

Up to Category 4, EN 954-1 PNOZ X4






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

- ▶ 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.
- ▶ The transformer is short circuit-proof. An electronic fuse is used on a DC supply.

Approvals

	PNOZ X4
	◆
	◆
	◆

Unit description

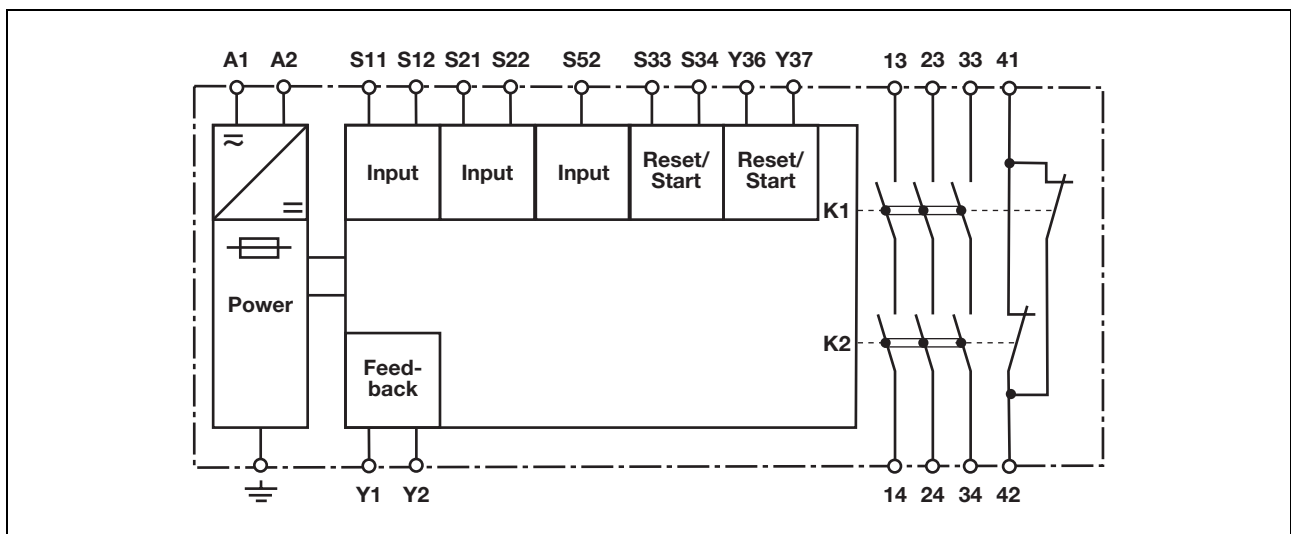
The safety relay meets the requirements of EN 60204-1 and IEC 60204-1 and may be used in applications with

- ▶ E-STOP pushbuttons
- ▶ Safety gates
- ▶ Light barriers

Safety features

The relay conforms to the following safety criteria:

Block diagram

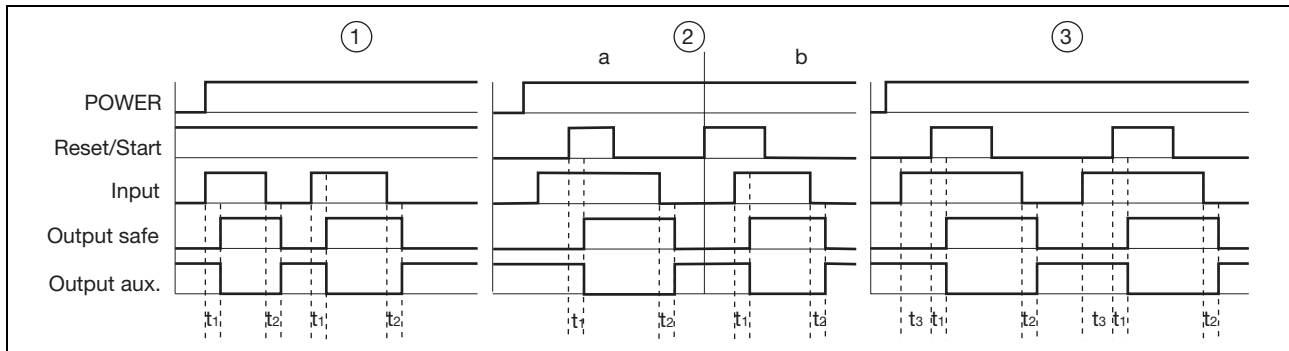


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Function description

- ▶ Single-channel operation: no redundancy in the input circuit, earth faults in the reset and input circuit are detected.
- ▶ Dual-channel operation 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 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
- ▶ Input: Input circuits S11-S12, S21-S22, S52
- ▶ Output safe: Safety outputs 13-14, 23-24, 33-34
- ▶ Output aux: Auxiliary contacts 41-42
- ▶ 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, 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 l_{max} in the input circuit:

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

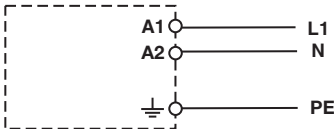
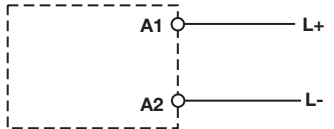
R_{lmax} = max. overall cable resistance (see technical details)
 R_l / km = cable resistance/km

- ▶ Use copper wire that can withstand 60/75 °C.
- ▶ Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.

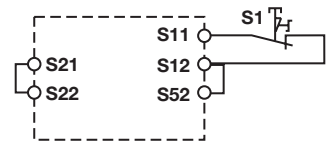
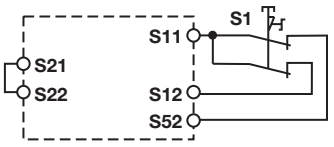

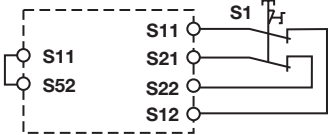
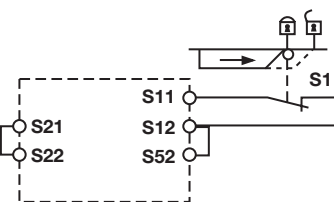
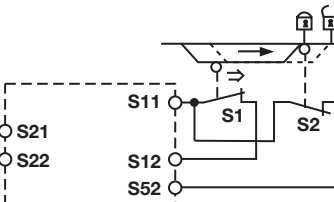
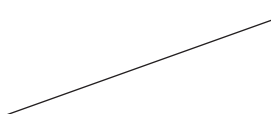
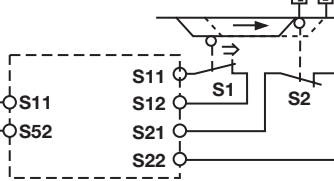
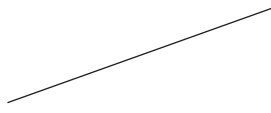
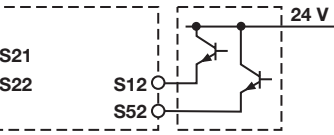
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Preparing for operation

► Supply voltage

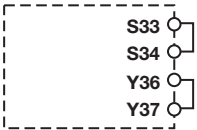
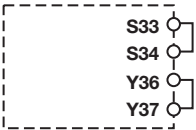
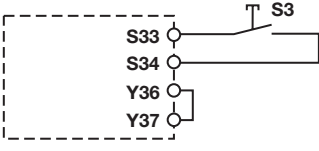
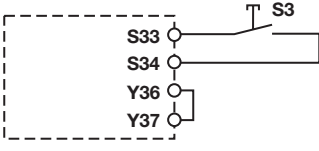
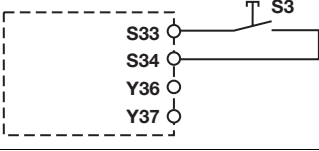
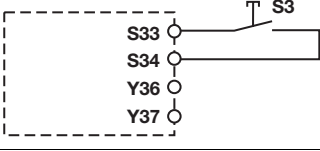
Supply voltage	AC	DC
		

► Input circuit

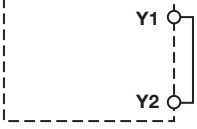
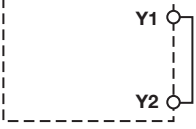
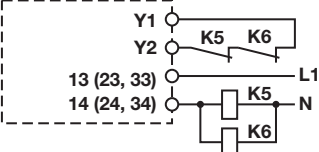
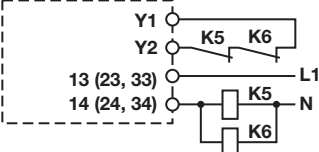
Input circuit	Single-channel	Dual-channel
E-STOP without detection of shorts across contacts		
E-STOP with detection of shorts across contacts		
Safety gate without detection of shorts across contacts		
Safety gate with detection of shorts across contacts		
Light barrier with detection of shorts across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

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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		
Manual reset		
Monitored reset		

▶ Feedback loop

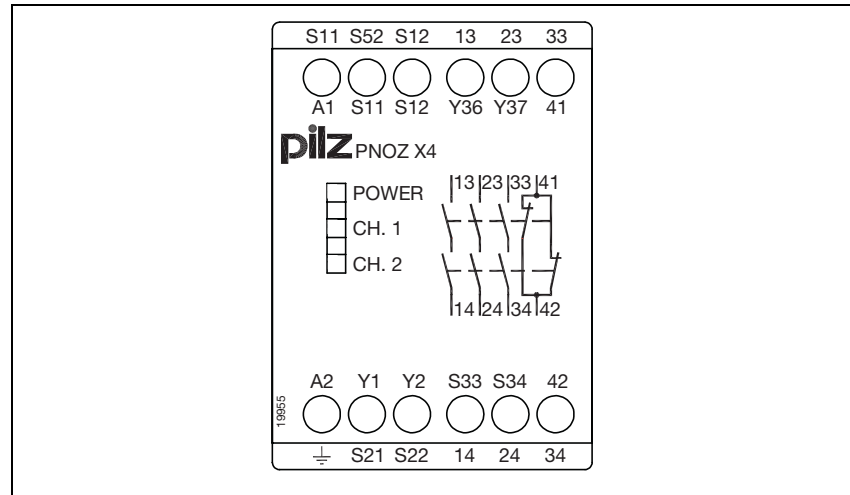
Feedback loop	Automatic reset	Manual/monitored reset
Link		
Contacts from external contactors		

▶ Key

S1/S2	Two-hand button
S3	Reset button
	Switch operated
	Gate open
	Gate closed

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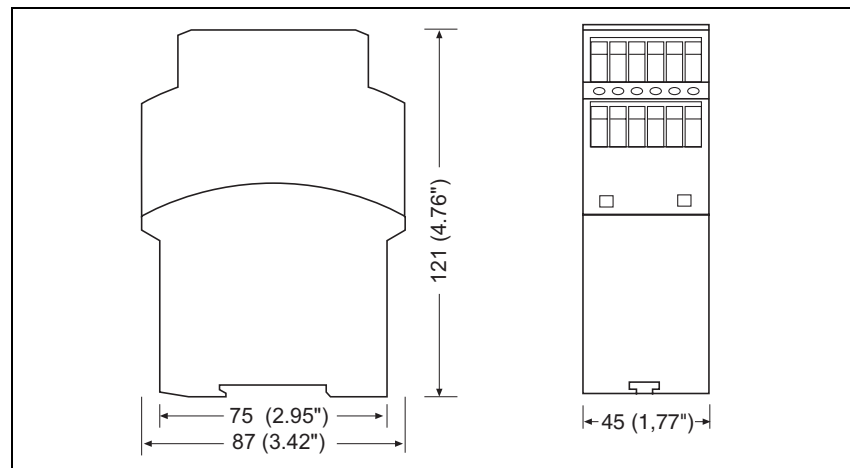
Terminal configuration



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

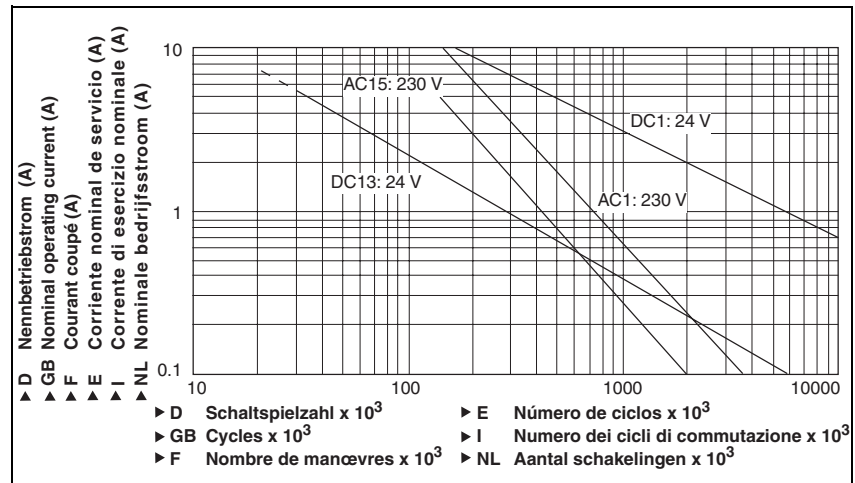


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Notice

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 graph



Technical details

Electrical data

Supply voltage	
Supply voltage U _B AC	24 V, 110 V, 115 V, 120 V, 230 V, 240 V
Supply voltage U _B DC	24 V
Voltage tolerance	-15 %/+10 %
Power consumption at U _B AC	5.0 VA Order no.: 774731, 774734, 774735, 774736, 774738, 774739
Power consumption at U _B DC	2.5 W Order no.: 774730
Frequency range AC	50 - 60 Hz
Residual ripple DC	160 %
Voltage and current at input circuit DC: 24.0 V	40.0 mA
reset circuit DC: 24.0 V	70.0 mA Order no.: 774730 90.0 mA Order no.: 774731, 774734, 774735, 774736, 774738, 774739
feedback loop DC: 24.0 V	70.0 mA Order no.: 774730 90.0 mA Order no.: 774731, 774734, 774735, 774736, 774738, 774739
Output contacts in accordance with EN 954-1 Category 4	Safety contacts (N/O): 3 Auxiliary contacts (N/C): 1
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	I _{min} : 0.01 A , I _{max} : 8.0 A P _{max} : 2000 VA
Safety contacts: DC1 at 24 V	I _{min} : 0.01 A , I _{max} : 8.0 A P _{max} : 200 W
Auxiliary contacts: AC1 at 240 V	I _{min} : 0.01 A , I _{max} : 8.0 A P _{max} : 2000 VA
Auxiliary contacts: DC1 at 24 V	I _{min} : 0.01 A , I _{max} : 8.0 A P _{max} : 200 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} : 7.0 A
Auxiliary contacts: AC15 at 230 V	I _{max} : 5.0 A
Auxiliary contacts: DC13 at 24 V (6 cycles/min)	I _{max} : 7.0 A
Contact material	AgSnO2 + 0.2 µm Au

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Electrical data	
External contact fuse protection to EN 60947-5-1	
Blow-out fuse, quick	
Safety contacts:	10 A
Auxiliary contacts:	10 A
Blow-out fuse, slow	
Safety contacts:	6 A
Auxiliary contacts:	6 A
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	6 A
Auxiliary contacts:	6 A
Max. overall cable resistance R_{lmax} input circuits, reset circuits	
single-channel at U_B DC	20 Ohm Order no.: 774730
single-channel at U_B AC	150 Ohm Order no.: 774731, 774734, 774735, 774736, 774738, 774739
dual-channel without detect. of shorts across contacts at U_B DC	20 Ohm Order no.: 774730
dual-channel without detect. of shorts across contacts at U_B AC	150 Ohm Order no.: 774731, 774734, 774735, 774736, 774738, 774739
dual-channel with detect. of shorts across contacts at U_B DC	15 Ohm Order no.: 774730
dual-channel with detect. of shorts across contacts at U_B AC	100 Ohm Order no.: 774731, 774734, 774735, 774736, 774738, 774739
Times	
Switch-on delay	
with automatic reset typ.	210 ms Order no.: 774731, 774734, 774735, 774736, 774738, 774739
	270 ms Order no.: 774730
with automatic reset max.	350 ms Order no.: 774731, 774734, 774735, 774736, 774738, 774739
	600 ms Order no.: 774730
with automatic reset after power on typ.	240 ms Order no.: 774731, 774734, 774735, 774736, 774738, 774739
	270 ms Order no.: 774730
with automatic reset after power on max.	390 ms Order no.: 774731, 774734, 774735, 774736, 774738, 774739
	600 ms Order no.: 774730
with manual reset typ.	55 ms Order no.: 774731, 774734, 774735, 774736, 774738, 774739
	70 ms Order no.: 774730
with manual reset max.	350 ms Order no.: 774731, 774734, 774735, 774736, 774738, 774739
	600 ms Order no.: 774730
with monitored reset typ.	30 ms Order no.: 774731, 774734, 774735, 774736, 774738, 774739
	40 ms Order no.: 774730
with monitored reset max.	50 ms Order no.: 774731, 774734, 774735, 774736, 774738, 774739
	70 ms Order no.: 774730
Delay-on de-energisation	
with E-STOP typ.	15 ms
with E-STOP max.	30 ms
with power failure typ.	50 ms Order no.: 774730
	55 ms Order no.: 774731, 774734, 774735, 774736, 774738, 774739
with power failure max.	70 ms Order no.: 774730
	80 ms Order no.: 774731, 774734, 774735, 774736, 774738, 774739
Recovery time at max. switching frequency 1/s	
after E-STOP	50 ms
after power failure	100 ms

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Times	
Waiting period with a monitored reset	150 ms Order no.: 774731, 774734, 774735, 774736, 774738, 774739 250 ms Order no.: 774730
Min. start pulse duration with a monitored reset	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
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. control 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 - 4.00 mm², 24 - 10 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.20 - 2.50 mm², 24 - 14 AWG
without crimp connectors or with TWIN crimp connectors	0.20 - 2.50 mm², 24 - 14 AWG
Torque setting with screw terminals	0.60 Nm
Dimensions	
Height	87.0 mm
Width	45.0 mm
Depth	121.0 mm
Weight	
	270 g Order no.: 774730 370 g Order no.: 774731, 774734, 774735, 774736, 774738, 774739

The standards current on **09/00** apply.

Max. continuous current		
Number of contacts	I_{max} (A) at U_B DC	I_{max} (A) at U_B AC
1	8.00 A Order no.: 774730, 774732	8.00 A Order no.: 774731, 774734, 774735, 774736, 774738, 774739
2	8.00 A Order no.: 774730, 774732	7.50 A Order no.: 774731, 774734, 774735, 774736, 774738, 774739
3	7.00 A Order no.: 774730, 774732	6.50 A Order no.: 774731, 774734, 774735, 774736, 774738, 774739

Order reference			
Type	Features	Terminals	Order no.
PNOZ X4	24 VAC	Screw terminals	774 731
PNOZ X4	110 VAC	Screw terminals	774 734
PNOZ X4	115 VAC	Screw terminals	774 735

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Type	Features	Terminals	Order no.
PNOZ X4	120 VAC	Screw terminals	774 736
PNOZ X4	230 VAC	Screw terminals	774 738
PNOZ X4	240 VAC	Screw terminals	774 739
PNOZ X4	24 VDC	Screw terminals	774 730