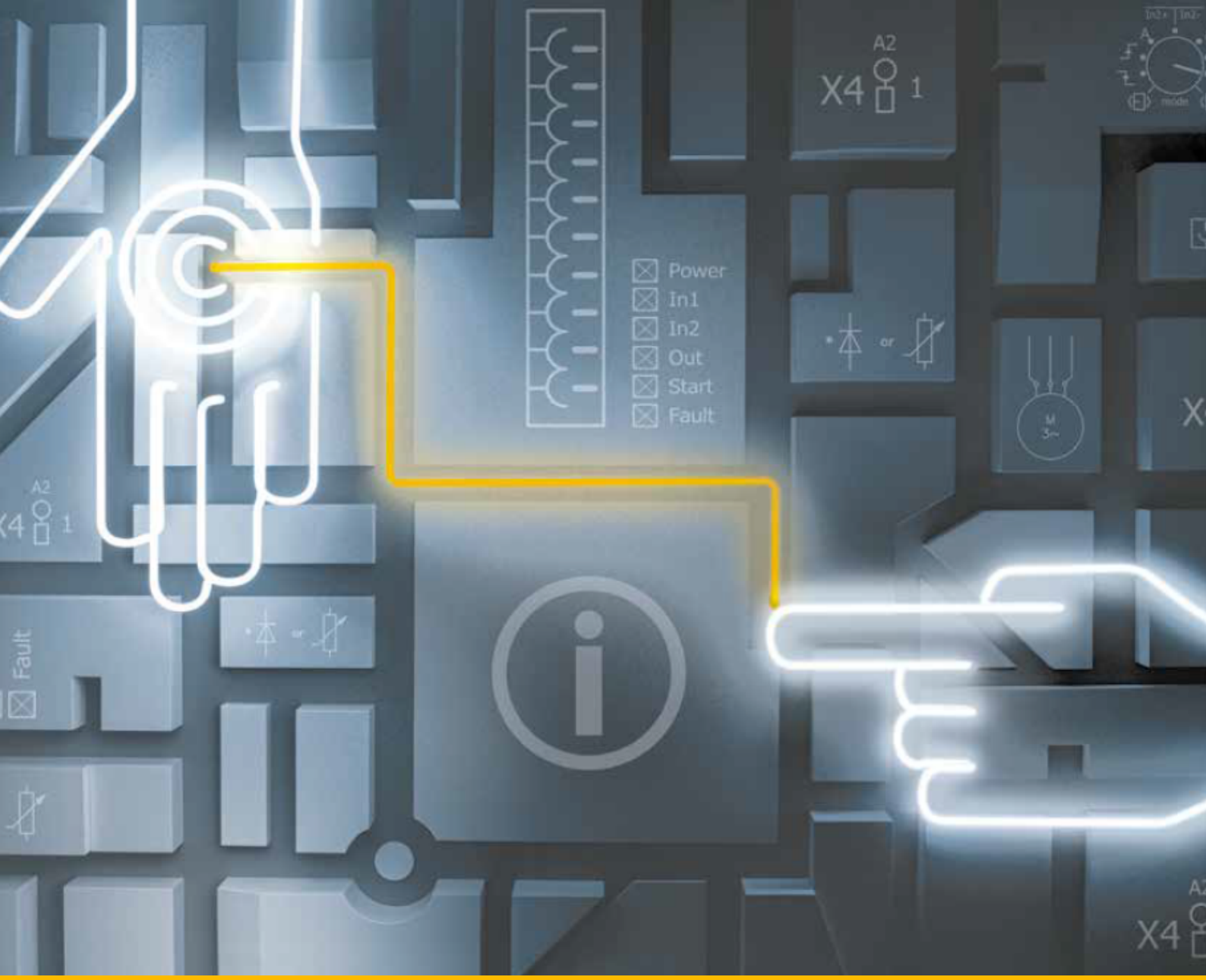


PNOZ XV3P

PILZ
THE SPIRIT OF SAFETY

Operating Manual-20122-EN-11
- 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 XV3P. 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 XV3P 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
- Light grids and safety switches with detection of shorts across contacts

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 [18]).

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 unit, a risk assessment is required in accordance with the Machinery Regulation.

Connecting additional units may result in further risks. Take the necessary measures to protect against corruption.

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, decommissioned and maintained 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.

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 stated 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

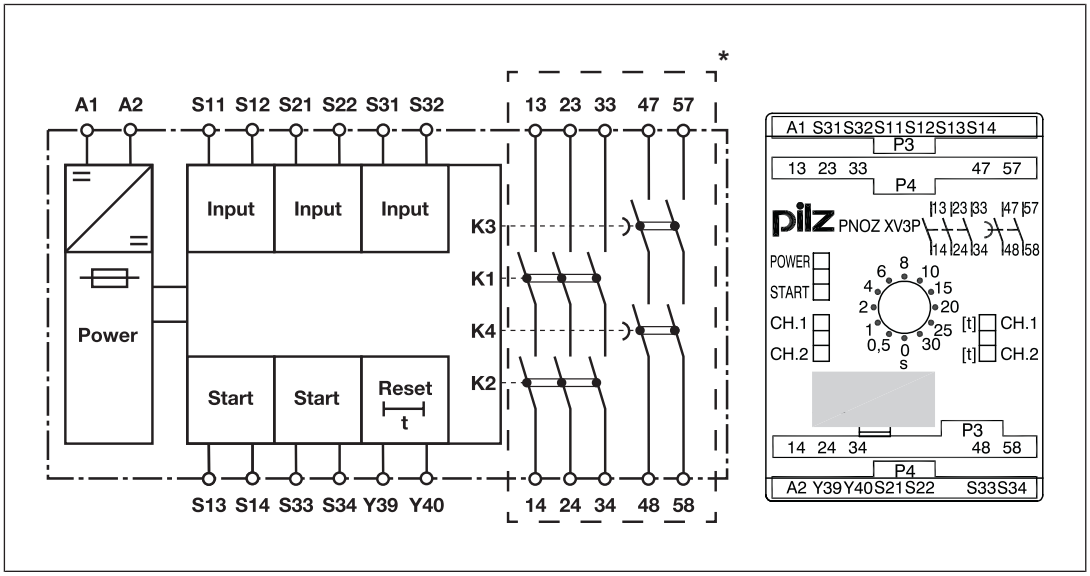
- Positive-guided relay outputs:
  - 3 safety contacts (N/O), instantaneous
  - 2 safety contacts (N/O), delay-on de-energisation
- Connection options for:
  - E-STOP pushbuttons
  - Safety gate limit switches
  - Start buttons
  - Light grids and safety switches with detection of shorts across contacts
- Delay time fixed or selectable
- Possible to cancel delay time
- LED display for:
  - Supply voltage
  - Switch state of the safety contacts
  - Start circuit
- Plug-in connection terminals (either spring-loaded terminal or screw terminal)
- 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 (over-voltage category III), Protective separation (overvoltage category II)

Function Description

The safety relay PNOZ XV3P 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 reset circuit Y39-Y40 and the start circuit S13-S14 are closed.

- Input circuit is closed (e.g. E-STOP pushbutton not operated):
  - The "START" LED is lit.
  - The LEDs "CH.1", "CH.1 [t]", "CH.2" and "CH.2 [t]" are lit.
  - Safety contacts 13-14, 23-24, 33-34, 47-48 and 57-58 are closed. The unit is active.
  - The "START" LED goes out.
- Input circuit is opened (e.g. E-STOP pushbutton operated):
  - The LEDs "CH.1" and "CH.2" go out.
  - Safety contacts 13-14, 23-24 and 33-34 are opened redundantly.
  - Safety contacts 47-48 and 57-58 open after the delay time has elapsed.
  - The LEDs "CH.1 [t]" and "CH.2 [t]" go out.

Before the unit can be restarted, the delay time must have elapsed and the unit must again be ready for operation.

Set delay time:

On units with selectable delay time, the delay time of the safety contacts 47-48 and 57-58 can be set on the front of the unit using a screwdriver.

Reset function:

The delay time cycle can be ended prematurely by opening the reset circuit Y39-Y40. For this purpose, one N/C contact is connected between Y39-Y40 instead of a link.

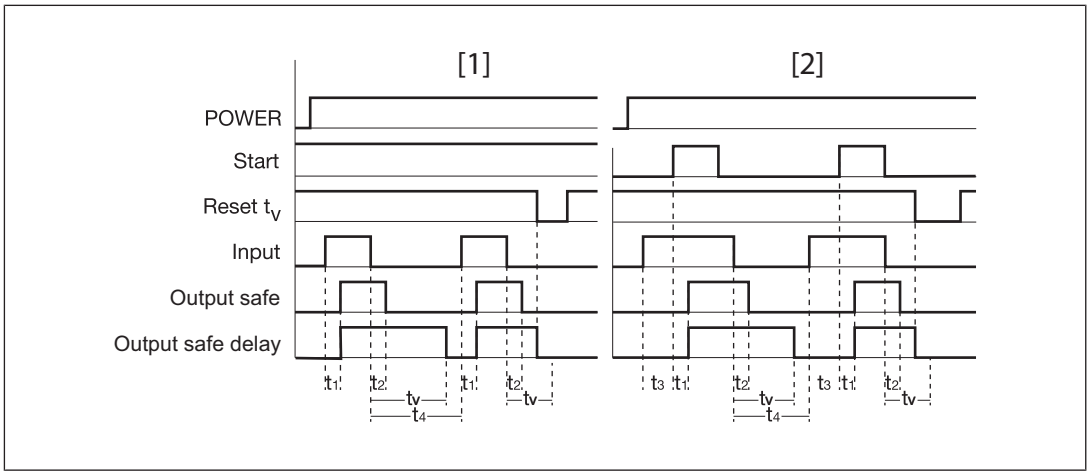
Operating modes

- 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, detects PNOZ XV3P
  - earth faults in the start and input circuit,
  - short circuits in the input circuit,
  - Shorts across contacts in the input circuit.
- Dual-channel operation without detection of shorts across contacts: Redundant input circuit, detects PNOZ XV3P
  - earth faults in the start and input circuit,
  - short circuits in the input circuit.
- Automatic start: Unit is active once the input circuit has been closed.
- Monitored start: Unit is active once the input circuit is closed and once the start circuit is closed after the waiting period has elapsed (see Technical details [📖 18]).
- Increase in the number of available contacts by connecting contact expandsion modules or external contactors/relays.

NOTICE

The device does not recognise short circuits or shorts across contacts in the start/feedback loop. Take suitable measures, such as fault exclusion through protected or separate installation.

Timing diagram



Legend

- Power: Supply voltage
- Start: Start circuit
- Reset t_v: Reset circuit
- Input: Input circuit
- Output safe: Safety contacts, instantaneous
- Output safe delay: Safety contacts, delayed
- [1]: Automatic start
- [2]: Monitored start
- t_1: Switch-on delay
- t_2: Delay-on de-energisation
- t_3: Waiting period with a monitored start
- t_4: Recovery time
- t_v: Delay time

NOTICE

In the case of a fault, the delay-on de-energisation safety contacts open after the set delay time + 50 ms + 15% of the set value, at the latest. An earlier shutdown is possible. For this reason, safety functions that require a minimum delay time must not be implemented.

Installation

NOTICE

Protection against manipulation

Protect the product from unauthorised access.

- 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 [18]" must be followed.
- Delivery status of units with screw terminals: Link between S11-S12 (dual-channel input circuit) and link between Y39-Y40 (reset circuit)
- Outputs 13-14, 23-24, 33-34 are instantaneous safety contacts, outputs 47-48, 57-58 are delay-on de-energisation safety contacts.
- Do not connect undesignated terminals.
- To prevent contact welding, a fuse should be connected before the output contacts (see Technical details [18]).
- 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 [18])
R_l / km = cable resistance/km

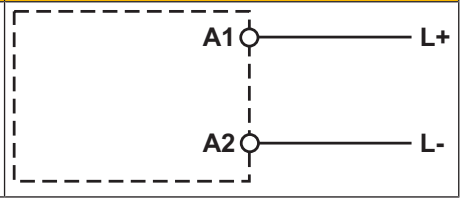
- Use copper wiring with a temperature stability of 60/75 °C.
- To prevent EMC interferences (particularly common-mode interferences) the measures described in EN 60204-1 must be executed. This includes the separate routing of cables of the control circuits (input, start and feedback loop) from other cables for energy transmission or the shielding of cables, for example.
- Adequate protection circuit must be provided on all output contacts with capacitive and inductive loads.
- Do not switch low currents using contacts that have been used previously with high currents.
- When connecting magnetically operated, reed proximity switches, ensure that the max. peak inrush current (on the input circuit) does not overload the proximity switch.
- The power supply must comply with the regulations for extra low voltages with protective electrical separation (SELV, PELV) in accordance with VDE 0100, Part 410.

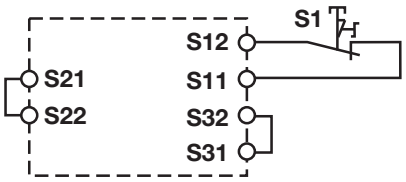
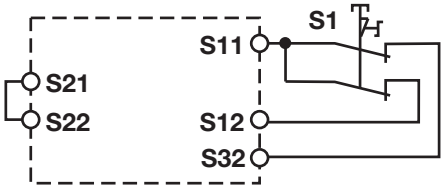
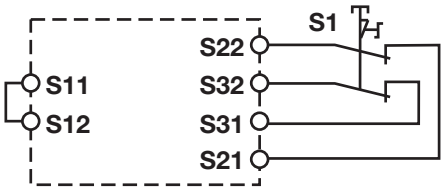
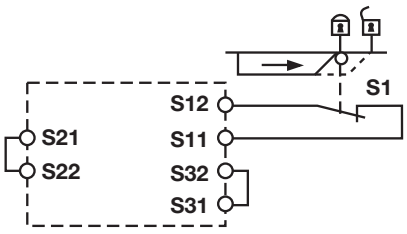
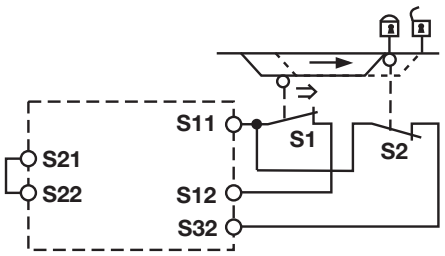
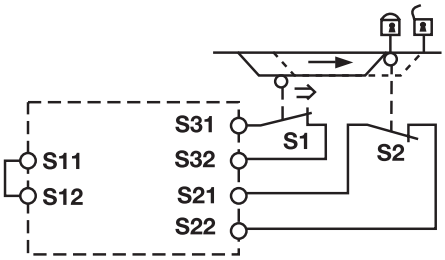
Important for detection of shorts across contacts:

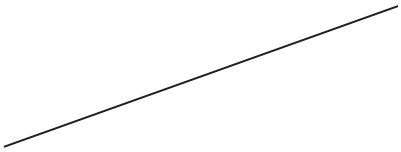
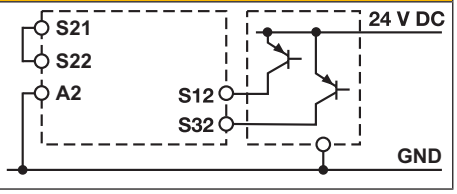
As this function for detecting shorts across contacts is not failsafe, it is tested by Pilz during the final control check. If there is a danger of exceeding the cable length, we recommend the following test once the unit is installed:

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		

Input circuit	Single-channel	Dual-channel
Light guard or safety switch, detection of shorts across contacts via ESPE		

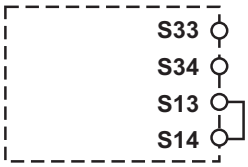
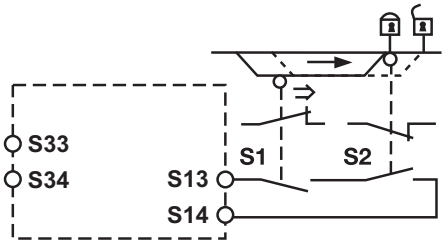
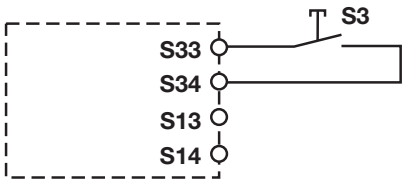
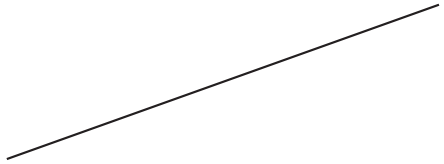
NOTICE

With single-channel wiring, the safety level of your plant/machine may be lower than the safety level of the unit (see Safety characteristic data [📖 29]). To achieve the stated safety level, appropriate measures must be taken on single-channel applications to exclude faults in the input circuit. Examples of such measures are: protected cable routing and positive-opening contacts in the E-STOP pushbutton.

NOTICE

Operation with a light guard or safety switch

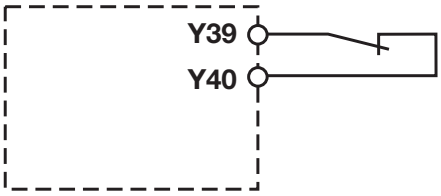
It must not be possible to switch off the supply voltage for the PNOZ XV3P separately from the supply voltage for the light guard or safety switch.

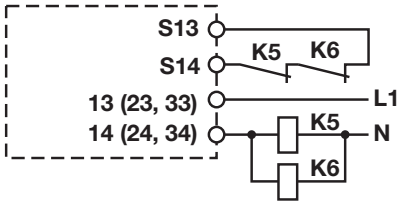
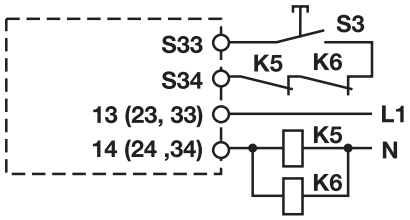
Start circuit	E-STOP wiring Safety gate without start-up test	Safety gate with start-up test
Automatic start		 Simultaneity S1 and S2: max. 3 s
Monitored start		

NOTICE

In the event of an automatic start:

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.

Reset delay time	Without reset	With reset
Link or N/C contact		

Feedback loop	Automatic start	Monitored start
Contacts from external contactors		

Legend

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

INFORMATION

With automatic start, S33 and S34 must not be linked; with monitored start, S13 and S14 must not be linked.

Delay time

When you bring the rotary switch to the desired position, make sure that the rotary switch locks in position (click feel).

Protection against manipulation

Attach the rotary switch using an adhesive seal (see order reference [32]).

If the adhesive seal is broken, check the setting.

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 Regulation, 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 3/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.

START
Start circuit is closed.

CH.1
Safety contacts of channel 1 are closed.

CH.2
Safety contacts of channel 2 are closed.

CH.1 [t]
Channel 3 safety contacts are closed.

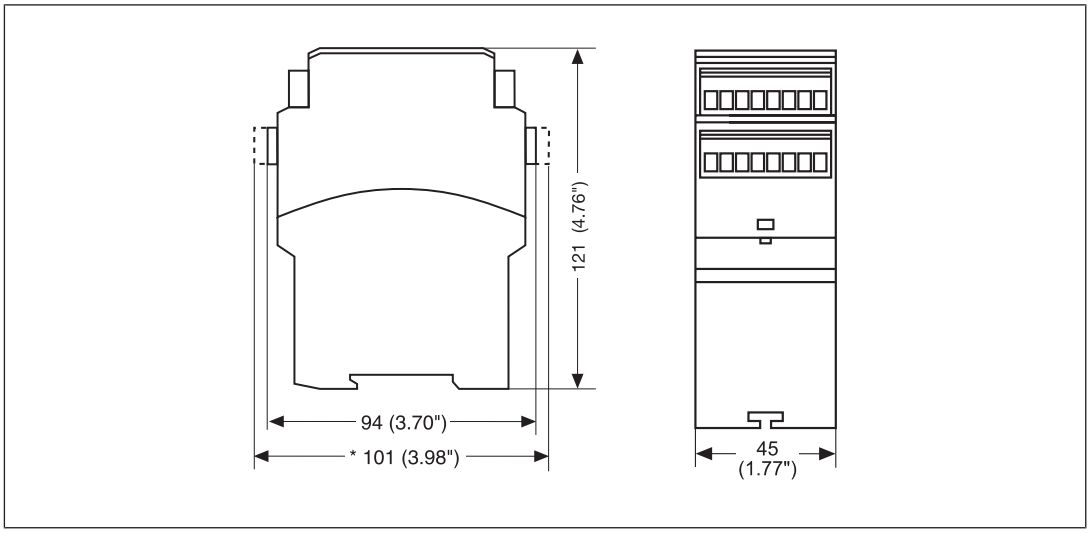
CH.2 [t]
Channel 4 safety contacts are closed.

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.
- In the case of an error, the delay-on de-energisation contacts may open before the delay time has elapsed.

Dimensions in mm

* with spring-loaded terminals



Technical details, Product ID 777510, 777512, 777514

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

General	777510	777512	777514
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed	CCC, CE, EAC, TÜV, UKCA, cULus Listed	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	**777510**	**777512**	**777514**
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)	4,5 W	4,5 W	4,5 W
Residual ripple DC	160 %	160 %	160 %
Duty cycle	100 %	100 %	100 %
Max. inrush current impulse			
Current pulse, A1	5 A	5 A	5 A
Pulse duration, A1	1 ms	1 ms	1 ms
Inputs	**777510**	**777512**	**777514**
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	35 mA	35 mA	35 mA
Start circuit DC	50 mA	50 mA	50 mA
Feedback loop DC	3,5 mA	3,5 mA	3,5 mA
Min. input resistance at power-on	135 Ohm	135 Ohm	135 Ohm
Max. overall cable resistance RImax			
Single-channel at UB DC	100 Ohm	100 Ohm	100 Ohm
Dual-channel without detection of shorts across contacts at UB DC	100 Ohm	100 Ohm	100 Ohm
Dual-channel with detection of shorts across contacts at UB DC	10 Ohm	10 Ohm	10 Ohm

Relay outputs	777510	777512	777514
Number of output contacts			
Safety contacts (N/O), instantaneous	**3**	**3**	**3**
Safety contacts (N/O), delayed	**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	**2.000 VA**	**2.000 VA**	**2.000 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 of safety contacts delayed			
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	**7 A**	**7 A**	**7 A**
Utilisation category of safety contacts delayed			
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	**7 A**	**7 A**	**7 A**

Relay outputs	777510	777512	777514
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**
Voltage	**24 V DC Resistive**	**24 V DC Resistive**	**24 V DC Resistive**
with current	**5 A**	**5 A**	**5 A**
Pilot Duty	**C300, R300**	**C300, R300**	**C300, R300**
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**
External contact fuse protection, delayed safety contacts			
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, 24 V 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	**777510**	**777512**	**777514**
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	**6,8 A**	**6,8 A**	**6,8 A**
Conv. therm. current with 3 contacts	**5,5 A**	**5,5 A**	**5,5 A**
Conv. therm. current with 4 contacts	**4,8 A**	**4,8 A**	**4,8 A**
Conv. therm. current with 5 contacts	**4,3 A**	**4,3 A**	**4,3 A**

Times	777510	777512	777514
Switch-on delay			
with automatic start typ.	**350 ms**	**350 ms**	**350 ms**
with automatic start max.	**650 ms**	**650 ms**	**650 ms**
with automatic start after power on typ.	**385 ms**	**385 ms**	**385 ms**
with automatic start after power on max.	**700 ms**	**700 ms**	**700 ms**
with monitored start typ.	**35 ms**	**35 ms**	**35 ms**
with monitored start max.	**70 ms**	**70 ms**	**70 ms**
Delay-on de-energisation			
with E-STOP typ.	**15 ms**	**15 ms**	**15 ms**
with E-STOP max.	**30 ms**	**30 ms**	**30 ms**
with power failure typ.	**85 ms**	**85 ms**	**85 ms**
with power failure max.	**200 ms**	**200 ms**	**200 ms**
Recovery time at max. switching frequency 1/s			
after E-STOP	**50 ms +tv**	**50 ms +tv**	**50 ms +tv**
after power failure	**250 ms**	**250 ms**	**250 ms**
Delay time tv	**0,1 s, 0,5 s, 1 s, 2 s, 4 s, 6 s, 8 s, 10 s, 15 s, 20 s, 25 s, 30 s**	**0,1 s, 0,2 s, 0,3 s, 0,4 s, 0,5 s, 0,6 s, 0,7 s, 0,8 s, 1 s, 1,5 s, 2 s, 3 s**	**0,5 s**
Time accuracy	**-15 %/+15 % +50 ms**	**-15 %/+15 % +50 ms**	**-15 %/+15 % +50 ms**
Repetition accuracy	**2 %**	**2 %**	**2 %**
Waiting period with a monitored start	**300 ms**	**300 ms**	**300 ms**
Min. start pulse duration with a monitored start	**30 ms**	**30 ms**	**30 ms**
Supply interruption before de-energisation	**20 ms**	**20 ms**	**20 ms**
Simultaneity, channel 1 and 2 max.	∞	∞	∞
Environmental data	**777510**	**777512**	**777514**
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**

Environmental data	777510	777512	777514
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	**777510**	**777512**	**777514**
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**
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	**7 mm**	**7 mm**	**7 mm**
Dimensions			
Height	**94 mm**	**94 mm**	**94 mm**
Width	**45 mm**	**45 mm**	**45 mm**
Depth	**121 mm**	**121 mm**	**121 mm**

Mechanical data	777510	777512	777514
Weight	**370 g**	**370 g**	**360 g**

Technical details, Product ID 777518, 787510, 78512

General	777518	787510	787512
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed	CCC, CE, EAC, TÜV, UKCA, cULus Listed	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	**777518**	**787510**	**787512**
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)	4,5 W	4,5 W	4,5 W
Residual ripple DC	160 %	160 %	160 %
Duty cycle	100 %	100 %	100 %
Max. inrush current impulse			
Current pulse, A1	5 A	5 A	5 A
Pulse duration, A1	1 ms	1 ms	1 ms
Inputs	**777518**	**787510**	**787512**
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	35 mA	35 mA	35 mA
Start circuit DC	50 mA	50 mA	50 mA
Feedback loop DC	3,5 mA	3,5 mA	3,5 mA
Min. input resistance at power-on	135 Ohm	135 Ohm	135 Ohm
Max. overall cable resistance Rlmax			
Single-channel at UB DC	100 Ohm	100 Ohm	100 Ohm
Dual-channel without detection of shorts across contacts at UB DC	100 Ohm	100 Ohm	100 Ohm
Dual-channel with detection of shorts across contacts at UB DC	10 Ohm	10 Ohm	10 Ohm
Relay outputs	**777518**	**787510**	**787512**
Number of output contacts			
Safety contacts (N/O), instantaneous	3	3	3
Safety contacts (N/O), delayed	2	2	2

Relay outputs	777518	787510	787512
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	**2.000 VA**	**2.000 VA**	**2.000 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 of safety contacts delayed			
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	**7 A**	**7 A**	**7 A**
Utilisation category of safety contacts delayed			
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	**7 A**	**7 A**	**7 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**
Voltage	**24 V DC Resistive**	**24 V DC Resistive**	**24 V DC Resistive**
with current	**5 A**	**5 A**	**5 A**
Pilot Duty	**C300, R300**	**C300, R300**	**C300, R300**

Relay outputs	777518	787510	787512
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**
External contact fuse protection, delayed safety contacts			
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, 24 V 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	**777518**	**787510**	**787512**
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	**6,8 A**	**6,8 A**	**6,8 A**
Conv. therm. current with 3 contacts	**5,5 A**	**5,5 A**	**5,5 A**
Conv. therm. current with 4 contacts	**4,8 A**	**4,8 A**	**4,8 A**
Conv. therm. current with 5 contacts	**4,3 A**	**4,3 A**	**4,3 A**

Times	777518	787510	787512
Switch-on delay			
with automatic start typ.	**350 ms**	**350 ms**	**350 ms**
with automatic start max.	**650 ms**	**650 ms**	**650 ms**
with automatic start after power on typ.	**385 ms**	**385 ms**	**385 ms**
with automatic start after power on max.	**700 ms**	**700 ms**	**700 ms**
with monitored start typ.	**35 ms**	**35 ms**	**35 ms**
with monitored start max.	**70 ms**	**70 ms**	**70 ms**
Delay-on de-energisation			
with E-STOP typ.	**15 ms**	**15 ms**	**15 ms**
with E-STOP max.	**30 ms**	**30 ms**	**30 ms**
with power failure typ.	**85 ms**	**85 ms**	**85 ms**
with power failure max.	**200 ms**	**200 ms**	**200 ms**
Recovery time at max. switching frequency 1/s			
after E-STOP	**50 ms +tv**	**50 ms +tv**	**50 ms +tv**
after power failure	**250 ms**	**250 ms**	**250 ms**
Delay time tv	**0,3 s, 5 s, 10 s, 20 s, 40 s, 60 s, 80 s, 100 s, 150 s, 200 s, 250 s, 300 s**	**0,1 s, 0,5 s, 1 s, 2 s, 4 s, 6 s, 8 s, 10 s, 15 s, 20 s, 25 s, 30 s**	**0,1 s, 0,2 s, 0,3 s, 0,4 s, 0,5 s, 0,6 s, 0,7 s, 0,8 s, 1 s, 1,5 s, 2 s, 3 s**
Time accuracy	**-15 %/+15 % +50 ms**	**-15 %/+15 % +50 ms**	**-15 %/+15 % +50 ms**
Repetition accuracy	**2 %**	**2 %**	**2 %**
Waiting period with a monitored start	**300 ms**	**300 ms**	**300 ms**
Min. start pulse duration with a monitored start	**30 ms**	**30 ms**	**30 ms**
Supply interruption before de-energisation	**20 ms**	**20 ms**	**20 ms**
Simultaneity, channel 1 and 2 max.	∞	∞	∞
Environmental data	**777518**	**787510**	**787512**
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**

Environmental data	777518	787510	787512
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	**777518**	**787510**	**787512**
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**	**Spring-loaded terminal**	**Spring-loaded terminal**
Mounting type	**plug-in**	**plug-in**	**plug-in**
Conductor cross section with screw terminals			
1 core flexible	**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**	–	–
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**0,2 - 1,5 mm², 24 - 16 AWG**	–	–
Torque setting with screw terminals	**0,5 Nm**	–	–
Stripping length with screw terminals	**7 mm**	–	–
Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector	–	**0,2 - 1,5 mm², 24 - 16 AWG**	**0,2 - 1,5 mm², 24 - 16 AWG**

Mechanical data	777518	787510	787512
Spring-loaded terminals: Terminal points per connection	–	2	2
Stripping length with spring-loaded terminals	–	8 mm	8 mm
Dimensions			
Height	94 mm	101 mm	101 mm
Width	45 mm	45 mm	45 mm
Depth	121 mm	121 mm	121 mm
Weight	370 g	370 g	370 g

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: 2023 PL	EN ISO 13849-1: 2023 Category	EN IEC 62061 SIL CL/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2023 T_M [year]
Safety contacts, instantaneous	PL e	Cat. 4	SIL 3	2,31E-09	SIL 3	2,03E-06	20
Safety contacts, delayed <30 s	PL d	Cat. 3	SIL 3	4,94E-09	SIL 3	1,26E-05	20
Safety contacts, delayed ≥30 s	PL c	Cat. 1	SIL 1	4,94E-09	SIL 2	4,64E-05	20

Explanatory notes for the safety-related characteristic data:

- 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 products used and may differ from these.

Supplementary data

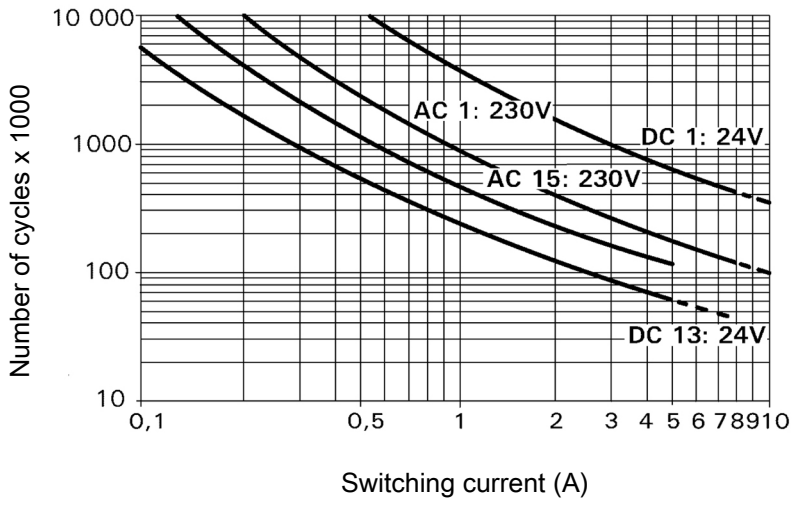
CAUTION!

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.

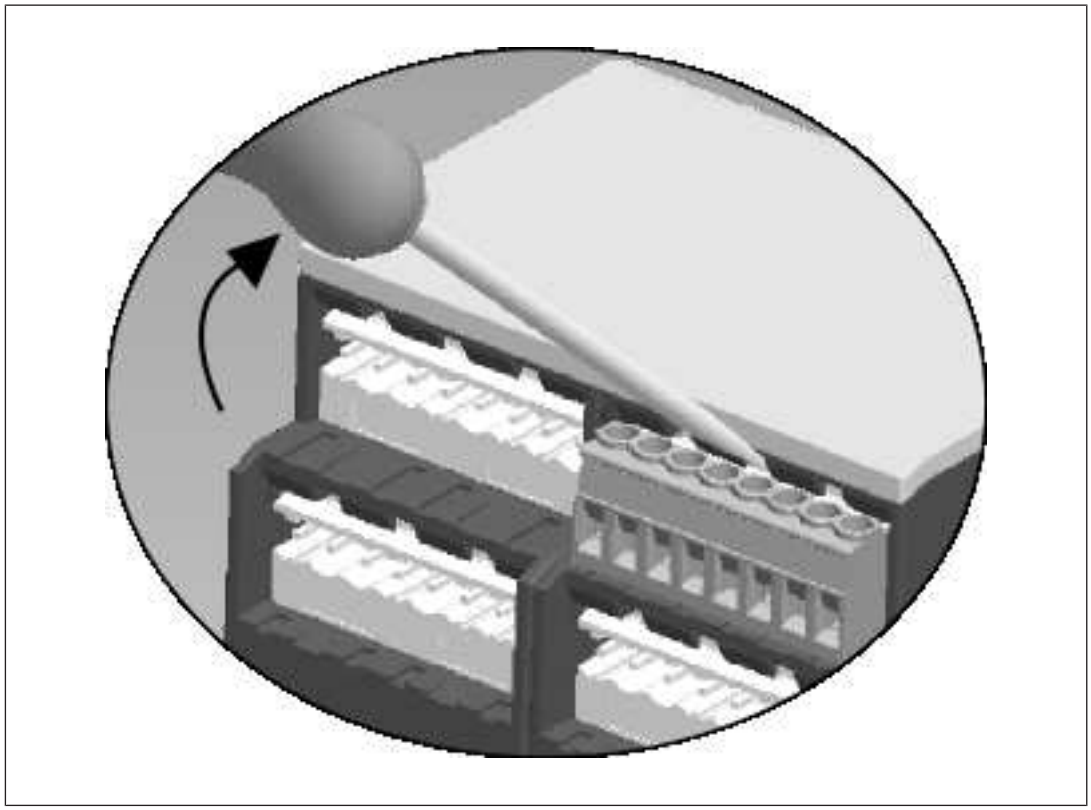
Remove plug-in terminals

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

Product type	Features	Connection type	Product ID
PNOZ XV3P	24 VDC; Delay: 0.5 s fixed	Screw terminals	777514
PNOZ XV3P C	24 VDC; Delay: selectable up to 3 s	Spring-loaded terminals	787512
PNOZ XV3P	24 VDC; Delay: selectable up to 3 s	Screw terminals	777512
PNOZ XV3P C	24 VDC; Delay: selectable up to 30 s	Spring-loaded terminals	787510
PNOZ XV3P	24 VDC; Delay: selectable up to 30 s	Screw terminals	777510
PNOZ XV3P	24 VDC; Delay: selectable up to 300 s	Screw terminals	777518

Accessories

Product type	Features	Product ID
Adhesive seal for myPNOZ (20 pieces)	Adhesive seal for myPNOZ to protect rotary switch settings from manipulation	2A000200

EU/EC declaration of conformity

These products meet the requirements of the directive 2006/42/EC on machinery up to and including 19 January 2027, and the EU regulation 2023/1230 of the European Parliament and of the Council from 20 January 2027. The full EU and EC declaration of conformity is available to download at www.pilz.com/manuals.

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

UKCA-Declaration of Conformity

These products comply 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/manuals.

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
+86 400-088-3566
Japan
+81 45 471-2281
South Korea
+82 31 778 3390

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

Europe
Austria
+43 1 7986263-444
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
Türkiye
+90 216 5775552
United Kingdom
+44 1536 460866

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

Reporting security vulnerabilities or security incidents
If you would like to report a security vulnerability or a security incident in connection with a Pilz product, please contact our **Pilz Product Security Incident Response Team (PSIRT).**
You can reach us at: www.pilz.com/psirt

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.

www.pilz.com/facebook
www.pilz.com/xing
www.pilz.com/linkedin
www.pilz.com/youtube

20122-EN-11, 2026-03 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, E-Mail: info@pilz.com, Internet: www.pilz.com

PILZ
THE SPIRIT OF SAFETY