

Up to Category 4, EN 954-1 PNOZ X2.8P



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

Unit features



- ▶ Positive-guided relay outputs:
 - 3 safety contacts (N/O), instantaneous
 - 1 auxiliary contact (N/C), instantaneous
- ▶ Connection options for:
 - E-STOP pushbutton
 - Safety gate limit switch
 - Reset button
 - Light barriers
- ▶ LED indicator for:
 - Switch status channel 1/2
 - Supply voltage
- ▶ See order reference for unit types

Safety features

The relay conforms to the following safety criteria:

- ▶ 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.

Approvals

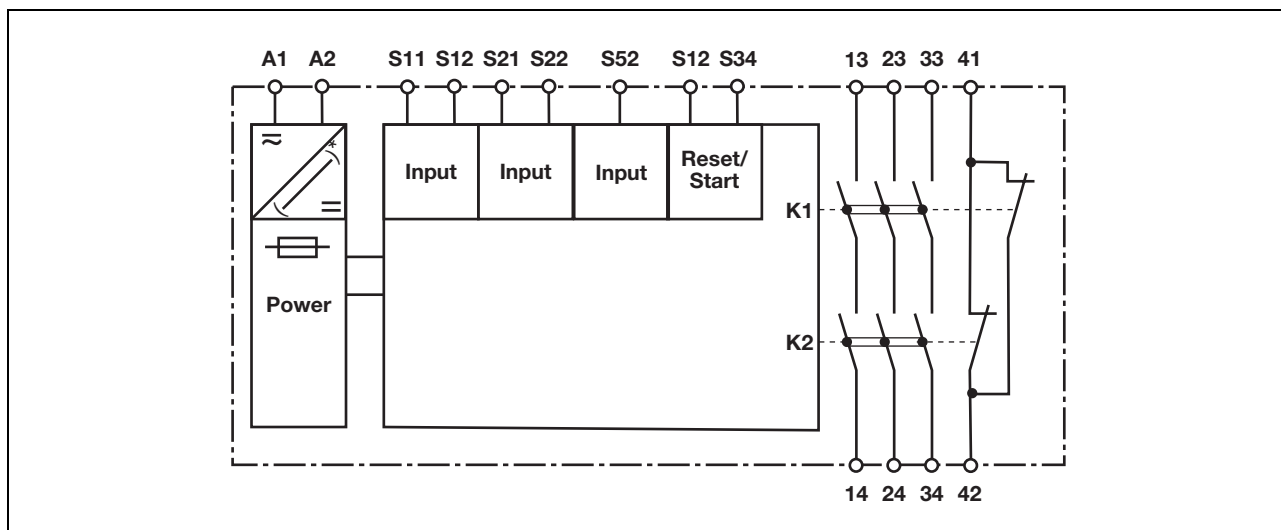
PNOZ X2.8P	
	◆
	◆

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
- ▶ Light barriers

Block diagram



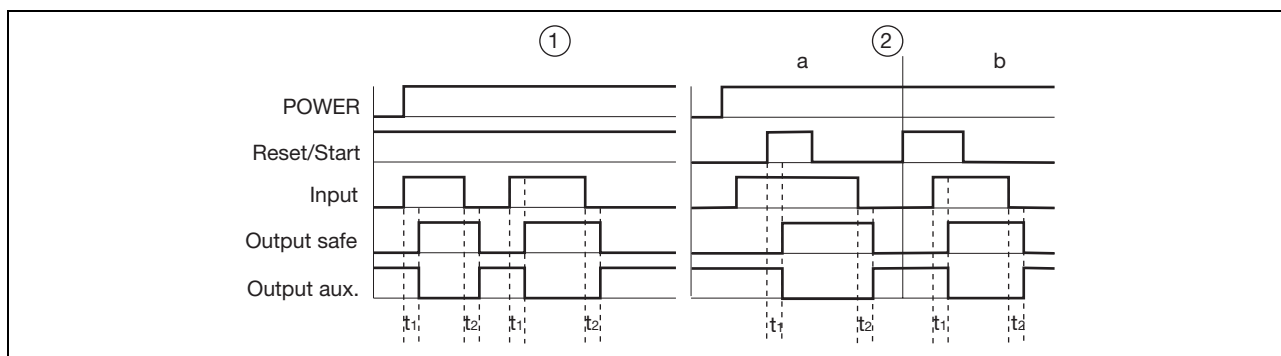
*only with UB 24 - 240 VAC/DC

Up to Category 4, EN 954-1 PNOZ X2.8P

Function description

- ▶ Single-channel operation: no redundancy in the input circuit, earth faults in the reset and input circuit are detected.
- ▶ Dual-channel operation without 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.
- ▶ Dual-channel operation with detection of shorts across contacts: redundant input circuit, detects
 - earth faults in the reset and input circuit,
 - short circuits and 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.
- ▶ 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 S12-S34
- ▶ Input: Input circuits S11-S12, S21-S22, S52
- ▶ Output safe: Safety contacts 13-14, 23-24, 33-34,
- ▶ Output aux: Auxiliary contacts 41-42
- ▶ 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

Please note:

- ▶ Information given in the “Technical details” must be followed.
- ▶ Outputs 13-14, 23-24, 33-34, are safety contacts, output 41-42 is an auxiliary contact (e.g. for display).
- ▶ 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:

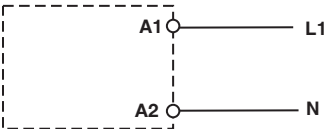
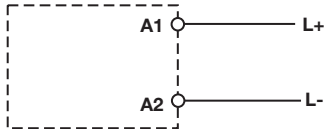
$$I_{max} = \frac{R_{I_{max}}}{R_l / km}$$

$R_{I_{max}}$ = 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.

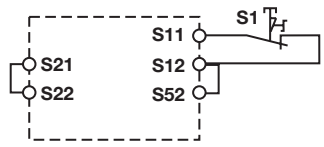
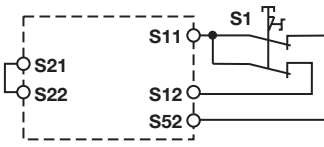

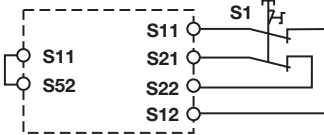
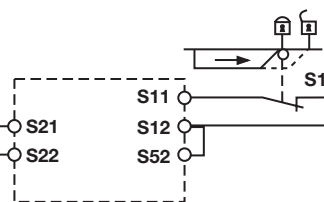
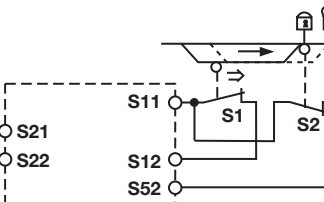

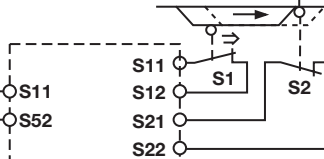

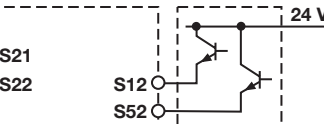
Up to Category 4, EN 954-1 PNOZ X2.8P

Preparing for operation

► Supply voltage

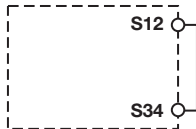
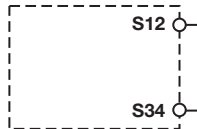
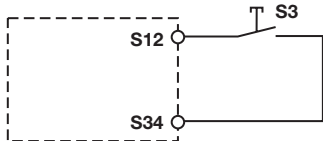
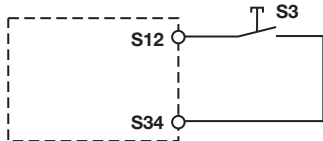
Supply voltage	AC	DC
		

► Input circuit

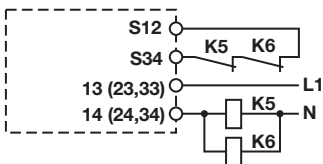
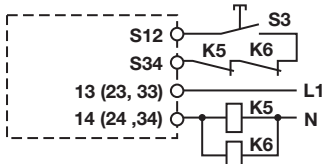
Input circuit	Single-channel	Dual-channel
E-STOP without detection of shorts across contacts		
E-STOP with detection of shorts across contacts		
Safety gate without detection of shorts across contacts		
Safety gate with detection of shorts across contacts		
Light barrier with detection of shorts across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

Up to Category 4, EN 954-1 PNOZ X2.8P




▶ Reset circuit

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

▶ Feedback loop

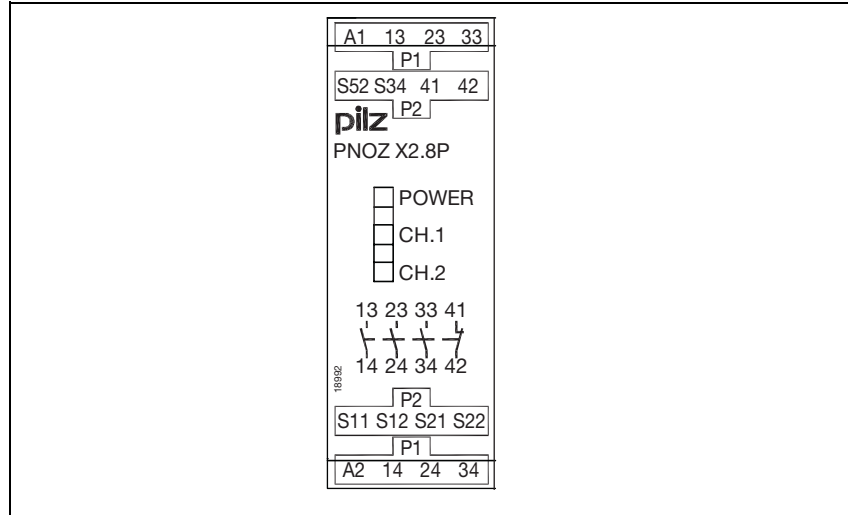
Feedback loop	Automatic reset	Manual reset
Contacts from external contactors		

▶ Key

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

Up to Category 4, EN 954-1 PNOZ X2.8P

Terminal configuration

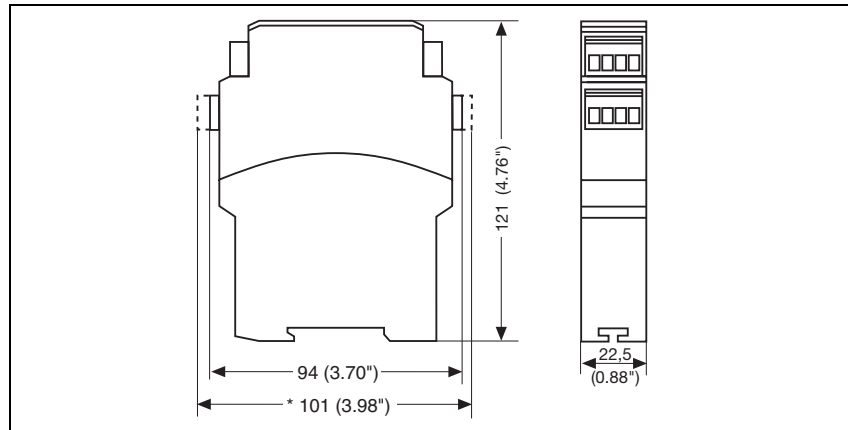


Installation

- ▶ 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 cage clamp terminals



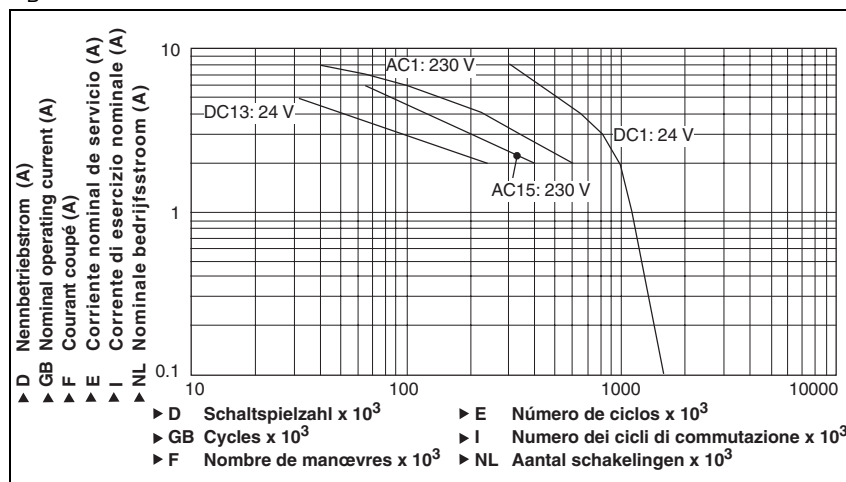
Up to Category 4, EN 954-1 PNOZ X2.8P

Notice

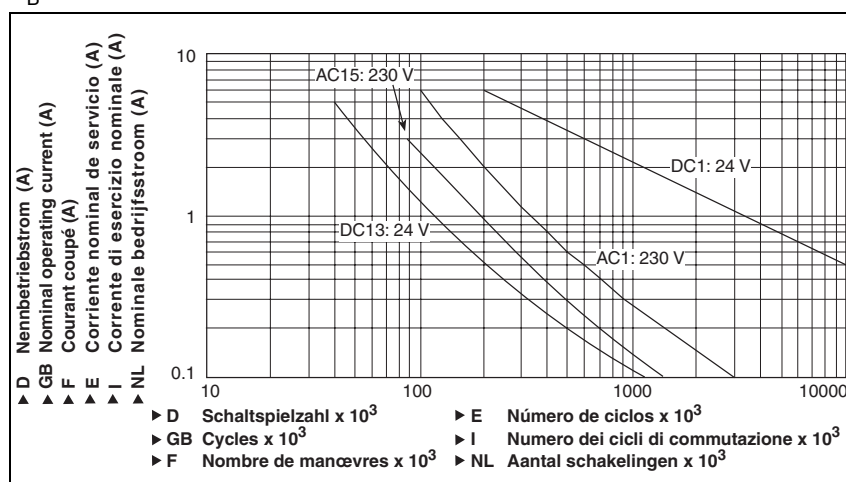
This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

Service life graph

U_B 24 VAC/DC



U_B 24 - 240 VAC/DC



Technical details

Electrical data

Supply voltage	
Supply voltage U_B AC:	24 - 240 V
Supply voltage U_B DC:	24 - 240 V
Voltage tolerance	-15% - 10%
Power consumption at U_B AC	Order no. 777301, 787301: 3.5 VA Order no. 777302, 787302: 4.5 VA
Power consumption at U_B DC	2.0 W
Frequency range AC	50 - 60 Hz
Residual ripple DC	160 %
Voltage and current at input circuit DC: 24.0 V	Order no. 777301, 787301: 30 mA Order no. 777302, 787302: 25 mA
reset circuit DC: 24.0 V	50 mA
feedback loop DC: 24.0 V	50 mA
Output contacts in accordance with EN 954-1 , Category 4	Safety contacts (N/O): 3
Output contacts in accordance with EN 954-1 , Category 3	Auxiliary contacts (N/C): 1

Up to Category 4, EN 954-1 PNOZ X2.8P

Electrical data	
Utilisation category in accordance with EN 60947-4-1 AC1: 240 V	I_{\min} : 0.01 A , I_{\min} : 6.0 A P_{\max} : 1500 VA
DC1: 24 V	I_{\min} : 0.01 A , I_{\min} : 6.0 A P_{\max} : 150 W
Utilisation category in accordance with EN 60947-5-1 AC15: 230 V	I_{\max} : Order no. 777301, 787301: 5.0 A Order no. 777302, 787302: 3.0 A
DC13: 24 V (DC13: 6 cycles/min)	I_{\max} : 4.0 A
Contact material	Order no. 777301, 787301: AgSnO₂ + 0.2 μAu Order no. 777302, 787302: AgCuNi + 0.2 μAu
External contact fuse protection in accordance with EN 60947-5-1 Blow-out fuse, quick Blow-out fuse, slow Circuit breaker	6 A 4 A 24 VAC/DC, 4 A , characteristic B/C
Max. overall cable resistance $R_{l\max}$ input circuits, reset circuits single-channel at U_B DC	Order no. 777301, 787301: 50 Ohm Order no. 777302, 787302: 45 Ohm
single-channel at U_B AC	Order no. 777301, 787301: 200 Ohm Order no. 777302, 787302: 45 Ohm
dual-channel without detect. of shorts across contacts at U_B DC	Order no. 777301, 787301: 100 Ohm Order no. 777302, 787302: 80 Ohm
dual-channel without detect. of shorts across contacts U_B AC	Order no. 777301, 787301: 320 Ohm Order no. 777302, 787302: 80 Ohm
dual-channel with detect. of shorts across contacts at U_B DC	15 Ohm
dual-channel with detect. of shorts across contacts U_B AC	Order no. 777301, 787301: 25 Ohm Order no. 777302, 787302: 15 Ohm
Times	
Switch-on delay with automatic reset typ.	Order no. 777301, 787301: 200 ms Order no. 777302, 787302: 340 ms
with automatic reset max.	Order no. 777301, 787301: 350 ms Order no. 777302, 787302: 400 ms
with automatic reset after power on typ.	Order no. 777301, 787301: 210 ms Order no. 777302, 787302: 600 ms
with automatic reset after power on max.	Order no. 777301, 787301: 400 ms Order no. 777302, 787302: 800 ms
with manual reset typ.	Order no. 777301, 787301: 100 ms Order no. 777302, 787302: 180 ms
with manual reset max.	Order no. 777301, 787301: 350 ms Order no. 777302, 787302: 400 ms
Delay-on de-energisation with E-STOP typ.	Order no. 777301, 787301: 12 ms Order no. 777302, 787302: 10 ms
with E-STOP max.	Order no. 777301, 787301: 30 ms Order no. 777302, 787302: 20 ms
with power failure typ.	Order no. 777301, 787301: 50 ms
with power failure max.	Order no. 777301, 787301: 80 ms
with power failure typ. $U_B = 24$ VAC/DC	Order no. 777302, 787302: 180 ms
with power failure max. $U_B = 24$ VAC/DC	Order no. 777302, 787302: 230 ms
with power failure typ. $U_B = 240$ VAC/DC	Order no. 777302, 787302: 1100 ms
with power failure max. $U_B = 240$ VAC/DC	Order no. 777302, 787302: 1500 ms
Recovery time at max. switching frequency 1/s after E-STOP after power failure	50 ms Order no. 777301, 787301: 150 ms Order no. 777302, 787302: 250 ms
Simultaneity, channel 1 and 2	∞
Supply interruption before de-energisation	Order no. 777301, 787301: 10 ms Order no. 777302, 787302: 20 ms

Up to Category 4, EN 954-1 PNOZ X2.8P

Environmental data	
EMC	Order no. 777301, 787301: EN 60947-5-1, EN 61000-6-2 Order no. 777302, 787302: EN 60947-5-1, EN 61000-6-2, EN 61000-6-4
Vibration in accordance with EN 60068-2-6	
Frequency:	10 - 55 Hz
Amplitude:	0.35 mm
Climatic suitability	IEC 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 on screw terminals	
1 core flexible	0.25 - 2.5 mm²
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0.25 - 1 mm²
without crimp connectors or with TWIN crimp connectors	0.2 - 1.5 mm²
Torque setting with screw terminals	0.5 Nm
Max. cross section of external conductors with cage clamp terminals: Flexible without crimp connectors	
	0.2 - 1.5 mm²
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
With cage clamp terminals	101 x 22.5 x 121 mm
Weight	Order no. 777301, 787301: 190 g Order no. 777302, 787302: 210 g

The standards current on **11/03** apply.

Max. continuous current		
Number of contacts	I_{max} (A) at U_B DC	I_{max} (A) at U_B AC
1	6.00	6.00
2	6.00	6.00
3	Order no.: 777301, 787301: 5.00 Order no.: 777302, 787302: 4.50	Order no.: 777301, 787301: 5.00 Order no.: 777302, 787302: 4.50

Order reference				
Type	Features		Terminals	Order no.
PNOZ X2.8P C	24 VAC	24 VDC	Cage clamp terminals	787 301
PNOZ X2.8P	24 VAC	24 VDC	Screw terminals	777 301
PNOZ X2.8P C	24 - 240 VAC	24 - 240 VDC	Cage clamp terminals	787 302
PNOZ X2.8P	24 - 240 VAC	24 - 240 VDC	Screw terminals	777 302