

Up to PL e of EN ISO 13849-1 PNOZ X2P



Safety relay for monitoring E-STOP pushbuttons and safety gates.

Approvals

	PNOZ X2P
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Unit features

- ▶ Positive-guided relay outputs:
 - 2 safety contacts (N/O), instantaneous
- ▶ Connection options for:
 - E-STOP pushbutton
 - Safety gate limit switch
 - Reset button
- ▶ LED indicator for:
 - Switch status channel 1/2
 - Supply voltage
- ▶ Plug-in connection terminals (either spring-loaded terminal or screw terminal)
- ▶ See order reference for unit types

- ▶ 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.

Unit Description

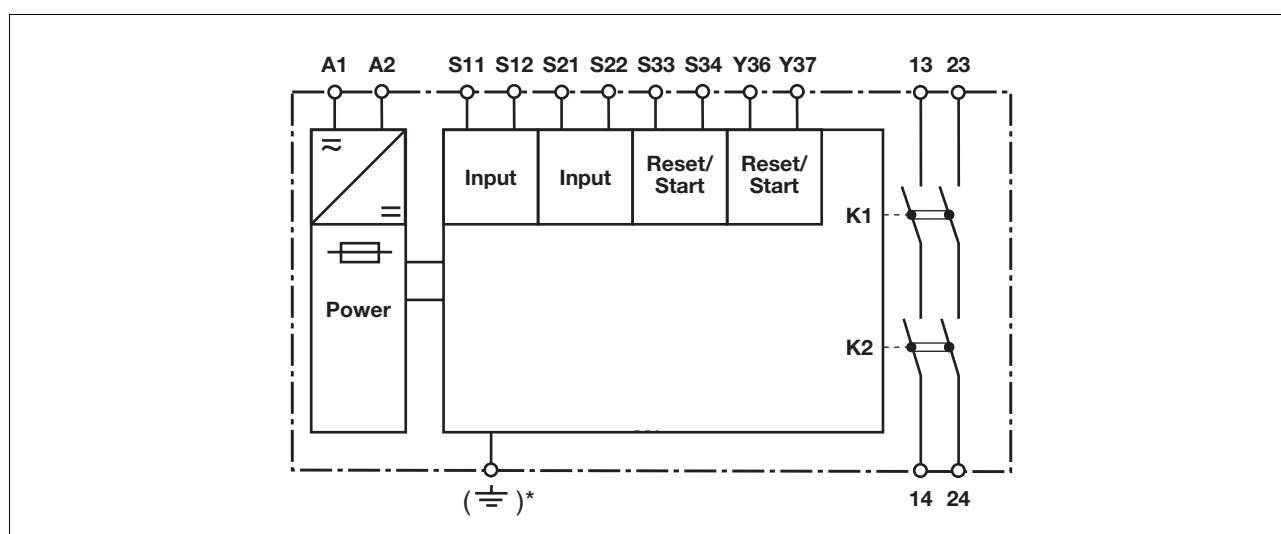
The safety relay meets the requirements of EN 60947-5-1, EN 60204-1 and VDE 0113-1 and may be used in applications with

- ▶ E-STOP pushbuttons
- ▶ Safety gates

Safety features

The relay meets the following safety requirements:

Block diagram



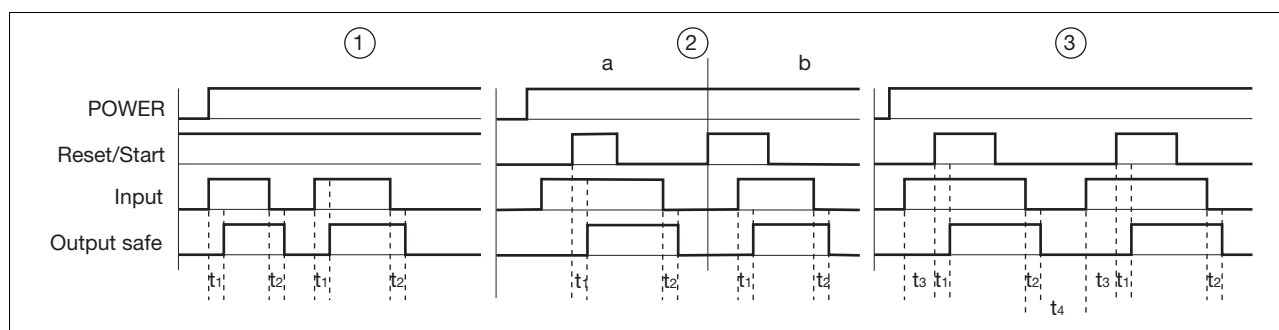
*only applicable for U_B 48 – 240 VAC/DC

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Function Description

- ▶ Single-channel operation: no redundancy in the input circuit, earth faults in the reset and input circuit are detected.
- ▶ Dual-channel operation with detection of shorts across contacts: redundant input circuit, detects
 - earth faults in the reset and input circuit,
- short circuits in the input circuit and, with a monitored reset, in the reset circuit too,
- shorts between contacts in the input circuit.
- ▶ Automatic start: Unit is active once the input circuit has been closed.
- ▶ Manual reset: Unit is active once the input circuit is closed and then the reset circuit is closed.
- ▶ Monitored reset: Unit is active once the input circuit is closed and once the reset circuit is closed after the waiting period has elapsed (see technical details).
- ▶ Increase in the number of available instantaneous safety contacts by connecting contact expansion modules or external contactors.

Timing diagram



Key

- ▶ Power: Supply voltage
- ▶ Reset/Start: Reset circuit S33-S34, Y36-Y37
- ▶ Input: Input circuits S11-S12, S21-S22
- ▶ Output safe: Safety outputs 13-14, 23-24
- ▶ ①: Automatic reset
- ▶ ②: Manual reset
- ▶ ③: Monitored reset
- ▶ a: Input circuit closes before reset circuit
- ▶ b: Reset circuit closes before input circuit
- ▶ t_1 : Switch-on delay
- ▶ t_2 : Delay-on de-energisation
- ▶ t_3 : Waiting period
- ▶ t_4 : Recovery time

Wiring

Please note:

- ▶ Information given in the “Technical details” must be followed.
- ▶ Outputs 13-14, 23-24 are safety contacts.
- ▶ To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- ▶ Calculation of the max. cable runs l_{max} in the input circuit:
- ▶ Use copper wire that can withstand 60/75 °C.
- ▶ Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.

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

R_{lmax} = max. overall cable resistance (see technical details)

R_l / km = cable resistance/km

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Preparing for operation

► Supply voltage

Supply voltage	AC	DC
U_B 24 VAC/DC		
U_B 48 - 240 VAC/DC		

► Input circuit

Input circuit	Single-channel	Dual-channel
E-STOP without detection of shorts across con- tacts	(only when U_B 24 VAC/DC) 	
E-STOP with detection of shorts across contacts		
Safety gate without detection of shorts across con- tacts	(only when U_B 24 VAC/DC) 	
Safety gate with detection of shorts across contacts		

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► Reset circuit

Reset circuit	E-STOP wiring (single-channel) Safety gate (single-channel)	E-STOP wiring (dual-channel) Safety gate (dual-channel)
Automatic reset	(only when U_B 24 VAC/DC) 	
Manual reset	(only when U_B 24 VAC/DC) 	
Monitored reset	(only when U_B 24 VAC/DC) 	

► Feedback circuit

Feedback circuit	Automatic reset	Monitored reset
Contacts from external contactors		

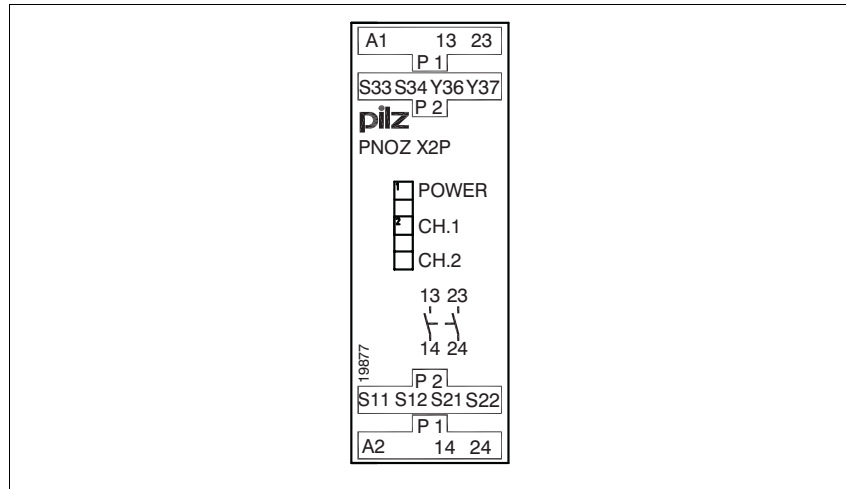
► Key

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

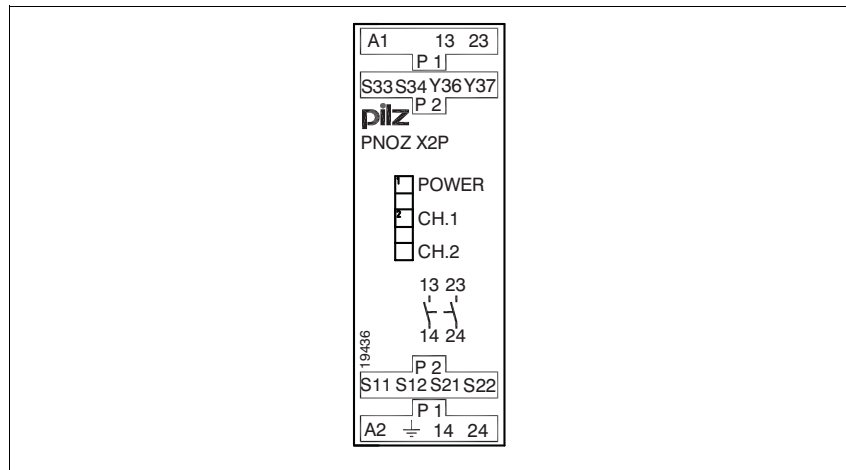
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Terminal configuration

U_B 24 VAC/DC



U_B 48 - 240 VAC/DC

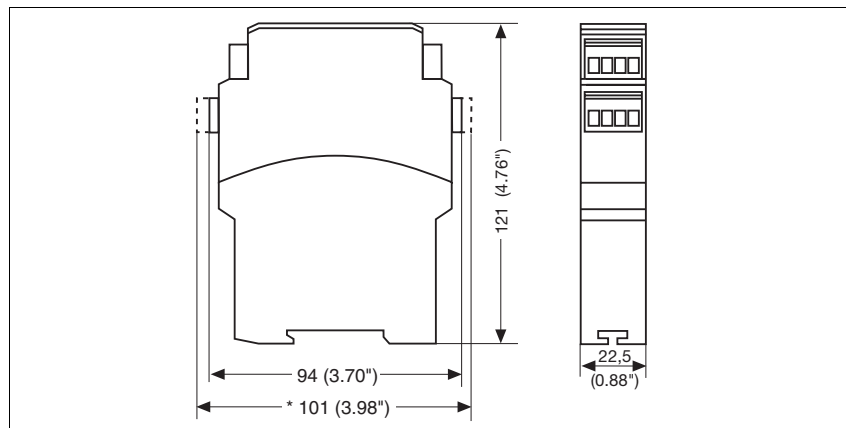


Installation

- ▶ The safety relay 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.
- ▶ Ensure the unit is mounted securely on a vertical DIN rail (35 mm) by using a fixing element (e.g. retaining bracket or an end angle).

Dimensions

* with spring-loaded terminals

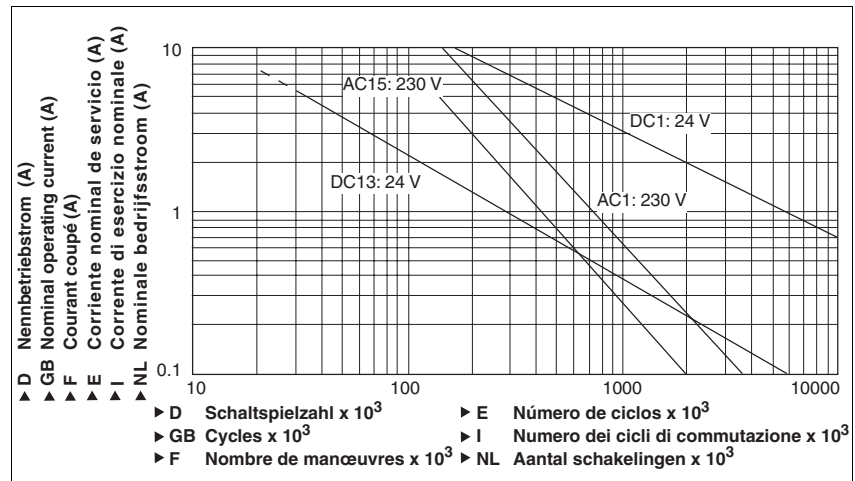


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Notice

This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

Service life trend



Technical details

Electrical data

Supply voltage	
Supply voltage U _B AC/DC	24 V, 48 - 240 V
Voltage tolerance	-15 %/+10 %
Power consumption at U _B AC	3.5 VA Order no.: 777307, 787307 4.5 VA Order no.: 777303, 787303
Power consumption at U _B DC	1.0 W Order no.: 777307, 787307 2.0 W Order no.: 777303, 787303
Frequency range AC	50 - 60 Hz
Residual ripple DC	160 %
Voltage and current at Input circuit DC: 24.0 V	15.0 mA Order no.: 777307, 787307 25.0 mA Order no.: 777303, 787303
Reset circuit DC: 24.0 V	25.0 mA Order no.: 777307, 787307 50.0 mA Order no.: 777303, 787303
Feedback loop DC: 24.0 V	25.0 mA Order no.: 777307, 787307 50.0 mA Order no.: 777303, 787303
Number of output contacts	
Safety contacts (S) instantaneous:	2
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	I_{min}: 0.01 A, I_{max}: 6.0 A P_{max}: 1500 VA
Safety contacts: DC1 at 24 V	I_{min}: 0.01 A, I_{max}: 6.0 A P_{max}: 150 W
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	I_{max}: 5.0 A
Safety contacts: DC13 at 24 V (6 cycles/min)	I_{max}: 4.0 A
Contact material	AgSnO2 + 0.2 µm Au
External contact fuse protection (I _k = 1 kA) to EN 60947-5-1	
Blow-out fuse, quick	
Safety contacts:	6 A
Blow-out fuse, slow	
Safety contacts:	4 A
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	4 A

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Electrical data	
Max. overall cable resistance R_{lmax} input circuits, reset circuits single-channel at U_B DC	100 Ohm Order no.: 777307, 787307 150 Ohm Order no.: 777303, 787303
single-channel at U_B AC	100 Ohm Order no.: 777307, 787307 50 Ohm Order no.: 777303, 787303
dual-channel with detect. of shorts across contacts at U_B DC	100 Ohm Order no.: 777307, 787307 15 Ohm Order no.: 777303, 787303
dual-channel with detect. of shorts across contacts at U_B AC	100 Ohm Order no.: 777307, 787307 30 Ohm Order no.: 777303, 787303
Safety-related characteristic data	
PL in accordance with EN ISO 13849-1	PL e (Cat. 4)
Category in accordance with EN 954-1	Cat. 4
SIL CL in accordance with EN IEC 62061	SIL CL 3
PFH in accordance with EN IEC 62061	2.31E-09
SIL in accordance with IEC 61511	SIL 3
PFD in accordance with IEC 61511	2.03E-06
t_M in years	20
Times	
Switch-on delay with automatic reset typ.	120 ms Order no.: 777307, 787307 60 ms Order no.: 777303, 787303
with automatic reset max.	150 ms Order no.: 777307, 787307 90 ms Order no.: 777303, 787303
with automatic reset after power on typ.	130 ms Order no.: 777307, 787307 60 ms Order no.: 777303, 787303
with automatic reset after power on max.	100 ms Order no.: 777303, 787303 160 ms Order no.: 777307, 787307
with manual reset typ.	38 ms
with manual reset max.	150 ms Order no.: 777307, 787307 90 ms Order no.: 777303, 787303
on monitored reset with rising edge typ.	38 ms
on monitored reset with rising edge max.	50 ms
Delay-on de-energisation with E-STOP typ.	12 ms Order no.: 777307, 787307 17 ms Order no.: 777303, 787303
with E-STOP max.	30 ms
with power failure typ.	40 ms Order no.: 777307, 787307 70 ms Order no.: 777303, 787303
with power failure max.	110 ms Order no.: 777303, 787303 70 ms Order no.: 777307, 787307
with power failure typ. U_B AC : 240 V with power failure max. U_B AC : 240 V	320 ms Order no.: 777307, 787307 500 ms Order no.: 777307, 787307
Recovery time at max. switching frequency 1/s after E-STOP	50 ms
after power failure	150 ms Order no.: 777303, 787303 550 ms Order no.: 777307, 787307
Waiting period with a monitored reset with rising edge	180 ms
Min. start pulse duration with a monitored reset with rising edge	30 ms
Simultaneity, channel 1 and 2	∞
Supply interruption before de-energisation	20 ms
Environmental data	
EMC	EN 60947-5-1, EN 61000-6-2, EN 61000-6-3
Vibration to EN 60068-2-6	
Frequency	10 - 55 Hz
Amplitude	0.35 mm

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Environmental data	
Climatic suitability	EN 60068-2-78
Airgap creepage in accordance with EN 60947-1	
Pollution degree	2
Overvoltage category	III
Rated insulation voltage	250 V
Rated impulse withstand voltage	4.00 kV
Ambient temperature	-10 - 55 °C
Storage temperature	-40 - 85 °C
Protection type	
Mounting (e.g. cabinet)	IP54
Housing	IP40
Terminals	IP20
Mechanical data	
Housing material	
Housing	PPO UL 94 V0
Front	ABS UL 94 V0
Cross section of external conductors with screw terminals	
1 core flexible	0.25 - 2.50 mm ² , 24 - 12 AWG Order no.: 777303, 777307
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.25 - 1.00 mm ² , 24 - 16 AWG Order no.: 777303, 777307
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm ² , 24 - 16 AWG Order no.: 777303, 777307
Torque setting with screw terminals	0.50 Nm Order no.: 777303, 777307
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	0.20 - 1.50 mm ² , 24 - 16 AWG Order no.: 787303, 787307
Spring-loaded terminals: Terminal points per connection	2 Order no.: 787303, 787307
Stripping length	8 mm Order no.: 787303, 787307
Dimensions	
Height	101.0 mm Order no.: 787303, 787307 94.0 mm Order no.: 777303, 777307
Width	22.5 mm
Depth	121.0 mm
Weight	200 g

The standards current on **2006-03** apply.

Order reference				
Type	Features		Terminals	Order no.
PNOZ X2P C	24 VAC	24 VDC	Spring-loaded terminals	787 303
PNOZ X2P	24 VAC	24 VDC	Screw terminals	777 303
PNOZ X2P C	48 - 240 VAC	48 - 240 VDC	Spring-loaded terminals	787 307
PNOZ X2P	48 - 240 VAC	48 - 240 VDC	Screw terminals	777 307