1 low profile screw aligned to the square marking on the switch	Alignment 2: Actuator PSEN cs6.1 low profile glue or PSEN cs6.1 low profile screw aligned to the triangle marking on the switch
	Actuator PSEN cs6.1 low profile glue or PSEN cs6.1 low profile screw to triangle marking is not suitable because the operating distances are too low.

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

Lateral offset when aligning to the semicircle marking

	Alignment 3: Actuator PSEN cs6.1 aligned to the semicircle marking on the switch

	Alignment 3: Actuator PSEN cs6.1 low profile glue or PSEN cs6.1 low profile screw aligned to the semicircle marking on the switch

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
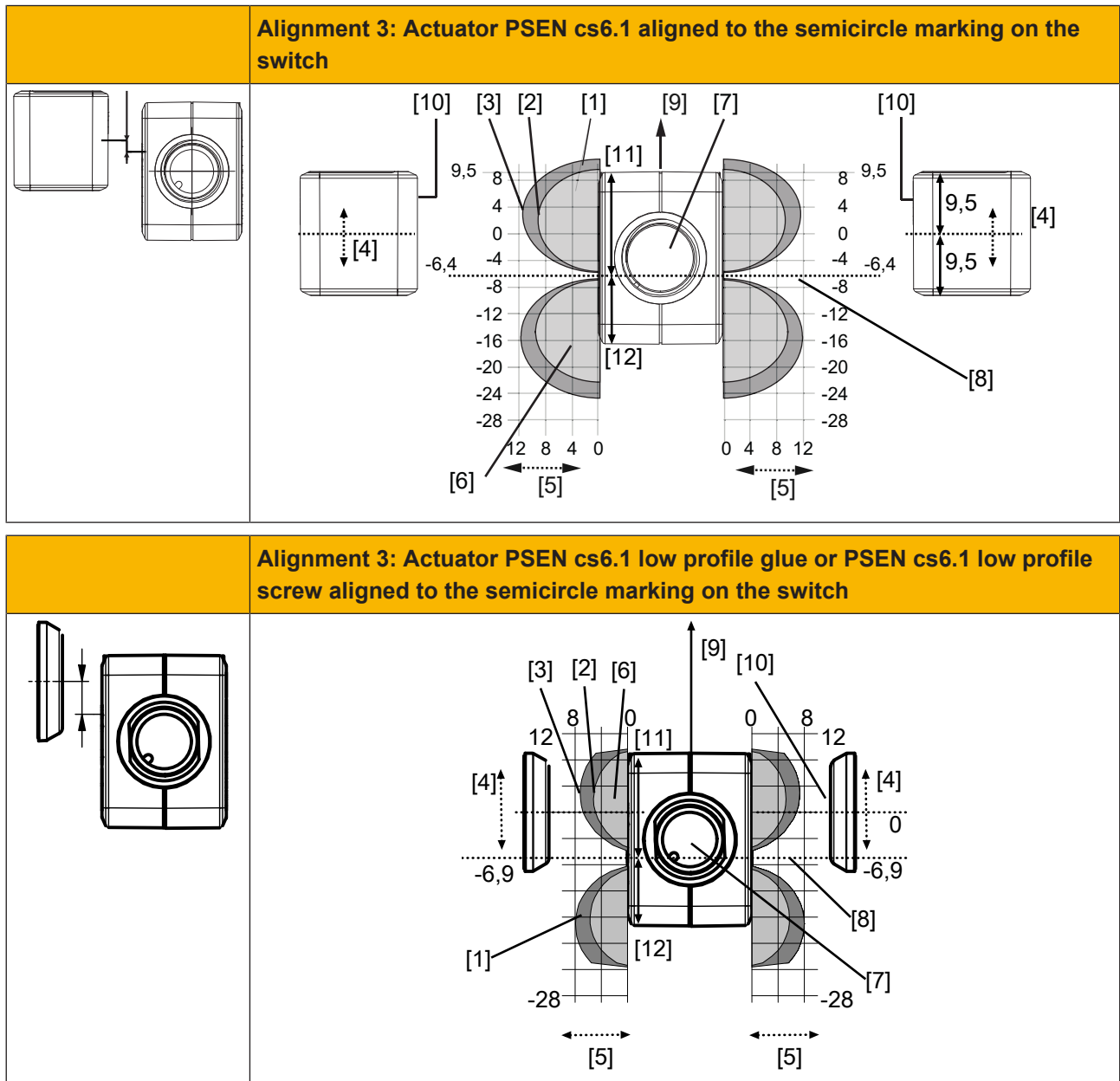
Vertical offset when aligning to the triangle or square marking
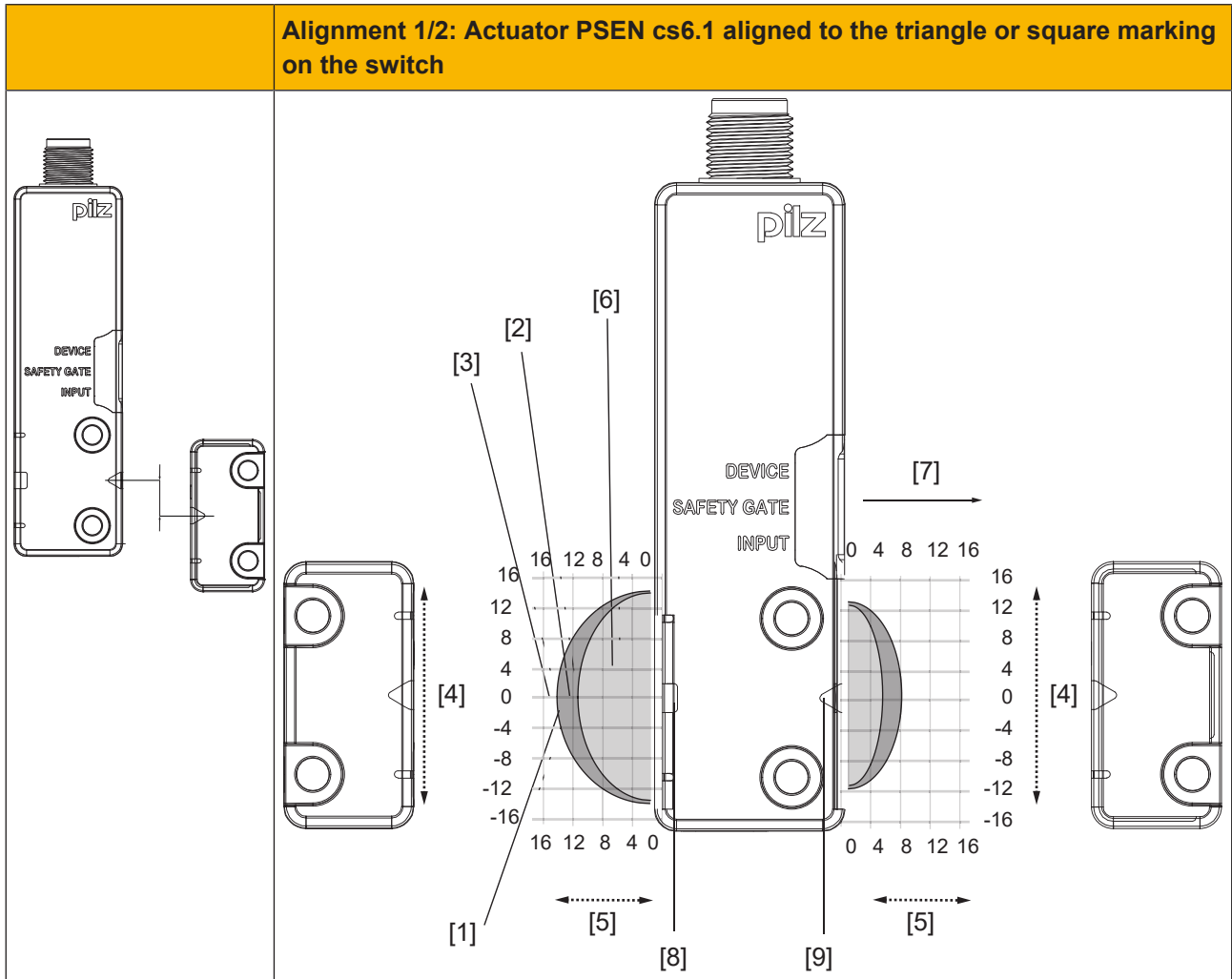
Alignment 1/2: Actuator PSEN cs6.1 aligned to the triangle or square marking on the switch

	Alignment 1/2: Actuator PSEN cs6.1 low profile glue or PSEN cs6.1 low profile screw aligned to the square marking on the switch
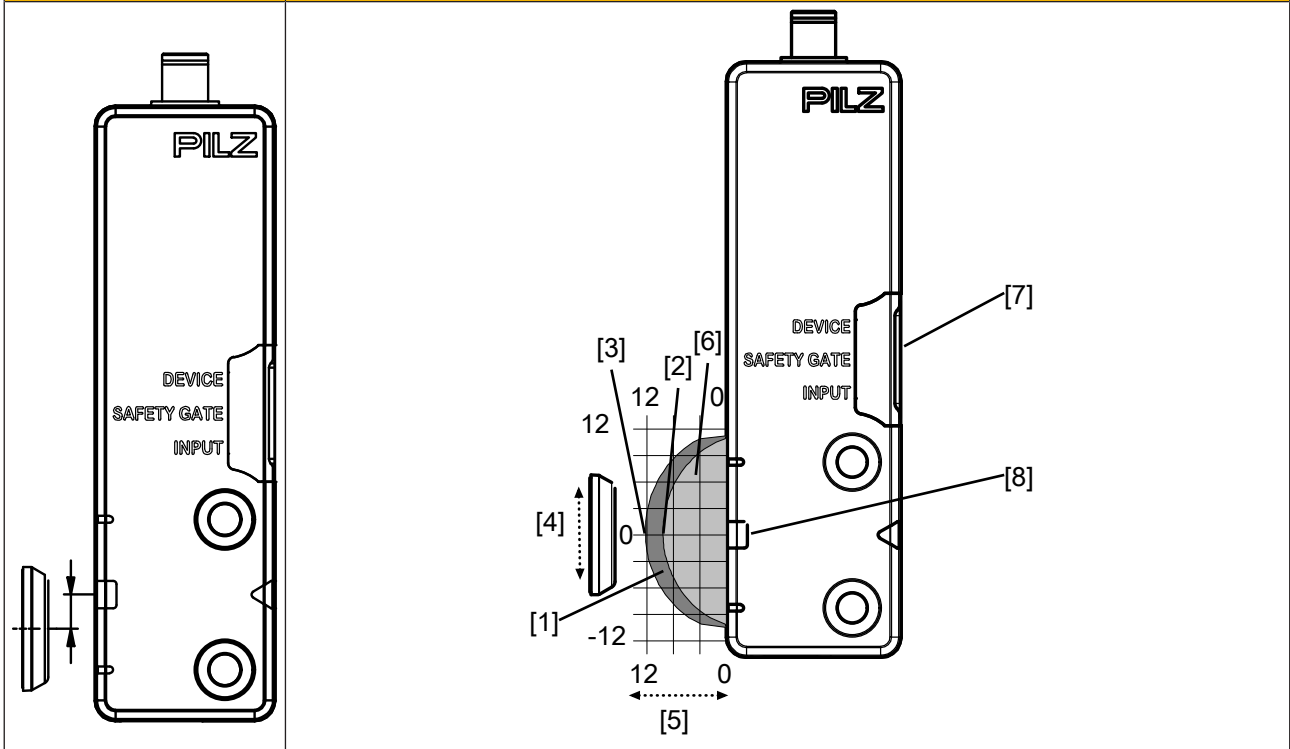
Legend

[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

Vertical offset when aligning to the semicircle marking

Alignment 3: Actuator PSEN cs6.1 aligned to the semicircle marking on the switch

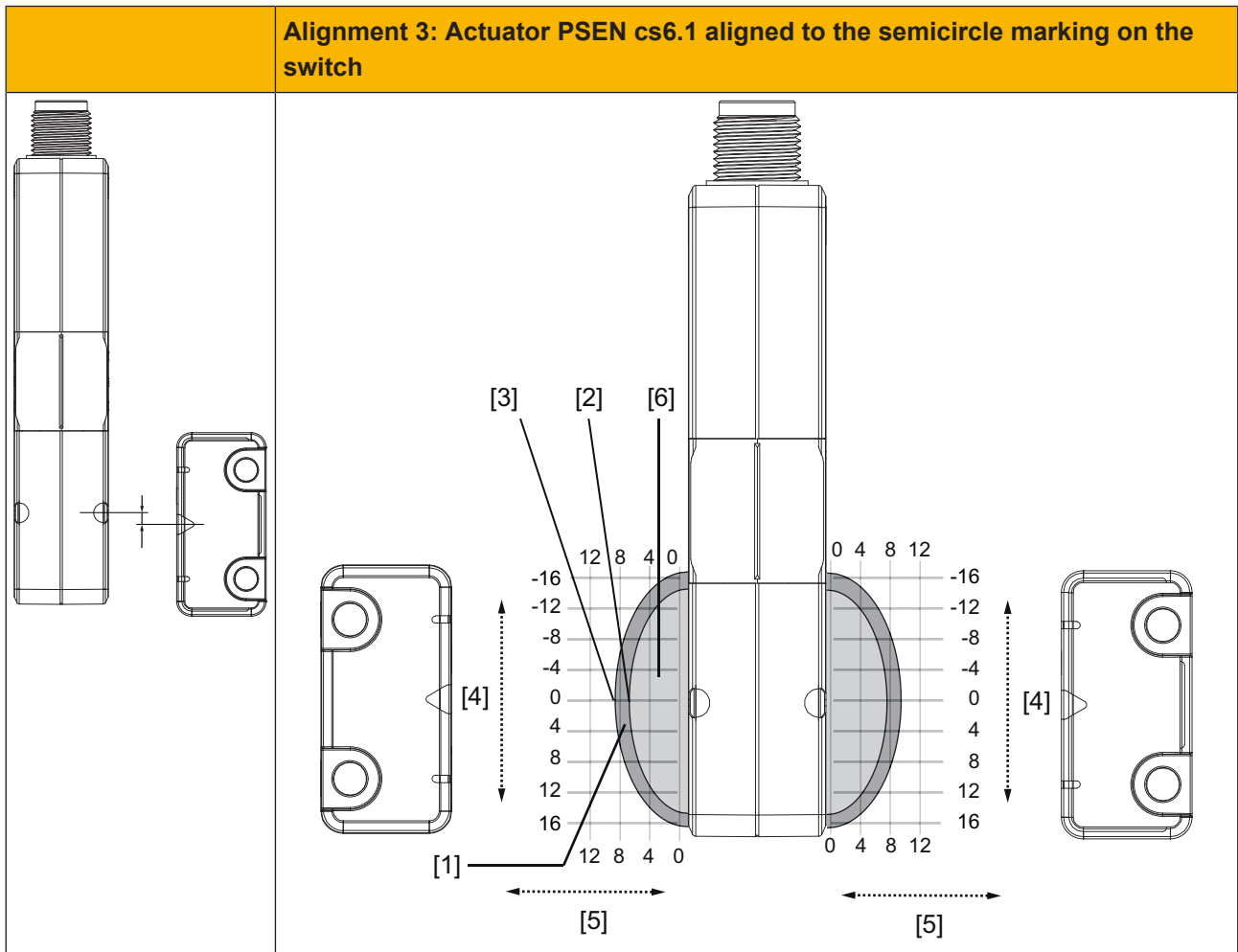|	**Alignment 3: Actuator PSEN cs6.1 low profile glue or PSEN cs6.1 low profile screw aligned to the semicircle marking on the switch**

Legend
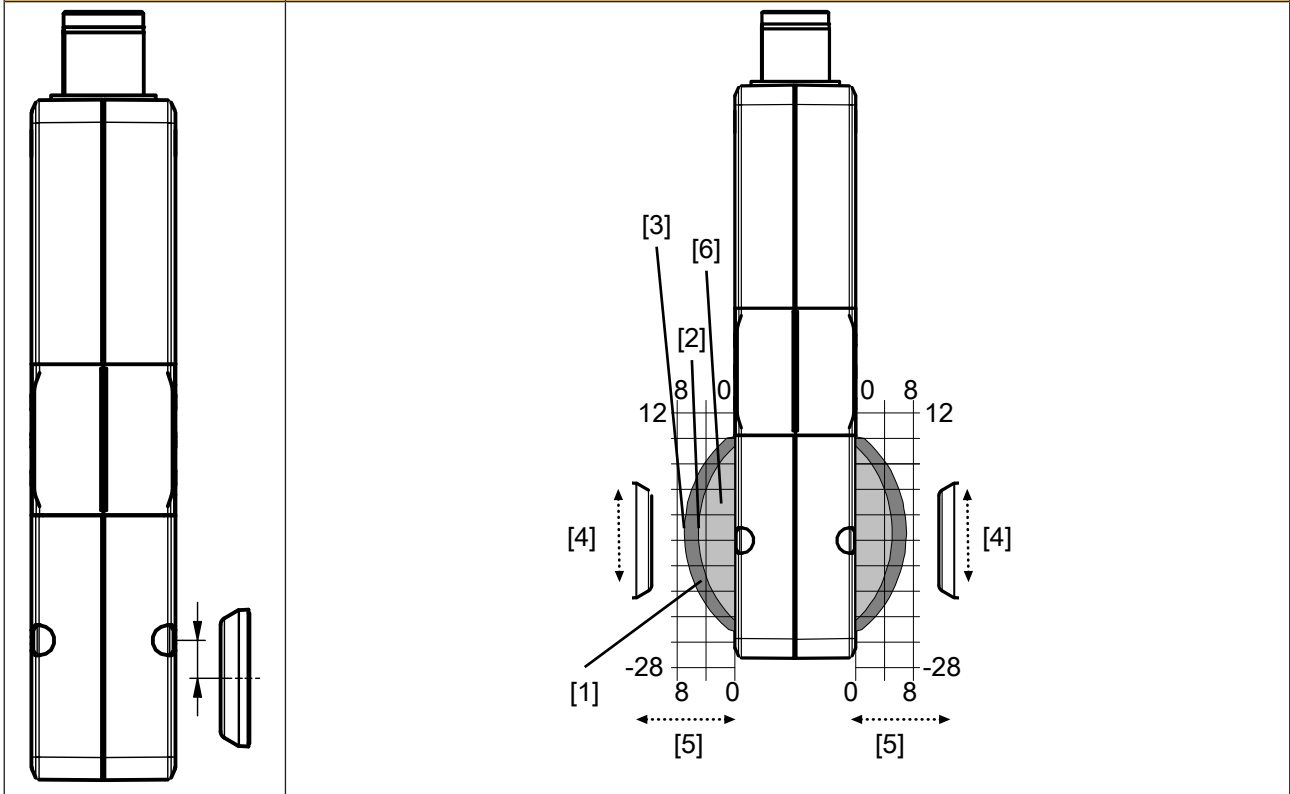
[1] Hysteresis

[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

Important information

▸ Information given in the Technical details [📖 39] 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 max. cable length l_{max} in the input circuit is calculated from

    – the max. cable capacitance at the safety outputs (see Technical data [📖 39]).

    – 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 a protective separation to 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).

Pin assignment, connector and cable

(8-pin M12 connector pin diagram: pins 1-8)	8-pin M12 connector
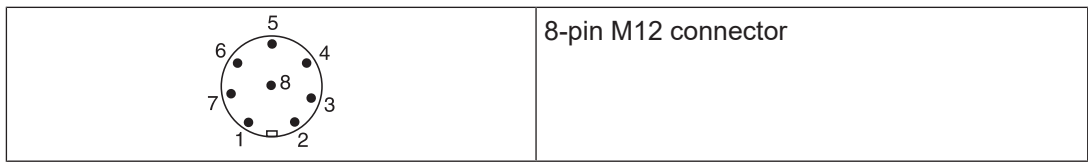
PIN	Connection designation	Function	Wire colour
1	S21	Input, channel 2	white
2	A1	+24 VUB	brown
3	12	Output, channel1	green
4	22	Output, channel2	yellow
5	Y32	Signal output/diagnostic output	grey
6	S11	Input, channel 1	pink
7	A2	0 V UB	blue
8	Y1	Diagnostics input	red

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

Please note:

▸ Information given in the Technical details [📖 39] must be followed.

▸ The use of Safety Device Diagnostics is described in the System Description "Safety Device Diagnostics".
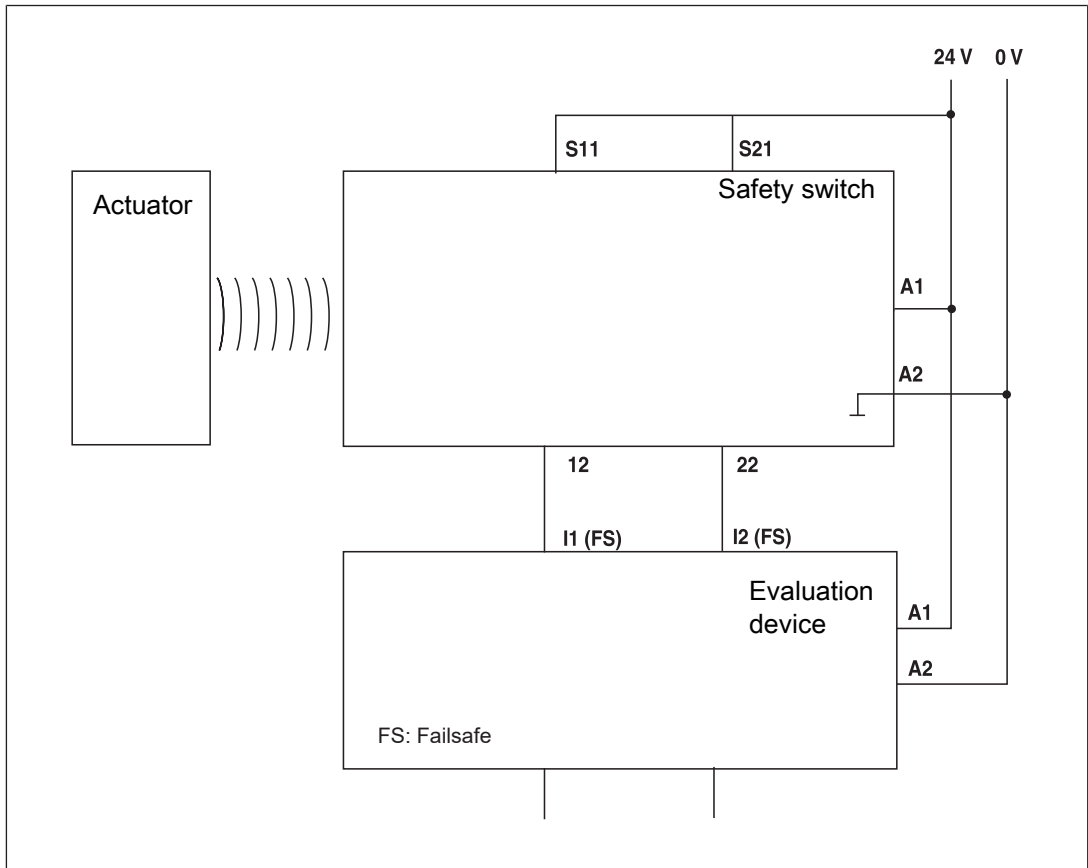
> ⚠ **CAUTION!**
>
> **Do not connect the signal output to 0 V!**
>
> If the signal output Y32 is connected to 0 V, the safety switch may be damaged as a result. Connect the signal output Y32 to a consumer, e.g. to the input on a control system, or leave the signal output unconnected. Also note the max. current (see Technical details [📖 39]).

Single connection

Connection diagram, single connection without SDD

```
                                              24 V    0 V

                        ┌──────┬──────┐
                        │ S11  │ S21  │  Safety switch
  ┌──────────┐   ┌──────┴──────┴──────┐
  │          │   │                     │          A1
  │ Actuator │))) │                     │
  │          │   │                     │          A2
  │          │   │                  ┌──┘
  └──────────┘   └──────┬──────┬────┘
                        │ 12   │ 22  │
                        │I1(FS)│I2(FS)│
                 ┌──────┴──────┴──────┐
                 │                     │  Evaluation
                 │                     │  device      A1
                 │                     │
                 │                     │              A2
                 │ FS: Failsafe        │
                 └──────┬──────┬───────┘
                        │      │
```

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.

When using the SDD, the series connection of maximum 16 sensors PSENcs 5.x and PSENcs 6.x is approved

In series connections with use of the SDD, use only use sensors that are suitable for 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.
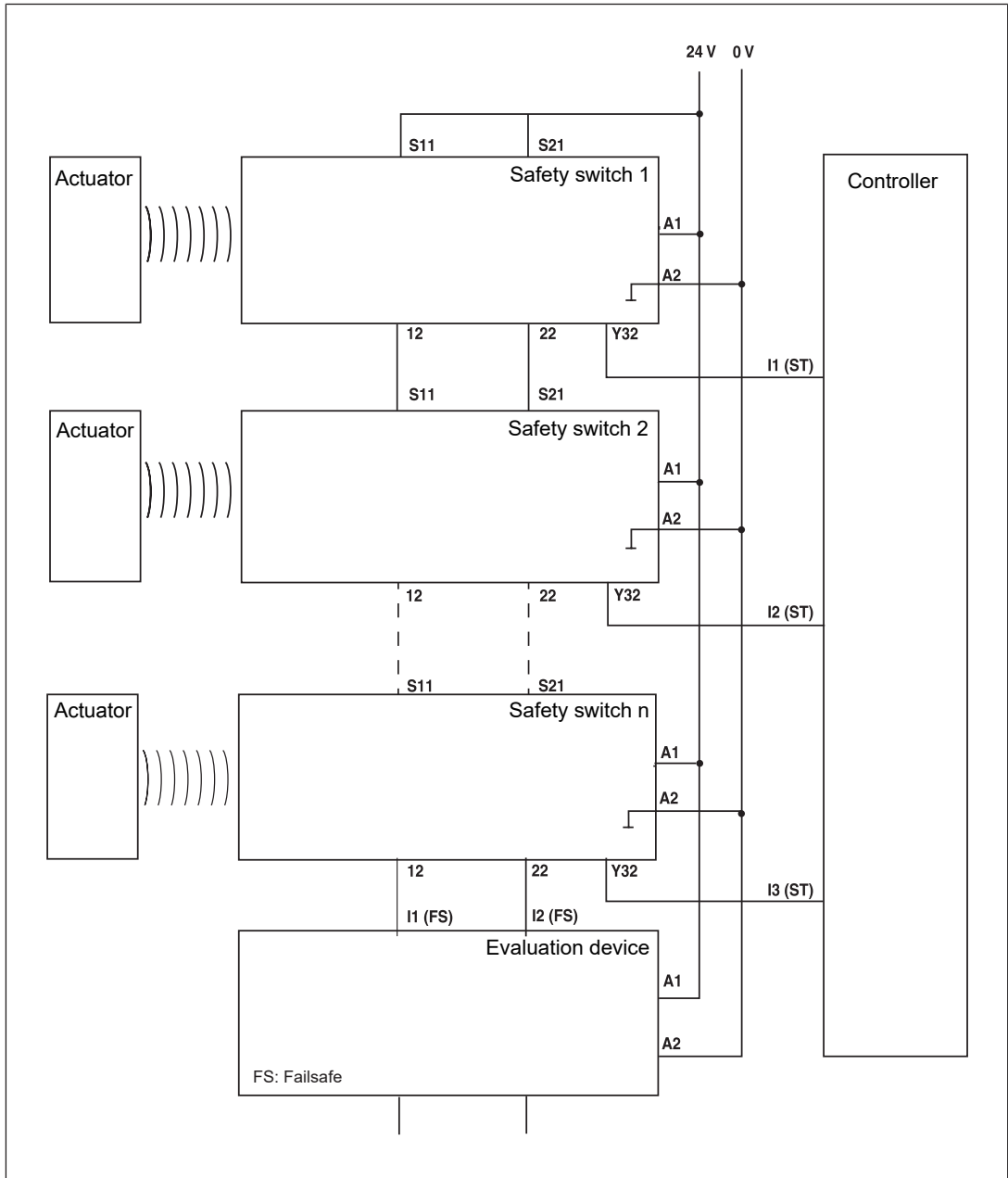> The max. delay-on de-energisation is made up of the
> risk time (see Technical details [📖 39])
> + (n-1) x max. delay-on de-energisation of the inputs
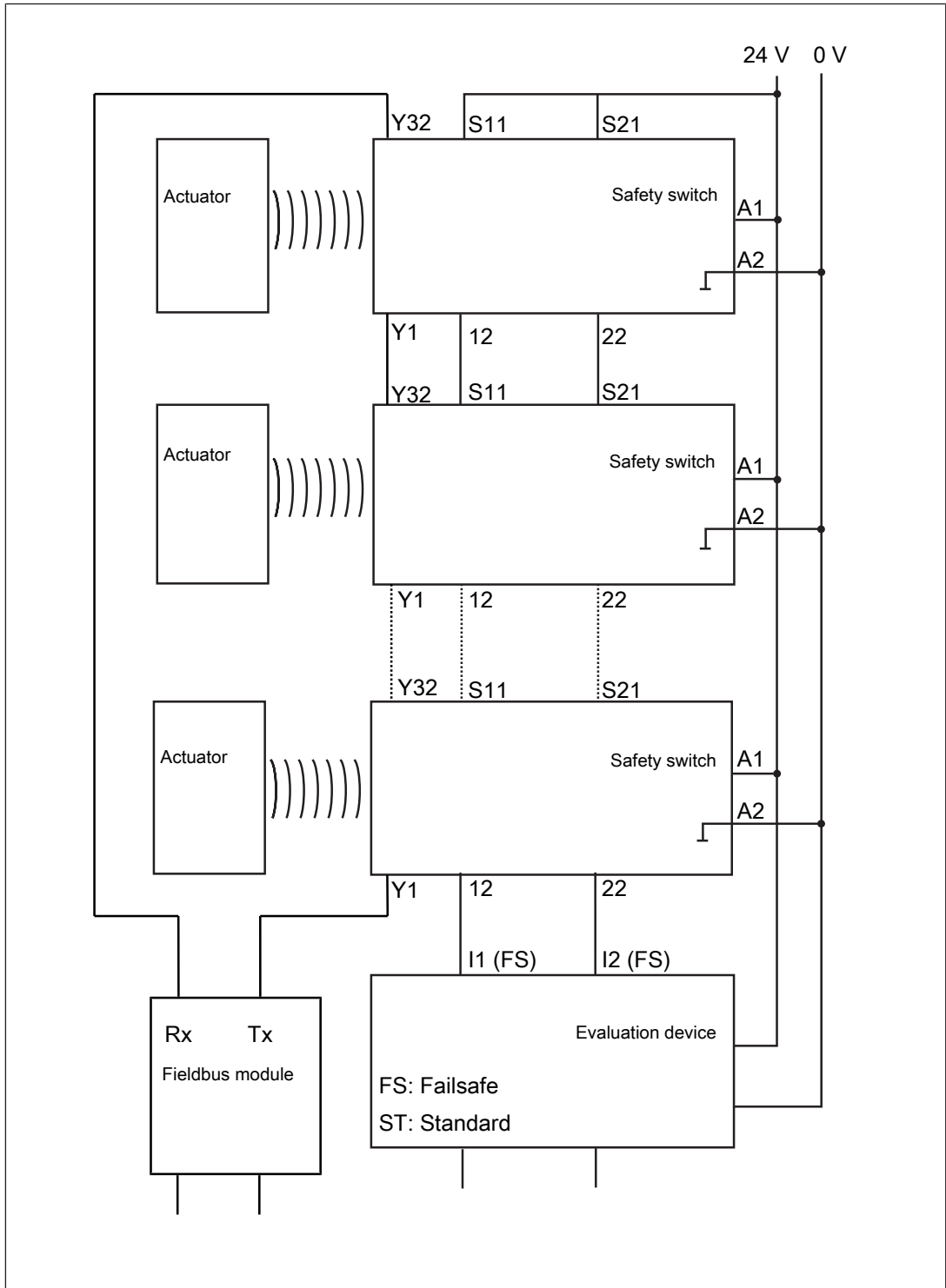> + max. delay-on de-energisation of the evaluation device

‣ 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

	24 V	0 V

Y32 | S11 | S21

Actuator)))))) Safety switch A1 A2

Y1 | 12 | 22
Y32 | S11 | S21

Actuator)))))) Safety switch A1 A2

Y1 | 12 | 22
Y32 | S11 | S21

Actuator)))))) Safety switch A1 A2

Y1 | 12 | 22

I1 (FS) | I2 (FS)

Rx Tx

Fieldbus module

Evaluation device

FS: Failsafe
ST: Standard

Connection to Pilz evaluation devices

The safety switch PSEN cs6.2 M12/8 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

| Without SDD | With SDD |

| Without SDD | With SDD |
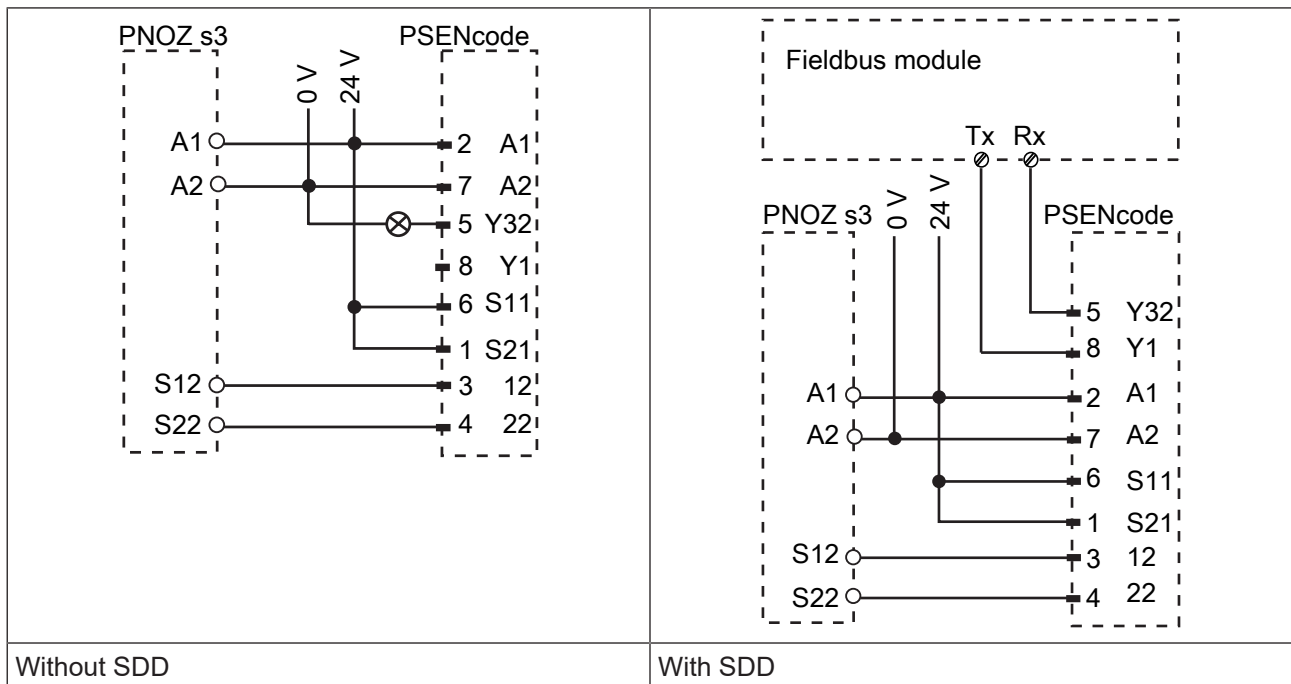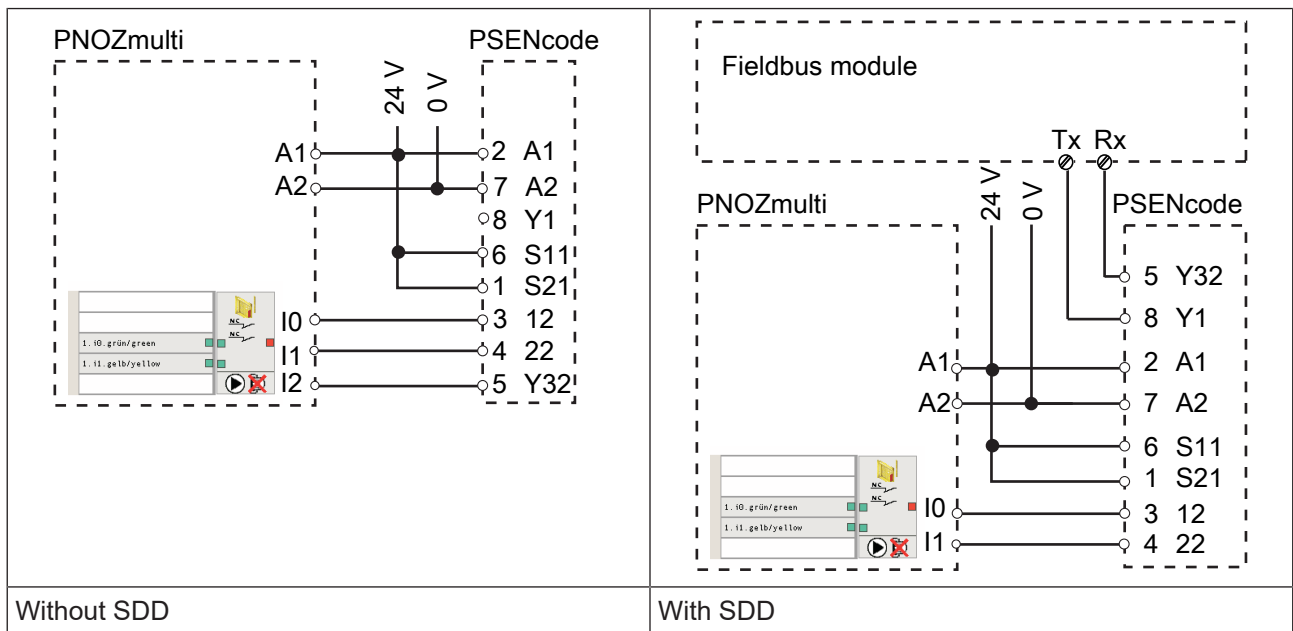
Teaching in the actuator

The first actuator to be detected by the safety switch (see Intended use [6]) is taught in automatically as soon as it is brought into the response range.

> **NOTICE**
>
> No other actuator may be taught in once this actuator has been taught.

Installation

**General**

> **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 [11]).

▸ Torque setting: Please note the information provided under Technical details [39].

▸ The distance between two safety switches must be maintained (see Technical details [39]).

The distance can be undershot in certain application cases (see diagrams).
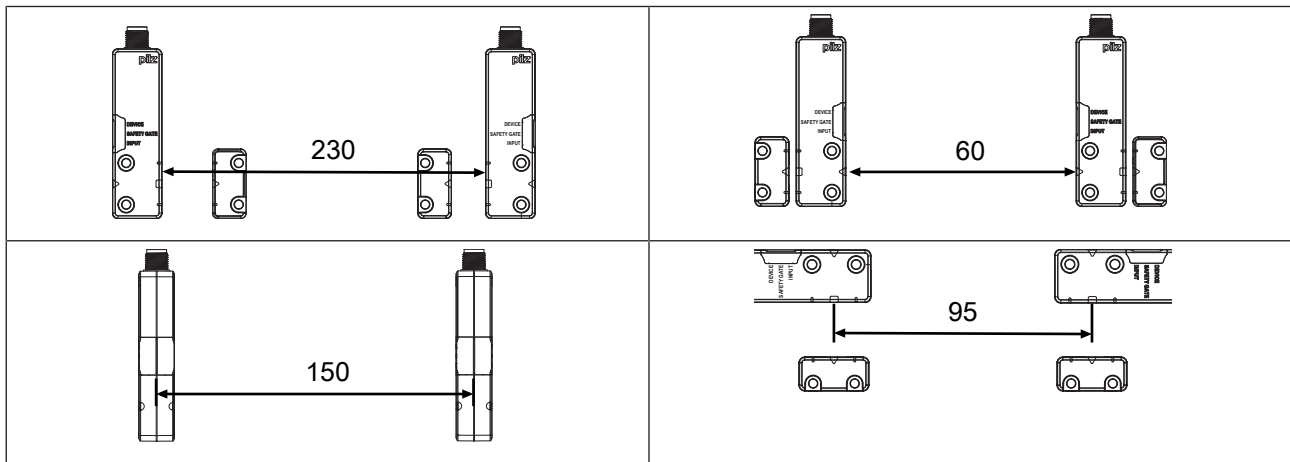
▸ Make sure that the safety switch and actuator cannot be used as an end stop.

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

▸ Please note the permitted bending radii for the cable (see Technical details [📖 39]), to avoid excessive force on the individual strands.

▸ Make sure that the bend protection is not damaged. Such damage can cause the whole product to fail.

▸ For simpler installation, the mounting brackets (see Order reference for Accessories [📖 48]) can be used.

> ⚠ **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 semicircle 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.
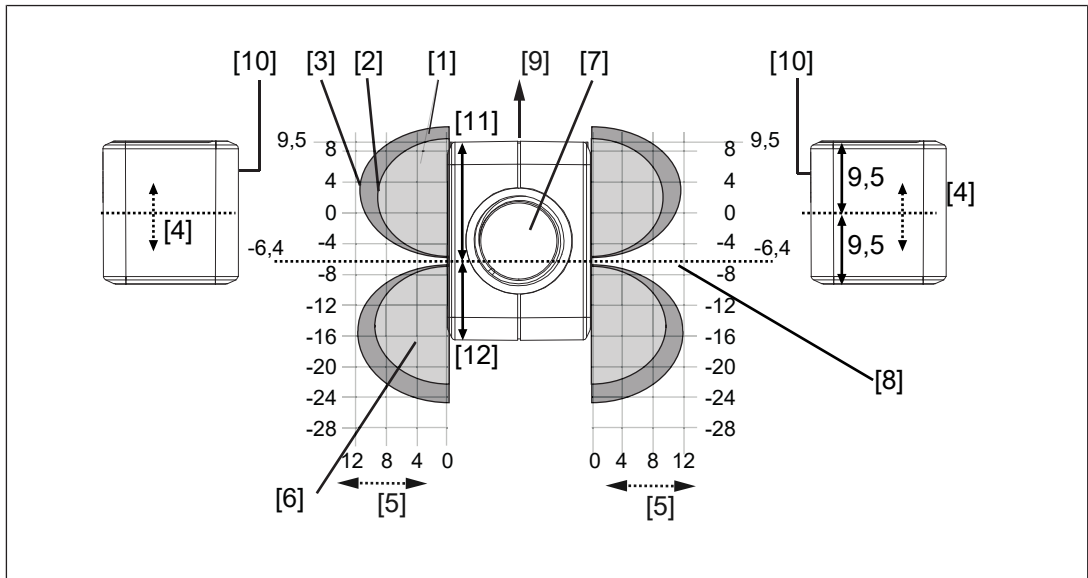
Legend

   [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

Safety switch

▸ Safety switches should only be secured using M4 screws with a flat head (e.g. M4 cheese-head or pan head screws).

Procedure:

1. Provide the mounting surface with two drill holes for fastening the safety switch (see Dimensions in mm [📖 37]).

2. Use a screw to ix 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.

Actuator 6.1

Procedure actuator PSEN cs6.1

1. Provide the mounting surface with two drill holes for fastening the actuator (see Dimensions [📖 37]).

2. 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.

3. Do not fully tighten the second screw on the actuator.

Actuator 6.1 low profile

> ⚠️ **WARNING!**
>
> **Loss of the manipulation protection by inadequate environmental conditions**
>
> The loss of the manipulation protection can allow manipulation of the interlocking device and it may lead to serious injury or death.
>
> – Make sure that the actuator has no direct or repetitive contact with materials such as methyl ethyl ketone (MEK), petrol or isopropanol.

▸ The actuator is secured against unauthorised removal, and against contamination by the sealing. The seal should be regarded as equivalent to using permanent fastenings in accordance with EN ISO 14119.

▸ By removing the actuator, the actuator will be destroyed.

▸ The actuator's adhesive force on the materials aluminium, stainless steel, polycarbonate and glass was checked. For deviating surface materials check the adhesive force on the surface.

▸ After a cure time of 24 hours, 90 % of the final adhesive force are achieved. The hardening must take place at min. 20 °C. With lower temperatures the cure time is clearly extended.

▸ No continuous force must affect the actuator.

Procedure actuator PSEN cs6.1 low profile glue:

1. To seal the low profile actuators correctly, it is necessary to prepare the surface to which the actuator is to be attached.

   The surface must be clean, dry and free of grease.

   Wipe off any solved grease and contaminations with a new, dry paper cloth.

   Clean the surface with 70% isopropanol. Use lint-free paper cloths and change the paper cloths frequently.

   The adhesive surface is clean when the paper remains clean.

   The cleaned surfaces must be sealed immediately to prevent any new contamination by dust and fingerprints.

2. Remove the protective foil from the assembly aid and fix it flush with the sides (see diagram) to the required sensing area of the safety switch.

3. Place the actuator into the assembly aid so that the actuator's covered adhesive surface is on the surface.

   Make sure that the actuator's centre is on the same level as the orientation arrows of the sensor and in the centre of the sensor.
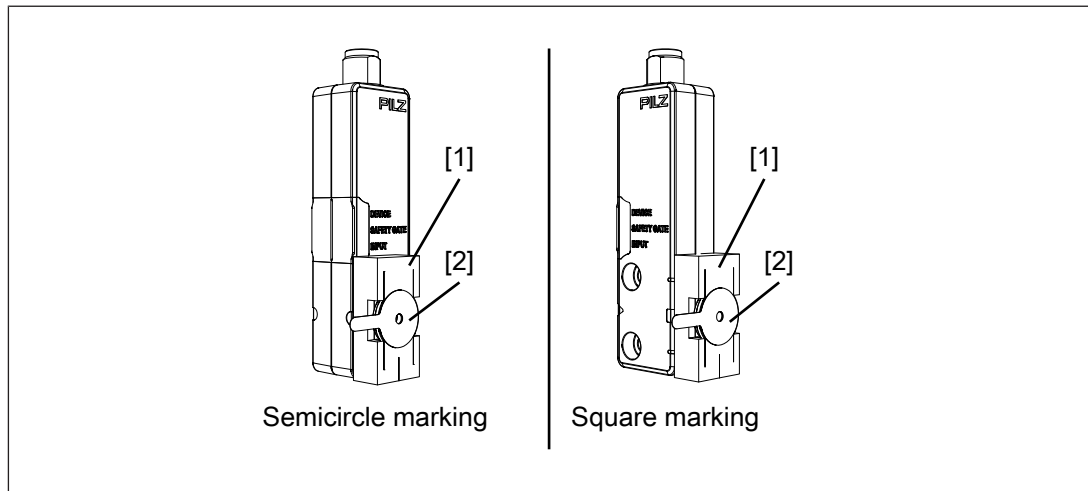

Fig.: Safety switch with assembly aid and low profile actuator oriented to semicircle and square marking

Legend

   [1] Assembly aid for low profile actuator

   [2] low profile actuator

4. Remove the protective foil from the adhesive foil of the actuator.

   Do not touch the adhesive foil after removing the protective foil!

5. Close the safety gate carefully and then press the actuator to the adhesive position.

6. Press on the actuator for at least 3 seconds with approx. 50 N.

   After this time, an adhesive force of approx. 50 % is achieved. The full adhesive force is achieved after 72 hours at an ambient temperature of at least 20 °C.

7. Check the adhesive force of the glue after 10 minutes.

   The actuator must no move when pressed sideways.

8. Remove the assembly aid from the safety switch and clean the sensing area of the safety switch.

Procedure actuator PSEN cs6.1 low profile screw

1. Provide the mounting surface with a drill hole for an additional screw connection of the actuator (see Dimensions in mm [📖 37]).

2. To seal the low profile actuators correctly, it is necessary to prepare the surface to which the actuator is to be attached.

   The surface must be clean, dry and free of grease.

   Wipe off any solved grease and contaminations with a new, dry paper cloth.

Clean the surface with 70% isopropanol. Use lint-free paper cloths and change the paper cloths frequently.

The adhesive surface is clean when the paper remains clean.

The cleaned surfaces must be sealed immediately to prevent any new contamination by dust and fingerprints.

3. Remove the protective foil from the adhesive foil of the actuator.

Do not touch the adhesive foil after removing the protective foil!

4. Insert the screw into the actuator's hole and position the screw at the hole on the mounting surface.

To screw on the actuator, use the supplied plastic M3 countersunk screw.

When using a screw mad from metal the operating distance change, please note the Warning [27].

5. Then press the actuator firmly to the gluing position.

6. Press on the actuator for at least 3 seconds with approx. 50 N.

After this time, an adhesive force of approx. 50 % is achieved. The full adhesive force is achieved after 72 hours at an ambient temperature of at least 20 °C.

7. Check the adhesive force of the glue after 10 minutes.

The actuator must no move when pressed sideways.

8. Additionally, attach the actuator using the M3 plastic screw supplied.

Align safety switch and actuator

▸ The actuator should only be secured using M4 screws with a flat head (e.g. M4 cheese-head or pan head screws).

The actuator should be protected from unauthorised removal and from contamination. Close the mounting holes using the seals provided. The use of seals should be regarded as equivalent to using permanent fastenings in accordance with EN ISO 14119.
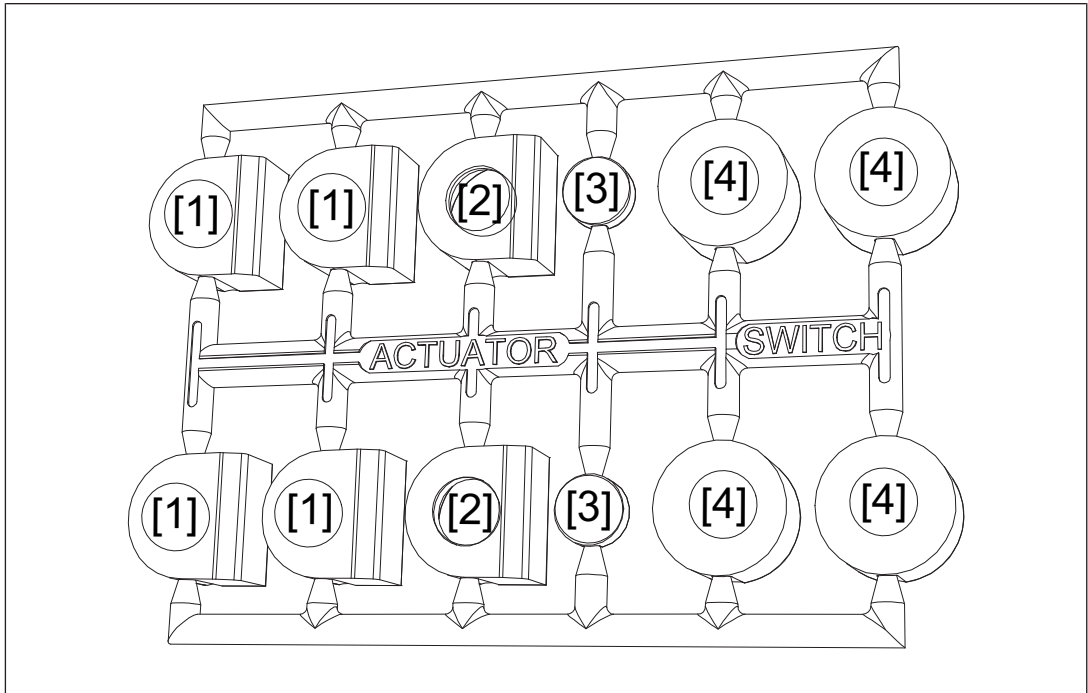
Legend

[1] 4 seals for actuators

[2] Unused seals

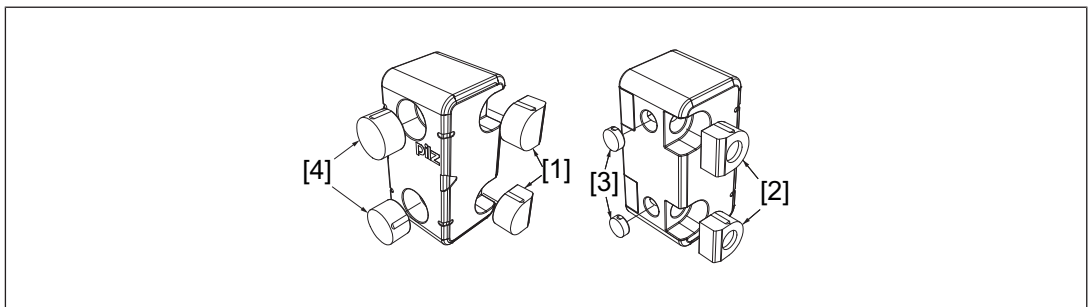[3] 2 seals for actuators

[4] 2 seals for switches, 2 seals unused

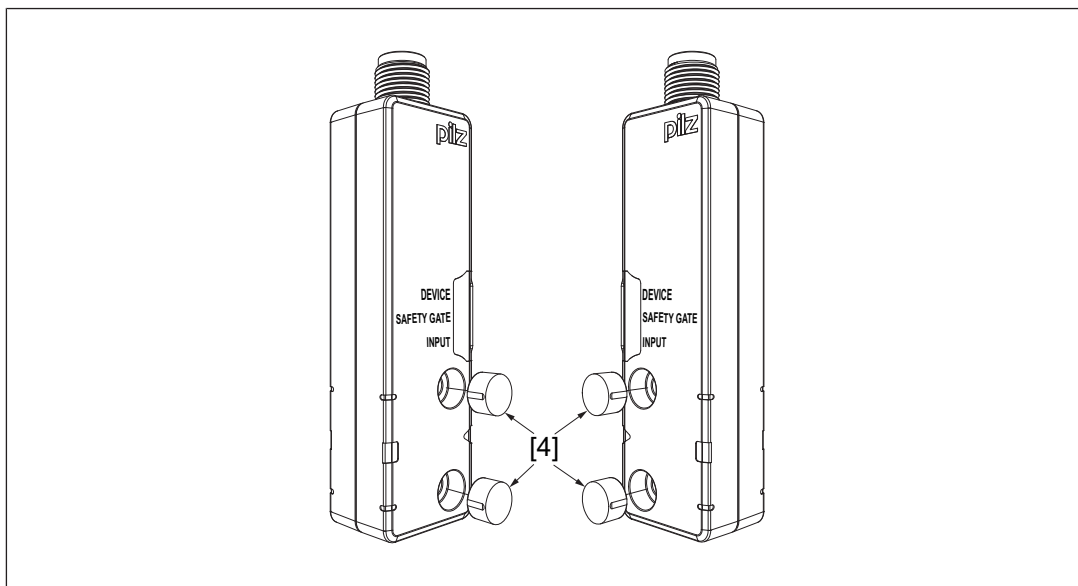Fig.: Applying the screw covers [1] and [3] on the actuator

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

Procedure:

1. Align the safety switch and tighten the screws.

2. Actuator PSEN cs6.1

    Align the actuator and tighten the screws.

3. Use the seals to close the mounting holes on the sensing face of the safety switch (see diagram, [4]).

Use in operating heights higher than 2000 m above sea level

When using the PSEN cs6.2 M12/8 note the reduced max. ambient temperature of +60 °C at a height of 2000 m to 4000 m.

Adjustment

▸ The stated operating distances (see Technical details [39]) 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 [11] and Lateral and vertical offset [13]).

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.

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
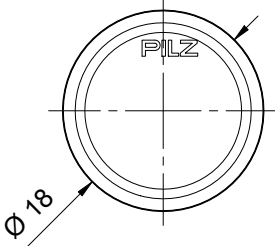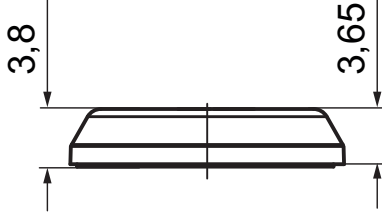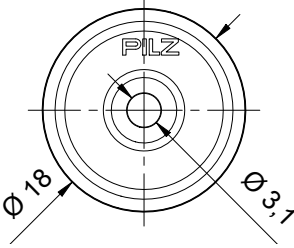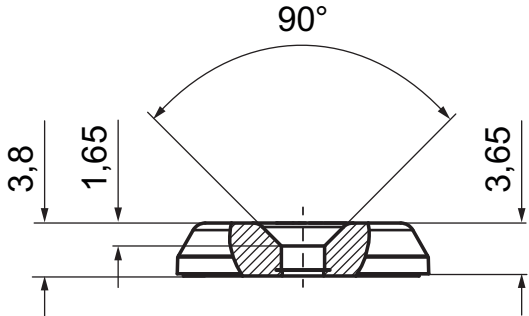
LED status			Switch status	Remedy / measure
Device	**Safety Gate**	**Input**		
Red	● off	● off	Internal error on switch	Change the switch.
Red	Yellow	Yellow	Supply voltage is outside the tolerance range	Ensure the voltage supply corresponds to the Technical details [📖 39].
Yellow	Display not definitive	Display not definitive	Supply voltage is at the limit of the tolerance range	Ensure the voltage supply corresponds to the Technical details [📖 39].
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

DEVICE
SAFETY GATE
INPUT

[3]

[1]
[2]

11,6
90
22
7,5
7,4
26,4

[4]   [4]

101,6
19

Actuator

[2]

Ø 4,5
22
8,3
7,5
4
18

Ø 4,5
37
22
8,3
7,5
9,5
19
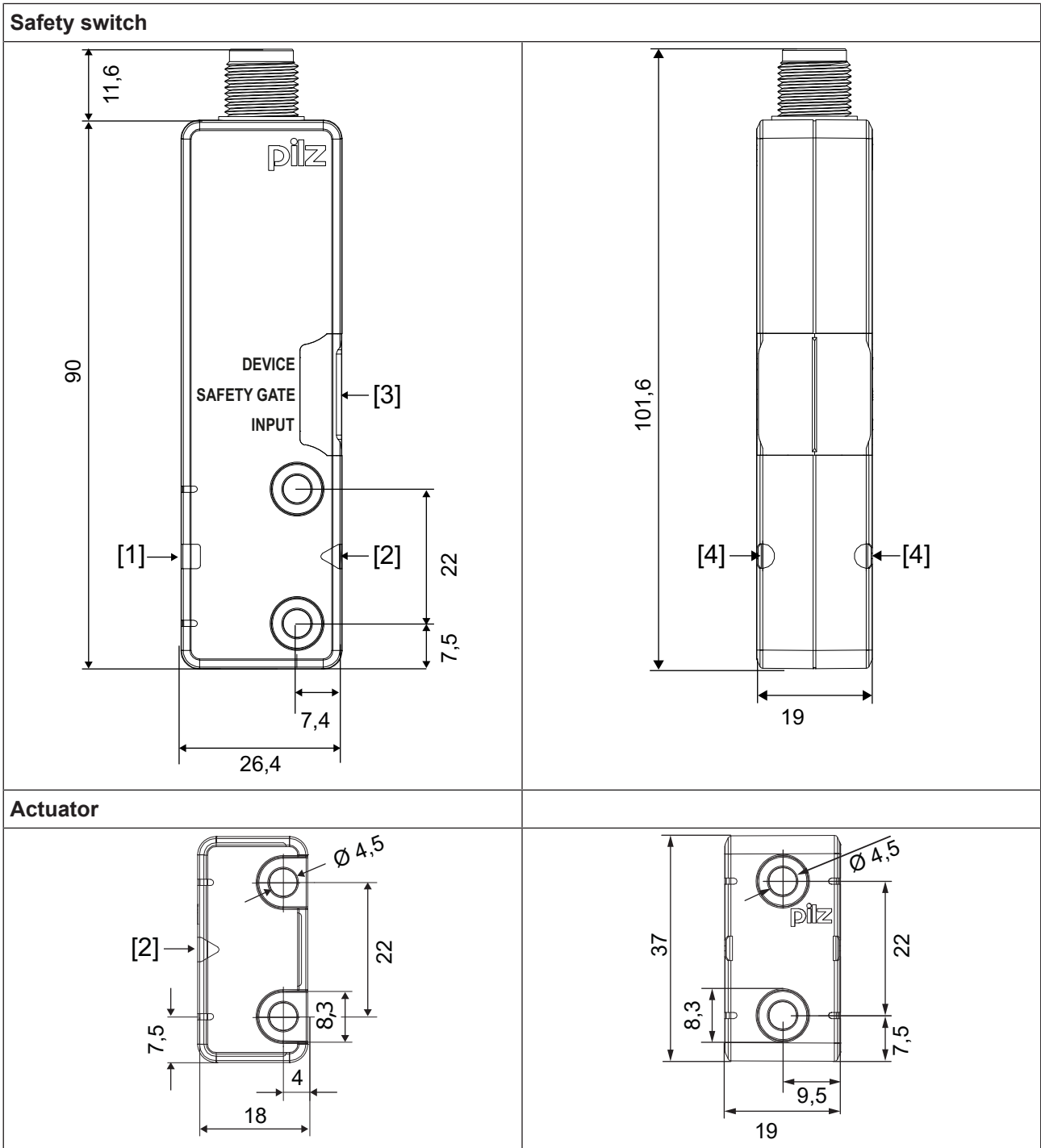
Legend:

[1] Square marking

[2] Triangle marking

[3] LEDs

[4] Semicircle marking

Actuator PSEN cs6.1 low profile glue

Actuator PSEN cs6.1 low profile screw

Technical details safety switch

General	
Certifications	**CE, EAC (Eurasian), ECOLAB, FCC, IC, TÜV, cU-Lus Listed**
Sensor's mode of operation	**Transponder**
Coding level in accordance with EN ISO 14119	**High**
Design in accordance with EN ISO 14119	**4**
Classification in accordance with EN 60947-5-3	**PDDB**
Pilz coding type	**uniquely 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)	**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	
Number	**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	
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	
Ambient temperature	
In accordance with the standard	**EN 60068-2-14**
Temperature range	**-25 - 70 °C**
Max. at max. operating height	**+60 °C**
Max. at max. operating height <2000 m	**+70 °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 sea level	**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**
Protection type	
Housing	**IP66, IP67**

Operating distances	
Actuator 1	
Type	**PSEN cs6.1**
Repetition accuracy switching distances	**3 %**
Change of operating distance with temperature changes	**+-0,02mm/°C**
Actuator 2	
Type	**PSEN cs6.1 low profile glue**
Repetition accuracy switching distances	**3 %**
Change of operating distance with temperature changes	**+-0,02mm/°C**
Actuator 3	
Type	**PSEN cs6.1 low profile screw**
Repetition accuracy switching distances	**3 %**
Change of operating distance with temperature changes	**+-0,02mm/°C**
Operating distances when the actuator approaches square marking	
Actuator 1	
Type	**PSEN cs6.1**
Assured operating distance Sao	**8 mm**
Assured release distance Sar	**20 mm**
Typical operating distance So	**11 mm**
Typical release distance Sr	**14 mm**
Typical hysteresis	**2 mm**
Actuator 2	
Type	**PSEN cs6.1 low profile glue**
Assured operating distance Sao	**5 mm**
Assured release distance Sar	**20 mm**
Typical operating distance So	**10 mm**
Typical release distance Sr	**12 mm**
Typical hysteresis	**2 mm**
Actuator 3	
Type	**PSEN cs6.1 low profile screw**
Assured operating distance Sao	**5 mm**
Assured release distance Sar	**20 mm**
Typical operating distance So	**10 mm**
Typical release distance Sr	**12 mm**
Typical hysteresis	**2 mm**

Operating distances when the actuator approaches triangle marking	
Actuator 1	
Type	**PSEN cs6.1**
Assured operating distance Sao	**4 mm**
Assured release distance Sar	**12 mm**
Typical operating distance So	**5 mm**
Typical release distance Sr	**8 mm**
Typical hysteresis	**2 mm**
Operating distances when the actuator approaches semicircle marking	
Actuator 1	
Type	**PSEN cs6.1**
Assured operating distance Sao	**3 mm**
Assured release distance Sar	**16 mm**
Typical operating distance So	**6 mm**
Typical release distance Sr	**8 mm**
Typical hysteresis	**2 mm**
Actuator 2	
Type	**PSEN cs6.1 low profile glue**
Assured operating distance Sao	**2 mm**
Assured release distance Sar	**14 mm**
Typical operating distance So	**5 mm**
Typical release distance Sr	**7 mm**
Typical hysteresis	**2 mm**
Actuator 3	
Type	**PSEN cs6.1 low profile screw**
Assured operating distance Sao	**2 mm**
Assured release distance Sar	**14 mm**
Typical operating distance So	**5 mm**
Typical release distance Sr	**7 mm**
Typical hysteresis	**2 mm**
Mechanical data	
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. torque setting for fixing screws	**1 Nm**
Dimensions	
Height	**26,4 mm**
Width	**101,6 mm**
Depth	**19 mm**
Weight	**68 g**

Where standards are undated, the 2015-11 latest editions shall apply.

Technical details actuator

Order no. 542183 PSEN cs6.1

See below for more order numbers

General	
Certifications	**CE, EAC (Eurasian), ECOLAB, TÜV, cULus Listed**
Sensor's mode of operation	**Transponder**
Coding level in accordance with EN ISO 14119	**High**
Pilz coding type	**fully coded**
Transponder	
Frequency band	**122 kHz - 128 kHz**
Environmental data	
Ambient temperature	
In accordance with the standard	**EN 60068-2-14**
Temperature range	**-25 - 70 °C**
Max. at max. operating height	**+60 °C**
Max. at max. operating height <2000 m	**+70 °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 sea level	**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**
Protection type	
Housing	**IP66, IP67**
Mechanical data	
Material	**PBT**
Max. torque setting for fixing screws	**1 Nm**
Dimensions	
Height	**18 mm**
Width	**37 mm**
Depth	**19 mm**
Weight	**15 g**

Order no. 542187 PSEN cs6.1 low profile glue

Order no. 542188 PSEN cs6.1 low profile screw

General	542187	542188
Certifications	CE, EAC (Eurasian), TÜV, cULus Listed	CE, EAC (Eurasian), TÜV, cULus Listed
Sensor's mode of operation	Transponder	Transponder
Coding level in accordance with EN ISO 14119	High	High
Pilz coding type	fully coded	fully coded
Transponder	**542187**	**542188**
Frequency band	122 kHz - 128 kHz	122 kHz - 128 kHz
Environmental data	**542187**	**542188**
Ambient temperature		
In accordance with the standard	EN 60068-2-14	EN 60068-2-14
Temperature range	-25 - 70 °C	-25 - 70 °C
Max. at max. operating height	+60 °C	+60 °C
Max. at max. operating height <2000 m	+70 °C	+70 °C
Storage temperature		
In accordance with the standard	EN 60068-2-1/-2	EN 60068-2-1/-2
Temperature range	-40 - 85 °C	-40 - 85 °C
Climatic suitability		
In accordance with the standard	EN 60068-2-30	EN 60068-2-30
Humidity	93 % r. h. at 40 °C	93 % r. h. at 40 °C
Max. operating height above sea level	4000 m	4000 m
EMC	EN 60947-5-3	EN 60947-5-3
Vibration		
In accordance with the standard	EN 60947-5-2	EN 60947-5-2
Frequency	10 - 55 Hz	10 - 55 Hz
Amplitude	1 mm	1 mm
Shock stress		
In accordance with the standard	EN 60947-5-2	EN 60947-5-2
Acceleration	30g	30g
Duration	11 ms	11 ms
Protection type		
Housing	IP67	IP67
Mechanical data	**542187**	**542188**
Material		
Top	PBT	PBT
Max. torque setting for fixing screws	–	0,1 Nm
Dimensions		
Height	3,8 mm	3,8 mm
Width	18 mm	18 mm
Depth	18 mm	18 mm

Mechanical data	542187	542188
Weight	**2 g**	**2 g**

Where standards are undated, the 2015-11 latest editions shall apply.

Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Class	C2
Source	
Class	C2, C3
Drain parameters	
Test pulse duration, safety outputs	450 µs
Min. test pulse interval	1,25 ms
Min. input resistance	9,9 kOhm
Max. capacitive load	1 nF

Single-pole output	
Interfaces	
Source	
Interface	Sensor
Class	C2
Drain	
Class	C1, C2
Source parameters	
Max. test pulse duration	150 µs
Max. rated current	0,1 A
Max. capacitive load	40 nF

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	9,56E-10	–	8,51E-06	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

Order reference

Safety switch

Product type	Features		Order no.
PSEN cs6.2 M12/8 1switch	Safety switch, uniquely fully coded	8-pin M12 connector	542 259

Actuator

Product type	Features		Order no.
PSEN cs6.1 M12 1actuator	Actuator, fully coded		542 183
PSEN cs6.1 low profile glue 1 actuator	Actuator fully coded, without screw		542 187
PSEN cs6.1 low profile screw 1 actuator	Actuator fully coded, with screw		542 188

Complete systems

Product type	Features		Order no.
PSEN cs6.2 M12/8/ PSEN cs6.1 M12 1unit	Safety gate system, uniquely fully coded	8-pin M12 connector	542 209

Accessories

Installation materials

Product type	Features	Order no.
PSEN bracket	Mounting bracket	532 110
PSEN mag/cs bracket straight	Mounting aid	532 111
PSEN screw M4x20 10pcs	Safety screws made from stainless steel with one-way slot	540 313
PSEN screw M4x26 10pcs	Safety screws made from stainless steel with one-way slot	540 314
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	532 112

Cable

Product type	Connection 1	Connection 2	Length	Order no.
PSEN cable M12-8sf	Straight, M12, 8-pin, socket	Open cable	3 m	540 319
			5 m	540 320
			10 m	540 321
			20 m	540 333
			30 m	540 326
PSEN cable M12-8af	Angled, M12, 8-pin, socket	Open cable	3 m	540 322
			5 m	540 323
			10 m	540 324
			30 m	540 325
PSEN cable M12-8sf M12-8sm	straight, M12, 8-pin, socket	straight, M12, 8-pin, pin	2 m	540 340
			5 m	540 341
			10 m	540 342
			20 m	540 343
			30 m	540 344

Series connection

Product type	Connection X1	Connection X2	Connection X3	Order no.
PSEN Y junction M12 SENSOR	M12, 8-pin, pin	M12, 8-pin, socket	M12, 8-pin, socket	540 315
PSEN Y junction M12 cable channel	M12, 8-pin, pin	M12, 8-pin, socket	M12, 8-pin, socket	540 316
PSEN T junction M12	M12, 8-pin, socket	M12, 8-pin, pin	M8, 4-pin, pin	540 331

Product type	Connection X1	Connection X2	Connec-tion X3	Order no.
PSEN Y junction M8-M12/ M12 PIGTAIL	M12, 8-pin, socket	M12, 8-pin, pin	M8, 8-pin, socket	540 337
PSEN Y junction M12-M12/ M12 PIGTAIL	M12, 8-pin, socket	M12, 8-pin, pin	M12, 8-pin, socket	540 338

Product type	Features	Order no.
PDP67 F 4 code	Decentralised passive junction	773 603
PDP67 F 4 code VA	Decentralised passive junction, V2A ring nut	773 613

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	535 111
PSEN ix2 F8 code	Interface for connecting max. 8 PSEN safety sensors	Spring-loaded terminal	535 112
SDD ES ETH	Fieldbus module Modbus/ TCP for Safety Device Dia-gnostics	Spring-loaded terminal	540 130
SDD ES Profibus	Fieldbus module Profibus for Safety Device Dia-gnostics	Spring-loaded terminal	540 132
SDD ES Profinet	Fieldbus module for Safety Device Diagnostics	Spring-loaded terminal	540 138

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.
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▶ Support

Technical support is available from Pilz round the clock.

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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.

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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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