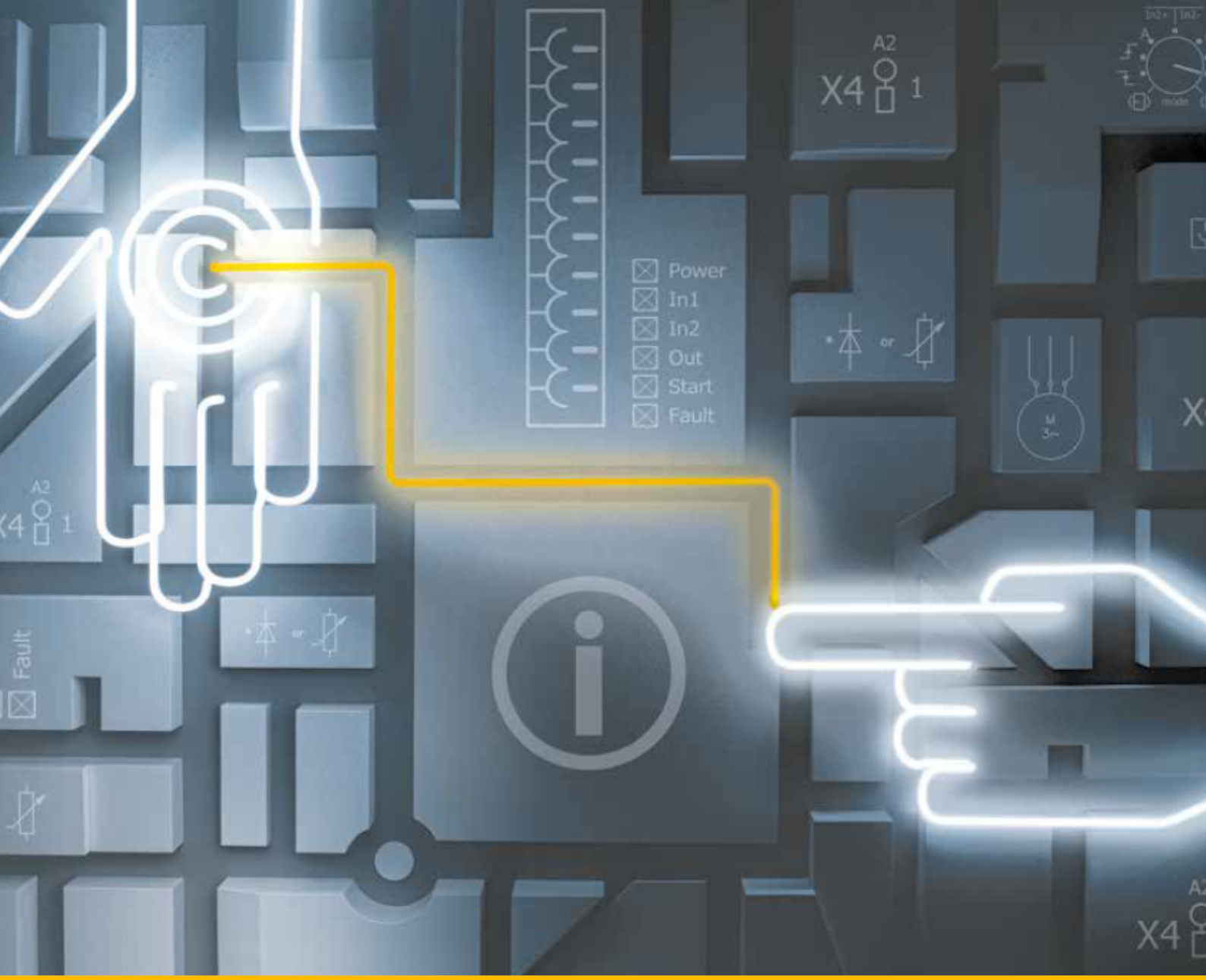


PNOZ 16SP

PILZ
THE SPIRIT OF SAFETY

Operating Manual-19900-EN-08
- Safety relays




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.

Introduction

Validity of documentation

This documentation is valid for the product PNOZ 16SP. 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.

Using the documentation

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

Definition of symbols

Information that is particularly important is identified as follows:

DANGER!

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

WARNING!

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

CAUTION!

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

NOTICE

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

INFORMATION

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

Safety

Intended use

The safety relay PNOZ 16SP provides a safety-related interruption of a safety circuit.

The safety relay meets the requirements of EN 60947-5-1 and EN 60204-1 and may be used in applications with:

- E-STOP pushbuttons
- Safety gates
- Pressure sensitive mats
- Pressure sensitive edges

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 [16]).

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.

Safety regulations

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 IEC 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.

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.

Warranty and liability

All claims to warranty and liability will be rendered invalid if

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

Disposal

- In safety-related applications, please comply with the mission time T_M in the safety-related characteristic data.
- When decommissioning, please comply with local regulations regarding the disposal of electronic devices (e.g. Electrical and Electronic Equipment Act).

For your safety

The unit meets all the necessary conditions for safe operation. However, please note the following:

- Note for overvoltage category III: If voltages higher than low voltage (>50 VAC or >120 VDC) are present on the unit, connected control elements and sensors must have a rated insulation voltage of at least 250 V.

Unit features

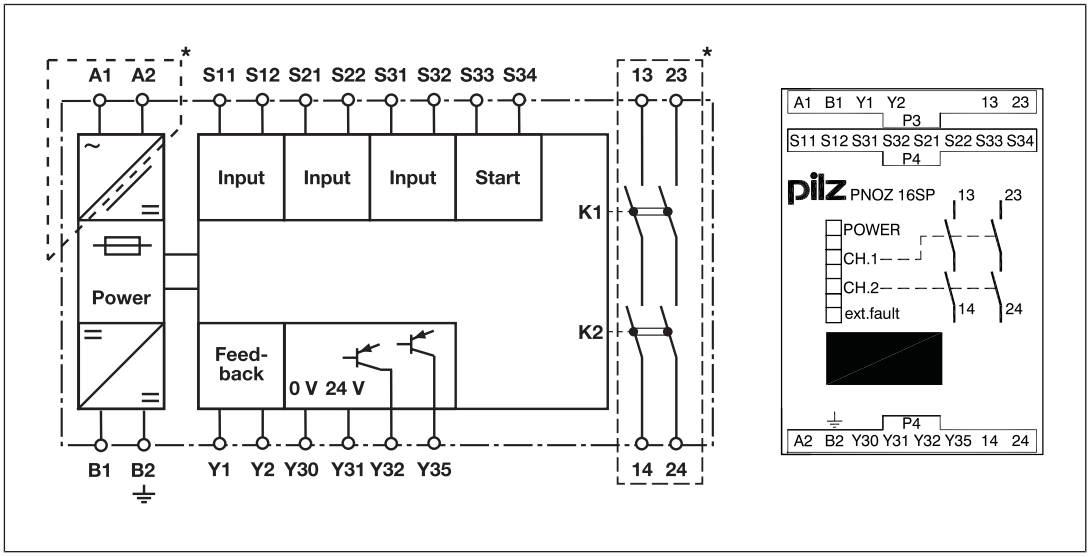
- Positive-guided relay outputs:
  - 2 safety contacts (N/O), instantaneous
- 2 semiconductor outputs
- Connection options for:
  - E-STOP pushbuttons
  - Safety gate limit switches
  - Start button
  - Pressure sensitive edges
  - Pressure sensitive mats
- LED indicator for:
  - Supply voltage
  - Switch state of the safety contacts
  - Detection of shorts across contacts, pressure sensitive mat
- Semiconductor outputs signal:
  - Supply voltage is present, no short across contacts
  - Switch state of the safety contacts
- See order reference for unit types

Safety features

The safety relay meets the following safety requirements:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The correct opening and closing of the safety function relays is tested automatically in each on-off cycle.

Block diagram/terminal configuration



*Insulation between the non-marked area and the relay contacts: Basic insulation (overvoltage category III), Protective separation (overvoltage category II)

Function Description

The safety relay PNOZ 16P provides a safety-oriented interruption of a safety circuit. When supply voltage is supplied the "POWER" LED is lit. The unit is ready for operation when the feedback loop Y1-Y2 and the start circuit S33-S34 are closed.

- Input circuit is closed (e.g. E-STOP pushbutton not operated):
  - The LEDs "CH.1" and "CH.2" are lit.
  - Safety contacts 13-14 and 23-24 are closed. The unit is active.
  - A high signal is present at the semiconductor output switch state Y32.
- Input circuit is opened (e.g. E-STOP pushbutton operated):
  - The LEDs "CH.1" and "CH.2" go out.
  - Safety contacts 13-14 and 23-24 are redundantly opened.
  - A low signal is present at the semiconductor output switch state Y32.

Semiconductor output short across contact Y35

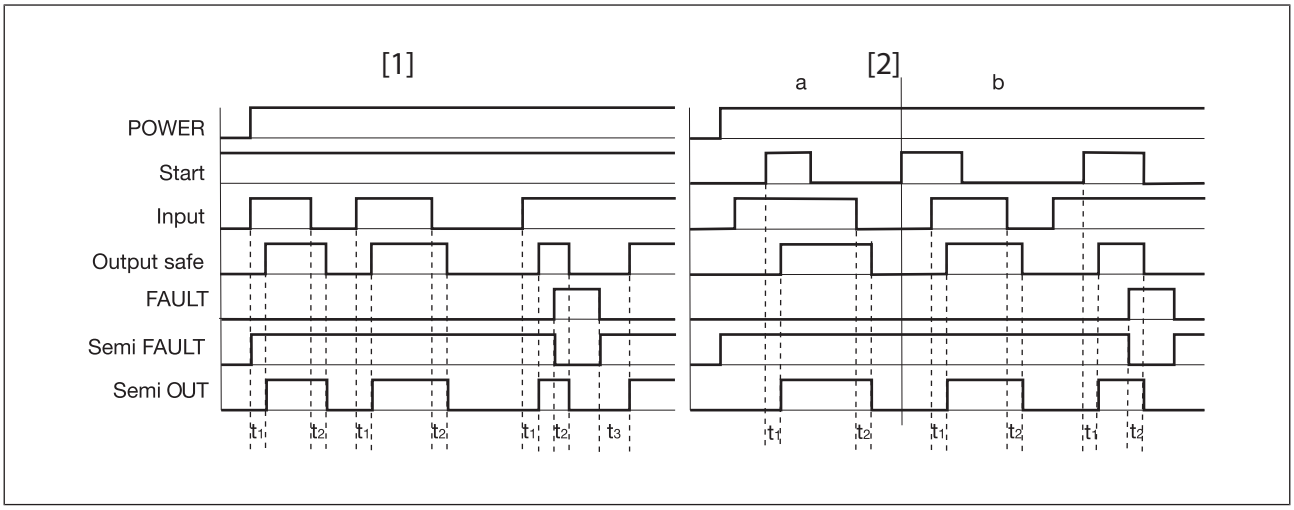
- A high signal is present at semi-conductor output Y35 if the supply voltage is present and the internal fuse has not blown.

Operating modes

- Single-channel operation: No redundancy in the input circuit, earth faults in the start and input circuit are detected.
- Dual-channel operation with detection of shorts across contacts: Redundant input circuit, PNOZ 16SP detects
  - earth faults in the start and input circuit,
  - short circuits in the input circuit,
  - shorts across contacts in the input circuit.

- Automatic start: Unit is active once the input circuit has been closed.
- Manual start: Unit is active once the input circuit and the start circuit are closed.
- Operating with pressure sensitive mat: When the pressure sensitive mat is actuated, a short is formed between the inputs and internal fault detection is energised. Safety contacts open and the "EXT.FAULT" LED is lit. If the pressure sensitive mat is cleared and supply voltage is maintained, the unit is ready for operation again once the recovery time has elapsed.
- Increase in the number of available contacts by connecting contact expandsion modules or external contactors/relays.

Timing diagram



Legend

- Power: Supply voltage
- Start: Start circuit
- Input: Input circuit
- Output safe: Safety contacts
- Semi FAULT: Semiconductor output short across contact
- Semi OUT: Semiconductor output switch state
- FAULT: Short across contacts in the input circuit due to actuation of pressure sensitive mat
- [1]: Automatic start
- [2]: Manual start
- a: Input circuit closes before start circuit
- b: Start circuit closes before input circuit
- t_1: Switch-on delay
- t_2: Delay-on de-energisation
- t_3: Recovery time after short across contacts

Installation

- The unit should be installed in a control cabinet with a protection type of at least IP54.
- Use the notch on the rear of the unit to attach it to a DIN rail (35 mm).
- When installed vertically: Secure the unit by using a fixing element (e.g. retaining bracket or end angle).

Wiring

Please note:

- Information given in the "Technical details [16]" must be followed.
- The outputs 13-14, 23-24 are safety contacts.
- Do not connect undesignated terminals.
- To prevent contact welding, a fuse should be connected before the output contacts (see Technical details [16]).
- Calculation of the max. cable length l_{max} in the input circuit:

$$l_{max} = \frac{R_{lmax}}{R_l / km}$$

R_{lmax} = max. overall cable resistance (see Technical details [16])
R_l / km = cable resistance/km

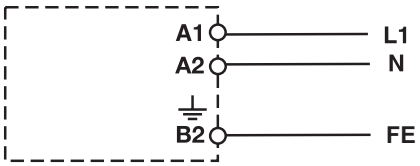
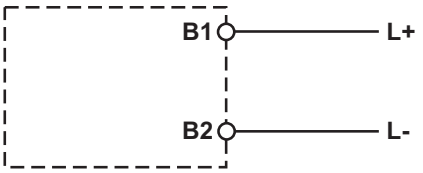
- Use copper wiring with a temperature stability of 60/75 °C.
- To prevent EMC interferences (particularly common-mode interferences) the measures described in EN 60204-1 must be executed. This includes the separate routing of cables of the control circuits (input, start and feedback loop) from other cables for energy transmission or the shielding of cables, for example.
- Do not switch low currents using contacts that have been used previously with high currents.
- Adequate protection must be provided on all output contacts with capacitive and inductive loads.
- With a 24 VDC supply voltage via terminals B1, B2, the power supply must comply with the regulations for extra low voltages with safe electrical separation (SELV, PELV).

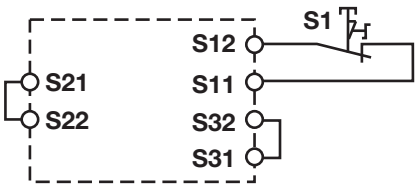
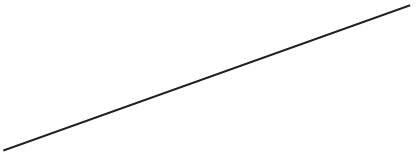
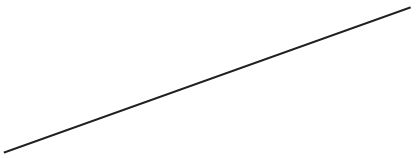
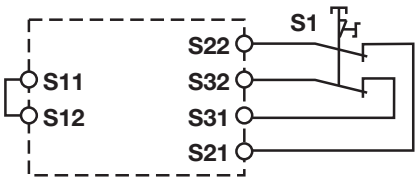
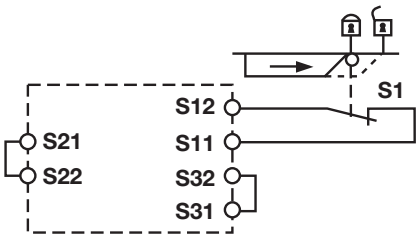
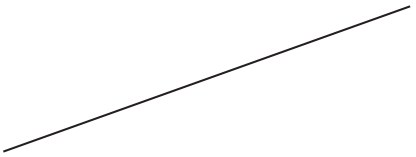
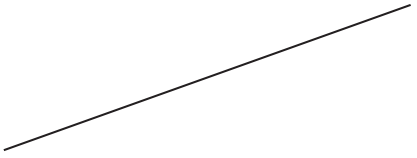
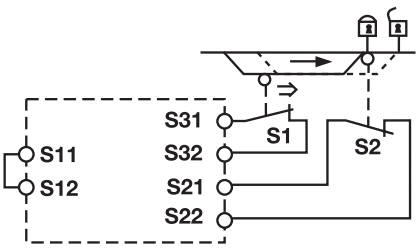
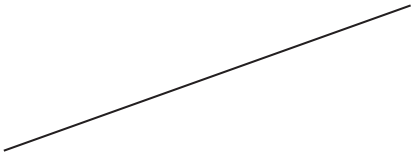
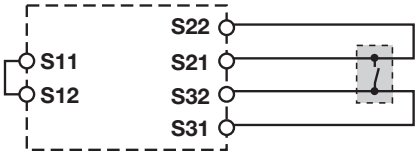
Important for detection of shorts across contacts:

As this function for detecting shorts across contacts is not failsafe, it is tested by Pilz during the final control check. If there is a danger of exceeding the cable length, we recommend the following test once the unit is installed:

1. Unit ready for operation (output contacts closed)
2. Short circuit the test terminals S22, S32 for detecting shorts across the inputs.
3. The unit‘s fuse must be triggered and the output contacts must open. Cable lengths in the scale of the maximum length can delay the fuse triggering for up to 2 minutes.
4. Reset the fuse: Remove the short circuit and switch off the supply voltage for approx. 1 minute.

Preparing for operation

Supply voltage	AC	DC
		

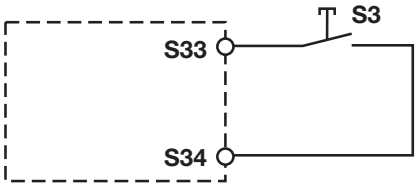
Input circuit	Single-channel	Dual-channel
E-STOP **without** detection of shorts across contacts		
E-STOP **with** detection of shorts across contacts		
Safety gate **without** detection of shorts across contacts		
Safety gate **with** detection of shorts across contacts		
Short circuit-forming pressure sensitive mat/edge		

NOTICE

With single-channel wiring the safety level of your machine/plant may be lower than the safety level of the unit (see Safety characteristic data [📖 25]).

NOTICE

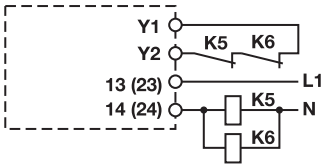
The overall system PNOZ 16SP and the short circuit-forming pressure sensitive mat or edge has to be assessed in accordance with the product standard EN ISO 13856-1 and/or EN ISO 13856-2.

Start circuit	Automatic start	Manual start
		

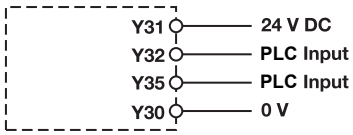
NOTICE

In the event of an automatic start or manual start with bridged start contact (fault):

The unit starts up automatically when the safeguard is reset, e.g. when the E-STOP pushbutton is released. Use external circuit measures to prevent an unexpected restart.

Feedback loop	without feedback loop monitoring	with feedback loop monitoring
Link or contacts from external contactors		

Semiconductor output



Legend

- S1/S2: E-STOP/safety gate switch
- S3: Reset button
- ⇑: Switch operated
- : Gate open
- : Gate closed

Operation

When the relay outputs are switched on, the mechanical contact on the relay cannot be tested automatically. Depending on the operational environment, measures to detect the non-opening of switching elements may be required under some circumstances.

When the product is used in accordance with the European Machinery Directive, a check must be carried out to ensure that the safety contacts on the relay outputs open correctly. Open the safety contacts (switch off output) and start the device again, so that the internal diagnostics can check that the safety contacts open correctly

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

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.

Status indicators

LEDs indicate the status and errors during operation:

LED on

POWER

Supply voltage is present.

CH.1
Safety contacts of channel 1 are closed.

CH.2
Safety contacts of channel 2 are closed.

EXT. FAULT

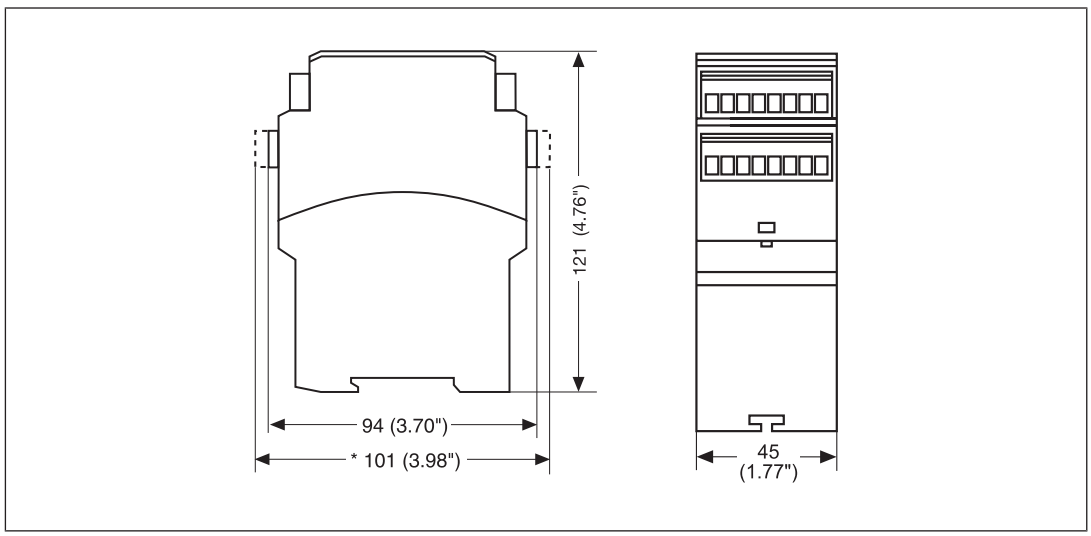
Short across contacts when operating with pressure sensitive mat.

Faults – Interference

- Earth fault: The supply voltage fails and the safety contacts open. Once the cause of the respective fault has been rectified and the supply voltage is switched off for approx. 1 minute, the unit is ready for operation again.
- Contact malfunctions: If the contacts have welded, reactivation will not be possible after the input circuit has opened.
- LED "POWER" does not light: Short circuit or no supply voltage.

Dimensions in mm

* with spring-loaded terminals



Technical details Order no. 777070, 777073, 777075

General	777070	777073	777075
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed	CCC, CE, EAC, TÜV, cULus Listed	CCC, CE, EAC, TÜV, cULus Listed
Electrical data	**777070**	**777073**	**777075**
Supply voltage			
Voltage	24 V	110 V	120 V
Kind	AC	AC	AC
Voltage tolerance	-15 %/+10 %	-15 %/+10 %	-15 %/+10 %
Output of external power supply (AC)	3,5 VA	3,5 VA	3,5 VA
Frequency range AC	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Supply voltage			
Voltage	24 V	24 V	24 V
Kind	DC	DC	DC
Voltage tolerance	-15 %/+10 %	-15 %/+10 %	-15 %/+10 %
Output of external power supply (DC)	2 W	2 W	2 W
Residual ripple DC	20 %	20 %	20 %
Duty cycle	100 %	100 %	100 %
Inputs	**777070**	**777073**	**777075**
Quantity	2	2	2
Voltage at			
Input circuit DC	24 V	24 V	24 V
Start circuit DC	24 V	24 V	24 V
Feedback loop DC	24 V	24 V	24 V
Current at			
Input circuit DC	25 mA	25 mA	25 mA
Start circuit DC	25 mA	25 mA	25 mA
Feedback loop DC	25 mA	25 mA	25 mA
Max. overall cable resistance RImax			
Single-channel at UB DC	40 Ohm	40 Ohm	40 Ohm
Single-channel at UB AC	40 Ohm	40 Ohm	40 Ohm
Dual-channel with detection of shorts across contacts at UB DC	80 Ohm	80 Ohm	80 Ohm
Dual-channel with detection of shorts across contacts at UB AC	80 Ohm	80 Ohm	80 Ohm
Max. resistance of pressure sensitive mat	80 Ohm	80 Ohm	80 Ohm
Semiconductor outputs	**777070**	**777073**	**777075**
Quantity	2	2	2
Voltage	24 V	24 V	24 V

Semiconductor outputs	777070	777073	777075
Current	20 mA	20 mA	20 mA
External supply voltage	24 V	24 V	24 V
Voltage tolerance	-15 %/+10 %	-15 %/+10 %	-15 %/+10 %
Residual current at "0" signal	0,1 mA	0,1 mA	0,1 mA
Max. internal voltage drop	4 V	4 V	4 V
Conditional rated short circuit current	100 A	100 A	100 A
Lowest operating current	0 mA	0 mA	0 mA
Utilisation category in accordance with EN 60947-1	DC-12	DC-12	DC-12
Relay outputs	**777070**	**777073**	**777075**
Number of output contacts			
Safety contacts (N/O), instantaneous	2	2	2
Max. short circuit current IK	1 kA	1 kA	1 kA
Utilisation category			
in accordance with the standard	EN 60947-4-1	EN 60947-4-1	EN 60947-4-1
Utilisation category of safety contacts			
AC1 at	240 V	240 V	240 V
Min. current	0,01 A	0,01 A	0,01 A
Max. current	8 A	8 A	8 A
Max. power	2000 VA	2000 VA	2000 VA
DC1 at	24 V	24 V	24 V
Min. current	0,01 A	0,01 A	0,01 A
Max. current	8 A	8 A	8 A
Max. power	200 W	200 W	200 W
Utilisation category			
in accordance with the standard	EN 60947-5-1	EN 60947-5-1	EN 60947-5-1
Utilisation category of safety contacts			
AC15 at	230 V	230 V	230 V
Max. current	5 A	5 A	5 A
DC13 (6 cycles/min) at	24 V	24 V	24 V
Max. current	6 A	6 A	6 A
Utilisation category in accordance with UL			
Voltage	240 V AC G. P.	240 V AC G. P.	240 V AC G. P.
with current	8 A	8 A	8 A
Pilot Duty	C300, R300	C300, R300	C300, R300

Relay outputs	777070	777073	777075
External contact fuse protection, safety contacts			
in accordance with the standard	**EN 60947-5-1**	**EN 60947-5-1**	**EN 60947-5-1**
Max. melting integral	**240 A²s**	**240 A²s**	**240 A²s**
Blow-out fuse, quick	**10 A**	**10 A**	**10 A**
Blow-out fuse, slow	**6 A**	**6 A**	**6 A**
Blow-out fuse, gG	**10 A**	**10 A**	**10 A**
Circuit breaker 24V AC/DC, characteristic B/C	**6 A**	**6 A**	**6 A**
Contact material	**AgSnO2 + 0,2 µm Au**	**AgSnO2 + 0,2 µm Au**	**AgSnO2 + 0,2 µm Au**
Conventional thermal current while loading several contacts	**777070**	**777073**	**777075**
Ith per contact at UB AC; AC1: 240 V, DC1: 24 V			
Conv. therm. current with 1 contact	**8 A**	**8 A**	**8 A**
Conv. therm. current with 2 contacts	**6 A**	**6 A**	**6 A**
Ith per contact at UB DC; AC1: 240 V, DC1: 24 V			
Conv. therm. current with 1 contact	**8 A**	**8 A**	**8 A**
Conv. therm. current with 2 contacts	**6 A**	**6 A**	**6 A**
Times	**777070**	**777073**	**777075**
Switch-on delay			
with automatic start typ.	**230 ms**	**230 ms**	**230 ms**
with automatic start max.	**350 ms**	**350 ms**	**350 ms**
with automatic start after power on typ.	**310 ms**	**310 ms**	**310 ms**
with automatic start after power on max.	**450 ms**	**450 ms**	**450 ms**
with manual start typ.	**230 ms**	**230 ms**	**230 ms**
with manual start max.	**350 ms**	**350 ms**	**350 ms**
Delay-on de-energisation			
with E-STOP typ.	**18 ms**	**18 ms**	**18 ms**
with E-STOP max.	**30 ms**	**30 ms**	**30 ms**
with power failure typ.	**50 ms**	**50 ms**	**50 ms**
with power failure max.	**100 ms**	**100 ms**	**100 ms**
Recovery time at max. switching frequency 1/s			
after E-STOP	**50 ms**	**50 ms**	**50 ms**
after power failure	**100 ms**	**100 ms**	**100 ms**

Times	777070	777073	777075
Supply interruption before de-energisation	20 ms	20 ms	20 ms
Simultaneity, channel 1 and 2 max.	∞	∞	∞
Environmental data	**777070**	**777073**	**777075**
Climatic suitability	EN 60068-2-78	EN 60068-2-78	EN 60068-2-78
Ambient temperature			
Temperature range	-10 - 55 °C	-10 - 55 °C	-10 - 55 °C
Storage temperature			
Temperature range	-40 - 85 °C	-40 - 85 °C	-40 - 85 °C
Climatic suitability			
Humidity	93 % r. h. at 40 °C	93 % r. h. at 40 °C	93 % r. h. at 40 °C
Condensation during operation	Not permitted	Not permitted	Not permitted
EMC	EN 60947-5-1, EN 61000-6-2, EN 61326-3-1	EN 60947-5-1, EN 61000-6-2, EN 61326-3-1	EN 60947-5-1, EN 61000-6-2, 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	0,35 mm	0,35 mm	0,35 mm
Airgap creepage			
in accordance with the standard	EN 60947-1	EN 60947-1	EN 60947-1
Overvoltage category	III / II	III / II	III / II
Pollution degree	2	2	2
Rated insulation voltage	250 V	250 V	250 V
Rated impulse withstand voltage	4 kV	4 kV	4 kV
Protection type			
Housing	IP40	IP40	IP40
Terminals	IP20	IP20	IP20
Mounting area (e.g. control cabinet)	IP54	IP54	IP54
Mechanical data	**777070**	**777073**	**777075**
Mounting position	Any	Any	Any
Mechanical life	10,000,000 cycles	10,000,000 cycles	10,000,000 cycles
Material			
Bottom	PPO UL 94 V1	PPO UL 94 V1	PPO UL 94 V1
Front	ABS UL 94 V0	ABS UL 94 V0	ABS UL 94 V0
Top	PPO UL 94 V1	PPO UL 94 V1	PPO UL 94 V1
Connection type	Screw terminal	Screw terminal	Screw terminal
Mounting type	plug-in	plug-in	plug-in

Mechanical data	777070	777073	777075
Conductor cross section with screw terminals			
1 core flexible	**0,25 - 2,5 mm², 24 - 12 AWG**	**0,25 - 2,5 mm², 24 - 12 AWG**	**0,25 - 2,5 mm², 24 - 12 AWG**
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	**0,25 - 1 mm², 24 - 16 AWG**	**0,25 - 1 mm², 24 - 16 AWG**	**0,25 - 1 mm², 24 - 16 AWG**
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**0,2 - 1,5 mm², 24 - 16 AWG**	**0,2 - 1,5 mm², 24 - 16 AWG**	**0,2 - 1,5 mm², 24 - 16 AWG**
Torque setting with screw terminals	**0,5 Nm**	**0,5 Nm**	**0,5 Nm**
Stripping length with screw terminals	**8 mm**	**8 mm**	**8 mm**
Dimensions			
Height	**94 mm**	**94 mm**	**94 mm**
Width	**45 mm**	**45 mm**	**45 mm**
Depth	**121 mm**	**121 mm**	**121 mm**
Weight	**335 g**	**335 g**	**335 g**

Where standards are undated, the 2022-09 latest editions shall apply.

Technical details Order no. 777076, 777077

General	777076	777077
Certifications	CCC, CE, EAC, TÜV, UKCA, cU-Lus Listed	CCC, CE, EAC, TÜV, UKCA, cU-Lus Listed
Electrical data	**777076**	**777077**
Supply voltage		
Voltage	230 V	240 V
Kind	AC	AC
Voltage tolerance	-15 %/+10 %	-15 %/+10 %
Output of external power supply (AC)	3,5 VA	3,5 VA
Frequency range AC	50 - 60 Hz	50 - 60 Hz
Supply voltage		
Voltage	24 V	24 V
Kind	DC	DC
Voltage tolerance	-15 %/+10 %	-15 %/+10 %
Output of external power supply (DC)	2 W	2 W
Residual ripple DC	20 %	20 %
Duty cycle	100 %	100 %
Inputs	**777076**	**777077**
Quantity	2	2
Voltage at		
Input circuit DC	24 V	24 V
Start circuit DC	24 V	24 V
Feedback loop DC	24 V	24 V
Current at		
Input circuit DC	25 mA	25 mA
Start circuit DC	25 mA	25 mA
Feedback loop DC	25 mA	25 mA
Max. overall cable resistance Rl-max		
Single-channel at UB DC	40 Ohm	40 Ohm
Single-channel at UB AC	40 Ohm	40 Ohm
Dual-channel with detection of shorts across contacts at UB DC	80 Ohm	80 Ohm
Dual-channel with detection of shorts across contacts at UB AC	80 Ohm	80 Ohm
Max. resistance of pressure sensitive mat	80 Ohm	80 Ohm
Semiconductor outputs	**777076**	**777077**
Quantity	2	2
Voltage	24 V	24 V
Current	20 mA	20 mA
External supply voltage	24 V	24 V
Voltage tolerance	-15 %/+10 %	-15 %/+10 %

Semiconductor outputs	777076	777077
Residual current at "0" signal	**0,1 mA**	**0,1 mA**
Max. internal voltage drop	**4 V**	**4 V**
Conditional rated short circuit current	**100 A**	**100 A**
Lowest operating current	**0 mA**	**0 mA**
Utilisation category in accordance with EN 60947-1	**DC-12**	**DC-12**
Relay outputs	**777076**	**777077**
Number of output contacts		
Safety contacts (N/O), instantaneous	**2**	**2**
Max. short circuit current IK	**1 kA**	**1 kA**
Utilisation category		
in accordance with the standard	**EN 60947-4-1**	**EN 60947-4-1**
Utilisation category of safety contacts		
AC1 at	**240 V**	**240 V**
Min. current	**0,01 A**	**0,01 A**
Max. current	**8 A**	**8 A**
Max. power	**2000 VA**	**2000 VA**
DC1 at	**24 V**	**24 V**
Min. current	**0,01 A**	**0,01 A**
Max. current	**8 A**	**8 A**
Max. power	**200 W**	**200 W**
Utilisation category		
in accordance with the standard	**EN 60947-5-1**	**EN 60947-5-1**
Utilisation category of safety contacts		
AC15 at	**230 V**	**230 V**
Max. current	**5 A**	**5 A**
DC13 (6 cycles/min) at	**24 V**	**24 V**
Max. current	**6 A**	**6 A**
Utilisation category in accordance with UL		
Voltage	**240 V AC G. P.**	**240 V AC G. P.**
with current	**8 A**	**8 A**
Pilot Duty	**C300, R300**	**C300, R300**
External contact fuse protection, safety contacts		
in accordance with the standard	**EN 60947-5-1**	**EN 60947-5-1**
Max. melting integral	**240 A²s**	**240 A²s**
Blow-out fuse, quick	**10 A**	**10 A**
Blow-out fuse, slow	**6 A**	**6 A**
Blow-out fuse, gG	**10 A**	**10 A**
Circuit breaker 24V AC/DC, characteristic B/C	**6 A**	**6 A**

Relay outputs	777076	777077
Contact material	AgSnO2 + 0,2 µm Au	AgSnO2 + 0,2 µm Au
Conventional thermal current while loading several contacts	**777076**	**777077**
Ith per contact at UB AC; AC1: 240 V, DC1: 24 V		
Conv. therm. current with 1 contact	8 A	8 A
Conv. therm. current with 2 contacts	6 A	6 A
Ith per contact at UB DC; AC1: 240 V, DC1: 24 V		
Conv. therm. current with 1 contact	8 A	8 A
Conv. therm. current with 2 contacts	6 A	6 A
Times	**777076**	**777077**
Switch-on delay		
with automatic start typ.	230 ms	230 ms
with automatic start max.	350 ms	350 ms
with automatic start after power on typ.	310 ms	310 ms
with automatic start after power on max.	450 ms	450 ms
with manual start typ.	230 ms	230 ms
with manual start max.	350 ms	350 ms
Delay-on de-energisation		
with E-STOP typ.	18 ms	18 ms
with E-STOP max.	30 ms	30 ms
with power failure typ.	50 ms	50 ms
with power failure max.	100 ms	100 ms
Recovery time at max. switching frequency 1/s		
after E-STOP	50 ms	50 ms
after power failure	100 ms	100 ms
Supply interruption before de-energisation	20 ms	20 ms
Simultaneity, channel 1 and 2 max.	∞	∞
Environmental data	**777076**	**777077**
Climatic suitability	EN 60068-2-78	EN 60068-2-78
Ambient temperature		
Temperature range	-10 - 55 °C	-10 - 55 °C
Storage temperature		
Temperature range	-40 - 85 °C	-40 - 85 °C
Climatic suitability		
Humidity	93 % r. h. at 40 °C	93 % r. h. at 40 °C
Condensation during operation	Not permitted	Not permitted

Environmental data	777076	777077
EMC	**EN 60947-5-1, EN 61000-6-2, EN 61326-3-1**	**EN 60947-5-1, EN 61000-6-2, EN 61326-3-1**
Vibration		
in accordance with the standard	**EN 60068-2-6**	**EN 60068-2-6**
Frequency	**10 - 55 Hz**	**10 - 55 Hz**
Amplitude	**0,35 mm**	**0,35 mm**
Airgap creepage		
in accordance with the standard	**EN 60947-1**	**EN 60947-1**
Overvoltage category	**III / II**	**III / II**
Pollution degree	**2**	**2**
Rated insulation voltage	**250 V**	**250 V**
Rated impulse withstand voltage	**4 kV**	**4 kV**
Protection type		
Housing	**IP40**	**IP40**
Terminals	**IP20**	**IP20**
Mounting area (e.g. control cabinet)	**IP54**	**IP54**
Mechanical data	**777076**	**777077**
Mounting position	**Any**	**Any**
Mechanical life	**10,000,000 cycles**	**10,000,000 cycles**
Material		
Bottom	**PPO UL 94 V1**	**PPO UL 94 V1**
Front	**ABS UL 94 V0**	**ABS UL 94 V0**
Top	**PPO UL 94 V1**	**PPO UL 94 V1**
Connection type	**Screw terminal**	**Screw terminal**
Mounting type	**plug-in**	**plug-in**
Conductor cross section with screw terminals		
1 core flexible	**0,25 - 2,5 mm², 24 - 12 AWG**	**0,25 - 2,5 mm², 24 - 12 AWG**
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	**0,25 - 1 mm², 24 - 16 AWG**	**0,25 - 1 mm², 24 - 16 AWG**
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**0,2 - 1,5 mm², 24 - 16 AWG**	**0,2 - 1,5 mm², 24 - 16 AWG**
Torque setting with screw terminals	**0,5 Nm**	**0,5 Nm**
Stripping length with screw terminals	**8 mm**	**8 mm**
Dimensions		
Height	**94 mm**	**94 mm**
Width	**45 mm**	**45 mm**
Depth	**121 mm**	**121 mm**
Weight	**335 g**	**335 g**

Where standards are undated, the 2022-09 latest editions shall apply.

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]
Short circuit-forming safety mats	**PL c**	**Cat. 1**	**SIL 1**	**4,77E-08**	**SIL 1**	**3,79E-03**	**20**
Sensor, 2-channel	**PL e**	**Cat. 4**	**SIL 3**	**2,31E-09**	**SIL 3**	**2,03E-06**	**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.

Supplementary data

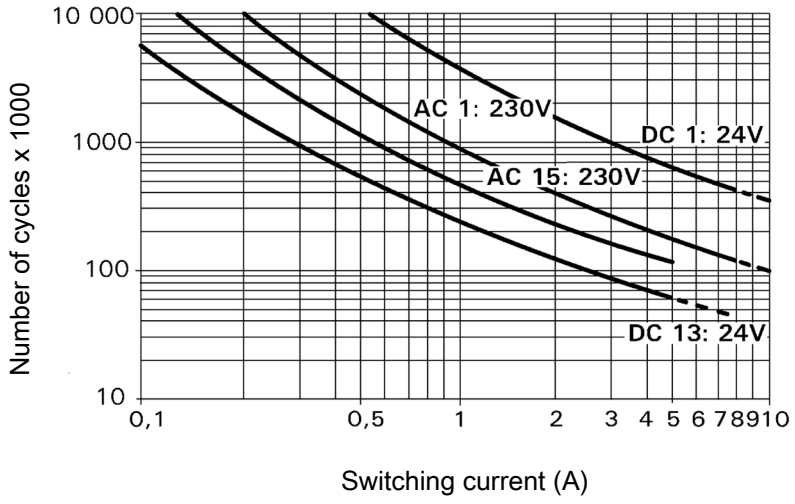
CAUTION!

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switch frequency and the load of the relay output.
If the service life graphs are not accessible, the stated PFH value can be used irrespective of the switch frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.

Service life graph

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.



Example

- Inductive load: 0.2 A
- Utilisation category: AC15
- Contact service life: 4 000 000 cycles

Provided the application to be implemented requires fewer than 4 000 000 cycles, the PFH value (see Technical details) can be used in the calculation.

To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With DC contactors, use flywheel diodes for spark suppression.

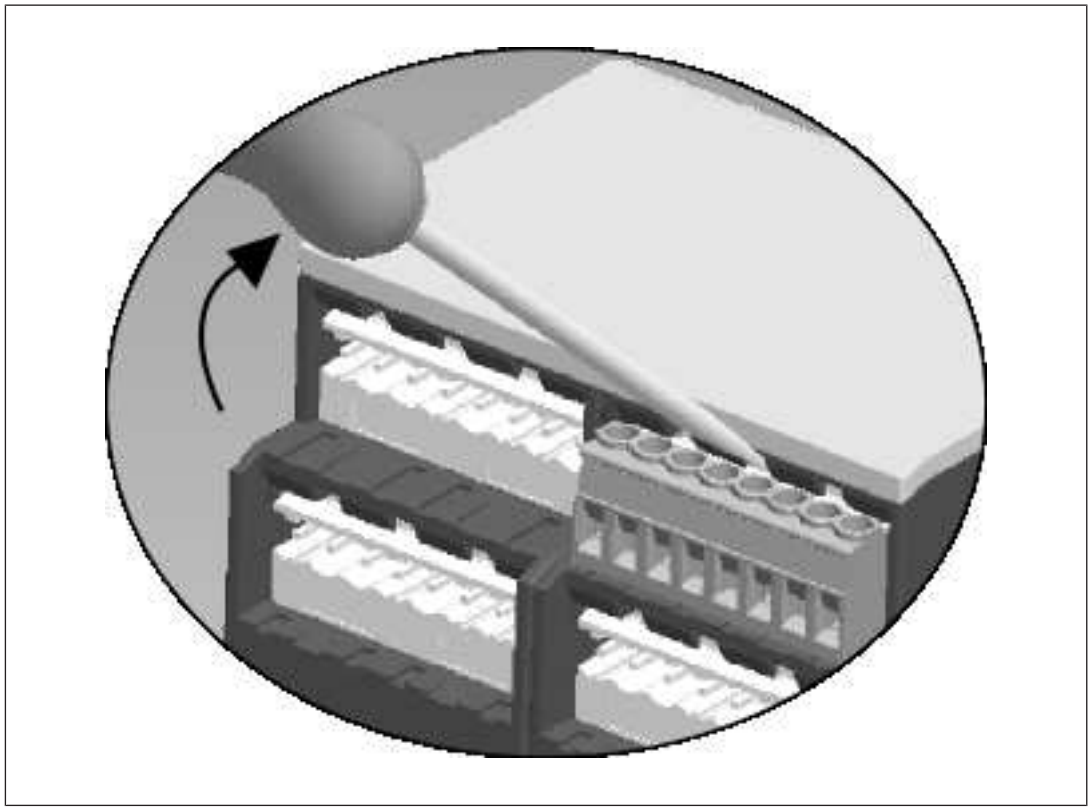
Remove plug-in terminals

Procedure

- Insert a suitable screwdriver into the housing recess behind the terminal.

Do **not** remove the terminals by pulling the cables!

- Lever the terminal out.



Order reference

Product type	Features	Connection type	Order no.
PNOZ 16SP	24 VAC, 24 VDC	Screw terminals	777070
PNOZ 16SP	110 VAC, 24 VDC	Screw terminals	777073
PNOZ 16SP	120 VAC, 24 VDC	Screw terminals	777075
PNOZ 16SP	230 VAC, 24 VDC	Screw terminals	777076
PNOZ 16SP	240 VAC, 24 VDC	Screw terminals	777077

EC declaration of conformity

This product/these products meet the requirements of the directive 2006/42/EC for machinery of the European Parliament and of the Council. The complete EC Declaration of Conformity is available on the Internet at www.pilz.com/downloads.
Authorised representative: Norbert Fröhlich, Pilz GmbH & Co. KG, Felix-Wankel-Str. 2, 73760 Ostfildern, Germany

UKCA-Declaration of Conformity

This product(s) complies with following UK legislation: Supply of Machinery (Safety) Regulation 2008.
The complete UKCA Declaration of Conformity is available on the Internet at www.pilz.com/downloads.

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