




## Up to Category 3, EN 954-1 PNOZ X2.1VP



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

### Approvals

	PNOZ X2.1VP
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### Unit features

- ▶ Positive-guided relay outputs:
  - 2 safety contacts (N/O), delay-on de-energisation
- ▶ 1 semiconductor output
- ▶ Connection options for:
  - E-STOP pushbutton
  - Safety gate limit switch
  - Reset button
- ▶ LED indicator for:
  - Switch status channel 1/2
  - Supply voltage
  - Semiconductor output
- ▶ Semiconductor output signals:
  - Switch status channel 1/2
- ▶ Plug-in connection terminals (either spring-loaded terminal or screw terminal)
- ▶ See order reference for unit types

### Safety features

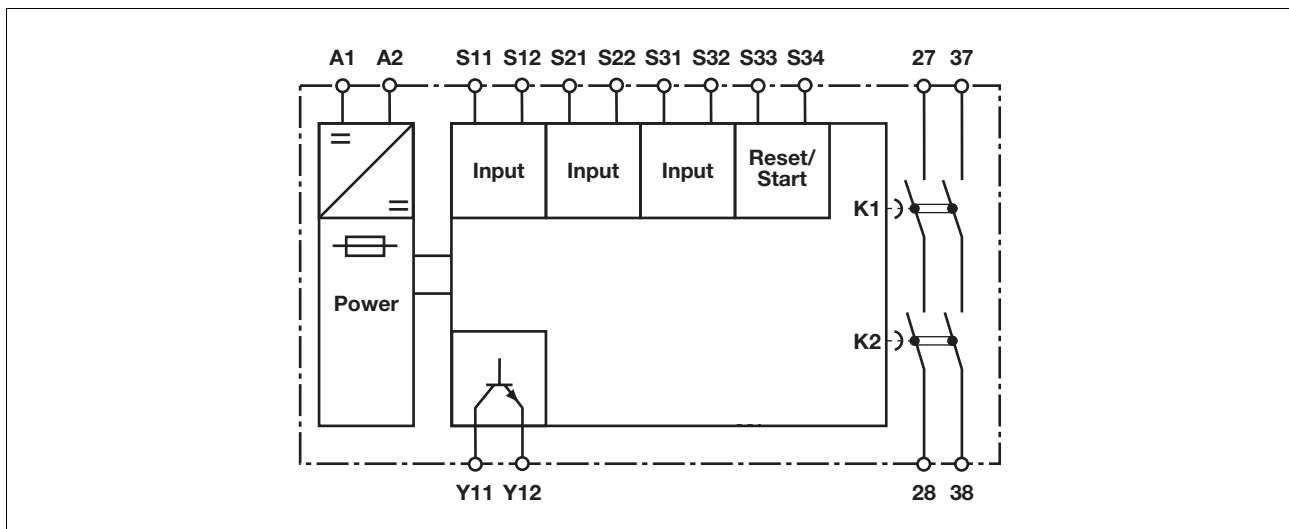
- The relay meets the following safety requirements:
- ▶ The circuit is redundant with built-in self-monitoring.
  - ▶ The safety function remains effective in the case of a component failure.
  - ▶ The correct opening and closing of the safety function relays is tested automatically in each on-off cycle.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

### Unit description

The safety relay meets the requirements of EN 60947-5-1, EN 60204-1 and VDE 0113-1 and may be used in applications with

- ▶ E-STOP pushbuttons
- ▶ Safety gates

### Block diagram

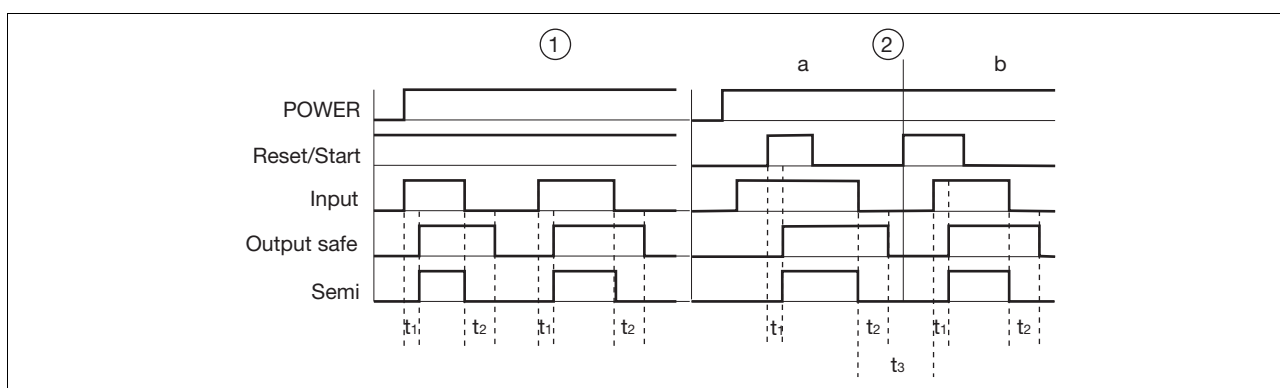


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### Function description

- ▶ Single-channel operation: no redundancy in the input circuit, earth faults in the reset 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 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 expansion modules or external contactors/relays.

### Timing diagram



### Key

- ▶ Power: Supply voltage
- ▶ Reset/start: Reset circuit S33-S34
- ▶ Input: Input circuits S11-S12, S21-S22, S31-S32
- ▶ Output safe: Safety contacts, delayed 27-28, 37-38
- ▶ Semi: Semiconductor output
- ▶ 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 27-28, 37-38 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  $I_{max}$  in the input circuit:

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

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


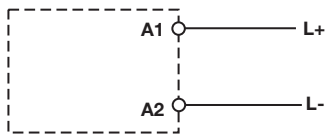
$R_l / km$  = cable resistance/km

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

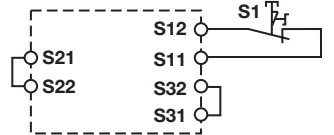
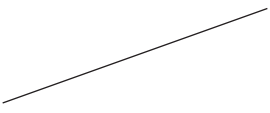
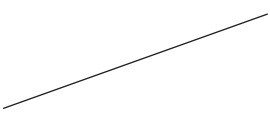
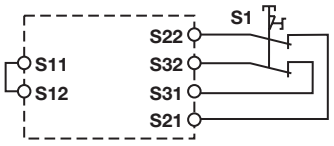
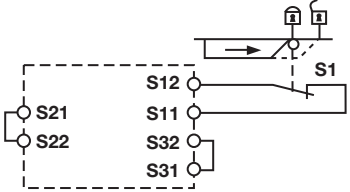
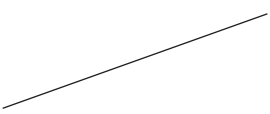
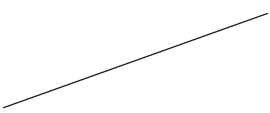
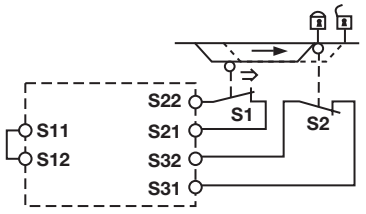
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### Preparing for operation

#### ► Supply voltage



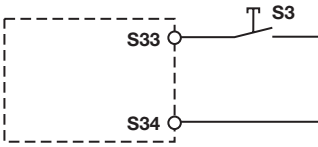
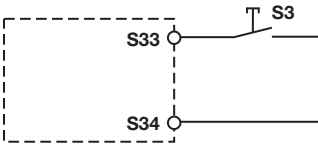
Supply voltage	AC	DC
		

#### ► Input circuit

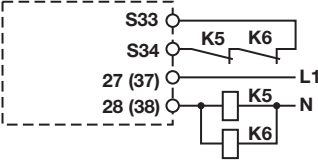
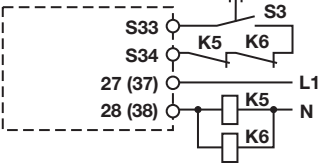
Input circuit	Single-channel	Dual-channel
E-STOP <b>without</b> detection of shorts across contacts		
E-STOP <b>with</b> detection of shorts across contacts		
Safety gate <b>without</b> detection of shorts across contacts		
Safety gate <b>with</b> detection of shorts across contacts		

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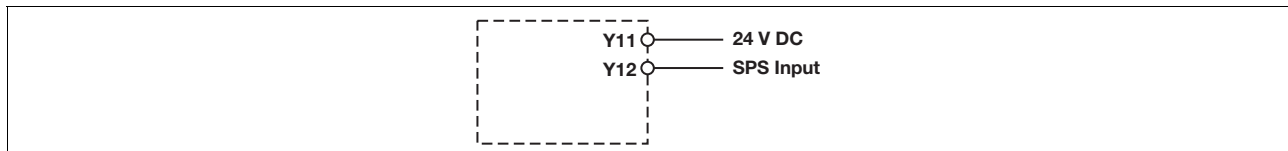
### ▶ Reset circuit

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




### ▶ Feedback loop

Feedback loop	Automatic reset	Manual reset
Contacts from external contactors		

### ▶ Semiconductor output

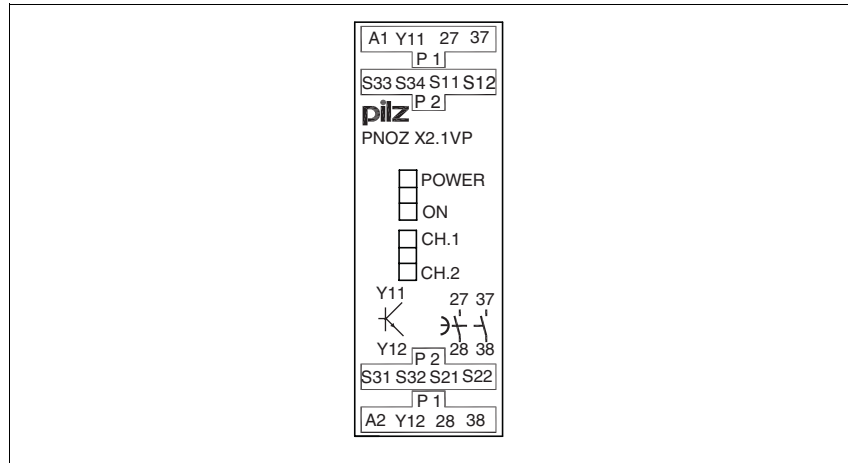


### ▶ Key

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

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### Terminal configuration

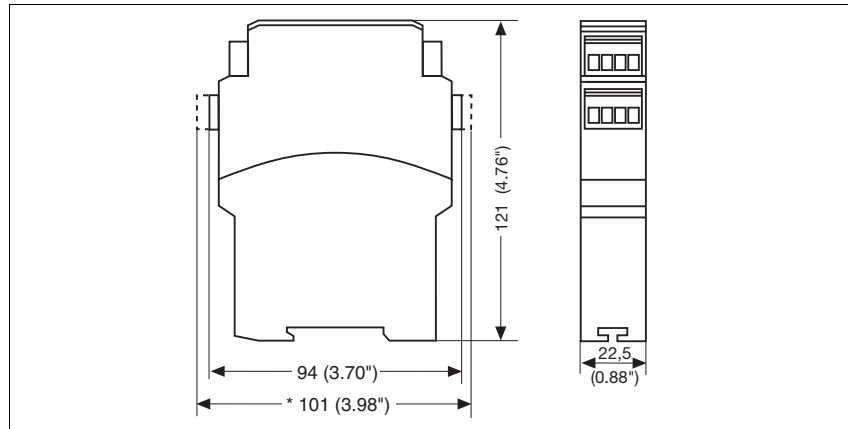


### Installation

- ▶ 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

\*with spring-loaded terminals

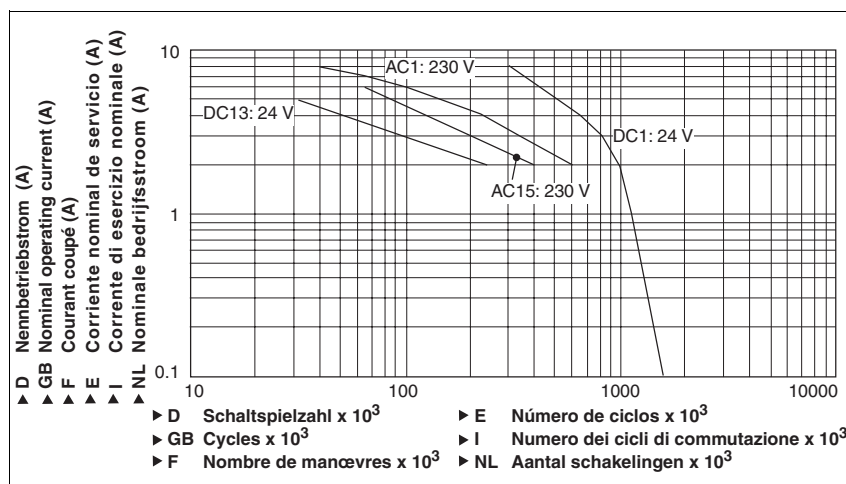


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### Notice

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 $U_B$ DC	<b>24 V</b>
Voltage tolerance	<b>-15 %/+10 %</b>
Power consumption at $U_B$ DC	<b>1.5 W</b>
Residual ripple DC	<b>20 %</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 (N/O), delayed:	<b>2</b>
Category of output contacts in accordance with <b>EN 954-1</b> , <b>EN ISO 13849-1</b>	
Delay time <30 s	<b>3</b>
Utilisation category in accordance with <b>EN 60947-4-1</b>	
Safety contacts, delayed: AC1 at <b>240 V</b>	$I_{min}$ : <b>0.01 A</b> , $I_{max}$ : <b>6.0 A</b> $P_{max}$ : <b>1500 VA</b>
Safety contacts, delayed: DC1 at <b>24 V</b>	$I_{min}$ : <b>0.01 A</b> , $I_{max}$ : <b>6.0 A</b> $P_{max}$ : <b>150 W</b>
Utilisation category in accordance with <b>EN 60947-5-1</b>	
Safety contacts, delayed: AC15 at <b>230 V</b>	$I_{max}$ : <b>5.0 A</b>
Safety contacts, delayed: DC13 at <b>24 V</b> (6 cycles/min)	$I_{max}$ : <b>4.0 A</b>
Conventional thermal current	<b>6.0 A</b>
Contact material	<b>AgSnO<sub>2</sub> + 0.2 µm Au</b>
External contact fuse protection ( $I_k = 1$ 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>
Semiconductor outputs (short circuit proof)	<b>24.0 V DC, 100 mA</b>
External supply voltage	<b>24.0 V DC</b>
Voltage tolerance	<b>-20 %/+20 %</b>

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Electrical data	
Max. overall cable resistance $R_{lmax}$ input circuits, reset circuits	
single-channel at $U_B$ DC	40 Ohm
dual-channel with detect. of shorts across contacts at $U_B$ DC	20 Ohm
Times	
Switch-on delay	
with automatic reset typ.	100 ms
with automatic reset max.	210 ms
with automatic reset after power on typ.	100 ms
with automatic reset after power on max.	210 ms
with manual reset typ.	35 ms
with manual reset max.	210 ms
Recovery time at max. switching frequency 1/s after E-STOP	1550 ms
after power failure	1550 ms
Delay time $t_V$ : fixed	0.75 s
Time accuracy	-30 %/+100 % Order no.: 777600 -30% / +100% Order no.: 787600
Simultaneity, channel 1 and 2	$\infty$
Supply interruption before de-energisation	10 ms
Environmental data	
EMC	EN 60947-5-1, EN 61000-6-2
Vibration to EN 60068-2-6	
Frequency	10 - 55 Hz
Amplitude	0.35 mm
Climatic suitability	EN 60068-2-78
Airgap creepage in accordance with EN 60947-1	
Pollution degree	2
Rated insulation voltage	250 V
Rated impulse withstand voltage	4.0 kV
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
Cross section of external conductors with screw terminals	
1 core flexible	0.25 - 2.50 mm <sup>2</sup> , 24 - 12 AWG Order no.: 777600
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.25 - 1.00 mm <sup>2</sup> , 24 - 16 AWG Order no.: 777600
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm <sup>2</sup> , 24 - 16 AWG Order no.: 777600
Torque setting with screw terminals	0.50 Nm Order no.: 777600
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	0.20 - 1.50 mm <sup>2</sup> , 24 - 16 AWG Order no.: 787600
Spring-loaded terminals: Terminal points per connection	2 Order no.: 787600
Stripping length	8 mm Order no.: 787600
Dimensions	
Height	101.0 mm Order no.: 787600 94.0 mm Order no.: 777600
Width	22.5 mm
Depth	121.0 mm
Weight	195 g Order no.: 787600 200 g Order no.: 777600

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The standards current on **2008-02** apply.

### Order reference

Type	Features	Terminals	Order no.
PNOZ X2.1VP C	24 VDC	Spring-loaded terminals	787 600
PNOZ X2.1VP	24 VDC	Screw terminals	777 600