

Up to PL e of EN ISO 13849-1 PNOZ X7P



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

Approvals

	PNOZ X7P
	◆
	◆
	◆

Unit features

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

- ▶ 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

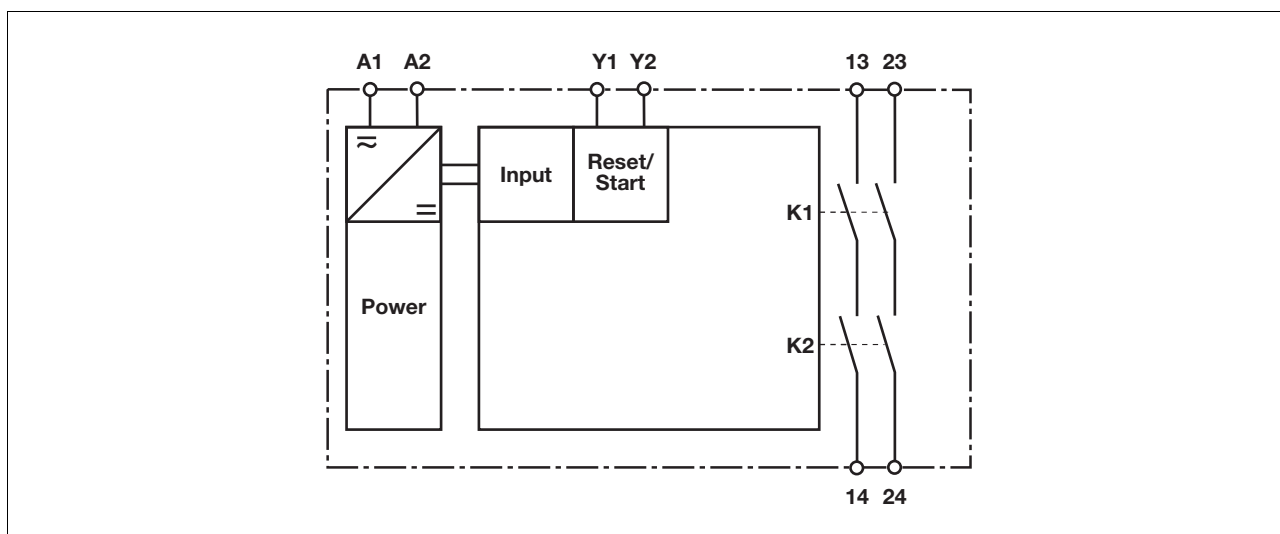
- ▶ E-STOP pushbuttons
- ▶ Safety gates

Safety features

The relay meets the following safety requirements:

- ▶ The circuit is redundant with built-in self-monitoring.
- ▶ The safety function remains effective in the case of a component failure.

Block diagram

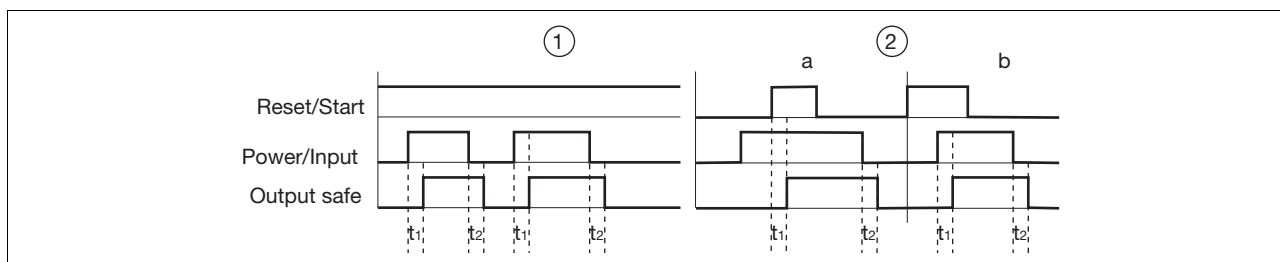


Up to PL e of EN ISO 13849-1 PNOZ X7P

Function description

- ▶ Single-channel operation: no redundancy in the input circuit, earth faults in the reset and input circuit are detected.
- ▶ 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.
- ▶ 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 Y1-Y2
- ▶ Input: Input circuits A1
- ▶ Output safe: Safety contacts 13-14, 23-24
- ▶ ①: Automatic reset
- ▶ ②: Manual reset
- ▶ a: Input circuit closes before reset circuit
- ▶ b: Reset circuit closes before input circuit
- ▶ t₁: Switch-on delay
- ▶ t₂: Delay-on de-energisation

Wiring

- PNOZ X7 AC: The cable runs depend on the cable capacitance.
- ▶ Stub circuit: Cable capacitance C_L and therefore the cable runs l_s are dependent on the supply voltage U_B
- ▶ Loop circuit, 1 phase: max. $l_r = 1$ km

Cable capacitance C_L depends on the supply voltage U_B

U_B [V]	24	110	120	230	240
C_L [nF]	37.5	37.5	37.5	7.5	7.5
Cable runs	Loop circuit		Stub circuit		

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:

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

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

$$R_l / km = \text{cable resistance/km}$$
- ▶ Use copper wire that can withstand 60/75 °C.
- ▶ Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.

Up to PL e of EN ISO 13849-1 PNOZ X7P

Preparing for operation

▶ Supply voltage

Supply voltage	AC	DC

▶ Input circuit

Input circuit	Single-channel	Dual-channel
E-STOP without detection of shorts across contacts		
Safety gate without detection of shorts across contacts		

▶ Reset circuit




Reset circuit	E-STOP wiring (single-channel)	E-STOP wiring (dual-channel)
Automatic reset		
Manual reset		

▶ Feedback circuit

Feedback circuit	Automatic reset	Monitored reset
Contacts from external contactors		

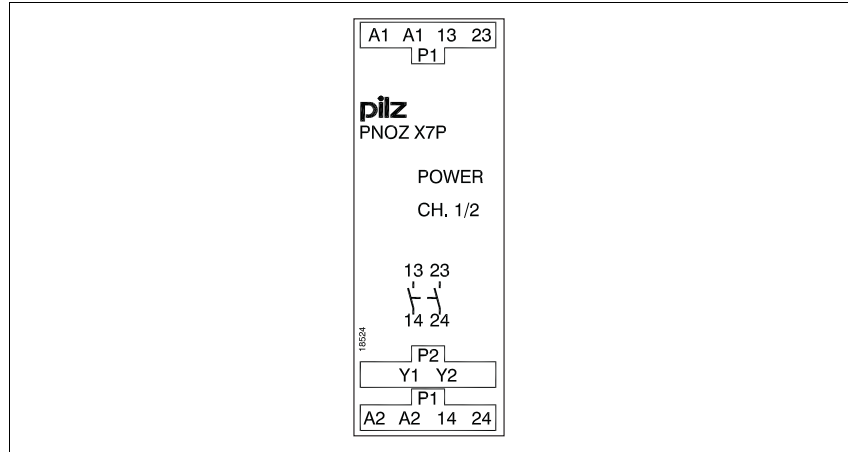
Up to PL e of EN ISO 13849-1 PNOZ X7P

► Key

S1	E-STOP pushbutton
S3	Reset button
	Switch operated
	Gate open
	Gate closed

Up to PL e of EN ISO 13849-1 PNOZ X7P

Terminal configuration

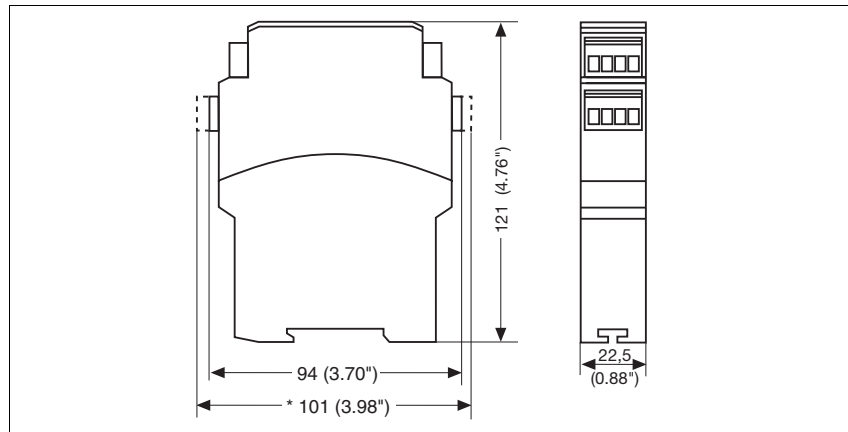


Installation

- ▶ 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

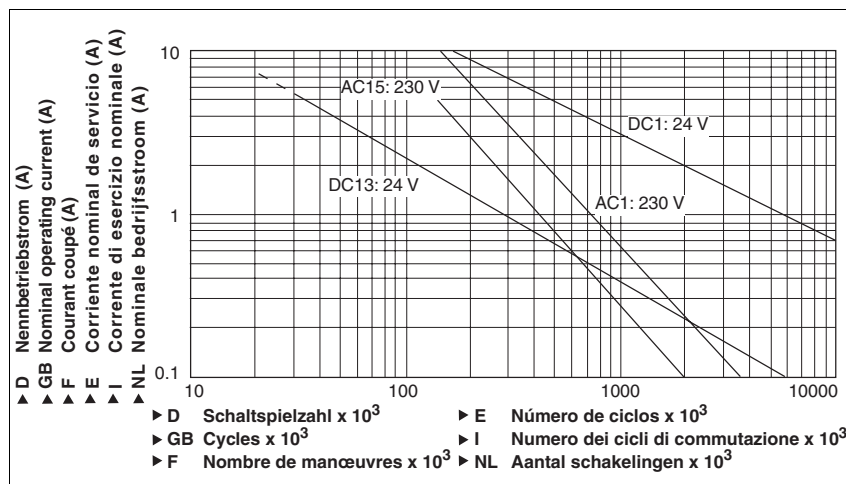


Up to PL e of EN ISO 13849-1 PNOZ X7P

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 graph



Technical details

Electrical data

Supply voltage	
Supply voltage U _B AC	110 - 120 V, 230 - 240 V
Supply voltage U _B AC/DC	24 V
Voltage tolerance	-15 %/+10 %
Power consumption at U _B AC	2.0 VA Order no.: 777053, 777056, 787053, 787056 3.0 VA Order no.: 777059, 787059
Power consumption at U _B DC	1.5 W Order no.: 777059, 787059
Frequency range AC	50 - 60 Hz
Residual ripple DC	160 %
Voltage and current at	
Input circuit DC: 110.0 - 120.0 V Order no.: 777053, 787053	17.0 mA Order no.: 777053, 787053
230.0 - 240.0 V Order no.: 777056, 787056	50.0 mA Order no.: 777059, 787059
24.0 V Order no.: 777059, 787059	8.0 mA Order no.: 777056, 787056
Reset circuit DC: 24.0 V	210.0 mA Order no.: 777059, 787059
	40.0 mA Order no.: 777053, 777056, 787053, 787056
Feedback loop DC: 24.0 V	210.0 mA Order no.: 777059, 787059
	40.0 mA Order no.: 777053, 777056, 787053, 787056
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} : 4.0 A Order no.: 777053, 777056, 787053, 787056 6.0 A Order no.: 777059, 787059 P _{max} : 1000 VA Order no.: 777053, 777056, 787053, 787056 1500 VA Order no.: 777059, 787059
Safety contacts: DC1 at 24 V	I _{min} : 0.01 A , I _{max} : 4.0 A Order no.: 777053, 777056, 787053, 787056 6.0 A Order no.: 777059, 787059 P _{max} : 100 W Order no.: 777053, 777056, 787053, 787056 150 W Order no.: 777059, 787059
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	I _{max} : 4.0 A Order no.: 777053, 777056, 787053, 787056 5.0 A Order no.: 777059, 787059
Safety contacts: DC13 at 24 V (6 cycles/min)	I _{max} : 4.0 A Order no.: 777053, 777056, 787053, 787056 6.0 A Order no.: 777059, 787059
Contact material	AgSnO2 + 0.2 µm Au

Up to PL e of EN ISO 13849-1 PNOZ X7P

Electrical data	
External contact fuse protection ($I_K = 1$ kA) to EN 60947-5-1	
Blow-out fuse, quick	
Safety contacts:	4 A Order no.: 777053, 777056, 787053, 787056 6 A Order no.: 777059, 787059
Blow-out fuse, slow	
Safety contacts:	4 A
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	4 A
Max. overall cable resistance $R_{i\max}$ input circuits, reset circuits	
single-channel at U_B DC	15 Ohm Order no.: 777059, 787059
single-channel at U_B AC	15 Ohm Order no.: 777059, 787059
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.	230 ms Order no.: 777053, 777056, 787053, 787056 50 ms Order no.: 777059, 787059
with automatic reset max.	150 ms Order no.: 777059, 787059 700 ms Order no.: 777053, 777056, 787053, 787056
with automatic reset after power on typ.	230 ms Order no.: 777053, 777056, 787053, 787056 50 ms Order no.: 777059, 787059
with automatic reset after power on max.	150 ms Order no.: 777059, 787059 700 ms Order no.: 777053, 777056, 787053, 787056
with manual reset typ.	140 ms Order no.: 777053, 777056, 787053, 787056 35 ms Order no.: 777059, 787059
with manual reset max.	150 ms Order no.: 777059, 787059 700 ms Order no.: 777053, 777056, 787053, 787056
Delay-on de-energisation	
with E-STOP typ.	45 ms Order no.: 777059, 787059 70 ms Order no.: 777053, 777056, 787053, 787056
with E-STOP max.	100 ms Order no.: 777053, 777056, 787053, 787056 70 ms Order no.: 777059, 787059
with power failure typ.	45 ms Order no.: 777059, 787059 70 ms Order no.: 777053, 777056, 787053, 787056
with power failure max.	100 ms Order no.: 777053, 777056, 787053, 787056 70 ms Order no.: 777059, 787059
Recovery time at max. switching frequency 1/s after E-STOP	120 ms Order no.: 777053, 777056, 787053, 787056 50 ms Order no.: 777059, 787059
after power failure	120 ms Order no.: 777053, 777056, 787053, 787056 150 ms Order no.: 777059, 787059
Supply interruption before de-energisation	20 ms
Environmental data	
EMC	EN 60947-5-1, EN 61000-6-2
Vibration to EN 60068-2-6	
Frequency	10 - 55 Hz
Amplitude	0.35 mm
Climatic suitability	EN 60068-2-78
Airgap creepage in accordance with EN 60947-1	
Pollution degree	2
Overvoltage category	III

Up to PL e of EN ISO 13849-1 PNOZ X7P

Environmental data	
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.: 777053, 777056, 777059
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.25 - 1.00 mm ² , 24 - 16 AWG Order no.: 777053, 777056, 777059
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm ² , 24 - 16 AWG Order no.: 777053, 777056, 777059
Torque setting with screw terminals	0.50 Nm Order no.: 777053, 777056, 777059
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.: 787053, 787056, 787059
Spring-loaded terminals: Terminal points per connection	2 Order no.: 787053, 787056, 787059
Stripping length	8 mm Order no.: 787053, 787056, 787059
Dimensions	
Height	101.0 mm Order no.: 787053, 787056, 787059 94.0 mm Order no.: 777053, 777056, 777059
Width	22.5 mm
Depth	121.0 mm
Weight	185 g Order no.: 787059 190 g Order no.: 777059 225 g Order no.: 787053, 787056 230 g Order no.: 777053, 777056

The standards current on **09/04** apply.

Conventional thermal current		
Number of contacts	I_{th} (A) at U_B AC/DC	I_{th} (A) at U_B AC
1	4 A Order no.: 777059, 787059	4 A Order no.: 777053, 777056, 787053, 787056
2	4 A Order no.: 777059, 787059	3 A Order no.: 777053, 777056, 787053, 787056

Order reference			
Type	Features	Terminals	Order no.
PNOZ X7P C	24 VAC/DC	Spring-loaded terminals	787 059
PNOZ X7P	24 VAC/DC	Screw terminals	777 059
PNOZ X7P C	110 - 120 VAC	Spring-loaded terminals	787 053
PNOZ X7P	110 - 120 VAC	Screw terminals	777 053
PNOZ X7P C	230 - 240 VAC	Spring-loaded terminals	787 056
PNOZ X7P	230 - 240 VAC	Screw terminals	777 056