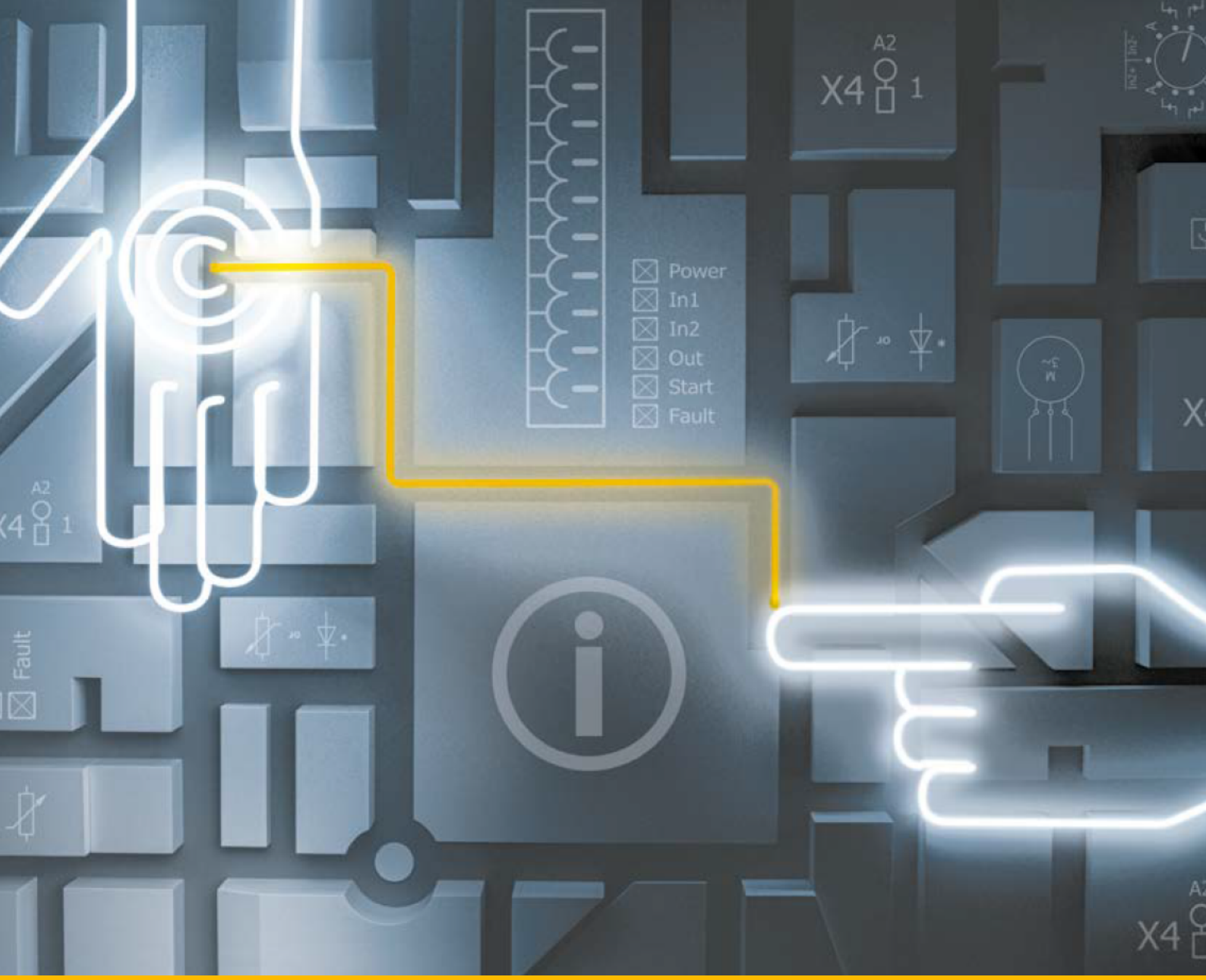


PSEN sI2-GL1/2/3-S

PILZ
THE SPIRIT OF SAFETY

Operating Manual-1005904-EN-01
- PSEN sensor technology

This document is the original document.

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

1 Introduction 5
1.1 Validity of documentation 5
1.2 Using the documentation 5
1.3 Definition of symbols 5

2 Safety 7
2.1 Intended use 7
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 10
2.2.4 Warranty and liability 10
2.2.5 Disposal 10
2.3 For your safety 11

3 Overview 12
3.1 Unit features 12
3.2 Scope of supply 13

4 Function description 14
4.1 Basic function 14
4.2 Block diagram 17
4.3 Safety Device Diagnostics 17
4.4 Operating modes 18
4.5 Lateral and vertical offset 21
4.6 Restart interlock 21
4.7 Latching force 22

5 Wiring 24
5.1 Important information 24
5.2 Guidelines for cable length 24
5.3 Recommended cable cross sections 25
5.4 Pin assignment 25

6 Connection to control systems and evaluation devices 27
6.1 Important information 27
6.2 Single connection 27
6.3 Series connection 28
6.4 Connection to Pilz evaluation devices 31

7 Teaching in the actuator 33
7.1 PSEN sl2-GL1-S 33
7.2 PSEN sl2-GL2-S 33
7.3 PSEN sl2-GL3-S 33

8 Installation 34
8.1 Important information 34
8.2 Installing on a swing gate 36

8.3 Installing on a sliding gate 37

9 Adjustment 38

10 Commissioning 39
10.1 Visual inspection 39
10.2 Function test 39

11 Operation 41
11.1 Normal operation 42
11.2 Error display 46
11.3 Exit fault condition 46
11.4 Set latching force 46
11.5 Safety switch restart 47

12 Maintenance and testing 48
12.1 Regular checks 48
12.2 Maintenance 49

13 Dimensions in mm 50

14 Technical details for safety switch 53

15 Technical details actuator 58

16 Supplementary data 60
16.1 Radio approval 60
16.2 Maximum inrush current 61
16.3 Test in aggressive ambient conditions 61

17 Classification according to ZVEI, CB24I 62

18 Safety characteristic data 63

19 Order reference 64
19.1 Safety switch 64
19.2 Actuator 64
19.3 Accessories 64

20 EC declaration of conformity 67

21 UKCA-Declaration of Conformity 68

1 Introduction

1.1 Validity of documentation

This documentation is valid for the product PSEN sl2-GL1/2/3-S. It is valid until new documentation is published.

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

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 to monitor the position of the gate and the guard locking of a moveable guard.

Safety function of safety switch:

- Guard with guard locking and interlock function,

  Together with the control system of the machine, the following functions can be performed:

  – The hazardous machine functions are not accessible due to the guard,

  – These hazardous machine functions cannot operate until the guard is closed and locked;

  – The guard remains closed and locked until the risk due to the not accessible, hazardous machine functions has disappeared;

  – When the guard is closed and locked, the hazardous machine functions that cannot be reached due to the guards can be executed. (The closure and locking of the guard do not by themselves start the hazardous machine functions.)
- When the actuator is in the response range of the safety switch and when a high signal is present at the safety input S31, it is checked whether the holding force is reached. When the holding force is reached, the guard locking is considered successfully activated and the safety outputs supply a high signal.
- When the actuator is outside the assured release distance S_{ar} or the holding force is not guaranteed, the safety outputs 12 and 22 are switched off. The hazardous machine function cannot be implemented:
- The safety outputs 12 and 22 supply a low signal when there is a low signal at the inputs S11 and S21.

The safety switch meets the requirements in accordance with:

- EN 60947-5-3 with one of the approved actuators,
- EN IEC 62061,
- EN ISO 13849-1,
- EN ISO 14119: (Coding level and design)

as specified in the explanatory notes for the safety-related characteristic data [📖 63]:

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

The safety level is achieved only when

- the safety outputs use 2-channel processing.

The use for personal protection is permitted only when the guard locking

- is activated via the safety input S31 and
- activated by a tested safety output and
- activated with a cable that is protected.

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 guard must be longer than the time required to stop the hazardous machine function.

Escape release

The safety switch has no escape release.

If the safety assessment necessitates an escape release, this feature must be implemented using an interruption of the supply voltage. It must be possible to interrupt the supply voltage from the danger zone. The escape release must correspond to category B.

Attach a latching switch within the danger zone to interrupt the supply voltage.

The switch must meet the following conditions:

- Meets the requirements of EN ISO 14119,
- Marked clearly as an escape release,
- No mixing-up with an E-STOP possible.

Restart interlock

The safety switch has no internal restart interlock.

If the safety assessment necessitates a restart interlock, this feature must be ensured via a safety controller of the plant or an accessory. For the implementation with an accessory Pilz recommends that you use the accessory PSEN sl restart interlock (see Order reference Accessories [64]). The plant may not be restarted in the danger zone if persons are still in the danger zone.

WARNING!

In the event of a power failure guard locking of the safety gate is not guaranteed

In the event of a power failure, guard locking cannot generate force and guard locking of the safety gate is not guaranteed. This can lead to serious injury or death.

– Ensure that the risk assessment takes a power failure into account.

Improper use

The following is deemed improper use in particular:

- Any component, technical or electrical modification to the product,
- Use of the product outside the areas described in this operating manual,
- Use of the product outside the technical details (see chapter entitled Technical Details [53]).

NOTICE

EMC-compliant electrical installation

The product is designed for use in an industrial environment. The product may cause interference if installed in other environments. If installed in other environments, measures should be taken to comply with the applicable standards and directives for the respective installation site with regard to interference.

Foreseeable misuse

- Use under corrosive environmental conditions (e.g. cooling emulsions, surface treatment, gases).

  The effect of the ambient conditions must be checked on the product. Ensure that the ambient conditions do not lead to any restriction of the function.

  Perform the checks as described in Test in aggressive ambient conditions [📖 61].
- Use of cable separators that are not listed in the Order reference Accessories [📖 64]
- Series connection with other safety switches is permitted only when considering the document "Series connection safety switches".
- Use of an actuator that is not listed in the Order reference [📖 64].

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

For use in a series connection with other sensor types

- System description "Series connection safety switches"

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

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.
- If substitute actuators are used, these must be installed as described under Installation [📖 34].
- Destroy any replaced actuators before disposal.

CAUTION!

Risk of burns

When a safety switch is operated at high ambient temperatures, high surface temperatures may occur on the housing.

- Do not touch the safety switch.
- Take suitable protective measures (e.g. wear protective gloves).

INFORMATION

The magnet surface and counterplate may heat up. When installing, make sure that heat dissipation is guaranteed.

▸ 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

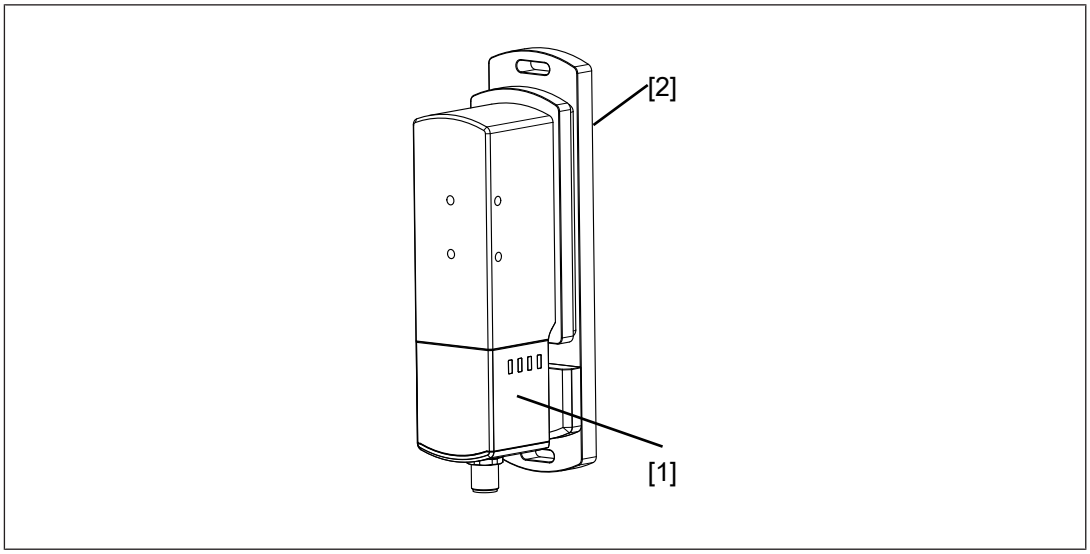
- Transponder technology for presence detection
- Device types Pilz coding type:
  - PSEN sl2-GL1-S: coded
  - PSEN sl2-GL2-S: fully coded
  - PSEN sl2-GL3-S: uniquely coded
- Dual-channel operation
- 2 safety outputs
- 2 safety inputs for series connection of multiple safety switches
- Magnetic guard locking for personal protection
- 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
- Output Y32
  - as a signal output
  - as a diagnostic output for Safety Device Diagnostics
- Input S31
  - for the activation request of the guard locking
- Input Y1
  - when no SDD is used: Input for the outputs Y32 of an upstream safety switch in a series connection:
  - when SDD is used: Diagnostic input
- The outputs 12, 22 and Y32 are digital DC outputs that supply current in accordance with IEC 61131.
- LEDs for
  - Supply voltage/fault
  - Gate closed
  - State of the inputs S11 and S21
  - State of the input of the magnetic guard locking S31
- M12, 12-pin male connector
- Latching force selectable in three stages
  - approx. 30 N (delivery state)
  - approx. 110 N
  - approx. 200 N
- Monitoring of shorts across contacts between the safety outputs

3.2 Scope of supply

- Scope of supply safety switch
  - Safety switch
  - Supplement
  - Adhesive label
- Scope of supply actuator
  - Actuator
  - Adhesive label

4 Function description

4.1 Basic function



Legend

[1] Safety switch

[2] Actuator

The safety gate system prevents the safety gate to the danger zone from being opened while there is a hazard present within the danger zone.

The guard locking is suitable for personal protection.

The safety gate system is suitable for use as a mechanical guard in accordance with EN ISO 14119.

The safety switch is marked with this symbol as a guard locking device: 

If the safety gate is in a locked condition and is opened by force, the safety outputs will shut down and the safety switch switches to a fault condition.
The LED "Device" lights up red and the LED "Lock" flashes red.

Safety outputs 12 and 22

The safety outputs 12 and 22 supply a high signal when **simultaneously**:

- the actuator is within the response range (safety gate closed) and
- there is a high signal at the inputs S11 and S21 and
- there is a high signal at the input S31 and
- the guaranteed holding force is ensured.
- When the safety switch is operated in SDD operation, the activation command for the guard locking via SDD must also be present.

The safety outputs 12 and 22 supply a low signal when **one** of the stated conditions is not met.

Safety inputs S11 and S21

- The safety input S11 affects safety output 12.

The safety input S21 affects safety output 22.

To ensure that a safety output supplies a high signal a high signal must be present at least at the corresponding input.

- Plausibility monitoring for safety inputs S11 and S21
  - If the signal at a safety input switches from high to low, while the other safety input remains high, an unequal status is displayed.
  - If the signal at this input switches back from low to high, while a high signal remains at the other input, a plausibility error is displayed and a partial operation lock is triggered. The OSSDs are switched off during the partial operation lock.

A switch to a high signal will only lead to error-free safety switch operation if both inputs had a low signal simultaneously. From this moment on, the switch to high may occur (partial operation lock see Error display [📖 46]).

Holding force

- guaranteed holding force F_{Zh}

  The holding force F_{Zh} must be greater than the force that a human can generate when he is in the position to open the gate.

  Guaranteed holding force F_{Zh} is reached also in unfavourable conditions The actual holding force that occurs during operation can therefore also reach F_{1max}.

- F_{1max} is the highest measured force in the test in accordance with EN ISO 14119.

Signal output/diagnostic output Y32 and diagnostic input Y1

- Signal output/diagnostic output Y32 without SDD

  The status of the actuator is output. The signal output/diagnostic output Y32 switches to high when the actuator is within the response range in error-free operation (safety gate closed) and h high signal is present at the diagnostic output Y1.

- 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.

- Link with diagnostic input Y1

  The signal output/diagnostic output Y32 is internally linked to diagnostic input Y1. SDD operation must not be activated.

Actuator within the response range	Diagnostic input Y1	Signal output/diagnostic output Y32
No	No effect	Low
Yes	Low	Low
Yes	High	High

- Diagnostic input Y1

  If an SDD fieldbus module is used, the diagnostic input Y1 is used for SDD communication.

  If no SDD fieldbus module is used, the diagnostic input Y1 must be connected to 24 V when Y32 is to be used as a signal output.

- Signal output/diagnostic output Y32 and diagnostic input Y1 connected in series

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.

When in a series connection the taught in is in the response range for all the safety switches and at the diagnostic input Y1 of the first safety switch there is a high signal present the signal output/diagnostic output Y32 of the last safety switch supplies a high signal.

Safety input S31

- When there is a high signal at the safety input S31 (control command of the magnetic guard locking) and the actuator is detected (safety gate closed) this is processed as an activation request of the guard locking.
- If there is a low signal at the safety input S31, the guard locking is deactivated and the safety outputs 12 and 22 also have a low signal.

Monitoring of the safety input S31 using an evaluation device

- Before and after the activation of the safety output S31 (guard locking activation) the state of the OSSDs must be tested by an evaluation device. In particular, the evaluation device must monitor that both OSSDs change their state according to the state of S31.
  - OSSDs must be high only with a high signal at S31.
  - OSSDs must only switch off when S31 switches from high to low.

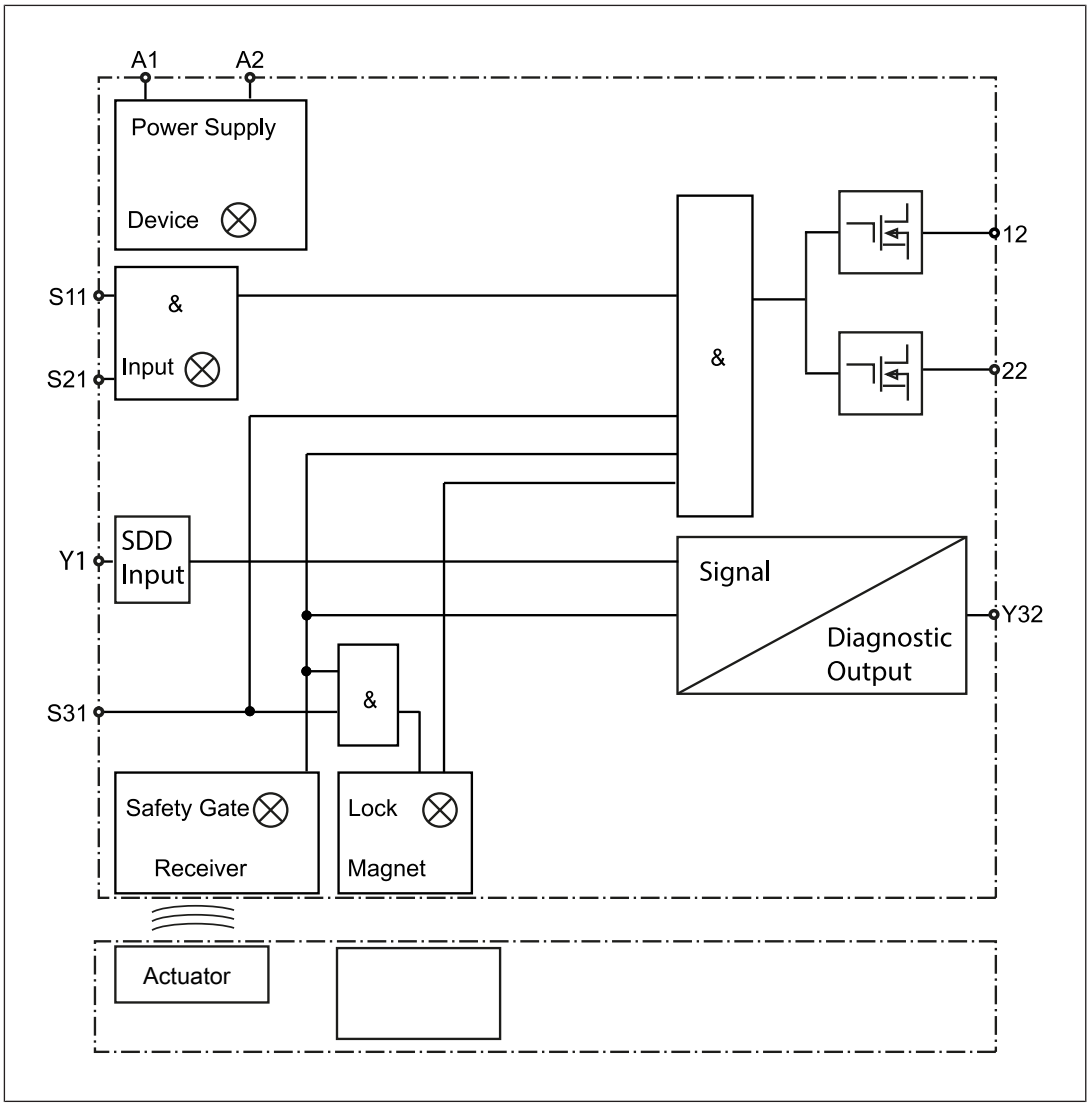
Magnetic guard locking device and magnet monitoring

- The locking magnet is switched on if
  - the actuator is detected (safety gate closed) **and**
  - there is a high signal at the input S31 (control command for magnetic guard locking) and no SDD is used

    or
  - the actuator is detected (safety gate closed) **and**
  - there is a high signal at the input S31 (control command for magnetic guard locking) **and**
  - the guard locking is activated by SDD.
- The holding force is measured after activation of the guard locking.
- After a signal change at the input S31 to low, wait for at least 500 ms, before supplying a high signal again at the input S31. The max. switching frequency (see Technical details [📖 53]) must not be exceeded.
- Guard locking may only be deactivated by the higher level safety controller when the hazardous machine movement has been completed.
- The guard locking is activated again when the signal switches from high to low and then again to high at the input S31.
- Detection of guard locking errors
  - If the holding force F_{zh} is not reached (due to soiling, for example) the holding force is not confirmed due to the monitoring of the locking magnet and a warning is displayed (see Normal operation [📖 42] The safety outputs 12 and 22 remain in low state and the safety switch does not switch to the fault condition.
  - When the locking magnet is switched on and an open winding or short circuit winding is detected, the safety switch switches to the fault condition.

– When the locking magnet is switched on and a magnet operation or monitoring fault is detected, the safety switch switches to the fault condition.

4.2 Block diagram



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 sensors 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.

- Safety Device Diagnostics provide the following benefits for the fieldbus module when wiring:
  - Information is passed on via the fieldbus module directly to the network.
  - Any assignment of inputs/outputs of the fieldbus module to the sensors.
  - This prevents wiring errors and an expansion or reduction of the sensors is possible without the need to change existing wiring.
  - Wiring in accordance with IP20: Rapid installation in the control cabined is enabled.
  - Wiring in accordance with IP67: Various passive junctions can be used (see Order reference Accessories [64]) to connect several sensors with only one cable from the field in the control cabinet.
- The latching force can be set using an SDD command.

  The setting can be made at any time (also while guard locking is active).

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.

- Normal operation

  In this document, normal operation describes operations in normal conditions for this safety switch.
  - When the application for this safety switch provides active use of Safety Device Diagnostics, this is normal operation.
  - When the application for this safety switch does not provide active use of Safety Device Diagnostics, this is normal operation.
- 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 signal S31.

- Operation with passive use of the Safety Device Diagnostics
  - After every restart the safety switch is in operation without Safety Device Diagnostics.
  - Safety switch supplies diagnostic data to Safety Device Diagnostics.
  - Activating/deactivating the guard locking is only via the signal S31.
- Operation with active use of the Safety Device Diagnostics
  - Activating/deactivating the guard locking is via a combination of a Safety Device Diagnostics command and the status of the safety input S31.

    The safety requirements are guaranteed by the signal S31 (the fieldbus for Safety Device Diagnostics communication is not safe).

Timing diagrams

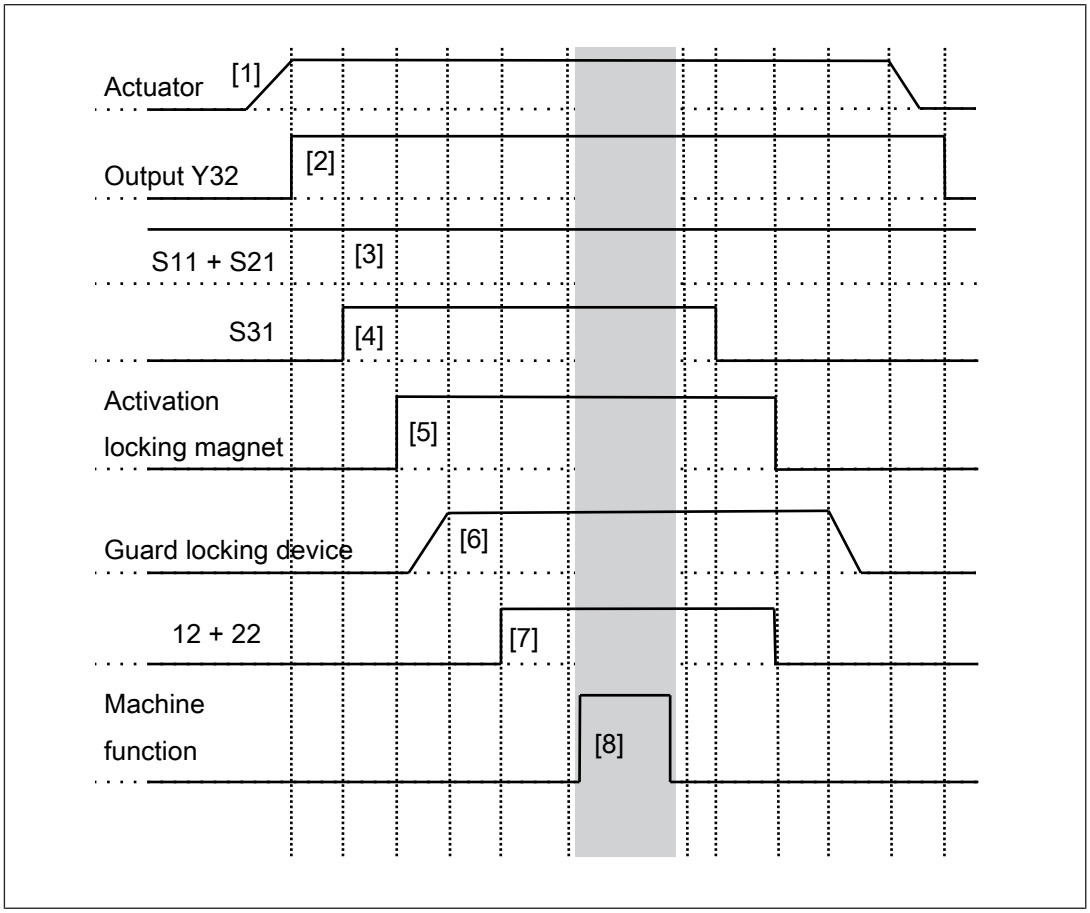


Fig.: Guard locking is controlled via S31

Legend

[1] Gate is closed

[2] Actuator detected

[3] There is a high signal at the safety inputs S11 and S21

[4] Guard locking is activated by the safety control system

[5] The guard locking is activated

[6] Guard locking is activated

[7] There is a high signal at safety outputs 12 and 22.
(Status message to safety controller: Guard locking activated successfully and holding force F_{Zh} reached)

[8] Execution of the hazardous machine function is permitted

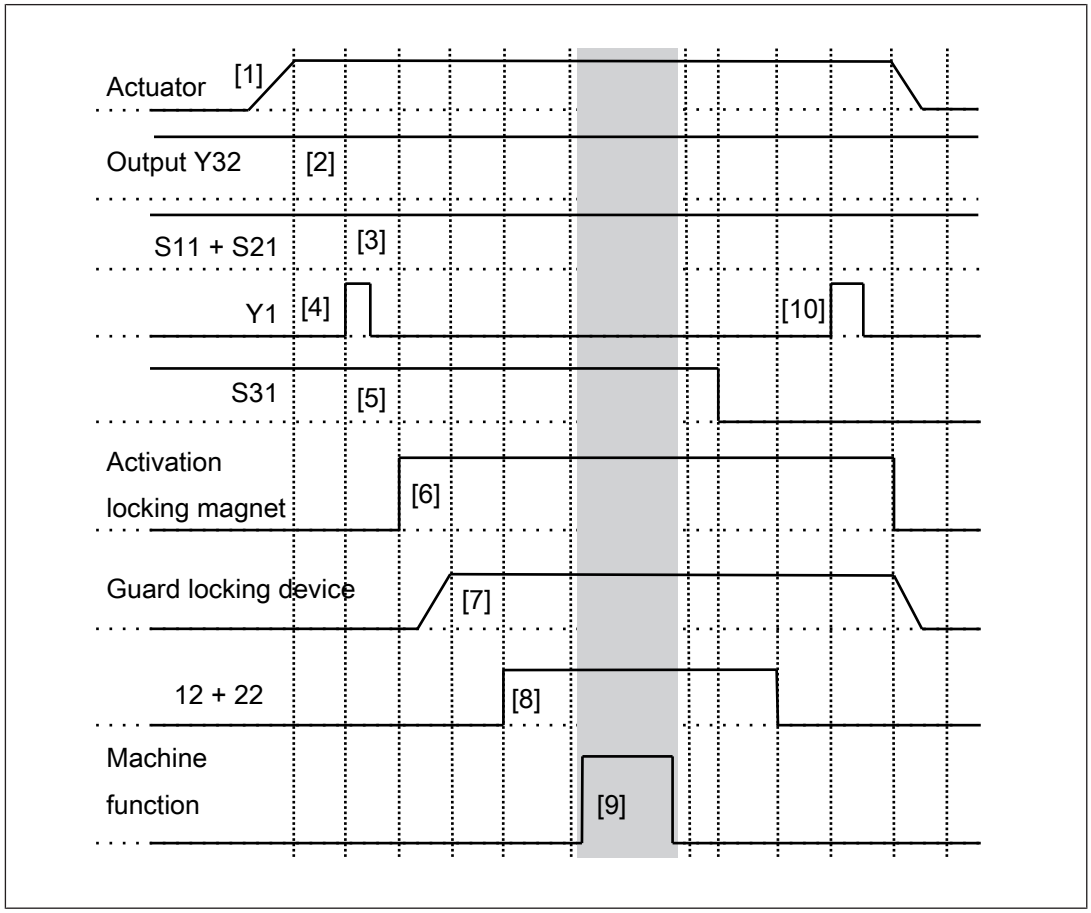


Fig.: Active use of Safety Device Diagnostics

Legend

[1] Gate is closed

[2] Actuator detected

[3] There is a high signal at the safety inputs S11 and S21

[4] Activation command of Safety Device Diagnostics

[5] Guard locking is activated by the safety controller

[6] The guard locking is activated

[7] Guard locking is active

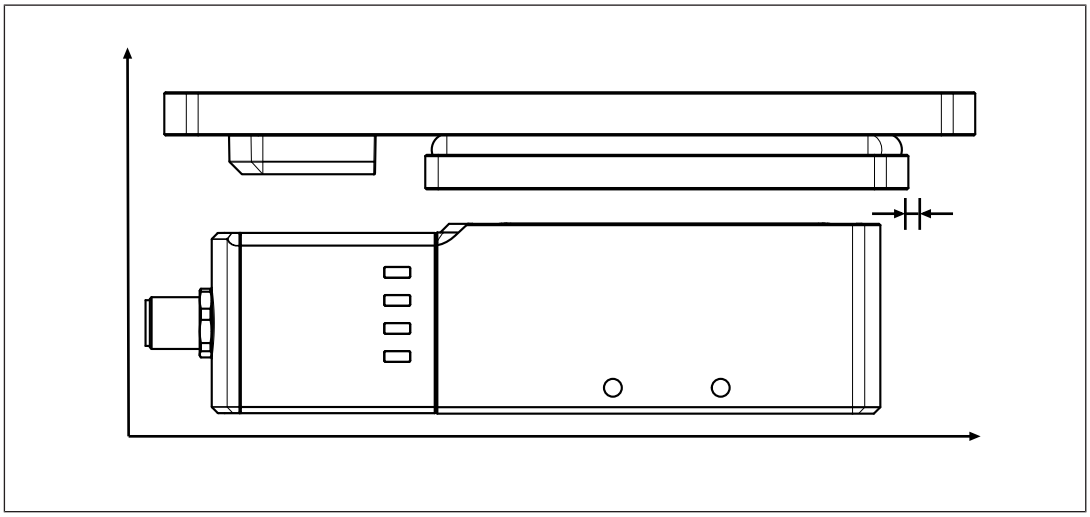
[8] There is a high signal at safety outputs 12 and 22.
(Status message to safety controller: Guard locking activated successfully and holding force F_{Zh} reached)

[9] Execution of the hazardous machine function is permitted

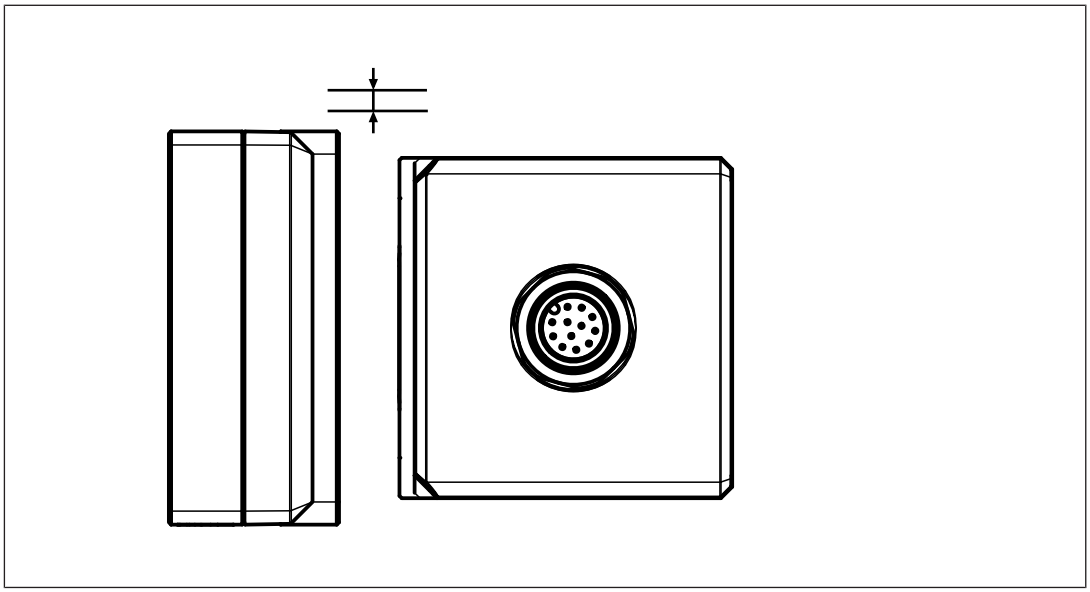
[10] Deactivation command of Safety Device Diagnostics

4.5 Lateral and vertical offset

- Max. vertical offset: 5 mm



- Max. lateral offset: 3 mm



4.6 Restart interlock

To prevent the machine restarting while there is someone inside the danger zone, the accessory PSEN sl restart interlock (see Order reference Accessories [📖 64]) and a padlock can be used to implement a restart interlock.

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

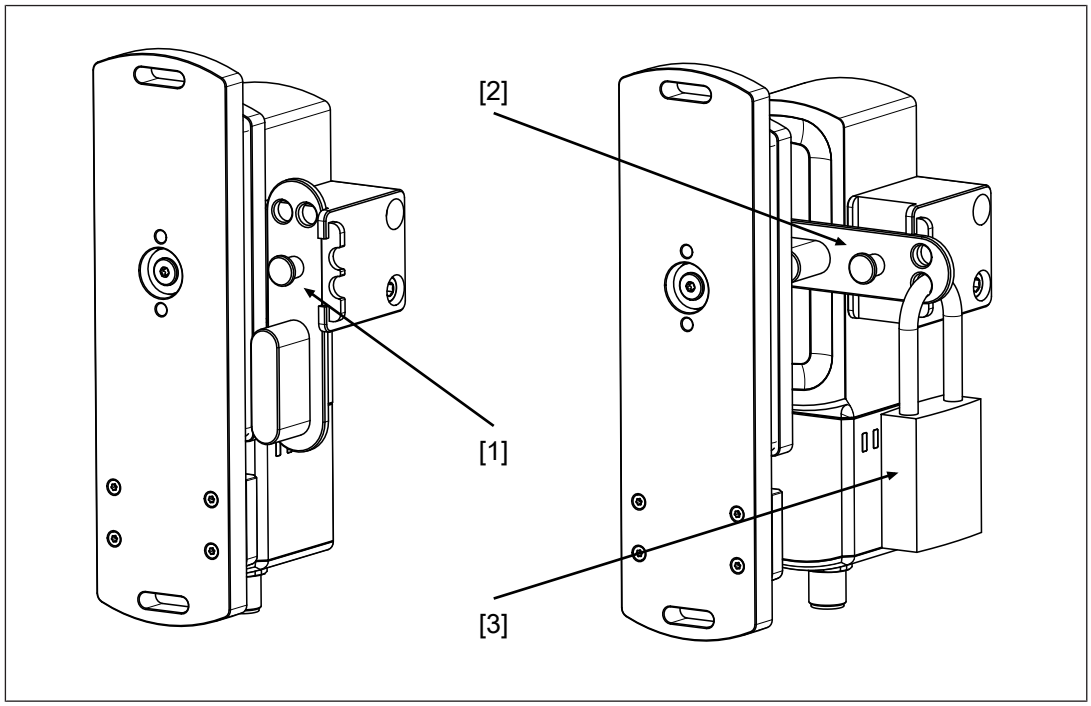


Fig.: Restart interlock on PSEN sl2

Legend

[1] Lever arm, open

[2] Lever arm, locked

[3] Padlock

4.7 Latching force

The latching force is the holding force from sensor to actuator when the guard locking is not activated.

The force typically consists of these components:

- Force of the permanent magnet in the actuator and
- optional actively created selectable force.

The latching force can be set (see Set latching force [📖 46]):

- with a transponder key or
- with an SDD command.

Latching force stages (when new)

Step	
1 (preset)	approx. 30 N (without additional current requirement of the sensor due to permanent magnet in the actuator)
2	approx. 110 N (implemented by current in the locking magnet)
3	Approx. 200 N (implemented by current in the locking magnet)

5 Wiring

5.1 Important information

- Information given in the Technical details [53] must be followed.
- The power supply must meet the regulations for extra low voltages with protective electrical separation (SELV, PELV).
- The power supply must have an overvoltage protection of ≤ 35 V DC.
- Make sure you comply with the wiring technology requirements (DIN EN 60204-1) and manipulation protection requirements (EN ISO 14119).
- Inrush current based on the cable length (see Maximum inrush current [61]).
- The protection type (see Technical details [53]) is only achieved when Pilz connection cables are used - these are available as an accessory - and when the connector torque is complied with (see Technical details).
- All the signals are based on the ground connection A2.

WARNING!

In the event of a power failure guard locking of the safety gate is not guaranteed

In the event of a power failure, guard locking cannot generate force and guard locking of the safety gate is not guaranteed. This can lead to serious injury or death.

– Ensure that the risk assessment takes a power failure into account.

- Use only the cables listed in the Order reference Accessories [64]
- Make sure that the sealing areas on the connector and the socket of the connection lines are not damaged.

5.2 Guidelines for cable length

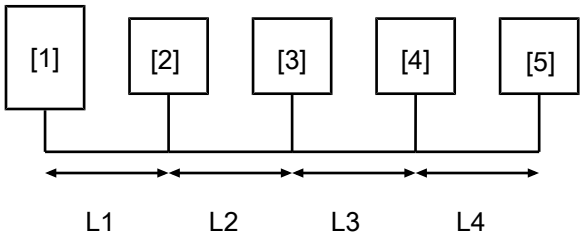
The max. cable length depends on the voltage drop at the cables to the safety switch. The level of voltage drop is determined by:

- the cable resistance,
- the current of the device and the current load of the outputs.

If the minimum permitted supply voltage at the device connector falls below the minimum permitted value (see Technical details [53]), the locking magnet is no longer activated reliably. The "Lock" LED registers an error when guard locking.

Possible remedies:

- Set supply voltage constantly to the upper tolerance range (see Technical details),
- Select a higher conductor cross section.
- Reduce load at the outputs, e.g. with evaluation device with semiconductor output.



- Maximum length for single connection: 50 m
- Maximum length in total for series connection: 30 m
- The lengths of the individual cables L1 – L4 may be combined as required. Examples are stated in the table.

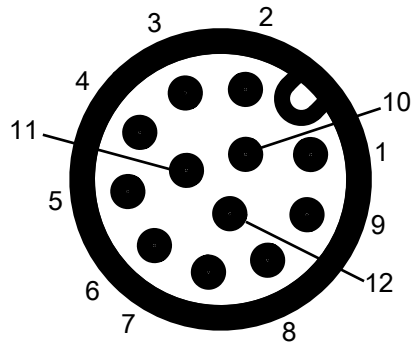
Supply voltage [V]	Number of sensors	L1 [m]	L2 [m]	L3 [m]	L4 [m]	Overall length [m]
24	1	50	-	-	-	50
24	max. 4	max. 27	1	1	1	30
24	max. 4	5	10	5	10	30

5.3 Recommended cable cross sections

- Cable type: LiYY 12 x 0.25 mm² (78 Ohm/km) from Pilz

If cable lengths greater than those stated are required, please contact Pilz.

5.4 Pin assignment



12-pin M12 male connector

PIN	Function	Terminal designation	Cable colour (Pilz cable)
1	+24 V UB	A1	Brown
2	0 V UB	A2	Blue
3	Reserved		White
4	Safety output channel 1	12	Green

PIN	Function	Terminal designation	Cable colour (Pilz cable)
5	Safety input guard locking	S31	Pink
6	Safety output channel 2	22	Yellow
7	Safety input channel 1	S11	Black
8	Signal output/diagnostic output	Y32	Grey
9	Diagnostic input	Y1	Red
10	Safety input channel 2	S21	Purple
11	Safety input guard locking	S31	Grey-pink
12	Reserved		Red-blue

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

6 Connection to control systems and evaluation devices

6.1 Important information

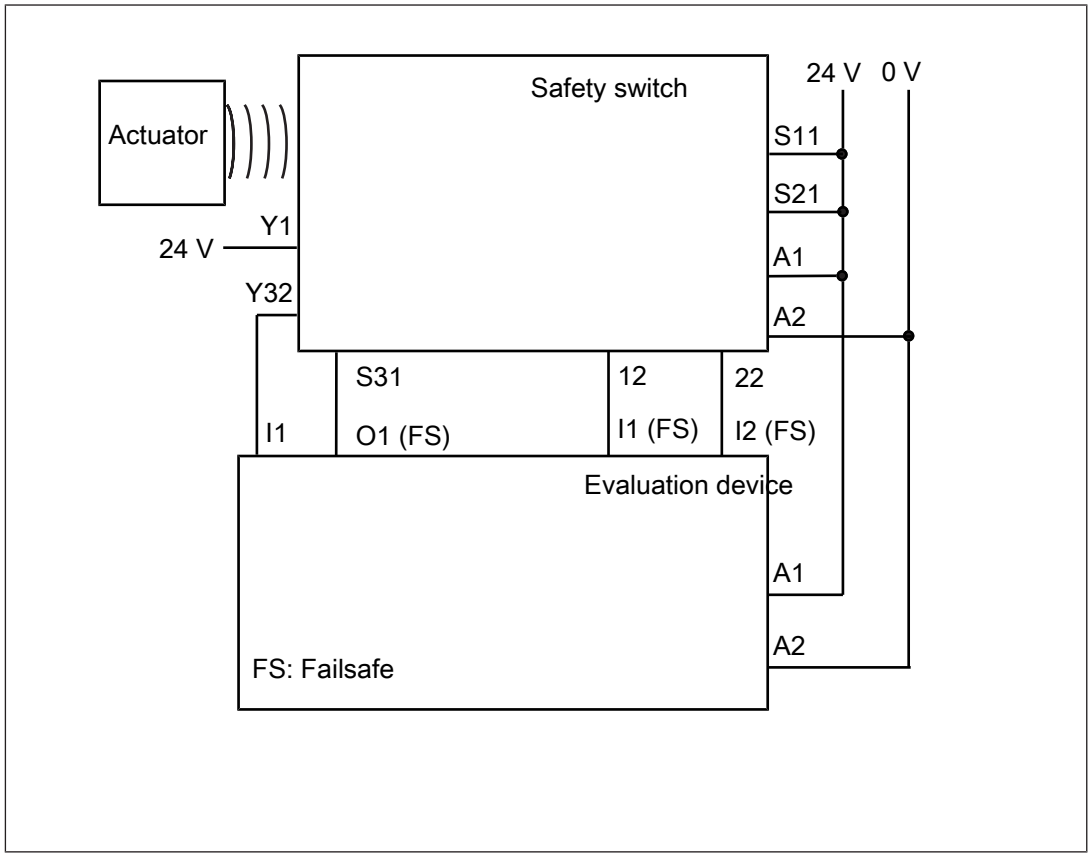
The selected evaluation device must have the following properties:

- 2-channel with plausibility monitoring

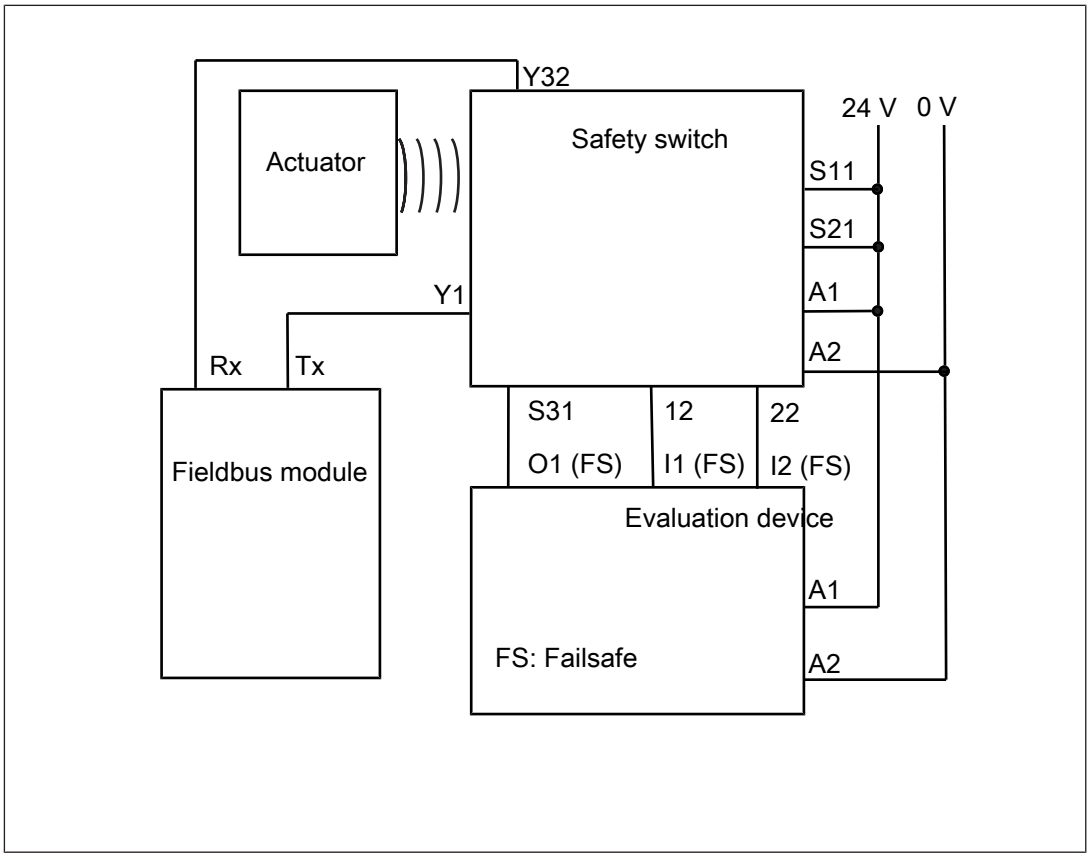
  Both OSSDs must change the switch state synchronously. In particular, the evaluation device must monitor that the state of both OSSDs was "Gate unlocked" before both return to the "Gate locked" state and vice-versa.
- OSSD signals are evaluated through 2 channels.
- Correspond to the C-type and class 3 interface from the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

6.2 Single connection

Connection diagram, single connection without SDD



Connection diagram, single connection with SDD



6.3 Series connection

- Series connection with other safety switches is permitted only when considering the document "Series connection safety switches".

CAUTION!

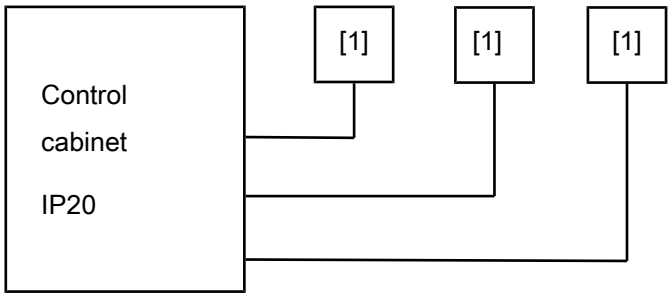
Extension of delay-on de-energisation

When several (n) devices are connected in series, the delay-on de-energisation time adds with the number of interconnected safety switches.
The may. delay-on de-energisation is composed of
max. delay-on de-energisation actuator
+ (n-1) x max. delay-on de-energisation of the inputs
+ delay-on de-energisation of the evaluation device

- In a series connection of several PSEN sl2 safety switches the current consumptions of the individual safety switches must be added together to determine the current consumption of the compete circuit.
- Maximum number of safety switches in a series connection
  - Logic wiring in the control cabinet (wiring in accordance with IP20)

    Each safety switch is connected to the control cabinet with a separate line.

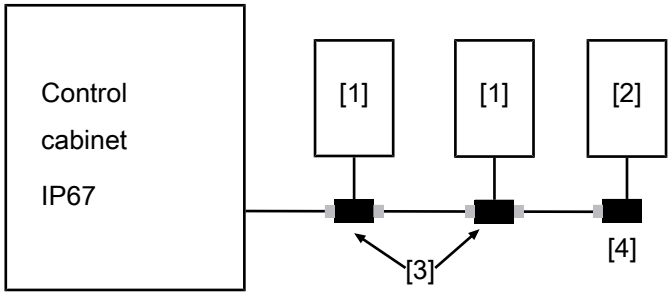
    A max. of 16 safety switches [1] can be connected in series.



– Logic wiring outside the control cabinet (wiring in accordance with IP67)

  One cable is laid from the control cabinet to the last safety switch [2] (see diagram). For connecting the first sensors it is necessary to use a cable separator [3] (see Order reference Accessories [📖 64]). To connect the last safety switch the PSEN ml end adapter [4] must be used.

  A max. of 4 safety switches can be connected in series.



– The max. numbers only apply taking the following conditions into account:

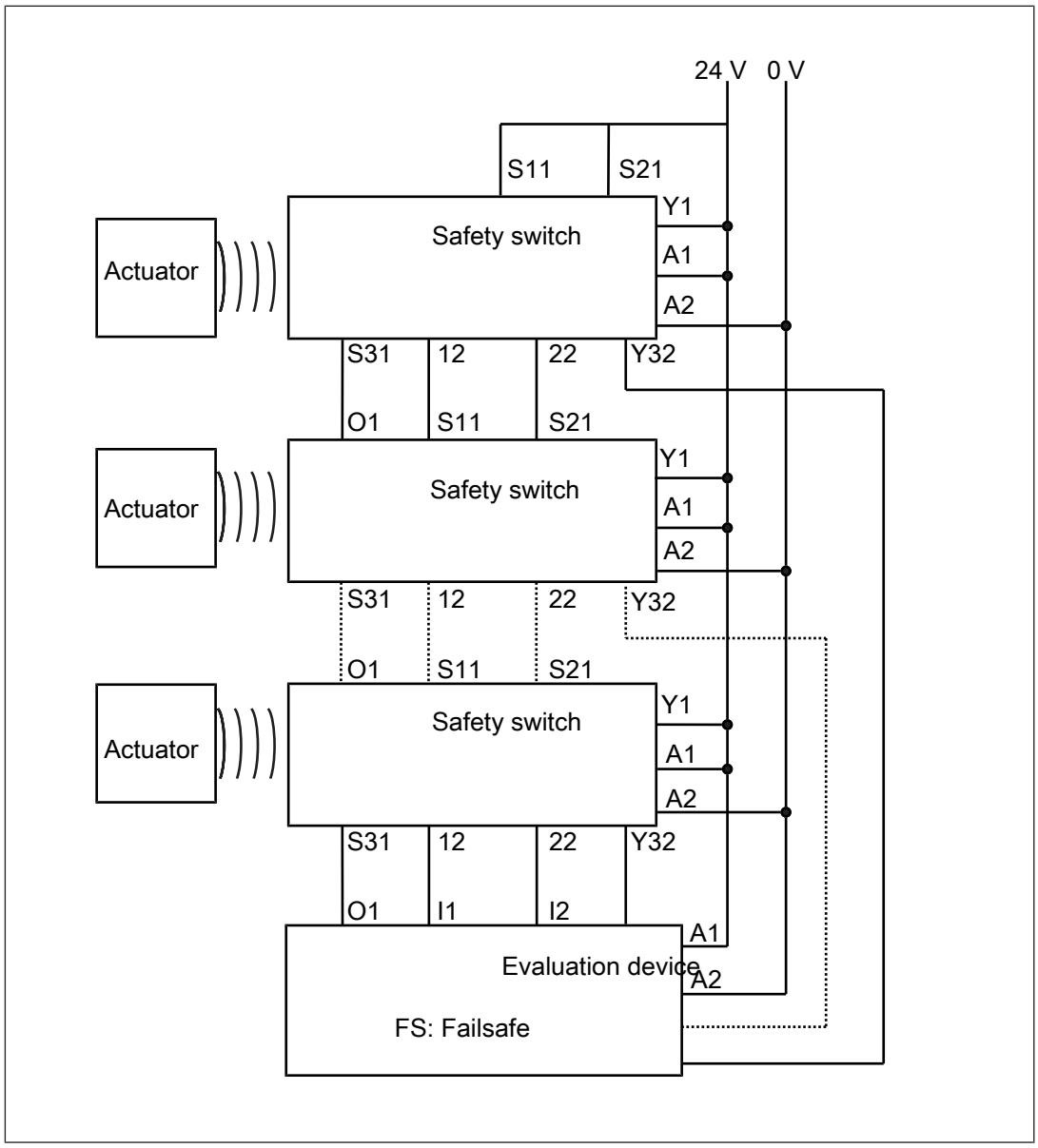
  Supply voltage = 24 V,

  Ambient temperature = 23 °C,

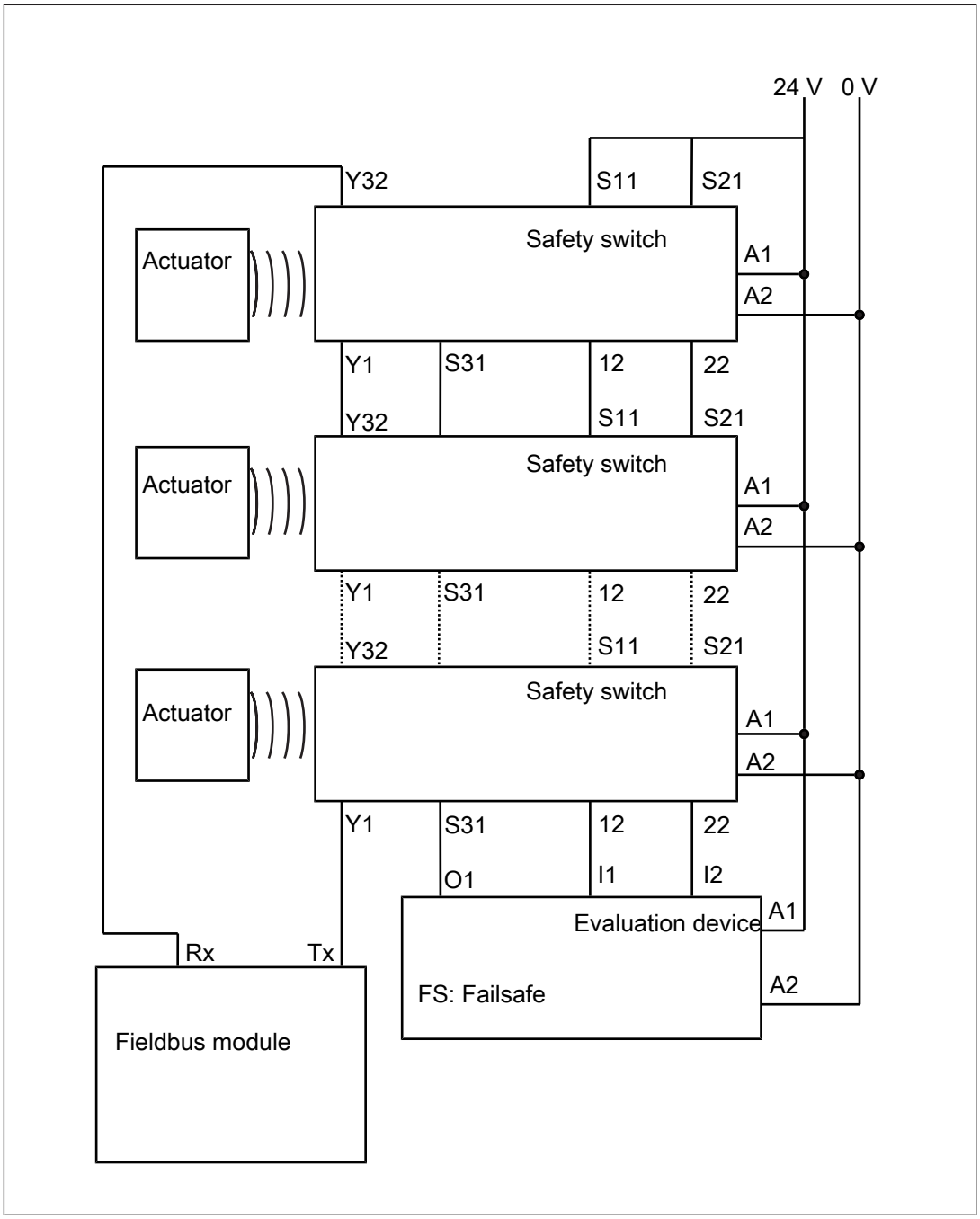
  Connection lines from Pilz 12 x 0.25 mm^2,

  Voltage at the outputs 5 mA each.

Connection diagram series connection without SDD (IP20)



Connection diagram, series connection with SDD (IP67)



6.4 Connection to Pilz evaluation devices

The safety switch can be connected to Pilz evaluation devices.

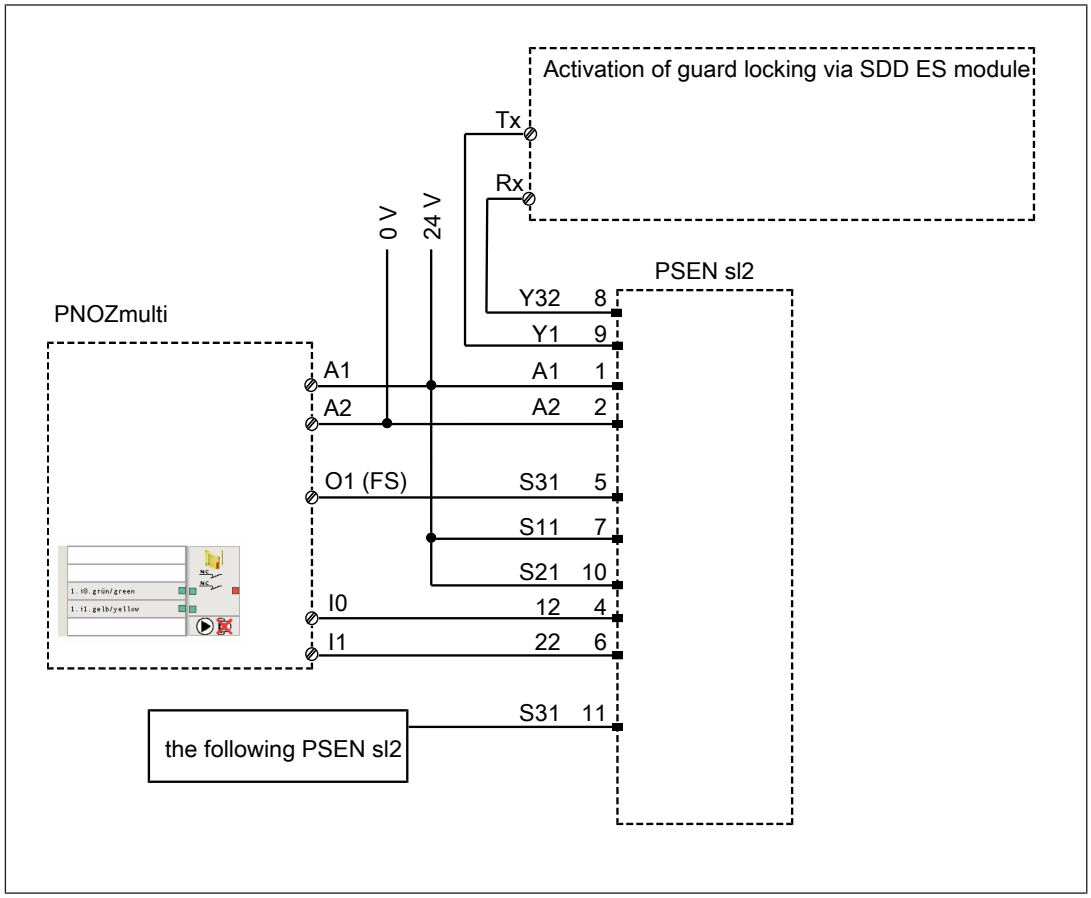
Suitable Pilz evaluation devices are, for example:

- PNOZmulti with safety gate function element
- PSSuniversal PLC 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

7.1 PSEN sl2-GL1-S

Any corresponding Pilz actuator (see Technical Details [53]) is detected as soon as it is brought into the response range.

7.2 PSEN sl2-GL2-S

Teaching in the actuator for the first time:

The first actuator to be detected by the safety switch (see Technical details [53]) 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 a waiting period of 20 s, the "Safety Gate" LED has quick yellow flashes. Trigger a system reset in the next 120 s by interrupting the supply voltage.
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.
- It is no loner possible to reteach his actuator on the same safety switch.

7.3 PSEN sl2-GL3-S

The first actuator to be detected by the safety switch (see Technical details [53]) 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

WARNING!

Potential loss of safety function due to gross manipulation

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

Use appropriate installation measures to prevent

- The wiring being modified.
- A short circuit being generated on the connector.
- The possibility of using a second actuator to open the safety gate.

CAUTION!

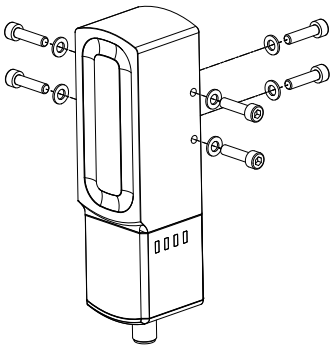
The unit's properties may be affected if installed in an environment containing electrically or magnetically conductive material. Please check the operating distances and the assured release distance.

INFORMATION

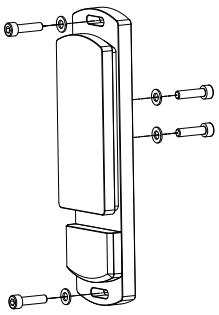
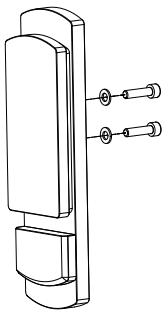
The magnet surface and counterplate may heat up. When installing, make sure that heat dissipation is guaranteed.

- Safety switches and actuators must be positioned so that they are secured against a change of position.
- Install safety switch and actuator so that the actuator is only loaded in closing direction.
- To fix the safety switch, there are 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.



- The actuator is installed with the back cover on the mounting surface.

	
PSEN sl2-L-AL Attachment from front or from back is possible	PSEN sl2-L-VA Attachment from back possible

- The service life of the safety gate system of 1,000,000 cycles is specified for a stop energy of 2 J.
- Also note the max. angular offset (see Technical details [📖 53]).
- The access to the safety switch and actuator has to be possible for maintenance and checking the correct operation.
- The function of the safety gate system used the safety switch as a stop. A high stop energy reduces the service life of the safety gate system.

  Ensure that The stop energy does not exceed the max. permitted value (see "Technical details" [📖 53]).

  The stop energy can be reduced by installing a buffer.

WARNING!

Potential loss of safety function due to damage of the safety gate system

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

– Ensure that Mounting brackets used to fix the safety gate system are not used as a stop.

- Use reliable fastening elements. A tool is required to loosen the fastening elements.
- Prevent self-loosening of the fastening elements,
  - on the safety switch: By complying with the max. torque setting (see Technical details [📖 53]) and medium-strength bonded screw retention.
  - on the actuator: By complying with the max. torque setting (see Technical details [📖 53]) and medium-strength bonded screw retention.
- Use the same type of screw to attach the safety switch and actuator.
- Use two M5 screws of the strength class 8.8. to fix the safety switch and actuator.
- Installation measures in accordance with EN ISO 14119
  - For all coding types:

    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 coded safety switches:

Installation of the safety switch and actuator must be concealed.

- 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 surface must 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.
- Circumvention of the safety switch in a reasonably foreseeable manner must be prevented.
- The actuator should be installed so it does not present a risk when using the safety gate.
- Alignment errors of the guard must not adversely affect the safety function of the guard.

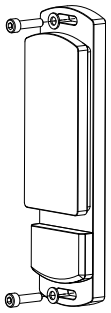
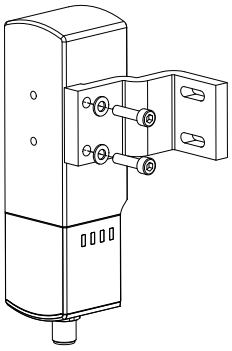
INFORMATION

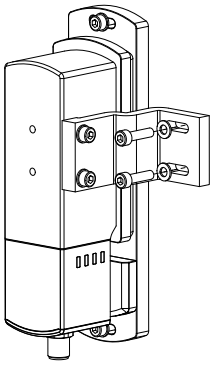
Mounting brackets are available as accessories [📖 64].

8.2 Installing on a swing gate

This chapter shows the graphics of the PSEN sl2-L-AL actuator.

Unless stated otherwise, the information also applies to the PSEN sl2-L-VA actuator.

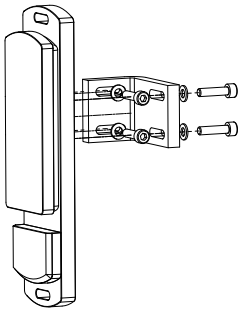
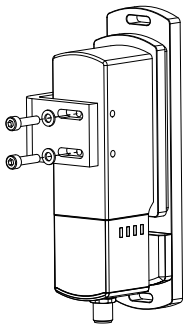
Align the actuator flush with the edge of the gate at the height required and tighten the screws. Close gate.	
Align the mounting bracket flush with the safety switch and tighten the screws.	

Align the safety switch and mounting bracket with the actuator and tighten the screws.	

8.3 Installing on a sliding gate

This chapter shows the graphics of the PSEN sl2-L-AL actuator.

Unless stated otherwise, the information also applies to the PSEN sl2-L-VA actuator.

Align the actuator mounting bracket flush with the sliding gate and tighten the screws. Install the actuator at the height required.	
Align the safety switch mounting bracket flush with the frame and fasten with screws. (Important: Do not tighten the screws.)	
Fix safety switch upright with a screw, close gate.	
Align mounting brackets, press firmly together and tighten screw.	
Remove the safety switch and tighten screw.	
Align the safety switch to the actuator and tighten the screws.	

9 Adjustment

- The stated operating distances (see Technical details [📖 53]) only apply when the safety switch and actuator are installed facing each other in parallel. Operating distances may deviate if other arrangements are used.
- Note the maximum permitted lateral and vertical offset (see Lateral and vertical offset [📖 21]).
- The guaranteed holding force can only be achieved when the adjustment was carried out correctly.
- Always test the function with a connected evaluation device.

10 Commissioning

NOTICE

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

10.1 Visual inspection

- 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.
- Remove any dirt from the safety switch and actuator.
- Check that the wiring is correct.
- Check the offset of the safety switch and actuator.
  - Max. lateral offset
  - Max. angular offset
  - Max. vertical offset
- Make sure that the sealing areas on the connector and the socket of the connection lines are not damaged.
- Check the alignment of the safety switch and actuator and correct it as required.

10.2 Function test

- Bring the actuator into the safety switch's response range.

  When der actuator is detected and a high signal is present at Y1, a high signal is present at the signal output Y32.
- Supply a high signal at the safety inputs S11 and S21.
- Supply a high signal at the safety input S31.

  When the guaranteed locking force is reaches, the guard locking is deemed to be successfully activated. "Lock" LED lights up green.

  There is a high signal at safety outputs 12 and 22 when guard locking is activated successfully.
- If one of these conditions is not met, the signal at the safety outputs 12 and 22 will be low.
- Check whether the signal output Y32 switches independently of the switching state of the safety outputs 12 and 22.
  - The signal output Y32 must supply a high signal independently of the switching state of the safety outputs 12 and 22, when the actuator is in trouble-free operation within the response range and a high signal is present at Y1.

– The signal output Y32 must supply a low signal independently of the switching state of the safety outputs 12 and 22, when the actuator is in trouble-free operation within the response range and a high signal is present at Y1.

Check the wiring of safety outputs 12 and 22 and signal output Y32 when signal output Y32 does not switch correctly.

Function check SDD (if used)

▶ Read out the serial numbers of all the connected safety devices.

When the serial numbers of the connected safety devices can be read out, the SDD communication works correctly.

11 Operation

NOTICE

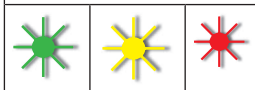
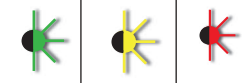
The safety functions should be checked after initial commissioning and each time the plant/machine is changed. The safety functions may only be checked by qualified personnel.

CAUTION!

Contaminated surfaces can reduce the holding force of the electro-magnet.

Make sure that the contact surfaces are clean.

Possible states of the LED

	LED off
	LED on in green, yellow or red
	LED flashes (500 ms on, 500 ms off) in green, yellow or red
	LED flashes quickly (50 ms on, 950 ms off) in yellow or red
	LED flashes very quickly (25 ms on, 475 ms off) in yellow
	Display of the previous state without change (only used in case of a fault)
	Display of the state as in normal operation (only used in case of a fault)

Status indicators

LED		
Device		The unit is ready for operation
Safety Gate		Actuator is within the response range
Lock		Guard locking active
Input		The unit is ready for operation

Guard locking controlled with SDD commands

- If guard locking is controlled with SDD commands, the lighting behaviour of the "Lock" LED is no longer primarily dependent on the switching state S31. The status of guard locking is displayed using LED.
- If guard locking cannot be activated with SDD commands, **and** no actuator is detected, this is indicated for 10 seconds, as specified in the table. Then it is switched back to normal condition. There is **no** display of the unsuccessful activation attempt.
- If guard locking cannot be activated with SDD commands, **and** the actuator is detected, this is indicated as specified in the table.

11.1 Normal operation

Inputs			Actuator detected	Outputs		Guard locking status	LED indicators				Meaning/remedy
S11	S21	S31		Y32	12+ 22		Device	Safety Gate	Input	Lock	
-	-	-	No	-	Low	Inactive	Green	Yellow	Yellow	Green	The safety switch is started. A self-test is carried out as part of the start procedure.
High	High	Low	No	Low	Low	Inactive	Green	●	Yellow	●	Safety gate open, actuator not detected, guard locking deactivated.
Low	Low	Low	No	Low	Low	Inactive	Green	●	●	●	Safety gate open, actuator not detected, guard locking deactivated, safety inputs S11 and S21 are low.
High	High	High	No	Low	Low	Inactive	Green	●	Yellow	Red	Safety gate open, actuator not detected, guard locking deactivated, safety inputs S11, S21 and S31 are high.
Low	Low	High	No	Low	Low	Inactive	Green	●		Red	Safety gate open, actuator not detected, guard locking deactivated, safety input S31 is high

Inputs			Actuator detected	Outputs		Guard locking status	LED indicators				Meaning/remedy
S11	S21	S31		Y32	12+ 22		Device	Safety Gate	Input	Lock	
Low	Low	Low	Yes	High	Low	Inactive	Green	Yellow	●	●	Safety gate closed, actuator detected, guard locking deactivated, safety inputs S11, S21 and S31 are low.
High	High	Low	Yes	High	Low	Inactive	Green	Yellow	Yellow	●	Safety gate closed, actuator detected, guard locking deactivated, safety inputs S11, S21 are high, and S31 is low.
High	High	High	Yes	High	Low	Inactive	Green	Yellow	Yellow	Red	Safety gate closed, actuator detected, guard locking deactivated, safety inputs S11, S21 and S31 are high.
Low	Low	High	Yes	High	Low	Inactive	Green	Yellow	●	Red	Safety gate closed, actuator detected, guard locking deactivated, safety inputs S11, S21 are low, S31 is high.
High	High	High	Yes	High	Low	Inactive	Green	Yellow	Yellow	Green	Safety gate closed, actuator detected, safety input S31 switches for low to high (state during activation attempt)
Low	Low	High	Yes	High	Low	Active	Green	Yellow	●	Green	Safety gate closed, actuator detected, guard locking activated, safety inputs S11, S21 are low, S31 is high.

Warnings

Inputs			Actu-ator detec-ted	Outputs		Guard lock-ing status	LED indicators				Meaning/remedy
S11	S21	S31		Y32	12+ 22		Device	Safety Gate	Input	Lock	
-	-	High	Yes	High	Low	Active	Green	Yellow	○	Green	Guard locking could not be activated. Problem of voltage supply or heavy soiling of the actuator. Check the wiring and the actuator. If you are using the SDD: Please note Guard locking controlled with SDD commands [📖 42]
-	-	-	-	-	-	-	Yellow	○	○	○	The supply voltage is outside the permitted range. Ensure the supply voltage as specified in the Technical details [📖 53].
-	-	-		-	-	-	Green	○	Yellow	○	Partial operation: Safety input S11 **or** S21 is high, after S11 **and** S21 were low. Close both inputs.
-	-	-		-	-		Red	○	Yellow	○	Partial operation: Safety input S11 **or** S21 is low, after S11 **and** S21 were high. Set both inputs to low (switch to normal operation).
-	-	-		-	Low	-	Red	○	Yellow	○	Partial operation lock: Set both inputs to low. This will cancel the lock.

Inputs			Actu-ator detec-ted	Outputs		Guard lock-ing status	LED indicators				Meaning/remedy
S11	S21	S31		Y32	12+ 22		Device	Safety Gate	Input	Lock	
-	-	-	Yes	Low	Low	Inact-ive	 Gree n	 Yel-low	○	○	▸ With fully coded safety switches: Actu-ator has been taught in. ▸ With uniquely coded safety switches: No other actuator may be taught in.
-	-	-	Yes	Low	Low	Inact-ive	 Gree n	 Yel-low	○	●	With coded safety switches: New actuator has been detected.
-	-	-	Yes	Low	Low	Inact-ive	 Gree n	 Yel-low	○	●	With coded safety switches: New actuator can be taught in.
-	-	-	Yes	Low	Low	Inact-ive	●	 Yel-low	●	 Red	The set latching force level is displayed: ▸ 1 time flashing red quickly: Latching force step 1 ▸ 2 times flashing red quickly: Latching force step 2 ▸ 3 times flashing red quickly: Latching force step 3

11.2 Error display

Inputs			Actu-ator detec-ted	Outputs		Guard lock-ing status	LED indicators				Meaning/remedy
S11	S21	S31		Y32	12+ 22		Device	Safety Gate	Input	Lock	
-	-	-	-	-	Low	-	Red	Yel-low	Yel-low	○	The supply voltage is outside the permitted range. Ensure the supply voltage as specified in the Technical details [📖 53].
-	-	High	Yes	High	Low	-	Red			Red	Holding force cannot be guaranteed.
-	-	High	No	Low	Low	-	Red			Red	Safety gate was opened by force.
-	-	-	-	-	Low	-	Red				Error at the safety out-puts.
-	-	-	-	-	Low	-	Red	-	-	-	Internal fault. Please contact Pilz.

11.3 Exit fault condition

You can only exit the fault condition by Restarting the safety switch [📖 47]

11.4 Set latching force

▸ Set latching force with SDD command

The SDD command can be used to set the latching force at any time (when guard locking is active, for example).

– Latching force step 1

– Latching force step 2

– Latching force step 3

With the transponder key PSEN sI2 Config Key, the latching force during normal operation can be set.

Prerequisites

- In the zone below the Pilz logo of the safety switch there must be no actuator and no PSEN sl2 Config Key.

Procedure:

1. Hold the PSEN sl2 Config Key in normal operation to the safety switch below the Pilz logo for 5 seconds. The latching force is increased by one stage.

   When the PSEN sl2 Config Key is held to the safety switch for another 5 seconds, the latching force is increased by another stage. When the highest stage is reached, the latching force is changed to the lowest stage.

- The set latching force stage is marked by quick flashing of the "Lock" LED.

  Quick flashing 1 x means that the stage 1 is set.

  Quick flashing 2 x means with a short interval means that the stage 2 is set.

  Quick flashing 3 x means with a short interval means that the stage 3 is set.

11.5 Safety switch restart

Disconnect the supply voltage from the safety switch and connect the safety switch back to the supply voltage. The safety switch starts automatically.

12 Maintenance and testing

INFORMATION

Pilz recommends creating a maintenance plan.

12.1 Regular checks

Regular checks can bring to light changes to the plant/machine, safeguards and ambient conditions.

INFORMATION

Checks may only be performed by qualified personnel.

NOTICE

Only Pilz may repair the device. Any guarantee is rendered invalid if the housing is opened or unauthorised modifications are carried out.

- Test intervals (in accordance with EN ISO 14119)
  - at least monthly for PL e
  - at least every 12 months for PL d
  - When safety switches are used under corrosive ambient conditions, the intervals must be shortened.
- Check that the safety switch and actuator are firmly secured.

  Tighten the fixing screws using the appropriate torque.
- Remove any dirt from the safety switch and actuator.
- Check that the wiring is correct.
- Check the offset of the safety switch and actuator.
  - Max. lateral offset
  - Max. angular offset
  - Max. vertical offset
- Make sure that the sealing areas on the connector and the socket of the connection lines are not damaged.
- Check the safety switch and actuator for damage.

  Replace the damaged safety switch and actuator.
- Check the brackets for wear when exchanging a safety switch or an actuator. Also exchange the mounting brackets.

12.2 Maintenance

CAUTION!

Contaminated surfaces can reduce the holding force of the electro-magnet.

Make sure that the contact surfaces are clean.

- Clean the safety switches and actuators every week with a soft cloth and a mild cleaning agent.

  When using a different cleaning agent, ensure that the safety switch and the actuator are not damaged by the cleaning agent.

13 Dimensions in mm

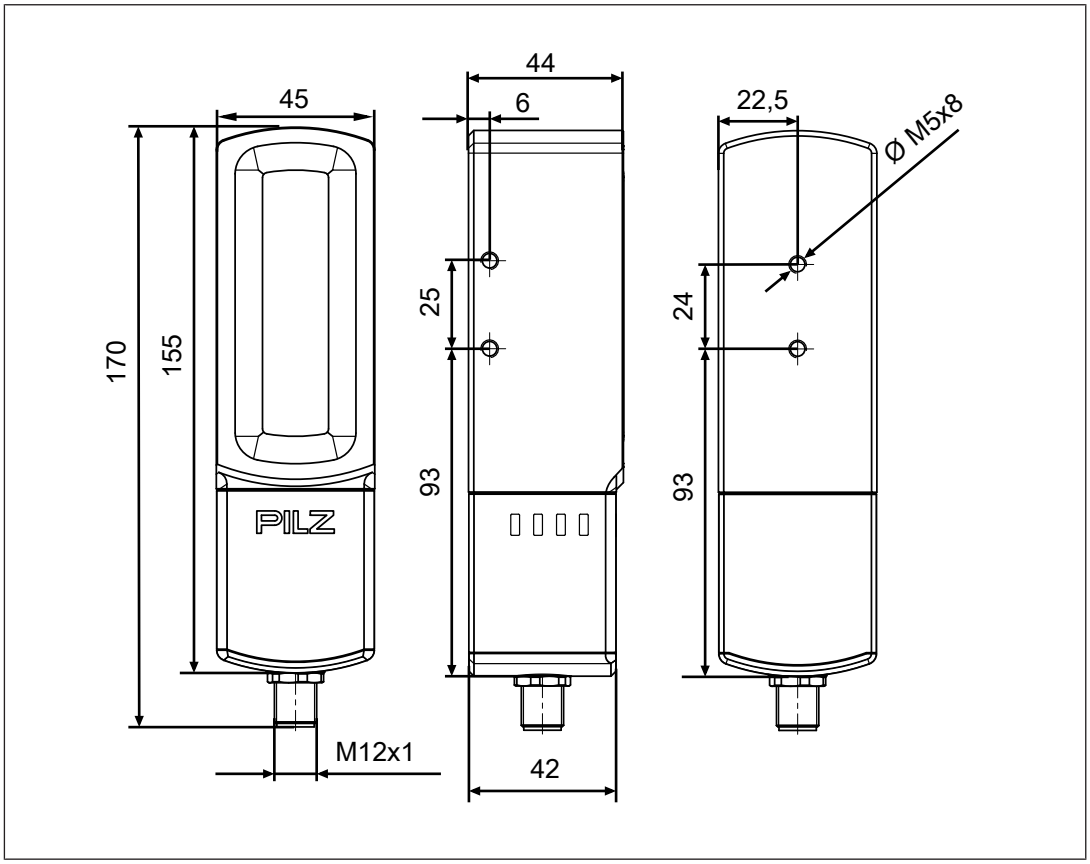


Fig.: Safety switch - front view, side view, rear view

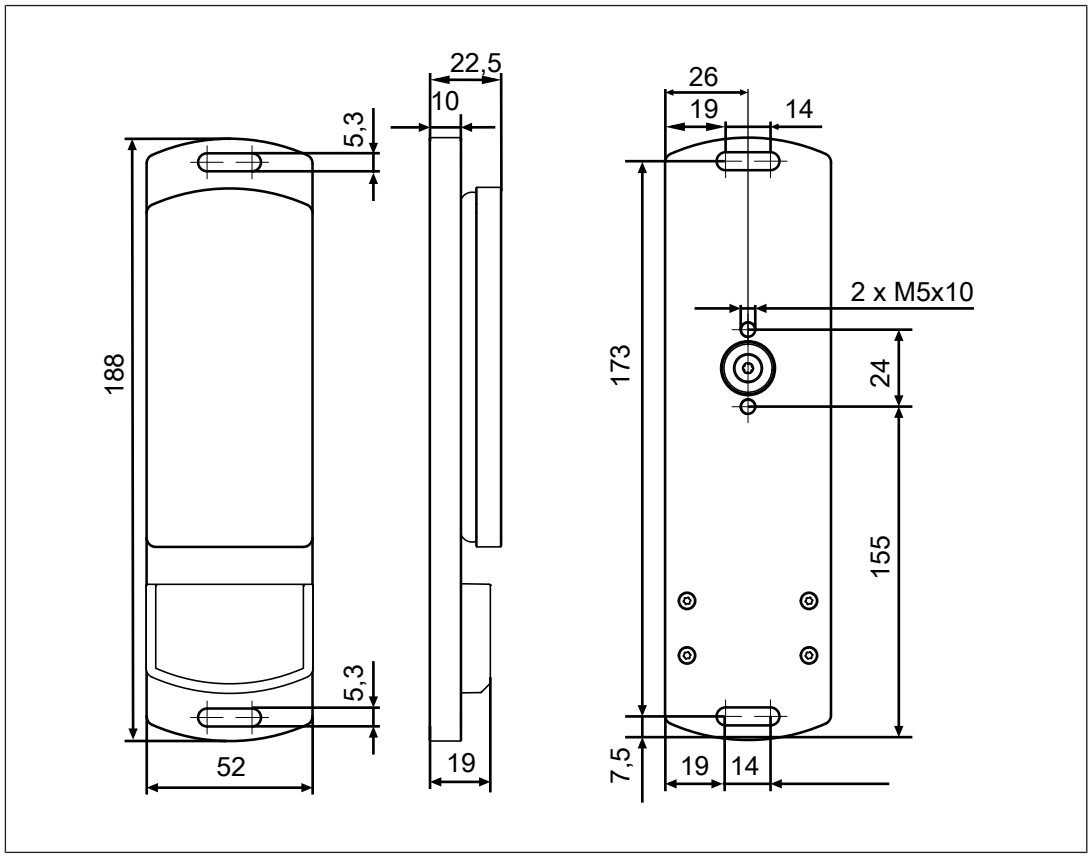


Fig.: Actuator PSEN sl2-L-AL-actuator - front view, side view, rear view

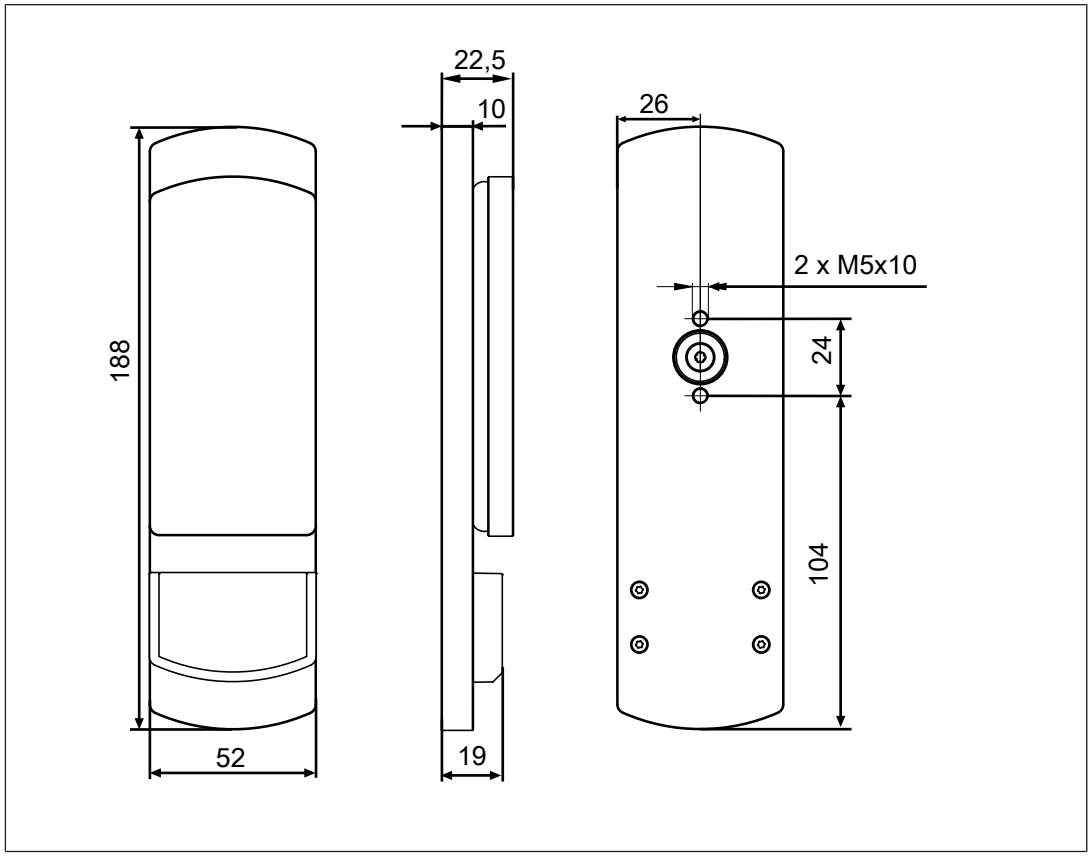


Fig.: Actuator PSEN sl2-L-VA-actuator - front view, side view, rear view

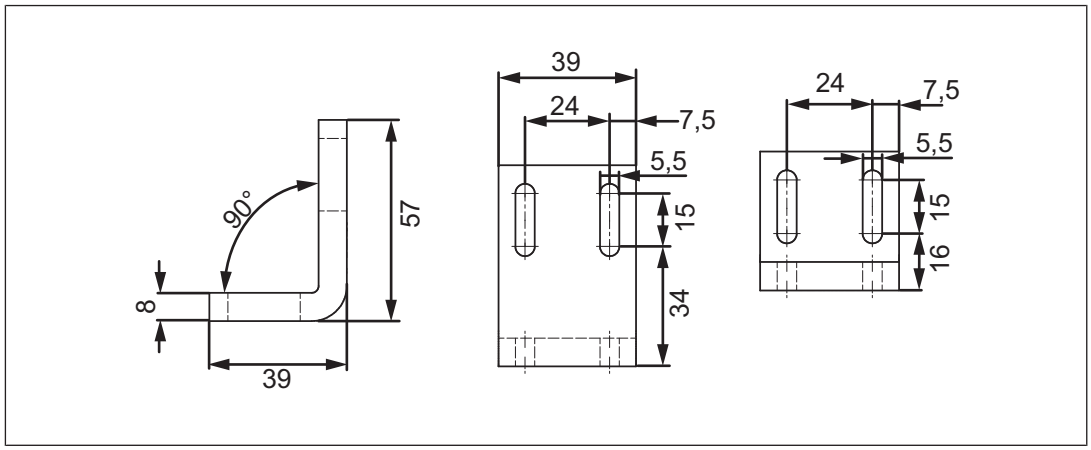


Fig.: Mounting bracket for sliding gate (see Accessories [64])

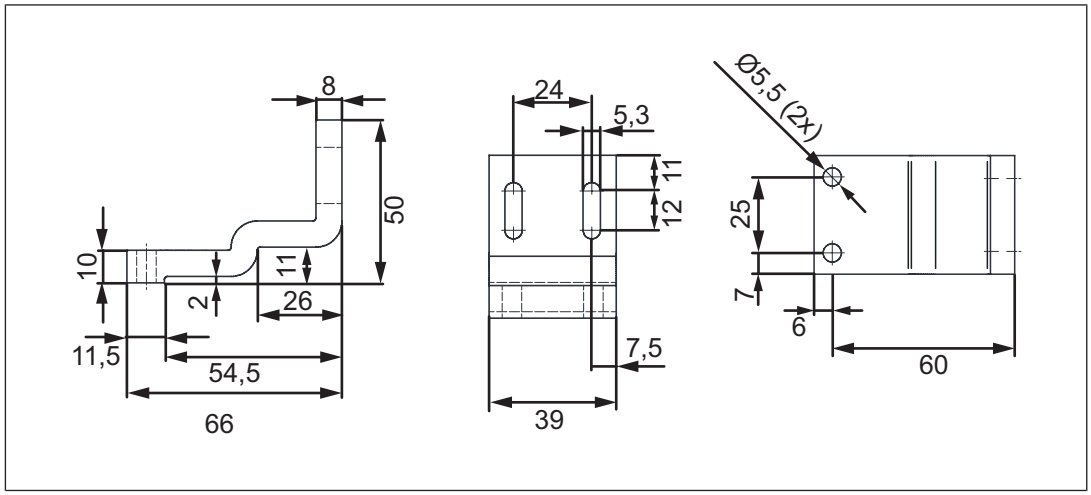


Fig.: Mounting bracket for swing gate (see Accessories [64])

14 Technical details for safety switch

General	6N000007	6N000008	6N000009
Certifications	CE, EAC, FCC, IC, TÜV, UKCA, cULus Listed	CE, EAC, FCC, IC, TÜV, UKCA, cULus Listed	CE, EAC, FCC, IC, TÜV, UKCA, cULus Listed
Sensor's mode of operation	Transponders	Transponders	Transponders
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
Transponders	**6N000007**	**6N000008**	**6N000009**
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	**6N000007**	**6N000008**	**6N000009**
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)	15,8 W	15,8 W	15,8 W
Max. switching frequency	1 Hz	1 Hz	1 Hz
Max. cable capacitance at the safety outputs			
No-load, PNOZ with relay contacts	70 nF	70 nF	70 nF
PNOZmulti, PNOZelog, PSS	70 nF	70 nF	70 nF
Max. unit fuse protection in accordance with UL	4 A	4 A	4 A
No-load current	23 mA	23 mA	23 mA
Inputs	**6N000007**	**6N000008**	**6N000009**
Quantity	4	4	4
Voltage at inputs	24 V DC	24 V DC	24 V DC
Input current range	5 mA	5 mA	5 mA
Semiconductor outputs	**6N000007**	**6N000008**	**6N000009**
OSSD safety outputs	2	2	2
Signal outputs	1	1	1
Switching current per output	100 mA	100 mA	100 mA
Short circuit-proof	Yes	Yes	Yes
Residual current at outputs	100 µA	100 µA	100 µA
Voltage drop at OSSDs	1,5 V	1,5 V	1,5 V

Semiconductor outputs	6N000007	6N000008	6N000009
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	**6N000007**	**6N000008**	**6N000009**
Max. test pulse duration, safety outputs	450 µs	450 µs	450 µs
Switch-on delay			
after UB is applied	1,6 s	1,6 s	1,6 s
Inputs typ.	3,5 ms	3,5 ms	3,5 ms
Inputs max.	5 ms	5 ms	5 ms
Actuator typ.	25 ms	25 ms	25 ms
Actuator max.	500 ms	500 ms	500 ms
Switch-on delay safety contacts			
Guard locking max.	500 ms	500 ms	500 ms
Delay-on de-energisation			
Inputs typ.	3 ms	3 ms	3 ms
Inputs max.	5 ms	5 ms	5 ms
Actuator typ.	40 ms	40 ms	40 ms
Actuator max.	260 ms	260 ms	260 ms
Delay-on de-energisation safety contacts			
Guard locking max.	40 ms	40 ms	40 ms
Risk time in accordance with EN 60947-5-3	500 ms	500 ms	500 ms
Supply interruption before de-energisation	10 ms	10 ms	10 ms
Simultaneity, channel 1 and 2 max.	∞	∞	∞
Processing time activate/ deactivate guard locking	390 ms	390 ms	390 ms
Environmental data	**6N000007**	**6N000008**	**6N000009**
Temperature of metal surface at ambient temperature: 25 °C	40 °C	40 °C	40 °C
Max. surface temperature	80 °C	80 °C	80 °C
Ambient temperature			
in accordance with the standard	EN 60068-2-14	EN 60068-2-14	EN 60068-2-14
Temperature range	-20 - 60 °C	-20 - 60 °C	-20 - 60 °C
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

Environmental data	6N000007	6N000008	6N000009
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**
Max. operating height above SL	**2000 m**	**2000 m**	**2000 m**
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	**6**	**6**	**6**
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	**32 V**	**32 V**	**32 V**
Rated impulse withstand voltage	**0,8 kV**	**0,8 kV**	**0,8 kV**
Protection type			
Housing	**IP67, IP6K9K**	**IP67, IP6K9K**	**IP67, IP6K9K**
in accordance with UL	**Type 1**	**Type 1**	**Type 1**
Operating distances	**6N000007**	**6N000008**	**6N000009**
Assured operating distance Sao	**0,0 mm**	**0,0 mm**	**0,0 mm**
Typical operating distance So	**0,0 mm**	**0,0 mm**	**0,0 mm**
Assured release distance Sar	**15 mm**	**15 mm**	**15 mm**
Typical release distance Sr	**12 mm**	**12 mm**	**12 mm**
Repetition accuracy switching distances	**40 %**	**40 %**	**40 %**
Typ. hysteresis	**2,5 mm**	**2,5 mm**	**2,5 mm**

Operating distances	6N000007	6N000008	6N000009
Actuator 1			
Type	**PSEN sI2-L-AL actuator**	**PSEN sI2-L-AL actuator**	**PSEN sI2-L-AL actuator**
Assured operating distance Sao	**0,0 mm**	**0,0 mm**	**0,0 mm**
Typical operating distance So	**0,0 mm**	**0,0 mm**	**0,0 mm**
Assured release distance Sar	**15 mm**	**15 mm**	**15 mm**
Typical release distance Sr	**12 mm**	**12 mm**	**12 mm**
Typ. hysteresis	**2,5 mm**	**2,5 mm**	**2,5 mm**
Actuator 2			
Type	**PSEN sI2-L-VA actuator**	**PSEN sI2-L-VA actuator**	**PSEN sI2-L-VA actuator**
Assured operating distance Sao	**0,0 mm**	**0,0 mm**	**0,0 mm**
Typical operating distance So	**0,0 mm**	**0,0 mm**	**0,0 mm**
Assured release distance Sar	**15 mm**	**15 mm**	**15 mm**
Typical release distance Sr	**12 mm**	**12 mm**	**12 mm**
Typ. hysteresis	**2,5 mm**	**2,5 mm**	**2,5 mm**
Mechanical data	**6N000007**	**6N000008**	**6N000009**
Max. impact energy	**2,0 J**	**2,0 J**	**2,0 J**
Mechanical life	**1,000,000 cycles**	**1,000,000 cycles**	**1,000,000 cycles**
Holding force FZh in accordance with EN ISO 14119	**1000 N**	**1000 N**	**1000 N**
Holding force F1max in accordance with EN ISO 14119	**2000 N**	**2000 N**	**2000 N**
Typ. latching force level, selectable	**30 N, 110 N, 200 N**	**30 N, 110 N, 200 N**	**30 N, 110 N, 200 N**
Magnetic holding force off	**30 N**	**30 N**	**30 N**
Max. vertical offset	**5 mm**	**5 mm**	**5 mm**
Max. lateral offset	**3 mm**	**3 mm**	**3 mm**
Max. angular offset	**+/-2,0 deg**	**+/-2,0 deg**	**+/-2,0 deg**
Max. angular offset around the X axis	**+/-2 deg**	**+/-2 deg**	**+/-2 deg**
Max. angular offset around the Y axis	**+/-2 deg**	**+/-2 deg**	**+/-2 deg**
Max. angular offset around the Z axis	**+/-2 deg**	**+/-2 deg**	**+/-2 deg**
Actuator 1	**PSEN sI2-L-AL actuator**	**PSEN sI2-L-AL actuator**	**PSEN sI2-L-AL actuator**
Actuator 2	**PSEN sI2-L-VA actuator**	**PSEN sI2-L-VA actuator**	**PSEN sI2-L-VA actuator**
Min. distance between safety switches	**20 mm**	**20 mm**	**20 mm**

Mechanical data	6N000007	6N000008	6N000009
Sensor flush installation in accordance with EN 60947-5-2	**yes, follow installation guidelines**	**yes, follow installation guidelines**	**yes, follow installation guidelines**
Connection type	**M12, 12-pin male connector**	**M12, 12-pin male connector**	**M12, 12-pin male connector**
Cable	**LiYY 12 x 0.25 mm2**	**LiYY 12 x 0.25 mm2**	**LiYY 12 x 0.25 mm2**
Material	**Plastic, plastic, steel-coated**	**Plastic, plastic, steel-coated**	**Plastic, plastic, steel-coated**
Material			
Top	**PBT**	**PBT**	**PBT**
Max. torque setting			
Connectors	**0,6 Nm**	**0,6 Nm**	**0,6 Nm**
Max. fixing screws torque settings	**3 Nm**	**3 Nm**	**3 Nm**
Dimensions			
Height	**170 mm**	**170 mm**	**170 mm**
Width	**45 mm**	**45 mm**	**45 mm**
Depth	**44 mm**	**44 mm**	**44 mm**
Actuator dimensions			
Height	**188 mm**	**188 mm**	**188 mm**
Width	**52 mm**	**52 mm**	**52 mm**
Depth	**22,5 mm**	**22,5 mm**	**22,5 mm**
Weight of safety switch	**1.467 g**	**1.467 g**	**1.467 g**

Where standards are undated, the 2017-09 latest editions shall apply.

15 Technical details actuator

General	6N000026	6N000027
Certifications	**CE, FCC, IC, TÜV, UKCA, cULus Listed**	**CE, FCC, IC, TÜV, UKCA, cULus Listed**
Sensor's mode of operation	**Transponders**	**Transponders**
Coding level in accordance with EN ISO 14119	**Low**	**Low**
Pilz coding type	**coded**	**coded**
Environmental data	**6N000026**	**6N000027**
Ambient temperature		
in accordance with the standard	**EN 60068-2-14**	**EN 60068-2-14**
Temperature range	**-25 - 55 °C**	**-25 - 55 °C**
Storage temperature		
in accordance with the standard	**EN 60068-2-1/-2**	**EN 60068-2-1/-2**
Temperature range	**-25 - 70 °C**	**-25 - 70 °C**
Climatic suitability		
in accordance with the standard	**EN 60068-2-78**	**EN 60068-2-78**
Humidity	**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**
Vibration		
in accordance with the standard	**EN 60947-5-2**	**EN 60947-5-2**
Frequency	**10 - 55 Hz**	**10 - 55 Hz**
Amplitude	**0,35 mm**	**0,35 mm**
Shock stress		
in accordance with the standard	**EN 60068-2-27**	**EN 60068-2-27**
Number of shocks	**6**	**6**
Acceleration	**30g**	**30g**
Duration	**11 ms**	**11 ms**
in accordance with the standard	**EN 60068-2-27**	**EN 60068-2-27**
Number of shocks	**500**	**500**
Acceleration	**10g**	**10g**
Duration	**16 ms**	**16 ms**
Protection type		
Housing	**IP67, IP6K9K**	**IP67, IP6K9K**
Mechanical data	**6N000026**	**6N000027**
Material		
Top	**PBT**	**PBT**
Anchor plate	**Nickel-plated steel**	**Nickel-plated steel**
Actuator	**Anticorodal, anodised**	**Stainless steel 1.4301**
Dimensions		
Height	**188 mm**	**188 mm**
Width	**52 mm**	**52 mm**
Depth	**22,5 mm**	**22,5 mm**
Weight of actuator	**626 g**	**1.102 g**

Where standards are undated, the 2017-09 latest editions shall apply.

16 Supplementary data

16.1 Radio approval

USA/Canada

FCC ID: VT8-RM01
IC: 7482A-RM01

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.

This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé.

Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

Ce transmetteur ne doit pas etre place au meme endroit ou utilise simultanement avec un autre transmetteur ou antenne.

16.2 Maximum inrush current

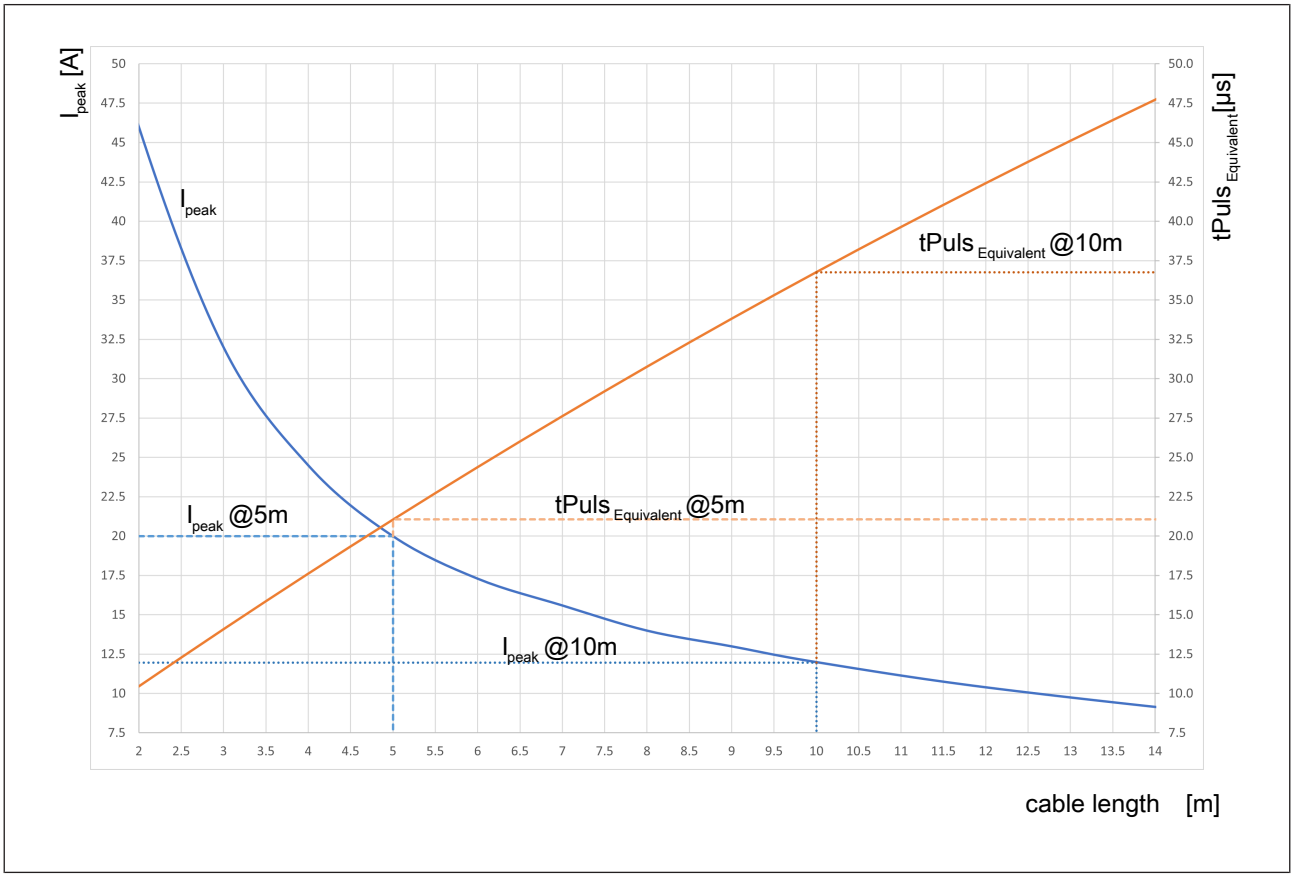


Fig.: Inrush current based on the cable length

Cable length in m	I_{peak} in A	Equivalent pulse time $tPuls_{equivalent}$ in µs
5	20	21.1
10	12	36.8

16.3 Test in aggressive ambient conditions

1. Expose the product to the aggressive ambient conditions, as would typically occur when using the product (dust, type of liquid, temperature, pressure, for example).
2. Carry out a visual check of the product.

   Check the sealing areas on the connector and on the socket of the connection cables for damage.

   Check all the product's parts for unchanged external appearance.
3. Install and wire the product and perform a Function test [39].

17 Classification according to ZVEI, CB24I

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

Input	
Interfaces	
Drain	
Class	C2
Source	
Class	C2, C3
Drain parameters	
Max. test pulse duration	0,5 ms
Min. test pulse interval	2 ms
Min. input resistance	2,7 kOhm
Max. capacitive load	1 nF

Single-pole output	
Interfaces	
Source	
Class	C2
Drain	
Class	C1, C2
Parameter source	
Max. test pulse duration	450 µs
Max. rated current	0,1 A
Max. capacitive load	70 nF

18 Safety characteristic data

NOTICE

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

Operating mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN IEC 62061 SIL CL/ maximum SIL	EN IEC 62061 PFH_D [1/h]	EN/IEC 61511 SIL	EN/IEC 61511 PFD	EN ISO 13849-1: 2015 T_M [year]
2-ch. OSSD	**PL e**	**Cat. 4**	**SIL CL 3**	**5,41E-09**	–	**1,20E-04**	**20**
1-ch. guard locking	**PL c**	**Cat. 2**	**SIL CL 2**	**2,22E-07**	–	**3,26E-03**	**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.

19 Order reference

19.1 Safety switch

Product type	Features	Order no.
PSEN sl2-GL1-S switch	Safety switch with guard locking (coded) for safety gate system PSENslock2, safe guard locking for personal protection, holding force 2000 N, M12, 12-pin male connector, series connection	6N000007
PSEN sl2-GL2-S switch	Safety switch with guard locking (fully coded) for safety gate system PSENslock2, safe guard locking for personal protection, holding force 2000 N, M12, 12-pin male connector, series connection	6N000008
PSEN sl2-GL1-S switch	Safety switch with guard locking (uniquely coded) for safety gate system PSENslock2, safe guard locking for personal protection, holding force 2000 N, M12, 12-pin male connector, series connection	6N000007

19.2 Actuator

Product type	Features	Order no.
PSEN sl2-L-AL actuator	Actuator for safety gate system PSENslock2, base plate of aluminium, for holding force 2000 N	6N000026
PSEN sl2-L-VA actuator	Actuator for safety gate system PSENslock2, base plate of stainless steel, for holding force 2000 N	6N000027

19.3 Accessories

Installation material

Product type	Features	Order no.
PSEN screw M5x20 10pcs	Safety screws made from stainless steel with one-way slot	540312
PSEN sl bracket swing door	Mounting bracket for swing gates and folding gates	570550
PSEN sl bracket sliding door	Mounting bracket for sliding gates	570551
PSEN sl restart interlock	Add-on module for the safety gate systems PSENslock and PSENsl2	570552
PSEN sl2 Config Key	Transponder key for setting the latching force on the safety switch	6N000031

Cable

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 female connector, straight	M12, 8-pin male connector, straight		540347
PSEN cable M12-8sf M12-8sm, 2m	2 m	M12, 8-pin female connector, straight	M12, 8-pin male connector, straight		540340
PSEN cable M12-8sf M12-8sm, 5m	5 m	M12, 8-pin female connector, straight	M12, 8-pin male connector, straight		540341
PSEN cable M12-8sf M12-8sm, 10m	10 m	M12, 8-pin female connector, straight	M12, 8-pin male connector, straight		540342
PSEN cable M12-8sf M12-8sm, 20m	20 m	M12, 8-pin female connector, straight	M12, 8-pin male connector, straight		540343
PSEN cable M12-8sf M12-8sm, 30m	30 m	M12, 8-pin female connector, straight	M12, 8-pin male connector, straight		540344
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
PSEN cable M12-12sf 2m	2 m	M12, 12-pin female connector, straight			570350
PSEN cable M12-12sf 3m	3 m	M12, 12-pin female connector, straight			570351
PSEN cable M12-12sf 5m	5 m	M12, 12-pin female connector, straight			570352
PSEN cable M12-12sf 10m	10 m	M12, 12-pin female connector, straight			570353
PSEN cable M12-12sf 20m	20 m	M12, 12-pin female connector, straight			570354
PSEN cable M12-12sf 30m	30 m	M12, 12-pin female connector, straight			570355
PSEN cable M12-12sf 50m	50 m	M12, 12-pin female connector, straight			570356

Adapter

Product type	Features	Connector X1	Connector X2	Connector X3	Order no.
PSEN ml end adapter		M12, 12-pin female connector	M12, 8-pin male connector		570487

Product type	Features	Order no.
Adapter/SL/ M12-8SMX/ M12-8SFX/ M12-12SF/PT	Adapter personal protection, 2 x 8-pin male connector, 1 x 12-pin M12 male connector	6N000030

20 EC declaration of conformity

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

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

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

21 UKCA-Declaration of Conformity

This product(s) complies with following UK legislation:

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

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

Representative: Pilz Automation Technology, Pilz House, Little Colliers Field, Corby, Northamptonshire, NN18 8TJ United Kingdom, eMail: mail@pilz.co.uk

Support

Technical support is available from Pilz round the clock.

Americas
Brazil
+55 11 97569-2804
Canada
+1 888 315 7459
Mexico
+52 55 5572 1300
USA (toll-free)
+1 877-PILZUSA (745-9872)

Asia
China
+86 21 60880878-216
Japan
+81 45 471-2281
South Korea
+82 31 778 3300

Australia and Oceania
Australia
+61 3 95600621
New Zealand
+64 9 6345350

Europe
Austria
+43 1 7986263-0
Belgium, Luxembourg
+32 9 3217570
France
+33 3 88104003
Germany
+49 711 3409-444
Ireland
+353 21 4804983
Italy, Malta
+39 0362 1826711
Scandinavia
+45 74436332
Spain
+34 938497433
Switzerland
+41 62 88979-32
The Netherlands
+31 347 320477
Turkey
+90 216 5775552
United Kingdom
+44 1536 462203

You can reach our international hotline on:
+49 711 3409-222
support@pilz.com

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

BLUEcoMPETENCE Alliance Member
Partner of the Engineering Industry Sustainability Initiative

BRANDS OF THE CENTURY PILZ 2019 GERMAN STANDARDS

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

1005904-EN-01, 2023-04 Printed in Germany

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

Headquarters: Pilz GmbH & Co. KG, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: info@pilz.com, Internet: www.pilz.com

PILZ
THE SPIRIT OF SAFETY