




## Up to Category 4, EN 954-1 PNOZ XV2.1



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

### Approvals

	PNOZ XV2.1
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### Unit features

- ▶ Positive-guided relay outputs:
  - 2 safety contacts (N/O), instantaneous
  - 2 safety contacts (N/O), delay-on de-energisation
- ▶ Connection options for:
  - E-STOP pushbutton
  - Safety gate limit switch
  - Reset button
- ▶ LED indicator for:
  - Switch status channel 1/2
  - Supply voltage
  - Reset circuit
- ▶ Delay-on de-energisation, fixed or selectable
- ▶ Delay time can be cancelled via reset button
- ▶ See order reference for unit types

The max. category the safety contacts can achieve in accordance with EN 954-1 is stated in the technical details.

### Safety features

The relay conforms to the following safety criteria:

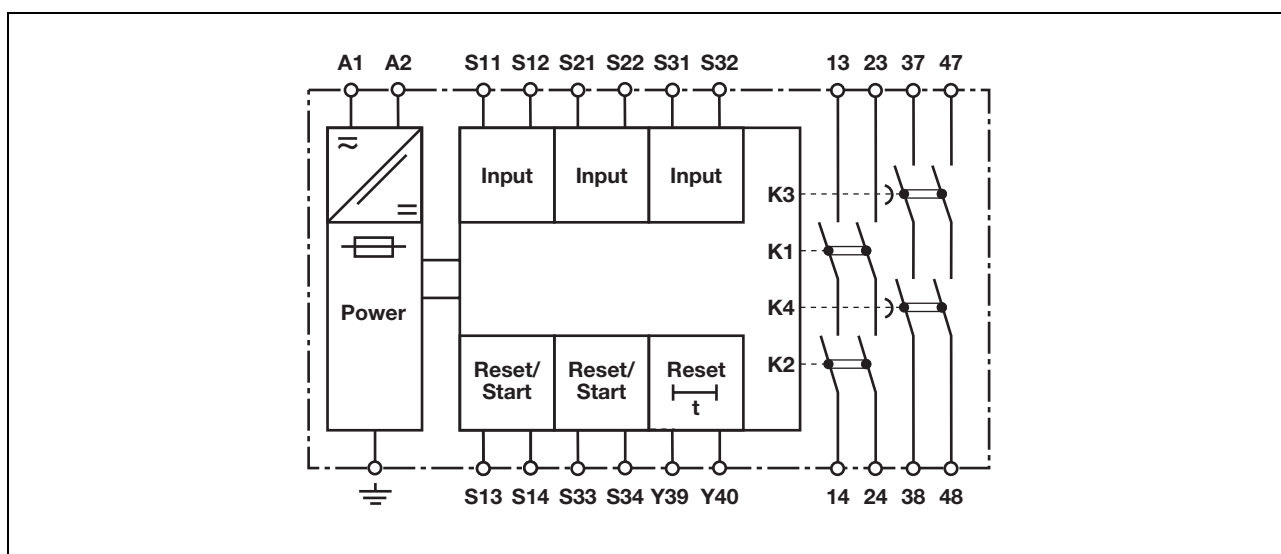
- ▶ The circuit is redundant with built-in self-monitoring.
- ▶ The safety function remains effective in the case of a component failure.
- ▶ The correct opening and closing of the safety function relays is tested automatically in each on-off cycle.
- ▶ The unit has an electronic fuse.

### 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

### Block diagram

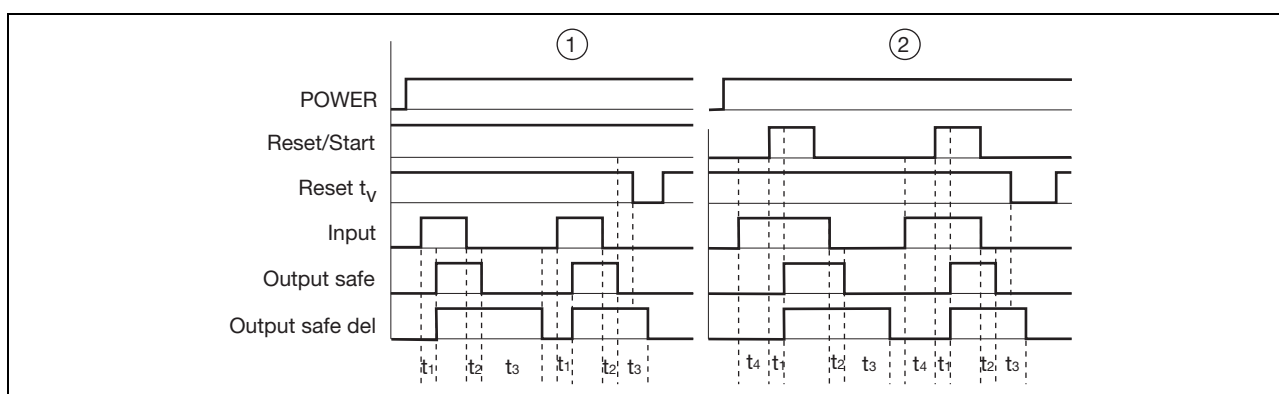


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### Function description

- ▶ Single-channel operation: no redundancy in the input circuit, earth faults in the reset 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.
- ▶ 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 S13-S14, S33-S34
- ▶ Reset  $t_v$ : Y39-Y40
- ▶ Input: Input circuits S11-S12, S21-S22, S31-S32
- ▶ Output safe: Safety contacts, instantaneous 13-14, 23-24
- ▶ Output safe del: Safety contacts, delayed 37-38, 47-48
- ▶ ①: Automatic reset
- ▶ ②: Monitored reset
- ▶  $t_1$ : Switch-on delay
- ▶  $t_2$ : Delay-on de-energisation
- ▶  $t_3$ : Delay time
- ▶  $t_4$ : Waiting period

### Wiring

#### Please note:

- ▶ Information given in the “Technical details” must be followed.
- ▶ Outputs 13-14, 23-24 are instantaneous safety contacts, outputs 37-38, 47-48 are delay-on de-energisation 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:

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

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

$R_l / km$  = cable resistance/km

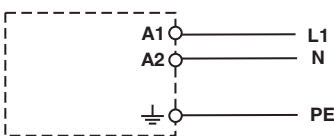
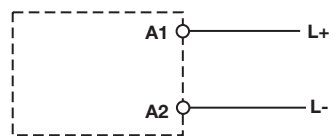
- ▶ Use copper wire that can withstand 60/75 °C.

- ▶ Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.

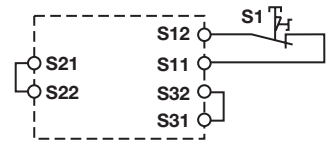
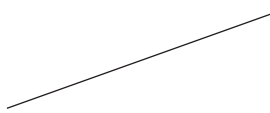
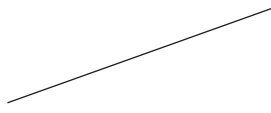
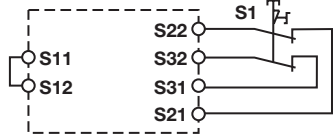
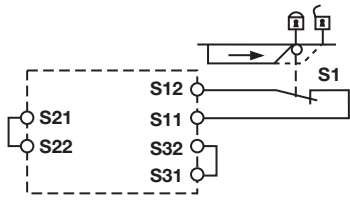
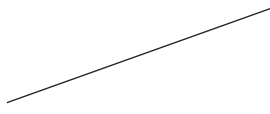
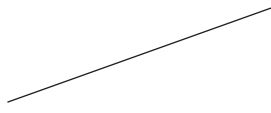
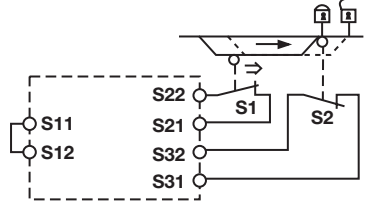
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### Preparing for operation

► Supply voltage

Supply voltage	AC	DC
		

► Input circuit

Input circuit	Single-channel	Dual-channel
E-STOP <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		

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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		
Monitored reset		




### ▶ Reset

Reset	Link	N/C contact for resetting the delay time
Link or N/C contact		

### ▶ Feedback loop

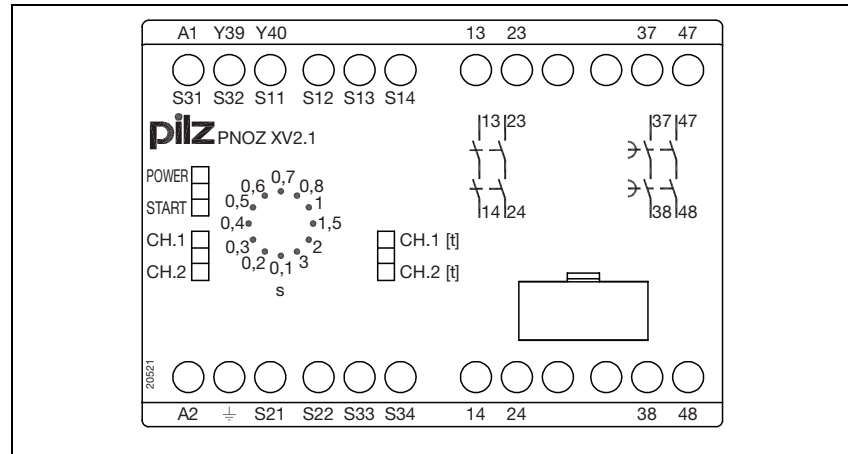
Feedback loop	Automatic reset	Monitored reset
Contacts from external contactors		

### ▶ Key

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

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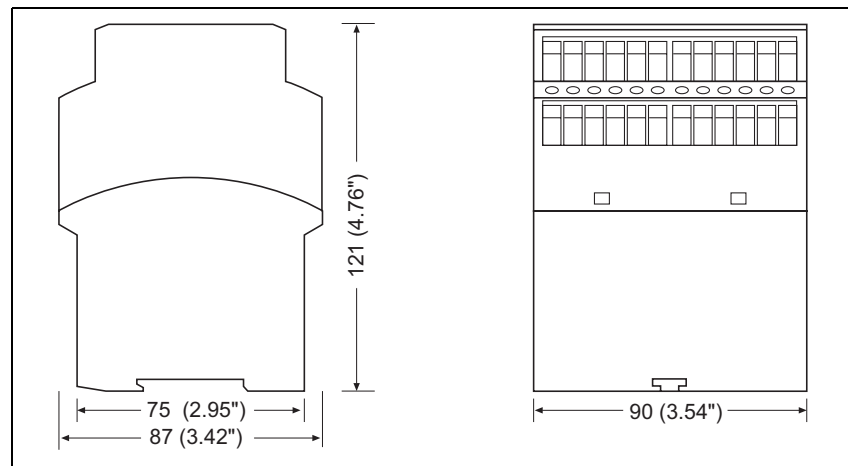
### Terminal configuration



### 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).

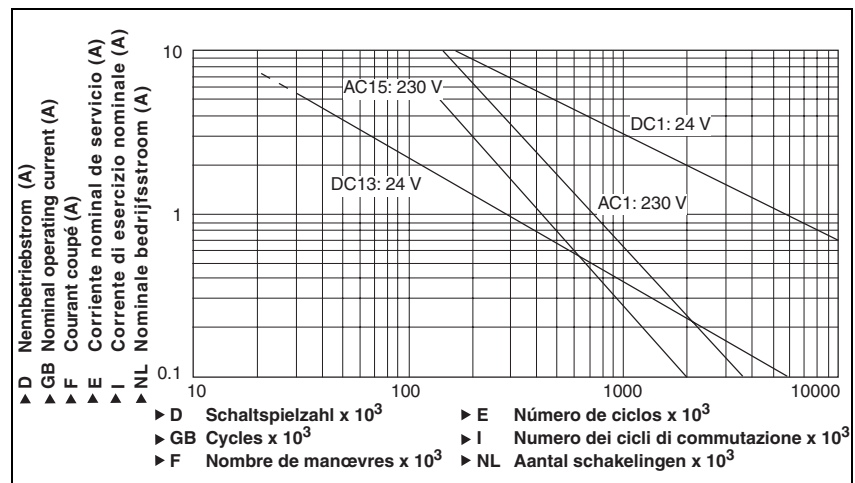
### Dimensions



### 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



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Technical details	
<b>Electrical data</b>	
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	8.5 VA
Power consumption at $U_B$ DC	5.0 W
Frequency range AC	50 - 60 Hz
Residual ripple DC	160 %
Voltage and current at input circuit: <b>24.0 VDC</b> reset circuit: <b>24.0 VDC</b> feedback loop: <b>24.0 VDC</b>	<b>35.0 mA</b> <b>30.0 mA</b> <b>3.1 mA</b>
Output contacts in accordance with <b>EN 954-1</b> , Category 4	Safety contacts (N/O): <b>2 ST</b>
Output contacts in accordance with <b>EN 954-1</b> Category 1 Order no. 774550, 774558 Category 3	Safety contacts (N/O), delayed: <b>2 ST</b> If delay time >30 s If delay time <30 s
Utilisation category in accordance with <b>EN 60947-4-1</b> AC1: <b>240 V</b>  DC1: <b>24 V</b>	$I_{min}: 0.01 A, I_{max}: 8.0 A$ $P_{max}: 2,000 VA$ $I_{min}: 0.01 A, I_{max}: 8.0 A$ $P_{max}: 200 W$
Utilisation category in accordance with <b>EN 60947-5-1</b> AC15: <b>230 V</b> DC13 (6 cycles/min): <b>24 V</b>	$I_{max}: 5.0 A$ $I_{max}: 7.0 A$
Contact material	<b>AgSnO<sub>2</sub> + 0.2 µm Au</b>
External contact fuse protection ( <b>EN 60947-5-1</b> ) Blow-out fuse, quick Blow-out fuse, slow Circuit breaker	<b>10 A</b> <b>6 A</b> <b>6 A, 24 VAC/DC, characteristic B/C</b>
Max. overall cable resistance $R_{lmax}$ input circuits, reset circuits	
Single-channel at $U_B$ DC	<b>200 Ohm</b>
Single-channel at $U_B$ AC	<b>200 Ohm</b>
Dual-channel with detect. of shorts across contacts at $U_B$ DC	<b>20 Ohm</b>
Dual-channel with detect. of shorts across contacts at $U_B$ AC	<b>20 Ohm</b>
<b>Times</b>	
Switch-on delay with automatic reset typ. with automatic reset max. with automatic reset after power on typ. with automatic reset after power on max. with monitored reset typ. with monitored reset max.	<b>400 ms</b> <b>550 ms</b> <b>625 ms</b> <b>870 ms</b> <b>50 ms</b> <b>60 ms</b>
Delay-on de-energisation with E-STOP typ. with E-STOP max. with power failure typ. $U_B = 24 VDC$ with power failure max. $U_B = 24 VDC$ with power failure typ. $U_B = 240 VAC$ with power failure max. $U_B = 240 VAC$	<b>15 ms</b> <b>30 ms</b> <b>120 ms</b> <b>500 ms</b> <b>900 ms</b> <b>2.200 ms</b>
Recovery time at max. switching frequency 1/s after E-STOP after power failure	<b>50 ms + <math>t_v</math></b> <b>2,250 ms</b>

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Delay time $t_v$ selectable	<b>0.10 s, 0.20 s, 0.30 s, 0.40 s, 0.50 s, 0.60 s, 0.70 s, 0.80 s, 1.00 s, 1.50 s, 2.00 s, 3.00 s</b> Order no.: 774 552
fixed	<b>0.00 s, 0.50 s, 1.00 s, 2.00 s, 4.00 s, 6.00 s, 8.00 s, 10.00 s, 15.00 s, 20.00 s, 25.00 s, 30.00 s</b> Order no.: 774550
Repetition accuracy	<b>0.00 s, 5.00 s, 10.00 s, 20.00 s, 40.00 s, 60.00 s, 80.00 s, 100.00 s, 150.00 s, 200.00 s, 250.00 s, 300.00 s</b> Order no.: 774558
Time accuracy	<b>0.5 s</b> Order no.: 774550
Waiting period with a monitored reset	<b>2 %</b>
Min. start pulse duration with a monitored reset	<b>-15% / +15% +50 ms</b>
Simultaneity, channel 1 and 2	<b>300 ms</b>
Supply interruption before de-energisation	<b>30 ms</b>
<b>Environmental data</b>	
EMC	<b>EN 60947-5-1, EN 61000-6-2, EN 61000-6-4</b>
Vibration in accordance with <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	<b>VDE 0110-1</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>
<b>Mechanical data</b>	
Housing material	
Housing	<b>PPO UL 94 V0</b>
Front	<b>ABS UL 94 V0</b>
Max. cross section of external conductors with screw terminals	
1 core flexible	<b>0.20 - 4.00 mm<sup>2</sup></b>
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	<b>0.20 - 2.50 mm<sup>2</sup></b>
without crimp connectors or with TWIN crimp connectors	<b>0.20 - 2.50 mm<sup>2</sup></b>
Torque setting with screw terminals	<b>0.60 Nm</b>
Dimensions (H x W x D)	<b>87 mm x 90 mm x 121 mm</b>
Weight	<b>580 g</b> Order no.: 774550, 774552, 774558 <b>570 g</b> Order no.: 774554

The standards current on **04/03** apply.

### Max. continuous current

Number of contacts	$I_{max}$ (A) at $U_B$ DC	$I_{max}$ (A) at $U_B$ AC
1	<b>8.00 A</b>	<b>8.00 A</b>
2	<b>7.00 A</b>	<b>7.00 A</b>
3	<b>5.70 A</b>	<b>5.70 A</b>
4	<b>5.00 A</b>	<b>5.00 A</b>

### Order reference

Type	Features	Terminals	Order no.
PNOZ XV2.1	24 - 240 VAC/DC	0.5 s fixed	Screw terminals 774 554
PNOZ XV2.1	24 - 240 VAC/DC	3 s selectable	Screw terminals 774 552

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Type	Features		Terminals	Order no.
PNOZ XV2.1	24 - 240 VAC/DC	30 s selectable	Screw terminals	774 550
PNOZ XV2.1	24 - 240 VAC/DC	300 s selectable	Screw terminals	774 558