



## ► PSEN sg2c-5CCLLE

**PILZ**

THE SPIRIT OF SAFETY

Operating Manual-1004172-EN-04

- 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

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# 1 Introduction

## 1.1 Validity of documentation

This documentation is valid for the product PSEN sg2c-5CCLLE. 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 Overview

### 2.1 Range of PSEN sg2c-5CCLLE Unit

- ▶ Safety switch
- ▶ Handle unit with actuator
- ▶ Colour covers for illuminated buttons
- ▶ Pin for escape release

### 2.2 Unit features

- ▶ Safe guard locking
- ▶ Safe interlocking (position monitoring)
- ▶ Transponder technology
- ▶ 2 safety inputs for series connection of multiple safety switches
- ▶ 2 safety outputs
- ▶ Guard locking element keeps the safety gate from being opened unintentionally
- ▶ Detection of broken bolt tongue and broken guard locking element
- ▶ Handle unit with locking lever to attach padlocks as a restart interlock
- ▶ Auxiliary release for opening the safety gate, when the plant's voltage is switched off
- ▶ Only on revolving and swing gates: Escape release for fast manual release of the guard locking in emergency situations from within the danger zone
- ▶ Suitable for left and right hinged safety gates
- ▶ Plug-in spring-loaded terminals
- ▶ LED display for:
  - Supply voltage/fault
  - Gate locked
  - State of the hazardous machine
  - State of the inputs
  - Bolt tongue engaged
- ▶ 2 illuminated pushbuttons
- ▶ 1 E-STOP pushbutton
- ▶ coded

## 3 Safety

### 3.1 Intended use

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

It meets the requirements in accordance with:

- ▶ EN 60947-5-3
- ▶ EN ISO 14119
- ▶ EN ISO 13849-1: up to PL e (Cat. 4)

The safety level PL e (Cat. 4) can be achieved when

- ▶ The safety outputs use 2-channel processing and
- ▶ The solenoid is operated 2-channel via safe relay outputs, suitable for PL e (Cat. 4) applications.

Wiring errors should be excluded using appropriate measures. The potential solutions are the protected cable layout or the use of pulsed semiconductor outputs.

### 3.2 Safety regulations

#### 3.2.1 Safety assessment

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

As an individual component, the product meets functional safety requirements in accordance with EN ISO 13849. 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.

#### 3.2.2 Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, maintained and decommissioned by persons who are competent to do so.

A competent person is a qualified and knowledgeable person who, because of their training, experience and current professional activity, has the specialist knowledge required. In order to inspect, assess and handle products, devices, systems, plant and machinery, this person must be familiar with the state of the art and the applicable national, European and international laws, directives and standards.

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

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

### 3.2.3

### 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.).

### 3.2.4

### 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).

## 3.3

### For your safety



#### WARNING!

#### Potential loss of safety function during adjustment and repair work!

When carrying out adjustment and repair work, make sure that the power supply of the plant is switched off and protected against switching on again.



#### WARNING!

#### Loss of safety function due to manipulative use of substitute actuating elements!

When substitute actuating elements are used, these have to be installed as described in chapter Install at profile. When substitute actuating elements are used in a manipulative way to defeat the protective device, operating the plant presents a threat to life.

The operator has to consider this in the hazard analysis and he must determine possible countermeasures.

## 4

# Function description

The interlocking and guard locking system prevents the safety gates to the danger zone from opening while the hazardous machine is switched on.

There is a high signal (safety gate closed and locked) at safety outputs X1-3 and X1-4 if the following conditions are met simultaneously:

- ▶ Inputs X2-3 and X2-4 are high and
- ▶ The bolt tongue is within the response range and
- ▶ The guard locking element is engaged in the bolt tongue and
- ▶ The escape or auxiliary release pin is in the correct position.

Signal output X1-9 is high if:

- ▶ The bolt tongue is within the response range

There is a low signal (safety gate open and hazardous machine function interlocked) at safety outputs X1-3 and X1-4 if the following occurs:

- ▶ Inputs X2-3 or X2-4 are low or
- ▶ The guard locking element is outside the bolt tongue or
- ▶ The escape or auxiliary release has been operated or
- ▶ The guard locking element is not engaged in the bolt tongue.

If the safety outputs have been shut down by either of the inputs X2-3 or X2-4, they cannot be switched back on until both inputs are low simultaneously.

To operate the solenoid, a high signal must be present at X1-6 (X2-6) and at X1-7 (X2-7) after the hazardous movement has been ended.

## 4.1

### Unlock mode

The system is operate in Unlock mode:

The safety gate to the danger zone is unlocked when the hazardous machine is stopped.

This enables easier access for cleaning staff once the shift has ended, for example.

- ▶ The guard locking element is disengaged from the bolt tongue as soon as the signal status at terminals X1-6 and X1-7 or X2-6 and X2-7 switches from Low to High.

## 4.2

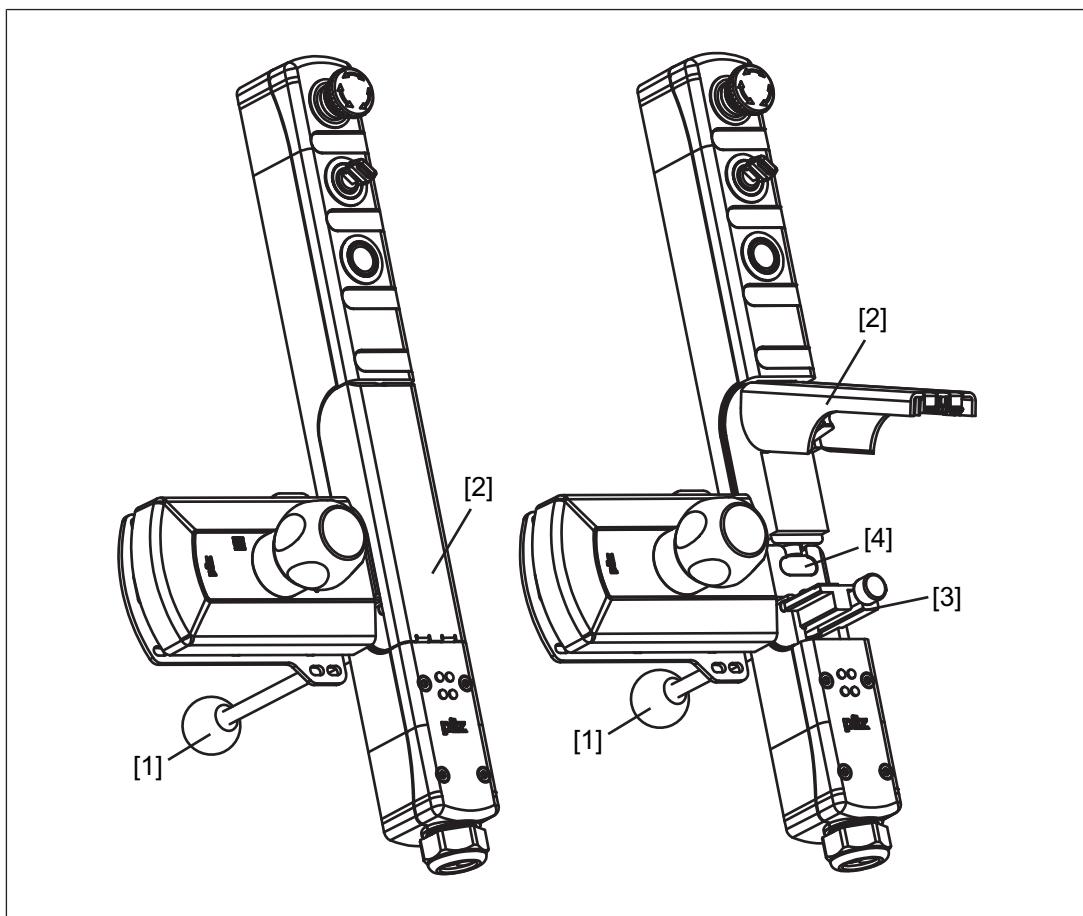
### Escape release on swing gates and revolving gates

The escape release enables the guard locking to be manually released from within the danger zone.



#### NOTICE

The escape release does not work on sliding gates. The PSEN sg2c may only be used on sliding gates if the risk analysis shows that nobody can become trapped in the danger zone.



### Mode of operation

Within the danger zone, if the escape release pin [1] is pressed in the direction of the safety gate, the cover on the escape release [2] detaches from the locked position and lifts upwards. The swivel piece [3] folds downwards. The bolt tongue [4] behind the swivel piece is released. The safety gate can be opened immediately, enabling the operator to leave the danger zone.



#### WARNING!

#### Loss of safety function due to the incorrect installation of the escape release!

If the escape release pin is accessible from the outside, the guard locking device can be released from the outside and the safety gates opened, although the hazardous machine is switched on.

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

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

It is also important to refer to the maintenance instructions (see chapter entitled Maintenance)



#### INFORMATION

When the escape or auxiliary release is operated, there is a low signal at the safety outputs X1-3 and X1-4. An error code is issued (see section entitled Remedy). The PSEN sg2c is not ready for operation again until the escape release or auxiliary release has been reset to its unoperated state and the error has been rectified and reset.

Please note that, following operation, the cover for the escape release must be inspected and reassembled.

## 4.3

## Auxiliary release

When the plant is powered down, the auxiliary release enables the guard locking device to be released from the access side to the danger zone.



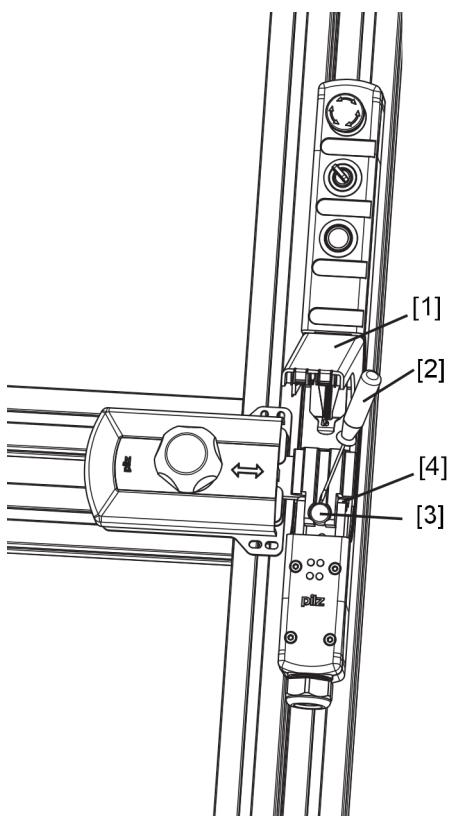
### INFORMATION

When the escape or auxiliary release is operated, there is a low signal at the safety outputs X1-3 and X1-4. An error code is issued (see section entitled Remedy). The PSEN sg2c is not ready for operation again until the escape release or auxiliary release has been reset to its unoperated state and the error has been rectified and reset.

Please note that, following operation, the cover for the escape release must be inspected and reassembled.

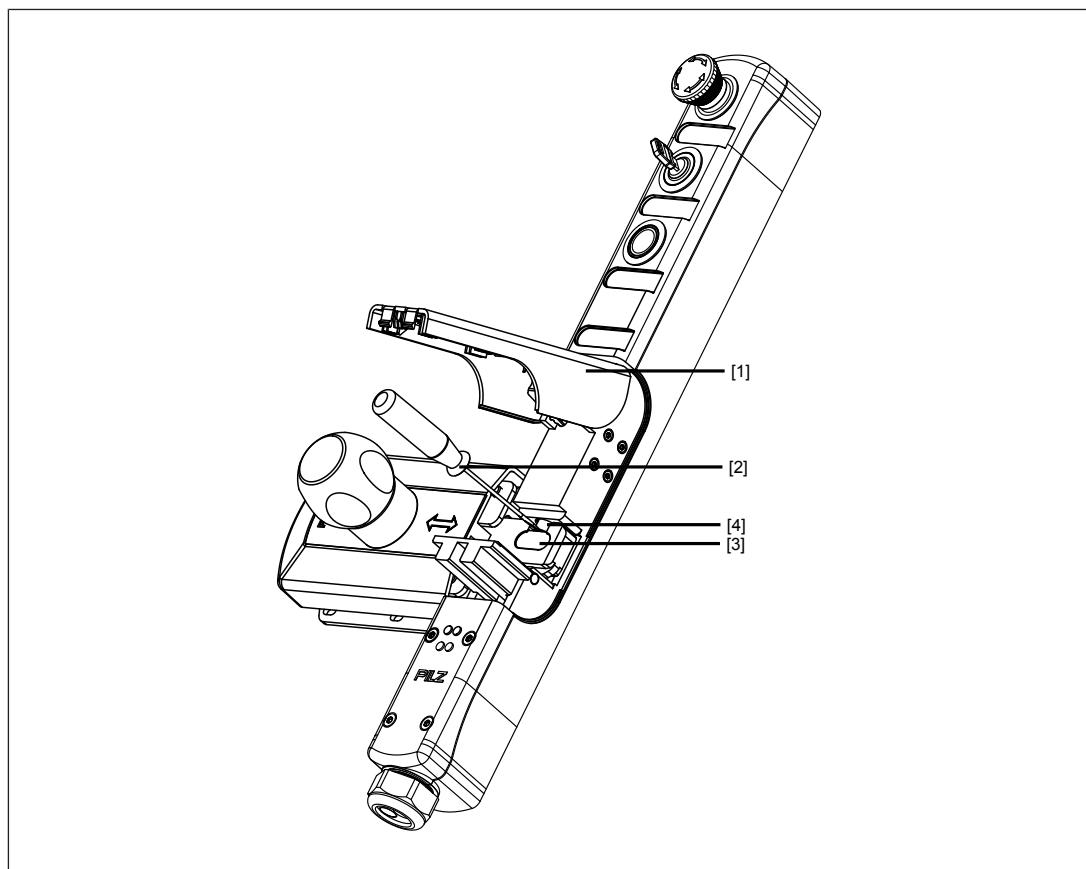
### Mode of operation on revolving and swing gates:

Carefully remove the cover of the escape release (1) from the latch below. Use a screwdriver (2) to pull out the escape or auxiliary release pin (3) from the swivel piece (4). The swivel piece folds downwards, the bolt tongue behind the swivel piece is released. The safety gate to the danger zone can be opened.



**Mode of operation on sliding gates:**

On sliding gate applications, a screwdriver [2] must be used to carefully push the locking pin [4] into the safety switch.

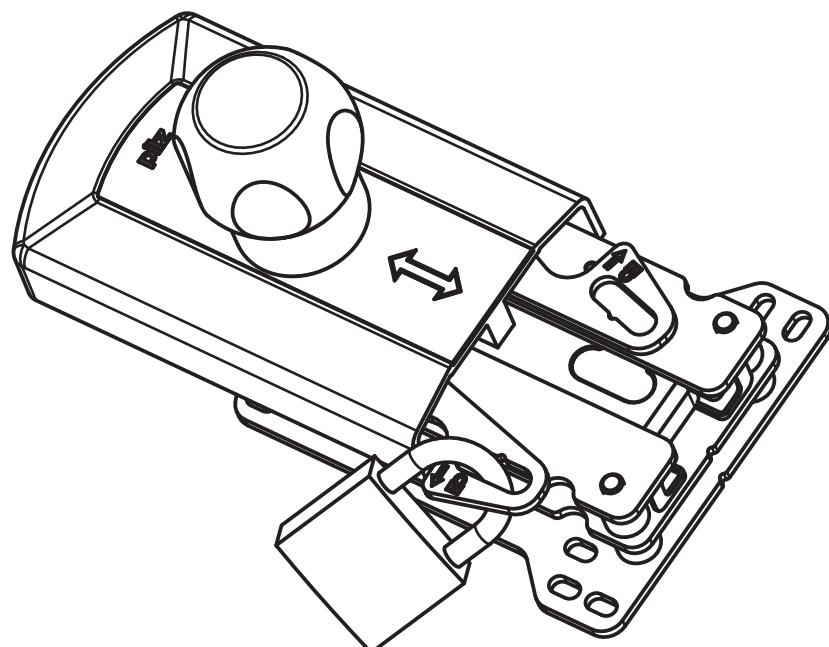


## 4.4

### Restart interlock

To prevent the machine restarting while there is someone inside the danger zone, a padlock can be attached to one of the locking levers (see illustration). As a result, the guard locking element cannot engage in the bolt tongue, the guard locking device is not activated and the machine is prevented from restarting.

The padlock's shackle diameter may be max. 8 mm.



## 4.5

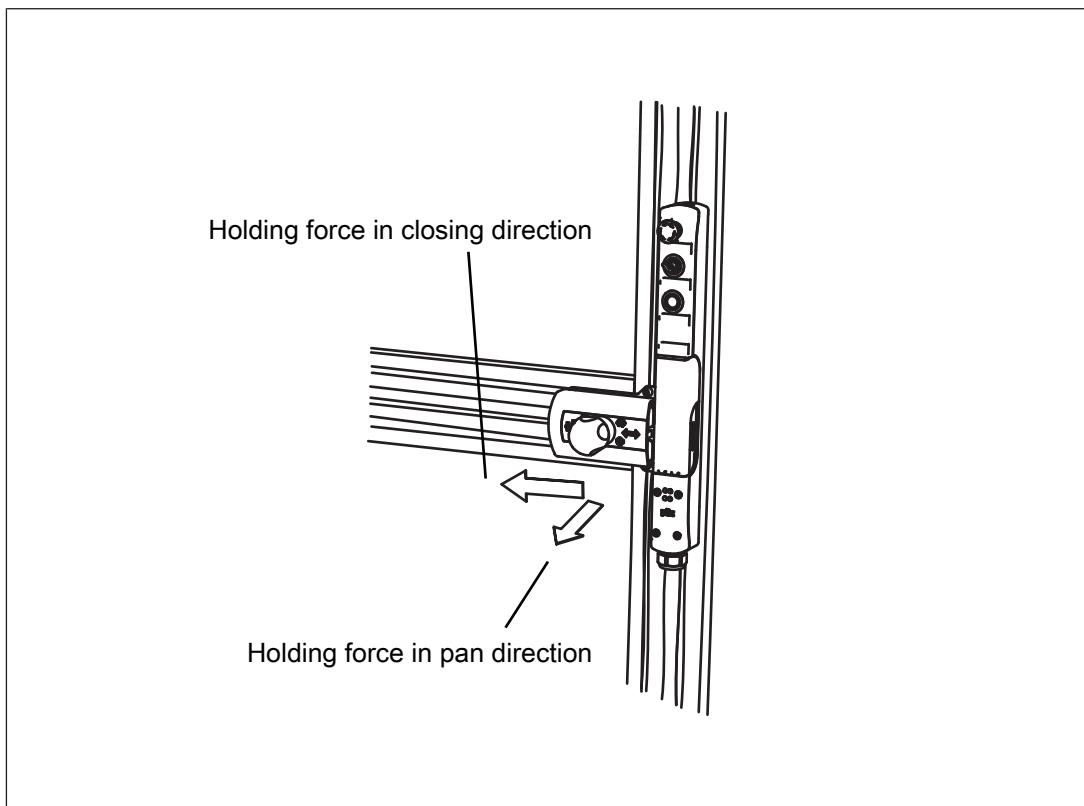
## Holding forces

The maximum holding forces that can be used to lock the safety gate are stated in the technical details.

A distinction is made between the following holding forces:

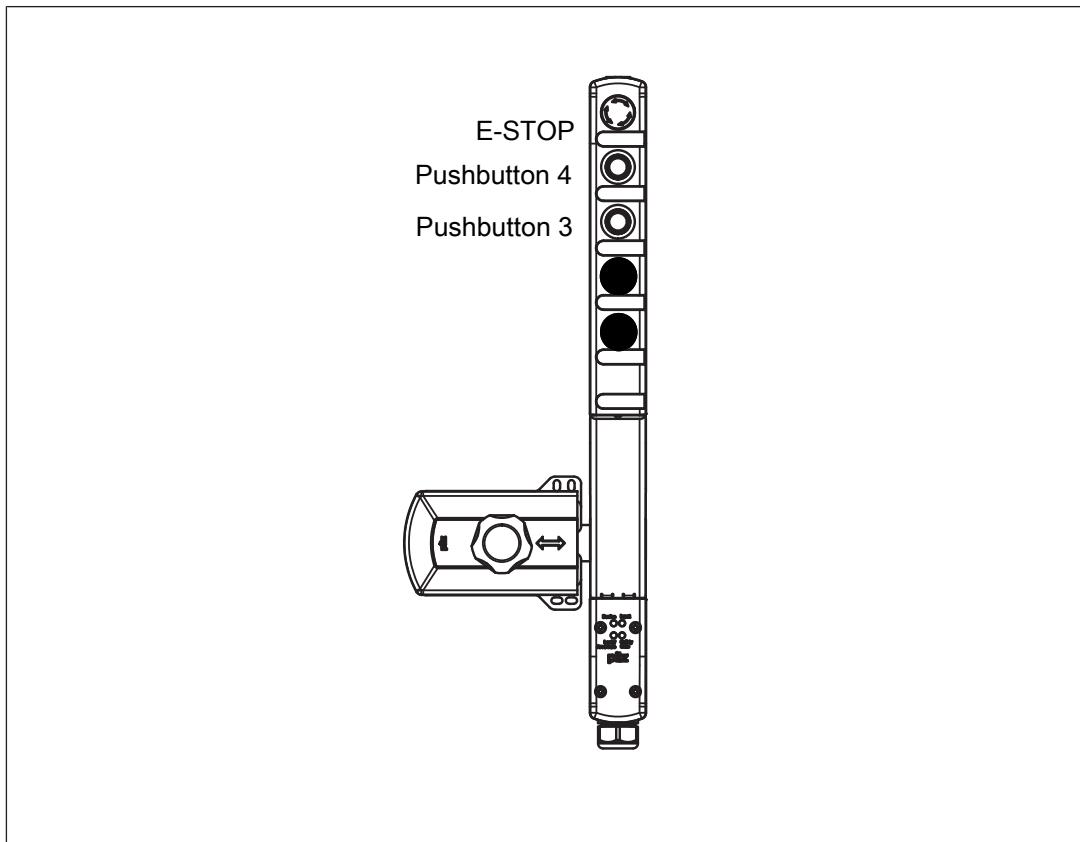
- ▶ Holding force in pan direction and
- ▶ Holding force in closing direction

On sliding gates the maximum holding force corresponds to the holding force in closing direction



## 4.6

## Pushbutton



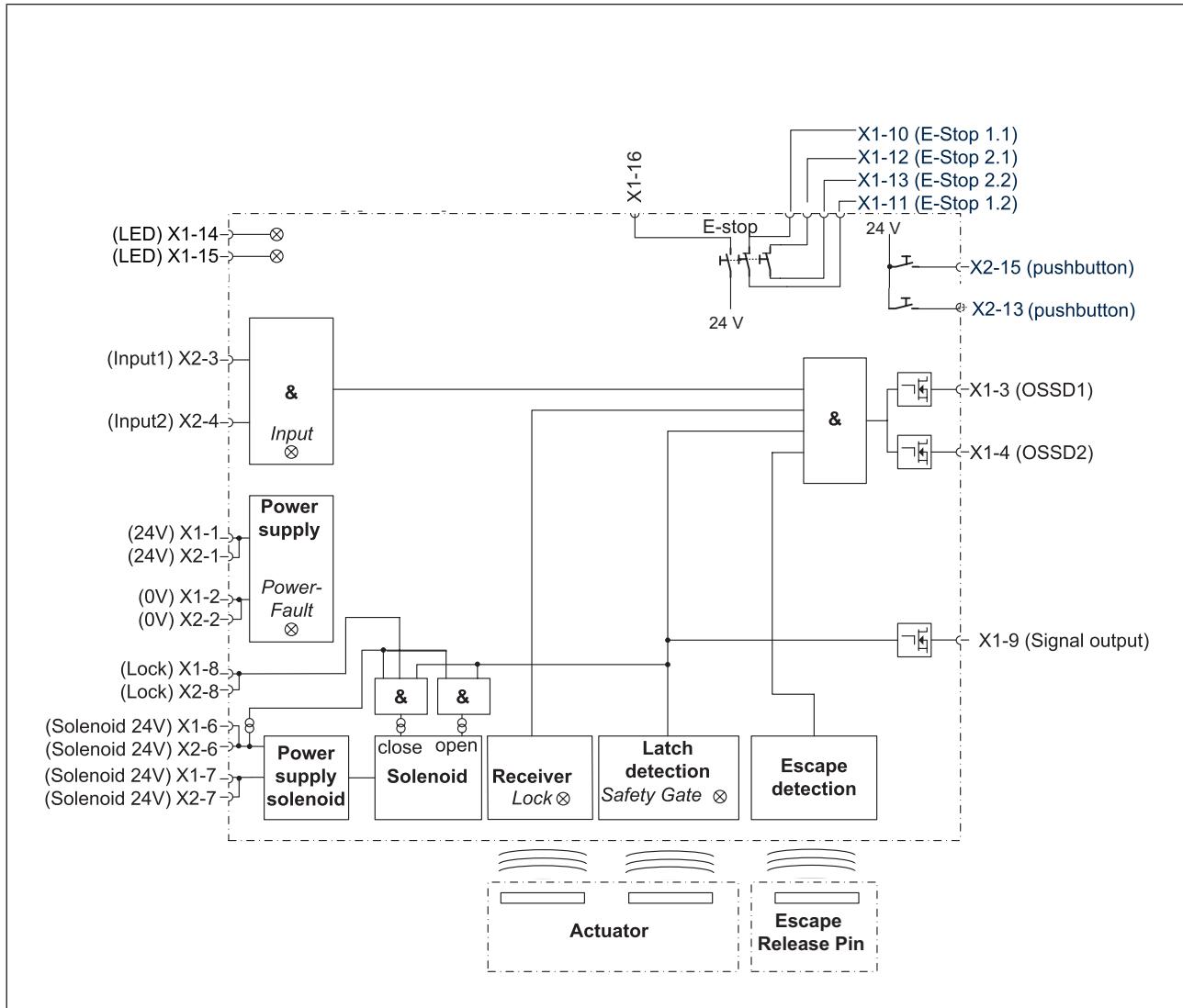
### ▶ Pushbutton 3 and pushbutton 4

The two illuminated pushbuttons can be used depending on the application:

- Operating a pushbutton switches the pushbutton output
- The LEDs of the pushbuttons can be operated via the LED inputs.

### ▶ E-STOP pushbuttons

## 4.7 Block diagram



## 5 Wiring

### 5.1 Notes on cable run

The maximum cable run depends on the voltage drop in the supply voltage conductors for solenoid operation. The level of voltage drop is determined by the

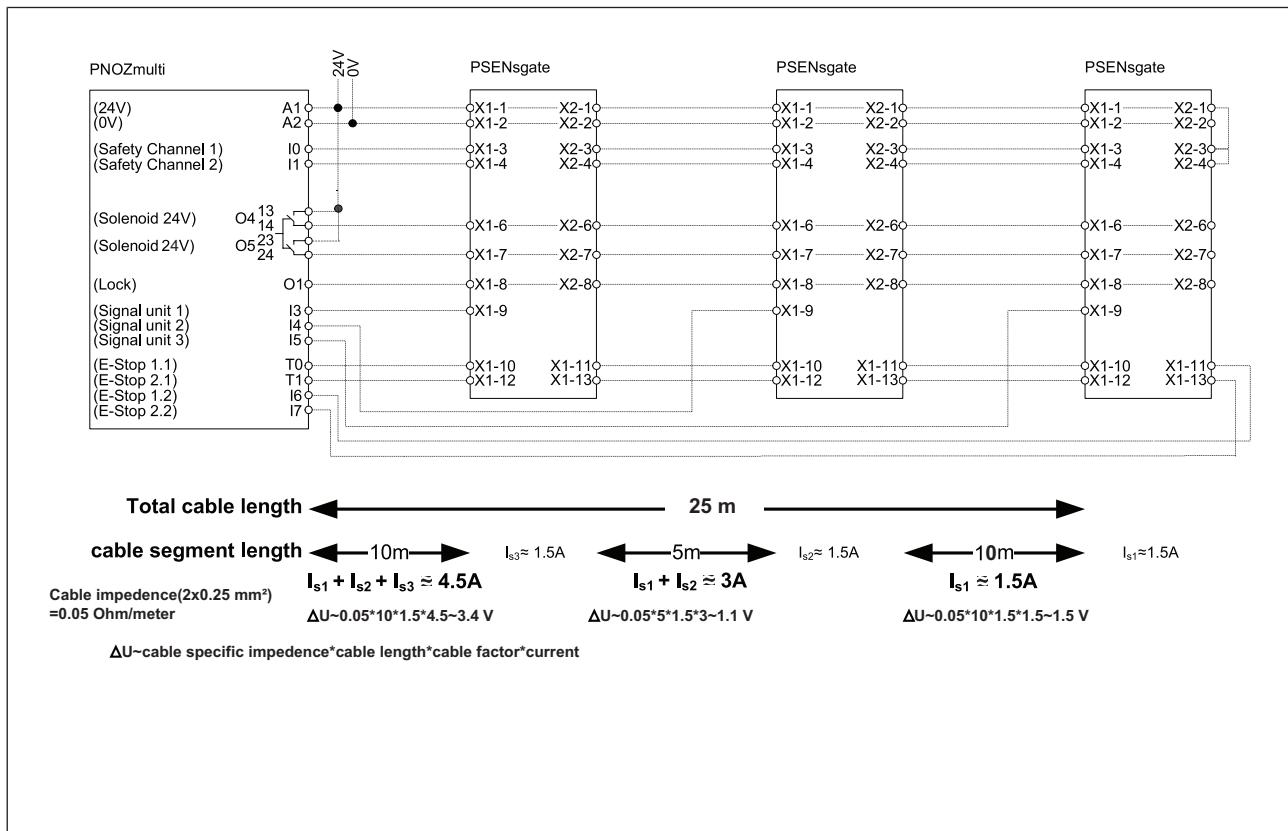
- ▶ cable resistance of the cables
- ▶ solenoid current of the solenoid

If the voltage drop in the supply voltage conductors becomes too high, the voltage for solenoid operation can permanently be set to the upper tolerance range (see Technical details).

The max. cable diameter is 10 mm.

Example:

- ▶ Connecting 3 safety switches in series
- ▶ Total cable run: 25 m
- ▶ Conductor cross section: 0.5 mm<sup>2</sup>
- ▶ Solenoid current per solenoid: 1.5 A
- ▶ Voltage for solenoid operation: 24 V



The voltage drop over all the safety switches is 6 V. This means, there are only 18.0 V at the terminals of the last solenoid. The solenoid is no longer operated reliably. If the voltage for operating the solenoid is increased by the max. permitted tolerance to 26.4, there are still 20.4 V at the terminals of the last solenoid. The solenoid switches reliably.

## 5.2 Recommended cable cross sections

The values in the table are valid for a series connection with max. 3 sensors and a voltage for solenoid operation of 24 V. The solenoid current is 1.5 A per solenoid.

For differing values the conductor cross section must be calculated.

Total cable run [m]	1 safety switches	2 safety switches	3 safety switches
5	0.25 mm <sup>2</sup> , AWG24	0.25 mm <sup>2</sup> , AWG24	0.5 mm <sup>2</sup> , AWG21
10	0.25 mm <sup>2</sup> , AWG24	0.25 mm <sup>2</sup> , AWG24	0.5 mm <sup>2</sup> , AWG21
15	0.25 mm <sup>2</sup> , AWG24	0.25 mm <sup>2</sup> , AWG24	0.5 mm <sup>2</sup> , AWG21
20	0.25 mm <sup>2</sup> , AWG24	0.5 mm <sup>2</sup> , AWG21	x
25	0.25 mm <sup>2</sup> , AWG24	0.5 mm <sup>2</sup> , AWG21	x
30	0.25 mm <sup>2</sup> , AWG24	x	x
40	0.5 mm <sup>2</sup> , AWG21	x	x
50	0.5 mm <sup>2</sup> , AWG21	x	x
60	0.5 mm <sup>2</sup> , AWG21	x	x
70	x	x	x

Cable runs marked with an x are not recommended.

For operating several safety switches with greater cable runs, the cables for solenoid operation (terminals X1-6 and X1-7) have to be carried individually, or several cables have to be used. If more than three safety switches are connected in series or cable runs over 60 m are required, please contact Pilz.

The permitted conductor cross section is at least 0.25 mm<sup>2</sup>. To have a higher conductor cross section, two cable cores can be inserted into a terminal. This adds together the conductor cross sections and halves the cable resistances. In this case, use a terminal lug! The signals important for cable resistance are:

- ▶ 24 V (X1-1 or X2-1)
- ▶ 0 V (X1-2 or X2-2)
- ▶ the two solenoid operation signals (X1-6 and X1-7 or X2-6 and X2-7).

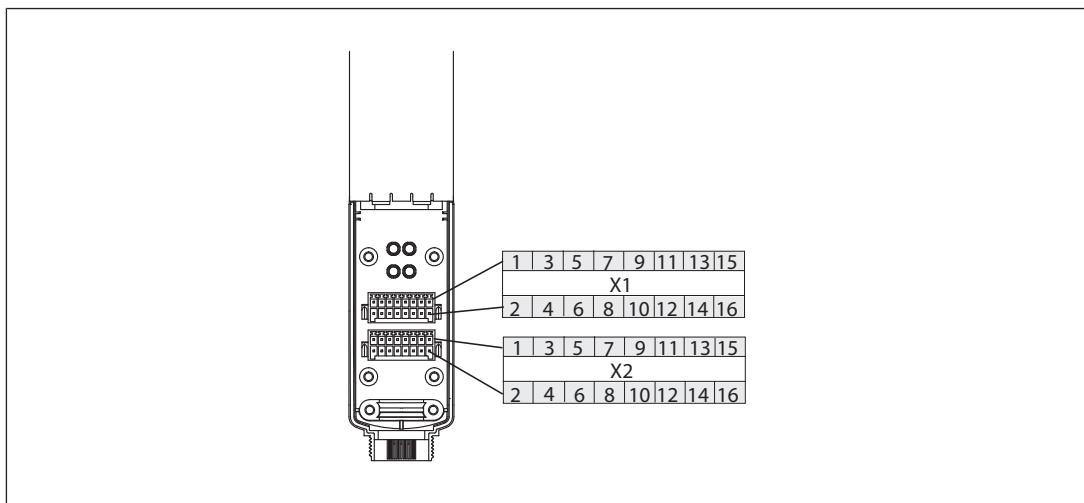
## 5.3 General wiring guidelines

Please note:

- ▶ All metallic surfaces on the safety switch are connected to 0 V via a resistor (100 kOhm) for functional earthing.
- ▶ UL requirements:
  - Use copper wiring with a temperature stability of 75 °C.
  - Use an LVLC supply (LVLC: limited voltage, limited current).
  - Use multicore cable with a cable diameter of 6 ... 10 mm.
- ▶ When 2 cables are used, make sure that both cables have the same cable diameter, otherwise the strain relief will fail.
- ▶ The permitted conductor cross section for the connectors is 0.25 - 1.0 mm<sup>2</sup>, 23 - 17 AWG.

- When calculating the max. cable run, remember to take into account the chapter "Notes on cable run".

## 5.4 Terminal configuration



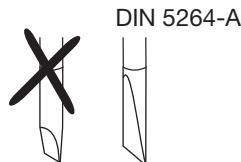
Terminal	PSEN sg2c-5CCLLE
X1-1 - X2-1 linked internally	+24 VDC supply voltage
X1-2 - X2-2 linked internally	0 V
X1-3	Safety output channel 1 (OSSD1)
X1-4	Safety output channel 2 (OSSD2)
X1-6 - X2-6 linked internally	Solenoid operation (24 V)
X1-7 - X2-7 linked internally	Solenoid operation (24 V)
X1-8 - X2-8 linked internally	Input for activating the safety gate guard locking device
X1-9	Signal output for state of the bolt tongue
X1-10	E-STOP 1.1
X1-11	E-STOP 1.2
X1-12	E-STOP 2.1
X1-13	E-STOP 2.2
X1-14	Pushbutton 3 LED3
X1-15	Pushbutton 4 LED4
X1-16	Signal output, E-STOP
X2-3	Input, channel 1
X2-4	Input, channel 2
X2-13	Pushbutton 3 channel 1
X2-15	Pushbutton 4 channel 1

## 5.5

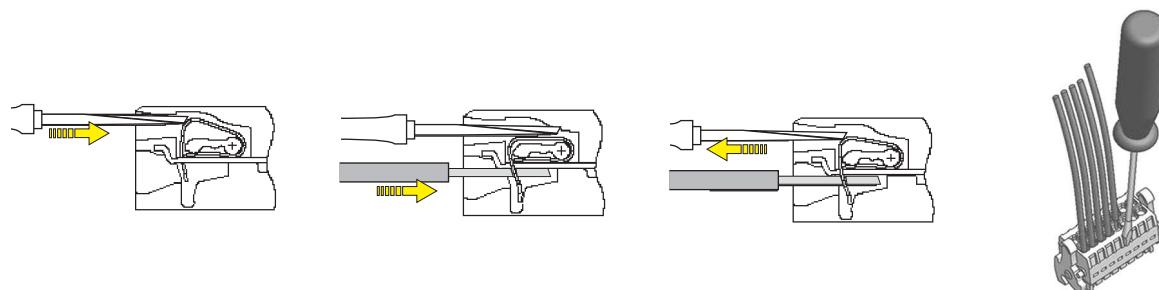
## Wiring the connection terminals

Connecting the cables:

- ▶ Use a flat blade screwdriver (DIN 5264-A)!



- ▶ Strip the wire back 7 mm.
- ▶ Insert the screwdriver into the square hole.
- ▶ Insert the stripped wire into the square hole as far as it will go.
- ▶ Pull out the screwdriver.
- ▶ Check that the cable is firmly seated.



## 5.6

## E-STOP pushbutton connection



### CAUTION!

With versions with integral E-STOP pushbutton, the E-STOP pushbutton (terminals X1-10 to X1-13) must be integrated into the plant/machine's E-STOP concept in accordance with EN/IEC 60204.

## 5.7

## EMC requirements

Please note:

- ▶ The power supply must meet the regulations for extra low voltages with protective electrical separation (SELV, PELV).
- ▶ The inputs and outputs of the safety switch must have a protective separation to voltages over 60 V AC.
- ▶ The supply voltage has to be at the safety switch terminals within the indicated tolerances (see Technical details).
- ▶ the supply voltage of the safety switch must be secured with a fuse of type quick between 2 A and 10 A.
- ▶ The electrical installation must be performed in accordance with IEC/EN 60204.
- ▶ The assured release distance ( $S_{ao}$ ) can be influenced by external influences (e.g.: temperature, dirt, EMC) (see Technical details).



### INFORMATION

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

## 5.8

## Connection to evaluation devices

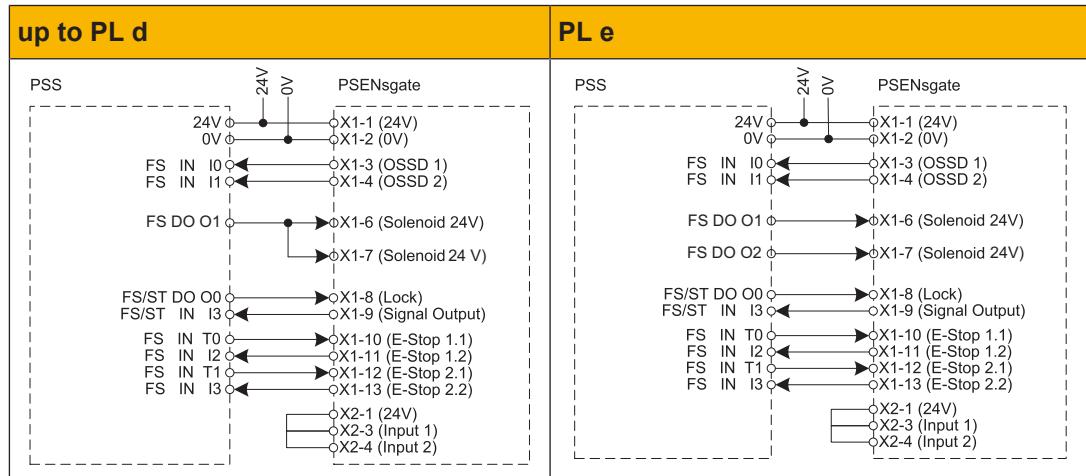
### 5.8.1

### Connection examples PNOZmulti

up to PL d	PL e

## 5.8.2

## Connection examples PSS



## 5.9

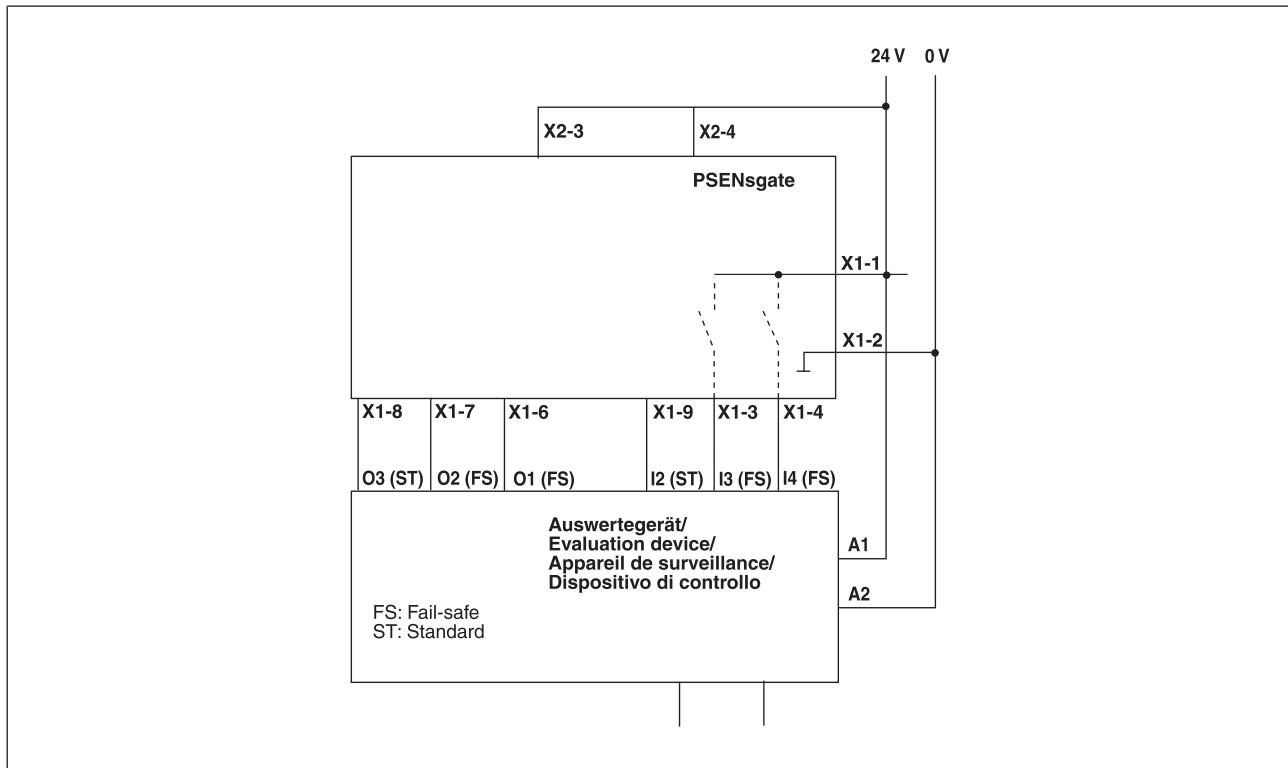
## Single connection



## INFORMATION

When the solenoid is operated in single-channel, only a safety level of PL d (Cat. 2) can be achieved.

To achieve PL e (Cat. 4), the solenoid must have dual-channel operation, e.g. via safe pulsed semiconductor outputs with high current load capacity (0.9 A for 50 ms).



## 5.10 Series connection



### CAUTION!

#### Extension of delay-on de-energisation

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

The max. delay-on de-energisation is 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



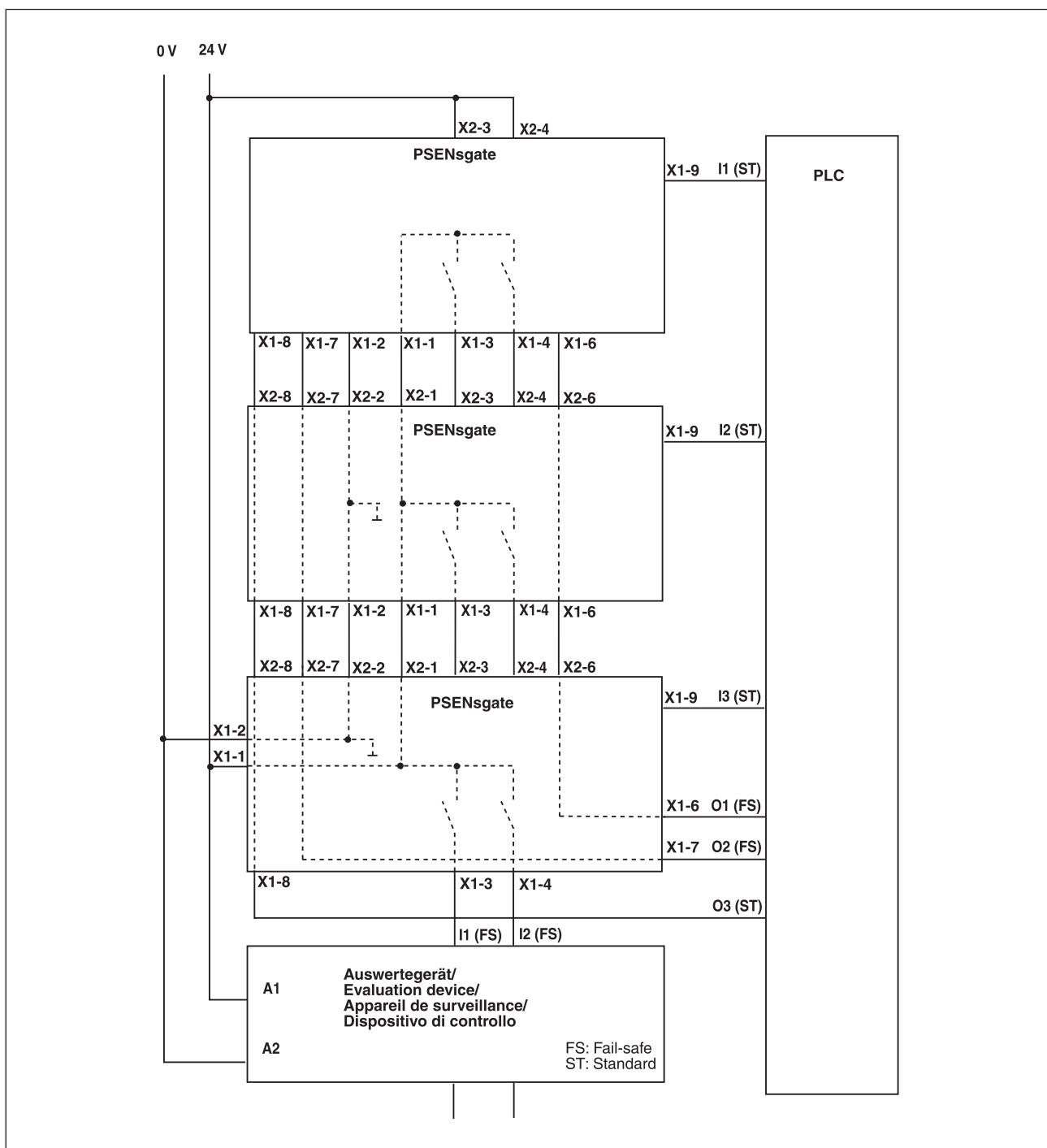
### INFORMATION

When the solenoid is operated in single-channel, only a safety level of PL d (Cat. 2) can be achieved.

To achieve PL e (Cat. 4), the solenoid must have dual-channel operation.

For applications with single-channel operation of the solenoid (up to PL d) a momentarily overloadable safe output (1.8 A for 50 ms) can be used.

The device can be switched in series with all safety switches from Pilz. The maximum switching current of the solenoid is present only while switching the solenoids for about 50 ms. The solenoids of the safety switches are switched with a low time offset of ca. 1 s, to avoid power surges at the evaluation device.



## 6

## Installation

- ▶ When installing make sure you comply with the requirements of EN ISO 14119.
- ▶ The safety switch and handle unit with actuator should be installed opposite each other in parallel.
- ▶ The safety switch and handle unit with actuator should be secured only with socket head cap screws M5 - DIN EN ISO 4762.



### NOTICE

It must not be possible to operate or remove the handle unit from inside the danger zone. Protect the handle unit from access, e.g. by covers on the hazard side of the door.



### INFORMATION

The handle unit should be protected from unauthorised removal and from contamination.



### CAUTION!

Safety switch and handle unit

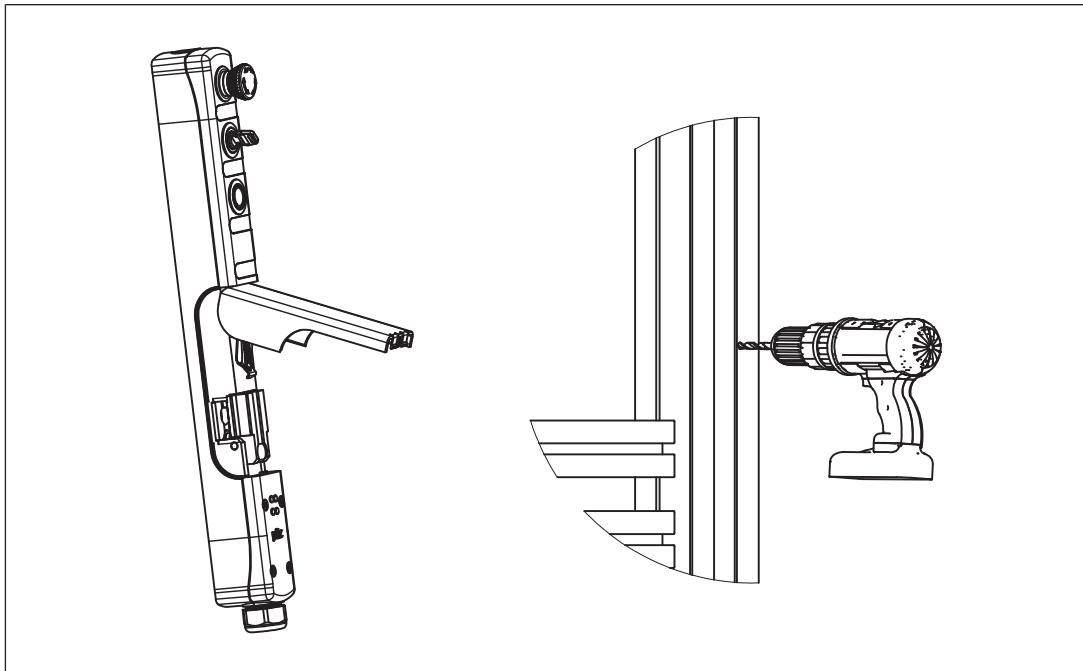
- Should not be exposed to heavy shock or vibration
- Should not be used as a limit stop

## 6.1

### Initial installation of safety switch

- ▶ On swing gates and revolving gates:
  - Open the cover for the escape release in the direction of opening and remove it.
  - Prepare 9 mm hole for the escape release and attach profile nuts to the aluminium profile (see also [Dimensions for the drill holes](#) [37]).

The escape release does not require a drill hole.



#### NOTICE

The escape release does not work on sliding gates. The PSEN sg2c may only be used on sliding gates if the risk analysis shows that nobody can become trapped in the danger zone.

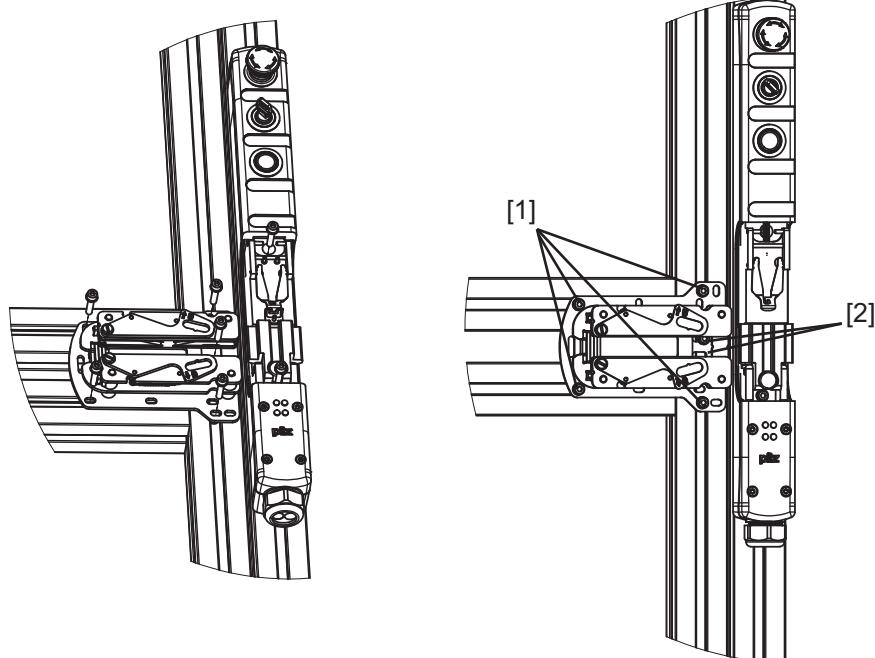
- ▶ Align actuator guide plate and safety switch. Please note the distance between the handle unit and the safety switch (see chapter [Adjustment \[39\]](#)).
- ▶ Fix actuator guide plate and safety switch with M5 - DIN EN ISO 4762 - socket head cap screws (hexagon socket, e.g.: Bossard: BN3 (without shaft), galvanised blue, torque setting  $M_a = 5 \text{ Nm}$ ). Use washer M5 - DIN125A (e.g.: Bossard: BN 715, galvanised blue, dimension:  $10 \times 5.3 \times 1$ ) for this.  
The fixing screws on the safety switch are located under the cover of the escape release. Use an appropriate screw adhesive (e.g. Loctite 2700) to protect the socket head cap screws from working loose.

**WARNING!**

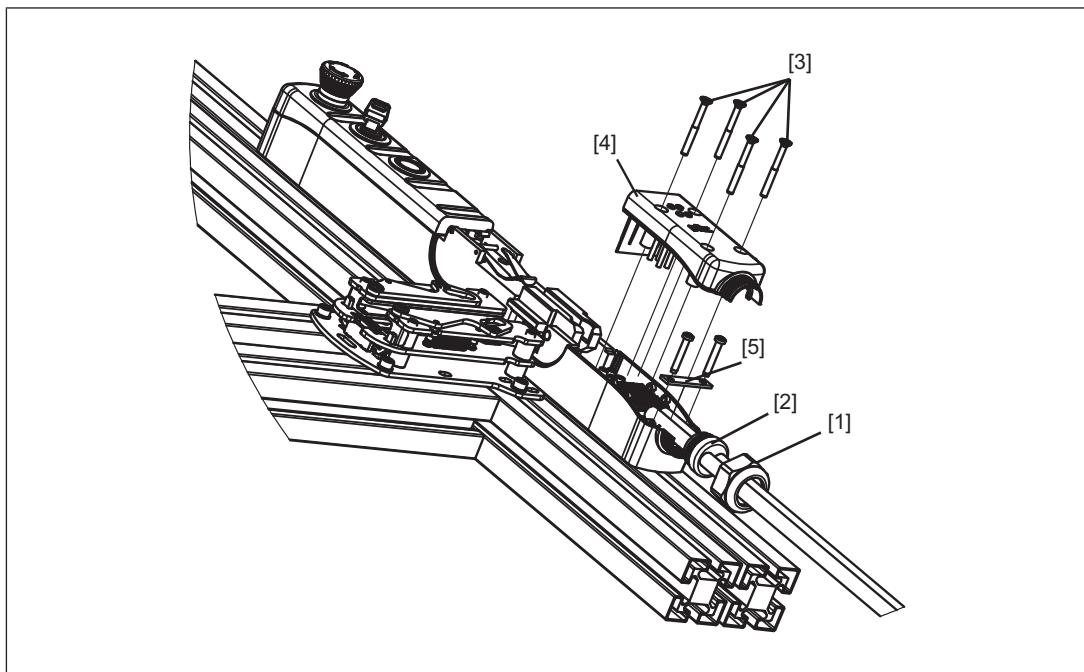
**Risk of manipulation of the safety device if the actuator guide plate is not secured permanently!**

If the actuator guide plate is not secured permanently, there is a risk that the safety function will be defeated through manipulation. Depending on the application, serious injury or death may result.

- If the actuator guide plate is installed using only the unprotected screws [1] accessible from the side, then one-way screws must be used for manipulation protection.
- If the screws used under the bolt tongue [2] are protected against manipulation, then this is not necessary.



- ▶ Unscrew the pressure screw [1] from the housing and remove the rubber seal [2].
- ▶ Thread the cable through the correctly oriented pressure screw and the rubber seal, remove the blind insert if necessary.
- ▶ Remove the countersunk screws [3] on the housing cover for the connection terminals and slowly remove the housing cover [4]. In doing so, the spring mechanism moves the cover of the escape release upwards.
- ▶ Unscrew the strain relief plate [5].
- ▶ Connect and insert connection terminals.
- ▶ Position cable and screw on the strain relief plate (torque setting Ma 0.9 Nm +/- 0.1 (8 in-lbs)).
- ▶ Fix housing cover with screws (torque setting Ma 1.7 Nm +/- 0.1 (15 in-lbs)).
- ▶ Move the rubber seal along the cables and position it in the housing.
- ▶ Screw pressure screw on the thread.

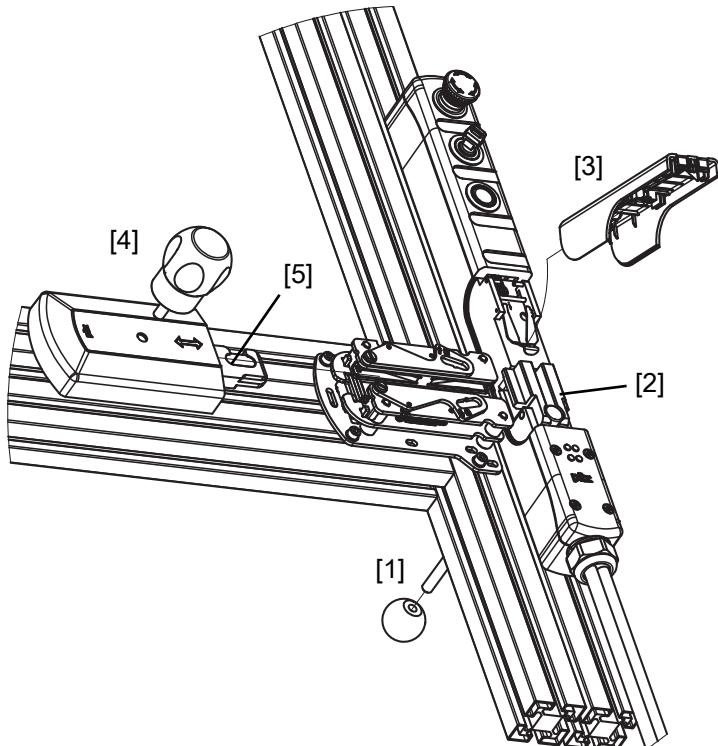


- ▶ Insert the escape or auxiliary release pin [1] into the safety switch and push it right to the back. The swivel piece [2] must be maintained in a vertical position, safe from the escape or auxiliary release pin. Screw the ball head on to the escape release pin. Check the escape release for ease of movement. Fold down the cover on the escape release ② and lock into position.
- ▶ Screw the ball handle [4] into the handle unit, lock the bolt tongue of the handle unit [5] into position in the actuator guide plate. (See section entitled [Initial installation of handle unit](#) [33])



#### INFORMATION

If the escape or auxiliary release pin is not inserted into the swivel piece correctly, commissioning of the PSEN sg2c will be aborted and an error code will be issued.



**WARNING!****Loss of safety function due to the incorrect installation of the escape release!**

If the escape release pin is accessible from the outside, the guard locking device can be released from the outside and the safety gates opened, although the hazardous machine is switched on.

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

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

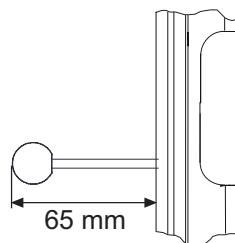
It is also important to refer to the maintenance instructions (see chapter entitled Maintenance)

**Shorten the escape release pin**

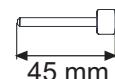
The escape release pin can be shortened, if required, so that it does not extend too much into the danger zone.

**NOTICE**

Inside the danger zone, the escape release pin must protrude at least 65 mm from the profile. After installation, the escape release must be checked for proper operation. When shortening the escape release pin, the material of the escape release must not exceed a temperature of 100 °C



Pin for escape release  
with ball handle



Pin for auxiliary release

If the escape release is not to be used, the escape release pin can be shortened to a length of 45 mm and then be used for the auxiliary release. The auxiliary release pin is also available as an accessory (see order references for [Accessories](#) [51]).

**NOTICE**

Please note that the escape release pin must not be shorter than 45 mm, to guarantee the full holding force.

## 6.2

### Initial installation of handle unit

- ▶ Check whether the present bolt tongue is correctly oriented at the handle unit. Standard is right-hand door hinge at delivery (leave of the door opens to the right).
- ▶ Coat the thread of the ball handle with screw adhesive (e.g. Loctite 2700) and screw firmly together with the handle unit by hand.

#### Install bolt tongue with handle unit:

- ▶ Remove the screw blocking the spring-loaded limit stop mechanism (see illustration "Handle unit and actuator with screw").
- ▶ Position the screwdrivers in the slots provided on the limit stop mechanism (see illustration "Unlock bolt").
- ▶ Press screwdriver towards the base plate to release the spring-loaded limit stop mechanism.
- ▶ Engage bolt tongue with handle unit in the actuator guide.
- ▶ Ensure by moving backwards and forwards towards the limit stop that the handle unit cannot be removed from the actuator guide.
- ▶ Re-attach the screw with a torque setting of 2 Nm +/-0.1. Use an appropriate screw adhesive (e.g. Loctite 2700) to protect the screw from working loose.

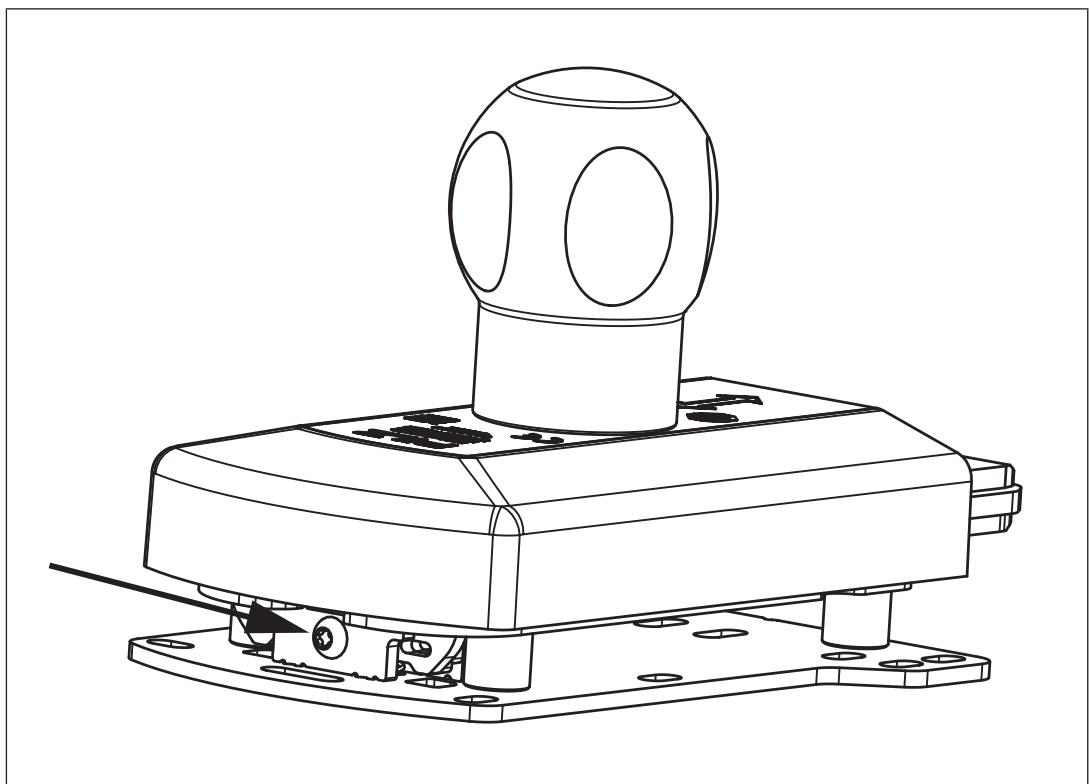


Fig.: Handle unit and actuator with screw

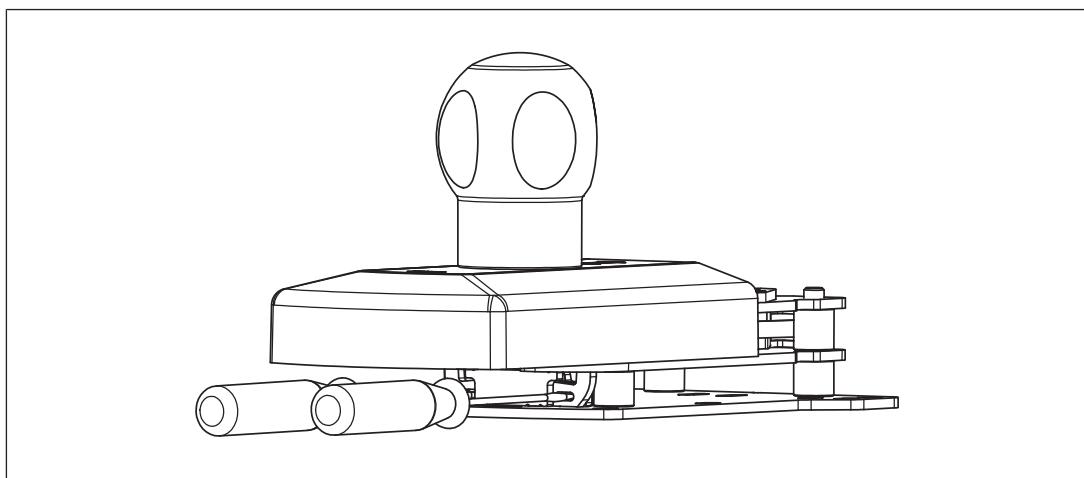


Fig.: Unlock bolt

## 6.3

### Second installation of safety switch and handle unit / upgrade for left-hinged gates

- ▶ Remove the screw blocking the spring-loaded limit stop mechanism (see illustration in previous section "Handle unit and actuator with screw").
- ▶ Uninstall the safety switch from the installation site (compare steps in section entitled [Initial installation of safety switch](#) [28] in reverse order).
- ▶ Uninstall handle unit from the gate. To do this, position the screwdrivers in the slots provided on the limit stop mechanism (see graphic "Unlock bolt").
- ▶ Press screwdriver towards the base plate to release the spring-loaded limit stop mechanism.
- ▶ Disengage bolt tongue with handle unit in the actuator guide.
- ▶ Remove exposed fixing screws.
- ▶ Unscrew ball handle from the handle unit.
- ▶ Remove the cover of the handle unit from the bolt tongue (2 countersunk screws).
- ▶ Take limit stop from the bolt tongue and insert it from the other side into the location hole.
- ▶ Turn bolt tongue around its longitudinal axis and screw together with the cover of the handle unit.
- ▶ Carry out the steps from the sections entitled [Initial installation of handle unit](#) [33] and [Initial installation of safety switch](#) [28].

## 6.4

### Labelling the pushbuttons

Colour covers are supplied with the unit PSEN sg2c-5CCLLE; these must be attached to the pushbuttons, based on their function (see also order references for Accessories).

- ▶ Press the colour covers into the pushbuttons in accordance with the required function.  
The colour covers lock into position on the pushbuttons.



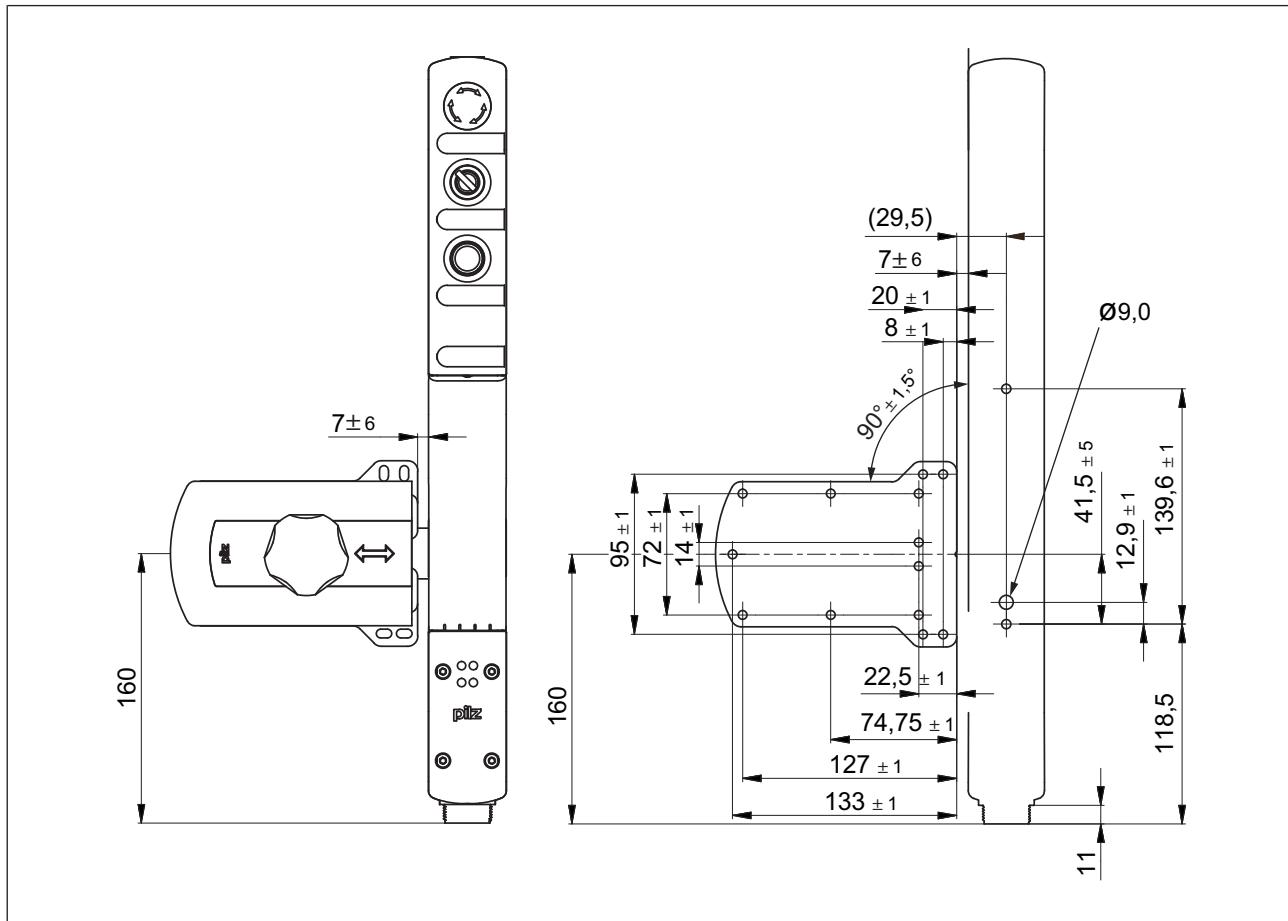
#### NOTICE

The safety switch may only be operated with colour covers correctly locked into position. Once the colour covers have locked into position, they can no longer be removed.

The fields below the pushbuttons can be used for inscribing the pushbuttons. The pushbuttons can be written with a lettering device for 12 mm lettering band or with 32 x 10 mm labels (e.g. Avery(R) article number: 3320).

## 6.5 Dimensions in mm

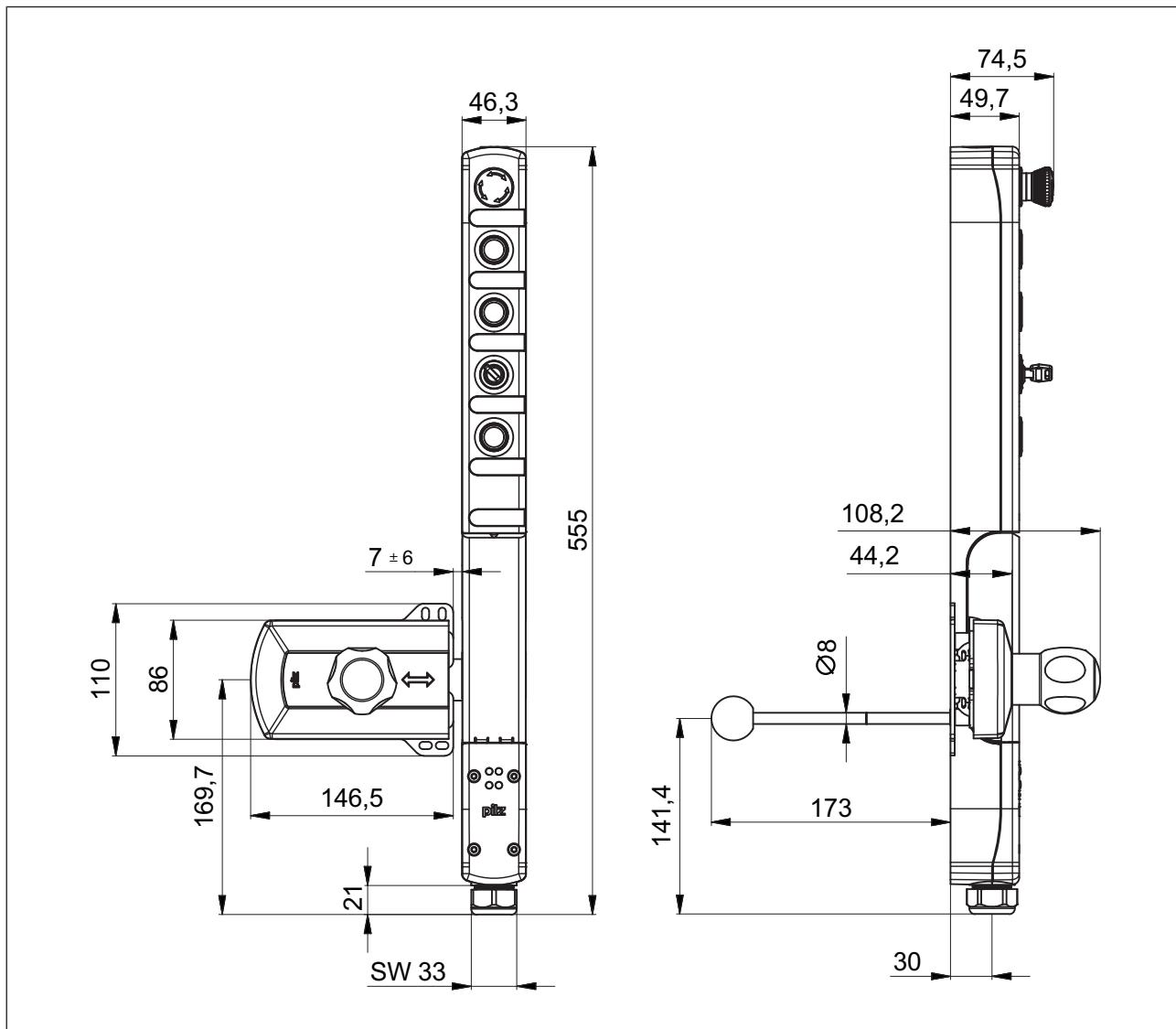
### 6.5.1 Drill holes



The bore diameter for all drill holes = M5.

Exception: Drill hole for the escape release (see value stated in the drawing).

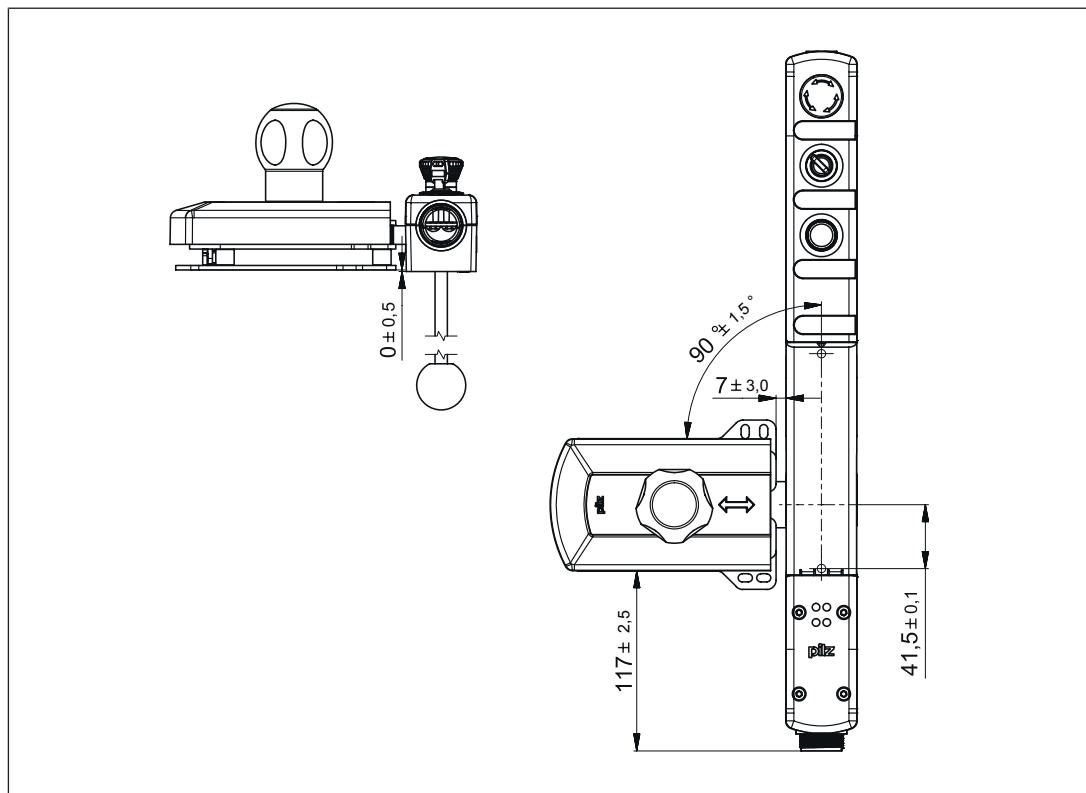
## 6.5.2 Unit



## 7

## Adjustment

- ▶ Make sure that the safety switch and handle unit with actuator are aligned correctly and that the distances are maintained, as stated in the drawing, otherwise the correct functionality is not guaranteed.
- ▶ Always check the function of the safety switch in conjunction with the handle unit with actuator, using one of the approved evaluation devices.



## 8

# Maintenance

Maintenance of the escape release:

- ▶ Check the correct functionality of the escape release at least every once per month.  
When dust, humidity, chemical or dirt exposure is high we recommend that you keep to shorter intervals.  
Please note that the cover of the escape release must also be checked for damage and then re-installed.
- ▶ Clean the escape release and the bolt tongue and test their mobility.
- ▶ If there are signs of wear on the safety switch or the mechanics are sluggish, check that the handle unit with actuator is correctly aligned with the switch. If necessary, re-adjust the handle unit with actuator.

Otherwise no maintenance work needs to be performed on the interlocking and guard locking system PSEN sg2c-5CCLLE. Please return any faulty devices to Pilz.

## 9

# Operation



## NOTICE

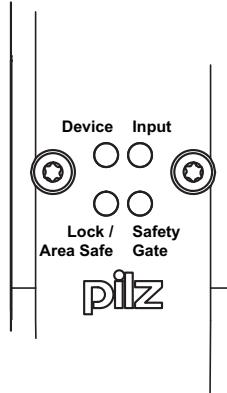
The safety functions should be checked after initial commissioning and each time the plant/machine is changed. The safety functions may only be checked by qualified personnel.

### Teaching in the actuator

Any corresponding Pilz actuator is detected as soon as it is brought into the response range.

### Status indicators

- ▶ "Device" LED illuminates green: The unit is ready for operation
- ▶ "Safety Gate" LED lights up yellow: Bolt tongue is engaged
- ▶ "Input" LED lights up yellow: Input circuits are closed or a HIGH signal is present
- ▶ "Lock / Area safe" LED illuminates blue: The guard locking element is engaged in the bolt tongue, guard locking is active. Signals X1-6 and X1-7 (or X2-6 and X2-7) are present.
- ▶ "Lock / Area safe" LED illuminates green: The guard locking element is engaged in the bolt tongue, guard locking is active. Signals X1-6 and X1-7 (or X2-6 and X2-7) are not present.



### Pushbutton status indicators

- ▶ Pushbutton LED [3] can be used depending on the application. It is operated via the input (see Terminal assignment) by applying an external +24 VDC.
- ▶ Pushbutton LED [4] can be used depending on the application. It is operated via the input (see Terminal assignment) by applying an external +24 VDC.

## 9.1

## Status table

This table shows the change of states of the inputs and outputs and the LEDs when switching from the "Lock" operating mode to the "Interlock" operating mode.

		Operating mode											
		Power on											
Release	Lock	Gate closed											
		---	---	---	---	---	---	---	---	---	---	---	---
		✓	✓	---	---	24 V	0 V	0 V	24 V	0 V	---	---	---
		✓	✓	✓	✓	---	24 V	0 V	24 V	24 V	0 V	---	---
		✓	✓	✓	✓	24 V							
		---	---	---	---	24 V	0 V	0 V	24 V	24 V	---	---	---
		---	---	---	---	24 V	0 V	0 V	24 V	24 V	---	---	---

### Legend

-  LED on
-  LED flashes
-  LED off
- No

## 9.2 Remedy

Fault conditions are indicated by flashing the LEDs. Some errors are displayed through periodic flashing (see table); with other errors it is possible to establish an error code through the number of flashes.

Fault	Cause	Remedy
Safety switch does not react, LED "Device" does not light	Supply voltage missing/too low	► Check supply voltage and apply 24 V
"Safety Gate" LED flashes a code and "Device" LED flashes red	See section on Error codes	► See section on Error codes
"Device" LED illuminates red	Internal error	► Please contact Pilz
"Input" LED flashes yellow, only one safety output switches	Only one channel of the input circuit is open (partial operation)	► Open both channels of the input circuit and close them again
Only one safety output switches	Only one channel of the input circuit is open, wiring error	► Check wiring of terminals X2-3 and X2-4
Signal output does not switch when actuator is engaged, "SafetyGate" LED does not light up	Actuator not detected	► Insert actuator as far as it will go
Solenoid does not switch	Supply voltage or voltage for solenoid operation is too low, error in the wiring	► Check voltages and apply 24 V, check wiring, ► Increase voltage for solenoid to increase tolerance, ► reduce cable length, ► Use cable with a greater conductor cross section
Solenoid does not switch, "SafetyGate" LED does not light up	Actuator not detected	► Insert actuator as far as it will go
Safety outputs fail to switch, "Lock /Area Safe" LED flashes red	Escape or auxiliary release pin is not correctly in position	► Position the escape or auxiliary release pin as far as it will go ► Perform reset by separating and then re-applying the supply voltage to X1-1 and X1-2 or X2-1 and X2-2
"Device" and "Lock/Area safe" LEDs flash red	Guard locking is active, 24V is present at inputs X2-3 and X2-4, escape or auxiliary release pin has been operated	► Position the escape or auxiliary release pin as far as it will go ► Perform reset by separating and then re-applying the supply voltage to X1-1 and X1-2 or X2-1 and X2-2
"Safety Gate" LED lights up and guard locking element is engaged, but the outputs are not switching.	Wrong actuator, e.g. 1.1-coded actuators with 2.2-coded safety switch	► Insert correct actuator

Fault	Cause	Remedy
When activating the guard locking X1-6 (X2-6), X1-7 (X2-7), X1-8 (X2-8) at 24V or when deactivating the guard locking X1-6 (X2-6) and X1-7 (X2-7), at 24V all the LEDs go out and the system starts up again	Supply voltage or voltage for solenoid operation is too low or wiring error	<ul style="list-style-type: none"> <li>▶ Check voltages and apply 24 V, check wiring,</li> <li>▶ reduce cable length,</li> <li>▶ Use cable with a greater conductor cross section</li> </ul>

### Error codes

Error codes are issued after 90 seconds at the latest at the "Safety Gate" LED. The number of LED flashes corresponds to the error code. The error code consists of one digit. (4 x flashing: error code 4). The flashing sequence is constantly repeated and separated from each other by longer periods.

Error code	Description	Remedy
1	Short circuit to 0 V DC on at least one of the two safety outputs X1-3 and X1-4	Check the wiring of terminals X1-3 and X1-4, rectify the wiring error, then perform reset by separating and then reapplying the supply voltage to X1-1 and X1-2 or X2-1 and X2-2
2	During operation, short circuit between safety output X1-3 and 24 V DC	Rectify the wiring error at terminal X1-3, then perform reset by separating and then reapplying the supply voltage to X1-1 and X1-2 or X2-1 and X2-2
3	During operation, short circuit between safety output X1-4 and 24 V DC	Rectify the wiring error at terminal X1-4, then perform reset by separating and then reapplying the supply voltage to X1-1 and X1-2 or X2-1 and X2-2
4	At least one of the two safety outputs X1-3 and X1-4 have voltage applied during system run-up	Check the wiring of terminals X1-3 and X1-4, rectify the wiring error, then perform reset by separating and then reapplying the supply voltage to X1-1 and X1-2 or X2-1 and X2-2

## 10 Technical details

<b>General</b>	
Certifications	<b>CE, FCC, TÜV, UKCA, cULus Listed</b>
Sensor's mode of operation	<b>Transponders</b>
Coding level in accordance with EN ISO 14119	<b>Low</b>
Design in accordance with EN ISO 14119	<b>4</b>
Pilz coding type	<b>coded</b>
<b>Transponders</b>	
Frequency band	<b>122 kHz - 128 kHz</b>
Max. transmitter output	<b>15 mW</b>
<b>Electrical data</b>	
Supply voltage	
Voltage	<b>24 V</b>
Kind	<b>DC</b>
Voltage tolerance	<b>-15 %/+10 %</b>
Output of external power supply (DC)	<b>2 W</b>
Max. inrush current at UB	<b>5 A</b>
Max. switching frequency	<b>1 Hz</b>
Magnet. supply voltage	<b>24 V</b>
Max. solenoid current for t < 150 ms	<b>1,5 A</b>
Max. cable capacitance at the safety outputs	
No-load, PNOZ with relay contacts	<b>40 nF</b>
PNOZmulti, PNOZelog, PSS	<b>70 nF</b>
Max. inrush current impulse	
Current pulse, A1	<b>5 A</b>
Pulse duration, A1	<b>0,0002 ms</b>
Max. unit fuse protection in accordance with UL	<b>3 A</b>
<b>Inputs</b>	
Quantity	<b>2</b>
Input voltage in accordance with EN 61131-2 Type 2	<b>24 V DC</b>
Current per input	<b>5 mA</b>
<b>Emergency stop</b>	
Number of N/C contacts	<b>2</b>
E-STOP release type	<b>Turn release</b>
Utilisation category	
in accordance with the standard	<b>EN 60947-5-1</b>
AC15 at	<b>24 V</b>
Current	<b>1,5 A</b>
DC13 at	<b>24 V</b>
Current	<b>1,5 A</b>
Mechanical life	<b>6050 cycles</b>
Signal outputs	
Output voltage	<b>24 V</b>
Max. current	<b>100 mA</b>

<b>Semiconductor outputs</b>	
OSSD safety outputs	<b>2</b>
Signal outputs	<b>2</b>
Switching current per output	<b>500 mA</b>
Breaking capacity per output	<b>12 W</b>
Residual current at "0" signal	<b>0,5 mA</b>
Short circuit-proof	<b>Yes</b>
<b>Pushbutton</b>	
Utilisation category	
in accordance with the standard	<b>EN 60947-5-1</b>
Contacts, AC12 at	<b>24 V</b>
Max. current	<b>0,1 A</b>
Contacts, DC12 at	<b>24 V</b>
Max. current	<b>0,1 A</b>
Mechanical life	<b>1,000,000 cycles</b>
Contact material	<b>AgNi</b>
<b>Times</b>	
Max. test pulse duration, safety outputs	<b>450 µs</b>
Switch-on delay	
after UB is applied	<b>1,1 s</b>
Inputs typ.	<b>15 ms</b>
Inputs max.	<b>20 ms</b>
Actuator typ.	<b>90 ms</b>
Actuator max.	<b>120 ms</b>
Delay-on de-energisation	
Inputs typ.	<b>15 ms</b>
Inputs max.	<b>20 ms</b>
Actuator typ.	<b>30 ms</b>
Actuator max.	<b>260 ms</b>
Supply interruption before de-energisation	<b>20 ms</b>
<b>Environmental data</b>	
Temperature of metal surface at ambient temperature: 25 °C	<b>40 °C</b>
Ambient temperature	
in accordance with the standard	<b>EN 60068-2-14</b>
Temperature range	<b>-20 - 55 °C</b>
Storage temperature	
in accordance with the standard	<b>EN 60068-2-1/2</b>
Temperature range	<b>-25 - 70 °C</b>
Climatic suitability	
in accordance with the standard	<b>EN 60068-2-78</b>
Humidity	<b>93 % r. h. at 40 °C</b>
EMC	<b>EN 55011: class A, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8</b>

**Environmental data**

## Vibration

in accordance with the standard	<b>EN 60068-2-6</b>
Frequency	<b>10 - 55 Hz</b>
Amplitude	<b>1 mm</b>

## Shock stress

in accordance with the standard	<b>EN 60068-2-27</b>
Acceleration	<b>30g</b>
Duration	<b>11 ms</b>

## Airgap creepage

Overvoltage category	<b>III</b>
Pollution degree	<b>3</b>

## Rated insulation voltage

**30 V**

## Rated impulse withstand voltage

**1 kV**

## Protection type

Housing	<b>IP54</b>
in accordance with UL	<b>type 1</b>

**Operating distances**

Assured operating distance Sao	<b>2 mm</b>
Min. operating distance Somin	<b>3 mm</b>
Typical operating distance So	<b>3 mm</b>
Assured release distance Sar	<b>4 mm</b>
Change of operating distance with temperature changes	<b>+0,01mm/°C</b>
Typ. hysteresis	<b>0,1 mm</b>

**Mechanical data**

Escape release available	<b>Yes</b>
Mechanical life	<b>200,000 cycles</b>
Max. holding force FZh in closing direction	<b>1000 N</b>
Max. holding force FZh in pan direction	<b>2000 N</b>
Max. vertical offset	<b>+/-2,5 mm</b>
Max. lateral offset	<b>+/-3,0 mm</b>
Max. angular offset	<b>+/-1,5 deg</b>
Max. retract speed of actuator	<b>0,5 m/s</b>
Actuator 1	<b>PSEN sg2 actuator</b>
Connection type	<b>Spring-loaded terminal, plug-in</b>
Cable	<b>LiYY 24 x 0.5 mm<sup>2</sup></b>
Material	
Top	<b>Plastic</b>
Actuator	<b>Stainless steel</b>
Dimensions	
Height	<b>555 mm</b>
Width	<b>200 mm</b>
Depth	<b>108 mm</b>

### Mechanical data

#### Actuator dimensions

Height	<b>110 mm</b>
Width	<b>195 mm</b>
Depth	<b>108 mm</b>
Weight of actuator	<b>1.390 g</b>
Weight	<b>2.670 g</b>

Where standards are undated, the 2022-11 latest editions shall apply.

## 11

## Classification according to ZVEI, CB24I

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

### Inputs

Drain	Source
Safety switch	C2

Drain parameters	Min.	Typ.	Max.
Test impulse duration	-	-	500 µs
Input resistance	6,6 kOhm	-	
Capacitive load	-	-	68 nF

### Safe 1-pole HL outputs

Source	Drain
Safety switch	C2

Source parameters	Min.	Typ.	Max.
Test impulse duration	-	-	450 µs
Rated current	-	-	0,5 A
Capacitive load	-	-	68 nF

## 12 Safety characteristic data

Operating mode	EN ISO 13849-1: 2015	EN ISO 13849-1: 2015	EN ISO 13849-1: 2015	EN ISO 13849-1: 2015	EN ISO 13849-1: 2015	Mechan. service life [cycles]
	PL	Category	PFH <sub>D</sub> [1/h]	T <sub>M</sub> [year]	B10 <sub>D</sub>	
1-ch. guard locking	PL d	Cat. 2	6,24E-09	20	-	200,000 cycles
2-ch. guard locking	PL e	Cat. 4	5,17E-10	20	-	200,000 cycles
Emergency stop	-	-	-	-	75.000	6050 cycles
2-ch. OSSD	PL e	Cat. 4	4,38E-09	20	-	200,000 cycles



### 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.

## 13 Order reference

### 13.1 Unit

Product type	Features	Order no.
PSEN sg2c-5CCLLE unit	Safety gate system (transponder technology) with safe interlocking and safe guard locking, 2 pushbuttons illuminated, 1 E-STOP pushbutton	570836

### 13.2 Safety switch

Product type	Features	Order no.
PSEN sg2c-5CCLLE switch	Safety switch, 2 pushbuttons illuminated, 1 E-STOP pushbutton	570837

### 13.3 Handle unit with actuator

Product type	Features	Order no.
PSEN sg2c actuator	Handle unit with actuator	570890

### 13.4 Accessories

Product type	Features	Order no.
PSEN sg2 cover	Escape release cover	570773
PSEN sg2c Set spring loaded terminals	Connection terminals, rubber seal, pressure screw	570777
PSEN sg escape release pin	Pin for escape release	570870
PSEN sg auxiliary release pin	Pin for auxiliary release	570871
PSEN sg color covers (pushbutton)	Colour covers for illuminated buttons	570875

## 14 Supplementary data

### 14.1 Radio approval

USA/Canada

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

FCC/IC-Requirements:

This product complies with Part 15 of the FCC Rules and with Industry Canada licence-exempt RSS standards. Operation is subject to the following two conditions:

- 1) this product may not cause harmful interference, and
- 2) this product must accept any interference received, including interference that may cause undesired operation.

Changes or modifications made to this product not expressly approved by Pilz may void the FCC authorization to operate this equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Le présent produit est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) le produit ne doit pas produire de brouillage, et
- (2) l'utilisateur de le produit doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

### 14.2 EC declaration of conformity

This product/these products meet the requirements of the directive 2006/42/EC on 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](http://www.pilz.com/downloads).

Representative: Pilz GmbH & Co. KG, Felix-Wankel-Str. 2, 73760 Ostfildern, Germany

## 15

## 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](http://www.pilz.com/downloads).

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