

## Up to Category 4, EN 954-1 PNOZ XV3.1



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

### Approvals

	PNOZ XV3.1
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### Unit features

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

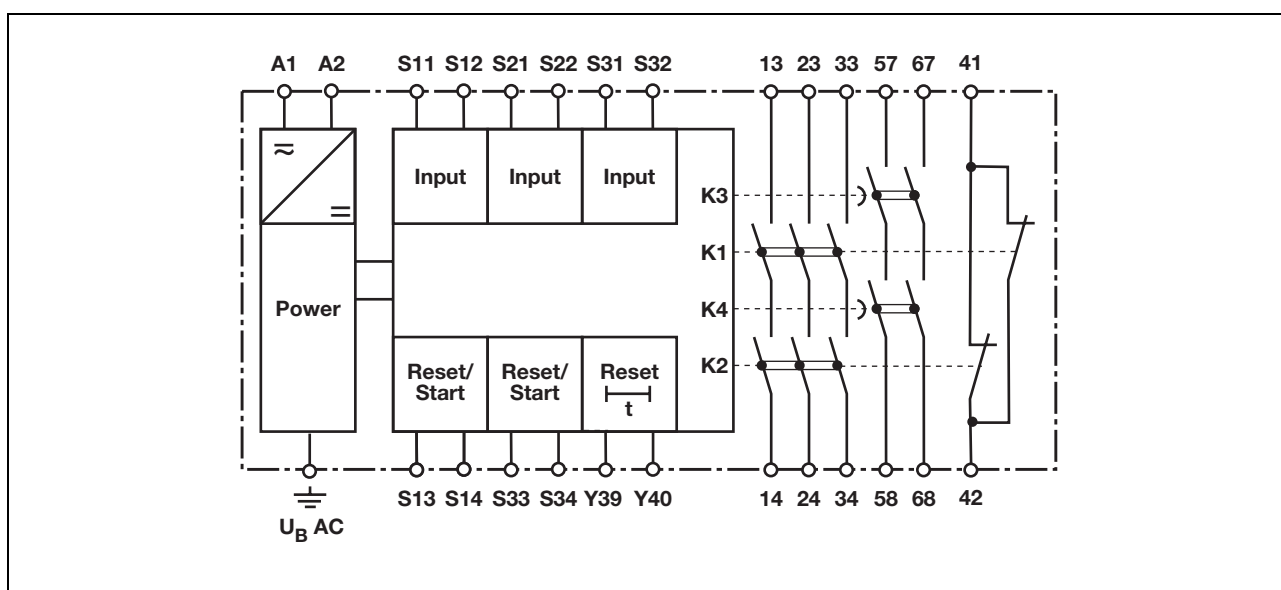
- ▶ The circuit is redundant with built-in self-monitoring.
- ▶ The safety function remains effective in the case of a component failure.
- ▶ The correct opening and closing of the safety function relays is tested automatically in each on-off cycle.
- ▶ The transformer is short circuit-proof. An electronic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

### Block diagram

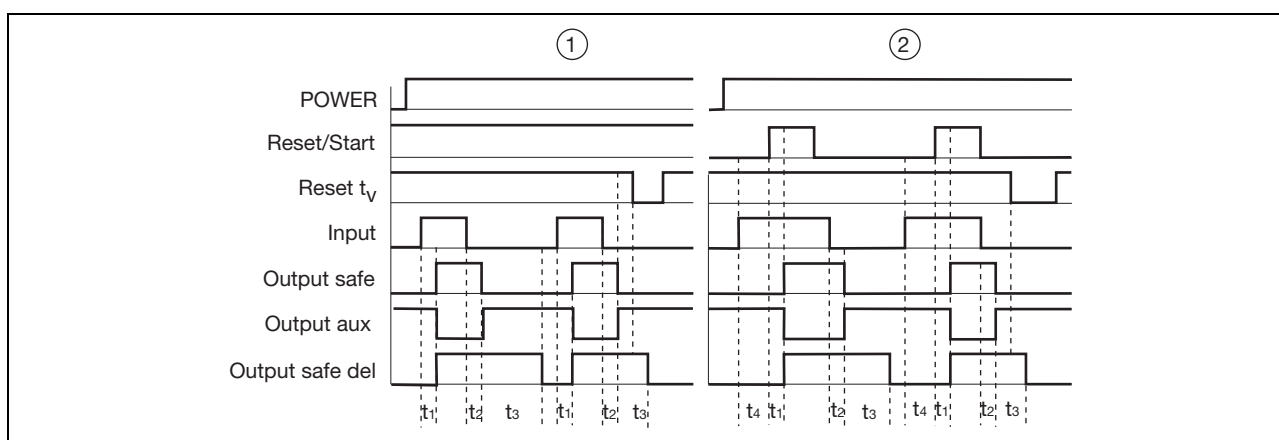


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### Function description

- ▶ 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
- ▶ Input: Input circuits S11-S12, S21-S22, S31-S32
- ▶ Output safe: Safety contacts, instantaneous 13-14, 23-24, 33-34
- ▶ Output safe del: Safety contacts, delayed 57-58, 67-68
- ▶ Output aux: Auxiliary contacts 41-42
- ▶ ①: Automatic reset
- ▶ ②: Monitored reset
- ▶ t<sub>1</sub>: Switch-on delay
- ▶ t<sub>2</sub>: Delay-on de-energisation
- ▶ t<sub>3</sub>: Delay time
- ▶ t<sub>4</sub>: Waiting period

### Wiring

#### Please note:

- ▶ Information given in the “Technical details” must be followed.
- ▶ Outputs 13-14, 23-24, 33-34 are instantaneous safety contacts, outputs 57-58, 67-68 are delay-on de-energisation safety contacts, output 41-42 is an instantaneous 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  $I_{max}$  in the input circuit:

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

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

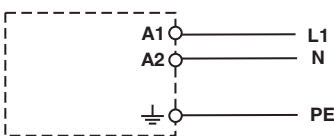
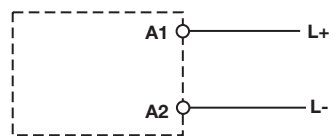
$R_l / km$  = cable resistance/km

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

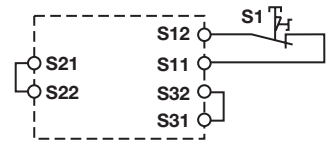
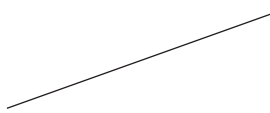
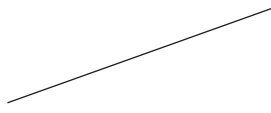
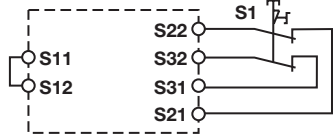
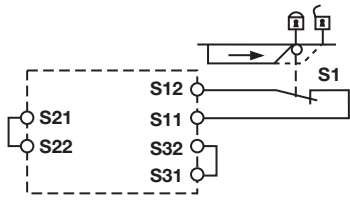
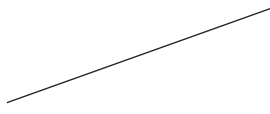
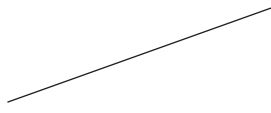
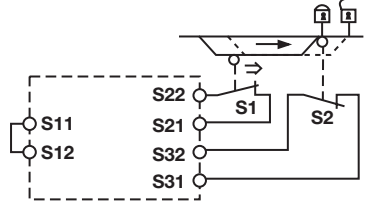
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### Preparing for operation

► Supply voltage


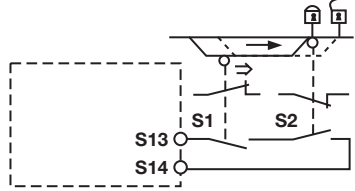
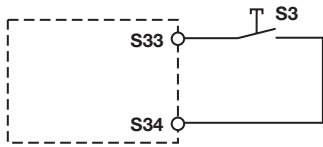

Supply voltage	AC	DC
		

► Input circuit

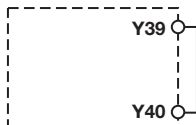
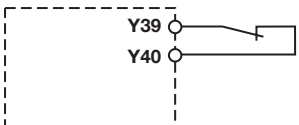
Input circuit	Single-channel	Dual-channel
E-STOP <b>without</b> detection of shorts across contacts		
E-STOP <b>with</b> detection of shorts across contacts		
Safety gate <b>without</b> detection of shorts across contacts		
Safety gate <b>with</b> detection of shorts across contacts		

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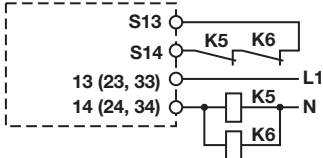
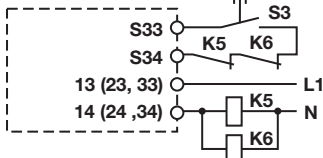
### ▶ Reset circuit

Reset circuit	E-STOP wiring, safety gate	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

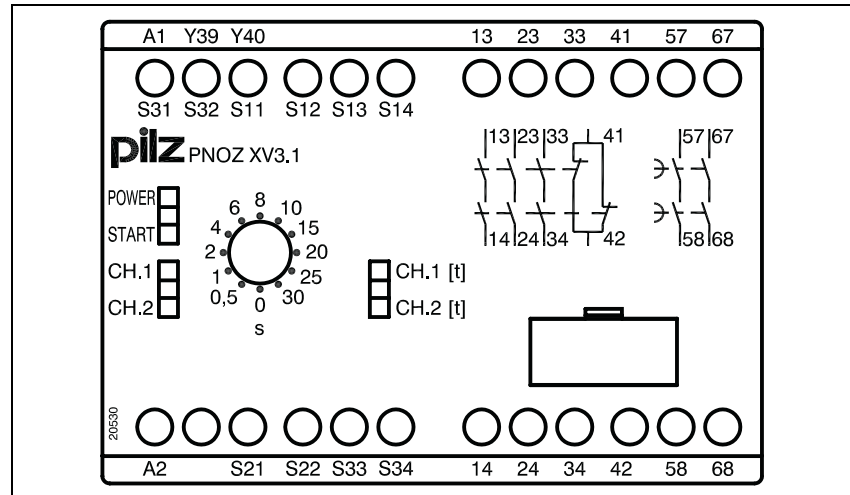
Feedback loop	Automatic reset	Monitored reset
Contacts from external contactors		

### ▶ Key

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

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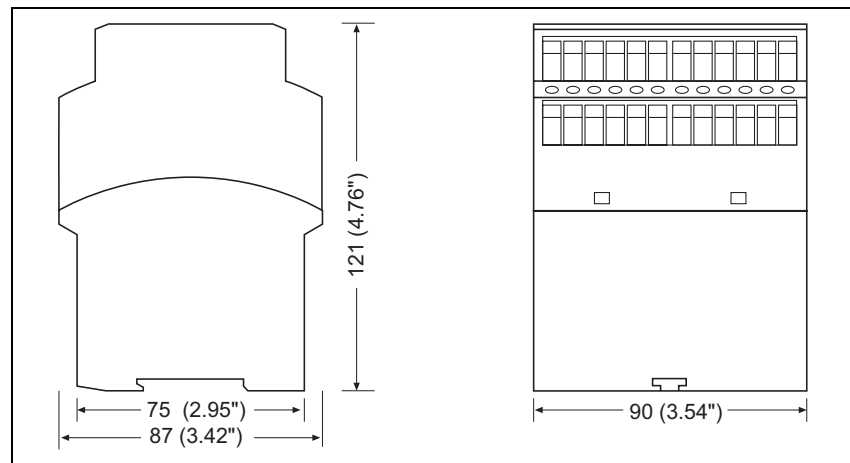
### Terminal configuration



### 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

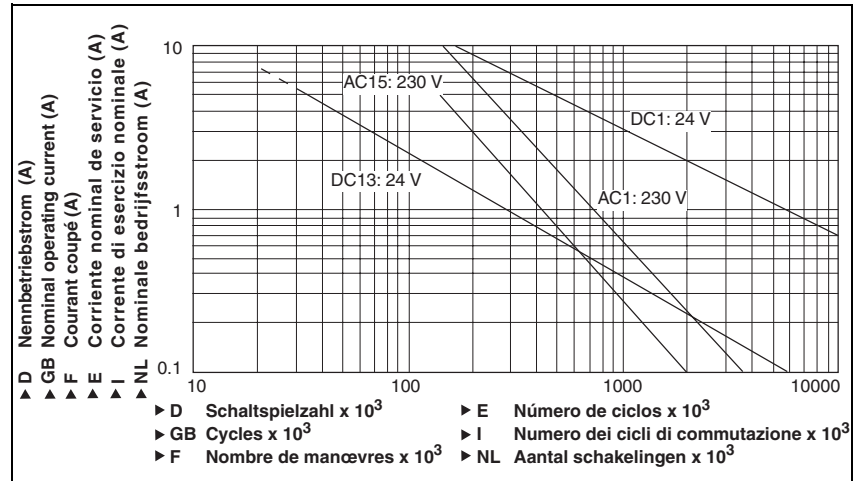


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### Notice

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	<b>24 - 240 V</b>
Supply voltage $U_B$ DC	<b>24 V, 24 - 240 V</b>
Voltage tolerance	<b>-15 % / +10 %</b>
Power consumption at $U_B$ AC	<b>8.5 VA</b> Order no.: 774610, 774612, 774618
Power consumption at $U_B$ DC	<b>4.5 W</b> Order no.: 774530, 774532, 774534, 774538
	<b>5.0 W</b> Order no.: 774610, 774612, 774618
Frequency range AC	<b>50 - 60 Hz</b>
Residual ripple DC	<b>160 %</b>
Voltage and current at input circuit: <b>24 VDC</b>	<b>40 mA</b> Order no.: 774610, 774612, 774618
	<b>50 mA</b> Order no.: 774530, 774532, 774534, 774538
reset circuit: <b>24 VDC</b>	<b>40.0 mA</b>
feedback loop: <b>24 VDC</b>	<b>3.1 mA</b>
Output contacts in accordance with <b>EN 954-1, Category 4</b>	Safety contacts (N/O): <b>3 ST</b> Auxiliary contacts (N/C): <b>1 ST</b>
Output contacts in accordance with <b>EN 954-1, Category 1</b>	Safety contacts (N/O), delayed: <b>2 ST</b>
Category <b>3</b>	When delay time >30 s When delay time <30 s
Utilisation category in accordance with <b>EN 60947-4-1</b>	
AC1: <b>240 V</b>	$I_{min}$ : <b>0.01 A</b> , $I_{max}$ : <b>8.00 A</b> $P_{max}$ : <b>2000 VA</b>
DC1: <b>24 V</b>	$I_{min}$ : <b>0.01 A</b> , $I_{max}$ : <b>8.00 A</b> $P_{max}$ : <b>200 W</b>
Utilisation category in accordance with <b>EN 60947-5-1</b>	
AC15: <b>230 V</b>	$I_{max}$ : <b>5.00 A</b>
DC13 (6 cycles/min): <b>24 V</b>	$I_{max}$ : <b>7.00 A</b>
Contact material	<b>AgSnO<sub>2</sub> + 0.2 μm Au</b>

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### Electrical data

External contact fuse protection (EN 60947-5-1)	
Blow-out fuse, quick	<b>10 A</b>
Blow-out fuse, slow	<b>6 A</b>
Circuit breaker	<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>100 Ohm</b> Order no.: 774530, 774532, 774534, 774538 <b>150 Ohm</b> Order no.: 774610, 774612, 774618
Single-channel at $U_B$ AC	<b>150 Ohm</b> Order no.: 774610, 774612, 774618
Dual-channel with detect. of shorts across contacts at $U_B$ DC	<b>10 Ohm</b> Order no.: 774530, 774532, 774534, 774538 <b>20 Ohm</b> Order no.: 774610, 774612, 774618
Dual-channel with detect. of shorts across contacts at $U_B$ AC	<b>20 Ohm</b> Order no.: 774610, 774612, 774618

### Times

Switch-on delay	
with automatic reset typ.	<b>400 ms</b>
with automatic reset max.	<b>850 ms</b> Order no.: 774530, 774532, 774534, 774538 <b>550 ms</b> Order no.: 774610, 774612, 774618
with automatic reset after power on typ.	<b>400 ms</b> Order no.: 774530, 774532, 774534, 774538 <b>625 ms</b> Order no.: 774610, 774612, 774618
with automatic reset after power on max.	<b>870 ms</b>
with monitored reset typ.	<b>40 ms</b> Order no.: 774530, 774532, 774534, 774538 <b>35 ms</b> Order no.: 774610, 774612, 774618
with monitored reset max.	<b>70 ms</b> Order no.: 774530, 774532, 774534, 774538 <b>60 ms</b> Order no.: 774610, 774612, 774618
Delay-on de-energisation	
with E-STOP typ.	<b>15 ms</b>
with E-STOP max.	<b>30 ms</b>
with power failure typ. $U_B = 24$ VDC	<b>110 ms</b> Order no.: 774530, 774532, 774534, 774534
with power failure max. $U_B = 24$ VDC	<b>150 ms</b> Order no.: 774530, 774532, 774534, 774534
with power failure typ. $U_B = 24$ VAC/DC	<b>90 ms</b> Order no.: 774610, 774612, 774618
with power failure max. $U_B = 240$ VAC/DC	<b>1900 ms</b> Order no.: 774610, 774612, 774618
Recovery time at max. switching frequency 1/s after E-STOP	<b>50 ms + <math>t_r</math></b>
after power failure	<b>200 ms</b> Order no.: 774530, 774532, 774534, 774538 <b>2000 ms</b> Order no.: 774610, 774612, 774618
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.: 774532, 774612 <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.: 774530, 774610 <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.: 774538, 774618
fixed	<b>0.5 s</b> Order no.: 774534
Repetition accuracy	<b>2 %</b>
Time accuracy	<b>-15 % / + 15 % + 50 ms</b>
Waiting period with a monitored reset	<b>300 ms</b>
Min. start pulse duration with a monitored reset	<b>30 ms</b>
Simultaneity, channel 1 and 2	$\infty$
Supply interruption before de-energisation	<b>20 ms</b>
<b>Environmental data</b>	
EMC	<b>EN 60947-5-1, EN 61000-6-2</b> <b>EN 61000-6-4</b> Order no.: 774610, 774612, 774618
Vibration in accordance with EN 60068-2-6	
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>

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### Environmental data

Storage temperature	-40 - 85 °C
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>
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>87.0 mm x 90.0mm x 121.0 mm</b>
Weight	<b>520 g</b> Order no.: 774534 <b>530 g</b> Order no.: 774530, 774532, 774538 <b>600 g</b> Order no.: 774610, 774612, 774618

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>8.0 A</b>	<b>8.0 A</b> Order no.: 774610, 774612, 774618
2	<b>7.8 A</b>	<b>7.8 A</b> Order no.: 774610, 774612, 774618
3	<b>6.5 A</b>	<b>6.5 A</b> Order no.: 774610, 774612, 774618
4	<b>5.5 A</b>	<b>5.5 A</b> Order no.: 774610, 774612, 774618
5	<b>5.0 A</b>	<b>5.0 A</b> Order no.: 774610, 774612, 774618

### Order reference

Type	Features	Terminals	Order no.
PNOZ XV3.1	24 VDC	30 s selectable	Screw terminals 774 530
PNOZ XV3.1	24 VDC	3 s selectable	Screw terminals 774 532
PNOZ XV3.1	24 VDC	0.5 s fixed	Screw terminals 774 534
PNOZ XV3.1	24 VDC	300 s selectable	Screw terminals 774 538
PNOZ XV3.1	24 - 240 VAC/DC	30 s selectable	Screw terminals 774 610
PNOZ XV3.1	24 - 240 VAC/DC	3 s selectable	Screw terminals 774 612
PNOZ XV3.1	24 - 240 VAC/DC	300 s selectable	Screw terminals 774 618