



Visualisation; Diagnostics

Easy to Configure

Programming IEC 61131-3

Rapid Installation

PSEN ml s 1.1

PILZ

THE SPIRIT OF SAFETY

► PSEN sensor technology

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SD means Secure Digital

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1 Introduction

1.1 Validity of documentation

This documentation is valid for the product PSEN ml s 1.1 from Version 2.0.

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

1.2 Using the documentation

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

1.3 Definition of symbols

Information that is particularly important is identified as follows:



DANGER!

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



WARNING!

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



CAUTION!

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



NOTICE

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



INFORMATION

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

2 Safety

2.1 Intended use

The safety gate system is used for interlocking and guard locking swing gates and sliding gates.

The safety gate system can be operated in two ways:

▶ **Unlocking with condition**

The safety gate system prevents the safety gate from being unlocked while there is any hazard within the danger zone.

▶ **Unlocking without condition**

The operator can unlock the safety gate system at any time. After starting the unlocking, the guard locking creates a stop command. The time required to unlock the interlocking guard has to be longer than the time required to stop the hazardous machine function.

The hazardous machine function may only be executed under the following conditions:

- ▶ There is a high signal at safety outputs 12 and 22 and
- ▶ There is a low signal at safety outputs S31 (Lock/Unlock Request 1) and S41 (Lock/Unlock Request 2).

Safety inputs S31 and S41 (solenoid operation) may only be operated under the following condition:

▶ **Plant is in a safe condition**

Make sure that this is the case with an AND operation in the safety system immediately before the output is operated.

The safety switch meets the requirements in accordance with:

- ▶ EN 60947-5-3 with the actuator PSEN ml 1.1: PDDDB
- ▶ EN 62061: SIL CL 3
- ▶ EN ISO 13849-1: PL e (Cat. 4)
- ▶ EN ISO 14119: Coding level Low, type 4

The safety switch may only be used with the corresponding actuator PSEN ml 1.1.

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

- ▶ the safety outputs use 2-channel processing
- ▶ The solenoid has 2-channel operation via safe, tested outputs, suitable for PL e (Cat. 4)/SIL CL 3 applications.

With 1-channel operation of the safety inputs S31 (Lock/Unlock Request 1) and S41 (Lock/Unlock Request 2) it is only possible to achieve safety level PL d (Cat. 2)/SIL CL 2.

Foreseeable misuse

- ▶ Safety switches and actuators of the safety gate system PSEN ml s 1.1 must **not** be used as mechanical limit stops
 - ▶ Use of the PSEN ml s 1.1 under corrosive environmental conditions (cooling emulsions, surface treatment, gases, ...)
- Please contact Pilz.

2.2 Safety regulations

2.2.1 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.

2.2.2 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 ml Y junction M12

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

2.2.3 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.

2.2.4 Warranty and liability

All claims to warranty and liability will be rendered invalid if

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

2.2.5 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).

2.3 For your safety



WARNING!

Loss of safety function due to substituting an actuator from the interlocking and guard locking system

Substituting an actuator for an inappropriate actuator may lead to serious injury and death.

- You should prevent the interlocking and guard locking system from being manipulated with an inappropriate 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](#) [📖 37]
- 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.

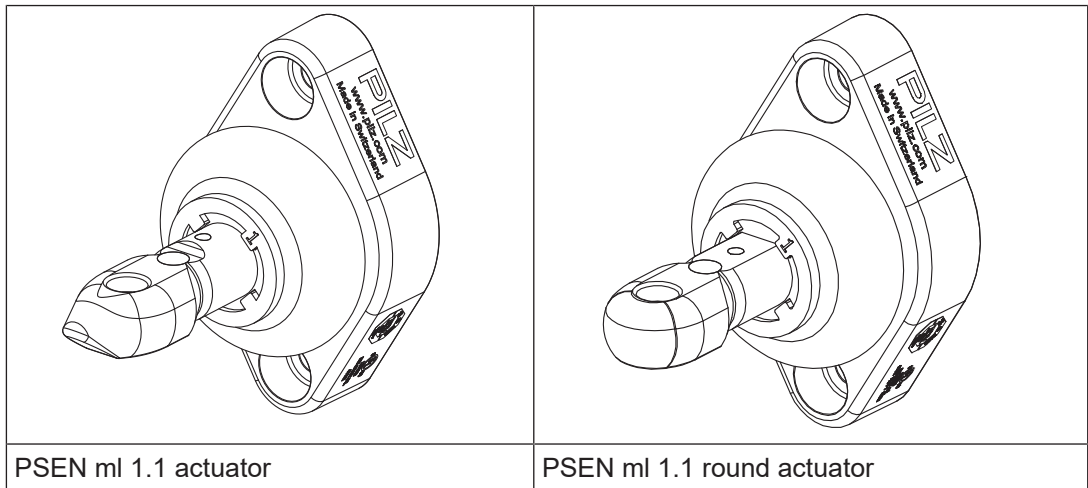
3 Overview

3.1 Unit features

- ▶ Safe guard locking for swing gates and sliding gates
- ▶ Safe interlocking (position monitoring)
- ▶ Transponder technology
- ▶ 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
- ▶ Monitoring of shorts between the safety outputs
- ▶ Guard locking element keeps the safety gate from being opened unintentionally
- ▶ Auxiliary release for opening the safety gate
- ▶ 1 signal output
- ▶ Suitable for left and right hinged safety gates
- ▶ Pilz coding type: Coded
- ▶ M12, 12-pin male connector
- ▶ LEDs:
 - Supply voltage/fault
 - Status of actuator
 - Status of guard locking
 - Status of safety inputs S11 and S21
- ▶ The bolt in the actuator can be rotated 90° in the actuator housing before the actuator is installed. As a result, the actuator can be installed vertically or horizontally.
- ▶ The safety switch PSEN ml s 1.1 can be expanded using up to three stationary and/or external escape releases (see [Order reference: Accessories \[75\]](#)).

The stationary escape release can be expanded by 25 mm max. two times.

The external escape releases are available with push/pull cables between 0.5 and 4 m in length (grading 50 cm).
- ▶ On small door radiuses, (see [Install the safety switch horizontally at a swing gate \[45\]](#)) the PSEN ml actuator center ring can be inserted (see [Order reference: Accessories \[75\]](#)).
- ▶ The actuator is available in two versions (see [Order reference: Accessories \[75\]](#)).
 - Standard actuator PSEN ml 1.1 actuator
 - Actuator with rounded head PSEN ml 1.1 round actuator



3.2

Scope of supply

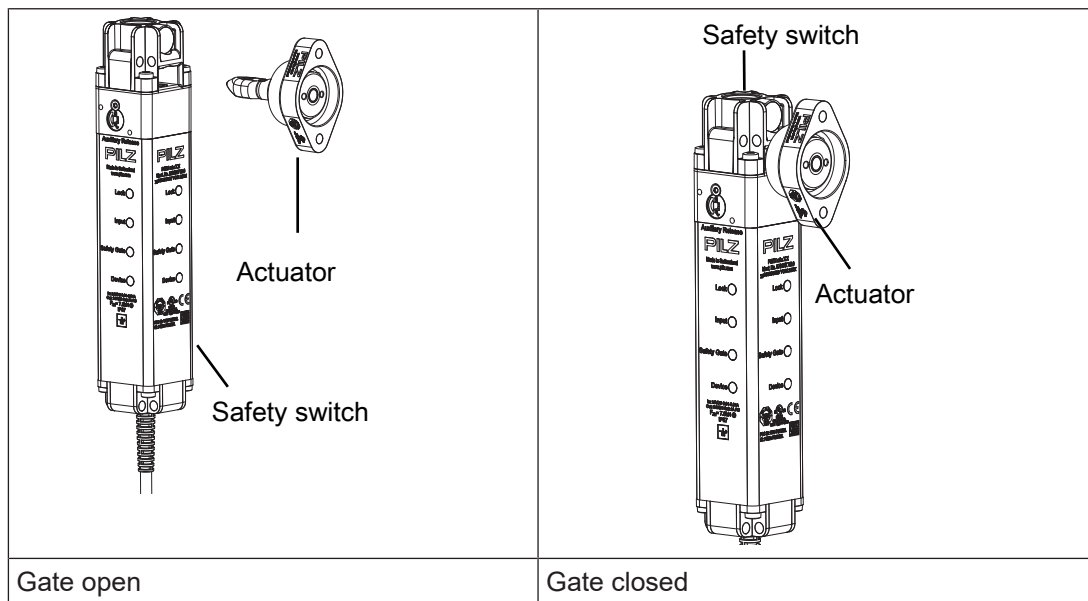
- ▶ Scope of supply PSEN ml s 1.1
 - Safety switch PSEN ml s 1.1
 - Actuator

4 Function description

4.1 Structure

The interlocking and guard locking system prevents the safety gates to the danger zone from being opened while there is any hazard within the danger zone (machine movement, voltage, ...).

The safety outputs may have a high or low signal, depending on the position of the actuator and the signal path of safety inputs S31 and S41 (solenoid operation).



Safety outputs 12 and 22

Under these conditions there is a high signal at safety outputs 12 and 22:

- ▶ Actuator is detected **and**
- ▶ Guard locking pin has successfully been activated (guard locking pin is in the locked position) **and**
- ▶ There is a high signal at the inputs S11 and S21

If one of these conditions is not met, the signal at the safety outputs will be low.

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 flashes yellow**
- ▶ 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**

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](#) [59]).

- ▶ 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 must be connected to 24 V. In a series connection the signal output/diagnostic output Y32 must be connected in series to the diagnostic input Y1 of the next sensor in the series connection.

▶ **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.

4.2 Activation of safety inputs S31 and S41 (solenoid operation)

- ▶ If there is a low signal at safety inputs S31 and S41, the guard locking pin does not change its position.
- ▶ Guard locking may only be deactivated once the hazardous movement has been completed.

Active use of Safety Device Diagnostics

- ▶ The safety inputs S31 and S41 have a high signal within max. 500 ms after the receipt of the guard locking activation.

Single connection

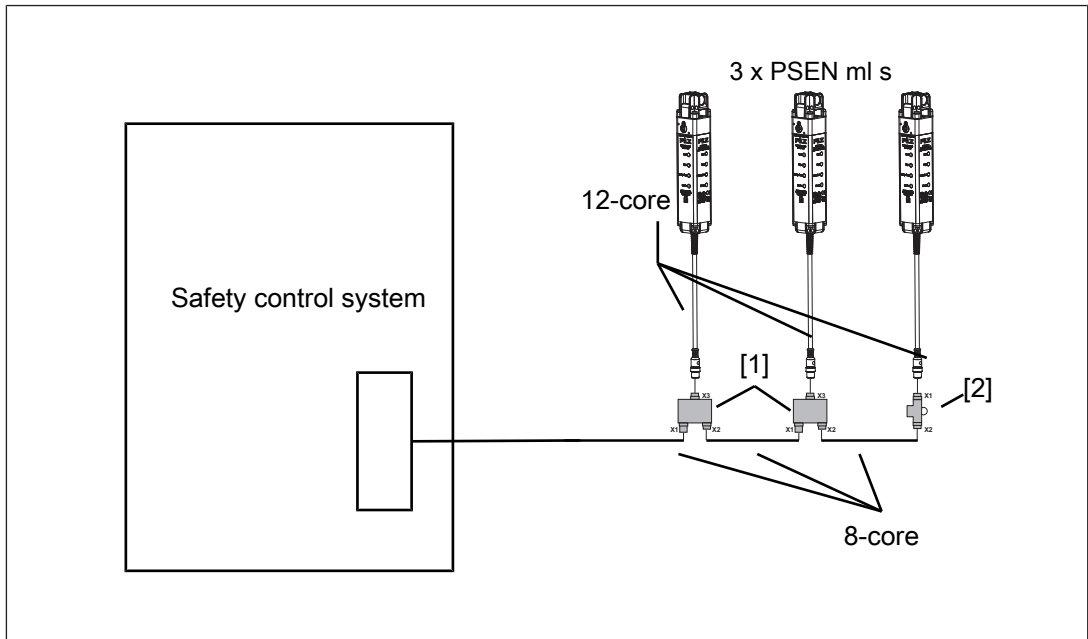
Guard locking is activated through a high signal (duration 350 - 400 ms) at inputs S31 and S41 (solenoid operation). After activation, the inputs must be low. Another pulse (duration 350 - 400 ms) at these inputs deactivates guard locking.

Series connection

In a series connection with n safety switches the guard locking is activated by a high signal with a minimum duration of $t = n * (350 - 400 \text{ ms})$ at the inputs S31 and S41 (solenoid operation).

| Number of safety switches in the series connection | Pulse duration Lock/Unlock Request in ms |
|--|--|
| 1 | 350 |
| 2 | 700 |
| 3 | 1050 |
| 4 | 1400 |
| 5 | 1750 |
| 6 | 2100 |

After activation, the inputs must be low. Another pulse of the specified duration at these inputs deactivates guard locking.

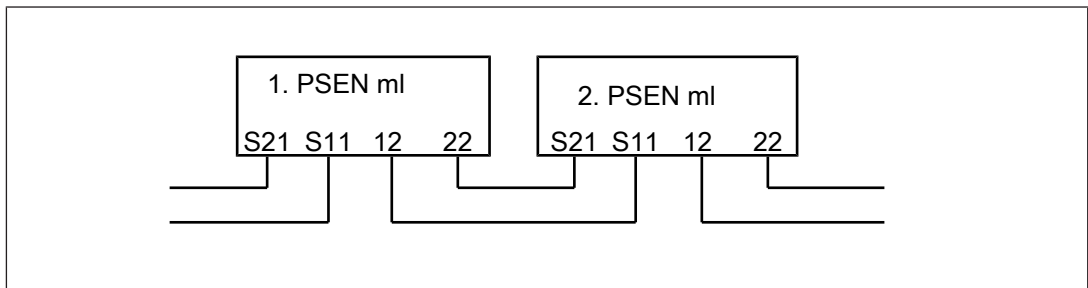


Legend

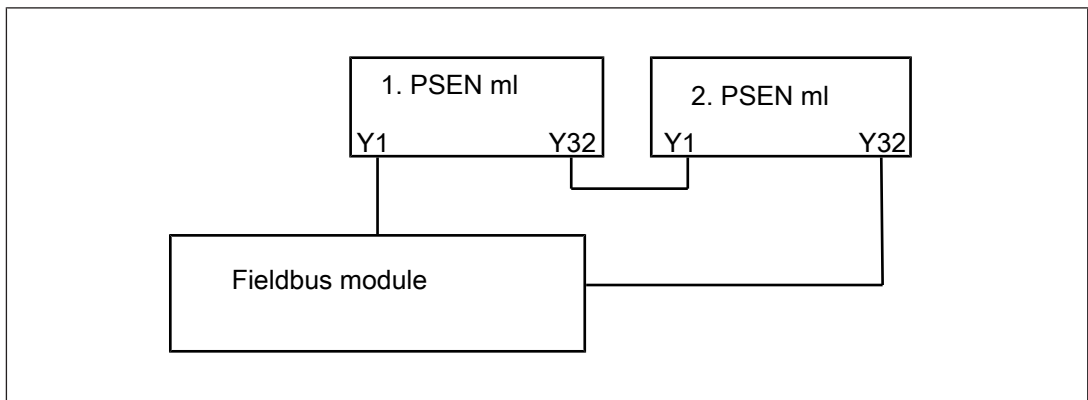
[1] PSEN ml Y junction M12

[2] PSEN ml end adapter

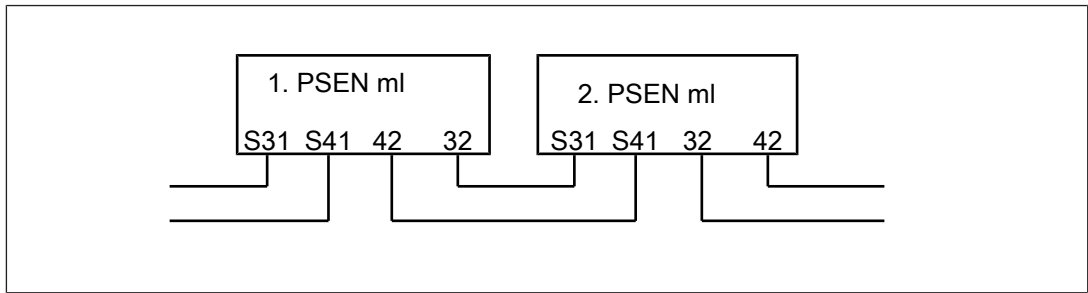
► Series connection of the OSSD outputs



► Series connection of diagnostics with Safety Device Diagnostics

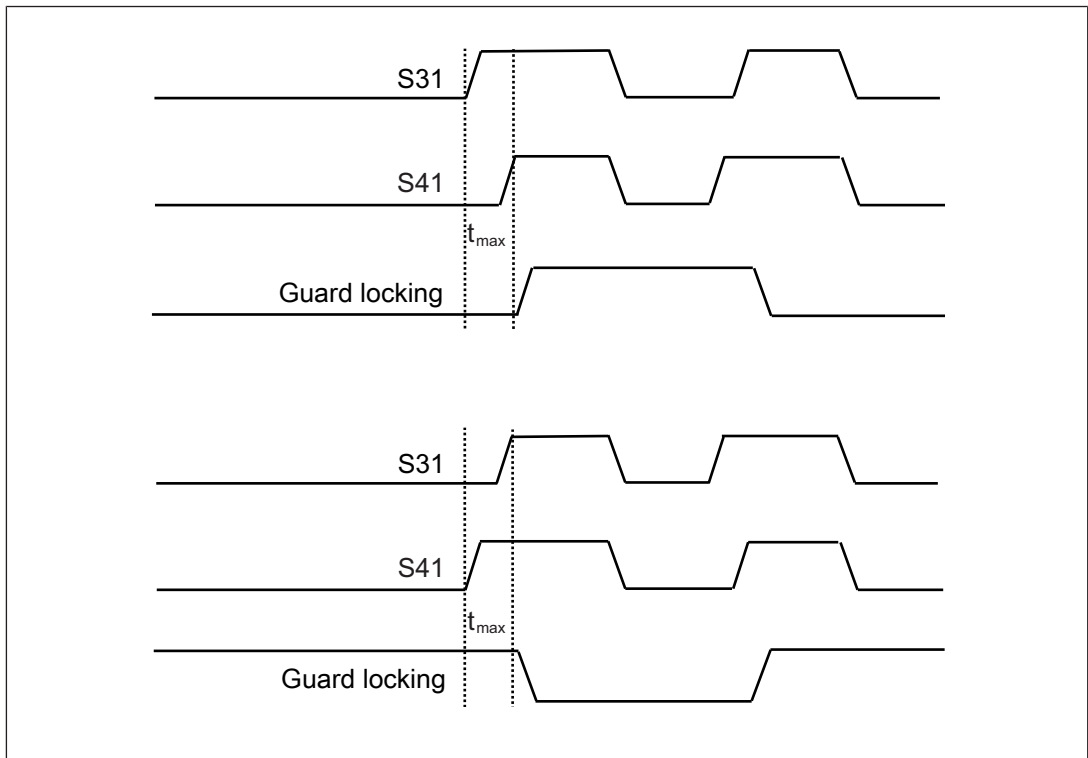


► Series connection of the solenoid operation



4.2.1 Activation with specification of direction

- ▶ The guard locking is activated when the time between the rising edges from S31 to S41 is between 40 ms and 500 ms (S31 before S41).
- ▶ The guard locking is deactivated when the time between the rising edges from S31 to S41 is between 40 ms and 500 ms (S41 before S31).



Legend

t_{max} Maximum time between the rising edges from S31 and S42

4.2.2 Activation without specification of direction

- ▶ The guard locking changes its state when the time between the rising edges from S31 and S41 < 20 ms.

4.3 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 switch)
 - Perform actions (example: poll updated actuator name)
 - Selectively activate or deactivate guard locking of individual PSEN ml within a series connection


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](#)  75) 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](#)  8].

4.4 Operating modes

The safety switch can be used in various operating modes.

- ▶ Operation without safety device diagnostics
 - Standard operating mode
After every restart the safety switch is in operation without Safety Device Diagnostics.
 - No communication with Safety Device Diagnostics
 - Activating/deactivating the guard locking is only via the signals S31 and S41
- ▶ Operation with passive use of the Safety Device Diagnostics
 - Safety switch supplies diagnostic data to Safety Device Diagnostics
 - Activating/deactivating the guard locking is only via the signals S31 and S41
- ▶ Operation with active use of the Safety Device Diagnostics
 - Activate/deactivate the guard locking by a combination of a Safety Device Diagnostics command and the status of the safety inputs S31 and S41 (S31 and S41 must have a high signal).
The safety requirements are guaranteed by the signals S31 and S41 (the fieldbus for Safety Device Diagnostics communication is not safe).
- ▶ Operation with specification of direction when activating/deactivating the guard locking
 - A specification of direction can be used to control the change of the guard locking status.
 - Toggling: The safety switch changes with each simultaneous controlling of S31 and S41 the guard locking status (activated <-> deactivated).
 - Force Direction: The safety switch is selectively activated or deactivated by offset activation of the rising edges of S31 and S41.

Timing diagrams

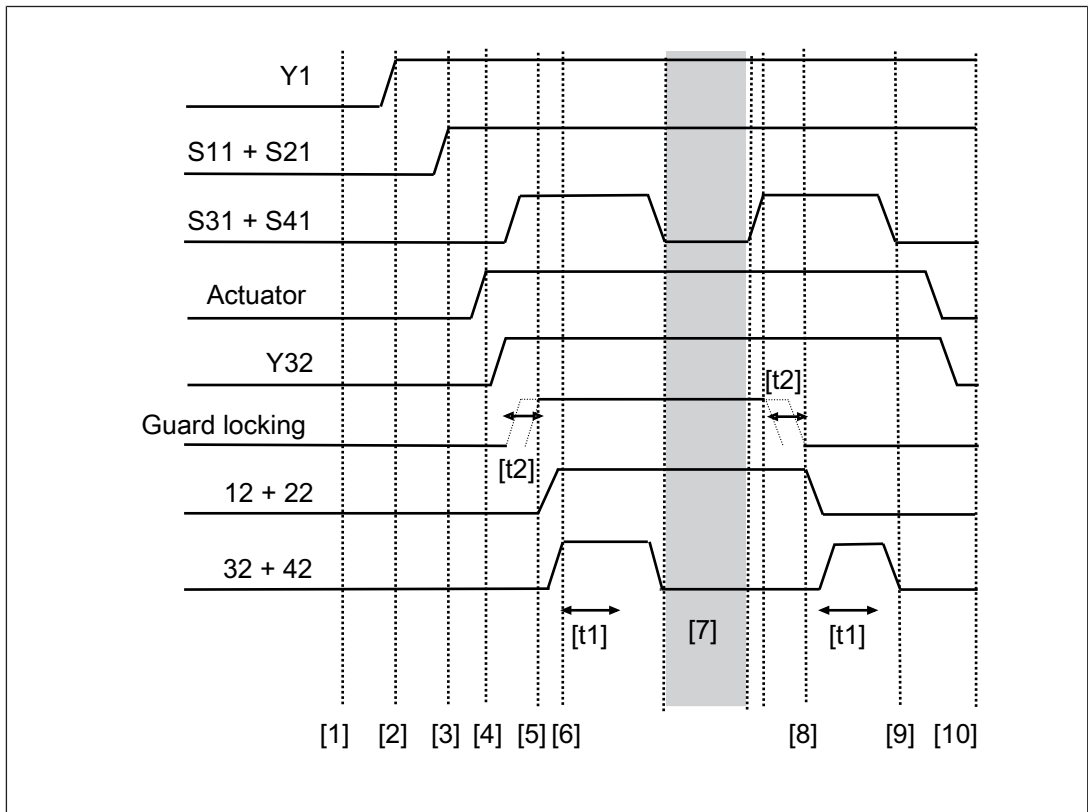


Fig.: Passive use of the Safety Device Diagnostics

Legend

- [1] Gate is open
- [2] The door connected upstream in the series connection is closed
- [3] The door connected upstream in the series connection is locked
- [4] Gate is closed
- [5] Guard locking is activated by the programmable safety system
- [6] Guard locking is activated
- [7] Execution of the hazardous machine function is permitted
- [8] Outputs will be deactivated
- [9] Guard locking will be deactivated
- [10] Gate is open
- [t1] Processing time of guard locking signal = 100 ms
- [t2] Time window for changing guard locking status

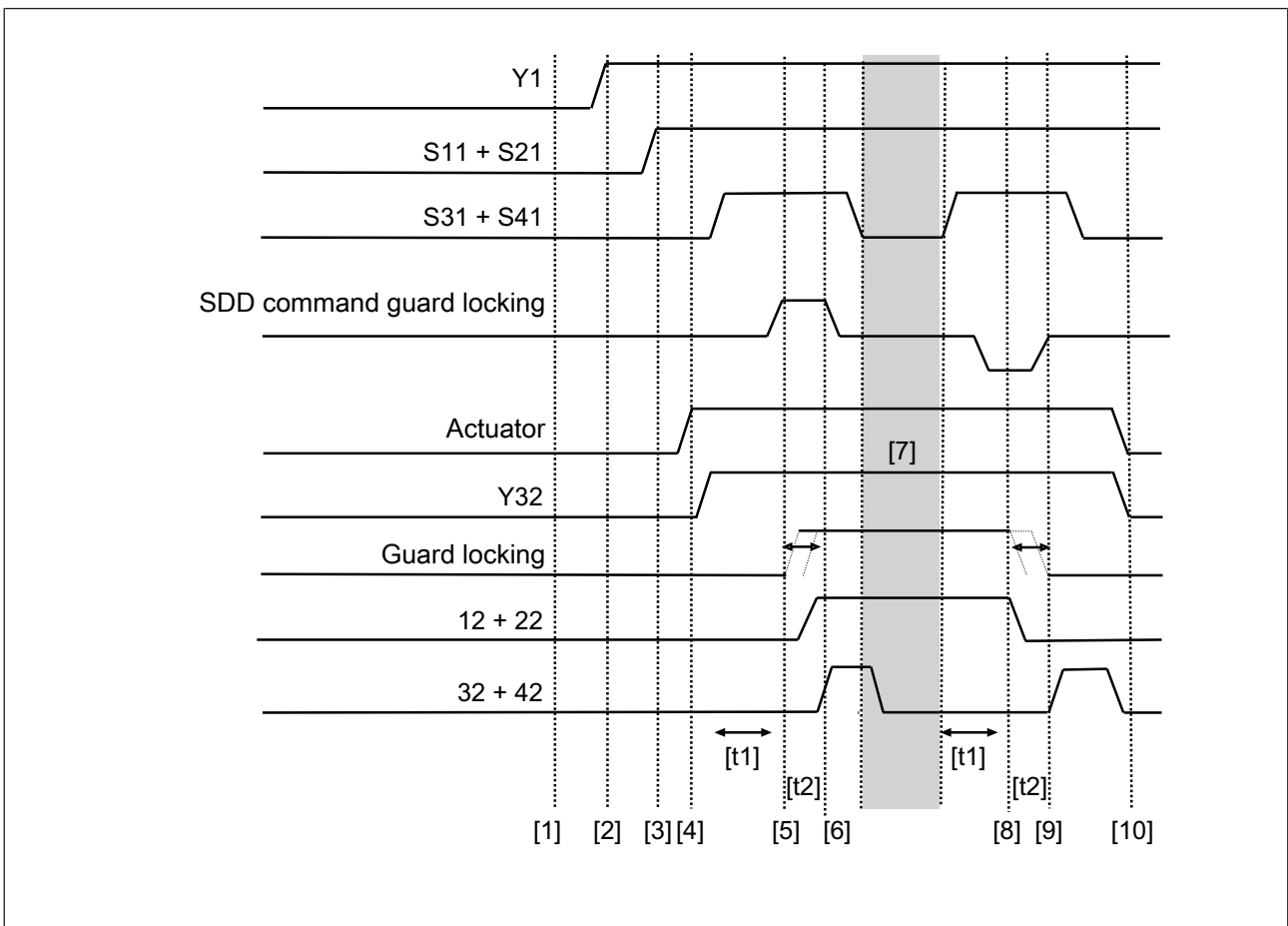
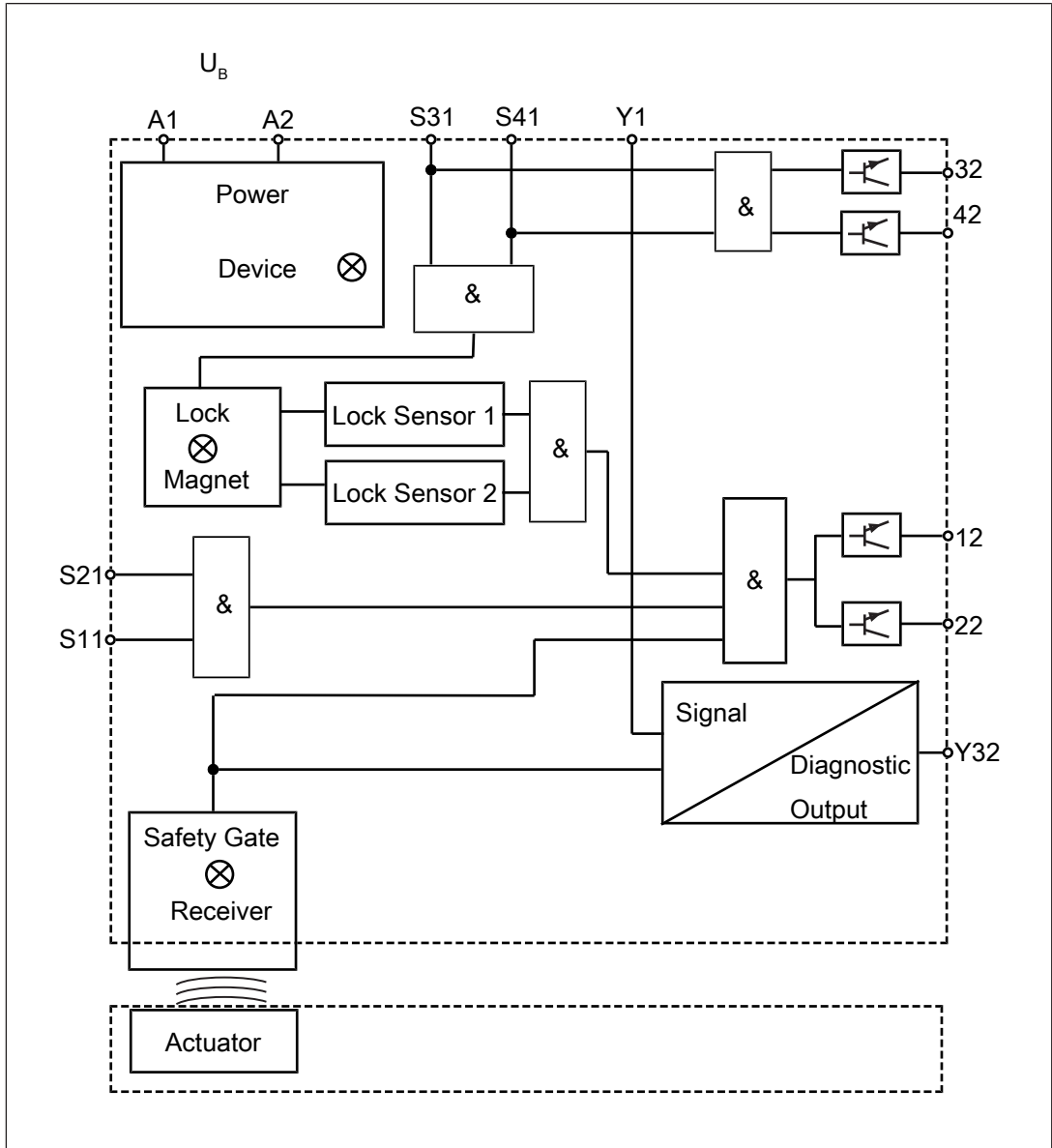


Fig.: Active use of Safety Device Diagnostics

Legend

- [1] Gate is open
- [2] The door connected upstream in the series connection is closed
- [3] The door connected upstream in the series connection is locked
- [4] Gate is closed
- [5] Guard locking is activated by the safety control system
- [6] Guard locking is activated
- [7] Execution of the hazardous machine function is permitted
- [8] Outputs will be deactivated
- [9] Guard locking will be deactivated
- [10] Gate is open
- [t1] Processing time of guard locking signal = 100 ms
- [t2] Time window for changing guard locking status

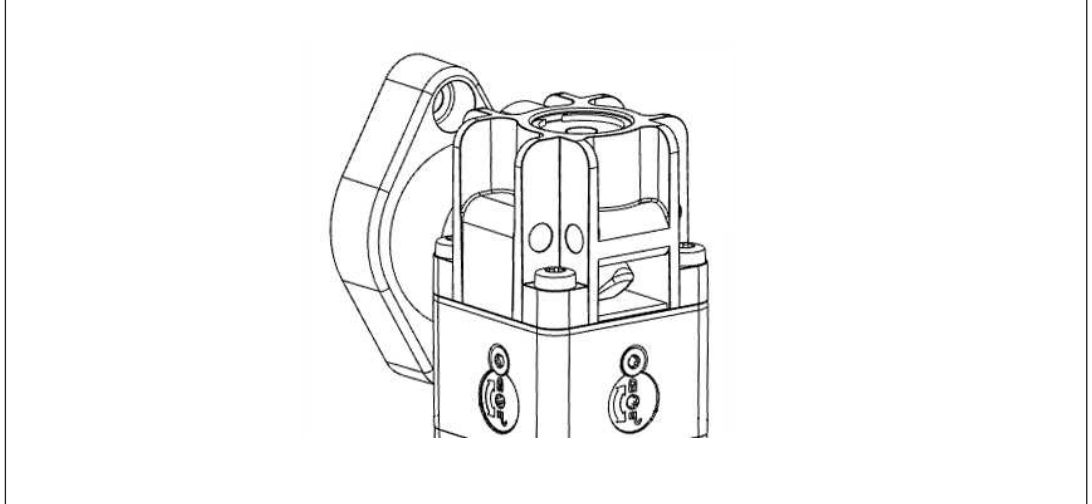
4.5 Block diagram



4.6 Auxiliary release

The auxiliary release enables guard locking to be opened from the access side to the danger zone.

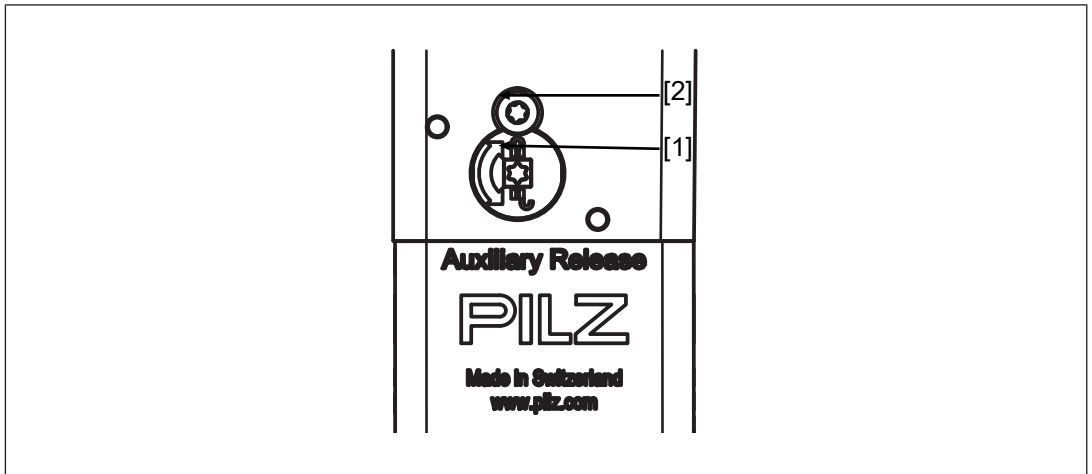
The safety switch has auxiliary releases on three sides.



INFORMATION

If guard locking is deactivated using the auxiliary release, there is a low signal at safety outputs 12 and 22. An error code will be issued (see under Operation) and the safety switch switches to a fault condition.

It is possible to open the guard locking using the control system.



Legend

- [1] Auxiliary release screw Torx T10
- [2] Security screw Torx T10, sealed with varnish when delivered

Mode of operation:

1. Remove the security screw [2] using a Torx T10 screwdriver.

2. Rotate the auxiliary release screw [1] half a turn anti-clockwise using a Torx T10 screwdriver. The guard locking pin is displaced and the bolt is released.

The safety gate to the danger zone can be opened.

4.6.1 Recommissioning

Recommission PSEN ml s 1.1

1. Rotate the auxiliary release screw [1] (see [Figure \[21\]](#)) half a turn clockwise using a Torx T10 screwdriver.
2. Re-insert the security screw [2] (see [Figure \[21\]](#)) using a Torx T10 screwdriver.
3. Seal the security screw with varnish.
4. Switch the voltage off and then on again.
5. Carry out a function test on the safety switch and actuator. The safety function may only be checked by qualified personnel.

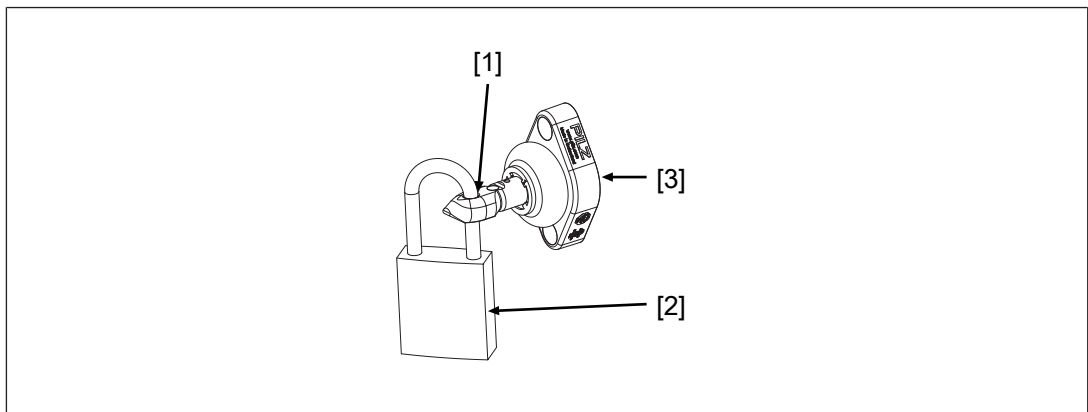


INFORMATION

If the auxiliary release screw is not turned back correctly after use, the PSEN ml s 1.1 switches to a fault condition.

4.7 Prevent restart

To prevent the machine restarting (unintentionally) while there is someone inside the danger zone, a padlock can be attached via the through hole on the actuator (see diagram). As a result the actuator cannot engage with the safety switch, guard locking is not activated and the machine is prevented from starting.



Legend

- [1] Through hole on the actuator for attaching a padlock
- [2] Padlock
- [3] Actuator

If the actuator is to be blocked using several locks in parallel, a multiple lock can be used (e.g. Brady – Lockout device, article no. 852439).

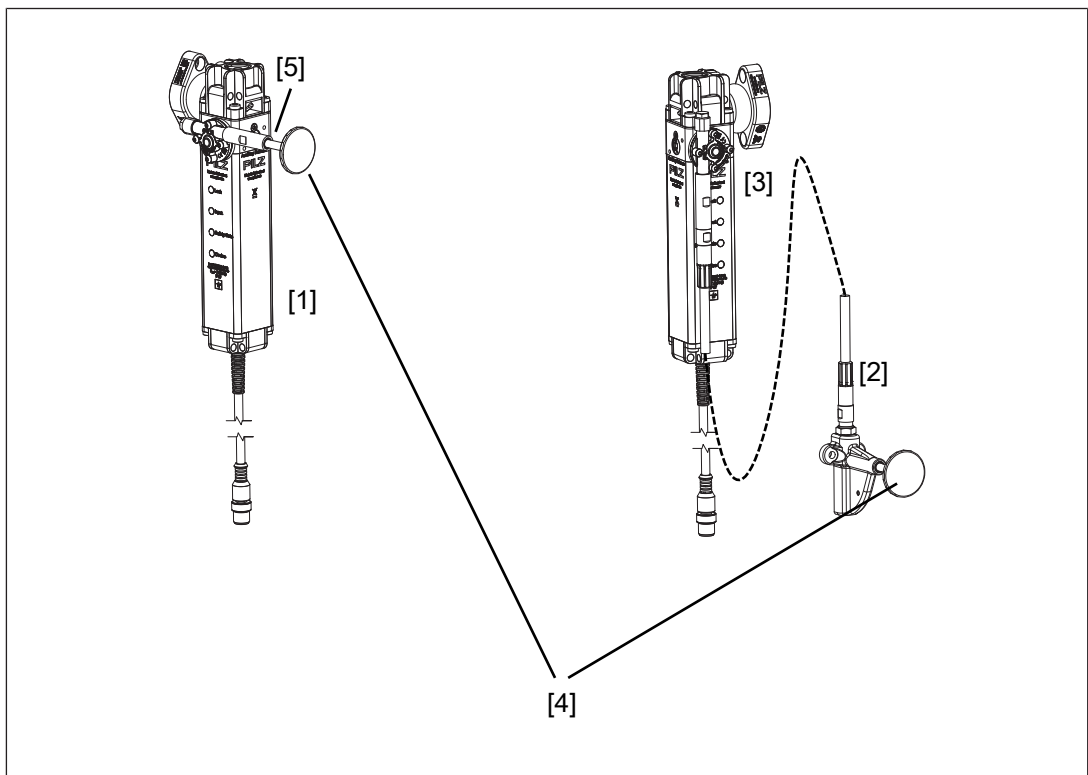
4.8 Escape release

Distinction between escape release and emergency release

- ▶ The emergency release enables the manual release of the guard locking without aids from outside the hazardous area.
- ▶ The emergency release enables the manual release of the guard locking without aids from within the danger zone and it corresponds to an escape release in accordance with EN ISO 14119.

If the escape release accessory (stationary or external) is installed within the danger zone, the accessory can be used as an escape release in accordance with EN ISO 14119.

If the escape release accessory (stationary or external) is installed outside the danger zone, the accessory can be used as an escape release in accordance with EN ISO 14119.



Legend

- [1] Escape release stationary
- [2] Escape release externally
- [3] Tension pressure cables in lengths of 0.50 m to 4 m
- [4] Button of the escape release pin
- [5] Escape release pin



INFORMATION

If guard locking is deactivated using the auxiliary release, there is a low signal at safety outputs 12 and 22. An error code will be issued (see under Operation) and the safety switch switches to a fault condition.

Mode of operation

If in the hazardous area the button of the escape release pin [4] is pressed towards the safety gate, the escape release impacts directly on the auxiliary release of the safety switch and the auxiliary release unlocks the safety gate. The safety gate can be opened immediately, enabling the operator to leave the danger zone.

There is a low signal at safety outputs 12 and 22 if the escape release was operated.

Scope

- ▶ Scope of supply stationary escape release
 - 1 escape release stationary
 - 1 adapter disk
 - 2 screws for adapter disk
 - 4 screws for installation on the adapter disk
- ▶ Scope of supply external escape release
 - 1 escape release external with installed push/pull cables (see [Order reference: Accessories \(📖 75\)](#))
 - 1 adapter disk
 - 2 screws for adapter disk
 - 4 screws for installation on the adapter disk

4.8.1

Recommissioning

1. Pull back the button of the escape release pin.
2. Switch the voltage off and then on again.
3. Carry out a function test using the escape release. The safety function may only be checked by qualified personnel.

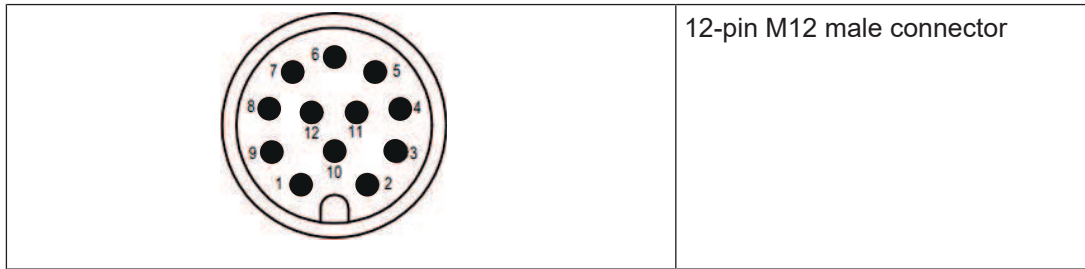
5 Wiring

5.1 Important information

- ▶ Hand-tighten the connector.
- ▶ Information given in the [Technical details \[68\]](#) must be followed.
- ▶ Note the max. cable length when operating with Safety Device Diagnostics.

| Supply voltage on the safety control system | Max. cable length |
|---|-------------------|
| ≥ 20.4 V | 50 m |
| ≥ 24 V | 120 m |
| ≥ 28.8 V | 180 m |

5.2 Pin assignment, connector and cable



| PIN | Function | Terminal designation | Cable colour (Pilz cable) |
|-----|--|----------------------|---------------------------|
| 1 | +24 V UB | A1 | Brown |
| 2 | 0 V UB | A2 | Blue |
| 3 | Operation of solenoid to open and close guard locking (channel 2) | S41 | White |
| 4 | Safety output channel 1 | 12 | Green |
| 5 | Operation of solenoid to open and close guard locking (channel 1) | S31 | Pink |
| 6 | Safety output channel 2 | 22 | Yellow |
| 7 | Safety input channel 1 | S11 | Black |
| 8 | Signal output/diagnostic output | Y32 | Grey |
| 9 | Diagnostics input | Y1 | Red |
| 10 | Safety input channel 2 | S21 | Purple |
| 11 | Operation of solenoid of the next safety switch in the series connection (channel 1) | 32 | Grey-pink |

| PIN | Function | Terminal designation | Cable colour (Pilz cable) |
|-----|--|----------------------|---------------------------|
| 12 | Operation of solenoid of the next safety switch in the series connection (channel 2) | 42 | Red-blue |

**NOTICE**

The colour marking for the connection lead only applies for the cable that Pilz supplies as an accessory

5.3**EMC requirements**

- ▶ Ensure the wiring and EMC requirements of EN 60204-1 are met.
- ▶ UL requirement: The supply voltage to the safety switch must be protected with a quick-acting fuse (see [Technical details \[68\]](#)).
- ▶ 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**

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.

6 Connection to control systems and evaluation devices

6.1 Important information

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

- ▶ 2-channel with feasibility monitoring

Both OSSDs must change switch state synchronously. In particular, the evaluation device must monitor that the state of **both** OSSDs was "Gate unlocked" before **both** return to the "Gate locked" state and vice-versa.

- ▶ OSSD signals are evaluated through 2 channels
- ▶ The state of the OSSDs must be tested before and after safety inputs S31 and S41 are activated (solenoid operation) (see [Timing diagram \[18\]](#))



WARNING!

Potential loss of safety function due to failure to test for a safe condition

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

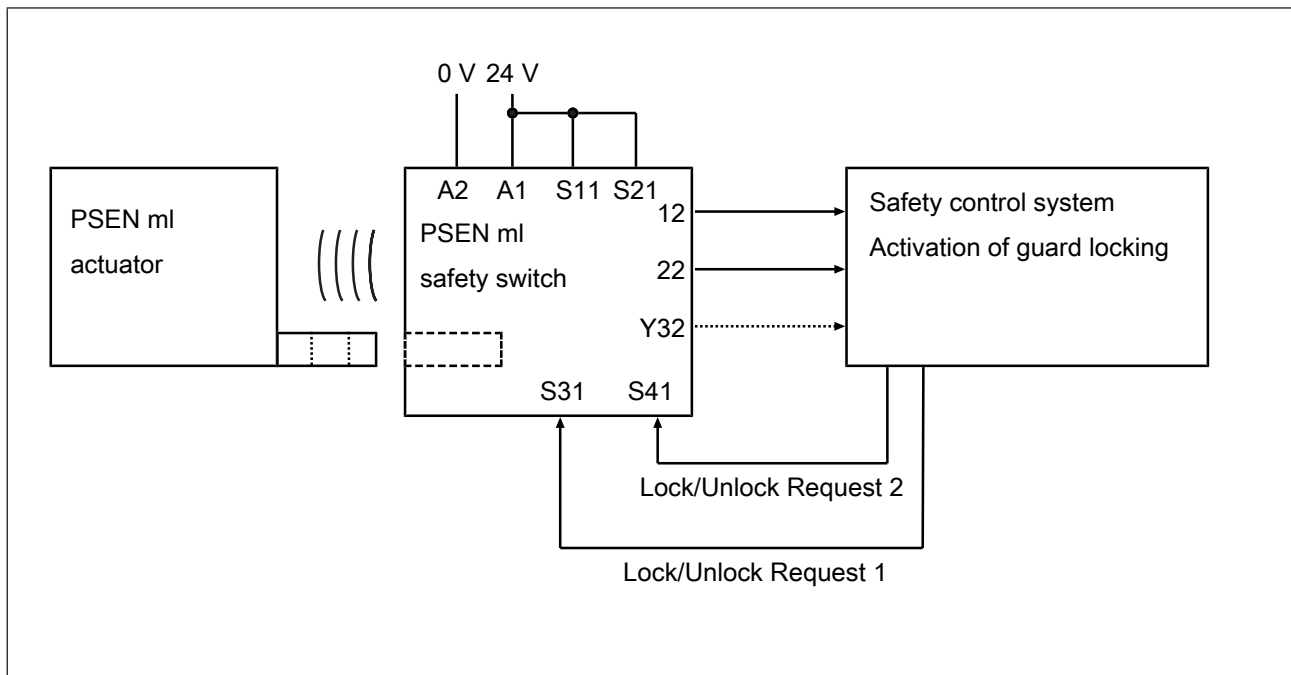
- Use an evaluation device/safety system to test whether the plant is in a safe condition.
- Do not operate the solenoid of the PSEN ml s 1.1 via S31/S41 unless the plant is in a safe condition.

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

6.2 Minimum requirements for activation of guard locking

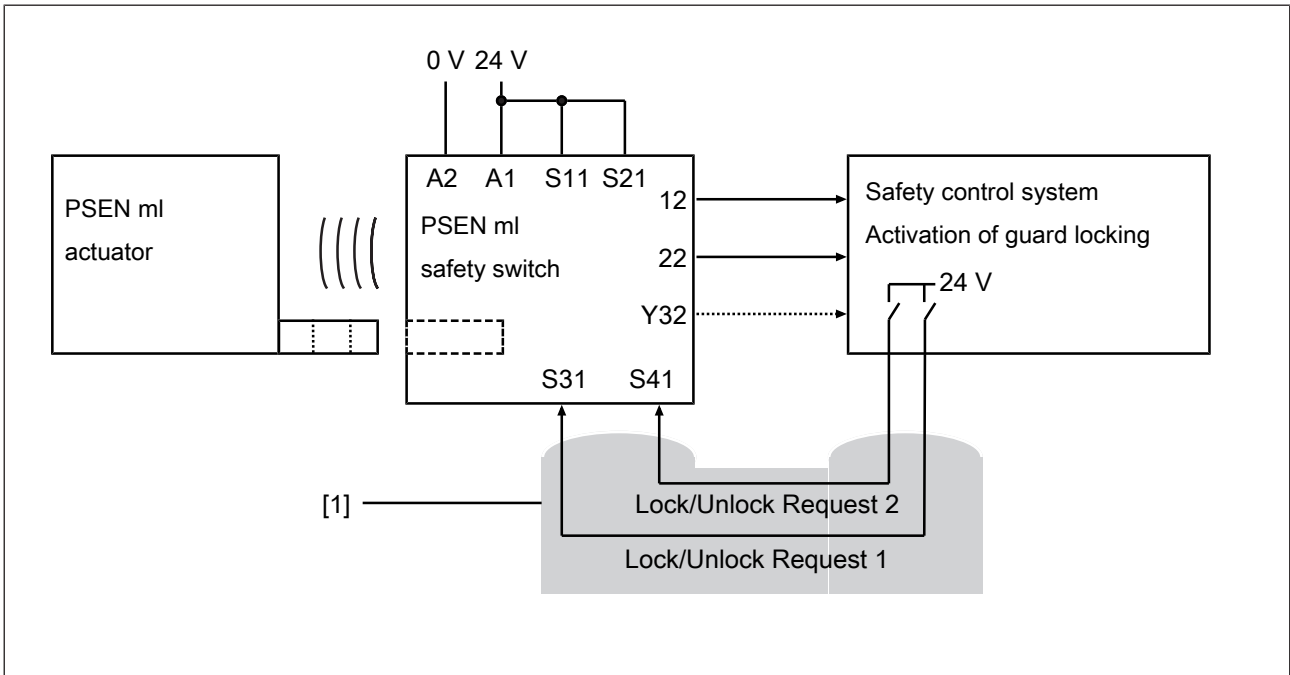
Use in PL e (Cat. 4) applications

- ▶ Safety inputs S31 and S41 (solenoid operation) have 2-channel operation via safe outputs, which are suitable for PL e (Cat. 4) applications
- ▶ 2-channel operation for safety inputs S31 and S41 (solenoid operation), each with 0.5 A
- ▶ 2-channel processing of safety outputs
- ▶ Monitoring of shorts across signal cables through activation of guard locking



Use in PL d (Cat. 3) applications

- ▶ 2-channel operation for safety inputs S31 and S41 (solenoid operation) via relay outputs
- ▶ 2-channel operation for safety inputs S31 and S41 (solenoid operation), each with 0.5 A
- ▶ 2-channel processing of safety outputs
- ▶ Exclusion of shorts across signal cables through appropriate measures (e.g. protected cable layout, see EN ISO 13849-2)

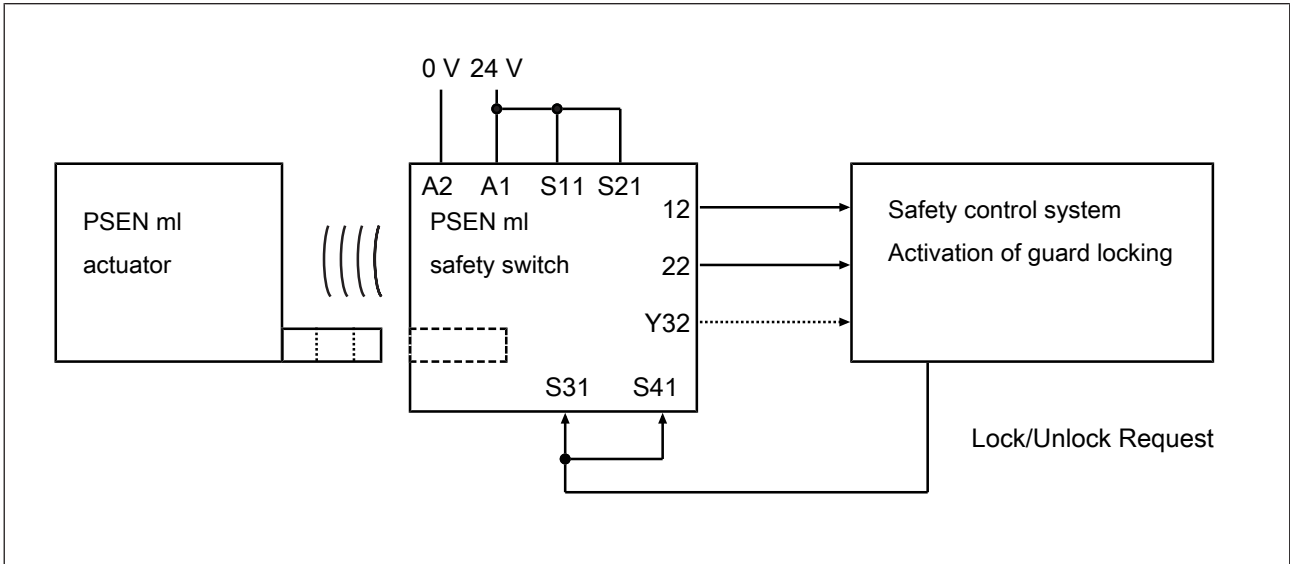


Legend

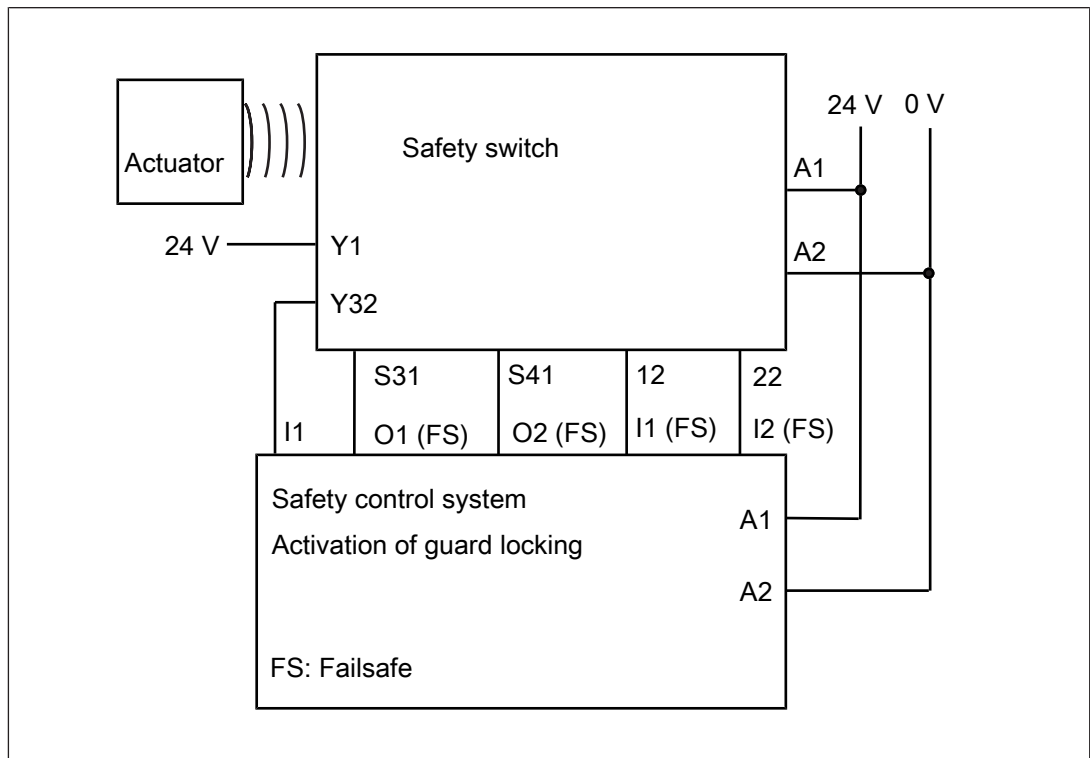
[1] Protected cable layout

Use in PL d (Cat. 2) applications

- ▶ 1-channel operation for safety inputs S31 and S41 (solenoid operation)
- ▶ 2-channel processing of safety outputs
- ▶ 1-channel operation for interconnected safety inputs S31 and S41 (solenoid operation), with 1 A



6.3 Single connection



6.4 Series connection



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 \[68\]](#))

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

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

The safety switches PSEN ml s 1.1 are suitable for series connection with max. 16 safety switches.

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

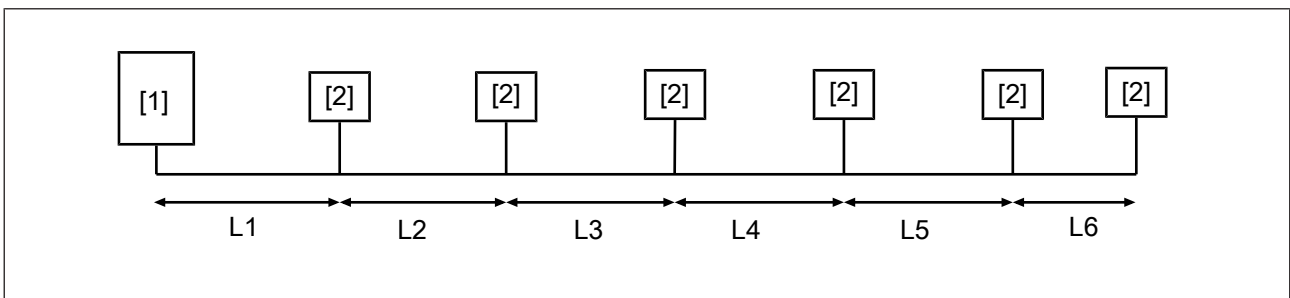
- ▶ The required SIL level (e.g. SIL CL 3),
- ▶ the required performance level (e.g. PL e (Cat. 4)),
- ▶ the maximum delay or risk time permitted by the application,
- ▶ Cable length (see notes on cable lengths),
- ▶ Height of supply voltage.

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

Notes on cable lengths

- ▶ Determine the values under the following conditions:

Room temperature (25°C), conductor cross section 0.25 mm², output load per output (12, 22, Y32) each ≤ 10mA



Legend

[1] Safety control system

[2] Safety switch PSEN ml

Examples for cable lengths

▶ Supply voltage at the safety control system $\geq 20.4 \text{ V}$

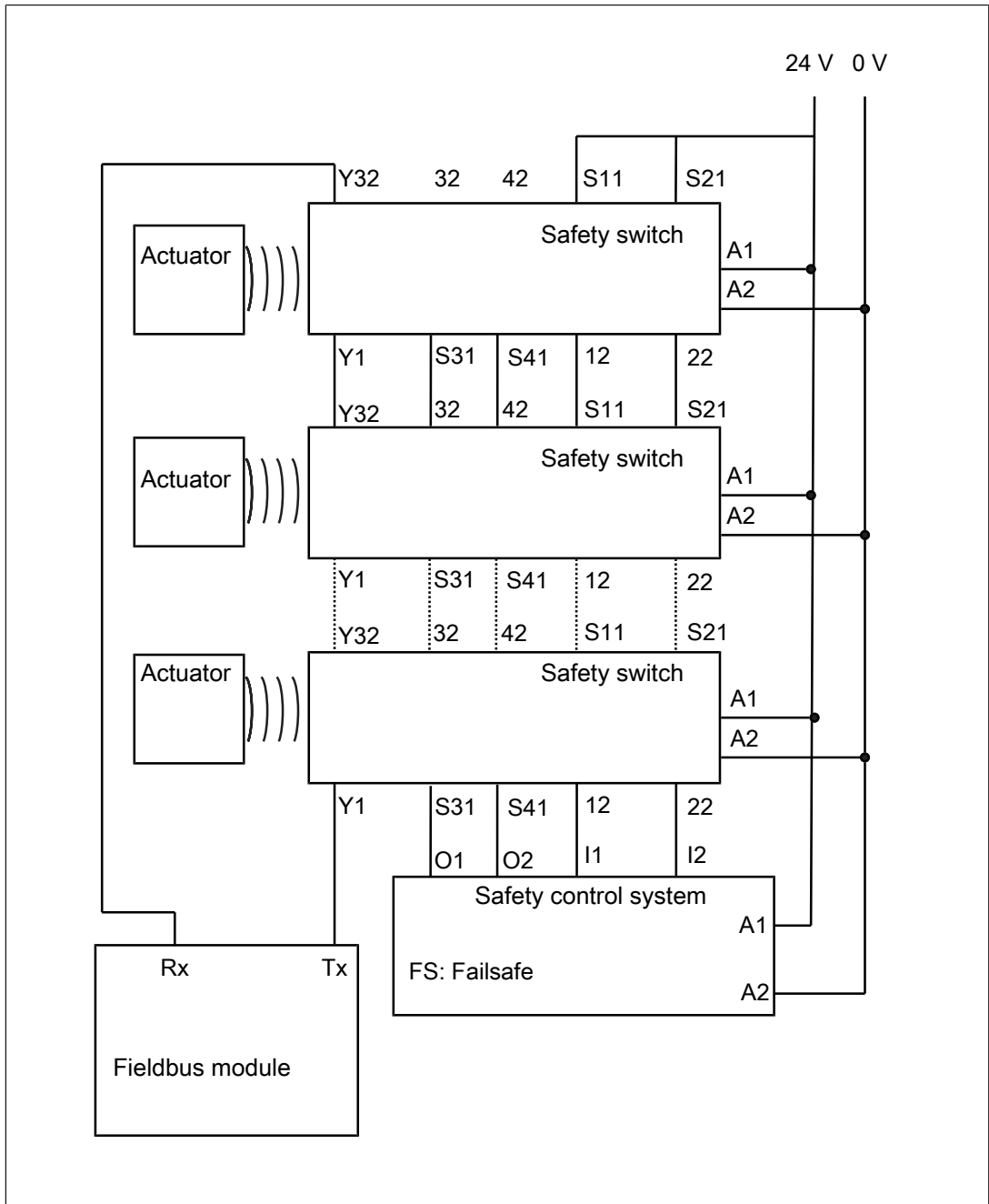
| Number of safety switches | L1 | L2 | L3 | L4 | L5 | L6 | Overall length |
|---------------------------|------|------|------|-----|-----|-----|----------------|
| 1 | 50 m | | | | | | 50 m |
| 2 | 30 m | 20 m | | | | | 50 m |
| 3 | 20 m | 10 m | 10 m | | | | 40 m |
| 4 | 20 m | 5 m | 5 m | 5 m | | | 35 m |
| 5 | 10 m | 5 m | 5 m | 5 m | 5 m | | 30 m |
| 6 | 5 m | 5 m | 5 m | 5 m | 5 m | 5 m | 30 m |

▶ Supply voltage at the safety control system $\geq 24 \text{ V}$

| Number of safety switches | L1 | L2 | L3 | L4 | L5 | L6 | Overall length |
|---------------------------|-------|------|------|------|------|------|----------------|
| 1 | 120 m | | | | | | 120 m |
| 2 | 60 m | 60 m | | | | | 120 m |
| 3 | 50 m | 50 m | 20 m | | | | 120 m |
| 4 | 50 m | 30 m | 20 m | 20 m | | | 120 m |
| 5 | 50 m | 20 m | 20 m | 20 m | 10 m | | 120 m |
| 6 | 20 m | 20 m | 20 m | 20 m | 20 m | 20 m | 120 m |

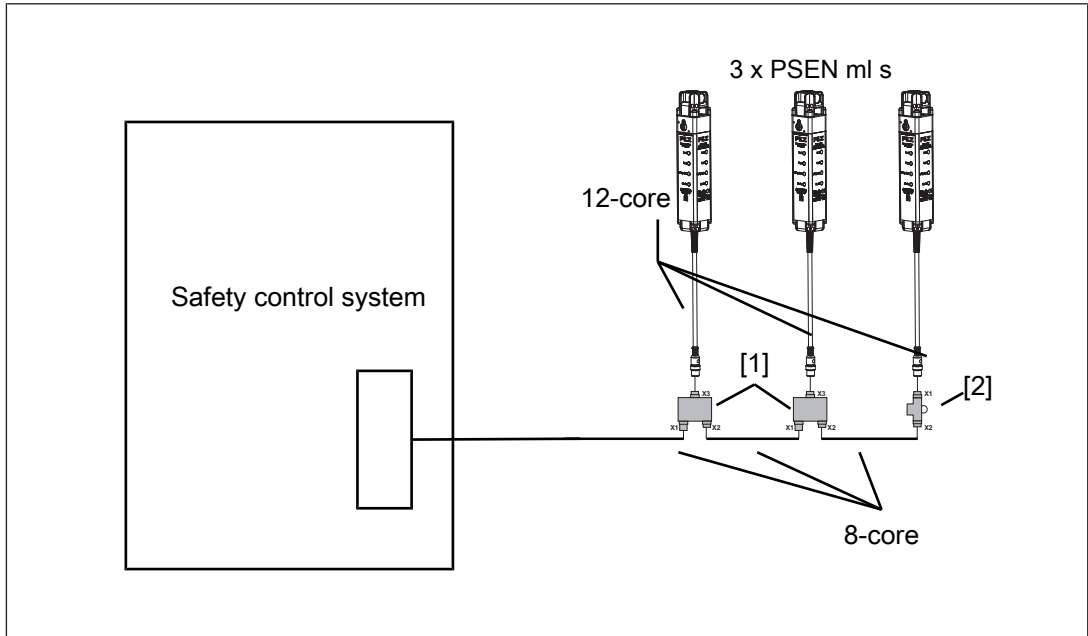
▶ Supply voltage at the safety control system $\geq 28.8 \text{ V}$

| Number of safety switches | L1 | L2 | L3 | L4 | L5 | L6 | Overall length |
|---------------------------|-------|------|------|------|------|------|----------------|
| 1 | 180 m | | | | | | 180 m |
| 2 | 130 m | 50 m | | | | | 180 m |
| 3 | 80 m | 50 m | 50 m | | | | 180 m |
| 4 | 50 m | 50 m | 50 m | 30 m | | | 180 m |
| 5 | 50 m | 50 m | 30 m | 30 m | 20 m | | 180 m |
| 6 | 50 m | 50 m | 20 m | 20 m | 20 m | 20 m | 180 m |



For connecting the safety switch PSEN ml s 1.1 in a series connection there are the following options:

- ▶ Wiring with the safety control system via PSEN ml Y junction



Legend

[1] PSEN ml Y junction M12

[2] PSEN ml end adapter

- ▶ When establishing the series connections with connection to the safety control system, use the following adapters:
 - PSEN ml Y junction M12
 - PSEN ml end adapter
- ▶ Connection in the control cabinet at the terminal block
 - Connect the 12-core cables of the safety switch to the terminal block of the control cabinet.

6.5 Connection to Pilz evaluation devices

The safety switch PSEN ml s 1.1 can be connected to Pilz evaluation devices, for example.

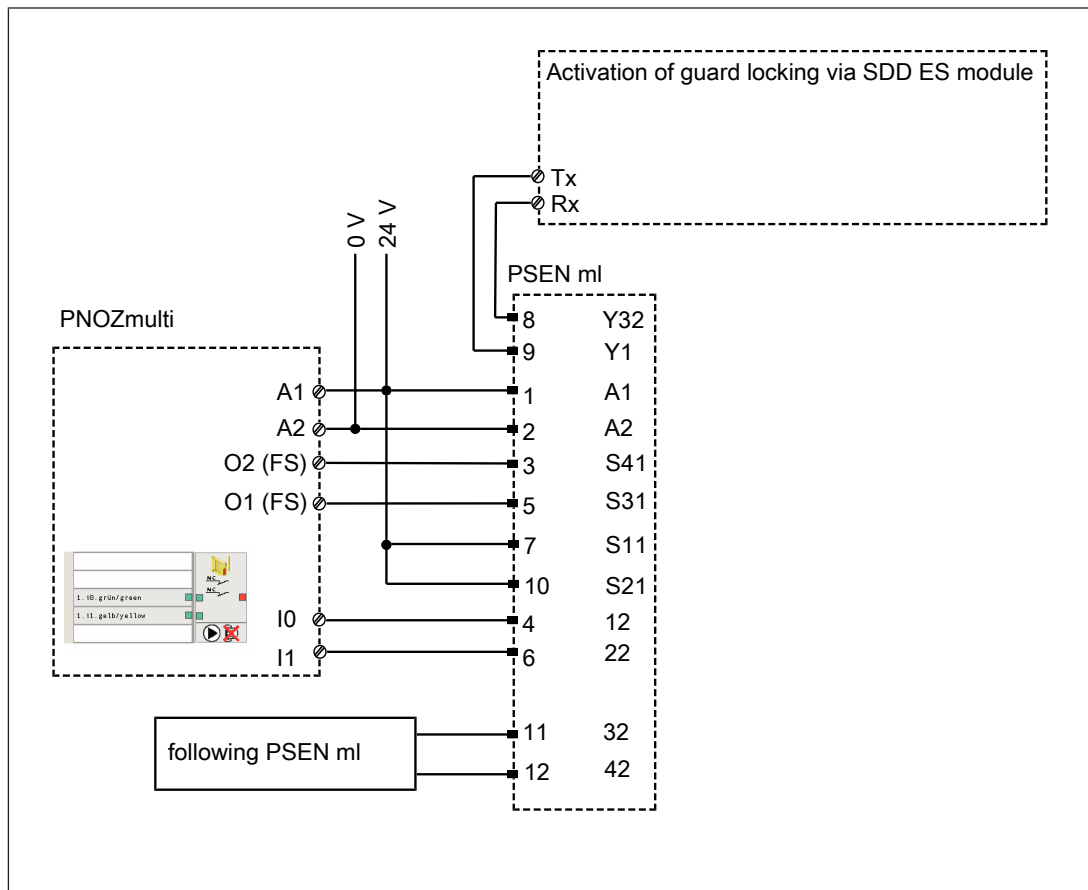
Suitable Pilz evaluation devices are, for example:

- ▶ 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.

Connection to PNOZmulti is illustrated by way of example.

6.5.1 Connection example with PNOZmulti and Safety Device Diagnostics



7 Teaching in the actuator

7.1 PSEN ml 1.1

Any corresponding Pilz actuator (see [Technical Details \[📖 68\]](#)) is detected as soon as it is brought into the response range.

8 Installation

8.1 Important information



INFORMATION

Refer to the guidelines for designing guards and integrating interlocks with guard locking in EN ISO 14120.



NOTICE

Install the safety switch and actuator so that the possibilities of defeat are reduced to a minimum (see guidelines for reducing the possibilities for defeating interlocking devices in EN ISO 14119).



NOTICE

Install safety switch and actuator so that it is not possible to reach through with hand or finger.

- ▶ The safety switch and actuator should be installed opposite each other in parallel.
- ▶ Make sure that the actuator makes complete contact with the mounting surface.
- ▶ Make sure that the at least one of the auxiliary release/escape releases can be operated after installation.
- ▶ For a minimum screw depth of 6 mm, M5 screws with resistance class 8.8 should be used to attach the safety switch and actuator.
- ▶ Torque setting: Please note the information provided under [Technical details \[68\]](#).
- ▶ Use non-removable flat head locking screws to attach the safety switch and actuator (e.g. cheese-head or pan head screws) or rivets.
- ▶ Use the same type of screw to attach the safety switch and actuator.
- ▶ Installation of the safety switch and actuator must be concealed.
- ▶ Prevent self-loosening of the fastening elements,
 - On the safety switch: Through maintaining the max. torque setting (see [Technical details \[68\]](#)).
 - On the actuator: Through maintaining the max. torque setting (see [Technical details \[68\]](#)) and bonded screw retention.
- ▶ Make sure that the actuator does not present a risk.
- ▶ The mounting surfaces for safety switches and actuators can have a max. unevenness of 0.5 mm.
- ▶ Prevent the safety switch and actuator being exposed to heavy shock or vibration.
- ▶ The fastening of safety switch and actuator has to be sufficiently stable to ensure the proper operation of the safety switch and the actuator.

- ▶ Pilz recommends that you use the PSEN ml actuator center ring (see [Order reference \[75\]](#)) only with small door radiuses (see [Install the safety switch horizontally at a swing gate \[45\]](#)).

8.2 Tapped hole

- ▶ To fix the safety switch at the three possible mounting positions, there are 3 drill holes on 3 sides.

As a result, the safety switch can be installed on the frames of left and right hinged sliding gates and swing gates. If necessary use a [Mounting plate \[47\]](#) or [Mounting bracket \[47\]](#) (see [Order reference: Accessories \[75\]](#)).

Different holding forces arise, based on the installation.

- [Fixing screws in parallel to actuator \[40\]](#):

Holding force $F_{Zn} = 7.500 \text{ N}$,

Holding force F_{1max} in accordance with EN ISO 14119 = 15.000 N

- [Fixing screws side-on to actuator \[40\]](#):

Holding force $F_{Zn} = 5.000 \text{ N}$,

Holding force F_{1max} in accordance with EN ISO 14119 = 10.000 N

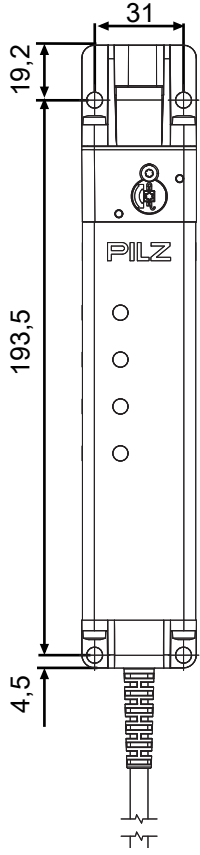
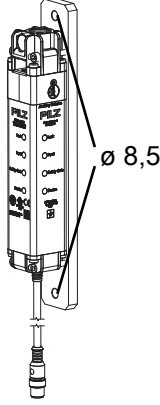
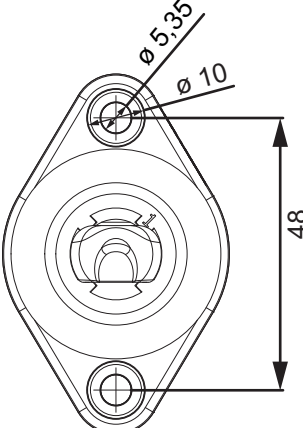


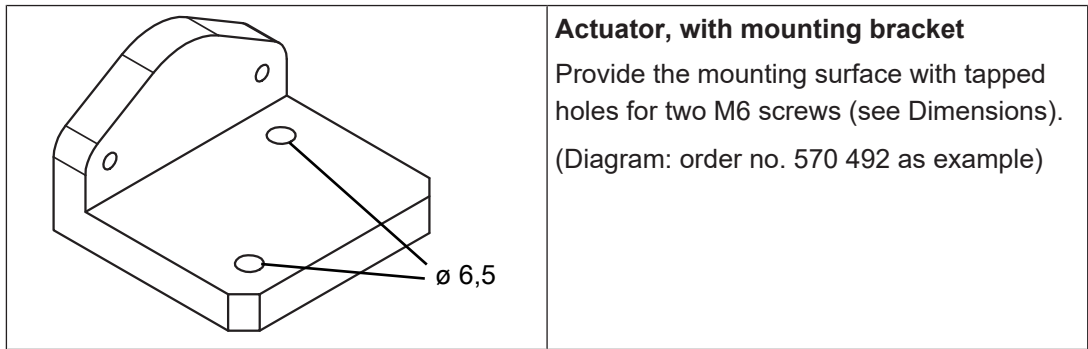
INFORMATION

Please note that the stated holding forces only apply when installed without a mounting bracket. The holding forces when installed with a mounting bracket can be found in the table "[Technical details for mounting bracket \[73\]](#)".

The tapped holes must have a depth of at least 6 mm.

| Installation of safety switch | Tapped hole |
|--|---|
| Fixing screws in parallel/side-on to actuator, no mounting plate | Tapped holes for four M5 screws on the mounting surface. |
| Fixing screws in parallel/side-on to actuator, with mounting plate | Tapped holes for two M8 screws on the mounting surface, for attaching the mounting plate. |

| | |
|---|--|
|  | <p>Fixing screws in parallel/side-on to actuator, no mounting plate</p> <p>Provide the mounting surface with tapped holes as indicated.</p> |
|  | <p>Fixing screws in parallel/side-on to actuator, with mounting plate</p> <p>Provide the mounting surface with tapped holes as indicated.</p> |
|  | <p>Actuator, no mounting bracket</p> <p>Provide the mounting surface with tapped holes for two M5 screws (see diagram).</p> |



8.3 Install fixing screws in parallel to actuator

Use four M5 screws to attach the switch to the mounting surface.

► Torque setting: Please note the information provided under [Technical details](#) [68].

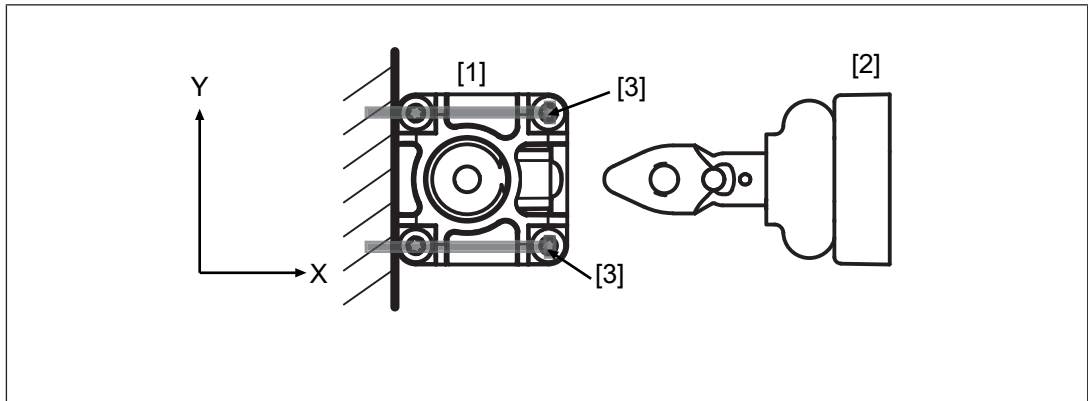


Fig.: Fixing screws of the safety switch in parallel to actuator

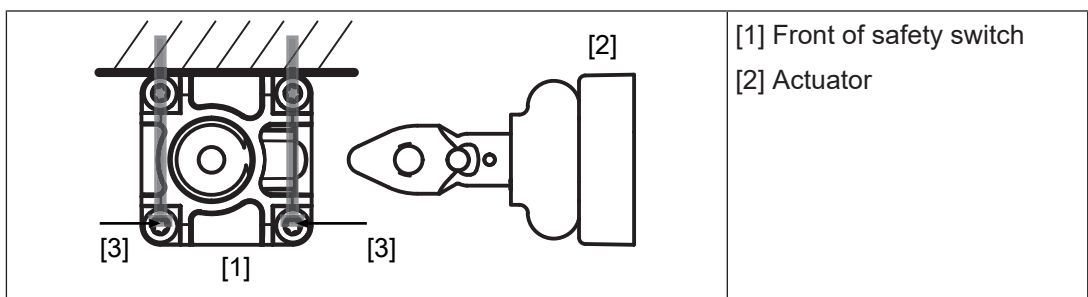
Legend

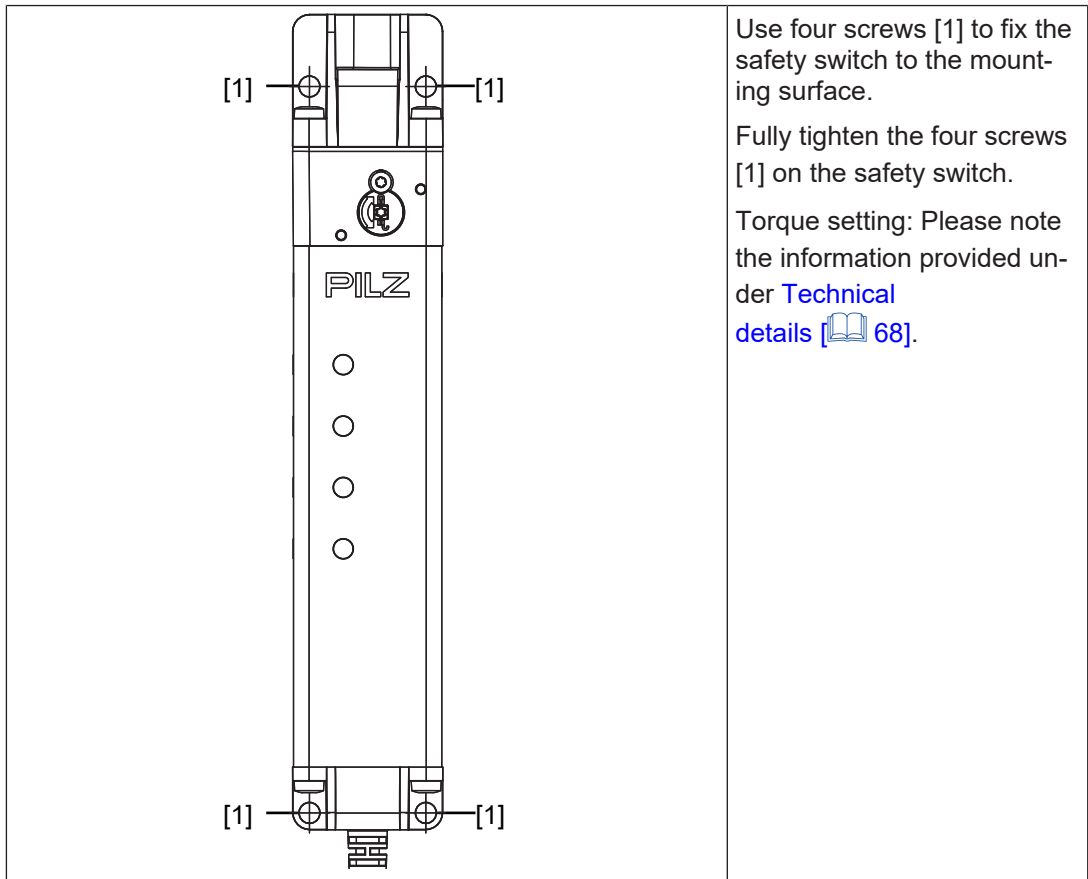
[1] Safety switch

[2] Actuator

[3] Fixing screws of the safety switch in parallel to actuator

8.4 Install fixing screws side-on to actuator





8.5 Centre the bolt in the actuator housing

The bolt must be centred in the actuator housing in order to maintain the distances on setting gates.

With small door radiuses, the bolt should be centred in the actuator housing.

Centre the bolt in the actuator housing (see diagram). Use the PSEN ml actuator center ring only with small door radiuses (see [Install the safety switch horizontally at a swing gate](#) [45]).

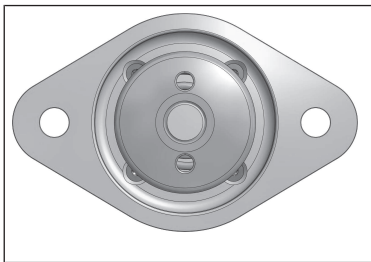
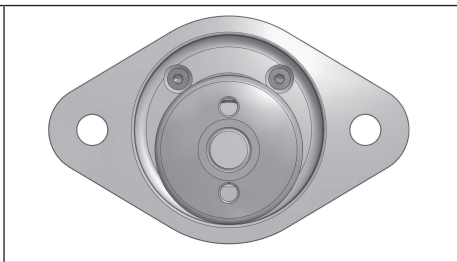
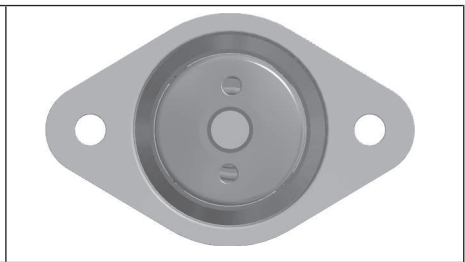


NOTICE

Reduction of the actuator's service life

When using the accessory PSEN ml actuator center ring the actuator's service life can be substantially reduced.

After 50.000 cycles it may happen that the actuator misaligns, and that it has to be realigned regularly.

| | | |
|---|---|--|
|  |  |  |
| <p>Bolt centred within the actuator housing</p> | <p>Bolt not centred within the actuator housing</p> | <p>Bolt with PSEN ml actuator center ring in the actuator housing</p> |

8.6 Rotate the bolt in the actuator housing 90°

The actuator can be installed vertically on a gate (see [Figure \[12\]](#)). To install the actuator horizontally, the bolt can be rotated 90° in the actuator housing prior to installation.

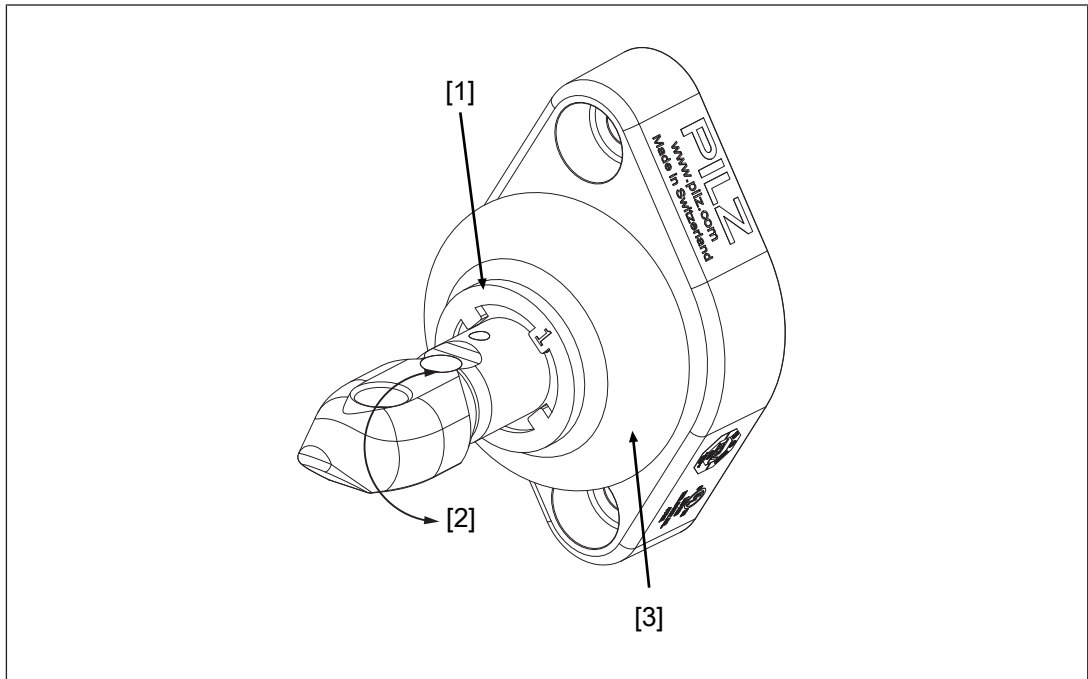


NOTICE

PSEN ml 1.1 round actuator has no lock against rotation

Ensure that the bolt in the actuator housing is turned to the correct position before installing.

1. On the housing skin [3] in the actuator housing, press down the spring plate [1] on both sides of the bolt and keep the plate held down.
2. Rotate the bolt in the housing skin by 90° in the required direction ([2]).

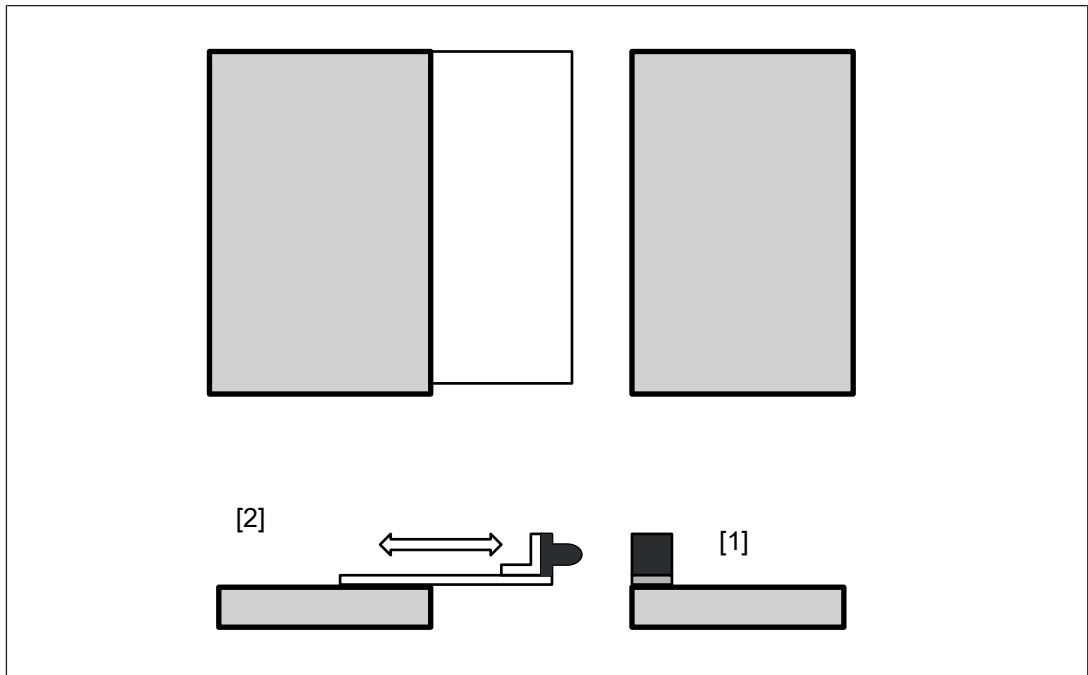


Legend

- [1] Spring plate in the housing skin
- [2] Bolt, can be rotated 90°
- [3] Housing skin

3. Centre the [bolt in the actuator housing \[41\]](#).

8.7 Installation on sliding gate



Legend

[1] Safety switch, installed on gate frame

[2] Actuator with mounting bracket (available as [Accessory \[75\]](#)), installed on sliding gate

1. Install the safety switch with the [fixing screws of the safety switch in parallel to the actuator \[40\]](#) or [side-on to actuator \[40\]](#) on the gate frame.
2. Use two M5 screws to fix the actuator to the gate.

8.8 Installation on swing gate

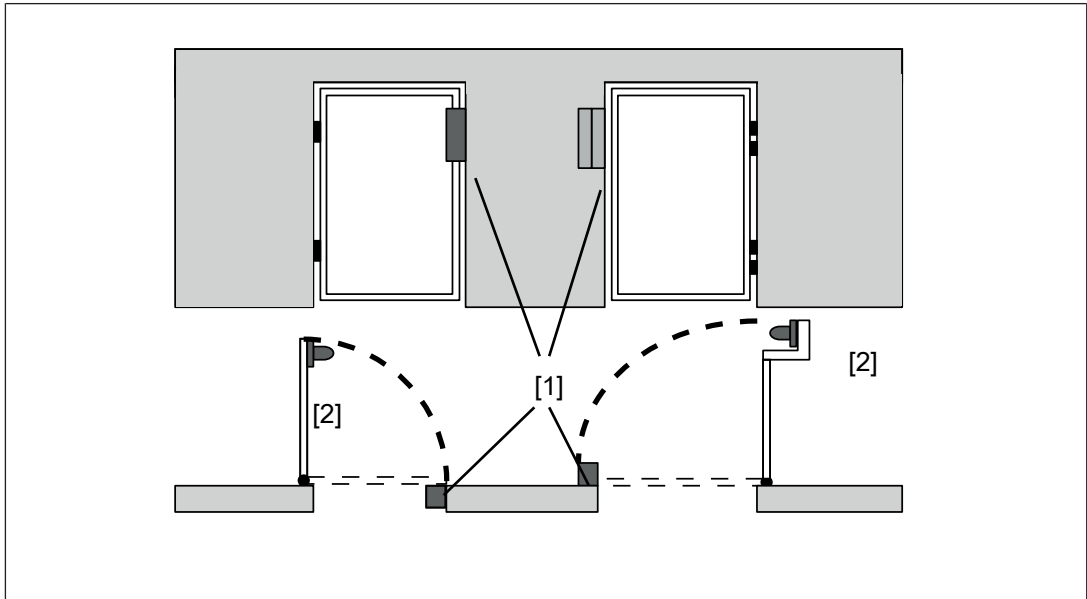




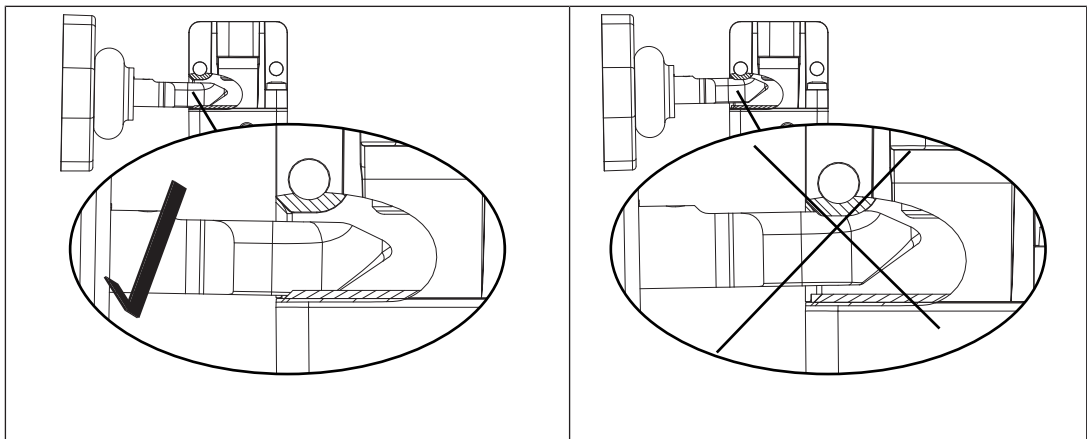
Fig.: Swing gate with internal and external hinge

Legend

- [1] Safety switch on gate frame
- [2] Actuator, installed on swing gate

1. Install the safety switch with the **fixing screws of the safety switch in parallel to the actuator**  40 or **side-on to actuator**  40 on the gate frame.
2. Use two M5 screws to fix the actuator to the gate.

The actuator should engage smoothly into the safety switch.

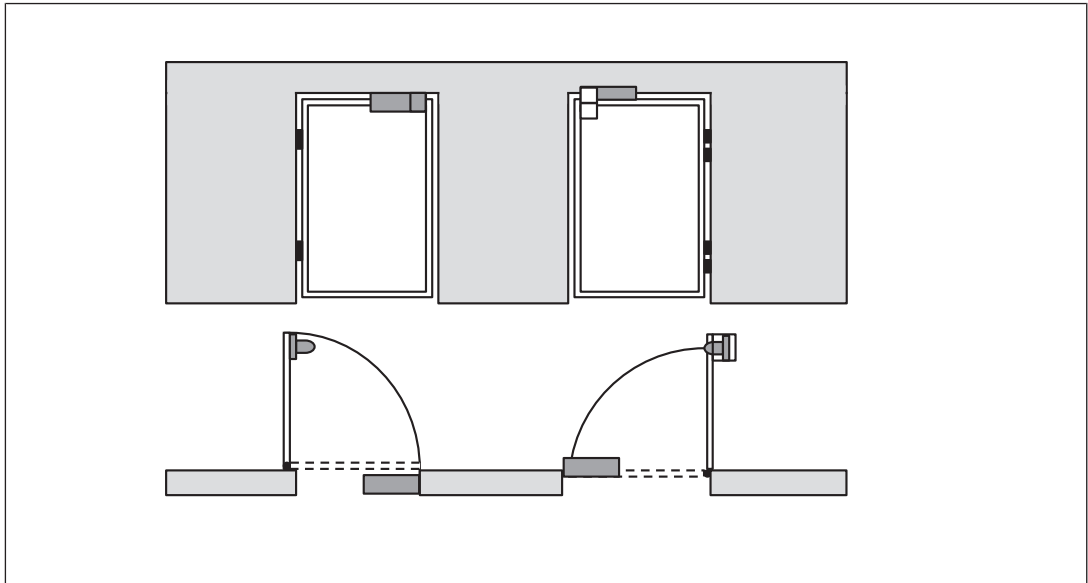


Install the safety switch horizontally at a swing gate

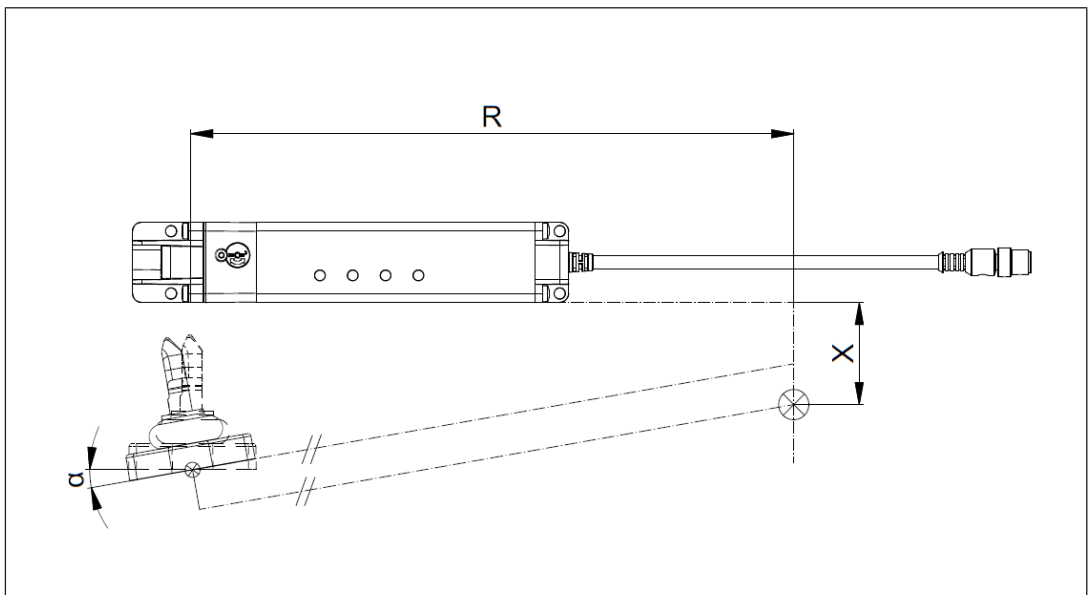
Please note:

Depending on the installation boundary conditions, a larger gate radius may be required (see diagram).

Please contact Pilz when smaller gate radii are required.



Make sure that a slight shift of the rotation point of the door is maintained when installing the actuator.



Legend

R The distance of the upper part of the safety switch from the rotation point of the door

X Parallel shift of the actuator

α Tilt angle when installing the actuator

► Tilt the actuator during installation by 10° in the following situations:

– $50 \text{ mm} < X < 75 \text{ mm}$ **and** $R < 600 \text{ mm}$

– $X < 50 \text{ mm}$ **and** $R < 500 \text{ mm}$

Pilz recommends that you use the PSEN ml actuator 10° adapter for correctly installing the actuator.

8.9 Installation with mounting bracket

1. Use two M6 screws to fix the mounting bracket PSEN ml actuator 10° adapter to the gate. The position of the drill holes can be taken from the section entitled Dimensions.
2. Use two M5 screws to fix the actuator to the mounting bracket.

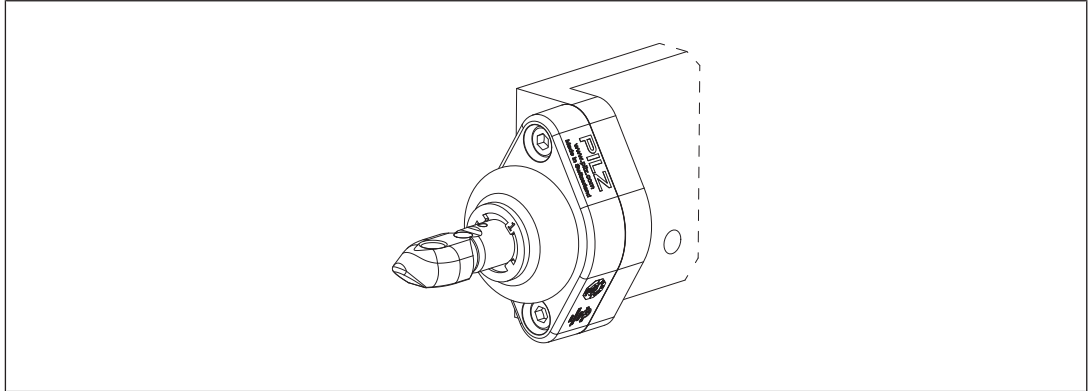


Fig.: Actuator, installed on mounting bracket

8.10 Installation with mounting plate

1. Attach the mounting plate to the swing gate/sliding gate.
2. Use four M5 screws to fix the safety switch [\[40 \]](#) to the mounting plate.

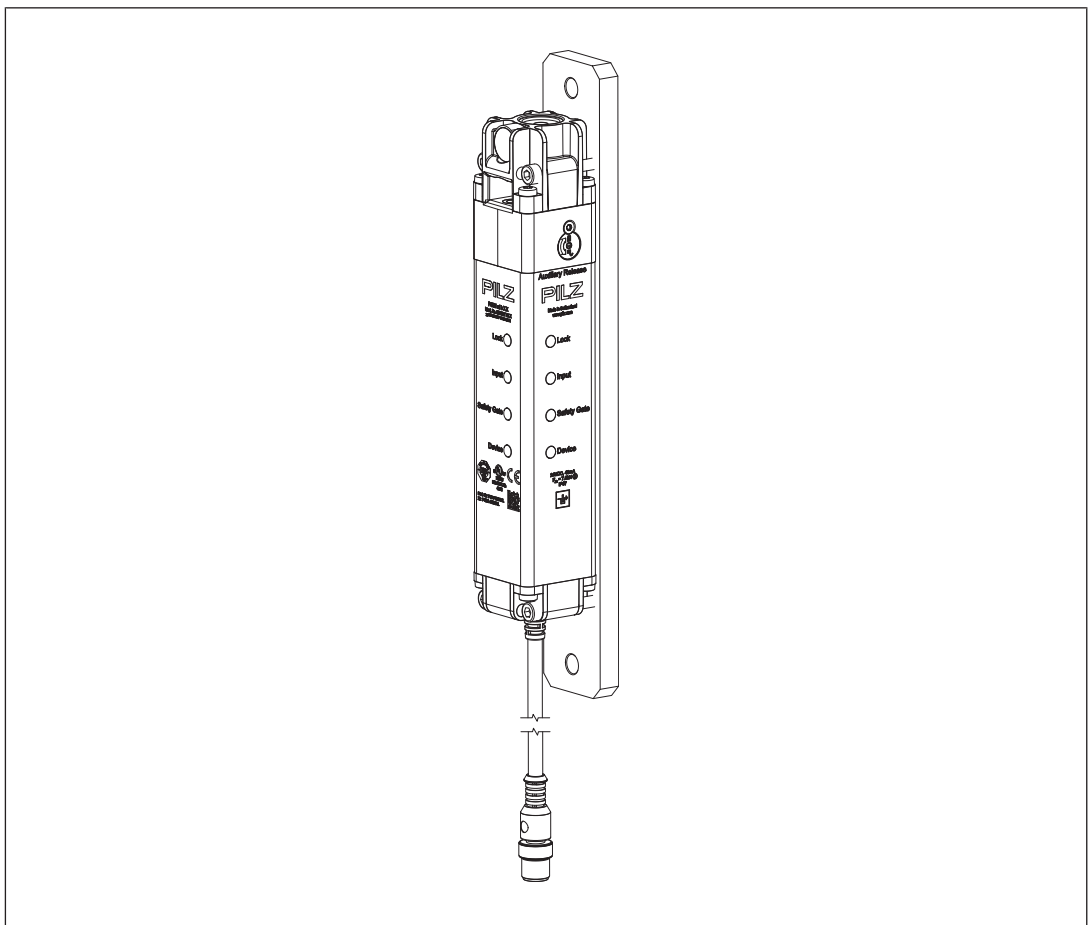


Fig.: Safety switch, installed on mounting plate

8.11 Installing the escape release

8.11.1 Important information



WARNING!

Risk of injury due to loss of the safety function.

Incorrect installation of the escape release means that the button of the escape release pin can be accessed from the outside. This can entail that the guard locking is unlocked from the outside and the safety gate is opened, although the hazardous machine is switched on.

- The escape release should be installed so that it is only accessible from inside the danger zone.

- ▶ The button of the escape release pin must be impossible to reach from a position outside the protected area.
- ▶ Make sure that the escape release cannot be operated unintentionally.
- ▶ Prevent the effect of transverse forces on the escape release.
- ▶ Secure the screw joints with a with a threadlocker.
- ▶ Ensure that the button of the escape release pin is clearly visible and that is it not covered.
- ▶ Maintain the min. bending radius of the push/pull cable of 60 mm when using the external escape release.



NOTICE

Functional restrictions of the external escape release imposed by incorrect installation

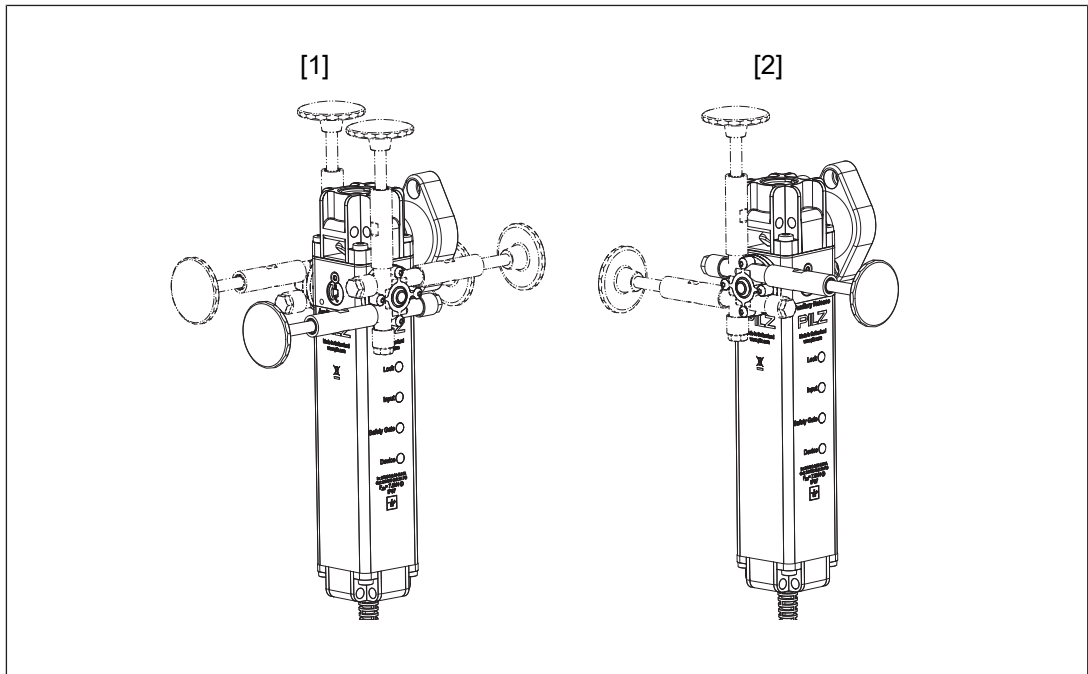
On escape releases with push/pull cables 0.5 m (order no. 570466) and 0.75 m (order no. 570467), bending the push/pull cable may reduce its functionality and lifetime.

Ensure that these versions are installed as straight as possible.

- ▶ Make sure that the button of the escape release pin does not present a risk.
- ▶ The mounting surface has to completely cover the bottom of the escape release housing. The bottom of the escape release housing must not be accessible after installation.

8.11.2 Installation positions for escape release

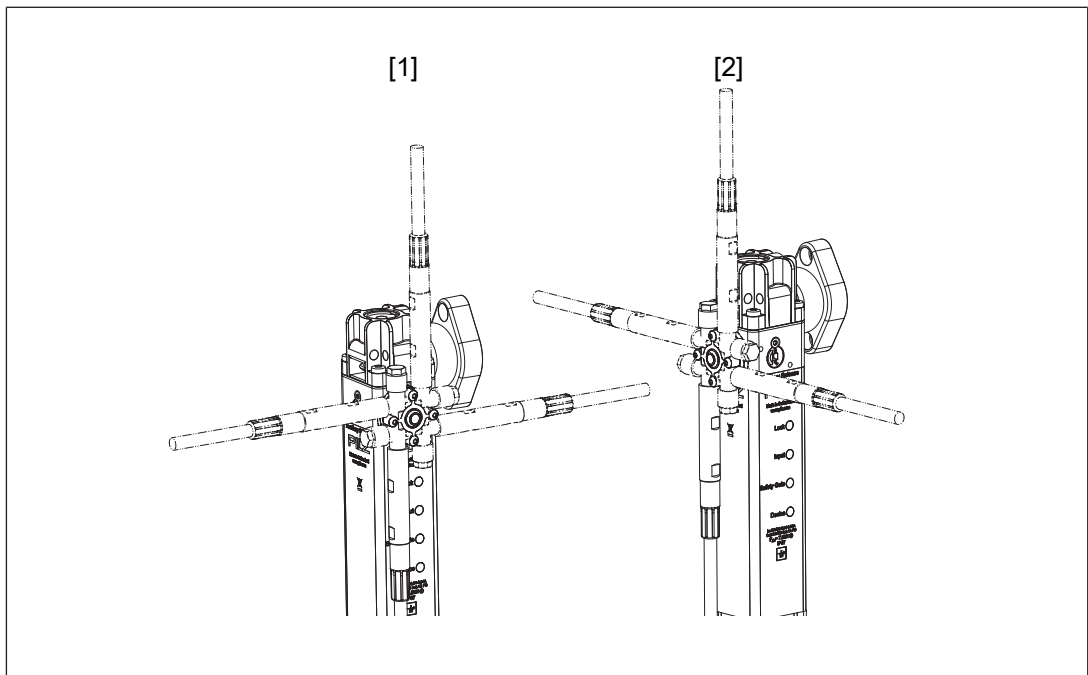
The stationary escape release can be installed on the three auxiliary releases in three different directions each.



Legend

- [1] Installation options at the sides
- [2] Installation options at the back

The external escape release can be installed on the three auxiliary releases in four different directions each. The push/pull cable can be led out on different sides.

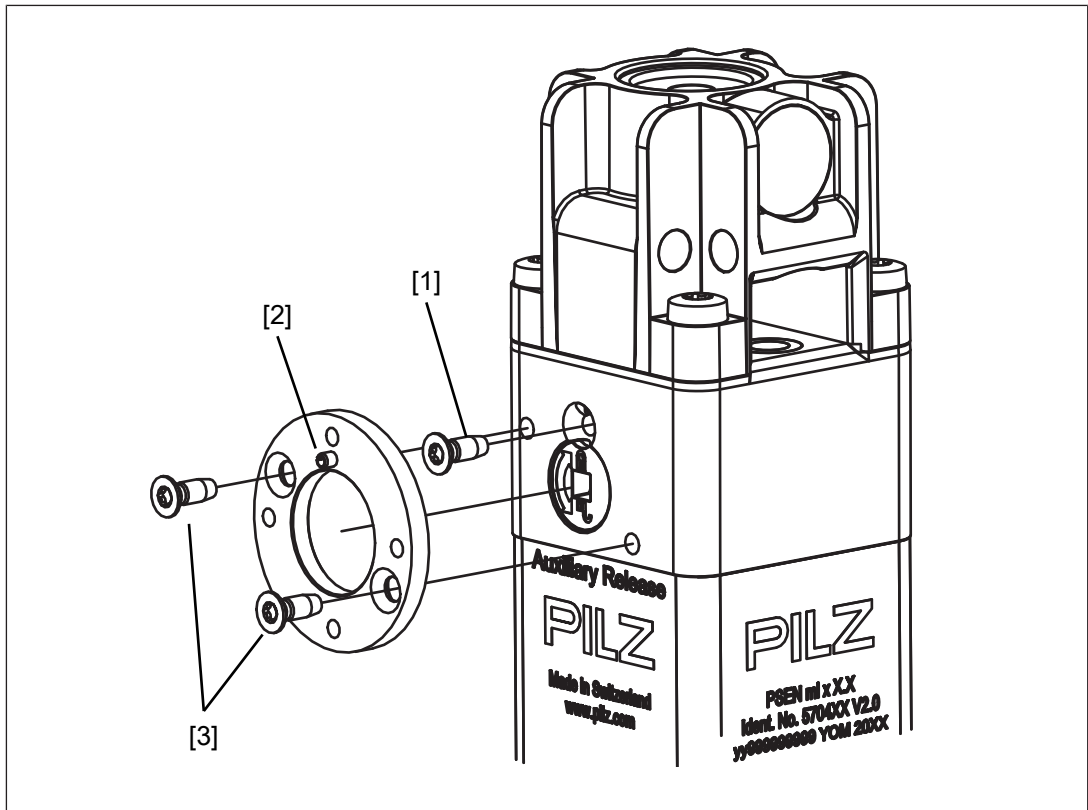


Legend

- [1] Installation options at the sides
- [2] Installation options at the back

8.11.3 Installation stationary escape release

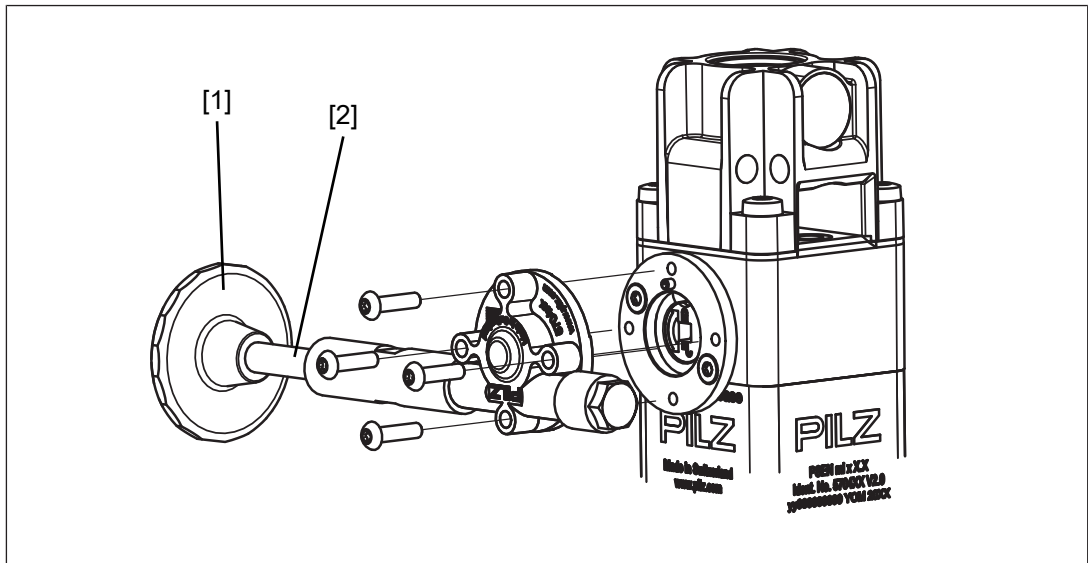
1. Remove the security screw [1] using a Torx T10 screwdriver T10.
2. Screw the adapter disk of the escape release with the two hexagon sockets M3x8 [3] on the safety switch with 1,2 - 1,5 Nm (see diagram). The pin of the adapter disk [2] must be at the place where the security screw of the auxiliary release [1] used to be.



Legend

- [1] Security screw of the auxiliary release
- [2] Pin in the adapter disk
- [3] Hexagon sockets M3x8

3. Screw the escape release with the four raised head screws M3x12 to the adapter disk with 1,2 - 1,5 Nm (see diagram).
 - ▶ The button of the escape release pin can be removed for the installation (e.g. when the escape release pin is to be run through a wall). The button of the escape release pin must be secured again with a threadlocker and hand-tightened after escape release installation is complete
 - ▶ To bridge larger distances the escape release pin can be extended by a max. of 25 mm two times (see [Order reference: Accessories \[75\]](#)).

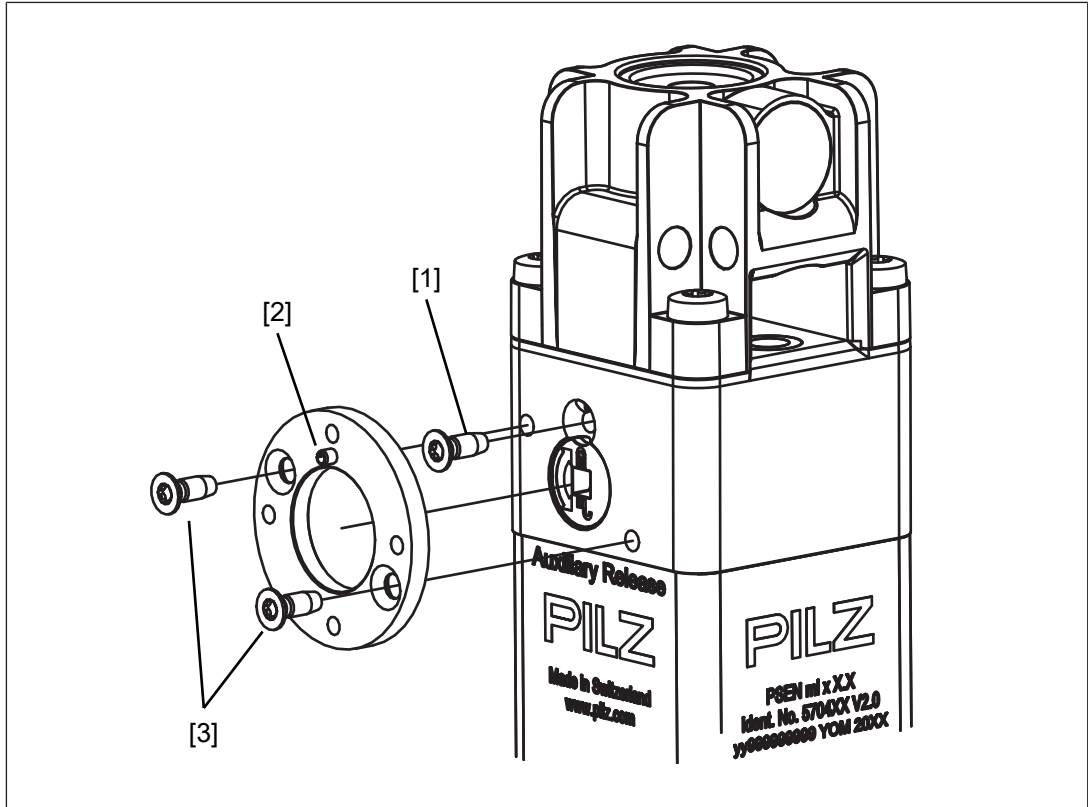


Legend

- [1] Button of the escape release pin
- [2] Escape release pin

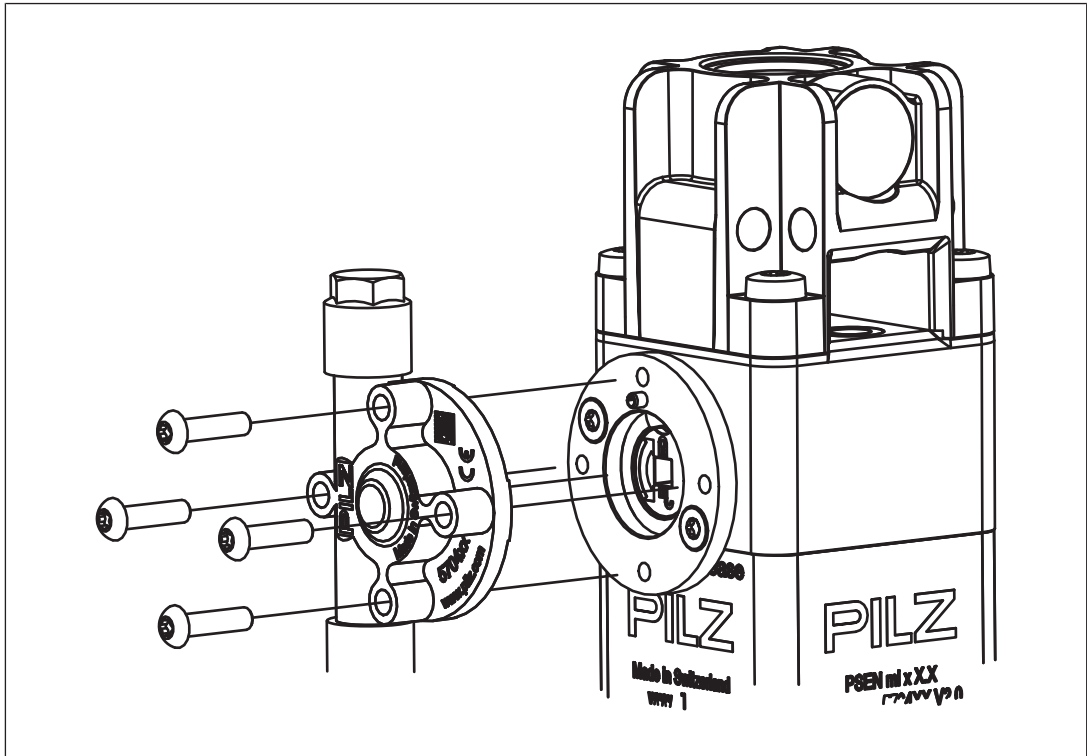
8.11.4 Installation external escape release

1. Remove the security screw [1] using a Torx T10 screwdriver T10.
2. Screw the adapter disk of the escape release with the two hexagon sockets M3x8 [3] on the safety switch with 1,2 - 1,5 Nm (see diagram). The pin of the adapter disk [2] must be at the place where the security screw of the auxiliary release [1] used to be.

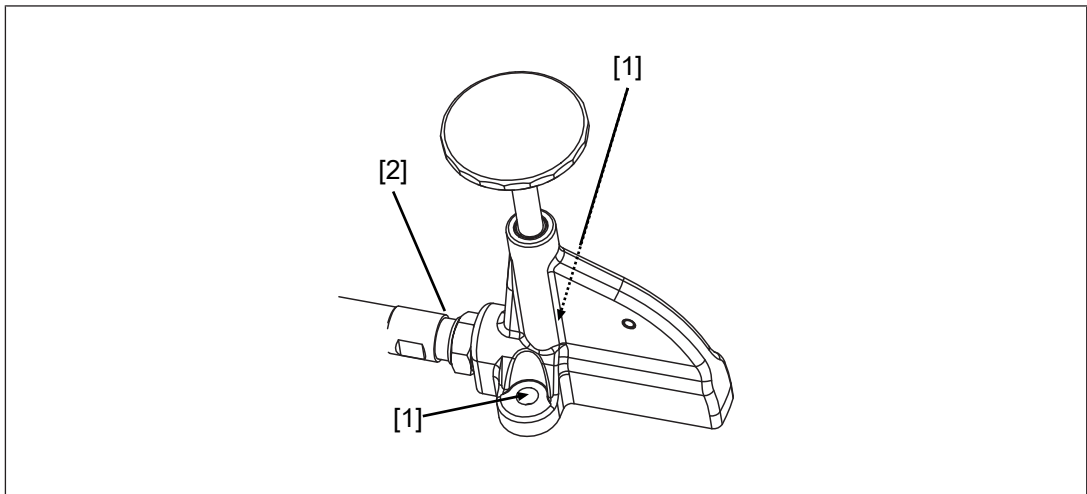


Legend

- [1] Security screw of the auxiliary release
 - [2] Pin in the adapter disk
 - [3] Hexagon sockets M3x8
3. Screw the escape release with the four raised head screws M3x12 to the adapter disk with 1,2 - 1,5 Nm (see diagram).



4. Screw the housing of the escape release with the screws [1] to a mounting surface with 6 - 6,5 Nm (see diagram).
 - ▶ The screws of the push/pull cable [2] can be loosened to make installation easier (e.g. when the push/pull cable is to be run through a wall). The screws must be fixed with 6 - 6,5 Nm after the escape release is installed.



Legend

- [1] Screwing the escape release to the mounting area
- [2] Screwing the cable

8.11.5 Uninstalling the escape release

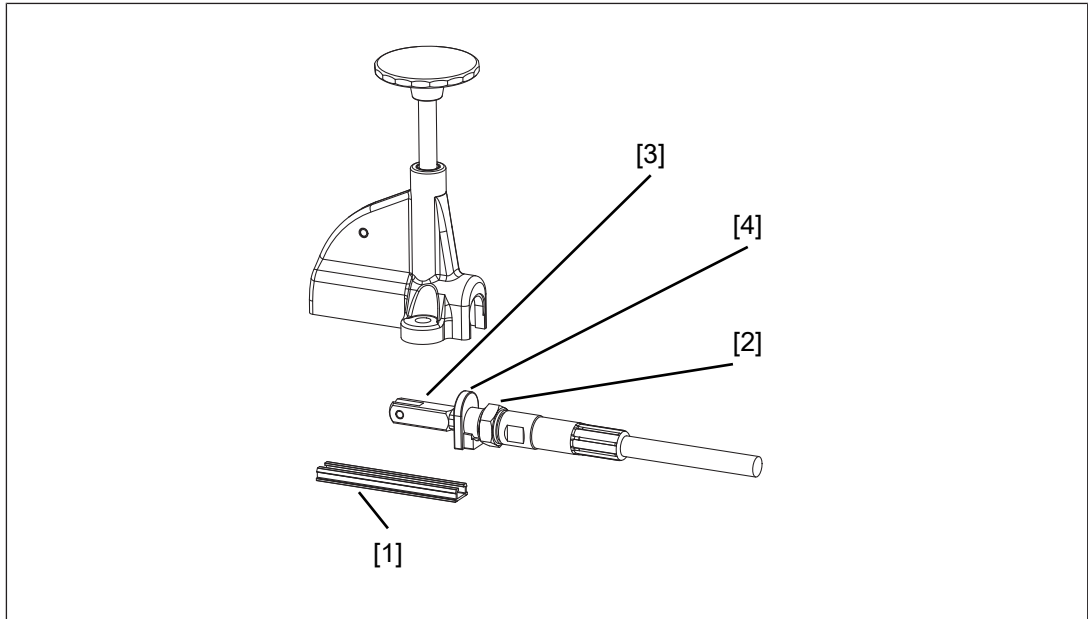
If the push/pull cable is to be run through a conduit pipe, the cable has to be uninstalled at the escape release first.

Prerequisites

- ▶ The conduit pipe must have a diameter of at least 12 mm.

Procedure:

1. Lift off the cover [1] (e.g. with a screwdriver with a flat blade).



Legend

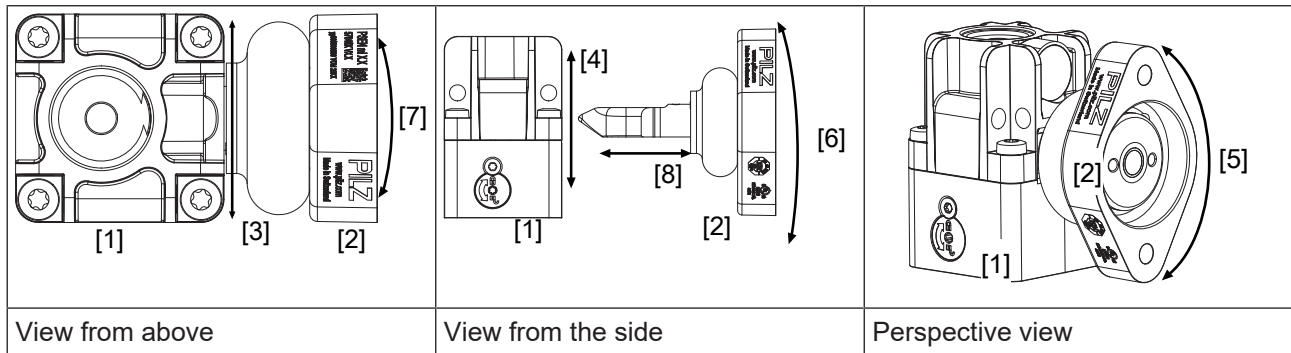
- [1] Cover
- [2] Nut M10 x 0,75
- [3] Fork head
- [4] Slot nut

2. Loosen the nut [2].
3. Pull out the push/pull cable with the slot nut [4] and remove the slot nut and the nut [2] from the cable.
4. Run the cable through the conduit pipe.
5. Push the nut [2] and the slot nut [4] over the fork head [3] back on the cable.
6. Push the cable with the fork head [3] on the fork in the escape release. The slot nut [4] must be fitted into the nut again.
7. Tighten the nut [2] with 6 - 6,5 Nm.
8. Put the lid [1] back on.

9 Adjustment

Please note:

- ▶ Safety switch and actuator must be aligned correctly
- ▶ Distances are maintained as stated in the following diagram
- ▶ Actuator is centred (see [Centre bolt in actuator housing](#) [41])
- ▶ Always test the function with a connected evaluation device.
- ▶ When installing an external or stationary escape release, check the function of the escape release with a connected evaluation device.



| | | |
|-----|---------------------------------------|------------|
| [1] | Safety switch | |
| [2] | Actuator | |
| [3] | Max. lateral offset | +/-3,0 mm |
| [4] | Max. vertical offset | +/-3,0 mm |
| [5] | Max. angular offset around the X axis | +/-2,0 deg |
| [6] | Max. angular offset around the Y axis | +/-2,5 deg |
| [7] | Max. angular offset around the Z axis | +/-7,5 deg |
| [8] | Max. offset in closing direction | +/-2 mm |

Attach safety switch and actuator

Once the safety switch and actuator are correctly aligned, the actuator's screw connection must be tightened.

1. Tighten up one M5 screw.
2. For applications with increased safety requirements (e.g. SIL CL 2 PL d), swap the second M5 screw for an M5 locking screw.
3. Tighten up the M5 screw or M5 locking screw.

Please note the max. torque setting stated in the [Technical details](#) [68].

10 Operation



NOTICE

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

Status indicators:





- ▶ "Device" LED illuminates green: The unit is ready for operation
- ▶ "Safety Gate" LED lights up yellow: Actuator is within the response range
- ▶ "Lock" LED lights up green: Guard locking active
- ▶ "Input" LED lights independently of the status of safety inputs S11 and S21

Legend:













| | |
|--|---|
| | LED off |
| | LED on |
| | LED flashes (500 ms on, 500 ms off) |
| | LED flashes quickly (50 ms on, 950 ms off) |
| | LED flashes very quickly (25 ms on, 475 ms off) |







10.1 Normal mode

| LED status | | | | Switch status |
|------------|-------------|------------|-----------|--|
| Device | Safety Gate | Input | Lock | |
| Green | Yellow | Yellow | Green | PSEN ml s 1.1 is started |
| Green | | | | Safety gate open, actuator not detected, guard locking deactivated, safety inputs S11 and S21 are low |
| Green | | Yellow | | Safety gate open, actuator not detected, guard locking deactivated, safety inputs S11 and S21 are high |
| Green | Yellow | Yellow | | Safety gate closed, actuator not detected, guard locking deactivated, safety inputs S11 and S21 are high |













| LED status | | | | Switch status |
|--|---|---|--|--|
| Device | Safety Gate | Input | Lock | |
|  Green |  Yellow |  Yellow |  Green | Safety gate closed, actuator detected, guard locking activated |

Warnings

| LED status | | | | Switch status | Remedy / measure |
|---|---|---|---|--|--|
| Device | Safety Gate | Input | Lock | | |
|  Green |  Yellow |  Yellow |  Green | Safety gate closed, actuator detected, guard locking cannot be activated / deactivated | Check the actuator's alignment [ 56] to the safety switch. |
| | | | | The supply voltage to safety inputs S31 and S41 was switched back on before the auxiliary release screw was turned back. | Turn back the auxiliary release screw and then switch the supply voltage on (see Recommissioning [ 22]). |
|  Green | Display not definitive | Display not definitive |  Yellow | Guard locking pin is in an intermediate position | |
|  Yellow | Display not definitive |  Yellow | Display not definitive | Safety switch active despite over or undervoltage | Check the supply voltage. If safety inputs S31 and S41 are activated or deactivated while an undervoltage warning is present, the safety switch switches to a fault condition. |
|  Green | Display not definitive |  Yellow | Display not definitive | Partial operation: One input is low, after both inputs were high | Open both inputs (switch to normal operation). |

| LED status | | | | Switch status | Remedy / measure |
|--|------------------------|---|--|--|---|
| Device | Safety Gate | Input | Lock | | |
|  Red | Display not definitive |  Yellow |  Green | Partial operation lock: One input is low, after both inputs were high | Open both inputs. This will cancel the lock. |
|  Red | Display not definitive |  Yellow |  Green | Partial operation lock: Both inputs are high | |

10.2 Error display

| LED status | | | | Switch status | Remedy / measure |
|--|---|---|--|--|---|
| Device | Safety Gate | Input | Lock | | |
|  Red |  Yellow |  Yellow | Display not definitive | Safety switch deactivated due to under or over-voltage | Check the supply voltage and switch the supply voltage off and then on again. |
|  Red | Previous LED display is retained | | Display not definitive | Safety outputs in fault condition | Check the wiring and switch the supply voltage off and then on again. |
|  Red |  |  |  Red | Auxiliary release/escape release activated | <ul style="list-style-type: none"> ▶ Auxiliary release: Turn back the auxiliary release screw and then switch the supply voltage on (see Recommissioning [22]). ▶ Escape release: Pull the button of the escape release pin back again and then switch on the supply voltage again (see Recommissioning under escape release [24]). |
| | | | | Error | Please contact Pilz. |
|  Red | Display not definitive | | | Safety switch does not start | Change the safety switch. |
|  Green |  Yellow |  Yellow | Display not definitive | Wrong actuator | Use the actuator PSEN ml 1.1. |

11 Checks and maintenance

Regular inspection of the switch function is required to guarantee the trouble-free, long-term function.

If the interlock and guard locking system is only used rarely (opening and closing the safety gate and activating/deactivating the guard locking device), a manual function test is required.

The correct function of the device should be checked at regular intervals and after each error.

Test intervals in accordance with EN ISO 14119:

- ▶ for SIL CL 3/PL e at least 1x per month
- ▶ for SIL CL 2/PL d at least 1x per year

The Appendix contains a [Check list](#)  79], which should help you perform the test.

Visual inspection:

- ▶ Check that the seal on the security screw on the auxiliary release is intact. If the seal is not intact, make sure that the security screw is inserted and use varnish to seal the security screw.
- ▶ Check the safety switch and actuator for damage.
- ▶ Make sure that the safety switch and actuator are firmly secured.
- ▶ Check the offset of the safety switch and actuator.
 - Max. lateral offset
 - Max. angular offset
 - Max. vertical offset
- ▶ Check that the wiring is correct.
- ▶ Remove any dirt from the safety switch and actuator.

Function test

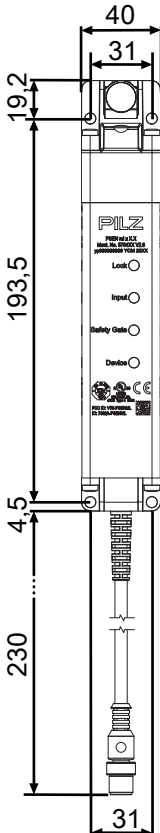
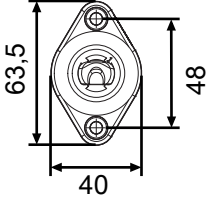
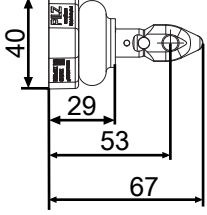
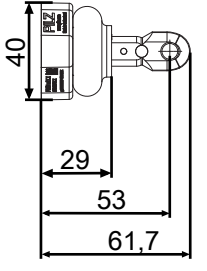
- ▶ The actuator is detected and at the signal output/ diagnostic output Y32 there is a high signal after detection of the actuator.
- ▶ The guard locking device can be activated/deactivated when the safety inputs S31 and S41 are activated.
- ▶ Under these conditions there is a high signal at safety outputs 12 and 22:
 - Actuator is detected **and**
 - Guard locking pin has successfully been activated (guard locking pin is in the locked position) **and**
 - There is a high signal at the inputs S11 and S21

If one of these conditions is not met, the signal at the safety outputs will be low.

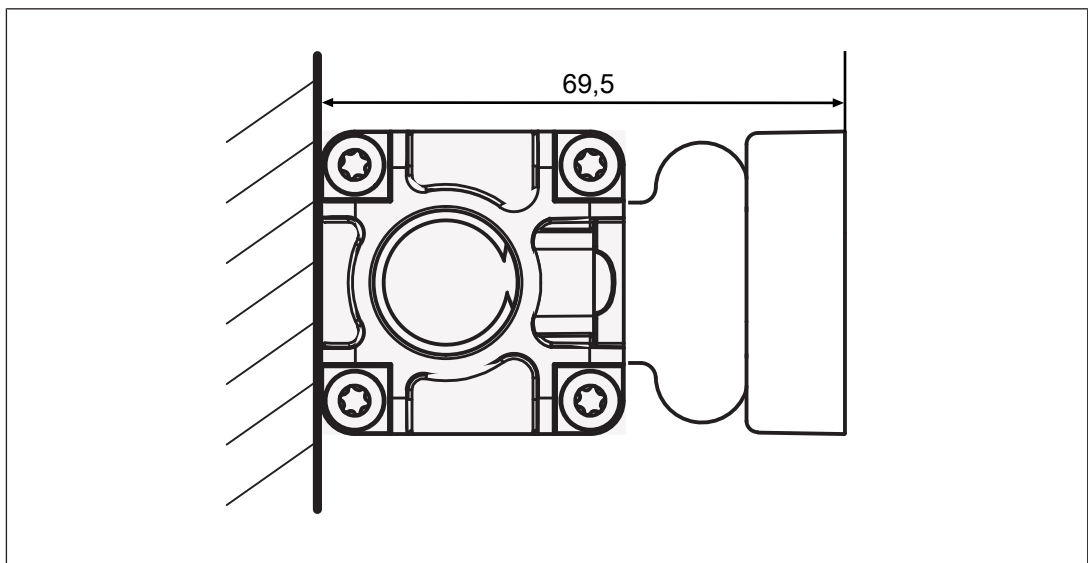
Escape release

- ▶ Test whether the button of the escape release pin can be detected and reached.
- ▶ Check the function of the escape release.

12 Dimensions

| | |
|--|--|
|  |  <p>Actuator without center ring, rear view</p> |
| |  <p>PSEN ml 1.1 actuator</p> |
| |  <p>PSEN ml 1.1 round actuator</p> |
| <p>Safety switch</p> | <p>Actuator</p> |

Distance between safety switch mounting surface and actuator mounting surface



Mounting plate (see [Accessories \[75\]](#))

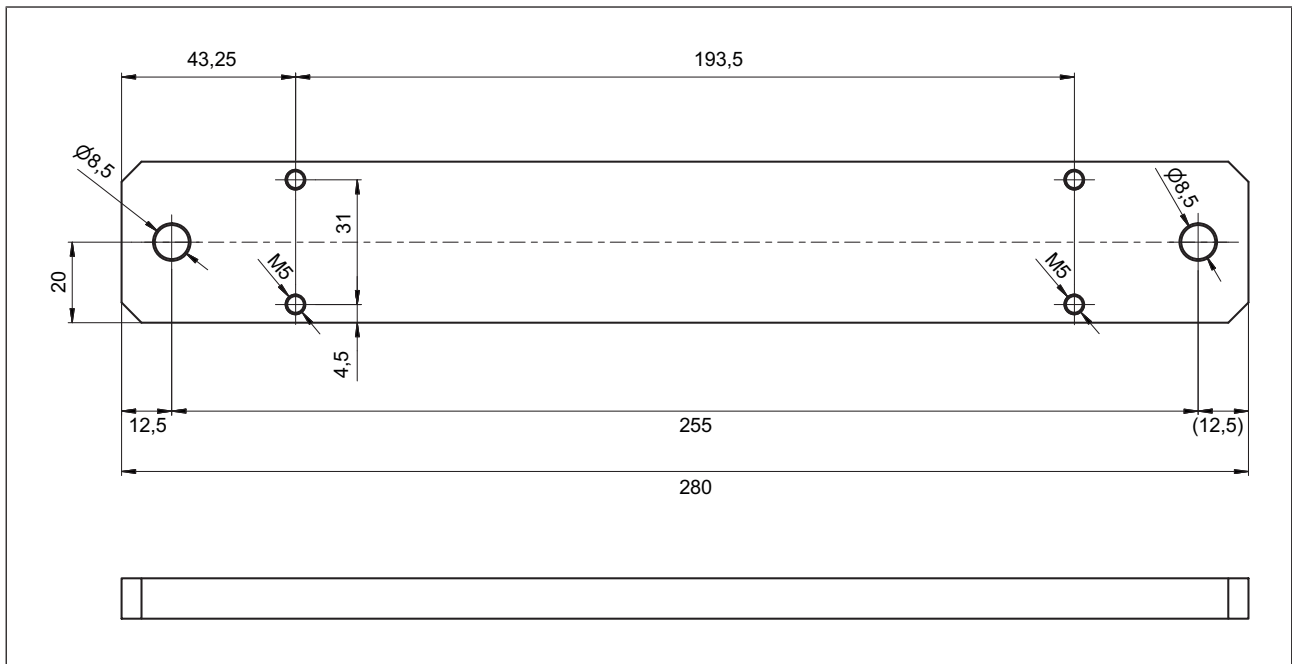


Fig.: Order no.: 570 490

Mounting bracket for sliding gate (see [Accessories \[75\]](#))

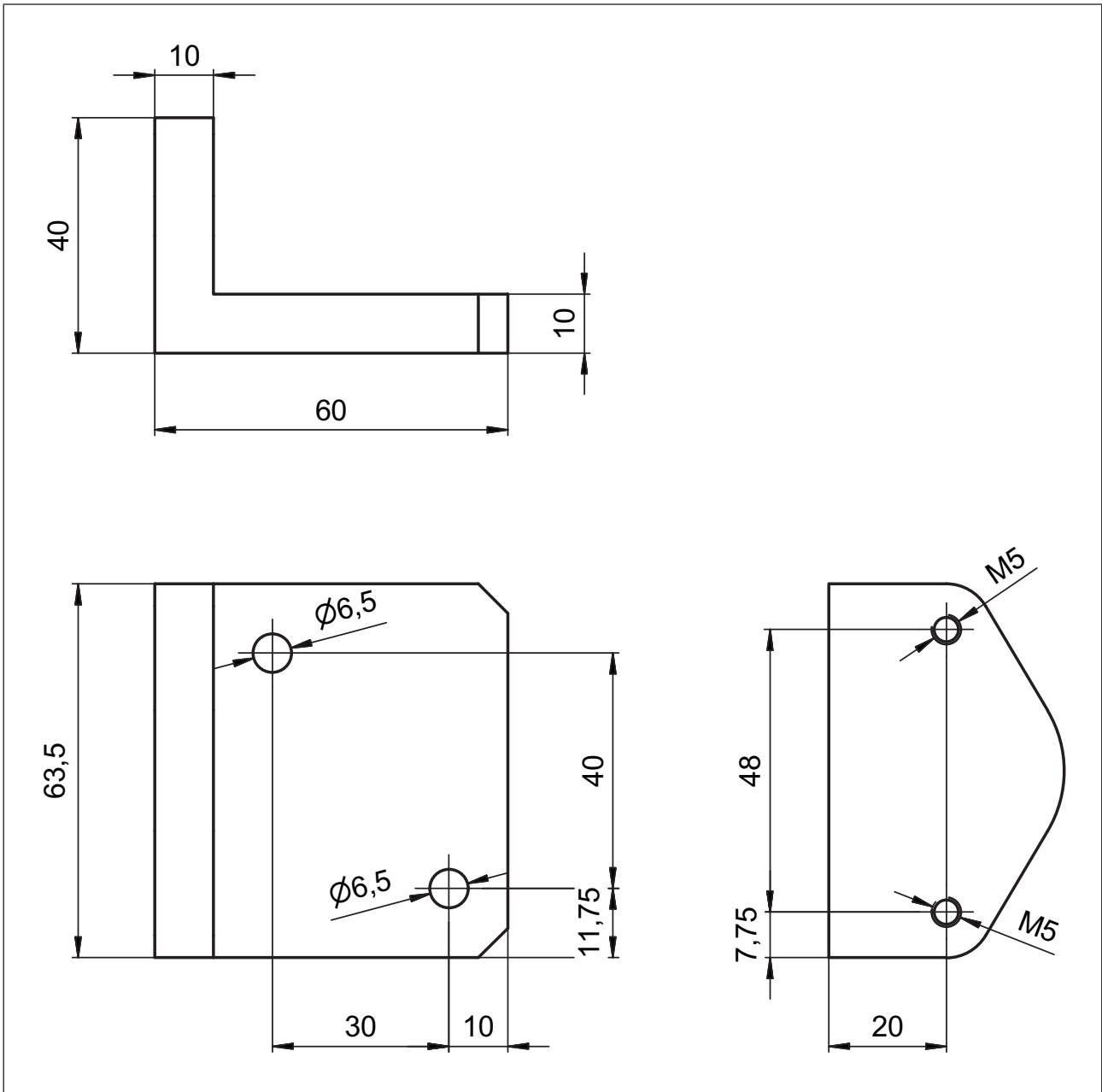


Fig.: Order no.: 570 492

Mounting bracket for swing gate (see [Accessories \[75\]](#))

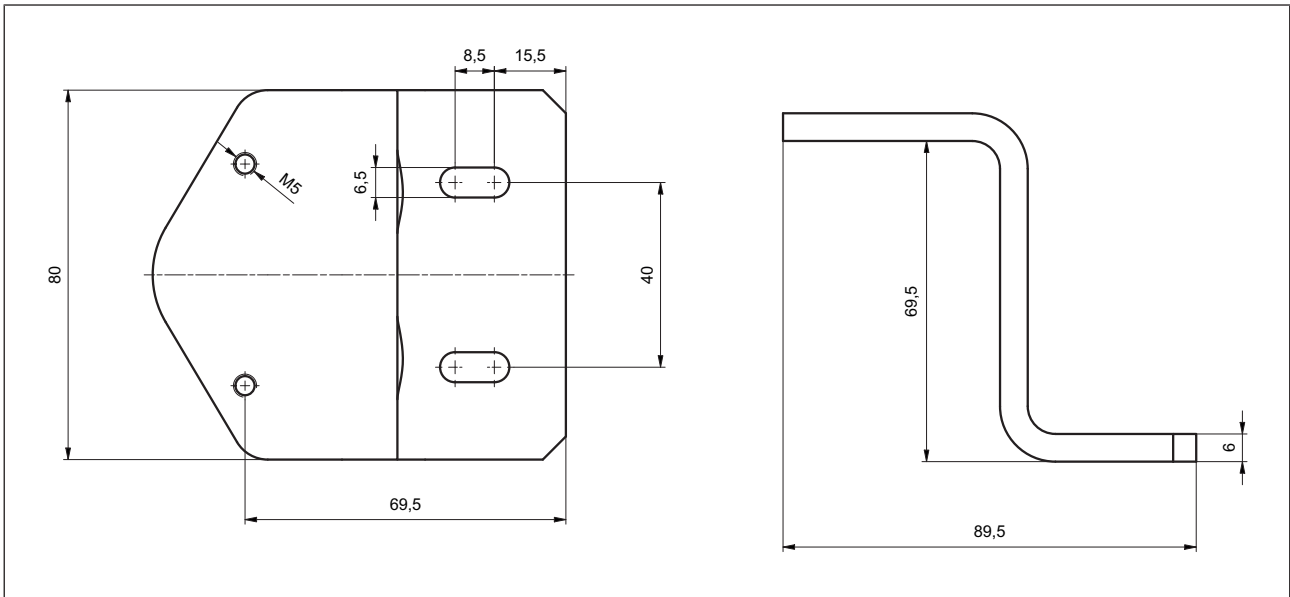


Fig.: Order no.: 570 493

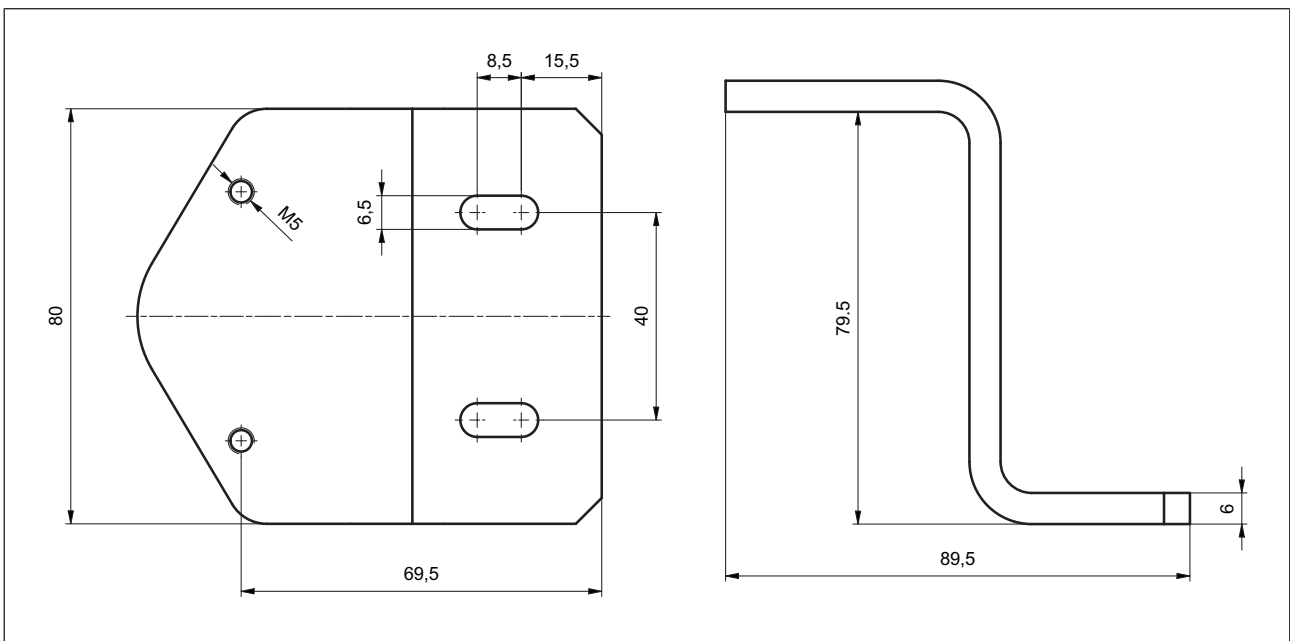


Fig.: Order no.: 570 494

Mounting bracket with handle unit for sliding gate (see [Accessories \[75\]](#))

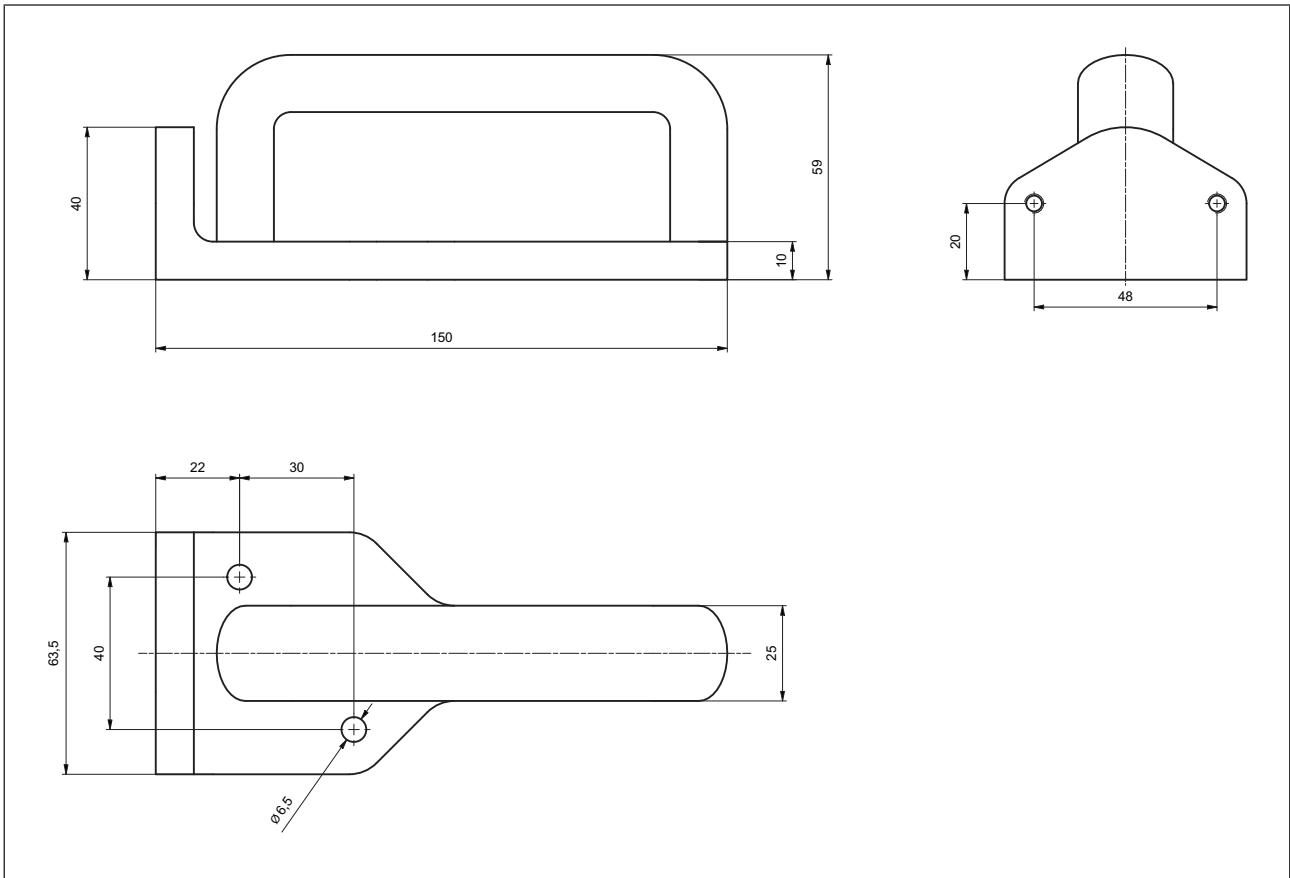


Fig.: Order no.: 570 495

Mounting bracket with handle unit for swing gate (see [Accessories \[75\]](#))

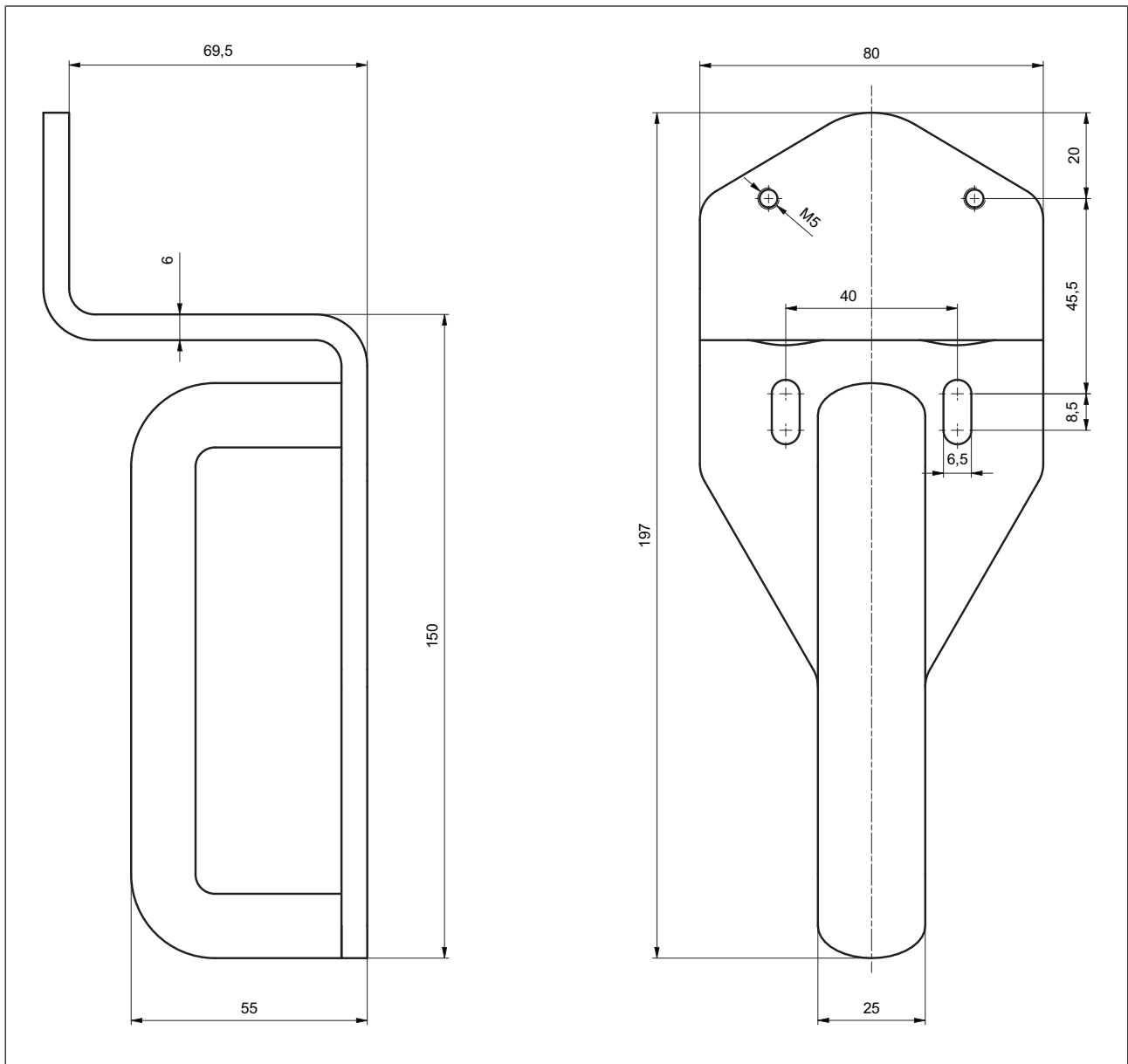


Fig.: Order no.: 570 496

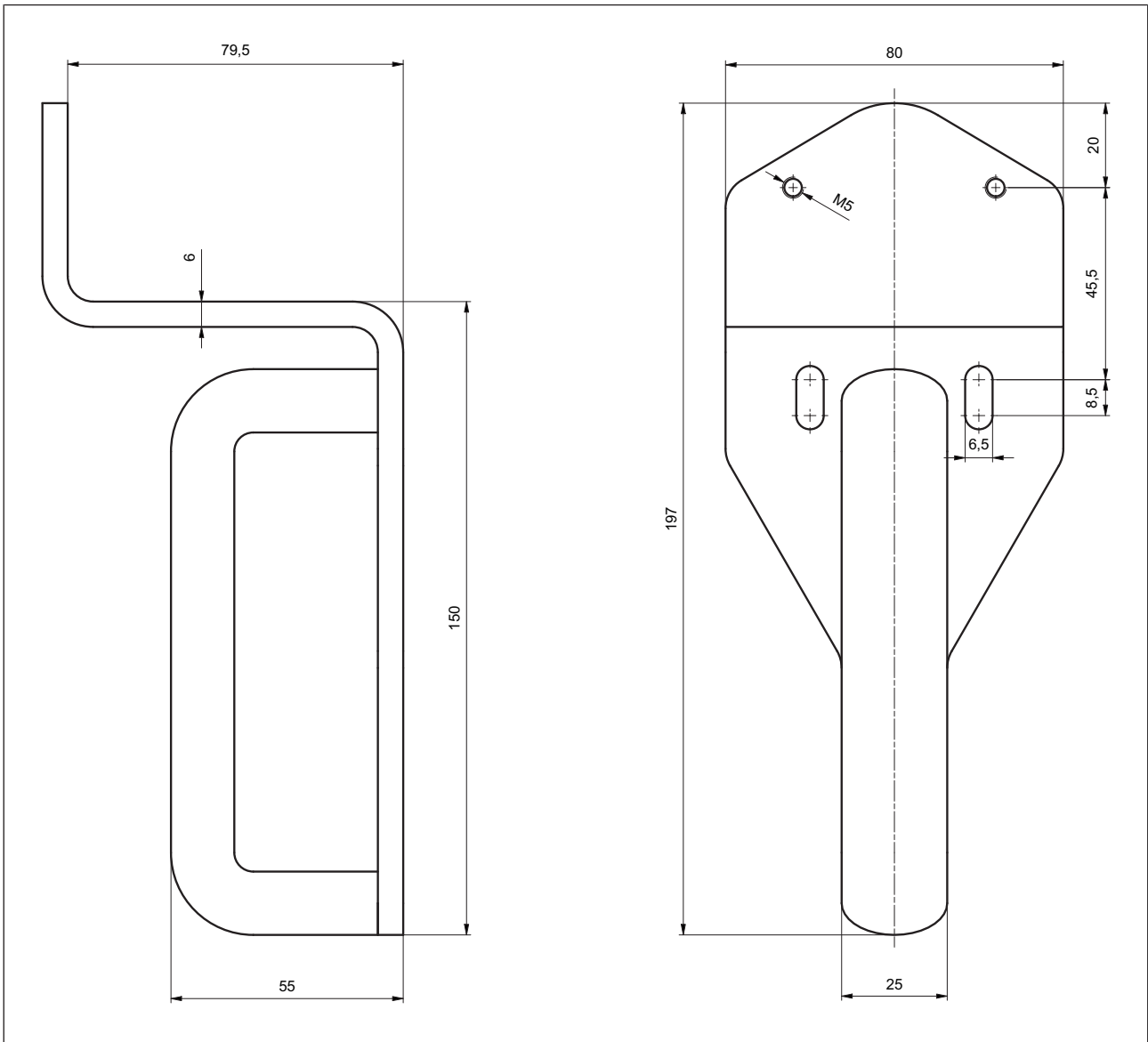


Fig.: Order no.: 570 497

13 Technical details

| General | |
|---|--------------------------------|
| Certifications | CE, FCC, IC, TÜV, cULus Listed |
| Sensor's mode of operation | Transponder |
| Coding level in accordance with EN ISO 14119 | Low |
| Design in accordance with EN ISO 14119 | 4 |
| Classification in accordance with EN 60947-5-3 | PDDb |
| Pilz coding type | Coded |
| Transponder | |
| Frequency band | 122 kHz - 128 kHz |
| Max. transmitter output | 15 mW |
| Electrical data | |
| Supply voltage | |
| Voltage | 24 V |
| Kind | DC |
| Voltage tolerance | -20 %/+20 % |
| Output of external power supply (DC) | 1 W |
| Max. switching frequency | 1 Hz |
| Magnet. supply voltage | 24 V |
| Max. solenoid current $t < 150$ ms | 1 A |
| Max. cable capacitance at the safety outputs | |
| No-load, PNOZ with relay contacts | 40 nF |
| PNOZmulti, PNOZelog, PSS | 70 nF |
| Max. inrush current impulse | |
| Current pulse, A1 | 5 A |
| Pulse duration, A1 | 0,0002 ms |
| Max. unit fuse protection in accordance with UL | 3 A |
| No-load current | 40 mA |
| Inputs | |
| Number | 4 |
| Voltage at inputs | 24 V DC |
| Current at solenoid input | 500 mA |
| 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 | 100 μ A |
| Voltage drop at OSSDs | 1 V |
| Conditional rated short circuit current | 100 A |

| Semiconductor outputs | |
|--|--|
| Lowest operating current | 1 mA |
| Utilisation category in accordance with EN 60947-1 | DC-13 |
| Times | |
| Test pulse duration, safety outputs | 450 µs |
| Switch-on delay | |
| after UB is applied | 1,1 s |
| Inputs typ. | 1 ms |
| Inputs max. | 3 ms |
| Actuator typ. | 30 ms |
| Actuator max. | 50 ms |
| Delay-on de-energisation | |
| Inputs typ. | 3 ms |
| Inputs max. | 5 ms |
| Actuator typ. | 30 ms |
| Actuator max. | 40 ms |
| Risk time in accordance with EN 60947-5-3 | 260 ms |
| Supply interruption before de-energisation | 20 ms |
| Simultaneity, channel 1 and 2 max. | 20 ms |
| Pulse duration Lock/Unlock Request | 350 - 400 ms |
| Processing time activate/deactivate guard locking | 100 ms |
| Environmental data | |
| Temperature of metal surface at ambient temperature: 25 °C | 40 °C |
| Ambient temperature | |
| In accordance with the standard | EN 60068-2-14 |
| Temperature range | 0 - 60 °C |
| Storage temperature | |
| In accordance with the standard | EN 60068-2-1/-2 |
| Temperature range | -25 - 70 °C |
| Climatic suitability | |
| In accordance with the standard | EN 60068-2-78 |
| Humidity | 93 % r. h. at 40 °C |
| EMC | EN 55011: class A, EN 60947-5-3, EN 61326-3-1 |
| Vibration | |
| In accordance with the standard | EN 60068-2-6 |
| Frequency | 10 - 55 Hz |
| Amplitude | 1 mm |
| Shock stress | |
| In accordance with the standard | EN 60068-2-27 |
| Number of shocks | 3 |
| Acceleration | 30g |
| Duration | 11 ms |
| Airgap creepage | |
| Overvoltage category | III |
| Pollution degree | 3 |

| Environmental data | |
|--|--|
| Rated insulation voltage | 75 V |
| Rated impulse withstand voltage | 0,8 kV |
| Protection type | |
| Housing | IP67 |
| In accordance with UL | type 1 |
| Mechanical data | |
| Length of cable with connector | 230 mm |
| Min. bending radius (fixed permanently) K1 | 5 x Ø |
| Min. bending radius (moving) K1 | 10 x Ø |
| Cable diameter K1 | 6,5 mm |
| Escape release available | No |
| Mechanical life | 1,000,000 cycles |
| Mechanical life with centering ring | 50,000 cycles |
| Holding force FZh | |
| Fixing screws in parallel to actuator | 7.500 N |
| Fixing screws side-on to actuator | 5.000 N |
| Holding force F1Max in accordance with ISO 14119 | |
| Fixing screws in parallel to actuator | 15.000 N |
| Fixing screws side-on to actuator | 10.000 N |
| Latching force | 30 N |
| Max. vertical offset | +/-3,0 mm |
| Max. lateral offset | +/-3,0 mm |
| Max. angular offset around the X axis | +/-2,0 deg |
| Max. angular offset around the Y axis | +/-2,5 deg |
| Max. angular offset around the Z axis | +/-7,5 deg |
| Max. offset in closing direction | +/-2 mm |
| Max. retract speed of actuator | 0,3 m/s |
| Actuator 1 | PSEN ml 1.1 |
| Min. distance between safety switches | 0 mm |
| Connection type | M12, 12-pin male connector |
| Cable | LiYY 12 x 0.25 mm² |
| Material | Aluminium, stainless steel, plastic, galvanised steel, Zn |
| Max. torque setting for fixing screws | 6 - 6,5 Nm |
| Max. torque setting escape release | 1,2 - 1,5 Nm |
| Max. torque setting for mounting plate | 22 - 24 Nm |
| Max. torque setting for mounting bracket | 14 - 16 Nm |
| Min. gate radius | 300 mm |
| Dimensions | |
| Height | 217,2 mm |
| Width | 40 mm |
| Depth | 40 mm |

Mechanical data

Actuator dimensions

| | |
|--------|---------|
| Height | 63,5 mm |
| Width | 40 mm |
| Depth | 67,2 mm |

Weight of safety switch **950 g**

Weight of actuator **145 g**

Weight **1.100 g**

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

13.1 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".

Inputs

| Drain | | Source | |
|---------------|----|-----------------------|--------|
| Safety switch | C2 | Safety control system | C2, C3 |

| Drain parameters | Min. | Typ. | Max. |
|-----------------------|---------|------|--------|
| Test impulse duration | - | - | 500 µs |
| Input resistance | 9 kOhm | - | - |
| Capacitive load | - | - | 1 nF |
| Test impulse interval | 1,25 ms | - | - |

Solenoid inputs

| Drain | | Source | |
|---------------|----|-----------------------|--------|
| Safety switch | C2 | Safety control system | C2, C3 |

| Drain parameters | Min. | Typ. | Max. |
|-----------------------|--------|------|--------|
| Test impulse duration | - | - | 500 µs |
| Input resistance | 16 Ohm | - | - |
| Capacitive load | - | - | 1,5 nF |

Safe 1-pole HL outputs

| Source | | Drain | |
|---------------|----|-------------------|--------|
| Safety switch | C2 | Evaluation device | C1, C2 |

| Source parameters | Min. | Typ. | Max. |
|-----------------------|------|------|--------|
| Test impulse duration | - | - | 450 µs |
| Rated current | - | - | 0,1 A |
| Capacitive load | - | - | 70 nF |

13.2 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 | EN IEC 62061 PFH ₀ [1/h] | Lambda d/ Lambda | EN ISO 13849-1: 2015, EN IEC B10D | EN ISO 13849-1: 2015 T _M [year] |
|---------------------|-------------------------|-------------------------------|---------------------|-------------------------------------|------------------|-----------------------------------|--|
| 1-ch. guard locking | PL d | Cat. 2 | SIL CL 2 | 2,54E-08 | - | - | 20 |
| 2-ch. guard locking | PL e | Cat. 4 | SIL CL 3 | 2,54E-08 | - | - | 20 |
| 2-ch. OSSD | PL e | Cat. 4 | SIL CL 3 | 1,90E-08 | - | - | 20 |

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.



NOTICE

Be sure that you observe the mechanical life. The safety characteristic data are only valid as long as the values of mechanical life are met.

14 Supplementary data

14.1 Radio approval

| USA/Canada | |
|---|---------------------|
| FCC ID: | VT8-PSENML |
| IC: | 7482A-PSENML |
| FCC/IC-Requirements: | |
| This product complies with Part 15 of the FCC Rules and with Industry Canada licence-exempt RSS standards. | |
| Operation is subject to the following two conditions: | |
| 1) this product may not cause harmful interference, and | |
| 2) this product must accept any interference received, including interference that may cause undesired operation. | |
| Changes or modifications made to this product not expressly approved by Pilz may void the FCC authorization to operate this equipment. | |
| NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. | |
| Le présent produit est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: | |
| (1) le produit ne doit pas produire de brouillage, et | |
| (2) l'utilisateur de le produit doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement. | |

14.2 Technical details for mounting bracket without handle unit

| General | 570492 | 570493 | 570494 |
|--|--------|--------|--------|
| Certifications | CE | CE | CE |
| Mechanical data | 570492 | 570493 | 570494 |
| Holding force FZh in accordance with ISO 14119 | – | 3000 N | 3000 N |
| Holding force F1max in accordance with ISO 14119 | – | 6000 N | 6000 N |
| Weight | 420 g | 420 g | 445 g |

14.3 Technical details for mounting bracket with handle unit

| General | 570495 | 570496 | 570497 |
|--|--------|--------|--------|
| Certifications | CE | CE | CE |
| Mechanical data | 570495 | 570496 | 570497 |
| Holding force FZh in accordance with ISO 14119 | 3000 N | 3000 N | 3000 N |
| Holding force F1max in accordance with ISO 14119 | 6000 N | 6000 N | 6000 N |
| Weight | 260 g | 600 g | 630 g |

14.4 Technical details escape release 570460, 570462, 570470

| General | 570460 | 570462 | 570470 |
|-----------------------------------|--------------------|--------------------|--------------------|
| Certifications | CE | CE | CE |
| Mechanical data | 570460 | 570462 | 570470 |
| Release force escape re- lease | 80 N | 80 N | 80 N |
| Service life escape re- lease | 6050 cycles | 6050 cycles | 6050 cycles |
| Weight | 115 g | 15 g | 420 g |

14.5 Technical details escape release 570471-570473

| General | 570471 | 570472 | 570473 |
|-----------------------------------|--------------------|--------------------|--------------------|
| Certifications | CE | CE | CE |
| Mechanical data | 570471 | 570472 | 570473 |
| Release force escape re- lease | 80 N | 80 N | 80 N |
| Service life escape re- lease | 6050 cycles | 6050 cycles | 6050 cycles |
| Weight | 470 g | 520 g | 570 g |

14.6 Technical details escape release 570474-570475

| General | 570474 | 570475 |
|------------------------------|--------------------|--------------------|
| Certifications | CE | CE |
| Mechanical data | 570474 | 570475 |
| Release force escape release | 80 N | 80 N |
| Service life escape release | 6050 cycles | 6050 cycles |
| Weight | 620 g | 670 g |

15 Order reference

15.1 System

| Product type | Features | | Order no. |
|----------------------------|--|----------------------|-----------|
| PSEN ml s 1.1 unit | Mechanical safety gate system with guard locking, coded, for series connection | 12-pin M12 connector | 570 406 |
| PSEN ml s 1.1 switch | Mechanical safety gate switch with guard locking, coded, for series connection | 12-pin M12 connector | 570 407 |
| PSEN ml 1.1 actuator | Actuator, coded | | 570 480 |
| PSEN ml 1.1 round actuator | Actuator with rounded head, coded | | 570 482 |

15.2 Accessories

Installation accessories

| Product type | Features | Order no. |
|--------------------------------------|---|-----------|
| PSEN ml escape release | Escape release stationary | 570 460 |
| PSEN ml escape release extension | Extension escape release stationary 25 mm | 570 462 |
| PSEN ml escape release cordset 0.5m | Escape release external with push/pull cable 0.5 m | 570 466 |
| PSEN ml escape release cordset 0.75m | Escape release external with push/pull cable 0.75 m | 570 467 |
| PSEN ml escape release cordset 1.0m | Escape release external with push/pull cable 1.0 m | 570 468 |
| PSEN ml escape release cordset 1.25m | Escape release external with push/pull cable 1.25 m | 570 469 |
| PSEN ml escape release cordset 1.5m | Escape release with push/pull cable 1.5 m | 570 470 |
| PSEN ml escape release cordset 2.0m | Escape release with push/pull cable 2 m | 570 471 |
| PSEN ml escape release cordset 2.5m | Escape release external with push/pull cable 2.5 m | 570 472 |
| PSEN ml escape release cordset 3.0m | Escape release with push/pull cable 3.0 m | 570 473 |
| PSEN ml escape release cordset 3.5m | Escape release with push/pull cable 3.5 m | 570 474 |
| PSEN ml escape release cordset 4.0m | Escape release with push/pull cable 4 m | 570 475 |

| Product type | Features | Order no. |
|--------------------------------------|---|-----------|
| PSEN ml actuator center ring | 5 center rings for PSENmlock actuator | 570 485 |
| PSEN ml actuator 10° adapter | Mounting bracket for installing the actuator (10° angle) at small swing gates with a radius of 300 - 500 mm | 570 484 |
| PSEN ml mounting plate | Mounting plate for installing the safety switch, with 4 hexagonal socket head screws and 1 tamper-proof pan head locking screw, M5x40 | 570 490 |
| PSEN ml bracket sliding door | Mounting bracket for installing the actuator on a sliding gate, with 2 hexagonal socket head screws and 1 tamper-proof pan head locking screw, M5x16 | 570 492 |
| PSEN ml bracket swinging door 70 | Mounting bracket for installing the actuator on a swing gate, with 2 hexagonal socket head screws and 1 tamper-proof pan head locking screw, M5x12. Height: 70 mm. | 570 493 |
| PSEN ml bracket swinging door 80 | Mounting bracket for installing the actuator on a swing gate, with 2 hexagonal socket head screws and 1 tamper-proof pan head locking screw, M5x12. Height: 80 mm. | 570 494 |
| PSEN ml door handle sliding door | Mounting bracket with handle unit for installing the actuator on a sliding gate, with 2 hexagonal socket head screws and 1 tamper-proof pan head locking screw, M5x16. | 570 495 |
| PSEN ml door handle swinging door 70 | Mounting bracket with handle unit for installing the actuator on a swing gate, with 2 hexagonal socket head screws and 1 tamper-proof pan head locking screw, M5x12. Height: 70 mm. | 570 496 |
| PSEN ml door handle swinging door 80 | Mounting bracket with handle unit for installing the actuator on a swing gate, with 2 hexagonal socket head screws and 1 tamper-proof pan head locking screw, M5x12. Height: 80 mm. | 570 497 |
| PSEN screw set bracket swinging door | Screw set for installing the actuator on a mounting bracket for swing gates, with 2 hexagonal socket head screws and 1 tamper-proof pan head locking screw, M5x12 | 570 498 |
| PSEN screw set bracket sliding door | Screw set for installing the actuator on amounting bracket for sliding gates, with 2 hexagonal socket head screws and 1 tamper-proof pan head locking screw, M5x16 | 570 499 |

Cable

| Product type | Features | Connector X1 | Connector X2 | Connector X3 | Order no. |
|---------------------------------|----------|---------------------------------------|--------------|--------------|-----------|
| PSEN cable axial M12 8-pole 3m | 3 m | M12, 8-pin female connector, straight | | | 540 319 |
| PSEN cable axial M12 8-pole 5m | 5 m | M12, 8-pin female connector, straight | | | 540 320 |
| PSEN cable axial M12 8-pole 10m | 10 m | M12, 8-pin female connector, straight | | | 540 321 |
| PSEN cable M12-8sf, 20m | 20 m | M12, 8-pin female connector, straight | | | 540 333 |

| Product type | Features | Connector X1 | Connector X2 | Connector X3 | Order no. |
|----------------------------------|----------|--|-------------------------------------|--------------|-----------|
| PSEN cable axial M12 8-pole 30m | 30 m | M12, 8-pin female connector, straight | | | 540 326 |
| PSEN cable M12-8sf M12-8sm, 0.5m | 0.5 m | M12, 8-pin female connector, straight | M12, 8-pin male connector, straight | | 540 345 |
| PSEN cable M12-8sf M12-8sm, 1m | 1 m | M12, 8-pin female connector, straight | M12, 8-pin male connector, straight | | 540 346 |
| PSEN cable M12-8sf M12-8sm, 1.5m | 1.5 m | M12, 8-pin female connector, straight | M12, 8-pin male connector, straight | | 540 347 |
| PSEN cable M12-8sf M12-8sm, 2m | 2 m | M12, 8-pin female connector, straight | M12, 8-pin male connector, straight | | 540 340 |
| PSEN cable M12-8sf M12-8sm, 5m | 5 m | M12, 8-pin female connector, straight | M12, 8-pin male connector, straight | | 540 341 |
| PSEN cable M12-8sf M12-8sm, 10m | 10 m | M12, 8-pin female connector, straight | M12, 8-pin male connector, straight | | 540 342 |
| PSEN cable M12-8sf M12-8sm, 20m | 20 m | M12, 8-pin female connector, straight | M12, 8-pin male connector, straight | | 540 343 |
| PSEN cable M12-8sf M12-8sm, 30m | 30 m | M12, 8-pin female connector, straight | M12, 8-pin male connector, straight | | 540 344 |
| PSEN cable M12-12sf 2m | 2 m | M12, 12-pin female connector, straight | | | 570 350 |
| PSEN cable M12-12sf 3m | 3 m | M12, 12-pin female connector, straight | | | 570 351 |
| PSEN cable M12-12sf 5m | 5 m | M12, 12-pin female connector, straight | | | 570 352 |
| PSEN cable M12-12sf 10m | 10 m | M12, 12-pin female connector, straight | | | 570 353 |
| PSEN cable M12-12sf 20m | 20 m | M12, 12-pin female connector, straight | | | 570 354 |
| PSEN cable M12-12sf 30m | 30 m | M12, 12-pin female connector, straight | | | 570 355 |
| PSEN cable M12-12sf 50m | 50 m | M12, 12-pin female connector, straight | | | 570 356 |

| Product type | Features | Connector X1 | Connector X2 | Connector X3 | Order no. |
|---|----------|--|--------------------------------------|--------------|-----------|
| PSEN cable M12-12sf/ M12-12sm 1m | 1 m | M12, 12-pin female connector, straight | M12, 12-pin male connector, straight | | 570 357 |
| PSEN cable M12-12sf/ M12-12sm 2m | 2 m | M12, 12-pin female connector, straight | M12, 12-pin male connector, straight | | 570 358 |
| PSEN cable M12-12sf/ M12-12sm 3m | 3 m | M12, 12-pin female connector, straight | M12, 12-pin male connector, straight | | 570 359 |
| PSEN cable M12-12sf/ M12-12sm 5m | 5 m | M12, 12-pin female connector, straight | M12, 12-pin male connector, straight | | 570 360 |
| PSEN cable M12-12sf/ M12-12sm 10m | 10 m | M12, 12-pin female connector, straight | M12, 12-pin male connector, straight | | 570 361 |
| PSEN cable M12-12sf/ M12-12sm 20m | 20 m | M12, 12-pin female connector, straight | M12, 12-pin male connector, straight | | 570 362 |

Series connection

| Product type | Features | Connector X1 | Connector X2 | Connector X3 | Order no. |
|------------------------------------|----------|------------------------------|-----------------------------|------------------------------|-----------|
| PSEN ml Y junction M12 | | M12, 8-pin female connector | M12, 8-pin female connector | M12, 12-pin female connector | 570 486 |
| PSEN ml end adapter | | M12, 12-pin female connector | M12, 8-pin male connector | | 570 487 |
| PSEN ml / PSENcs Y junction M12 | | M12, 8-pin female connector | M12, 8-pin male connector | M12, 8-pin female connector | 570 489 |

17 **EC declaration of conformity**

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

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