




Up to Category 4, EN 954-1 PNOZ X9



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

Approvals

PNOZ X9	
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Unit features

- ▶ Positive-guided relay outputs:
 - 7 safety contacts (N/O), instantaneous
 - 2 auxiliary contacts (N/C), instantaneous
- ▶ 2 semiconductor outputs
- ▶ Connection options for:
 - E-STOP pushbutton
 - Safety gate limit switch
 - Reset button
 - Light barriers
- ▶ LED indicator for:
 - Switch status channel 1/2
 - Supply voltage
 - Reset circuit
 - Input circuits
- ▶ Semiconductor output signals:
 - Supply voltage is present
 - Switch status channel 1/2
- ▶ See order reference for unit types

- ▶ Safety gates
- ▶ Light barriers

Safety features

The relay conforms to the following safety criteria:

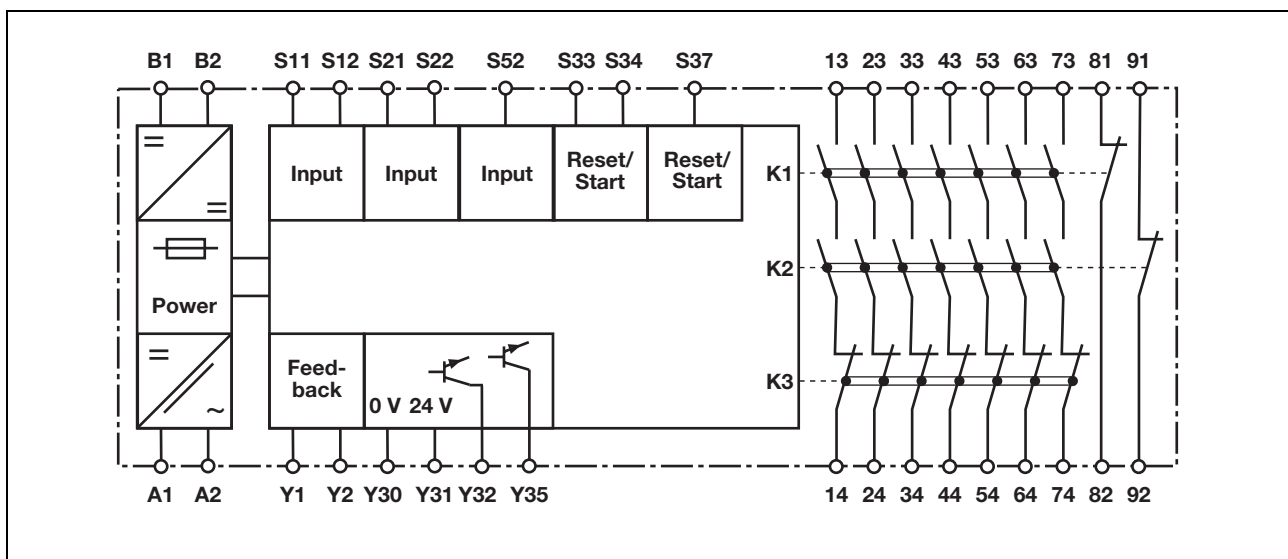
- ▶ The circuit is redundant with built-in self-monitoring.
- ▶ The safety function remains effective in the case of a component failure.
- ▶ The correct opening and closing of the safety function relays is tested automatically in each on-off cycle.
- ▶ The transformer is short circuit-proof. An electronic fuse is used on a DC supply.

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

Block diagram

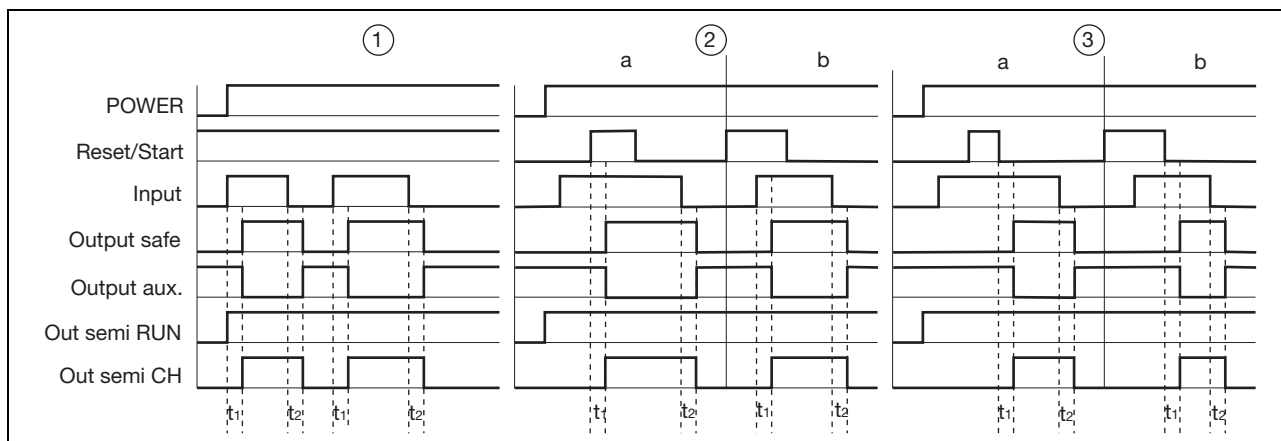


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Function description

- ▶ 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 then the reset circuit is closed and opened again.
 - the reset circuit is closed and then opened again once the input 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 S33-S34
- ▶ Input: Input circuits S11-S12, S21-S22, S52
- ▶ Output safe: Safety contacts 13-14, 23-24, 33-34, 43-44, 53-54, 63-64, 73-74
- ▶ Output aux.: Auxiliary contacts 81-82, 91-92
- ▶ Out semi RUN: Semiconductor output supply voltage Y35
- ▶ Out semi CH: Semiconductor output switch status Y32
- ▶ 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

Wiring

Please note:

- ▶ Information given in the “Technical details” must be followed.
- ▶ Outputs 13-14, 23-24, 33-34, 43-44, 53-54, 63-64, 73-74 are safety contacts, outputs 81-82, 91-92 are auxiliary contacts (e.g. for display).
- ▶ To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- ▶ Calculation of the max. cabling runs I_{max} in the input circuit:

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

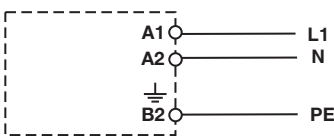
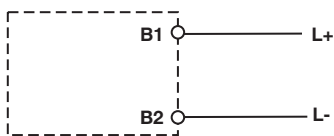
R_{lmax} = max. overall cable resistance (see technical details)
 R_l / km = cable resistance/km

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

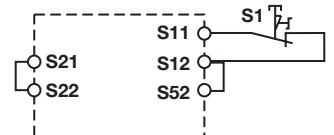
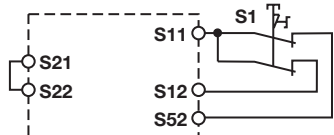

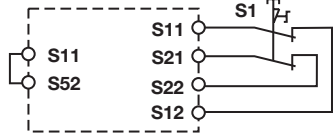
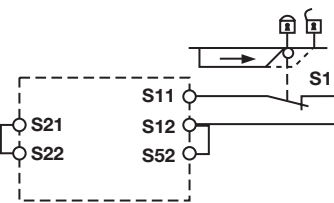
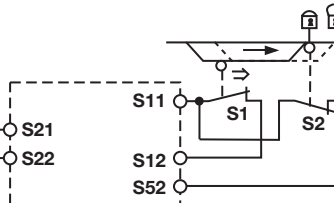
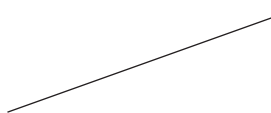
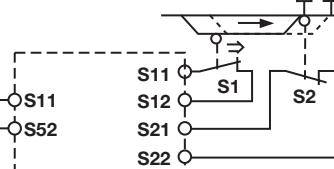
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Preparing for operation

► Supply voltage



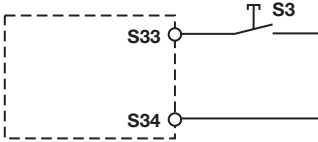
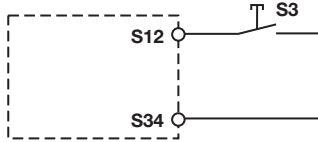
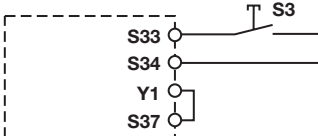
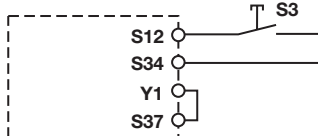
Supply voltage	AC	DC
		

► Input circuit

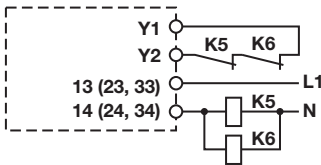
Input circuit	Single-channel	Dual-channel
E-STOP without detection of shorts across contacts		
E-STOP with detection of shorts across contacts		
Safety gate without detection of shorts across contacts		
Safety gate with detection of shorts across contacts		

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▶ Reset circuit

Reset circuit	E-STOP/safety gate wiring (single and dual-channel, without shorts across contacts)	E-STOP/safety gate wiring (dual-channel, with shorts across contacts)
Automatic reset		
Manual reset		
Monitored reset		




▶ Feedback loop

Feedback loop	Contacts from external contactors
	

▶ Semiconductor output

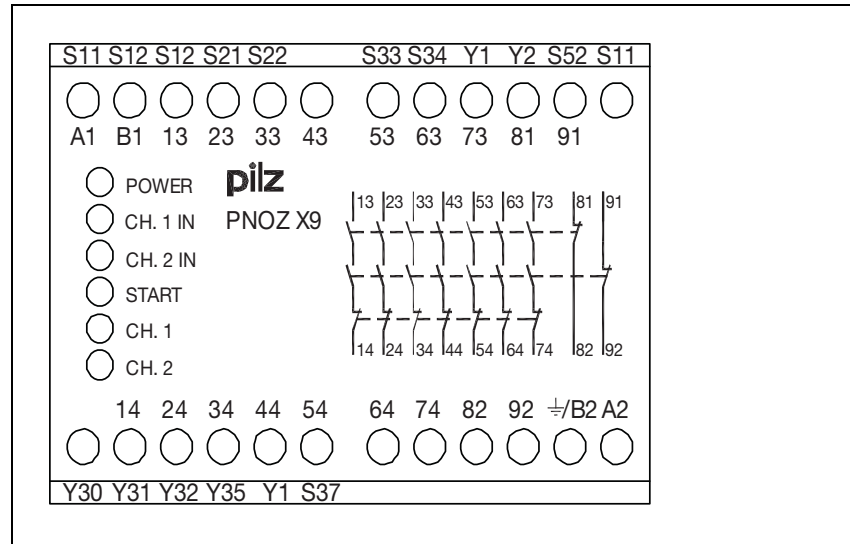


▶ Key

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

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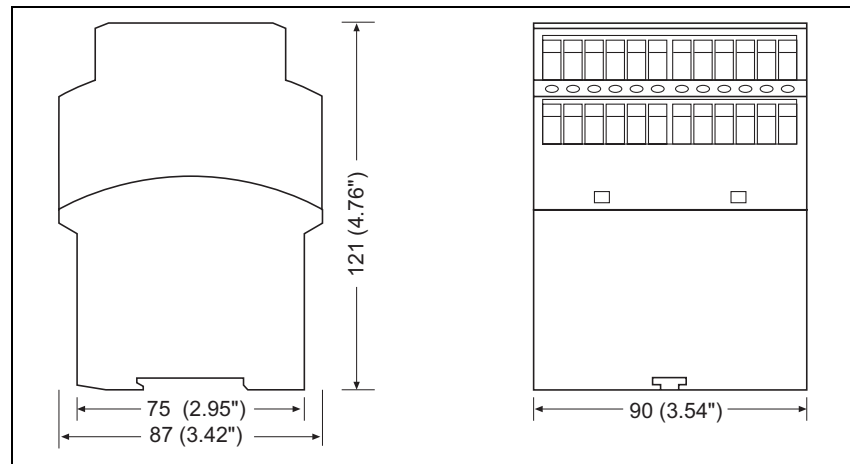
Terminal configuration



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

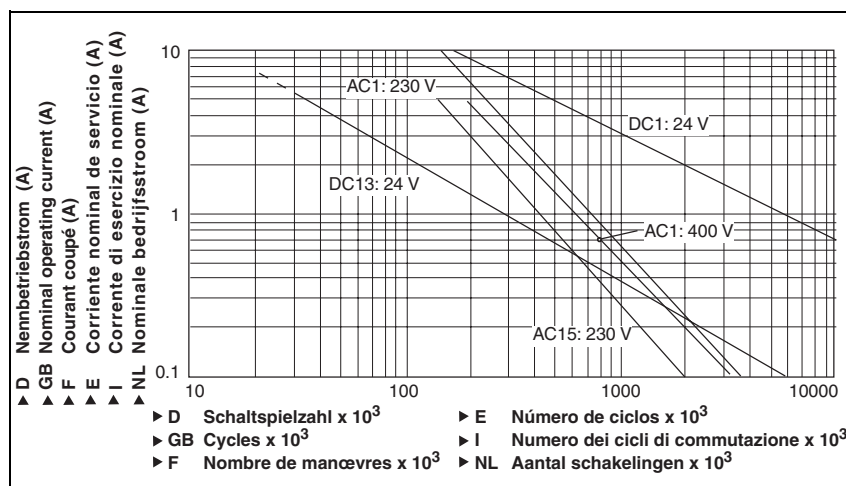


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Notice

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 U _B AC	24 V, 42 V, 100 - 120 V, 200 - 230 V
Supply voltage U _B DC	24 V
Voltage tolerance	-15% / +10%
Power consumption at U _B AC	11.0 VA
Power consumption at U _B DC	5.5 W
Frequency range AC	50 - 60 Hz
Residual ripple DC	160 %
Voltage and current at input circuit: 24 VDC	50 mA
reset circuit: 24 VDC	100.0 mA
feedback loop: 24 VDC	100.0 mA
Output contacts in accordance with EN 954-1, Category 4	Safety contacts (N/O): 7 Auxiliary contacts (N/C): 2
Utilisation category in accordance with EN 60947-4-1 AC1: 240 V	I _{min} : 0.01 A, I _{max} : 8.00 A P _{max} : 2,000 VA
Safety contacts: AC1: 400 V	I _{min} : 0.01 A, I _{max} : 5.00 A P _{max} : 2,000 VA
DC1: 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 AC15: 230 V	I _{max} : 5.0 A
DC13 (6 cycles/min): 24 V	I _{max} : 7.0 A
Contact material	AgSnO ₂ + 0.2 µm Au
External contact fuse protection (EN 60947-5-1)	
Blow-out fuse, quick	10 A
Blow-out fuse, slow	6 A
Circuit breaker	6 A, 24 VAC/DC, characteristic B/C
Semiconductor outputs (short circuit proof)	24 VDC, 20 mA
External supply voltage	24 VDC
Voltage tolerance	-20 % / +20 %

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Max. overall cable resistance R_{lmax} input circuits, reset circuits

Single-channel at U_B DC	45 Ohm
Single-channel at U_B AC	45 Ohm
Dual-channel without detect. of shorts across contacts at U_B DC	90 Ohm
Dual-channel without detect. of shorts across contacts at U_B AC	90 Ohm
Dual-channel with detect. of shorts across contacts at U_B DC	15 Ohm
Dual-channel with detect. of shorts across contacts at U_B AC	15 Ohm

Times

Switch-on delay	
with automatic reset typ.	200 ms
with automatic reset max.	250 ms
with automatic reset after power on typ.	220 ms
with automatic reset after power on max.	300 ms
with manual reset typ.	200 ms
with manual reset max.	250 ms
with monitored reset typ.	150 ms
with monitored reset max.	220 ms

Delay-on de-energisation	
with E-STOP typ.	20 ms
with E-STOP max.	30 ms
with power failure typ.	170 ms
with power failure max.	250 ms

Recovery time at max. switching frequency 1/s after E-STOP	50 ms
after power failure	300 ms

Simultaneity, channel 1 and 2	150 ms
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Supply interruption before de-energisation	35 ms
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Environmental data

EMC	EN 60947-5-1, EN 61000-6-2
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Vibration in accordance with EN 60068-2-6

Frequency	10 - 55 Hz
Amplitude	0.35 mm

Climatic suitability	EN 60068-2-78
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Airgap creepage	EN 60947-1
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Ambient temperature	-10 - 55 °C
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Storage temperature	-40 - 85 °C
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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 - 4.00 mm ²

2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.20 - 2.50 mm ²
without crimp connectors or with TWIN crimp connectors	0.20 - 2.50 mm ²

Torque setting with screw terminals	0.60 Nm
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Dimensions (H x W x D)	
with screw terminals	87.0 mm x 90.0 mm x 121.0 mm

Weight	750 g
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The standards current on 06/04 apply.

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Max. continuous current

Number of contacts	1.00	2.00	3.00	4.00	5.00	6.00	7.00
I _{max} on DC units (in A)	8.00	8.00	8.00	7.00	6.00	5.50	5.00
I _{max} on AC units (in A)	8.00	5.60	4.60	4.00	3.50	3.20	3.00

Order reference

Type	Features	Terminals	Order no.
PNOZ X9	24 VAC/DC	Screw terminals	774 609
PNOZ X9	42 VAC 24 VDC	Screw terminals	774 601
PNOZ X9	110 - 120 VAC 24 VDC	Screw terminals	774 605
PNOZ X9	220 - 230 VAC 24 VDC	Screw terminals	774 606