



▶ PNOZ XV1P

PILZ

THE SPIRIT OF SAFETY

Operating Manual-20596-EN-13
- Safety relays



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SD means Secure Digital

Introduction	5
Validity of documentation	5
Using the documentation	5
Definition of symbols	5
Safety	6
Intended use	6
Safety regulations	6
Safety assessment	6
Use of qualified personnel	7
Warranty and liability	7
Disposal	7
For your safety	7
Unit features	8
Safety features	8
Block diagram/terminal configuration	8
Function Description	9
Operating modes	9
Timing diagram	10
Installation	11
Wiring	11
Preparing for operation	12
Delay time	14
Operation	14
Status indicators	15
Faults – Interference	15
Dimensions in mm	15
Technical details, Product ID 777601, 777602	16
Technical details, Product ID 787601, 787602	21
Safety characteristic data	25
Supplementary data	26
Service life graph	26

Remove plug-in terminals	28
Order reference	28
Product.....	28
Accessories.....	29
EU/EC declaration of conformity	29
UKCA-Declaration of Conformity	29

Introduction

Validity of documentation

This documentation is valid for the product PNOZ XV1P. 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 XV1P 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](#) [ 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 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, de-commissioned 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

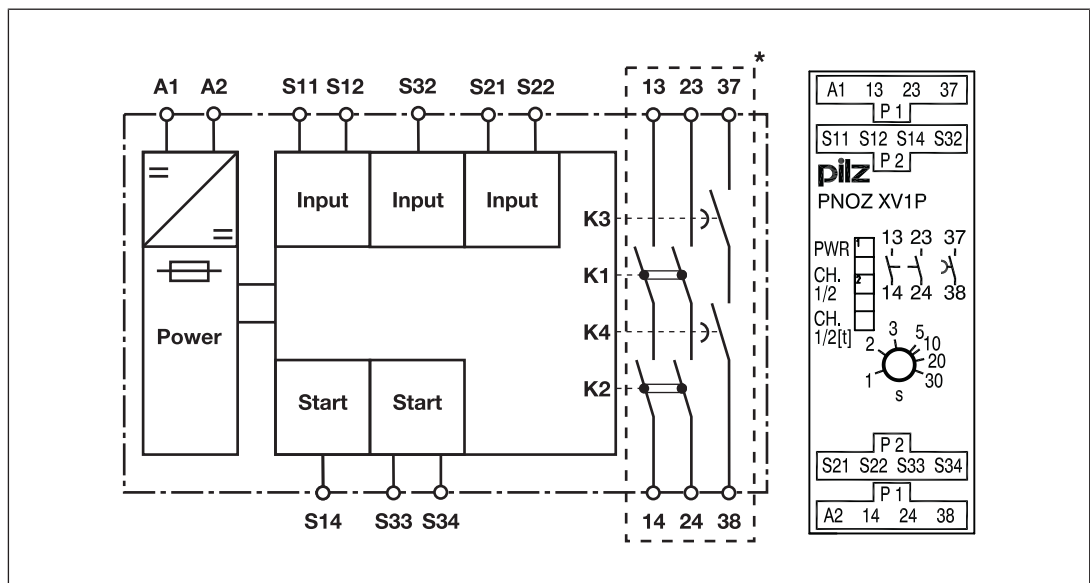
- ▶ Positive-guided relay outputs:
 - 2 safety contacts (N/O), instantaneous
 - 1 safety contact (N/O), delay-on de-energisation
- ▶ Connection options for:
 - E-STOP pushbuttons
 - Safety gate limit switches
 - Start buttons
 - Light grids and safety switches with detection of shorts across contacts
- ▶ Selectable delay time
- ▶ LED display for:
 - Supply voltage
 - Switch status of the safety contacts
- ▶ 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 XV1P provides a safety-oriented interruption of a safety circuit. When the supply voltage is applied via the E-STOP pushbutton, the "PWR" LED is lit. The unit is ready for operation when the start circuit S11-S14 is closed.

- ▶ Input circuit is closed (e.g. E-STOP pushbutton not operated):
 - The LEDs "CH.1/2" and "CH.1/2[t]" are lit.
 - Safety contacts 13-14, 23-24 and 37-38 are closed, the unit is active.
- ▶ Input circuit is opened (e.g. E-STOP pushbutton operated):
 - Safety contacts 13-14 and 23-24 are redundantly opened.
 - The LED "CH.1/2" goes out.
 - Once the set delay time has elapsed, safety contact 37-38 is opened redundantly.
 - The LED "CH.1/2[t]" goes 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:

The delay time for safety contact 37-38 can be set on the front of the unit using a screwdriver.

Operating modes

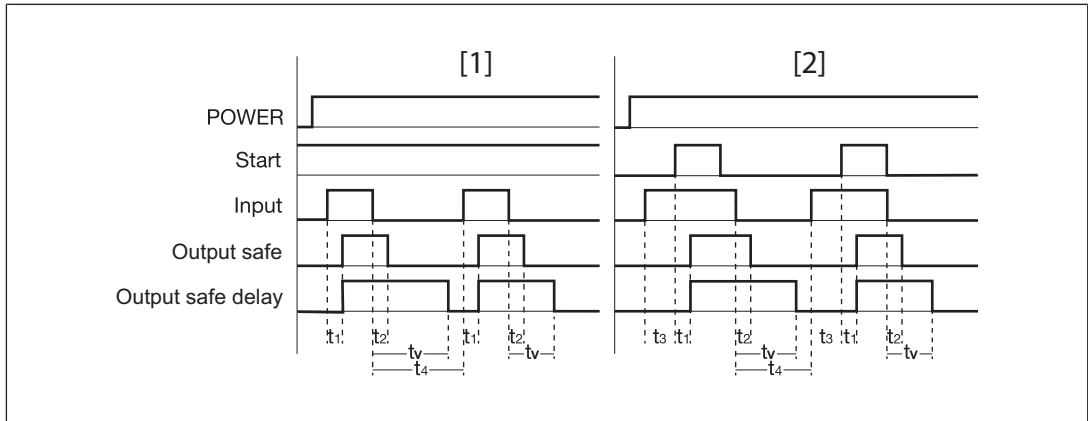
- ▶ Single-channel operation: No redundancy in the input circuit, earth faults in the start and input circuit are detected.
- ▶ Dual-channel operation without detection of shorts across contacts: Redundant input circuit, detects PNOZ XV1P
 - earth faults in the start and input circuit,
 - short circuits in the input circuit.
- ▶ Dual-channel operation with detection of shorts across contacts: Redundant input circuit, detects PNOZ XV1P
 - 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.
- ▶ 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 \[16\]](#)).
- ▶ Increase in the number of available contacts by connecting contact expansion 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
- ▶ Input: Input circuit
- ▶ Output safe: Safety contacts, instantaneous
- ▶ Output safe delay: Delayed safety contact
- ▶ [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 + 20% 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 \[16\]](#)" must be followed.
- ▶ Outputs 13-14, 23-24 are instantaneous safety contacts, output 37-38 is a delay-on de-energisation safety contact.
- ▶ 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:

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

$R_{l_{\max}}$ = 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.
- ▶ 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.
- ▶ 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.

- 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		
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 \[25\]](#)). 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 XV1P separately from the supply voltage for the light guard or safety switch.

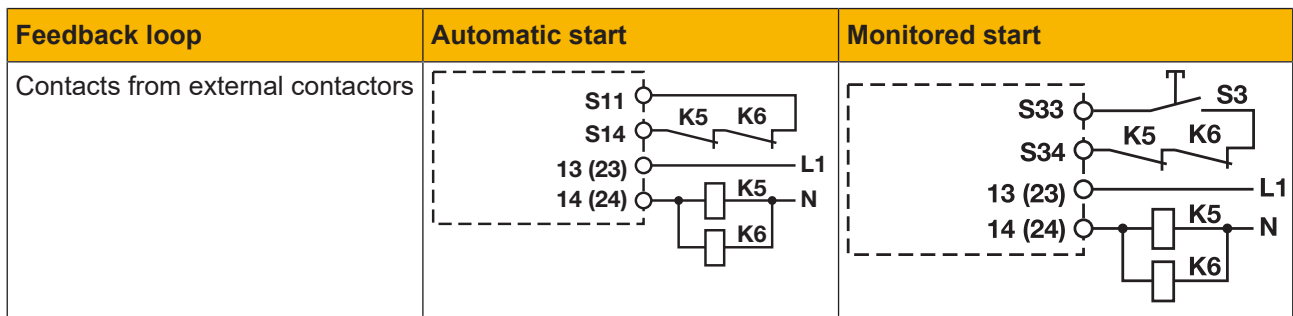
Start circuit	E-STOP wiring, safety gate without start-up test	Safety gate with start-up test
Automatic start		<p>Simultaneity S1 and S2: max. 1 s</p>
Monitored start		



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.



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, S11 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 \[28\]](#)).

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



PWR

Supply voltage is present.



CH.1/2

Safety contacts of channel 1 and 2 are closed.



CH.1/2[t]

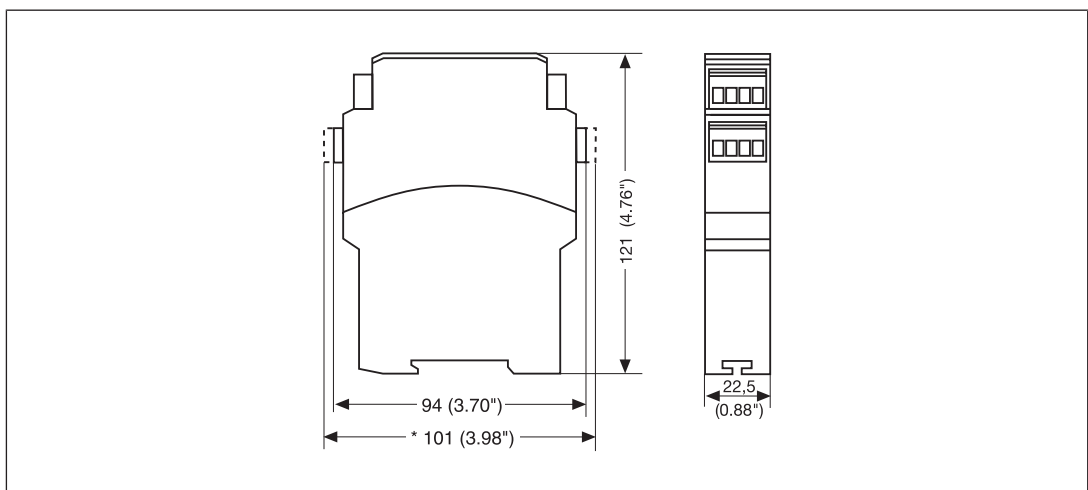
Safety contacts of channel 3 and 4 are closed.

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 "PWR" 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 777601, 777602

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

General	777601	777602
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	777601	777602
Supply voltage		
Voltage	24 V	24 V
Kind	DC	DC
Voltage tolerance	-15 %/+10 %	-15 %/+10 %
Output of external power supply (DC)	3,5 W	3,5 W
Residual ripple DC	20 %	20 %
Duty cycle	100 %	100 %
Max. inrush current impulse		
Current pulse, A1	5 A	5 A
Pulse duration, A1	1 ms	1 ms
Inputs	777601	777602
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	35 mA	35 mA
Start circuit DC	35 mA	35 mA
Feedback loop DC	3,5 mA	3,5 mA
Max. overall cable resistance RI-max		
Single-channel at UB DC	100 Ohm	100 Ohm
Dual-channel without detection of shorts across contacts at UB DC	150 Ohm	150 Ohm
Dual-channel with detection of shorts across contacts at UB DC	15 Ohm	15 Ohm
Relay outputs	777601	777602
Number of output contacts		
Safety contacts (N/O), instantaneous	2	2
Safety contacts (N/O), delayed	1	1
Max. short circuit current I _K	1 kA	1 kA
Utilisation category		
in accordance with the standard	EN 60947-4-1	EN 60947-4-1

Relay outputs	777601	777602
Utilisation category of safety contacts		
AC1 at	240 V	240 V
Min. current	0,01 A	0,01 A
Max. current	5 A	5 A
Max. power	1.250 VA	1.250 VA
DC1 at	24 V	24 V
Min. current	0,01 A	0,01 A
Max. current	5 A	5 A
Max. power	125 W	125 W
Utilisation category of safety contacts delayed		
AC1 at	240 V	240 V
Min. current	0,01 A	0,01 A
Max. current	5 A	5 A
Max. power	1250 VA	1250 VA
DC1 at	24 V	24 V
Min. current	0,01 A	0,01 A
Max. current	5 A	5 A
Max. power	125 W	125 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	1,5 A	1,5 A
DC13 (6 cycles/min) at	24 V	24 V
Max. current	2 A	2 A
Utilisation category of safety contacts delayed		
AC15 at	230 V	230 V
Max. current	2 A	2 A
DC13 (6 cycles/min) at	24 V	24 V
Max. current	4 A	4 A
Utilisation category in accordance with UL		
Voltage with current	240 V AC G. P.	240 V AC G. P.
Pilot Duty	5 A	5 A
	C300, R300	C300, R300

Relay outputs	777601	777602
External contact fuse protection, safety contacts		
in accordance with the standard	EN 60947-5-1	EN 60947-5-1
Max. melting integral	66 A²s	66 A²s
Blow-out fuse, quick	6 A	6 A
Blow-out fuse, slow	4 A	4 A
Blow-out fuse, gG	6 A	6 A
Circuit breaker 24V AC/DC, characteristic B/C	4 A	4 A
External contact fuse protection, delayed safety contacts		
Max. melting integral	66 A²s	66 A²s
Blow-out fuse, quick	6 A	6 A
Blow-out fuse, slow	4 A	4 A
Blow-out fuse, gG	6 A	6 A
Circuit breaker, 24 V AC/DC, characteristic B/C	4 A	4 A
Contact material	AgSnO₂ + 0,2 µm Au	AgSnO₂ + 0,2 µm Au
Conventional thermal current while loading several contacts	777601	777602
I _{th} per contact at UB DC; AC1: 240 V, DC1: 24 V		
Conv. therm. current with 1 contact	5 A	5 A
Conv. therm. current with 2 contacts	3,7 A	3,7 A
Conv. therm. current with 3 contacts	3 A	3 A
Times	777601	777602
Switch-on delay		
with automatic start typ.	300 ms	300 ms
with automatic start max.	550 ms	550 ms
with automatic start after power on typ.	350 ms	350 ms
with automatic start after power on max.	750 ms	750 ms
with monitored start typ.	30 ms	30 ms
with monitored start max.	60 ms	60 ms
Delay-on de-energisation		
with E-STOP typ.	15 ms	15 ms
with E-STOP max.	30 ms	30 ms
with power failure typ.	100 ms	100 ms
with power failure max.	150 ms	150 ms
Recovery time at max. switching frequency 1/s		
after E-STOP	50 ms +tv	50 ms +tv
after power failure	300 ms	300 ms

Times	777601	777602
Delay time tv	0,1 - 3 s	1 - 30 s
Time accuracy	-20 %/+20 %	-20 %/+20 %
Repetition accuracy	2 %	2 %
Waiting period with a monitored start	300 ms	300 ms
Min. start pulse duration with a monitored start	30 ms	30 ms
Supply interruption before de-energisation	20 ms	20 ms
Simultaneity, channel 1 and 2 max.	∞	∞
Environmental data	777601	777602
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
EMC	EN 60947-5-1, EN 61000-6-2, EN 61000-6-3, EN 61326-3-1	EN 60947-5-1, EN 61000-6-2, EN 61000-6-3, 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	777601	777602
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

Mechanical data	777601	777602
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	7 mm	7 mm
Dimensions		
Height	94 mm	94 mm
Width	22,5 mm	22,5 mm
Depth	121 mm	121 mm
Weight	230 g	230 g

Technical details, Product ID 787601, 787602

General	787601	787602
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	787601	787602
Supply voltage		
Voltage	24 V	24 V
Kind	DC	DC
Voltage tolerance	-15 %/+10 %	-15 %/+10 %
Output of external power supply (DC)	3,5 W	3,5 W
Residual ripple DC	20 %	20 %
Duty cycle	100 %	100 %
Max. inrush current impulse		
Current pulse, A1	5 A	5 A
Pulse duration, A1	1 ms	1 ms
Inputs	787601	787602
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	35 mA	35 mA
Start circuit DC	35 mA	35 mA
Feedback loop DC	3,5 mA	3,5 mA
Max. overall cable resistance R _{I-max}		
Single-channel at UB DC	100 Ohm	100 Ohm
Dual-channel without detection of shorts across contacts at UB DC	150 Ohm	150 Ohm
Dual-channel with detection of shorts across contacts at UB DC	15 Ohm	15 Ohm
Relay outputs	787601	787602
Number of output contacts		
Safety contacts (N/O), instantaneous	2	2
Safety contacts (N/O), delayed	1	1
Max. short circuit current I _K	1 kA	1 kA
Utilisation category		
in accordance with the standard	EN 60947-4-1	EN 60947-4-1

Relay outputs	787601	787602
Utilisation category of safety contacts		
AC1 at	240 V	240 V
Min. current	0,01 A	0,01 A
Max. current	5 A	5 A
Max. power	1.250 VA	1.250 VA
DC1 at	24 V	24 V
Min. current	0,01 A	0,01 A
Max. current	5 A	5 A
Max. power	125 W	125 W
Utilisation category of safety contacts delayed		
AC1 at	240 V	240 V
Min. current	0,01 A	0,01 A
Max. current	5 A	5 A
Max. power	1250 VA	1250 VA
DC1 at	24 V	24 V
Min. current	0,01 A	0,01 A
Max. current	5 A	5 A
Max. power	125 W	125 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	1,5 A	1,5 A
DC13 (6 cycles/min) at	24 V	24 V
Max. current	2 A	2 A
Utilisation category of safety contacts delayed		
AC15 at	230 V	230 V
Max. current	2 A	2 A
DC13 (6 cycles/min) at	24 V	24 V
Max. current	4 A	4 A
Utilisation category in accordance with UL		
Voltage with current	240 V AC G. P.	240 V AC G. P.
Pilot Duty	5 A	5 A
	C300, R300	C300, R300

Relay outputs	787601	787602
External contact fuse protection, safety contacts		
in accordance with the standard	EN 60947-5-1	EN 60947-5-1
Max. melting integral	66 A²s	66 A²s
Blow-out fuse, quick	6 A	6 A
Blow-out fuse, slow	4 A	4 A
Blow-out fuse, gG	6 A	6 A
Circuit breaker 24V AC/DC, characteristic B/C	4 A	4 A
External contact fuse protection, delayed safety contacts		
Max. melting integral	66 A²s	66 A²s
Blow-out fuse, quick	6 A	6 A
Blow-out fuse, slow	4 A	4 A
Blow-out fuse, gG	6 A	6 A
Circuit breaker, 24 V AC/DC, characteristic B/C	4 A	4 A
Contact material	AgSnO₂ + 0,2 µm Au	AgSnO₂ + 0,2 µm Au
Conventional thermal current while loading several contacts	787601	787602
I _{th} per contact at UB DC; AC1: 240 V, DC1: 24 V		
Conv. therm. current with 1 contact	5 A	5 A
Conv. therm. current with 2 contacts	3,7 A	3,7 A
Conv. therm. current with 3 contacts	3 A	3 A
Times	787601	787602
Switch-on delay		
with automatic start typ.	300 ms	300 ms
with automatic start max.	550 ms	550 ms
with automatic start after power on typ.	350 ms	350 ms
with automatic start after power on max.	750 ms	750 ms
with monitored start typ.	30 ms	30 ms
with monitored start max.	60 ms	60 ms
Delay-on de-energisation		
with E-STOP typ.	15 ms	15 ms
with E-STOP max.	30 ms	30 ms
with power failure typ.	100 ms	100 ms
with power failure max.	150 ms	150 ms
Recovery time at max. switching frequency 1/s		
after E-STOP	50 ms +tv	50 ms +tv
after power failure	300 ms	300 ms

Times	787601	787602
Delay time tv	0,1 - 3 s	1 - 30 s
Time accuracy	-20 %/+20 %	-20 %/+20 %
Repetition accuracy	2 %	2 %
Waiting period with a monitored start	300 ms	300 ms
Min. start pulse duration with a monitored start	30 ms	30 ms
Supply interruption before de-energisation	20 ms	20 ms
Simultaneity, channel 1 and 2 max.	∞	∞
Environmental data	787601	787602
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
EMC	EN 60947-5-1, EN 61000-6-2, EN 61000-6-3, EN 61326-3-1	EN 60947-5-1, EN 61000-6-2, EN 61000-6-3, 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	787601	787602
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	Spring-loaded terminal	Spring-loaded terminal
Mounting type	plug-in	plug-in

Mechanical data	787601	787602
Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector	0,2 - 1,5 mm ² , 24 - 16 AWG	0,2 - 1,5 mm ² , 24 - 16 AWG
Spring-loaded terminals: Terminal points per connection	2	2
Stripping length with spring-loaded terminals	8 mm	8 mm
Dimensions		
Height	101 mm	101 mm
Width	22,5 mm	22,5 mm
Depth	121 mm	121 mm
Weight	230 g	230 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!

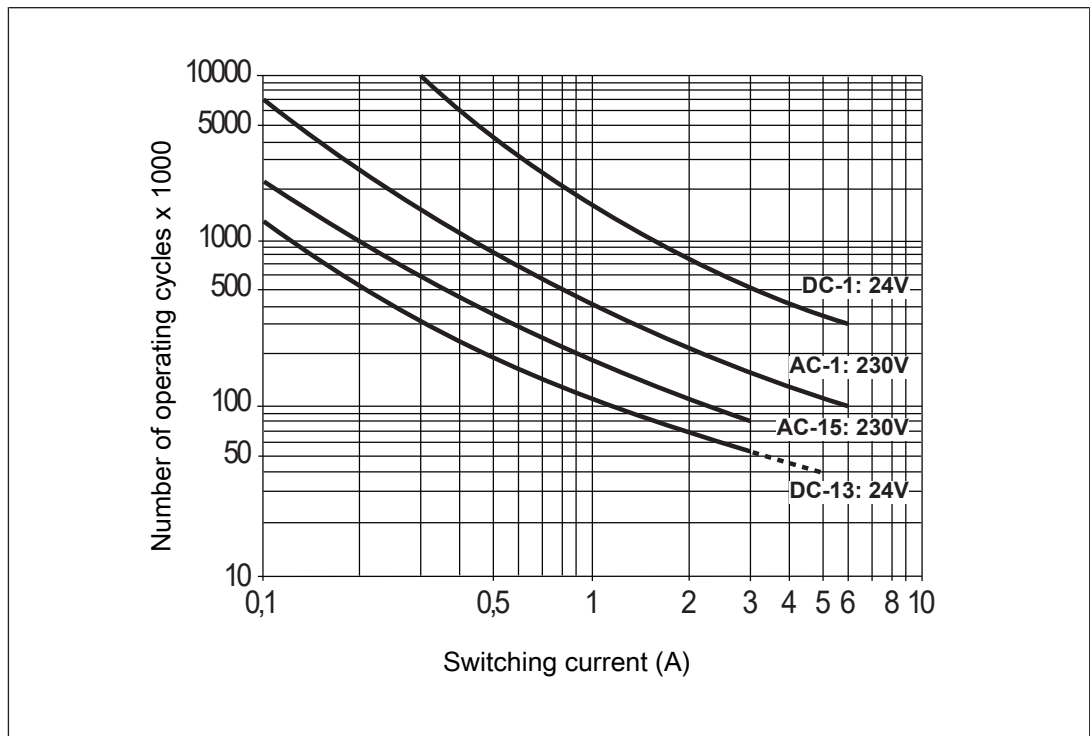
It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

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.

Service life graph: Safety contacts (N/O), instantaneous

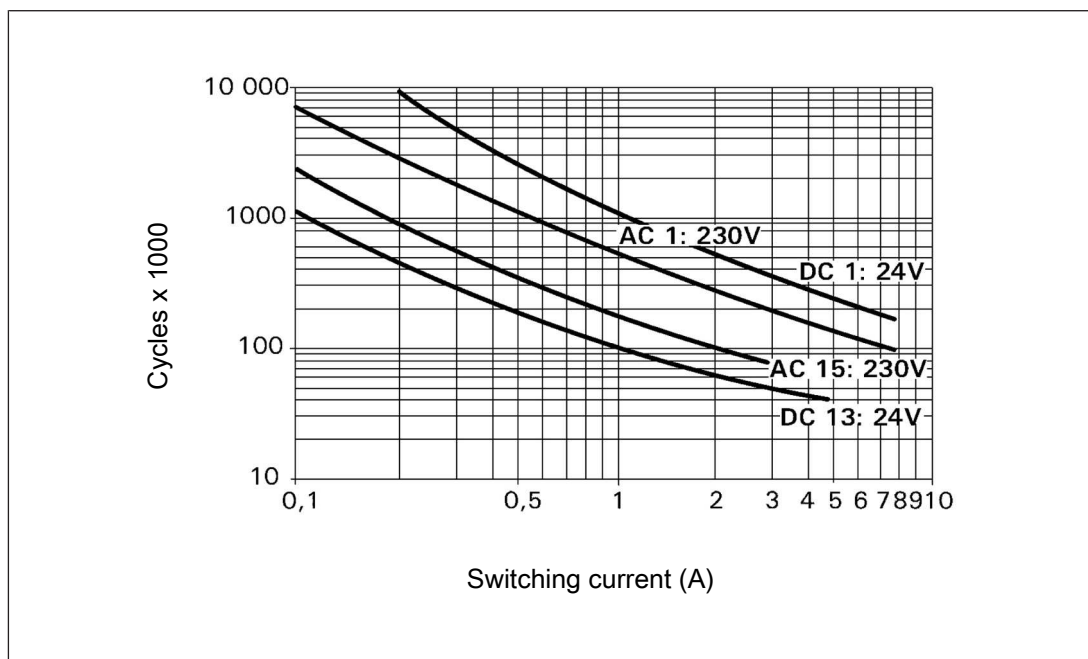


Example

- ▶ Inductive load: 0.2 A
- ▶ Utilisation category: AC15
- ▶ Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value (see [Technical details \[16\]](#)) can be used in the calculation.

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

Service life graph: Safety contact (N/O), delay-on de-energisation**Example**

- ▶ Inductive load: 0.2 A,
- ▶ Utilisation category: AC15
- ▶ Contact service life: 900 000 cycles

Provided the application to be implemented requires fewer than 900 000 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.

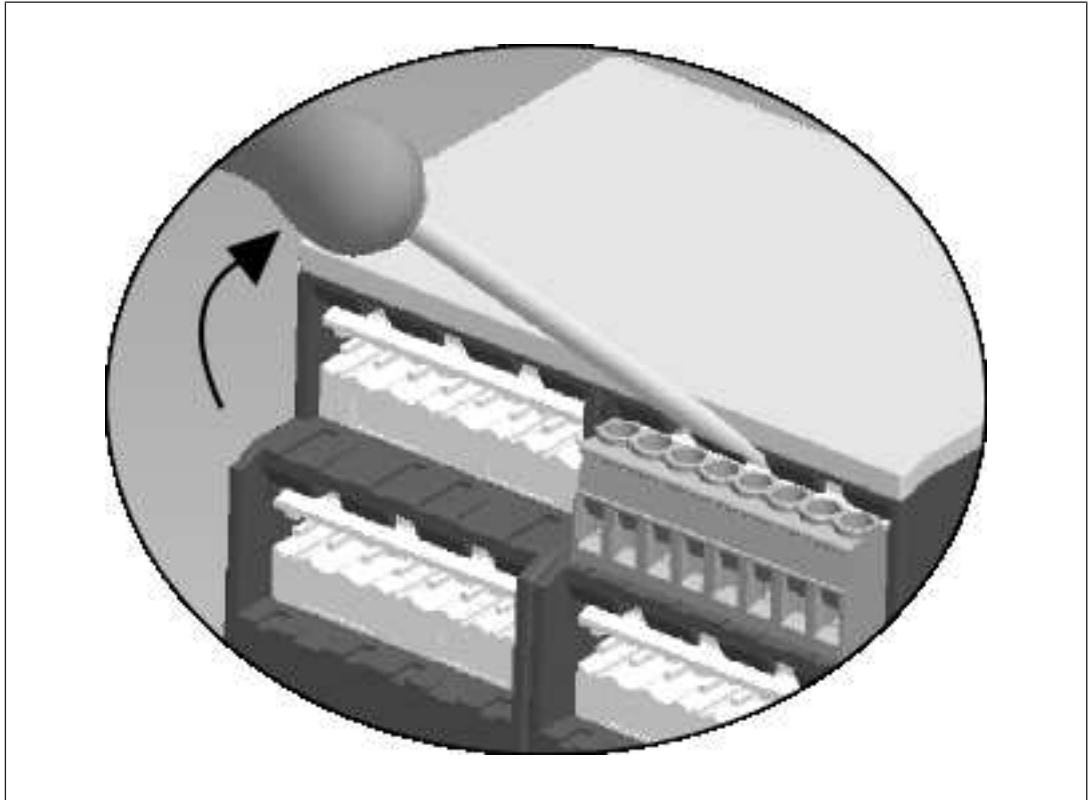
Remove plug-in terminals

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 XV1P	24 VDC; Delay: selectable up to 3 s	Screw terminals	777601
PNOZ XV1P C	24 VDC; Delay: selectable up to 3 s	Spring-loaded terminals	787601
PNOZ XV1P	24 VDC; Delay: selectable up to 30 s	Screw terminals	777602
PNOZ XV1P C	24 VDC; Delay: selectable up to 30 s	Spring-loaded terminals	787602

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.

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