

Up to Category 4, EN 954-1 PNOZ X2P



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

Approvals

	PNOZ X2P
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	◆
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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 cage clamp 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

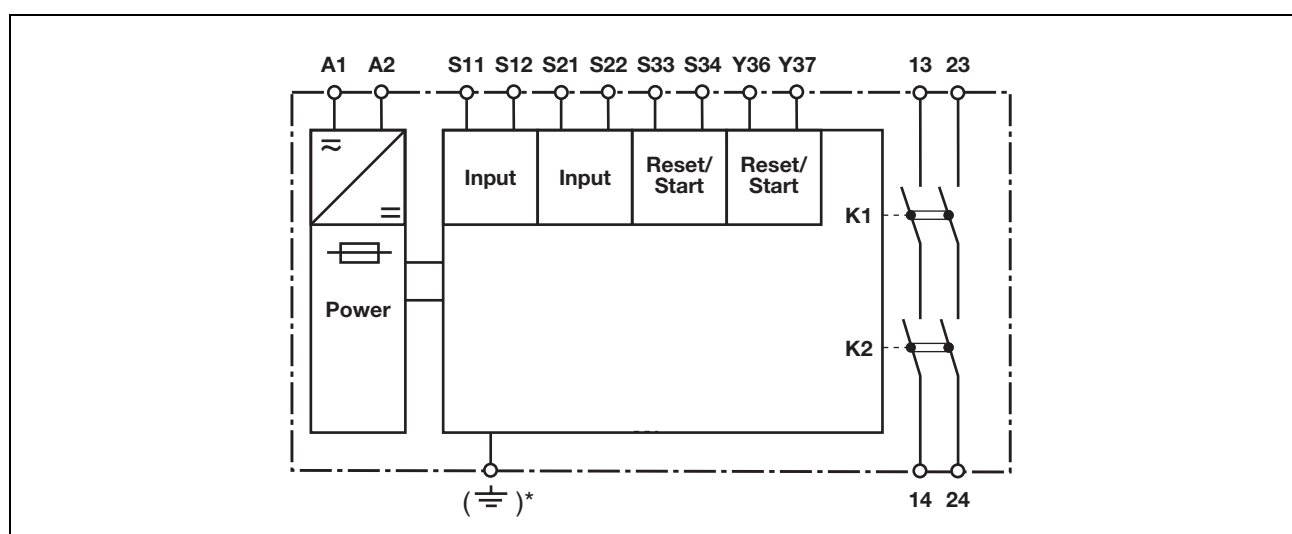
The safety relay meets the requirements of EN 60204-1 and IEC 60204-1 and may be used in applications with

- ▶ E-STOP pushbuttons
- ▶ Safety gates

Safety features

The relay conforms to the following safety criteria:

Block diagram



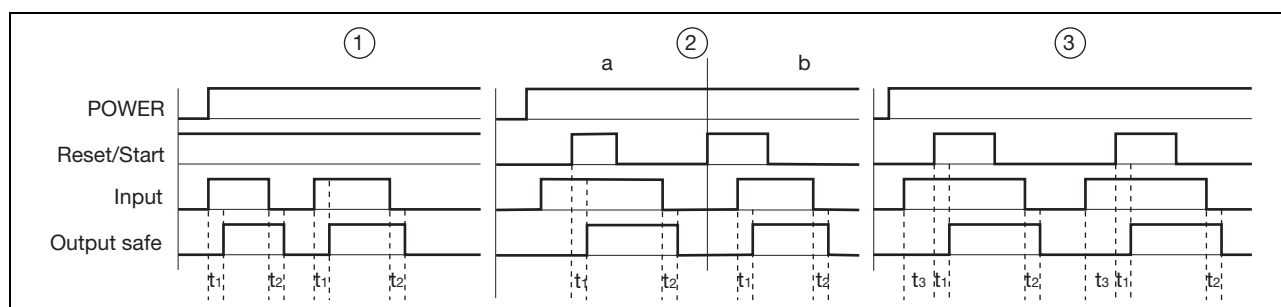
*only applicable for U_B 48 – 240 VAC/DC

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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 contacts by connecting contact expander modules or external contactors/relays.

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
- ▶ t₁: Switch-on delay
- ▶ t₂: Delay-on de-energisation
- ▶ t₃: Waiting period

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 I_{max} in the input circuit:

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

R_{lmax} = max. overall cable resistance (see technical details)
 R_l / km = cable resistance/km
- ▶ Use copper wire that can withstand 60/75 °C.
- ▶ Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.

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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 contacts	(only when U _B 24 VAC/DC) 	
E-STOP with detection of shorts across contacts		
Safety gate without detection of shorts across contacts	(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 (single-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 loop

feedback loop	Automatic reset	Monitored reset
Contacts of external contactors		

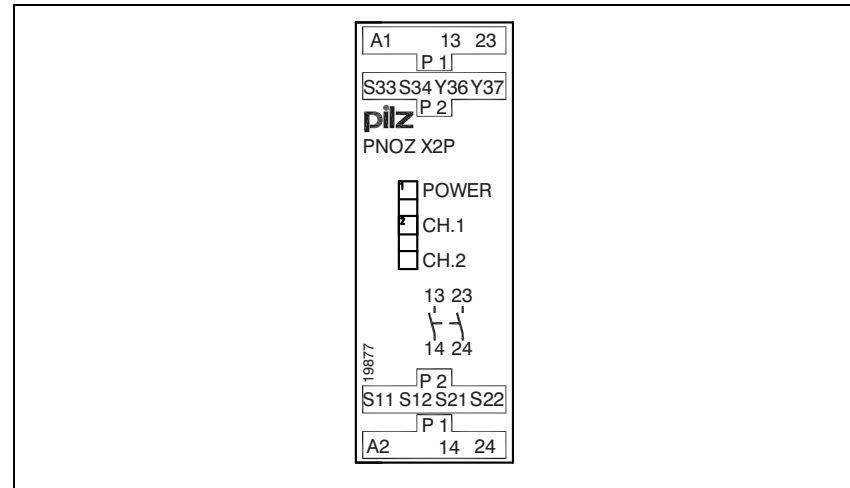
► Key

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

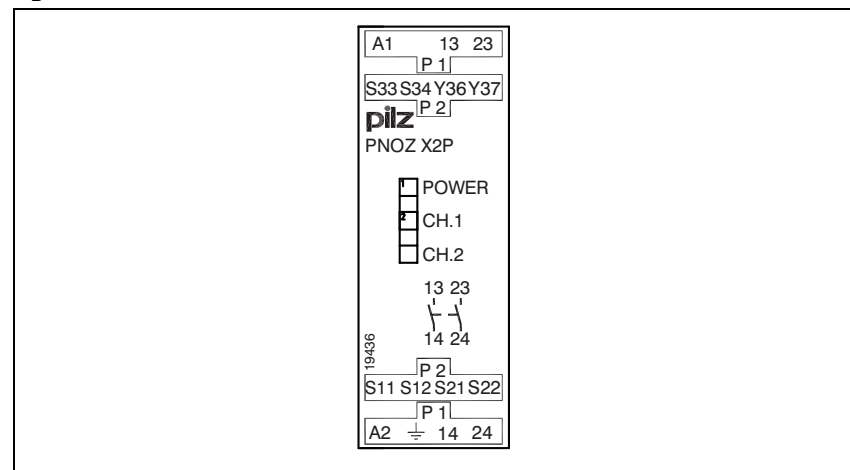
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Terminal configuration

U_B 24 VAC/DC



U_B 48 - 240 VAC/DC

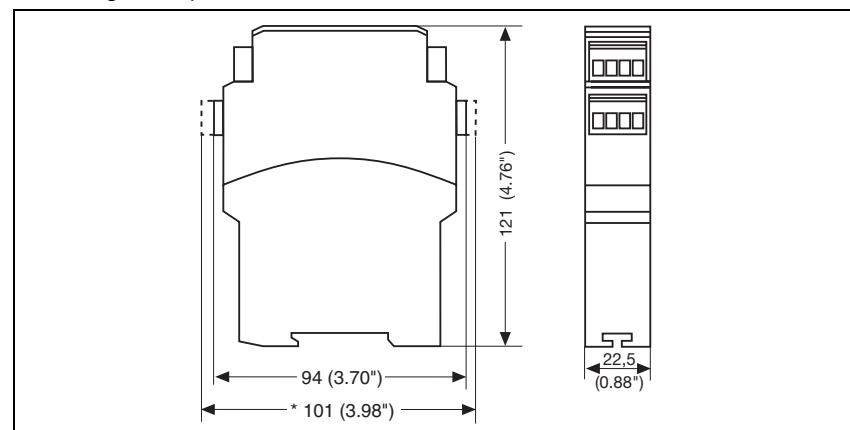


Installation

- ▶ 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 cage clamp terminals

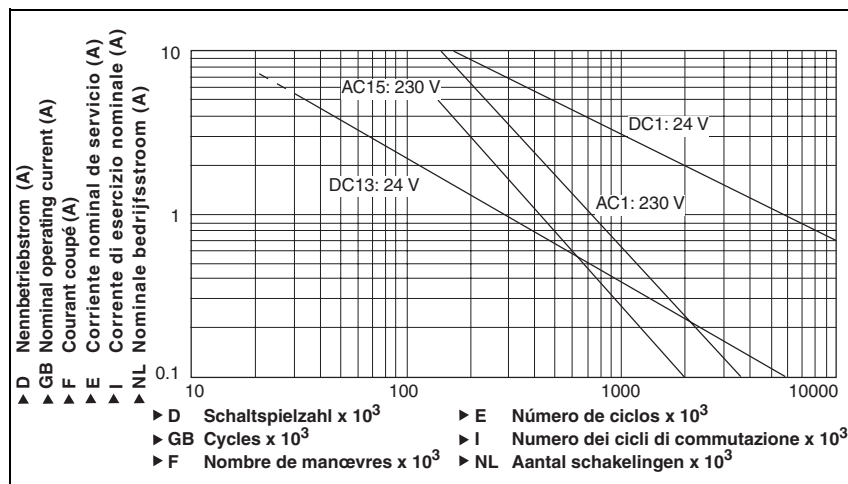


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Notice

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
Supply voltage U _B AC/DC	48 - 240 V
Voltage tolerance	-15 - 10 %
Power consumption at U _B	4.5 VA / 777307, 787307: 3.5 VA 2.0 W / 777307, 787307: 1.0 W
Frequency range AC	50 - 60 Hz
Residual ripple DC	160 %
Voltage and current at input circuit DC: 24.0 V	25 mA / 777307, 787307: 15 mA
reset circuit DC: 24.0 V	50 mA / 777307, 787307: 25 mA
feedback loop DC: 24.0 V	50 mA / 777307, 787307: 25 mA
Output contacts in accordance with EN 954-1, Category 4	Safety contacts (N/O): 2
Utilisation category in accordance with EN 60947-4-1 AC1: 240 V	I _{min} : 0.01 A , I _{max} : 6.0 A P: 1500 A
DC1: 24 V	I _{min} : 0.01 A , I _{max} : 6.0 A P: 150 W
Utilisation category in accordance with EN 60947-5-1 AC15: 230 V DC13: 24 V (DC13: 6 cycles/min)	5.0 A 4.0 A / 777307, 787307: 3.0 A
Contact material	AgSnO₂ + 0.2 µm Au
External contact fuse protection in accordance with EN 60947-5-1	
Blow-out fuse, quick	6 A
Blow-out fuse, slow	4 A
Circuit breaker	24 VAC/DC: 4 A, characteristic B/C
Max. overall cable resistance R _{lmax} input circuits, reset circuits	
Single-channel at U _B DC	150 Ohm / 777307, 787307: 100 Ohm
Single-channel at U _B AC	150 Ohm / 777307, 787307: 100 Ohm
Dual-channel with detect. of shorts across contacts at U _B DC	15 Ohm / 777307, 787307: 100 Ohm
Dual-channel with detect. of shorts across contacts at U _B AC	30 Ohm / 777307, 787307: 100 Ohm

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Times	
Switch-on delay	
with automatic reset typ.	60 ms / 777307, 787307: 120 ms
with automatic reset max.	90 ms / 777307, 787307: 150 ms
with manual reset typ.	38 ms
with manual reset max.	90 ms / 777307, 787307: 150 ms
with monitored reset typ.	38 ms
with monitored reset max.	50 ms
Delay-on de-energisation	
with dual-channel E-STOP typ.	17 ms/ 777307, 787307: 12 ms
with dual-channel E-STOP max.	30 ms
with power failure or single-channel E-STOP typ.	70 ms / 777307, 787307: $U_B = 48\text{ V}$: 40 ms, $U_B = 240\text{ V}$: 320 ms
with power failure or single-channel E-STOP max.	110 ms / 777307, 787307: $U_B = 48\text{ V}$: 70 ms, $U_B = 240\text{ V}$: 500 ms
Recovery time at max. switching frequency 1/s	
after E-STOP	50 ms
after power failure	150 ms / 777307, 787307: 550 ms
Waiting period with a monitored reset	180 ms
Simultaneity	∞
Supply interruption before de-energisation	20 ms
Environmental data	
EMC	EN 60947-5-1, EN 61000-6-2
Vibration in accordance with EN 60068-2-6	
Frequency:	10 – 55 Hz
Amplitude:	0.35 mm
Climatic suitability	EN 60068-2-78
Airgap creepage	VDE 0110-1
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
Max. cross section of external conductors with screw terminals:	
1 core flexible	0.20 - 2.5 mm ²
2 core with the same cross section, flexible with crimp connectors,	
no plastic sleeve	0.20 - 1.00 mm ²
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm ²
Torque setting with screw terminals	0.5 Nm
Max. cross section of external conductors with cage clamp terminals: flexible without crimp connectors:	0.20 – 1.50 mm ²
Cage clamp terminals:	
Terminal points per connection	2
Stripping length	8 mm
Dimensions (H x W x D) with screw terminals	94 x 22.5 x 121 mm
Dimensions (H x W x D) with cage clamp terminals	101 x 22.5 x 121 mm
Weight	200 g

The standards current on 11/01 apply.

Order reference				
Type	Features		Terminals	Order no.
PNOZ X2P C	24 VAC	24 VDC	Cage clamp terminals	787 303
PNOZ X2P	24 VAC	24 VDC	Screw terminals	777 303

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Type	Features		Terminals	Order no.
PNOZ X2P C	48 - 240 VAC	48 - 240 VDC	Cage clamp terminals	787 307
PNOZ X2P	48 - 240 VAC	48 - 240 VDC	Screw terminals	777 307