



PSEN ml ba 1.1/2.1/2.2

PILZ
THE SPIRIT OF SAFETY

► PSEN sensor technology

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

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SD means Secure Digital

1	Introduction	6
1.1	Validity of documentation	6
1.2	Using the documentation	6
1.3	Definition of symbols	6
2	Safety	8
2.1	Intended use	8
2.2	Safety regulations	9
2.2.1	Safety assessment	9
2.2.2	Additional documents that apply	9
2.2.3	Use of qualified personnel	9
2.2.4	Warranty and liability	10
2.2.5	Disposal	10
2.3	For your safety	10
3	Overview	11
3.1	Approved combinations	11
3.2	Device features	11
4	Function description	13
4.1	Structure	13
4.2	Activation of safety inputs S31 and S41 (solenoid operation)	14
4.2.1	Activation with specification of direction	14
4.2.2	Activation without specification of direction	15
4.3	Safety Device Diagnostics	15
4.4	Operating modes	16
4.5	Block diagram	19
4.6	Auxiliary release	20
4.6.1	Recommissioning	21
4.7	Prevent restart	21
4.8	Escape release accessory	22
4.8.1	Recommissioning	23
5	Wiring	24
5.1	Important information	24
5.2	Pin assignment, connector and cable	24
5.3	EMC requirements	25
6	Connection to control systems and evaluation devices	26
6.1	Important information	26
6.2	Minimum requirements for activation of guard locking	27
6.3	Single connection	29
6.4	Connection to Pilz evaluation devices	30
7	Teaching in the actuator	31
8	Installation	32
8.1	Important information	32

8.2	Installation types	33
8.2.1	Installation on sliding gate	33
8.2.2	Installation on swing gate	34
8.3	Installation safety switch	36
8.3.1	Installation without mounting plate	37
8.3.2	Installation with mounting plate	37
8.3.3	Installation using L-brackets	38
8.4	Actuator installation	39
8.4.1	Installation without mounting bracket	39
8.4.2	Installation with mounting bracket	39
8.4.3	Install fixing screws side-on to actuator	40
8.4.4	Install fixing screws in parallel to actuator	40
8.4.5	Centre the bolt in the actuator housing	41
8.4.6	Rotate the bolt in the actuator housing 90°	42
8.5	Escape release	43
8.5.1	Important information	43
8.5.2	Installation positions for escape release	44
8.5.3	Installation stationary escape release	46
8.5.4	Installation external escape release	48
8.5.5	Dismantling of escape release (order no. 570466 - 570475)	53
8.6	Auxiliary release	54
9	Adjustment	55
9.1	Attach safety switch and actuator	55
10	Operation	56
10.1	Normal operation mlock	56
10.2	Error display	59
11	Checks and maintenance	60
12	Dimensions	62
13	Technical details	70
14	Classification according to ZVEI, CB24I	75
15	Safety characteristic data	76
16	Supplementary data	77
16.1	Radio approval	77
16.2	Technical details for mounting bracket without handle unit	77
16.3	Technical details for mounting bracket with handle unit	77
16.4	Technical details escape release 570460, 570462, 570470	78
16.5	Technical details for escape release 570463	78
16.6	Technical details escape release 570466-570469	78
16.7	Technical details escape release 570471-570473	79
16.8	Technical details escape release 570474-570475	79

16.9	Technical details for auxiliary release 570461	79
17	Order reference	80
17.1	System	80
17.2	Accessories	81
18	Appendix	84
19	EC declaration of conformity	85
20	UKCA-Declaration of Conformity	86

1 Introduction

1.1 Validity of documentation

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

This documentation is valid for the product PSEN ml ba 1.1/2.1/2.2 from Version 2.0.

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: Pddb
- ▶ EN 62061: SIL CL 3
 - EN ISO 13849-1: PL e (Cat. 4)
- ▶ EN ISO 14119
 - Coding level with actuator PSEN ml ba 1.1: low, type 4
 - Coding level with actuator PSEN ml ba 2.1/2.2: high, type 4

The safety switch may only be used with one of the approved actuators (see [Approved combinations](#)  11).

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

- ▶ For the interlock, the safety outputs have 2-channel processing
- ▶ For the guard locking device, 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

- ▶ Use of the product as an emergency release with the escape release accessory. For an emergency release use a PSEN ml b 1.1/2.1/2.2.
- ▶ Safety switches and actuators of the safety gate system must not be used as mechanical limit stops
- ▶ Use under corrosive environmental conditions (e.g. cooling emulsions, surface treatment, gases).
- ▶ Use in environments with high dust pollution

2.2 Safety regulations

2.2.1 Safety assessment

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

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

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)

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

For the use of passive junctions

- ▶ Operating manual for a passive junction

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 persons who are competent to do so.

A competent person is a qualified and knowledgeable person who, because of their training, experience and current professional activity, has the specialist knowledge required. To be able to inspect, assess and operate devices, systems and machines, the person has to be informed of the state of the art and the applicable national, European and international laws, directives and standards.

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

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

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

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



WARNING!

Risk of injury due to loss of the safety function

Replacing an actuator (e.g. defective actuator) with an inappropriate actuator from the interlock and guard locking system 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 (optional) in a safe place and protect it from unauthorised access.
- Destroy any replaced actuators before disposal.

3 Overview

3.1 Approved combinations

An approved combination (unit) consists of a safety switch and the corresponding actuator. For information such as product type, features and order number, see Order reference.

PSEN ml ba 1.1

Safety switch	Actuator
PSEN ml ba 1.1 switch	PSEN ml 1.1 actuator
	PSEN ml 1.1 round actuator

PSEN ml ba 2.X

Safety switch	Actuator
PSEN ml ba 2.1 switch	PSEN ml 2.1 actuator
	PSEN ml 2.1 round actuator
PSEN ml ba 2.2 switch	PSEN ml 2.1 actuator
	PSEN ml 2.1 round actuator

3.2 Device features

- ▶ Safe guard locking for swing gates and sliding gates
- ▶ Safe interlocking (position monitoring)
- ▶ Transponder technology
- ▶ 2 safety outputs
- ▶ Safety Device Diagnostics (SDD)
 - Safety Device Diagnostics can be used to retrieve sensor information on one or more sensors, to perform actions and to read and write configuration parameters
 - Manipulation protection in accordance with ISO 14119 is possible by verifying the short name of the actuator through the controller via SDD communication
- ▶ Diagnostic input for Y1 for Safety Device Diagnostics (SDD)
- ▶ Signal output/diagnostic output Y32 for Safety Device Diagnostics
- ▶ 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
 - PSEN ml ba 1.1: coded
 - PSEN ml ba 2.1: fully coded
 - PSEN ml ba 2.2: uniquely coded
- ▶ M12, 8-pin male connector

▶ LEDs:

- Supply voltage/fault
- Status of actuator
- Status of guard locking
- Input lights up yellow (without function)

- ▶ 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 can be expanded with up to three stationary and/or external escape releases (see [Order reference: Accessories \[81\]](#)).

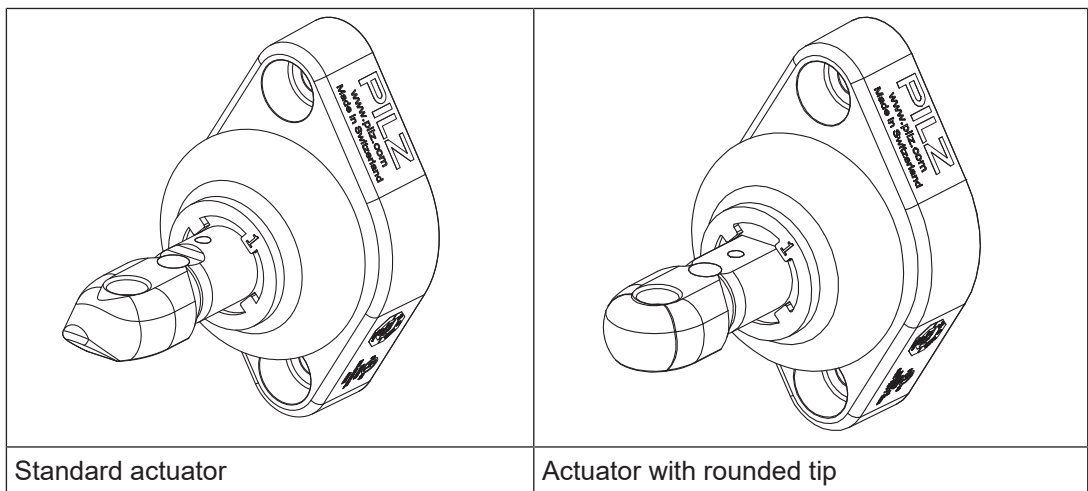
The escape release enables the manual release of the guard locking without aids from **inside** the danger zone and it corresponds to an escape release in accordance with EN ISO 14119.

The stationary escape release can be extended by a maximum of 50 mm (twice by 25 mm).

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 \[34\]](#)) the PSEN ml actuator center ring can be inserted (see [Order reference: Accessories \[81\]](#)).

- ▶ The actuator is available in two types (see [Order reference: Accessories \[81\]](#)).
 - Standard actuator
 - Actuator with rounded tip

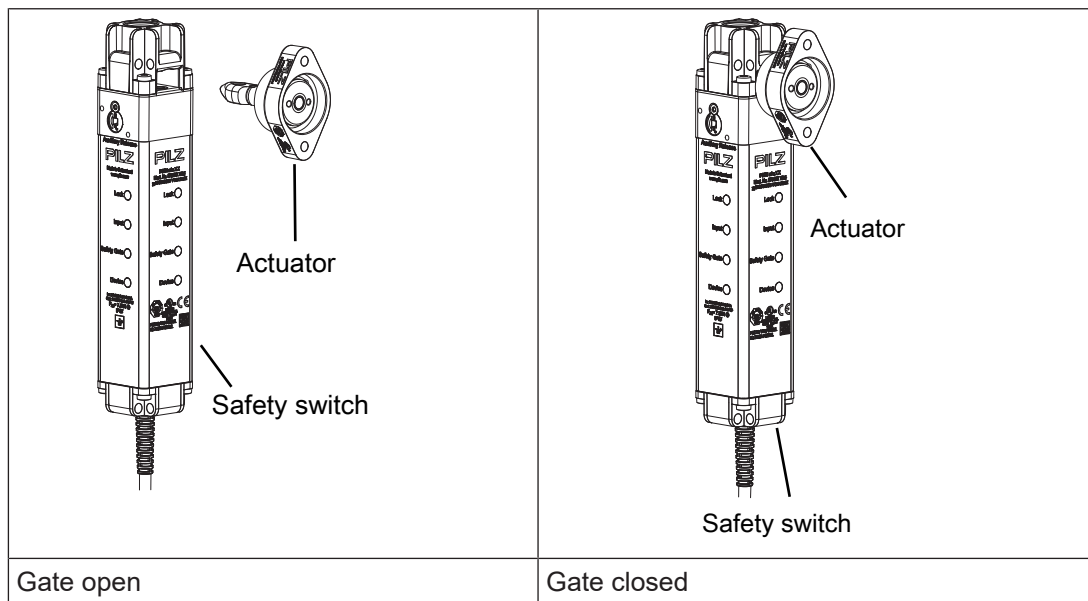


4 Function description

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)

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

- ▶ Diagnostic input Y1

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

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

- ▶ Signal output/diagnostic output Y32 in SDD mode

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

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.

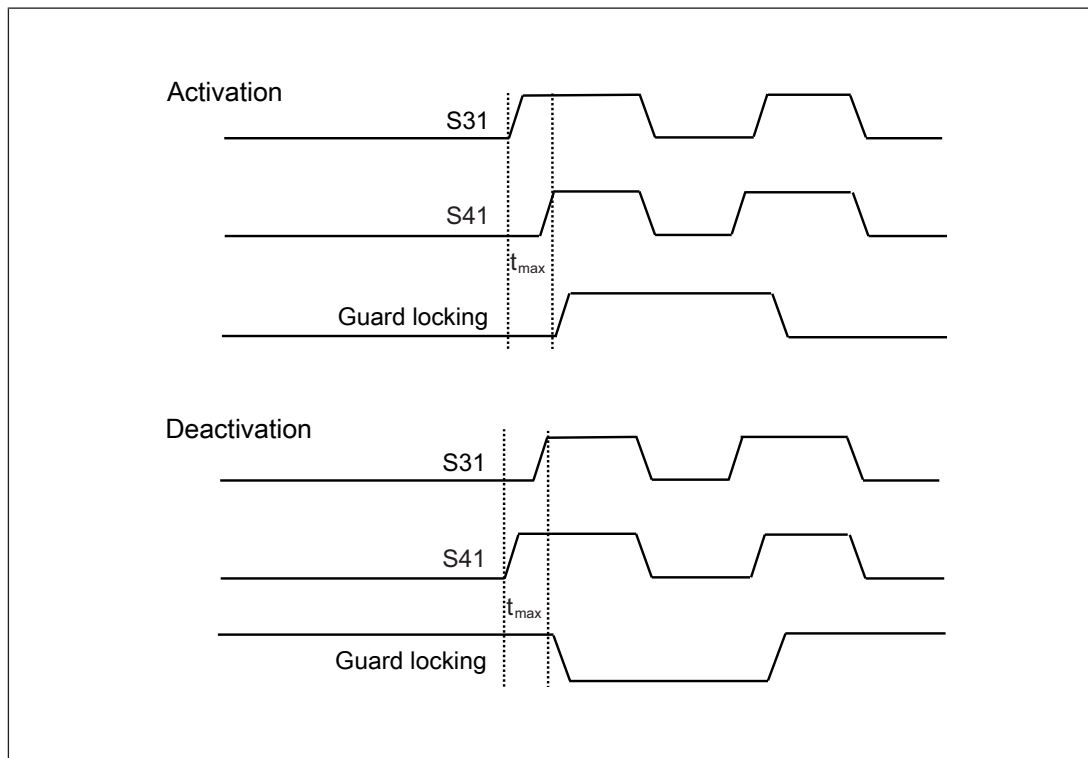
Active use of Safety Device Diagnostics

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

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.

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 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.

Further information on Safety Device Diagnostics can be found in [Additional documents that apply](#) [ 9].

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 specified direction when activating/deactivating guard locking

A specified direction can be used to control switching of the guard locking status.

 - Toggle: The safety switch changes the guard locking status (activated <-> deactivated) each time S31 and S41 are activated simultaneously.
 - Force direction: The safety switch is selectively activated or deactivated by offset activation of the rising edges at S31 and S41.

Timing diagrams

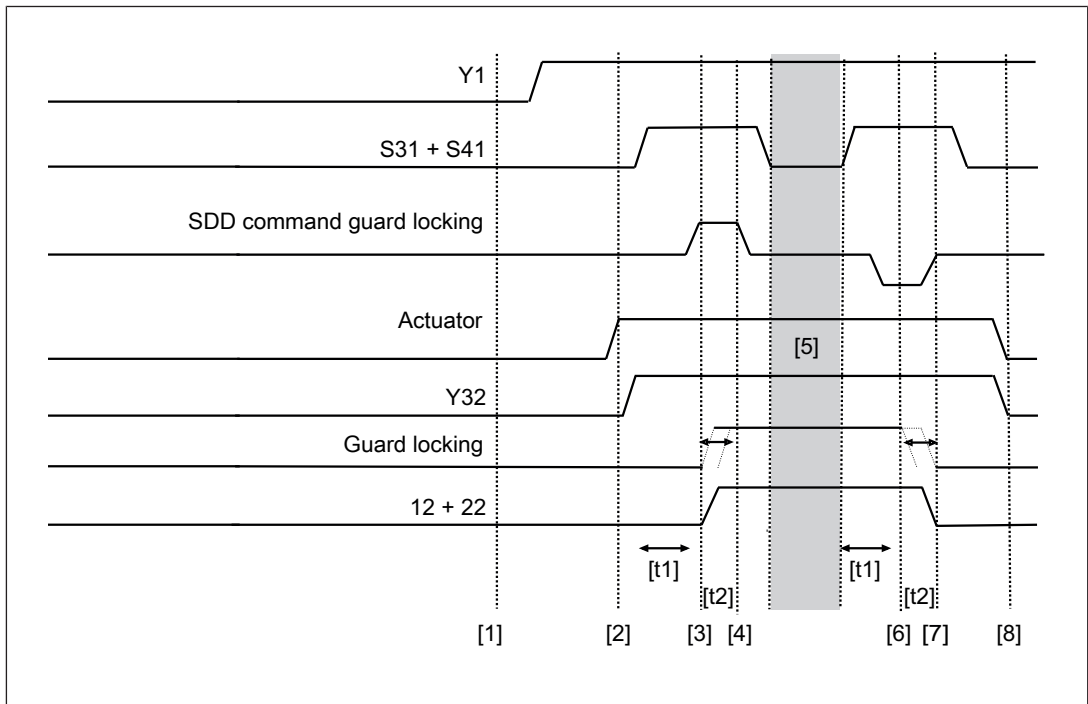


Fig.: Active use of Safety Device Diagnostics

Legend

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

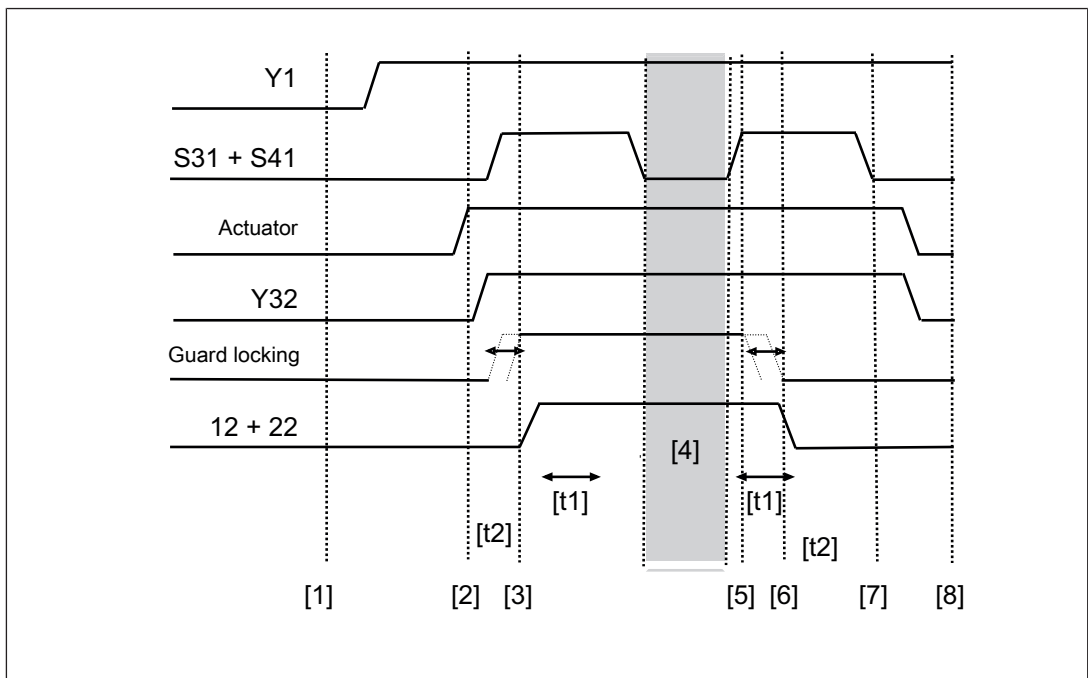
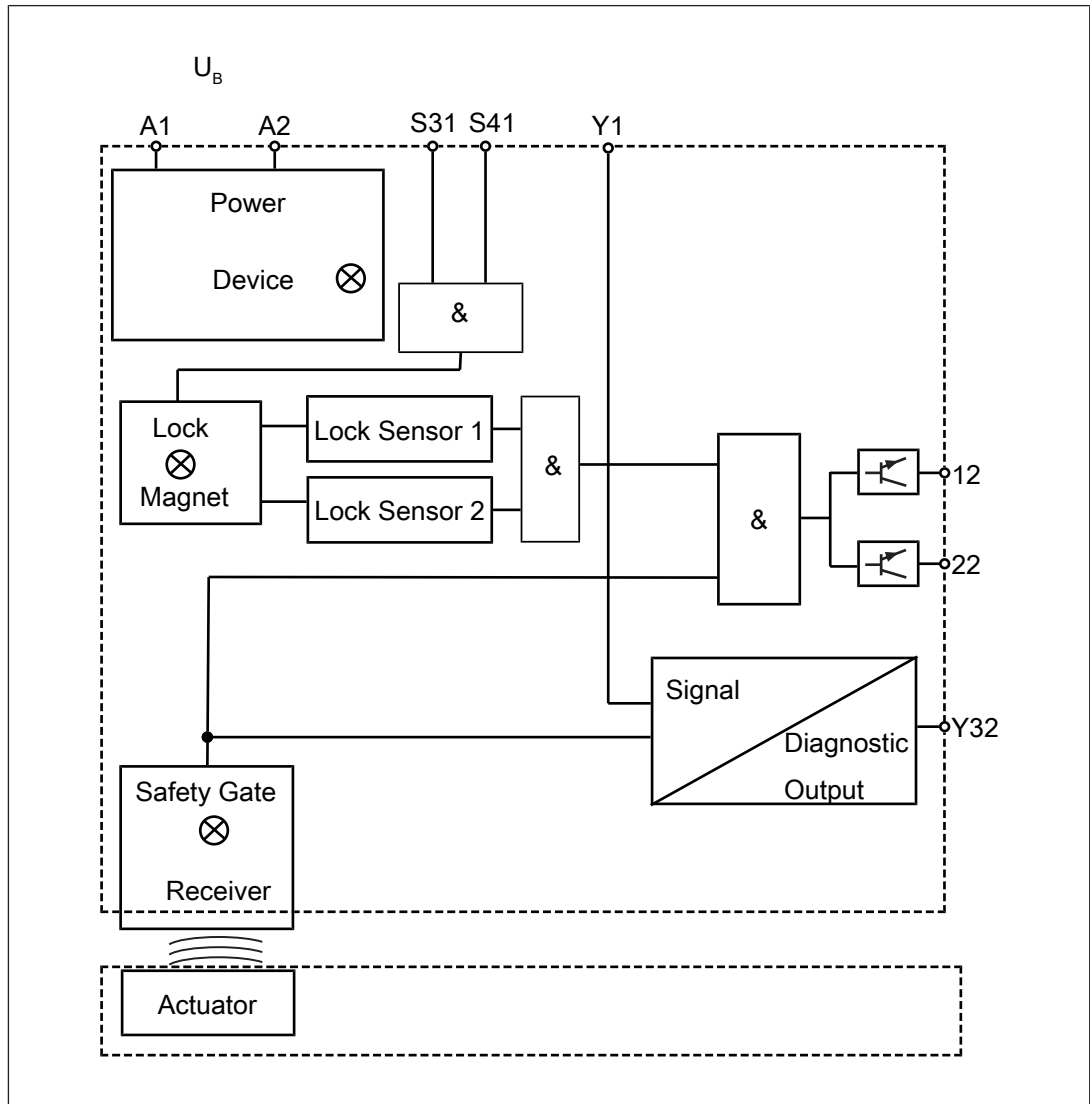


Fig.: Passive use of the Safety Device Diagnostics

Legend

- [1] Gate is open
- [2] Gate is closed
- [3] Guard locking is activated
- [4] Execution of the hazardous machine function is permitted
- [5] Outputs will be deactivated
- [6] Guard locking will be deactivated
- [7] Gate is open
- [t1] Processing time of guard locking signal = 100 ms
- [t2] Time window for changing guard locking status

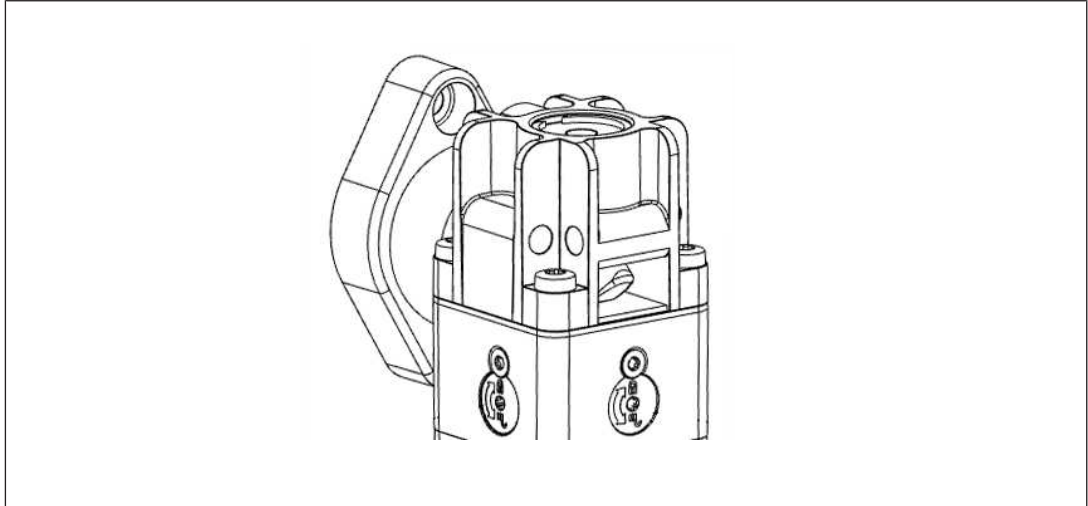
4.5 Block diagram



4.6 Auxiliary release

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

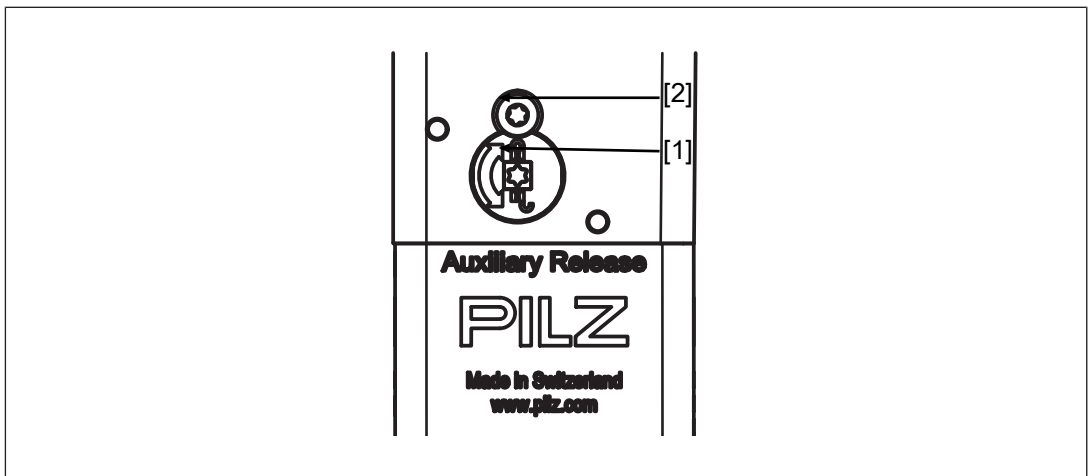
The safety switch has auxiliary releases on three sides.



INFORMATION

If guard locking is deactivated using the auxiliary release, there is a low signal at safety outputs 12 and 22. A warning will be output (see chapter [Operation](#) [59]). The safety switch does **not** switch to the fault condition.

It is possible to open 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 the safety switch

1. Turn the auxiliary release screw [1] (see [Figure \[20\]](#)) half a turn clockwise using a Torx T10 screwdriver.
2. Re-insert the security screw [2] (see [Figure \[20\]](#)) using a Torx T10 screwdriver.
3. Seal the security screw with varnish.
4. Carry out a function test on the safety switch and actuator. The safety function may only be checked by qualified personnel.

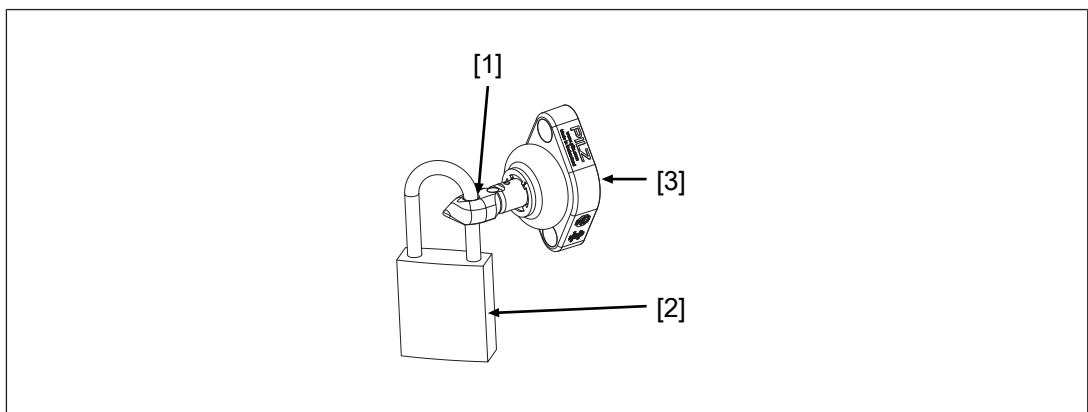


INFORMATION

If the auxiliary release screw is not turned back correctly after use, guard locking cannot be activated/deactivated.

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 accessory

The escape release enables the manual release of the guard locking without aids from inside the danger zone and corresponds to an escape release in accordance with EN ISO 14119.

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

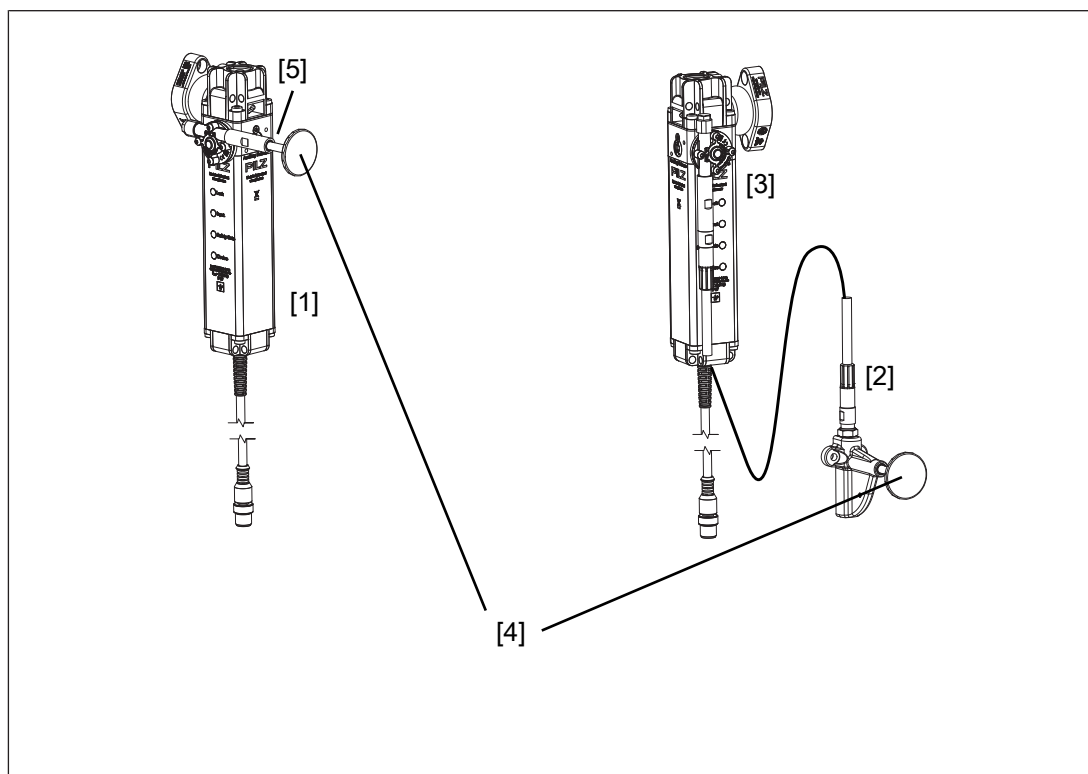
The safety switch switches to normal operation when recommissioning without restart.

For this reason the safety switch with the escape release accessory must not be used as an emergency release.



NOTICE

For an emergency release use PSEN ml b 1.1/2.1/2.2 with the escape release accessory.




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 escape release, there is a low signal at safety outputs 12 and 22. A warning will be output (see [Operation](#) [ 59]). The safety switch does **not** switch to the fault condition.

Mode of operation

In the danger zone, if the button of the escape release pin 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](#) [ 81])
 - 1 adapter disk
 - 2 screws for adapter disk
 - 4 screws for installation on the adapter disk

4.8.1

Recommissioning

1. Pull back the escape release handle.
2. Acknowledge the stop signal in the controller.
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 \[70\]](#) must be followed.
- ▶ Note the max. cable length when operating with Safety Device Diagnostics.

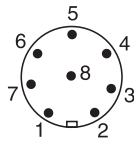
Supply voltage on the safety control system	Max. cable length
≥ 20.4 V	50 m
≥ 24 V	120 m
≥ 28.8 V	180 m

5.2 Pin assignment, connector and cable



NOTICE


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



8-pin M12 connector

PIN	Function	Terminal designation	Cable colour (Pilz cable)
1	Operation of solenoid to open and close guard locking (channel 2)	S41	white
2	+24 V UB	A1	Brown
3	Safety output channel 1	12	Green
4	Safety output channel 2	22	Yellow
5	Signal output/diagnostic output	Y32	grey
6	Operation of solenoid to open and close guard locking (channel 1)	S31	Pink
7	0 V UB	A2	Blue
8	Diagnostics input	Y1	Red

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](#) [ 70]).
- ▶ 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

The selected evaluation device must have the following properties:

- ▶ 2-channel with plausibility monitoring

Both OSSDs must change the 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 \[17\]](#)).
- ▶ The use of Safety Device Diagnostics is described in the System Description "Safety Device Diagnostics".



WARNING!

Hazard due to loss of the safety function

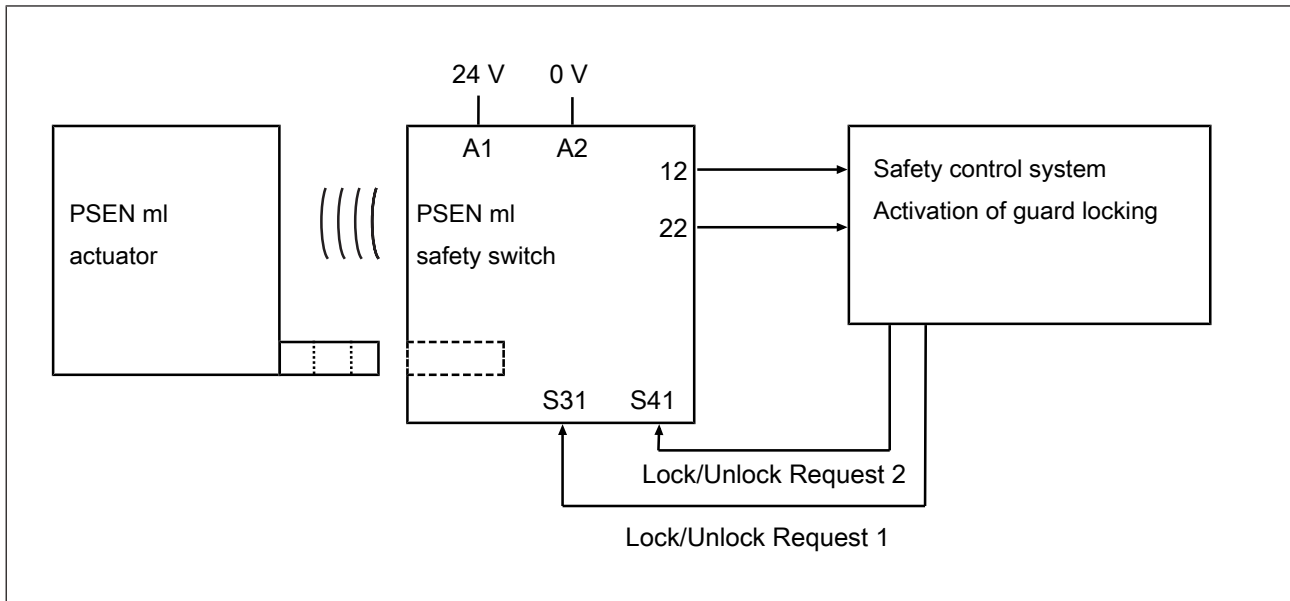
Depending on the application, serious injury or death may result. The safety function can be lost when the safe state is not checked regularly.

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

6.2 Minimum requirements for activation of guard locking

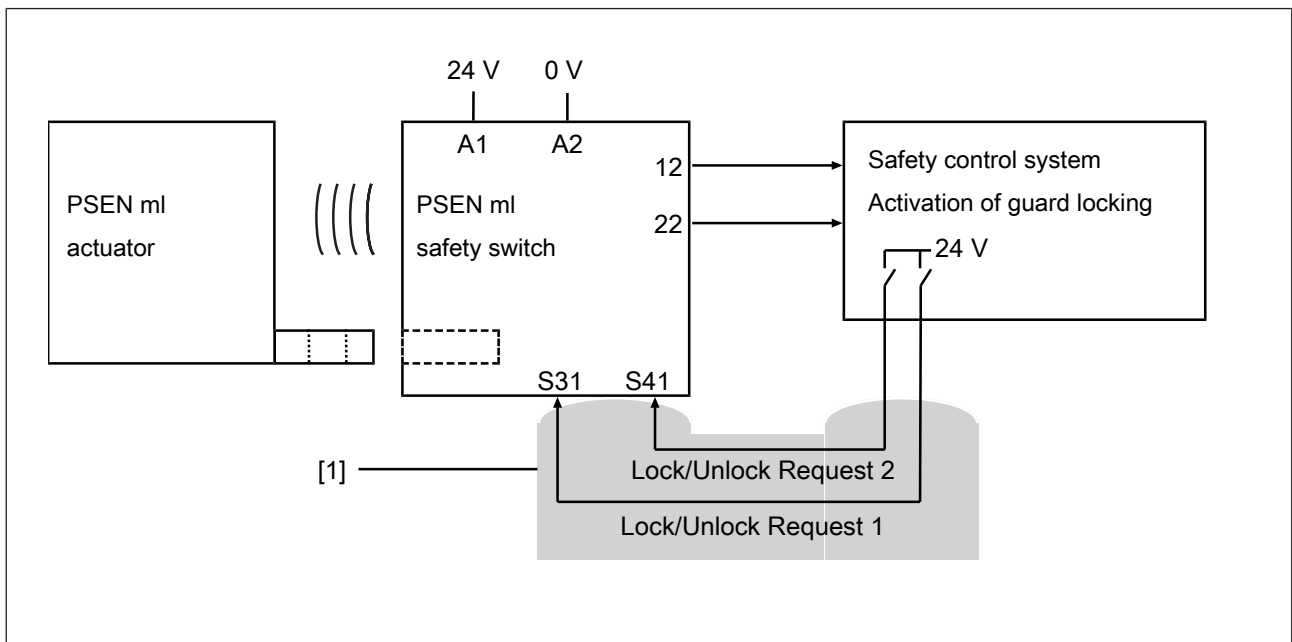
Use in PL e (Cat. 4) applications

- ▶ 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 safe 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)

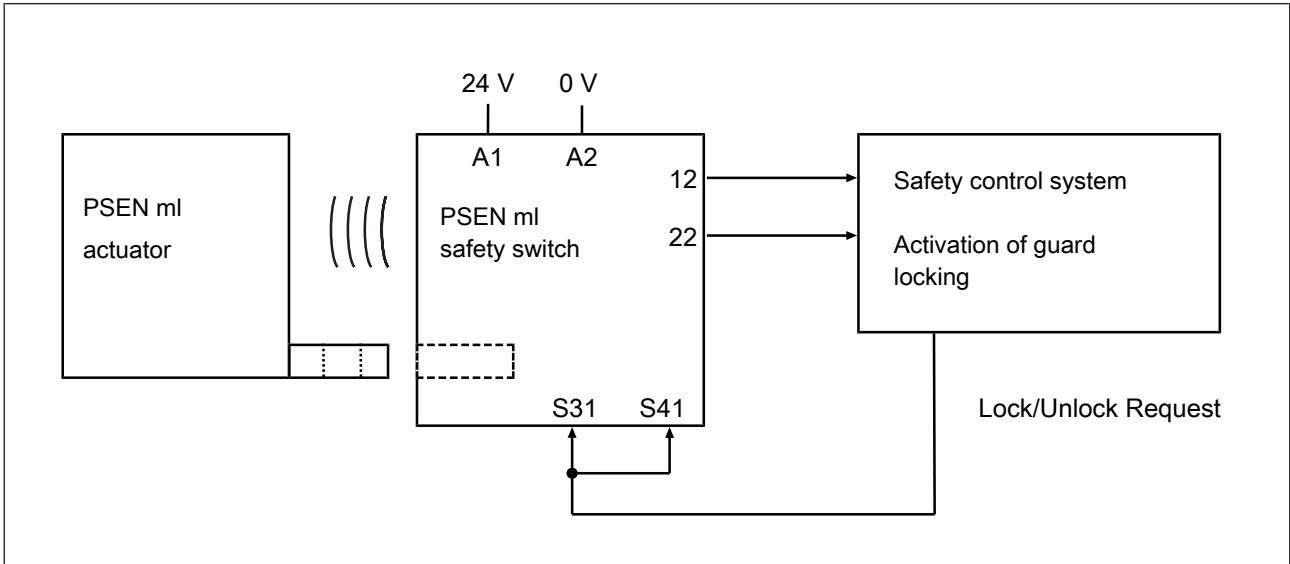


Legend

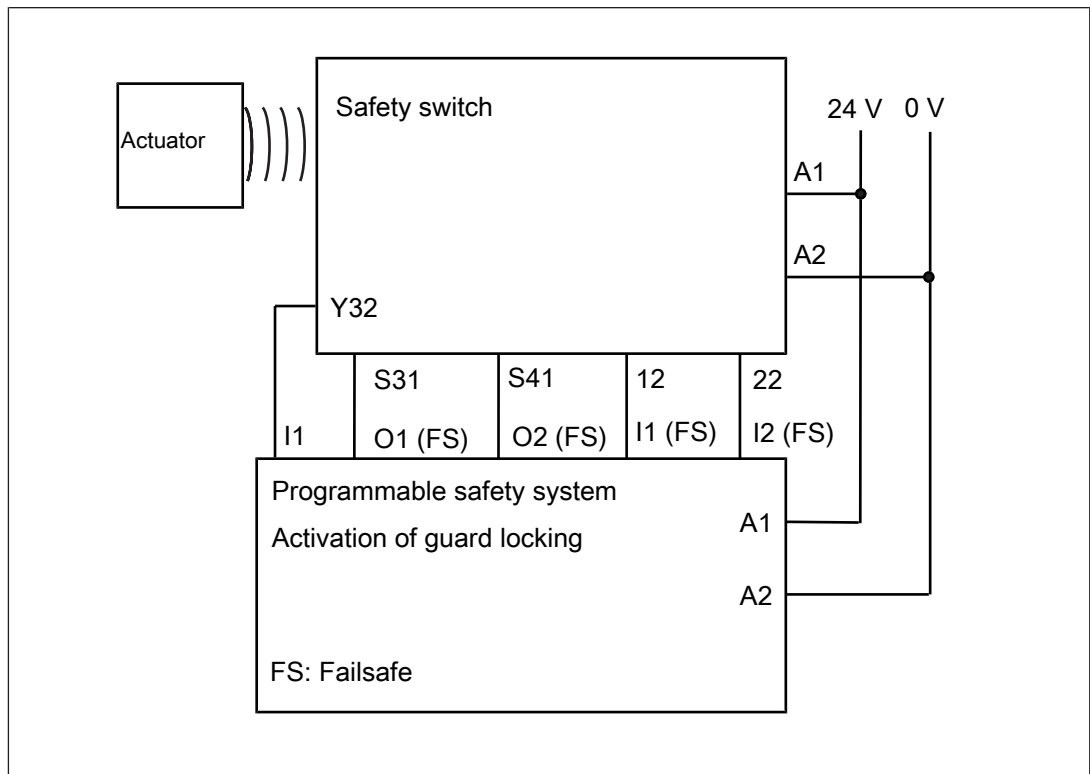
[1] Protected cable layout

Use in PL d (Cat. 2) applications

- ▶ 1-channel operation for safety inputs S31 and S41 (solenoid operation) via safe outputs
- ▶ 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 Connection to Pilz evaluation devices

The safety switch can be connected to Pilz evaluation devices.

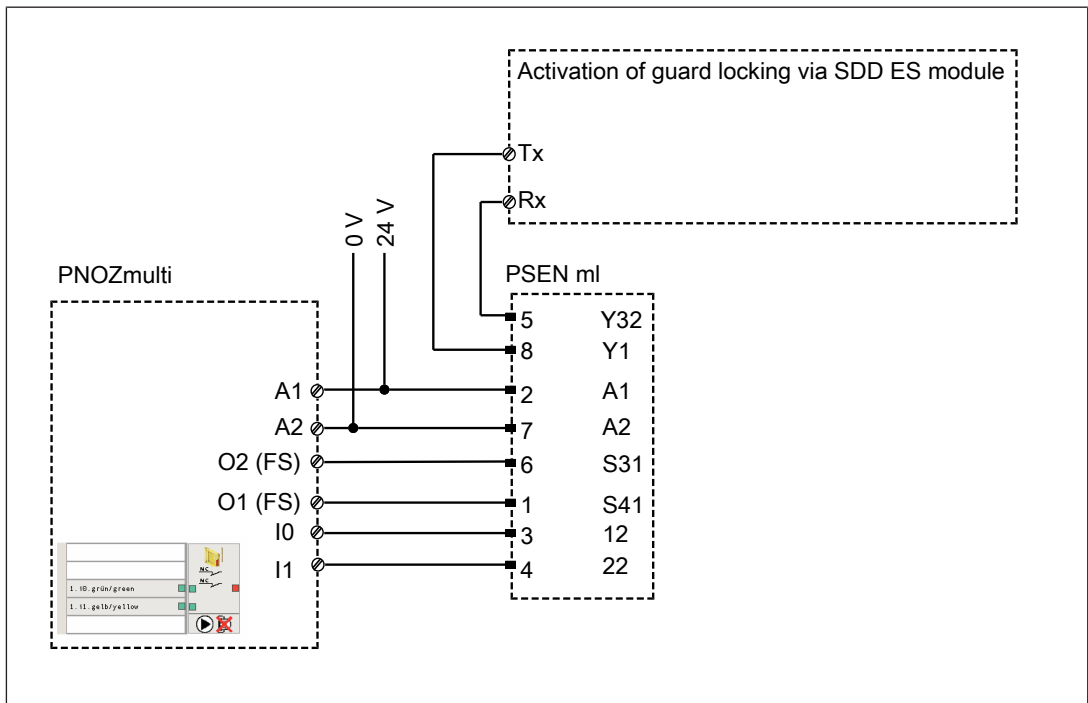
Suitable Pilz evaluation devices are, for example:

- ▶ PNOZmulti for safety gate monitoring
Configure the switch in the PNOZmulti Configurator with switch type 3.
- ▶ 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.

Connection example with PNOZmulti and Safety Device Diagnostics



7 Teaching in the actuator

PSEN ml ba 1.1

Any corresponding Pilz actuator (see [Technical Details \[70\]](#)) is detected as soon as it is brought into the response range.

PSEN ml ba 2.1

Teaching in the actuator for the first time:

The first actuator to be detected by the safety switch (see [Technical details \[70\]](#)) is taught in automatically as soon as it is brought into the response range.

To teach in a new actuator:

- ▶ A maximum of 8 learning procedures are possible.
- 1. The actuator that is to be taught in must be brought into the safety switch's response range as the only transponder. As soon as the actuator is detected, the "Safety Gate" LED will flash yellow.
- 2. After 20 s has elapsed, the "Safety Gate" LED turns to quick yellow flashes. Trigger a system reset in the next 120 s by interrupting the power supply.
- 3. When the supply voltage is switched back on, the learning procedure is complete and the number of permitted additional learning procedures is reduced by 1.



NOTICE

- The actuator must not be removed during the learning procedure.
- This actuator cannot be retaught on the same safety switch.

PSEN ml ba 2.2

The first actuator to be detected by the safety switch (see [Technical details \[70\]](#)) 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.

8 Installation

8.1 Important information









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).



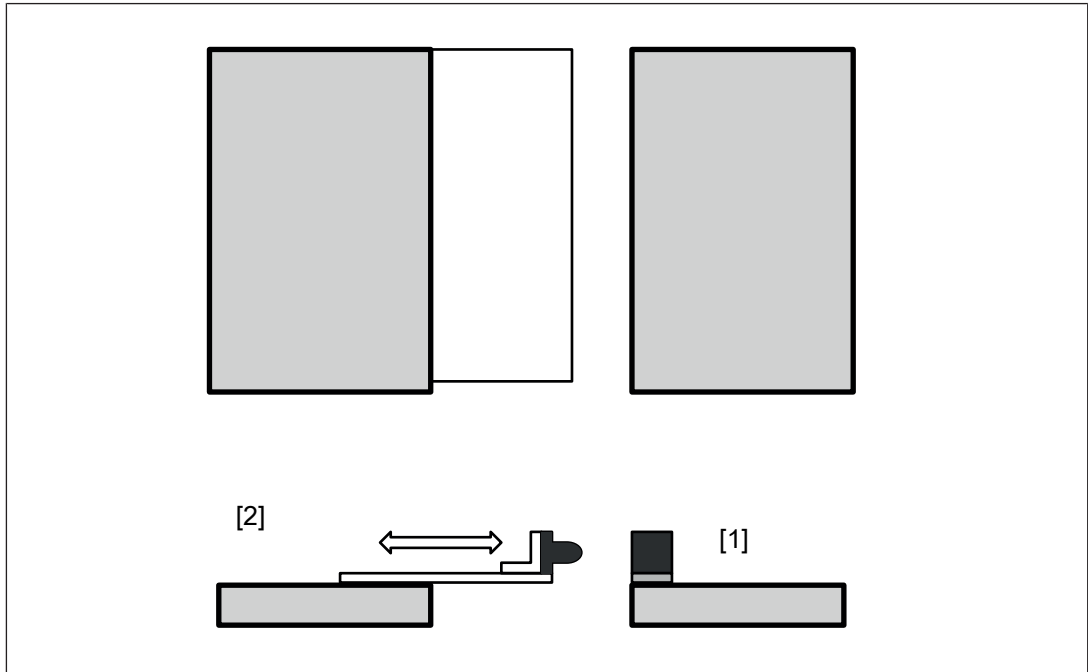
NOTICE

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

- ▶ The fastening of safety switch and actuator has to be sufficiently stable to ensure the proper operation of the safety switch and the actuator.
- ▶ Prevent the safety switch and actuator being exposed to heavy shock or vibration.
- ▶ The mounting surfaces for safety switches and actuators can have a max. unevenness of 0.5 mm.
- ▶ The actuator must rest flush on the mounting surface.
- ▶ The safety switch and actuator should be installed opposite each other in parallel.
- ▶ After installation, at least one of the auxiliary releases/escape releases must be operated.
- ▶ Use the same type of screw to attach the safety switch and actuator.
- ▶ Use non-removable flat head locking screws to attach the safety switch and actuator (e.g. cheese-head or pan head screws) or rivets.
- ▶ 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.
- ▶ For a minimum screw depth of 7.2 mm, M6 screws with resistance class 8.8 should be used to attach the L-bracket.
- ▶ Prevent self-loosening of the fastening elements,
 - On the safety switch: By complying with the max. torque setting (see [Technical details](#)  70).
 - On the actuator: By complying with the max. torque setting (see [Technical details](#)  70) and medium-strength threadlockers.
- ▶ Pilz recommends that you use the PSEN ml actuator center ring (see [Order reference](#)  81) only with small door radiuses (see [Install the safety switch horizontally at a swing gate](#)  34).
- ▶ Torque setting: Please note the information provided under [Technical details](#)  70. Don't fully tighten the safety screws until the safety switches and actuators are correctly aligned and the function has been tested (see [Adjustment](#)  55).
- ▶ Installation of the safety switch and actuator must be concealed.

8.2 Installation types

8.2.1 Installation on sliding gate



Legend

[1] Safety switch, installed on gate frame

[2] Actuator with mounting bracket (available as [Accessory \[81\]](#)), 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.

8.2.2 Installation on swing gate

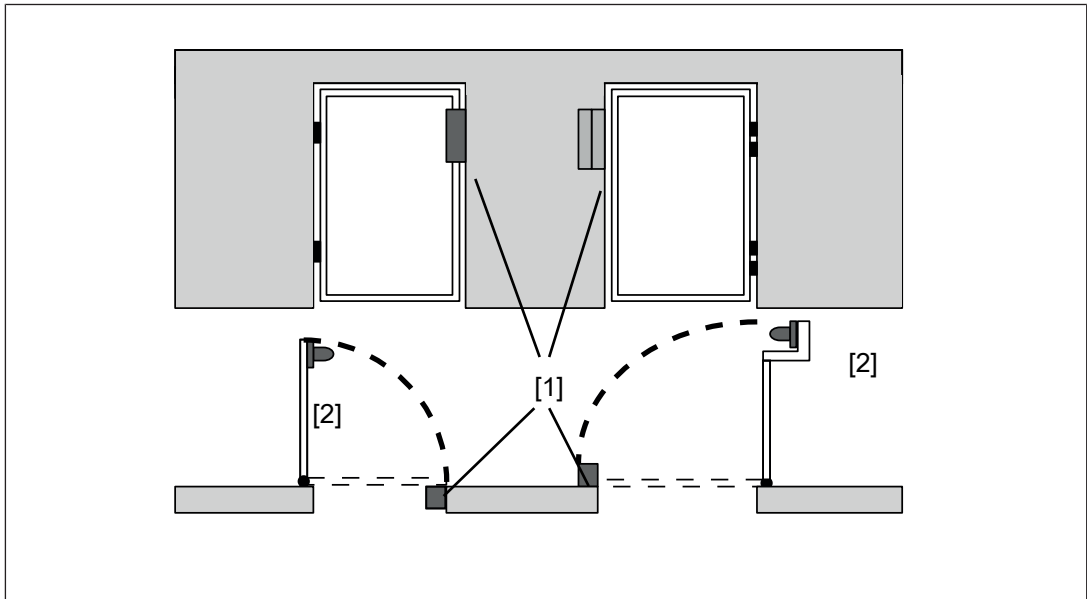




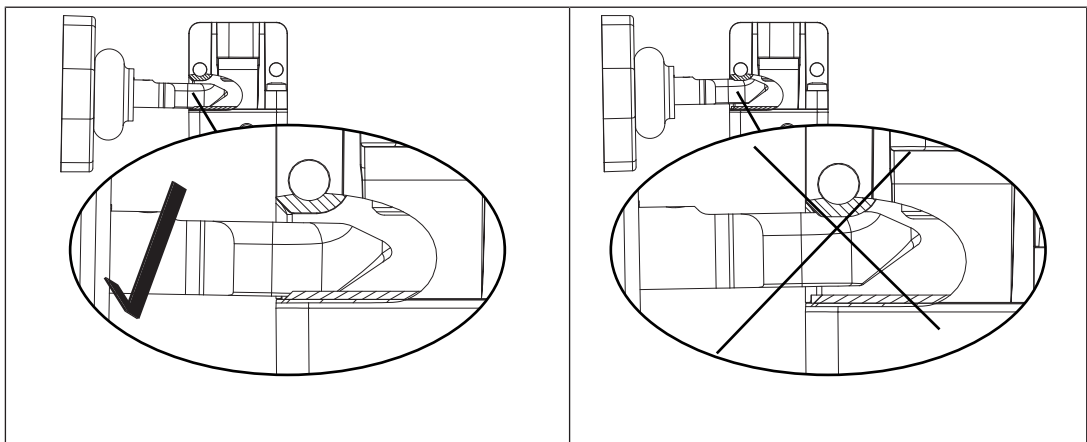
Fig.: Swing gate with internal and external hinge

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.

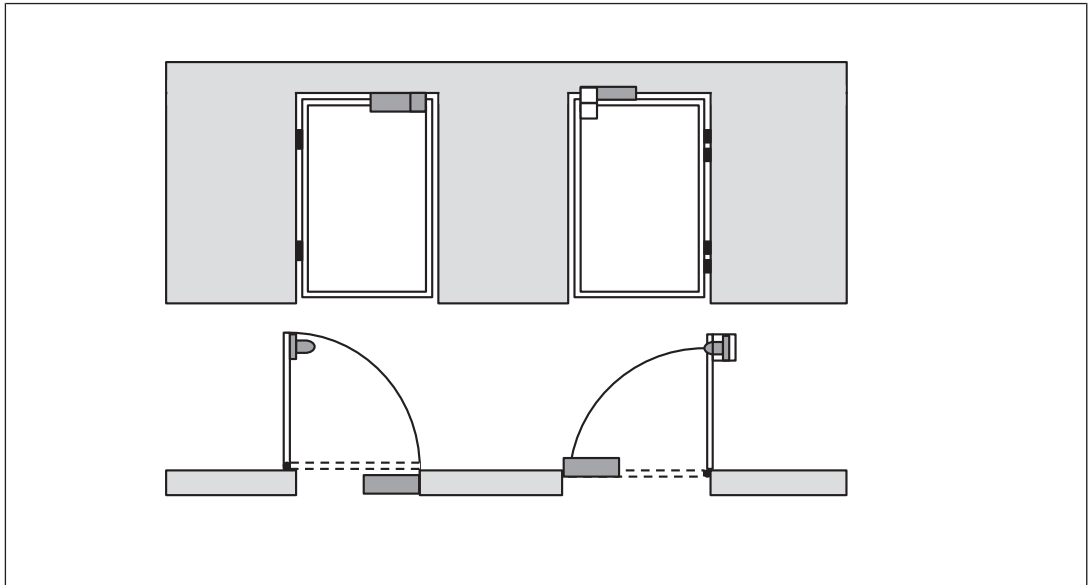
The actuator should engage smoothly into the safety switch.



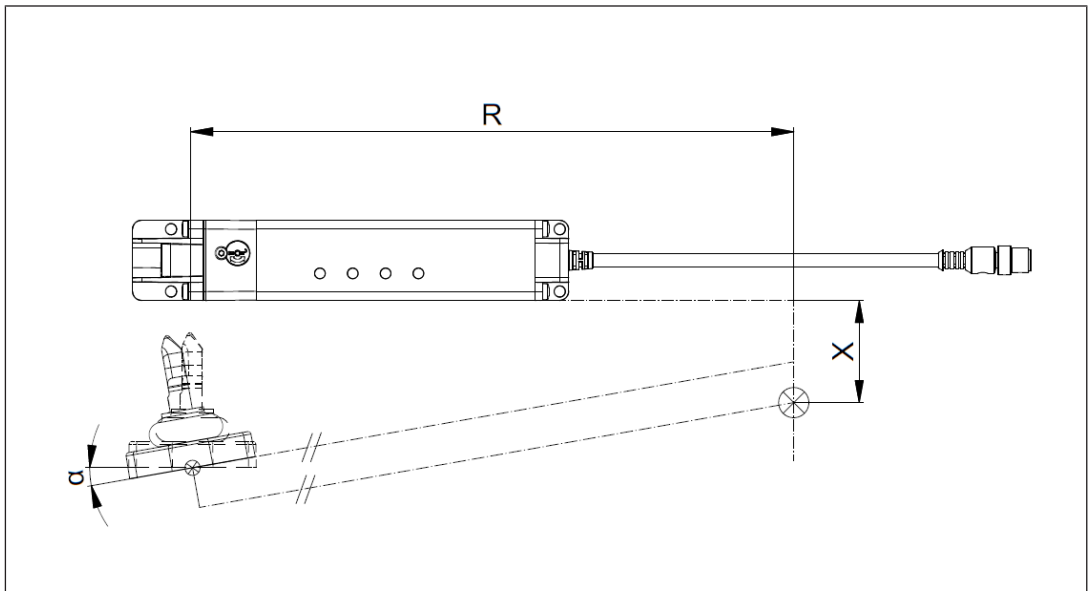
Install the safety switch horizontally at a swing gate

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

Please contact Pilz when smaller gate radiuses are required.



Maintain a slight shift of the rotation point of the door 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 by 10° when installing, when the door radius is $R < 600$ mm.

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

8.3 Installation safety switch

- ▶ To fix the safety switch at the three possible mounting positions, there are three drill holes on three 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 \[37\]](#) or [Mounting bracket \[39\]](#) (see [Order reference: Accessories \[81\]](#)).

Different holding forces arise, based on the installation.

- Fixing screws in parallel to actuator:

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:

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

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



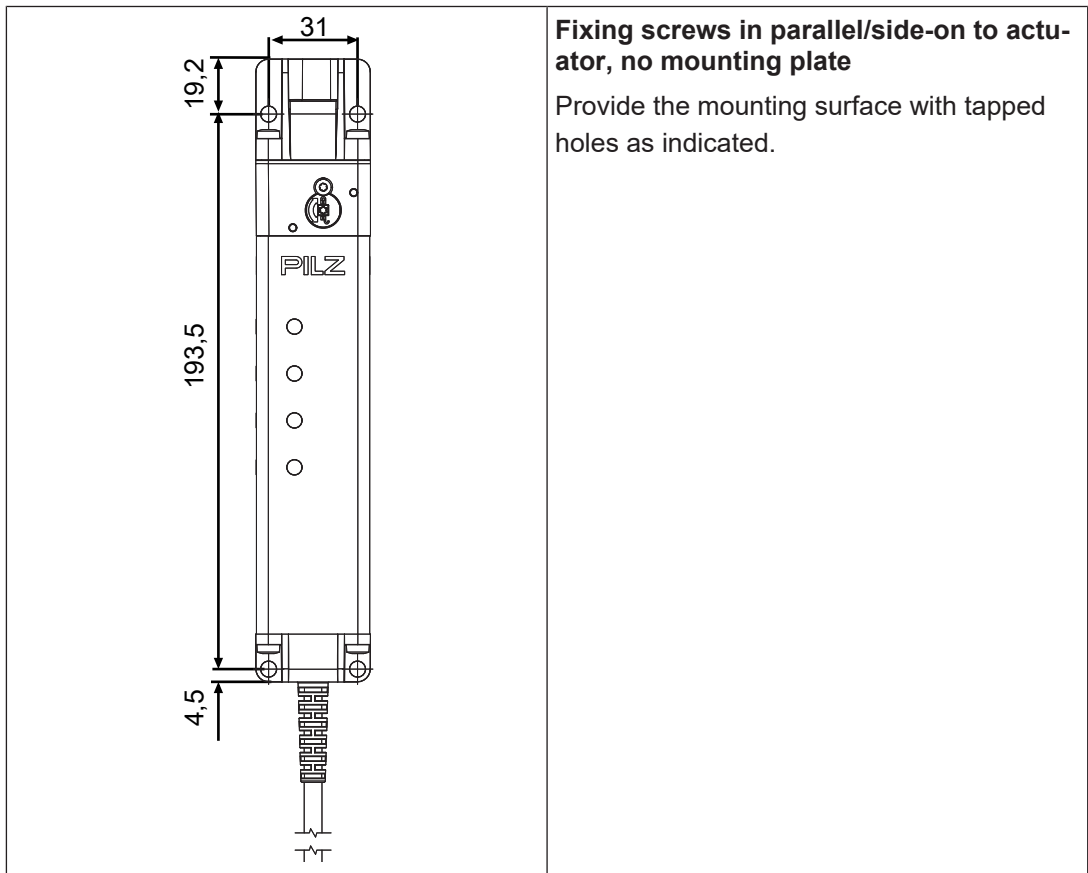
INFORMATION

The specified holding forces only apply to installation without mounting bracket. The holding forces when installed with a mounting bracket can be found in the table "[Technical details for mounting bracket \[77\]](#)".

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.
Fixing screws crosswise to actuator with L-bracket	Tapped holes for two M6 screws on the mounting surface, for attaching the mounting surface

8.3.1 Installation without mounting plate

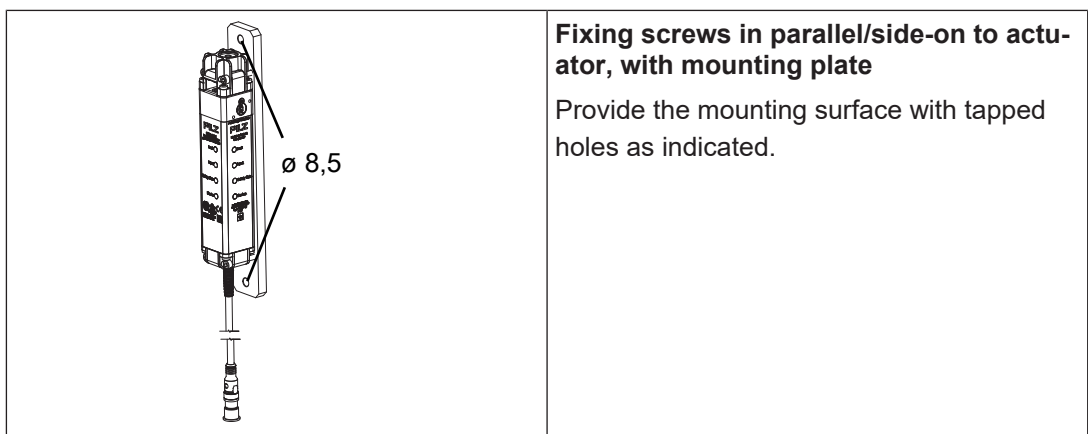


Fixing screws in parallel/side-on to actuator, no mounting plate

Provide the mounting surface with tapped holes as indicated.

1. Attach the safety switch to the swing gate/sliding gate.
2. Use four M5 screws to fix the safety switch to the mounting surface.

8.3.2 Installation with mounting plate



Fixing screws in parallel/side-on to actuator, with mounting plate

Provide the mounting surface with tapped holes as indicated.

1. Attach the mounting plate to the swing gate/sliding gate.
2. Use four M5 screws to fix the safety switch to the mounting plate.



NOTICE

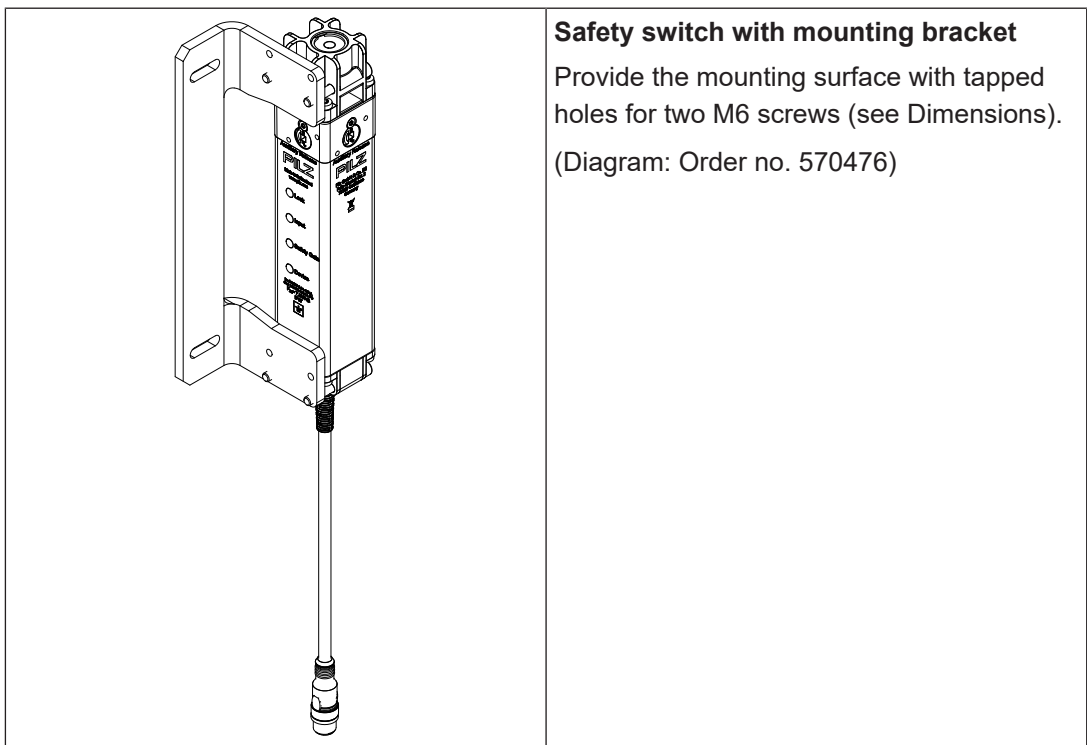
Correct distances when installing the actuator

The actuator must be attached at the same distance to the mounting surface as the safety switch.

If the safety switch is installed using a mounting plate, then the actuator **must** also be installed using a mounting plate (see Install actuator on mounting plate).

8.3.3

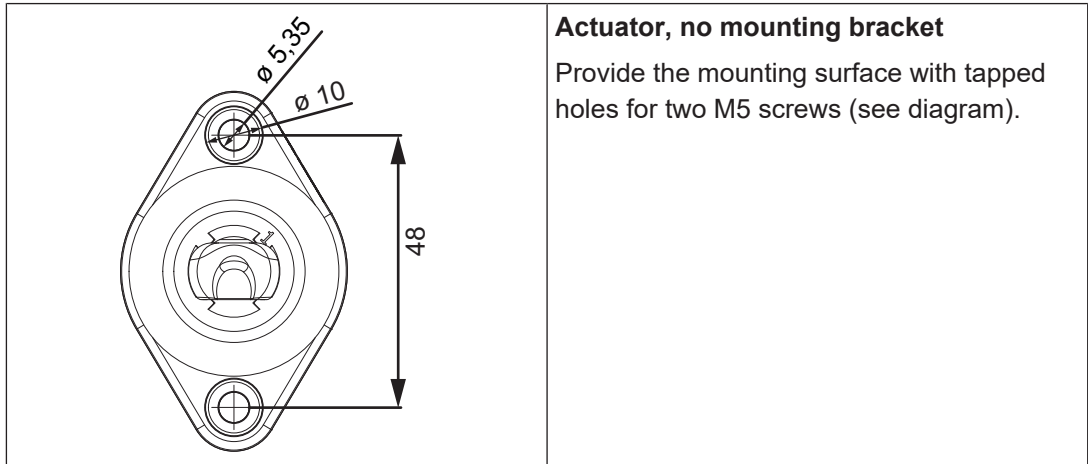
Installation using L-brackets



1. Use two M6 screws to fix the mounting bracket to the gate. The position of the drill holes can be taken from the section entitled Dimensions.
2. Use four M5 screws to fix the safety switch to the mounting bracket.

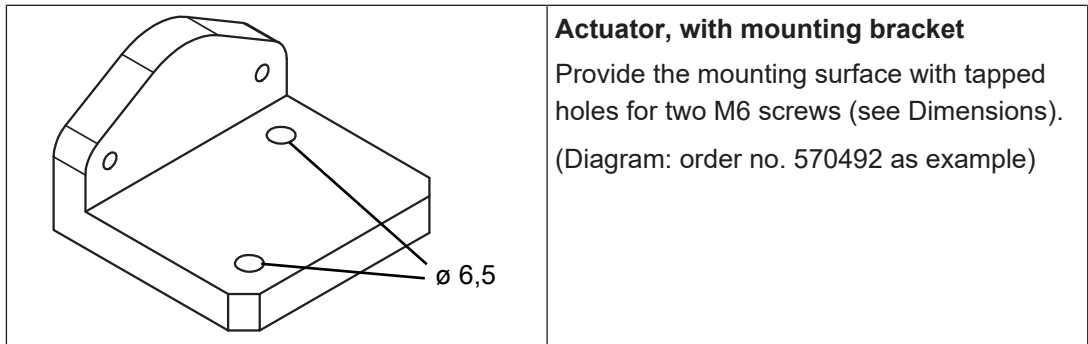
8.4 Actuator installation

8.4.1 Installation without mounting bracket



1. Attach the actuator to the gate.
2. Use two M5 screws to fix the actuator to the mounting surface.

8.4.2 Installation with mounting bracket



1. Use two M6 screws to fix the mounting bracket 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.

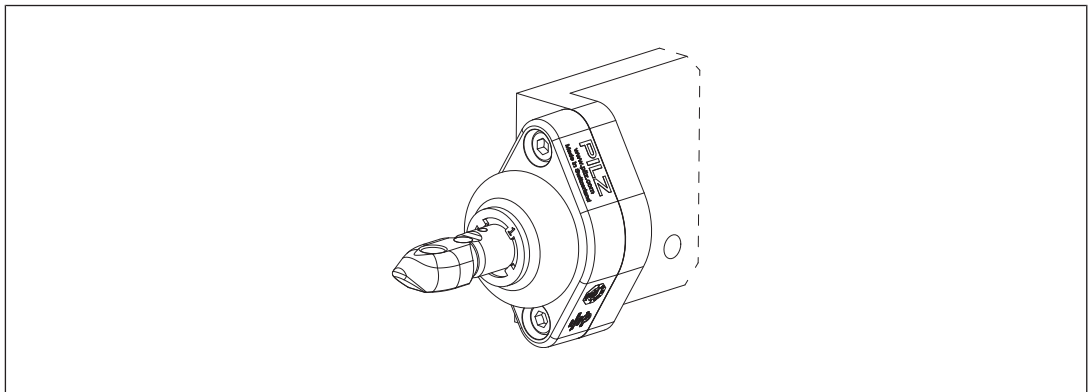


Fig.: Actuator, installed on mounting bracket

8.4.3 Install fixing screws side-on to actuator

Use four M5 screws to fix the safety switch to the mounting surface.

► Torque setting: Please note the information provided under [Technical details](#) [70].

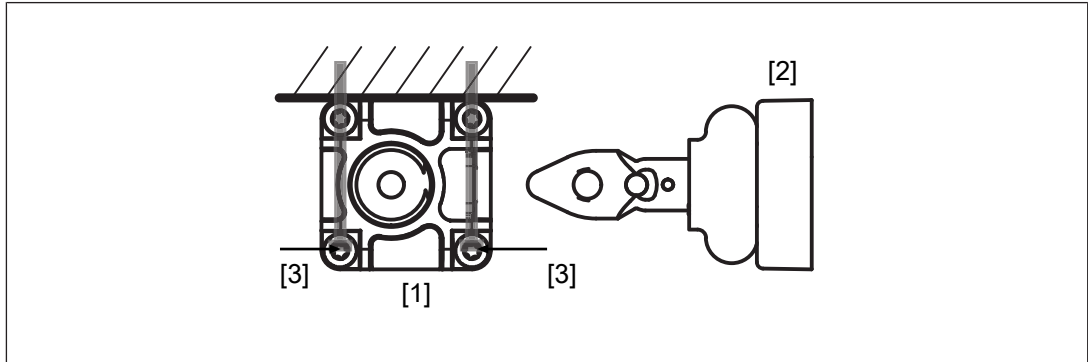


Fig.: Fixing screws of the safety switch crosswise to actuator

Legend

- [1] Front of safety switch
- [2] Actuator
- [3] Fixing screws of the safety switch crosswise to actuator

8.4.4 Install fixing screws in parallel to actuator

Use four M5 screws to fix the safety switch to the mounting surface.

► Torque setting: Please note the information provided under [Technical details](#) [70].

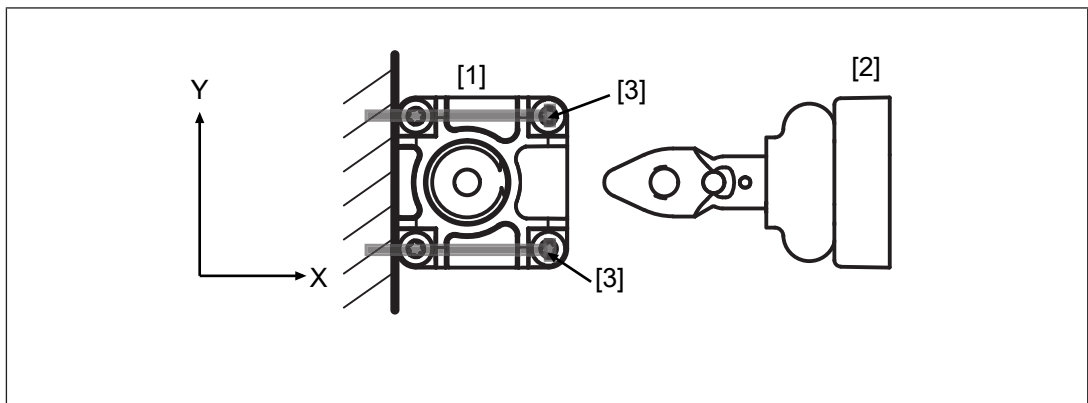


Fig.: Fixing screws of the safety switch in parallel to actuator

Legend

- [1] Safety switch
- [2] Actuator
- [3] Fixing screws of the safety switch in parallel to actuator

8.4.5 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 \[34\]](#)).



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>

8.4.6 Rotate the bolt in the actuator housing 90°

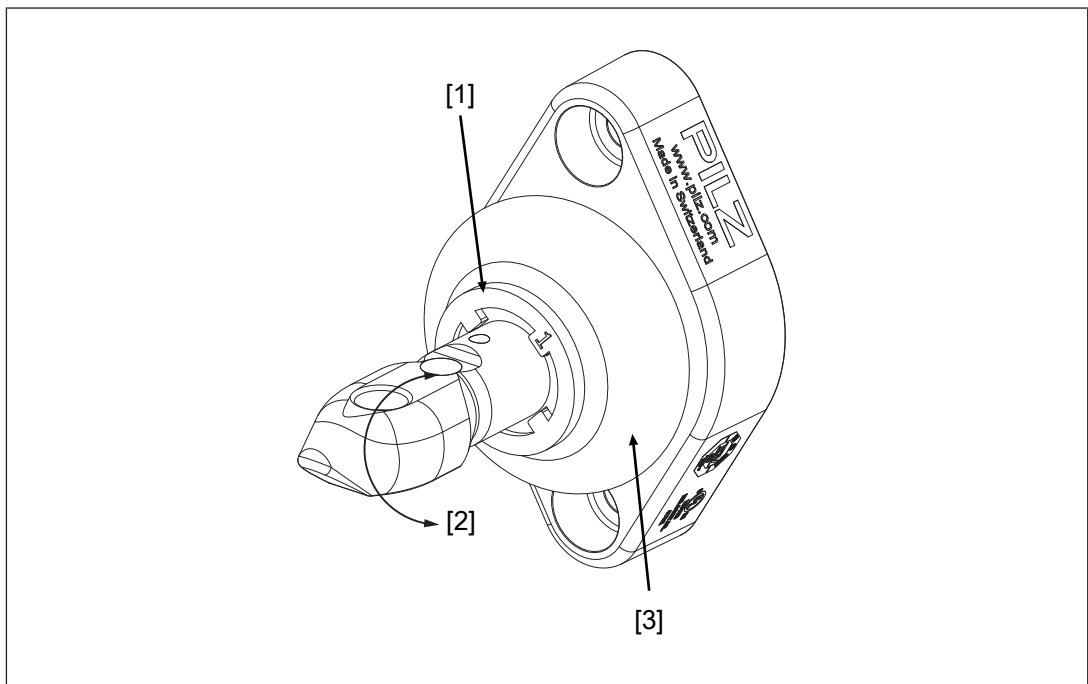
The actuator can be installed vertically on a gate (see [Figure 13](#)). To install the actuator horizontally, the bolt can be rotated 90° in the actuator housing prior to installation.

**NOTICE**

PSEN ml 1.1/2.1 round actuator has no anti-rotation device

Turn the bolt in the actuator housing 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](#).

8.5 Escape release

8.5.1 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 may mean 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.
- ▶ Prevent any unintended operation of the escape release.
- ▶ Prevent the effect of transverse forces on the escape release.
- ▶ Secure the screw connections with a medium-strength threadlocker.
- ▶ The button of the escape release pin must be clearly visible and it must not be concealed.
- ▶ 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**

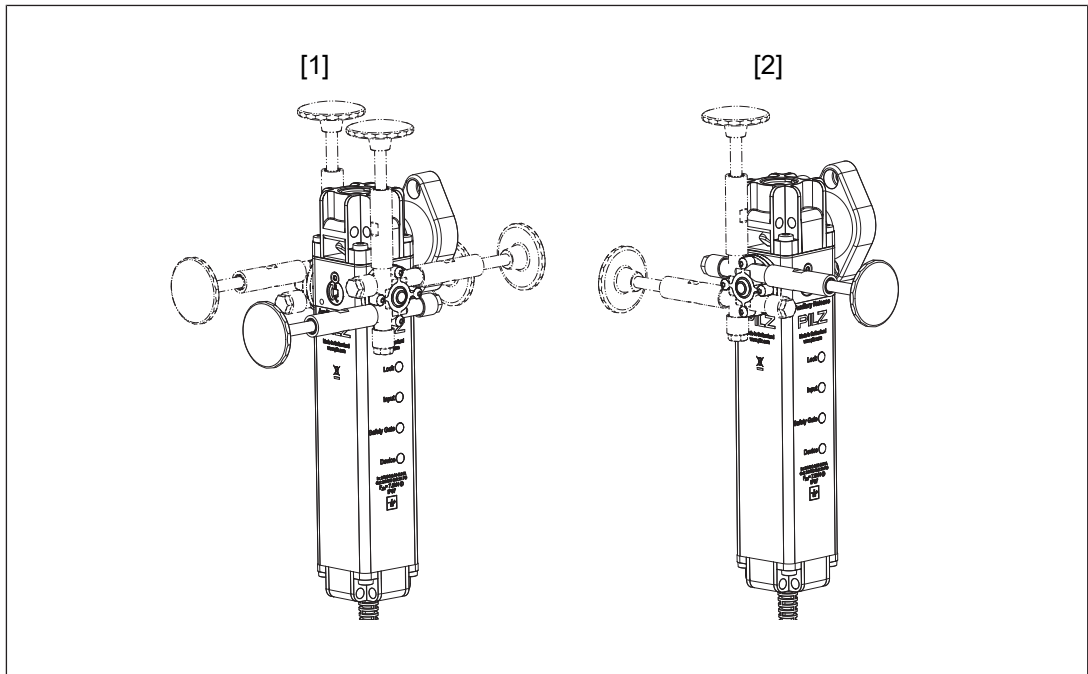
On escape releases with push/pull cables 0.5 m (order no. 570466) and 0.75 m (order no. 570467), bending the push/pull cable may reduce its functionality and lifetime.

Ensure that these versions are installed as straight as possible.

- ▶ 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.

8.5.2 Installation positions for escape release

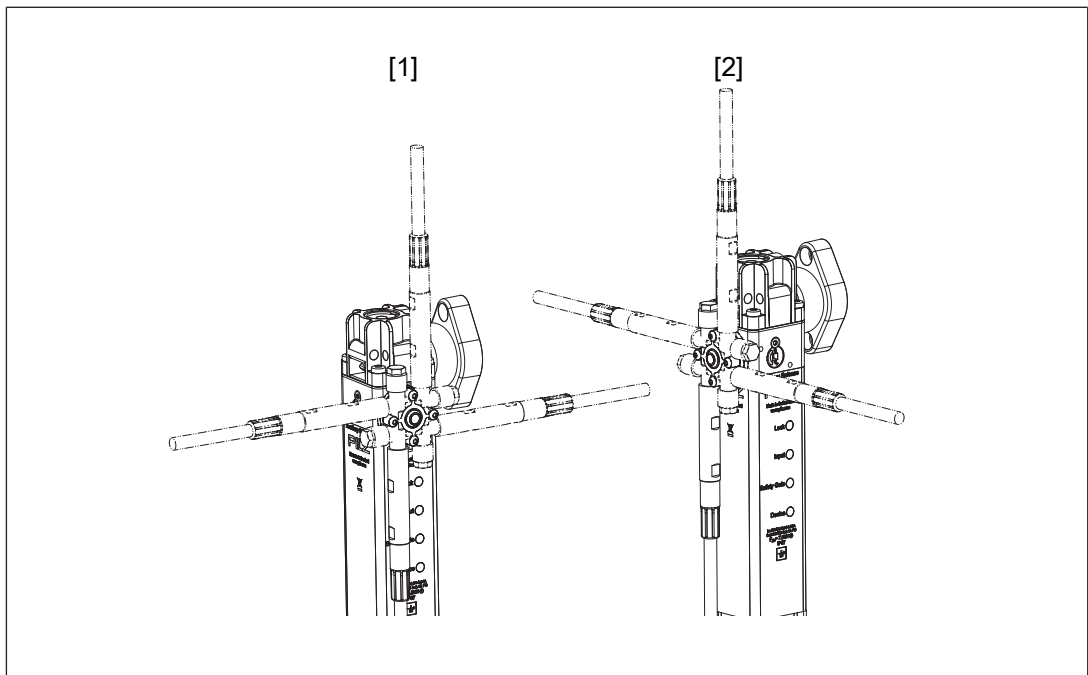
The stationary escape release can be installed on the three auxiliary releases in three different directions each.



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.

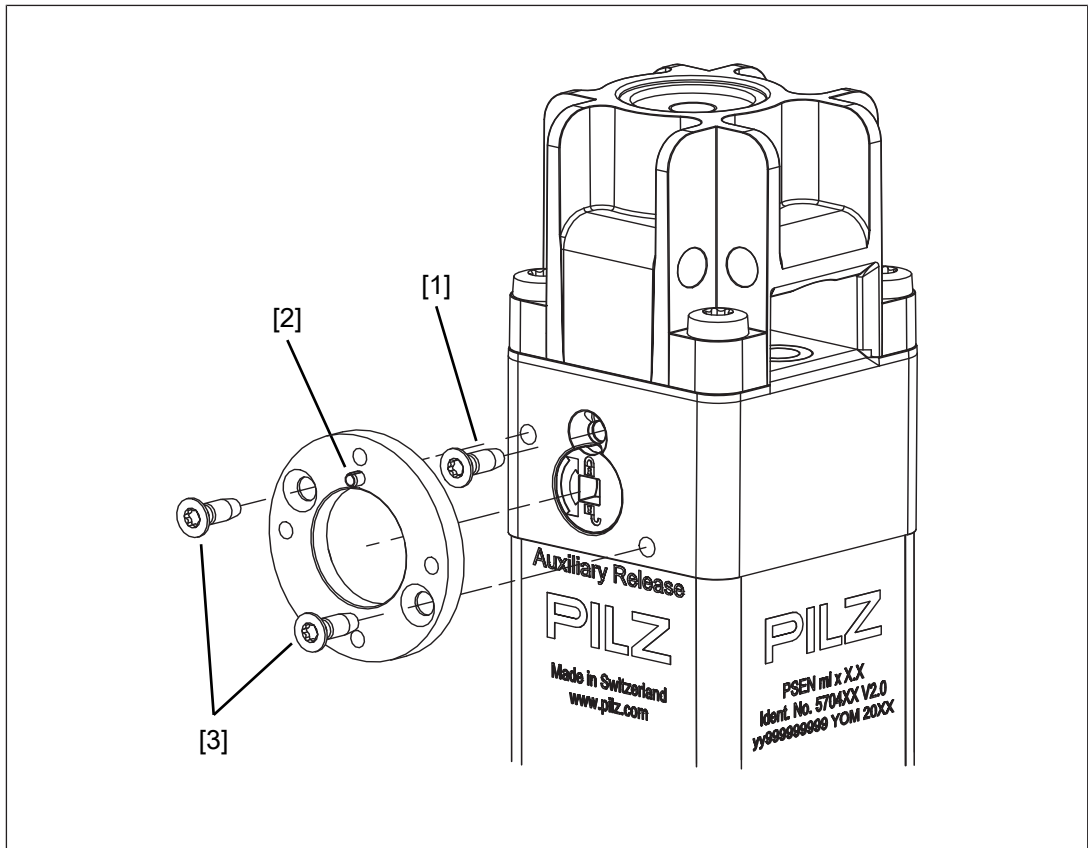


Legend

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

8.5.3 Installation stationary escape release

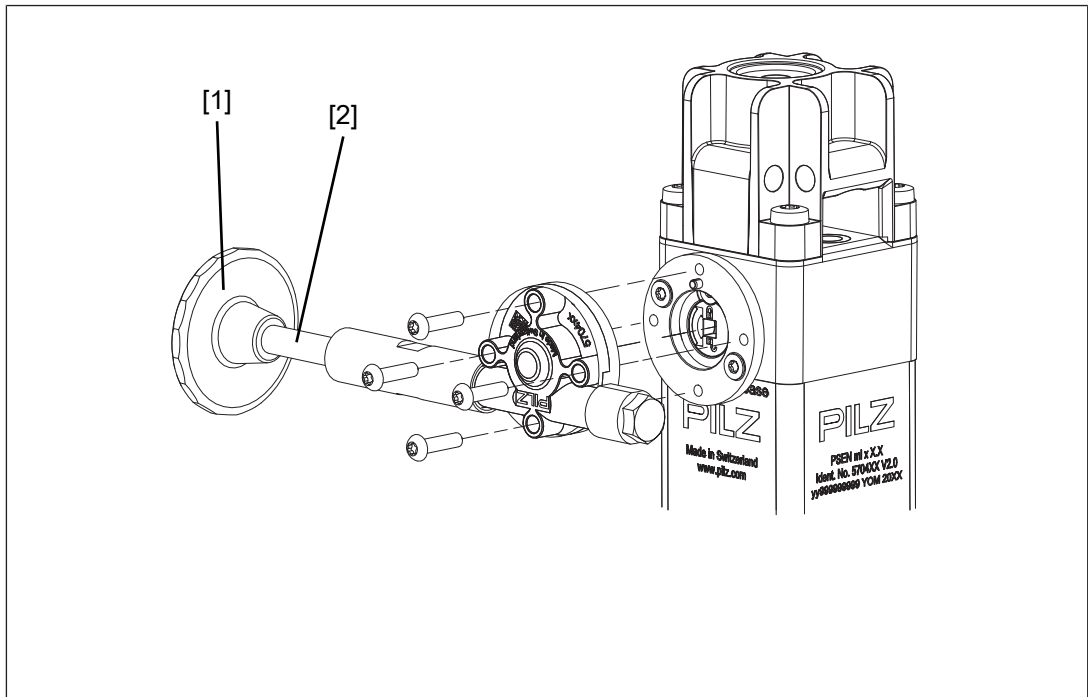
1. Remove the security screw [1] using a Torx T10 screwdriver T10.
2. Screw the adapter disk of the escape release with the two hexagon sockets M3x8 [3] on the safety switch with 1,2 - 1,5 Nm (see diagram). The pin of the adapter disk [2] must be at the place where the security screw of the auxiliary 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). Once the installation of the escape release is complete, the button of the escape release pin must be secured again with a medium-strength threadlocker and hand-tightened
 - ▶ To bridge larger distances the escape release pin can be extended by a max. of 25 mm two times (see [Order reference: Accessories \[81\]](#)).

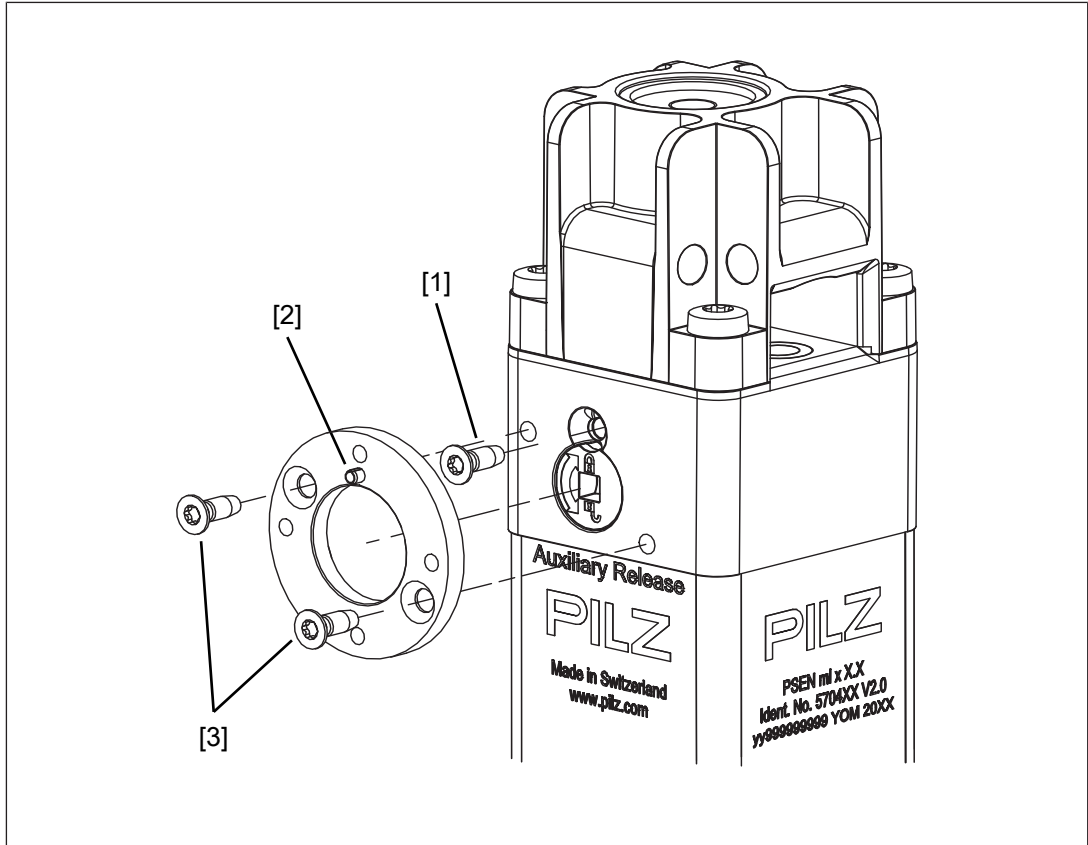


Legend

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

8.5.4 Installation external escape release

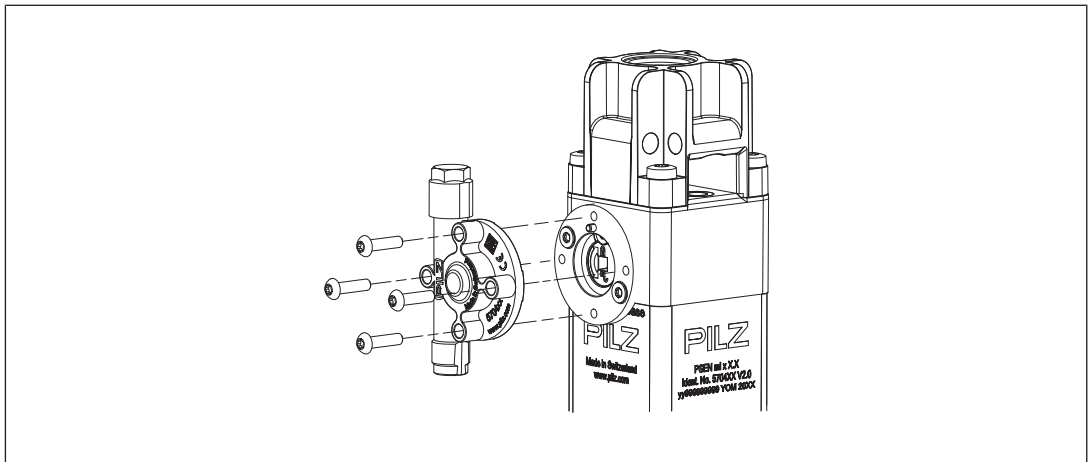
1. Remove the security screw [1] using a Torx T10 screwdriver T10.
2. Screw the adapter disk of the escape release with the two hexagon sockets M3x8 [3] on the safety switch with 1,2 - 1,5 Nm (see diagram). The pin of the adapter disk [2] must be at the place where the security screw of the auxiliary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



Legend

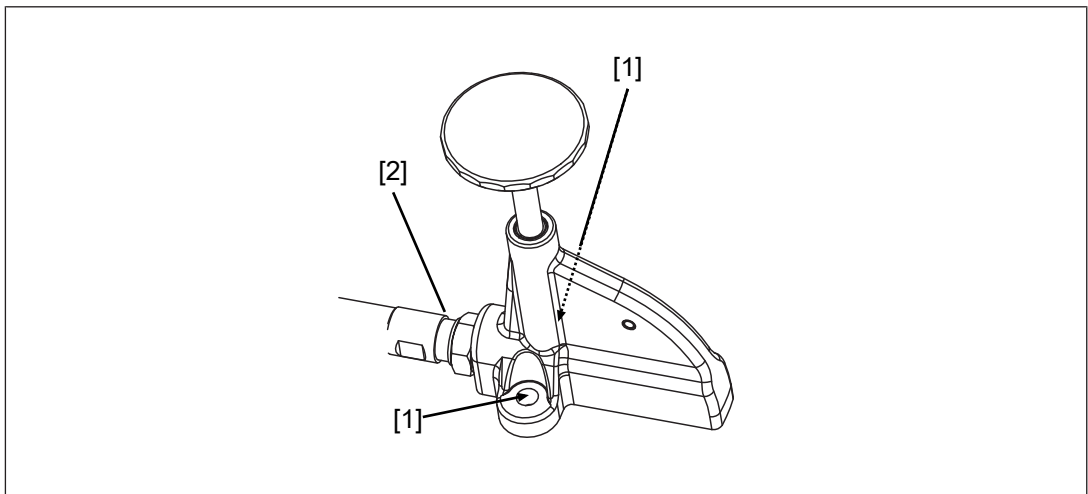
- [1] Security screw of the auxiliary release
- [2] Pin in the adapter disk
- [3] Hexagon sockets M3x8

- Screw the escape release with the four raised head screws M3x12 to the adapter disk with 1,2 - 1,5 Nm (see diagram).



Fastening for the housing of the escape release (order no. 570466 - 570475)

Screw the housing of the escape release with the screws [1] to a mounting surface with 6 - 6,5 Nm (see diagram).

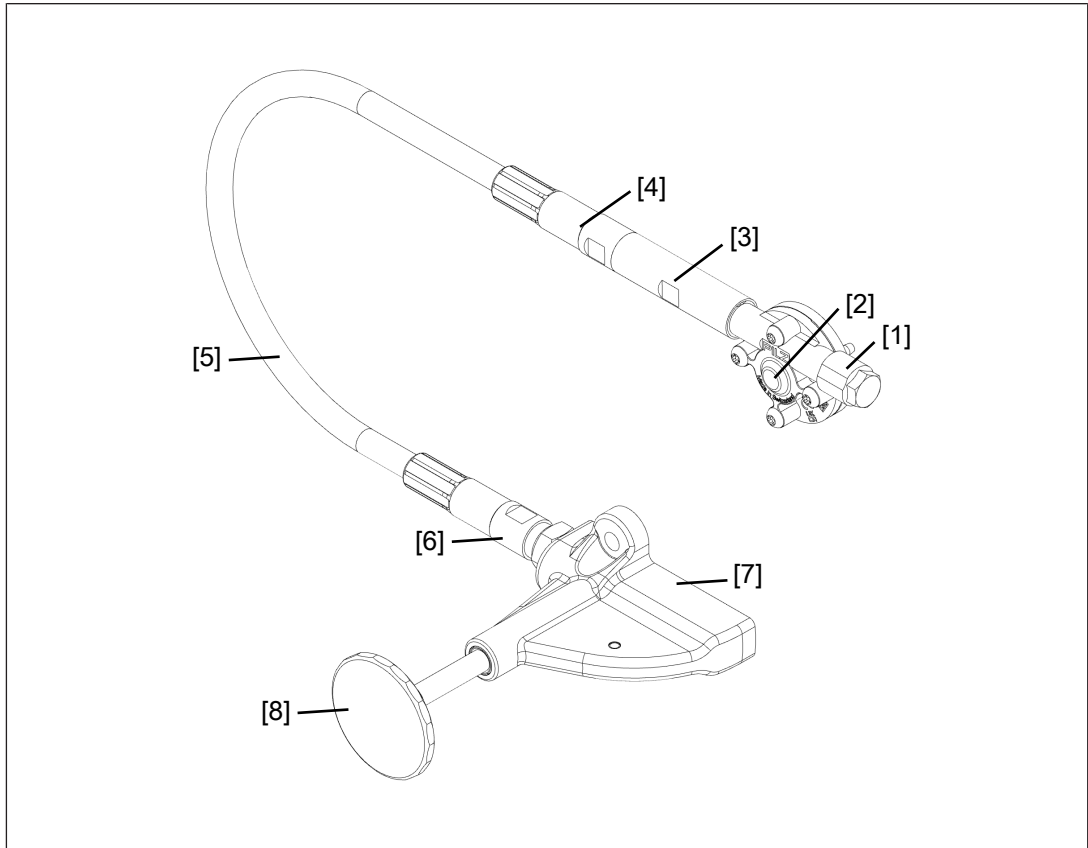


Legend

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

Material of the escape release

When selecting the cleaning agent, consider the material of the escape release.



Number	Material
1	Zinc coated
2	Zinc coated
3	Free-cutting steel coated
4	Stainless steel
5	Push-pull cable: steel Insulation: plastic: PE-HD
6	Stainless steel
7	Zinc coated
8	Zinc coated

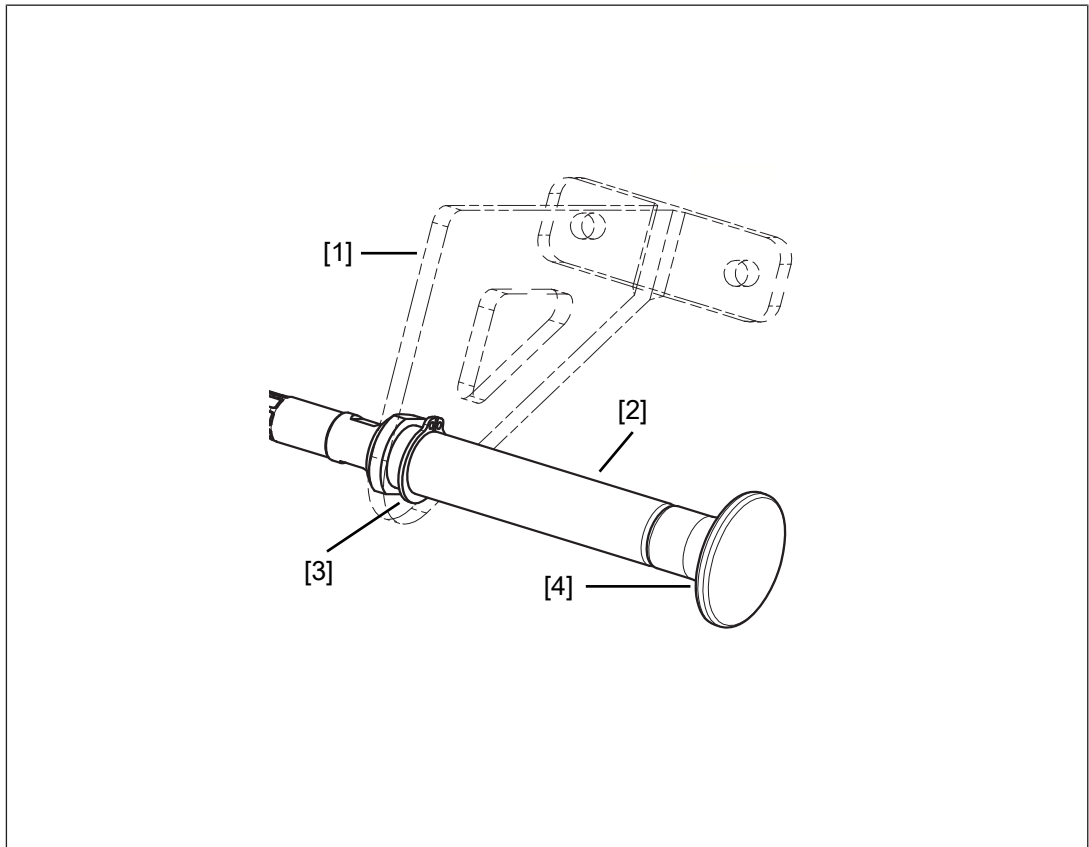
Fastening for the escape release (order no. 570463)

The escape release is fastened using a bracket (not in the Pilz portfolio). The bracket must have the following properties:

- ▶ Corrosion-resistant material
- ▶ Material thickness: 4 +/- 0.5 mm
- ▶ Only low elastic deformation may occur at a force of 150 N. The cable must be able to move with it.

Fasten escape release:

- ▶ Insert the cylinder through the hole in the bracket [1].
- ▶ Install the retaining ring [3] using circlip pliers for outer rings.
- ▶ Pull the piston rod [2] out completely.
- ▶ Apply a threadlocking adhesive evenly on the thread of the piston rod and then turn the red button handle [4] as far as it will go.
- ▶ Leave the adhesive to set for min. 24 hours.



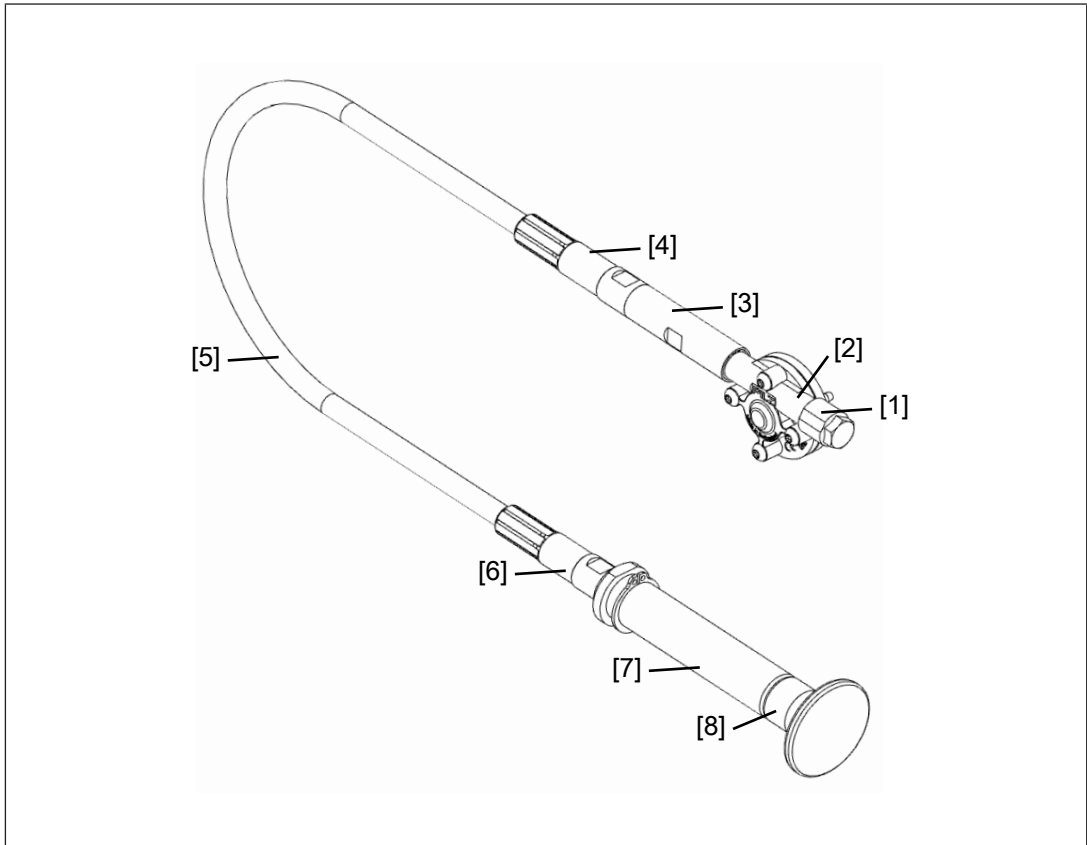
Legend

- [1] Bracket (not in the Pilz portfolio)
- [2] Cylinder
- [3] Retaining ring
- [4] Button handle

- ▶ 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.

Material of the escape release

When selecting the cleaning agent, consider the material of the escape release.



Number	Material
1	Zinc coated
2	Zinc coated
3	Stainless steel
4	Stainless steel
5	Push-pull cable: steel Insulation: plastic: PE-HD
6	Stainless steel
7	Stainless steel
8	Reinforced plastic: PA6 GF

8.5.5 Dismantling of escape release (order no. 570466 - 570475)

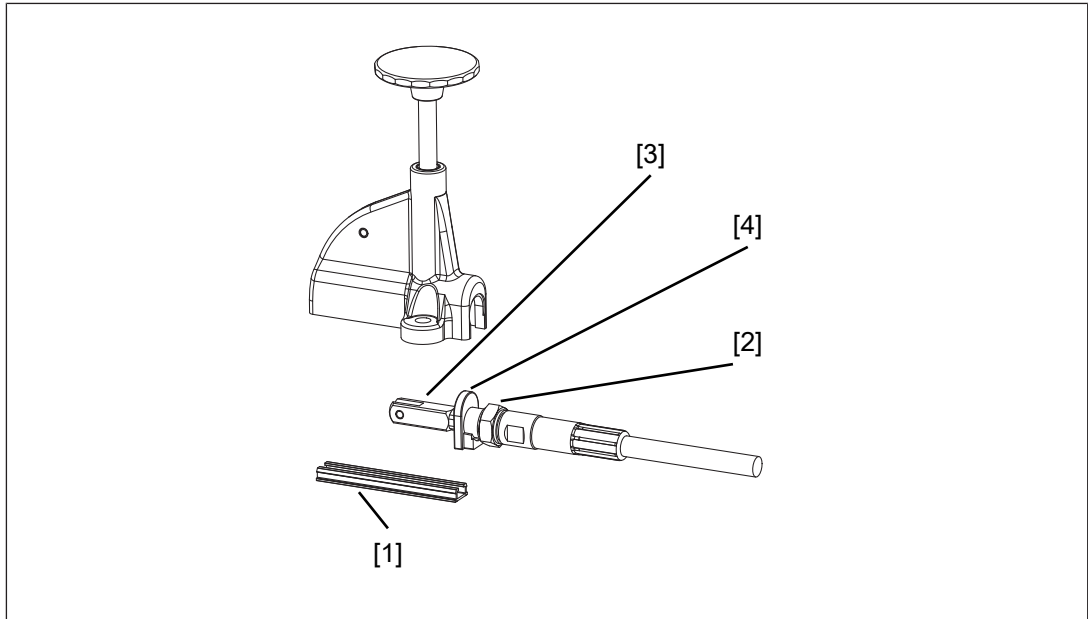
If the push/pull cable is to be run through a conduit pipe, the cable has to be uninstalled at the escape release first.

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

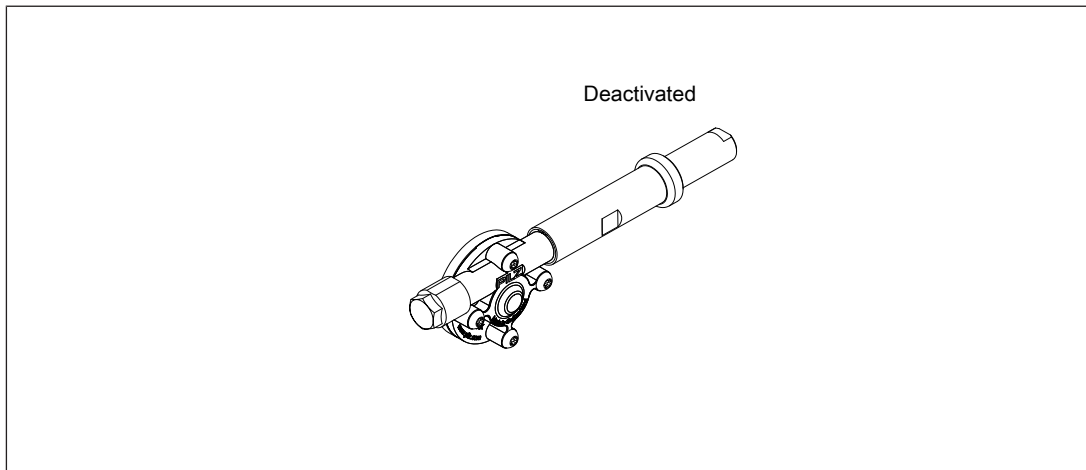
- [1] Cover
- [2] Nut M10 x 0,75
- [3] Fork head
- [4] Slot nut

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.

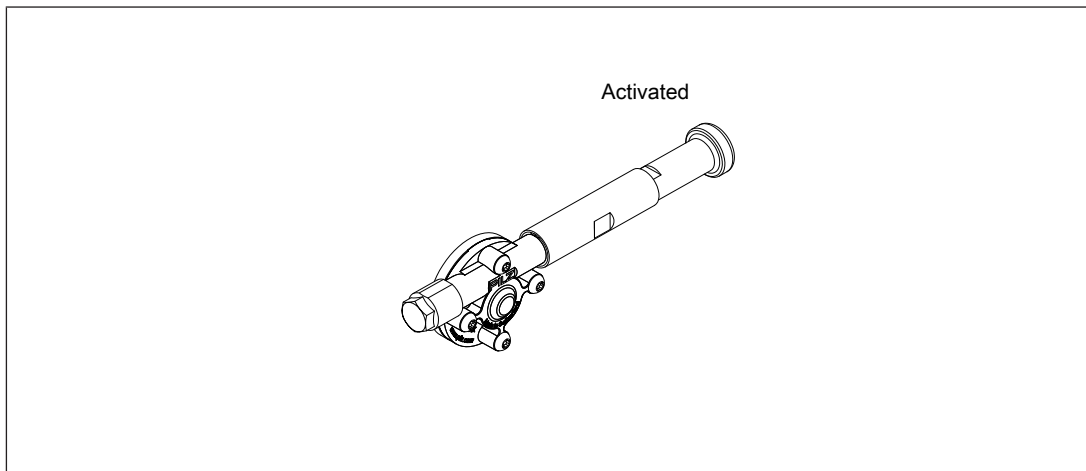
8.6 Auxiliary release

Install the auxiliary release on the safety switch as described in Installation external escape release.

- ▶ Use an 8 mm spanner to release the button handle.
- ▶ Apply a low-strength threadlocker (e.g. a threadlocking adhesive) evenly on the thread of the piston rod and then turn the red button handle as far as it will go. Max. torque setting: 1 Nm



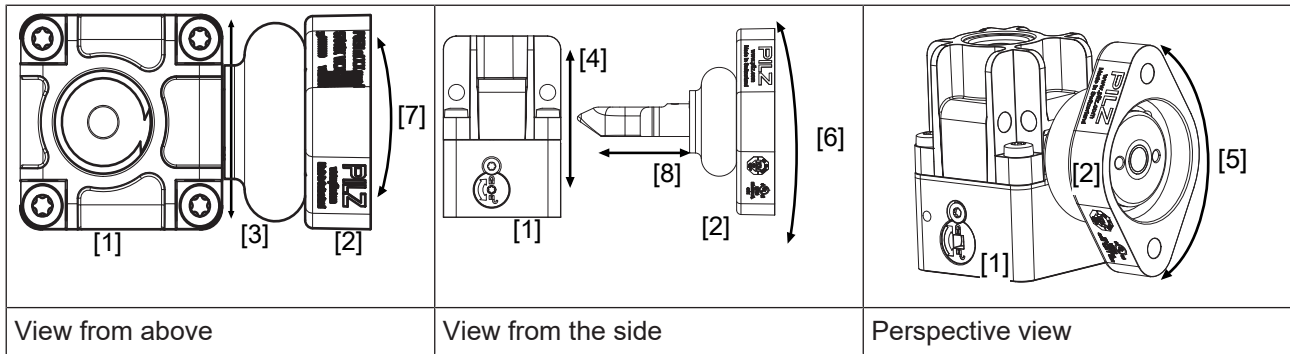
To activate the auxiliary release the button handle must be unscrewed and then screwed back on to the piston rod rotated 180°.



9 Adjustment

After installation, check whether adjustment is necessary. To check this refer to the diagrams with the stated values for max. offset and correct if necessary.

- ▶ Always test the function with a connected evaluation device.
- ▶ Use a connected evaluation device to check the function of the escape release.
- ▶ Safety switch and actuator must be aligned correctly



[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

9.1 Attach safety switch and actuator

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






Procedure:

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 \[70\]](#).

10 Operation

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)

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 up yellow: The unit is ready for 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.




10.1 Normal operation mlock

LED status				Switch status
Device	Safety Gate	Input	Lock	
 Green	 Yellow	 Yellow	 Green	The safety switch is started
 Green	 LED off	 Yellow	 LED off	Safety gate open, actuator not detected, guard locking deactivated
 Green	 Yellow	 Yellow	 LED off	Safety gate closed, actuator detected, guard locking deactivated












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 [55] 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 [21]).
 Green	Display not definitive	 Yellow	 Yellow	Guard locking pin is in an intermediate position	
 Yellow	Display not definitive	 Yellow	Display not definitive	Safety switch active despite over or under-voltage	Check the supply voltage. If safety inputs S31 and S41 are activated or deactivated while an under-voltage warning is present, the safety switch switches to a fault condition.

LED status				Switch status	Remedy / measure
Device	Safety Gate	Input	Lock		
 Green	Display not definitive	Display not definitive	 Red	Auxiliary release/escape release activated	<ul style="list-style-type: none"> ▶ Auxiliary release: Turn back the auxiliary release screw and then recommission the safety switch again (see Recommissioning [ 21]) ▶ Escape release: Pull the button of the escape release pin back again and then recommission the safety switch (see Recommissioning)

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 [11]). ▶ 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).
 Red	Display not definitive			Safety switch does not start	Change the safety switch.
 Green	 Yellow	Display not definitive	Display not definitive	Wrong actuator	Use only approved combinations (see Approved combinations [11])

11 Checks and maintenance

It is not necessary to perform maintenance work on the product in normal operation. Please return any faulty products to Pilz.

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 once per month
- ▶ for SIL CL 2/PL d at least every year

The Appendix contains a [Check list](#)  84], 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, insert the security screw and use varnish to seal the security screw.
- ▶ Check the safety switch and actuator for damage.
Replace the damaged safety switch and actuator.
- ▶ Check that the safety switch and actuator are firmly secured.
Tighten the fixing screws using the appropriate torque.
- ▶ 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

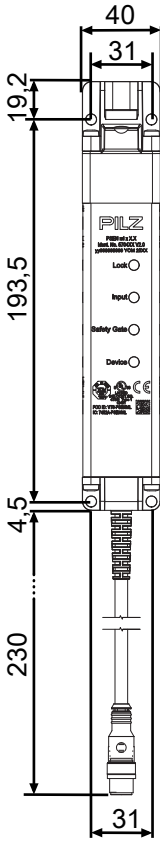
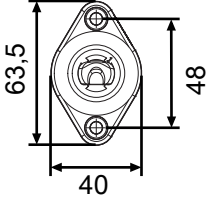
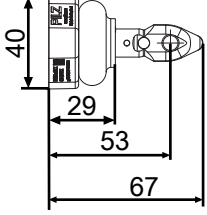
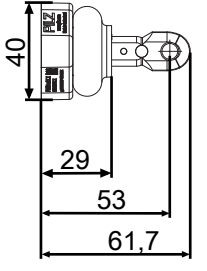
- ▶ The actuator is detected and at the signal output/ diagnostic output Y32 there is a high signal after detection of the actuator.
- ▶ The guard locking device can be activated/deactivated when the safety inputs S31 and S41 are activated.
- ▶ Under these conditions there is a high signal at safety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

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>40 31 19.2 193.5 4.5 230 31</p>	 <p>63.5 48 40</p> <p>Actuator without center ring, rear view</p>
	 <p>40 29 53 67</p> <p>PSEN ml 1.1/PSEN ml 2.1 actuator</p>
	 <p>40 29 53 61.7</p> <p>PSEN ml 1.1/PSEN ml 2.1 round actuator</p>
<p>Safety switch</p>	<p>Actuator</p>

Mounting plate (see [Accessories \[81\]](#))

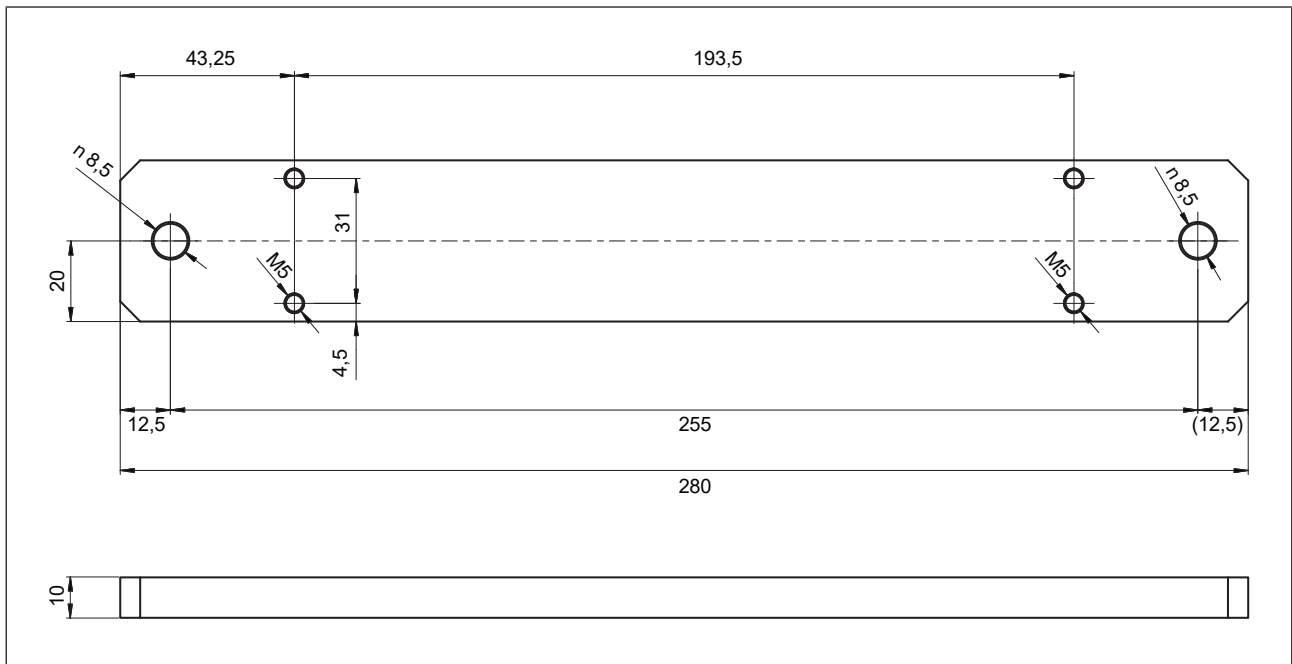


Fig.: Order no.: 570490

Mounting bracket for sliding gate (see [Accessories \[81\]](#))

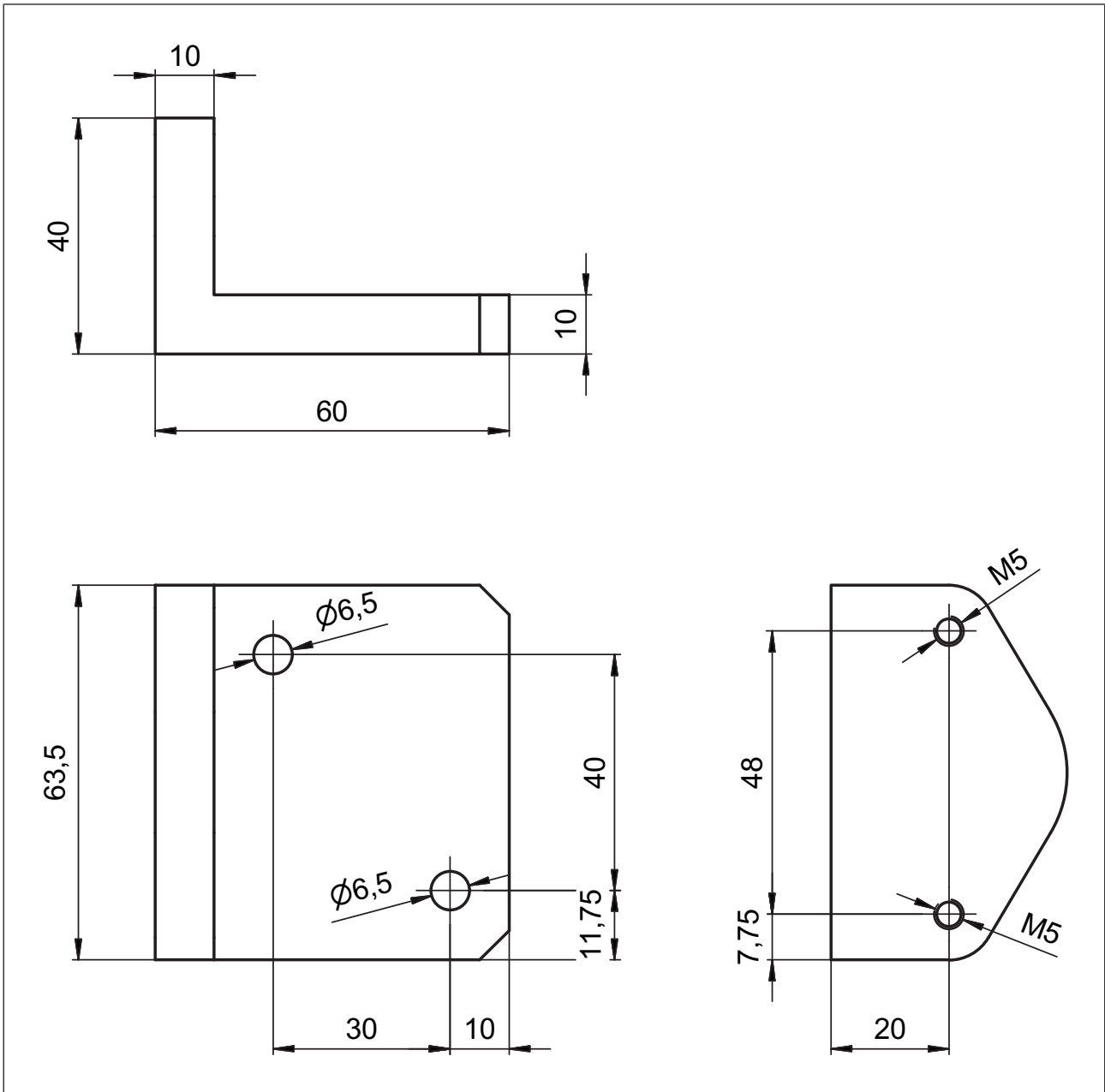


Fig.: Order no.: 570492

Mounting bracket for swing gate (see [Accessories \[81\]](#))

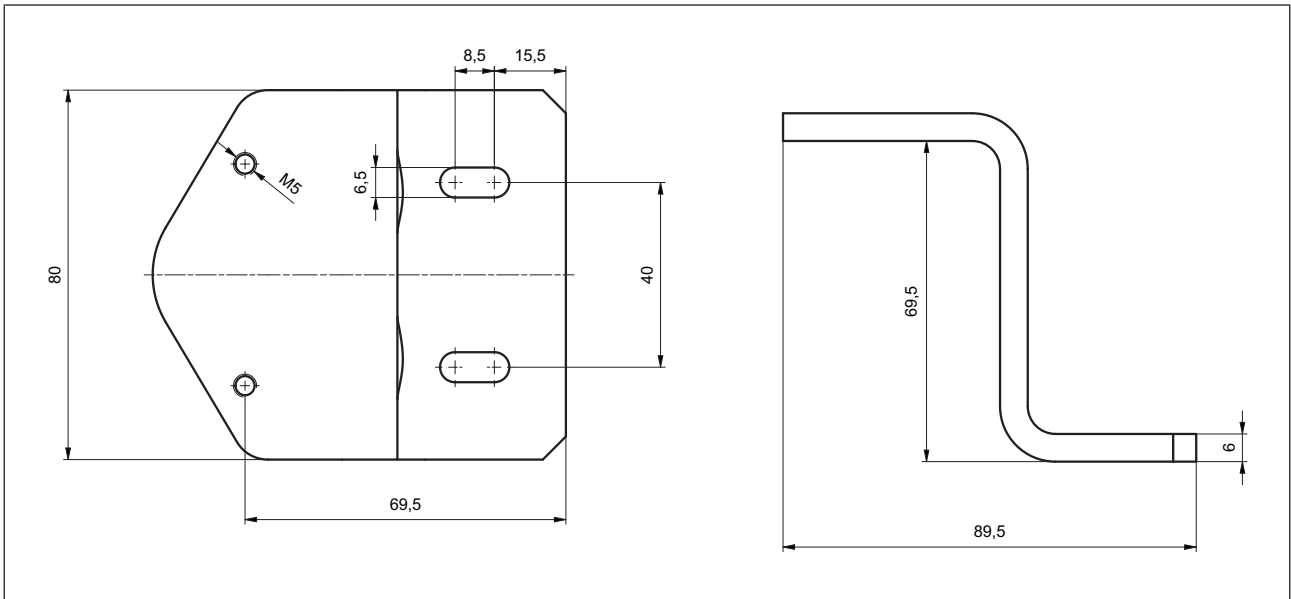


Fig.: Order no.: 570493

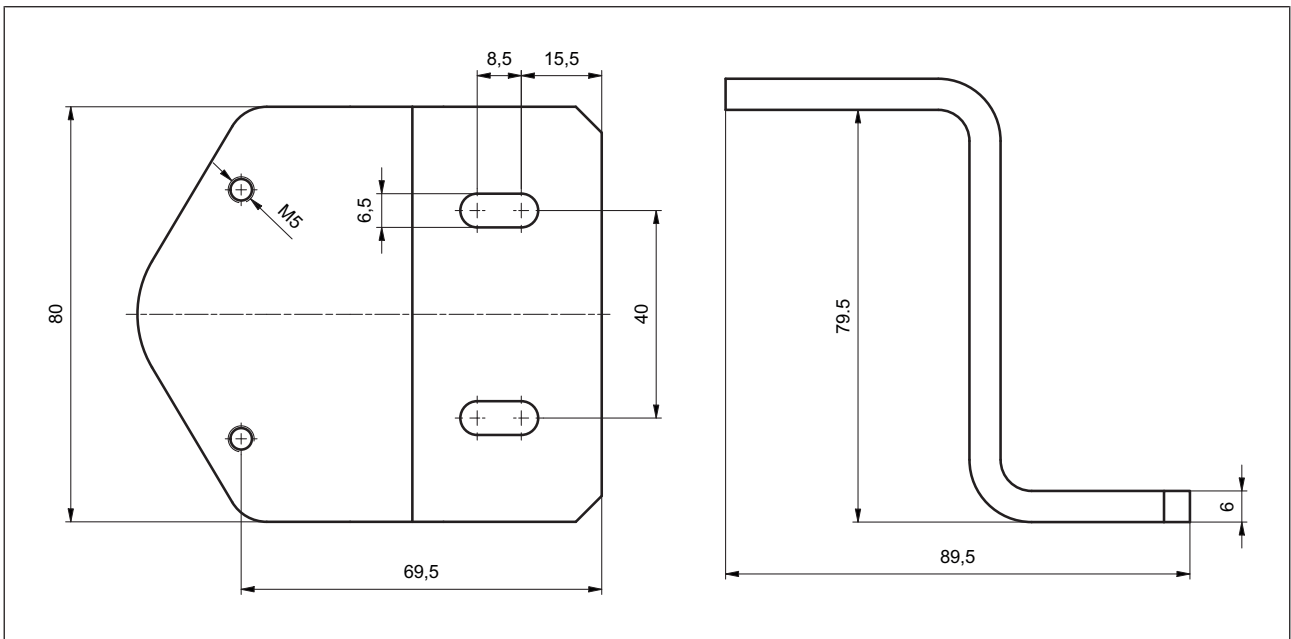


Fig.: Order no.: 570494

Mounting bracket with handle unit for sliding gate (see [Accessories \[81\]](#))

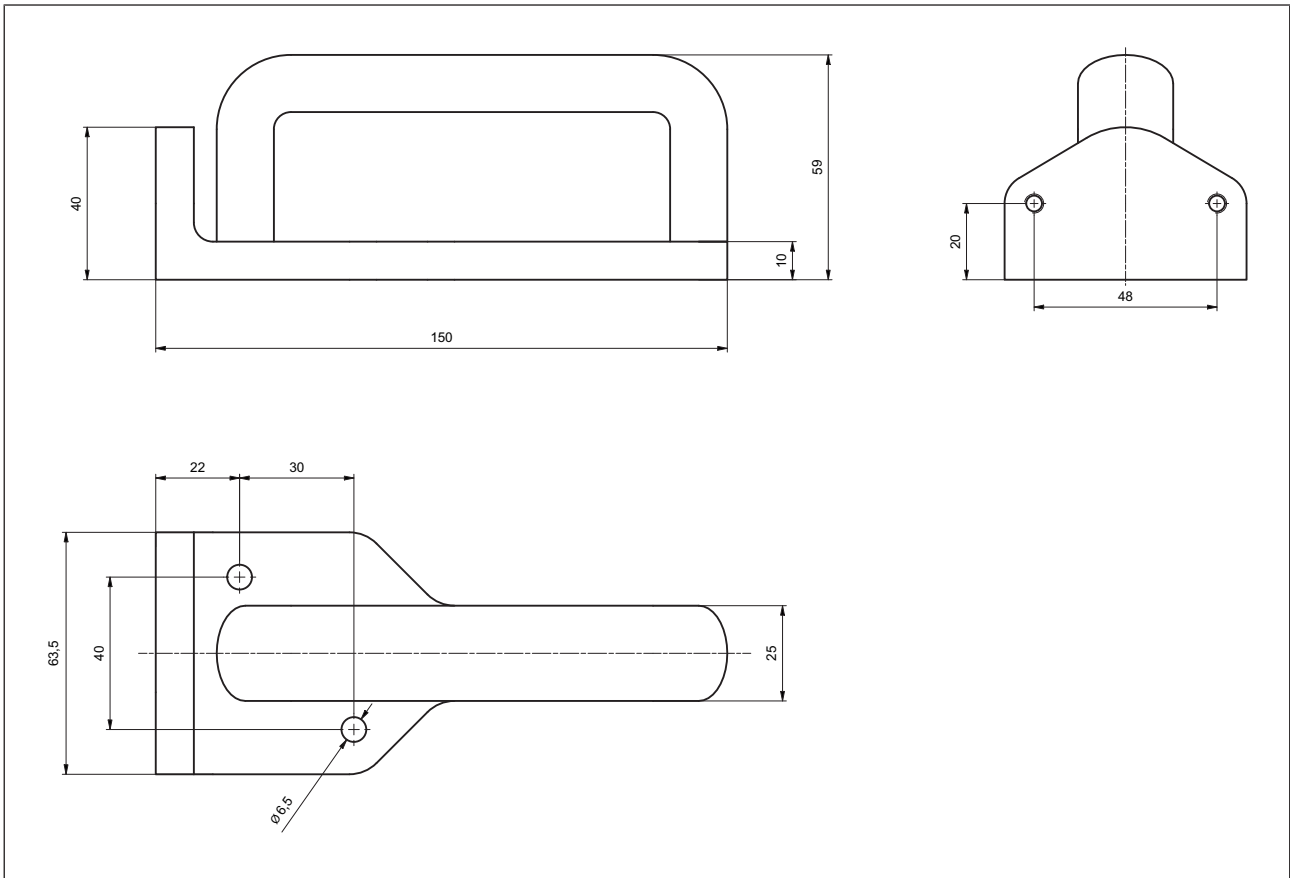


Fig.: Order no.: 570495

Mounting bracket with handle unit for swing gate (see [Accessories \[81 \]](#))

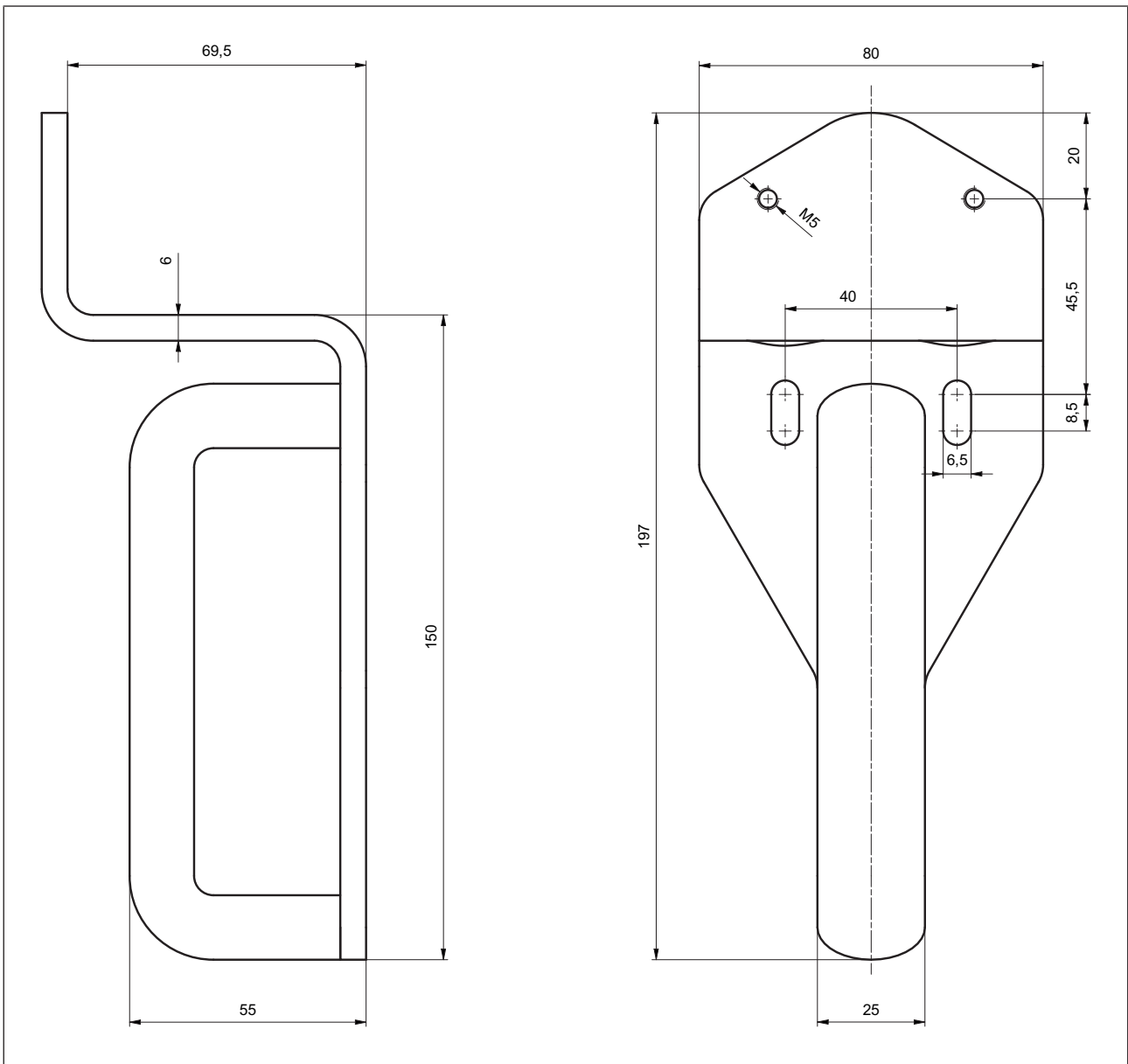


Fig.: Order no.: 570496

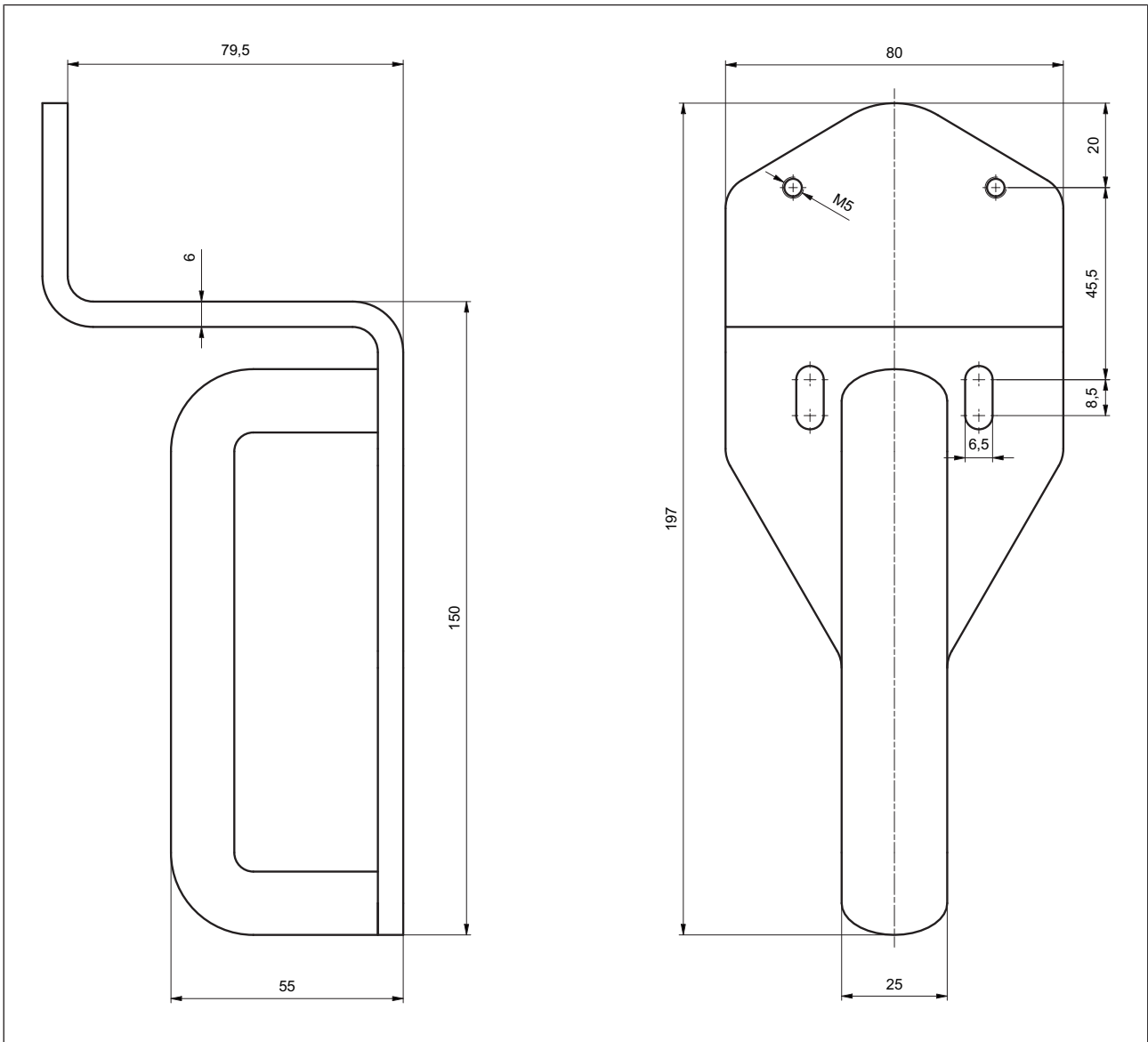


Fig.: Order no.: 570497

L-bracket for the safety switch (see [Accessories \[81\]](#))

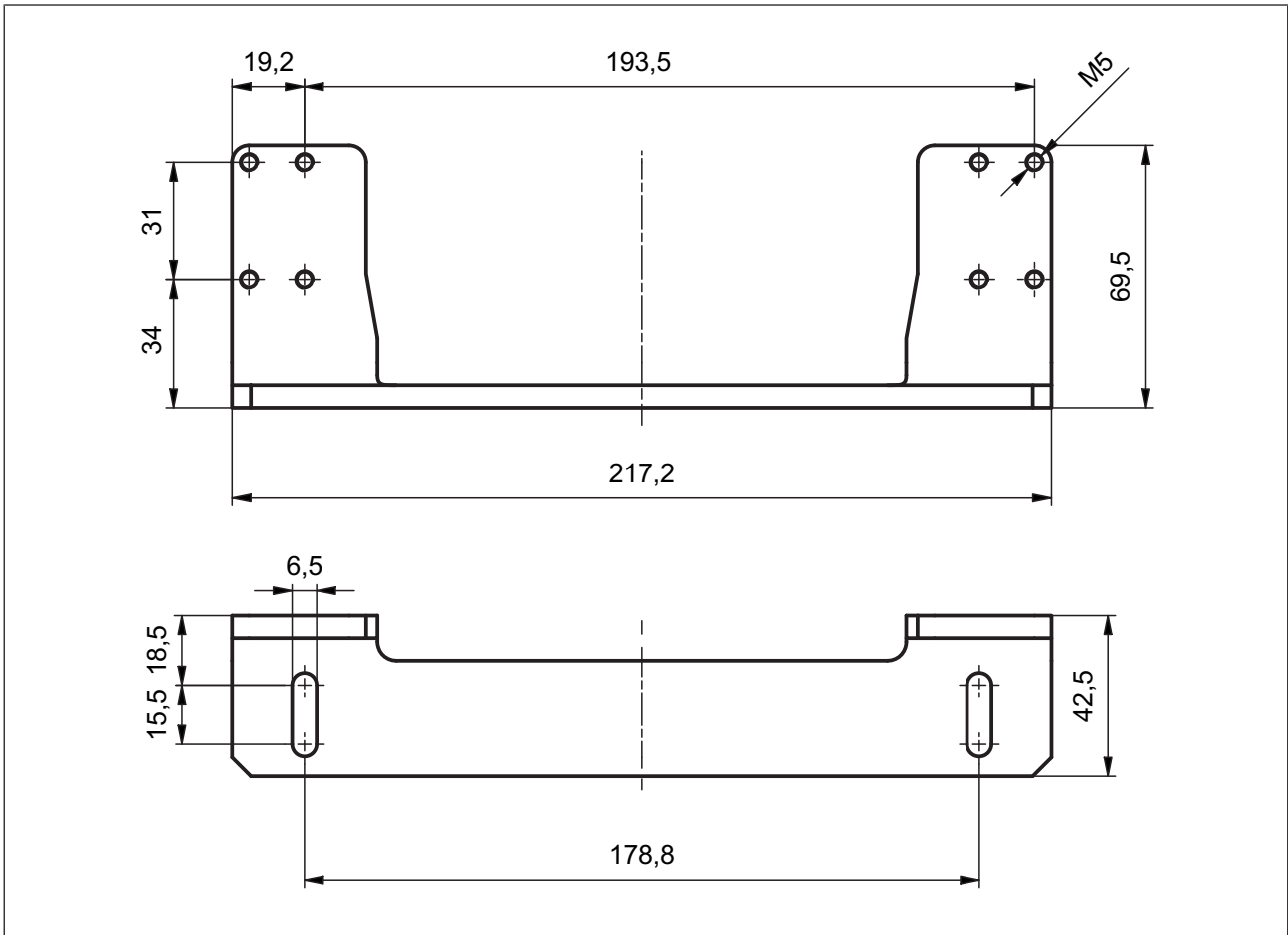
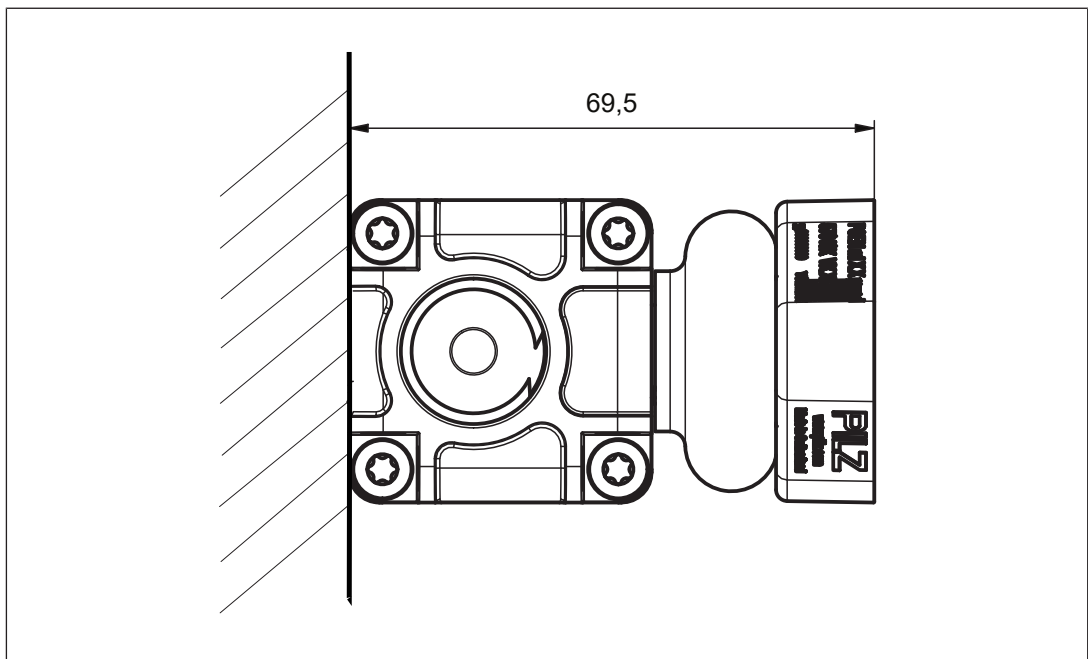


Fig.: Order no.: 570476

Distance between safety switch mounting surface and actuator mounting surface



13 Technical details

General	570424	570426	570428
Certifications	CE, FCC, IC, SEV, UKCA, UL/cUL	CE, FCC, IC, TÜV, UKCA, cULus Listed	CE, FCC, IC, TÜV, UKCA, cULus Listed
Sensor's mode of operation	Transponder	Transponder	Transponder
Coding level in accordance with EN ISO 14119	Low	High	High
Design in accordance with EN ISO 14119	4	4	4
Classification in accordance with EN 60947-5-3	PDDB	PDDB	PDDB
Pilz coding type	Coded	fully coded	uniquely coded
Transponder	570424	570426	570428
Frequency band	122 kHz - 128 kHz	122 kHz - 128 kHz	122 kHz - 128 kHz
Max. transmitter output	15 mW	15 mW	15 mW
Electrical data	570424	570426	570428
Supply voltage			
Voltage	24 V	24 V	24 V
Kind	DC	DC	DC
Voltage tolerance	-20 %/+20 %	-20 %/+20 %	-20 %/+20 %
Output of external power supply (DC)	1 W	1 W	1 W
Max. switching frequency	1 Hz	1 Hz	1 Hz
Magnet. supply voltage	24 V	24 V	24 V
Max. solenoid current t <150 ms	1 A	1 A	1 A
Max. cable capacitance at the safety outputs			
No-load, PNOZ with relay contacts	40 nF	40 nF	40 nF
PNOZmulti, PNOZelog, PSS	70 nF	70 nF	70 nF
Max. inrush current impulse			
Current pulse, A1	5 A	5 A	5 A
Pulse duration, A1	0,0002 ms	0,0002 ms	0,0002 ms
Max. unit fuse protection in accordance with UL	3 A	3 A	3 A
No-load current	40 mA	40 mA	40 mA
Inputs	570424	570426	570428
Number	2	2	2
Voltage at inputs	24 V DC	24 V DC	24 V DC
Current at solenoid input	500 mA	500 mA	500 mA

Semiconductor outputs	570424	570426	570428
Number of OSSD safety outputs	2	2	2
Signal outputs	1	1	1
Switching current per output	100 mA	100 mA	100 mA
Breaking capacity per output	2,4 W	2,4 W	2,4 W
Potential isolation from system voltage	No	No	No
Short circuit-proof	yes	yes	yes
Residual current at outputs	100 µA	100 µA	100 µA
Voltage drop at OSSDs	1 V	1 V	1 V
Conditional rated short circuit current	100 A	100 A	100 A
Lowest operating current	1 mA	1 mA	1 mA
Utilisation category in accordance with EN 60947-1	DC-13	DC-13	DC-13
Times	570424	570426	570428
Test pulse duration, safety outputs	450 µs	450 µs	450 µs
Switch-on delay			
after UB is applied	1,1 s	1,1 s	1,1 s
Actuator typ.	30 ms	30 ms	30 ms
Actuator max.	50 ms	50 ms	50 ms
Delay-on de-energisation			
Actuator typ.	30 ms	30 ms	30 ms
Actuator max.	40 ms	40 ms	40 ms
Risk time in accordance with EN 60947-5-3	260 ms	260 ms	260 ms
Supply interruption before de-energisation	20 ms	20 ms	20 ms
Simultaneity, channel 1 and 2 max.	20 ms	20 ms	20 ms
Pulse duration Lock/Unlock Request	350 - 400 ms	350 - 400 ms	350 - 400 ms
Processing time activate/deactivate guard locking	100 ms	100 ms	100 ms
Environmental data	570424	570426	570428
Temperature of metal surface at ambient temperature: 25 °C	40 °C	40 °C	40 °C
Ambient temperature			
In accordance with the standard	EN 60068-2-14	EN 60068-2-14	EN 60068-2-14
Temperature range	0 - 60 °C	0 - 60 °C	0 - 60 °C

Environmental data	570424	570426	570428
Storage temperature			
In accordance with the standard	EN 60068-2-1/-2	EN 60068-2-1/-2	EN 60068-2-1/-2
Temperature range	-25 - 70 °C	-25 - 70 °C	-25 - 70 °C
Climatic suitability			
In accordance with the standard	EN 60068-2-78	EN 60068-2-78	EN 60068-2-78
Humidity	93 % r. h. at 40 °C	93 % r. h. at 40 °C	93 % r. h. at 40 °C
EMC	EN 55011: class A, EN 60947-5-3, EN 61326-3-1	EN 55011: class A, EN 60947-5-3, EN 61326-3-1	EN 55011: class A, EN 60947-5-3, EN 61326-3-1
Vibration			
In accordance with the standard	EN 60068-2-6	EN 60068-2-6	EN 60068-2-6
Frequency	10 - 55 Hz	10 - 55 Hz	10 - 55 Hz
Amplitude	1 mm	1 mm	1 mm
Shock stress			
In accordance with the standard	EN 60068-2-27	EN 60068-2-27	EN 60068-2-27
Number of shocks	3	3	3
Acceleration	30g	30g	30g
Duration	11 ms	11 ms	11 ms
Airgap creepage			
Overvoltage category	III	III	III
Pollution degree	3	3	3
Rated insulation voltage	75 V	75 V	75 V
Rated impulse withstand voltage	0,8 kV	0,8 kV	0,8 kV
Protection type			
Housing	IP67	IP67	IP67
In accordance with UL	type 1	type 1	type 1
Mechanical data	570424	570426	570428
Length of cable with connector	230 mm	230 mm	230 mm
Min. bending radius (fixed permanently) K1	5 x Ø	5 x Ø	5 x Ø
Min. bending radius (moving) K1	10 x Ø	10 x Ø	10 x Ø
Cable diameter K1	6,2 mm	6,2 mm	6,2 mm
Escape release available	No	No	No
Mechanical life	1,000,000 cycles	1,000,000 cycles	1,000,000 cycles
Mechanical life with centering ring	50,000 cycles	50,000 cycles	50,000 cycles
Holding force FZh			
Fixing screws in parallel to actuator	7.500 N	7.500 N	7.500 N
Fixing screws side-on to actuator	5.000 N	5.000 N	5.000 N

Mechanical data	570424	570426	570428
Holding force F1Max in accordance with ISO 14119			
Fixing screws in parallel to actuator	15.000 N	15.000 N	15.000 N
Fixing screws side-on to actuator	10.000 N	10.000 N	10.000 N
Latching force	30 N	30 N	30 N
Max. vertical offset	+/-3,0 mm	+/-3,0 mm	+/-3,0 mm
Max. lateral offset	+/-3,0 mm	+/-3,0 mm	+/-3,0 mm
Max. angular offset around the X axis	+/-2,0 deg	+/-2,0 deg	+/-2,0 deg
Max. angular offset around the Y axis	+/-2,5 deg	+/-2,5 deg	+/-2,5 deg
Max. angular offset around the Z axis	+/-7,5 deg	+/-7,5 deg	+/-7,5 deg
Max. offset in closing direction	+/-2 mm	+/-2 mm	+/-2 mm
Max. retract speed of actuator	0,3 m/s	0,3 m/s	0,3 m/s
Actuator 1	PSEN ml 1.1	PSEN ml 2.1	PSEN ml 2.1
Min. distance between safety switches	0 mm	0 mm	0 mm
Connection type	M12, 8-pin male connector	M12, 8-pin male connector	M12, 8-pin male connector
Cable	LiYY 8 x 0.25 mm²	LiYY 8 x 0.25 mm²	LiYY 8 x 0.25 mm²
Material	Aluminium, stainless steel, plastic, galvanised steel, Zn	Aluminium, stainless steel, plastic, galvanised steel, Zn	Aluminium, stainless steel, plastic, galvanised steel, Zn
Max. torque setting for fixing screws	6 - 6,5 Nm	6 - 6,5 Nm	6 - 6,5 Nm
Max. torque setting escape release	1,2 - 1,5 Nm	1,2 - 1,5 Nm	1,2 - 1,5 Nm
Max. torque setting for mounting plate	22 - 24 Nm	22 - 24 Nm	22 - 24 Nm
Max. torque setting for mounting bracket	14 - 16 Nm	14 - 16 Nm	14 - 16 Nm
Min. gate radius	300 mm	300 mm	300 mm
Dimensions			
Height	217,2 mm	217,2 mm	217,2 mm
Width	40 mm	40 mm	40 mm
Depth	40 mm	40 mm	40 mm
Actuator dimensions			
Height	63,5 mm	63,5 mm	63,5 mm
Width	40 mm	40 mm	40 mm
Depth	67,2 mm	67,2 mm	67,2 mm
Weight of safety switch	950 g	950 g	950 g
Weight of actuator	145 g	145 g	145 g

Mechanical data	570424	570426	570428
Weight	1.100 g	1.100 g	1.100 g

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

14 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".

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

15 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	EN ISO 13849-1: 2015	EN IEC 62061	EN IEC 62061	EN ISO 13849-1: 2015
	PL	Category	SIL CL	PFH _D [1/h]	T _M [year]
1-ch. guard locking	PL d	Cat. 2	SIL CL 2	4,22E-09	20
2-ch. guard locking	PL e	Cat. 4	SIL CL 3	4,22E-09	20
2-ch. OSSD	PL e	Cat. 4	SIL CL 3	2,38E-09	20
Escape release		Cat B			20

Explanatory notes for the safety-related characteristic data:

- ▶ Safety characteristic data in accordance with EN IEC 62061 and EN/IEC 61511 was calculated based on EN/IEC 61508.
- ▶ T_M is the maximum mission time in accordance with EN ISO 13849-1. The value also applies as the retest interval in accordance with EN/IEC 61508-6 and EN/IEC 61511 and as the proof test interval and mission time in accordance with EN IEC 62061.

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



INFORMATION

A safety function's SIL/PL values are **not** identical to the SIL/PL values of the units that are used and may be different. We recommend that you use the PAScal software tool to calculate the safety function's SIL/PL values.



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.

16 Supplementary data

16.1 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.	

16.2 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

16.3 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

16.4 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

16.5 Technical details for escape release 570463

General	
Certifications	CE
Environmental data	
Ambient temperature	
Temperature range	0 - 60 °C
Mechanical data	
Release force escape release	80 N
Service life escape release	6050 cycles
Weight	375 g

16.6 Technical details escape release 570466-570469

General	570466	570467	570468	570469
Certifications	CE	CE	CE	CE
Mechanical data	570466	570467	570468	570469
Release force es- cape release	80 N	80 N	80 N	80 N
Service life escape release	6050 cycles	6050 cycles	6050 cycles	6050 cycles
Weight	320 g	345 g	370 g	395 g

16.7 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

16.8 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

16.9 Technical details for auxiliary release 570461

General	
Certifications	CE
Environmental data	
Temperature range	0 - 60 °C
Mechanical data	
Release force escape release	80 N
Service life escape release	6050 cycles
Weight	100 g

17 Order reference

17.1 System

Product type	Features		Order no.
PSEN ml ba 1.1 unit	Mechanical safety gate system with guard locking and automatic reset, coded, for single connection	8-pin M12 male connector, 0.23 m cable	570424
PSEN ml ba 1.1 switch	Mechanical safety switch with guard locking and automatic reset, coded, for single connection	8-pin M12 male connector, 0.23 m cable	570425
PSEN ml ba 2.1 unit	Mechanical safety gate system with guard locking and automatic reset, fully coded, for single connection	8-pin M12 male connector, 0.23 m cable	570426
PSEN ml ba 2.1 switch	Mechanical safety switch with guard locking and automatic reset, fully coded, for single connection	8-pin M12 male connector, 0.23 m cable	570427
PSEN ml ba 2.2 unit	Mechanical safety gate system with guard locking and automatic reset, uniquely coded, for single connection	8-pin M12 male connector, 0.23 m cable	570428
PSEN ml ba 2.2 switch	Mechanical safety switch with guard locking and automatic reset, uniquely coded, for single connection	8-pin M12 male connector, 0.23 m cable	570429
PSEN ml 1.1 actuator	Actuator, coded		570480
PSEN ml 2.1 actuator	Actuator, fully coded		570481
PSEN ml 1.1 round actuator	Actuator with rounded head, coded		570482
PSEN ml 2.1 round actuator	Actuator with rounded head, fully coded		570483

17.2 Accessories

Installation accessories

Product type	Features	Order no.
PSEN ml escape release	Escape release stationary	570460
PSEN ml auxiliary release hd1	Auxiliary release, hygienic design 1	570461
PSEN ml escape release extension	Extension escape release stationary 25 mm	570462
PSEN ml escape release cordset 1.5m hd1	Escape release external with push/pull cable 1.5 m, hygienic design 1	570463
PSEN ml escape release cordset 0.5m	Escape release external with push/pull cable 0.5 m	570466
PSEN ml escape release cordset 0.75m	Escape release external with push/pull cable 0.75 m	570467
PSEN ml escape release cordset 1.0m	Escape release external with push/pull cable 1.0 m	570468
PSEN ml escape release cordset 1.25m	Escape release external with push/pull cable 1.25 m	570469
PSEN ml escape release cordset 1.5m	Escape release external with push/pull cable 1.5 m	570470
PSEN ml escape release cordset 2.0m	Escape release external with push/pull cable 2 m	570471
PSEN ml escape release cordset 2.5m	Escape release external with push/pull cable 2.5 m	570472
PSEN ml escape release cordset 3.0m	Escape release with push/pull cable 3.0 m	570473
PSEN ml escape release cordset 3.5m	Escape release external with push/pull cable 3.5 m	570474
PSEN ml escape release cordset 4.0m	Escape release external with push/pull cable 4 m	570475
PSEN ml mounting plate angled	Mounting bracket for installing the safety switch, with 4 hexagonal socket head screws and 1 tamper-proof pan head locking screw, M5x40	570476
PSEN ml actuator center ring	1 center rings for PSENmlock actuator	570485
PSEN ml actuator 10° adapter	Mounting bracket for installing the actuator (10° angle) at small swing gates with a radius of 300 - 500 mm	570484
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	570490
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	570492

Product type	Features	Order no.
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.	570493
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.	570494
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.	570495
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.	570496
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.	570497
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	570498
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	570499

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			540319
PSEN cable axial M12 8-pole 5m	5 m	M12, 8-pin female connector, straight			540320
PSEN cable axial M12 8-pole 10m	10 m	M12, 8-pin female connector, straight			540321
PSEN cable M12-8sf, 20m	20 m	M12, 8-pin female connector, straight			540333
PSEN cable axial M12 8-pole 30m	30 m	M12, 8-pin female connector, straight			540326
PSEN cable M12-8sf M12-8sm, 0.5m	0.5 m	M12, 8-pin female connector, straight	M12, 8-pin male connector, straight		540345
PSEN cable M12-8sf M12-8sm, 1m	1 m	M12, 8-pin female connector, straight	M12, 8-pin male connector, straight		540346

Product type	Features	Connector X1	Connector X2	Connector X3	Order no.
PSEN cable M12-8sf M12-8sm, 1.5m	1.5 m	M12, 8-pin fe- male con- nector, straight	M12, 8-pin male con- nector, straight		540347
PSEN cable M12-8sf M12-8sm, 2m	2 m	M12, 8-pin fe- male con- nector, straight	M12, 8-pin male con- nector, straight		540340
PSEN cable M12-8sf M12-8sm, 5m	5 m	M12, 8-pin fe- male con- nector, straight	M12, 8-pin male con- nector, straight		540341
PSEN cable M12-8sf M12-8sm, 10m	10 m	M12, 8-pin fe- male con- nector, straight	M12, 8-pin male con- nector, straight		540342
PSEN cable M12-8sf M12-8sm, 20m	20 m	M12, 8-pin fe- male con- nector, straight	M12, 8-pin male con- nector, straight		540343
PSEN cable M12-8sf M12-8sm, 30m	30 m	M12, 8-pin fe- male con- nector, straight	M12, 8-pin male con- nector, straight		540344

19 **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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20

UKCA-Declaration of Conformity

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

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

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