

## Up to PL e of EN ISO 13849-1 PNOZ X2.1



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

### Approvals

	PNOZ X2.1
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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
- ▶ See order reference for unit types

- ▶ 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 unit has an electronic fuse.

### 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

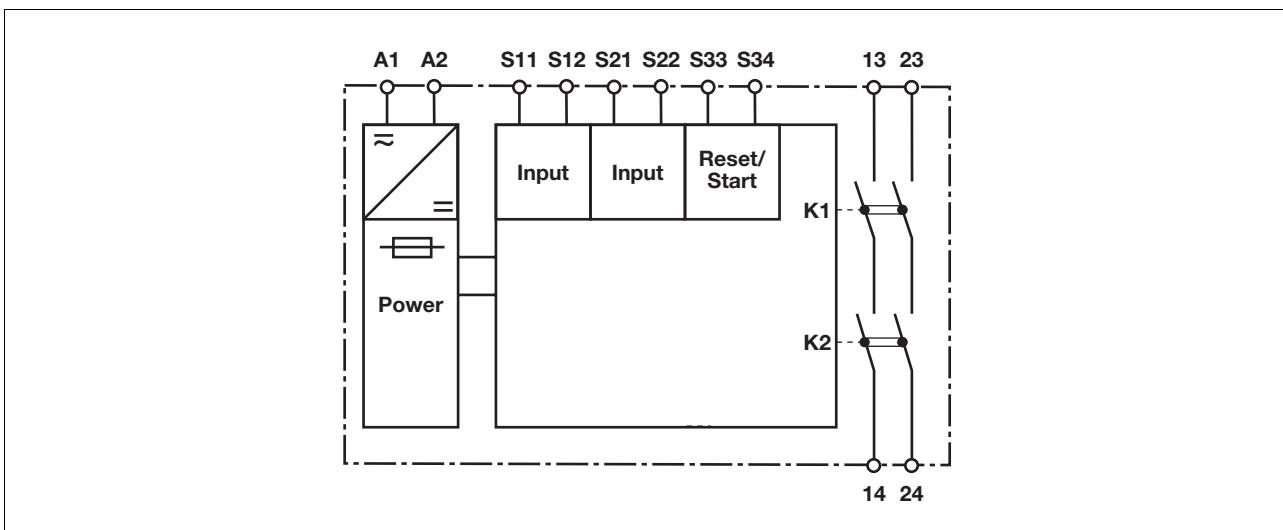
- ▶ E-STOP pushbuttons
- ▶ Safety gates

### Safety features

The relay meets the following safety requirements:

- ▶ The circuit is redundant with built-in self-monitoring.

### Block diagram

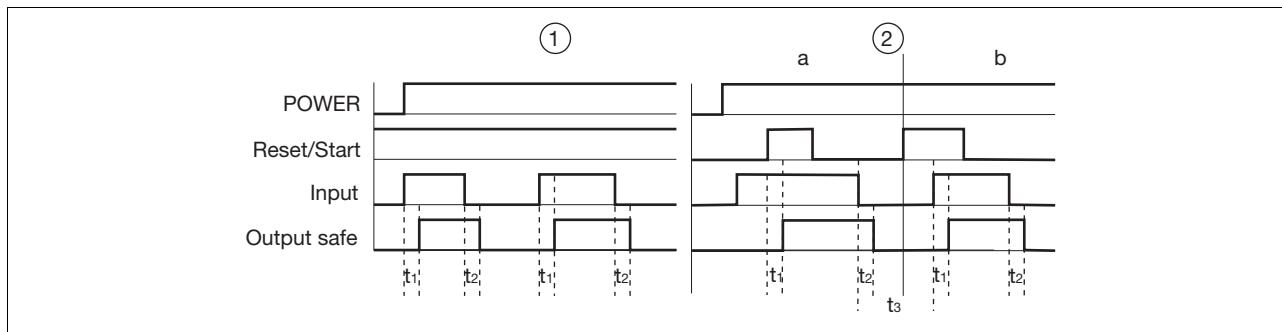


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### Function description

- ▶ Single-channel operation: no redundancy in the input circuit, earth faults in the reset and input circuit are detected.
- ▶ Dual-channel operation 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.
- ▶ 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 S33-S34
- ▶ Input: Input circuits S11-S12, S21-S22
- ▶ 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
- ▶ t<sub>1</sub>: Switch-on delay
- ▶ t<sub>2</sub>: Delay-on de-energisation
- ▶ t<sub>3</sub>: Recovery time

### 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<sub>max</sub> in the input circuit:

$$I_{\text{max}} = \frac{R_{I\text{max}}}{R_I / \text{km}}$$

R<sub>I</sub><sub>max</sub> = max. overall cable resistance (see technical details)

R<sub>I</sub> / 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 <b>without</b> detection of shorts across contacts		
E-STOP <b>with</b> detection of shorts across contacts		
Safety gate <b>without</b> detection of shorts across contacts		
Safety gate <b>with</b> detection of shorts across contacts		

- ▶ 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		

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### ► Feedback loop

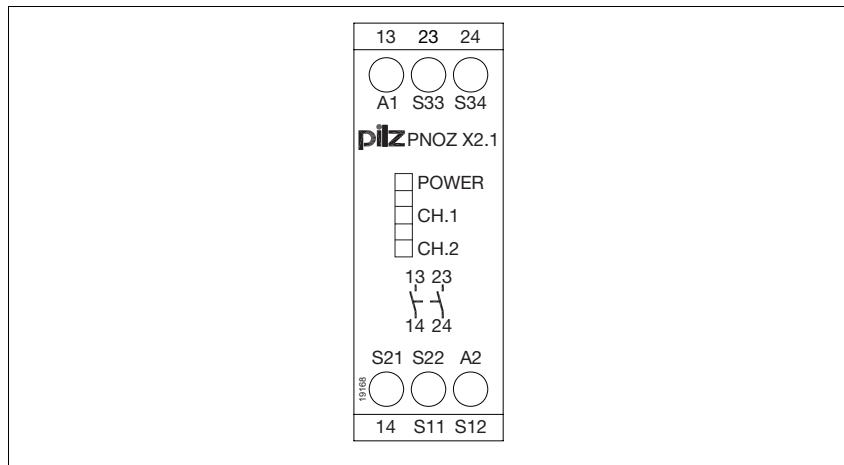
Feedback loop	Automatic reset	Manual reset
Contacts from external contactors		

### ► Key

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

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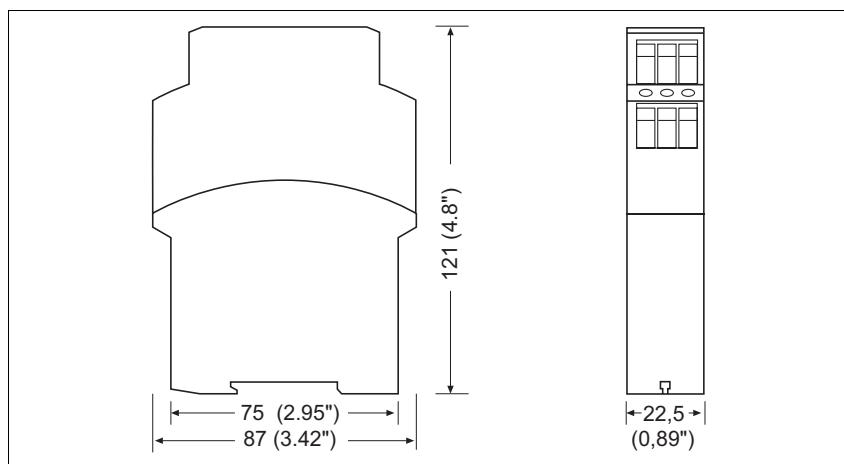
### Terminal configuration



### 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

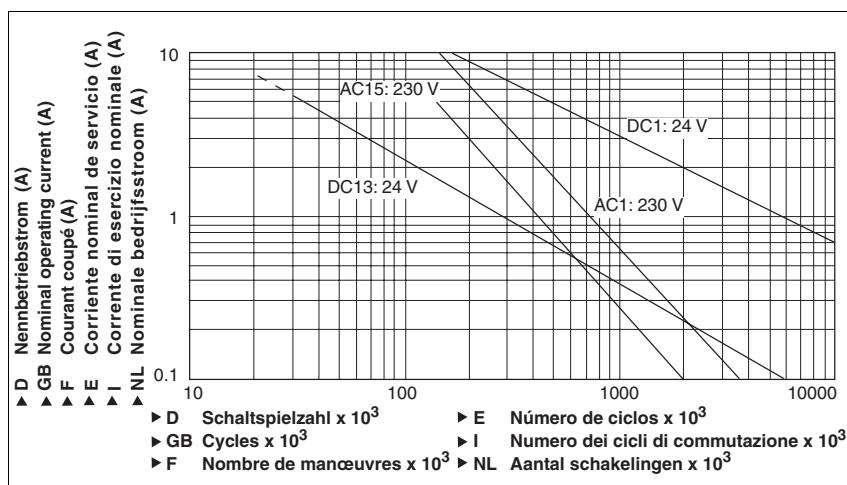


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### Notice

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	<b>24 V</b>
Supply voltage U <sub>B</sub> AC/DC	<b>24 V</b>
Voltage tolerance	-15 %/+10 %
Power consumption at U <sub>B</sub> AC	<b>4.5 VA</b>
Power consumption at U <sub>B</sub> DC	<b>2.0 W</b>
Frequency range AC	<b>50 - 60 Hz</b>
Residual ripple DC	<b>160 %</b>
Voltage and current at	
Input circuit DC: <b>24.0 V</b>	<b>25.0 mA</b>
Reset circuit DC: <b>24.0 V</b>	<b>50.0 mA</b>
Feedback loop DC: <b>24.0 V</b>	<b>50.0 mA</b>
Number of output contacts	
Safety contacts (S) instantaneous:	<b>2</b>
Utilisation category in accordance with <b>EN 60947-4-1</b>	
Safety contacts: AC1 at <b>240 V</b>	I <sub>min</sub> : <b>0.01 A</b> , I <sub>max</sub> : <b>6.0 A</b> P <sub>max</sub> : <b>1500 VA</b>
Safety contacts: DC1 at <b>24 V</b>	I <sub>min</sub> : <b>0.01 A</b> , I <sub>max</sub> : <b>6.0 A</b> P <sub>max</sub> : <b>150 W</b>
Utilisation category in accordance with <b>EN 60947-5-1</b>	
Safety contacts: AC15 at <b>230 V</b>	I <sub>max</sub> : <b>5.0 A</b>
Safety contacts: DC13 at <b>24 V</b> (6 cycles/min)	I <sub>max</sub> : <b>4.0 A</b>
Conventional thermal current	<b>6.0 A</b>
Contact material	<b>AgSnO<sub>2</sub> + 0.2µ Au</b>
External contact fuse protection (I <sub>K</sub> = 1 kA) to <b>EN 60947-5-1</b>	
Blow-out fuse, quick	
Safety contacts:	<b>6 A</b>
Blow-out fuse, slow	
Safety contacts:	<b>4 A</b>
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	<b>4 A</b>

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#### **Electrical data**

Max. overall cable resistance $R_{\text{max}}$ input circuits, reset circuits	
single-channel at $U_B$ DC	<b>150 Ohm</b>
single-channel at $U_B$ AC	<b>150 Ohm</b>
dual-channel with detect. of shorts across contacts at $U_B$ DC	<b>15 Ohm</b>
dual-channel with detect. of shorts across contacts at $U_B$ AC	<b>30 Ohm</b>
Min. input resistance in the starting torque	<b>21 Ohm</b>

#### **Safety-related characteristic data**

PL in accordance with <b>EN ISO 13849-1</b>	<b>PL e (Cat. 4)</b>
Category in accordance with <b>EN 954-1</b>	<b>Cat. 4</b>
SIL CL in accordance with <b>EN IEC 62061</b>	<b>SIL CL 3</b>
PFH in accordance with <b>EN IEC 62061</b>	<b>2.31E-09</b>
SIL in accordance with <b>IEC 61511</b>	<b>SIL 3</b>
PFD in accordance with <b>IEC 61511</b>	<b>2.03E-06</b>
$t_M$ in years	<b>20</b>

#### **Times**

Switch-on delay	
with automatic reset typ.	<b>60 ms</b>
with automatic reset max.	<b>90 ms</b>
with automatic reset after power on typ.	<b>60 ms</b>
with automatic reset after power on max.	<b>100 ms</b>
with manual reset typ.	<b>38 ms</b>
with manual reset max.	<b>90 ms</b>
Delay-on de-energisation	
with E-STOP typ.	<b>17 ms</b>
with E-STOP max.	<b>30 ms</b>
with power failure max.	<b>110 ms</b>
Recovery time at max. switching frequency 1/s	
after E-STOP	<b>50 ms</b>
after power failure	<b>150 ms</b>
Min. start pulse duration with a monitored reset	
with rising edge	<b>30 ms</b>
Simultaneity, channel 1 and 2	<b><math>\infty</math></b>
Supply interruption before de-energisation	<b>20 ms</b>

#### **Environmental data**

EMC	<b>EN 60947-5-1, EN 61000-6-2</b>
Vibration to <b>EN 60068-2-6</b>	
Frequency	<b>10 - 55 Hz</b>
Amplitude	<b>0.35 mm</b>
Climatic suitability	<b>EN 60068-2-78</b>
Airgap creepage in accordance with <b>EN 60947-1</b>	
Pollution degree	<b>2</b>
Overvoltage category	<b>III</b>
Rated insulation voltage	<b>250 V</b>
Rated impulse withstand voltage	<b>4.00 kV</b>
Ambient temperature	<b>-10 - 55 °C</b>
Storage temperature	<b>-40 - 85 °C</b>
Protection type	
Mounting (e.g. cabinet)	<b>IP54</b>
Housing	<b>IP40</b>
Terminals	<b>IP20</b>

#### **Mechanical data**

Housing material	
Housing	<b>PPO UL 94 V0</b>
Front	<b>ABS UL 94 V0</b>

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#### Mechanical data

Cross section of external conductors with screw terminals

1 core flexible **0.20 - 4.00 mm<sup>2</sup> , 24 - 10 AWG**

2 core, same cross section, flexible:

with crimp connectors, without insulating sleeve **0.20 - 2.50 mm<sup>2</sup> , 24 - 14 AWG**

without crimp connectors or with TWIN crimp connectors **0.20 - 2.50 mm<sup>2</sup> , 24 - 14 AWG**

Torque setting with screw terminals **0.60 Nm**

Dimensions

Height **87.0 mm**

Width **22.5 mm**

Depth **121.0 mm**

Weight **200 g**

No. stands for order number.

The standards current on **2009-02** apply.

#### Order reference

Type	Features		Terminals	Order no.
PNOZ X2.1	24 VAC	24 VDC	Screw terminals	774 306