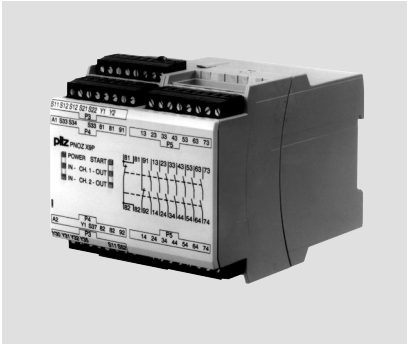


## Up to PL e of EN ISO 13849-1 PNOZ X9P



Safety relay for monitoring E-STOP pushbuttons, safety gates and light beam devices

### Approvals

PNOZ X9P	
	◆
	◆
	◆

Order no. 777607 is without approval

### 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
  - Light barriers
  - Reset button
- ▶ LED indicator for:
  - Switch status channel 1/2
  - Input circuits
  - Supply voltage
  - Reset circuit
- ▶ Semiconductor outputs signal:
  - Switch status channel 1/2
  - Supply voltage is present
- ▶ Plug-in connection terminals (either spring-loaded terminal or screw terminal)
- ▶ See order reference for unit types

### 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

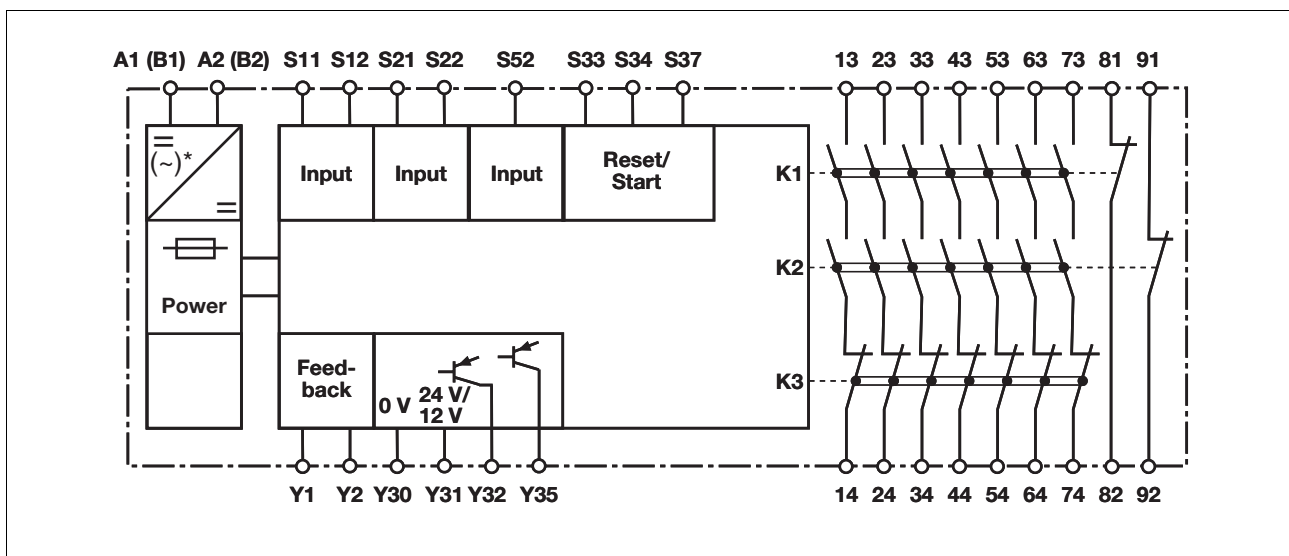
- ▶ E-STOP pushbuttons
- ▶ Safety gates
- ▶ Light beam devices

### 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.

### Block diagram



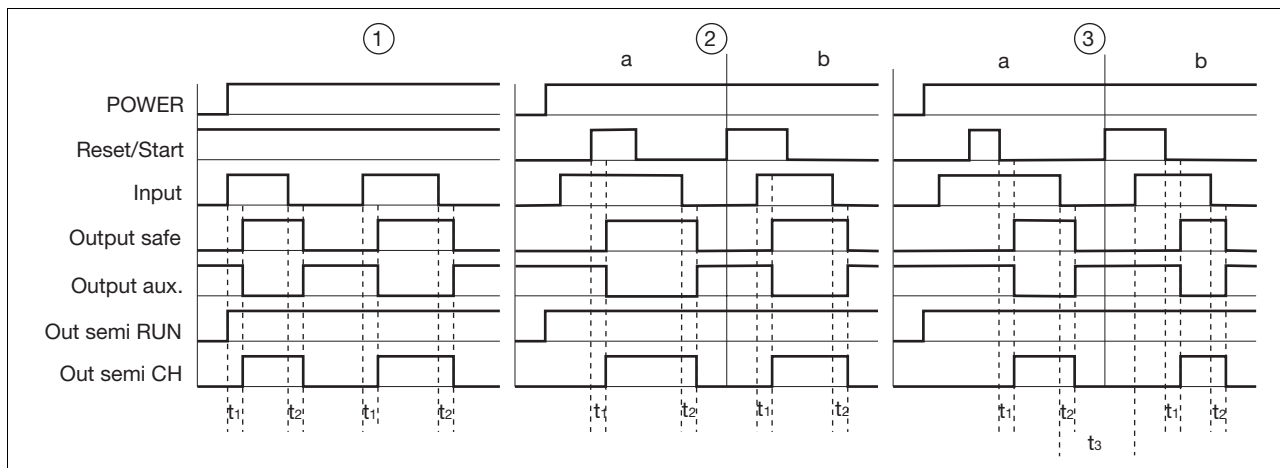
\*Only applies when  $U_B = 100 - 240 \text{ VAC}$

## Up to PL e of EN ISO 13849-1 PNOZ X9P

### 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,
  - shorts between contacts in the input circuit.
- ▶ Automatic start: Unit is active once the input circuit has been closed.
- ▶ 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.
- ▶ 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 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, 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
- ▶  $t_1$ : Switch-on delay
- ▶  $t_2$ : Delay-on de-energisation
- ▶  $t_3$ : Recovery time

### 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.

## Up to PL e of EN ISO 13849-1 PNOZ X9P

### Preparing for operation

#### ► Supply voltage

Supply voltage	AC	DC
$U_B = 12 \text{ VDC}/24 \text{ VDC}/100 - 240 \text{ VAC}$		
$U_B = 12 \text{ VDC}/24 \text{ VDC}$		

#### ► 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		
Light beam device <b>with</b> detection of shorts across contacts via ESPE		

## Up to PL e of EN ISO 13849-1 PNOZ X9P

### ▶ Reset circuit

Reset circuit	E-STOP/safety gate wiring (single-channel 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 circuit

Feedback circuit	
Contacts from external contactors	

### ▶ Semiconductor output

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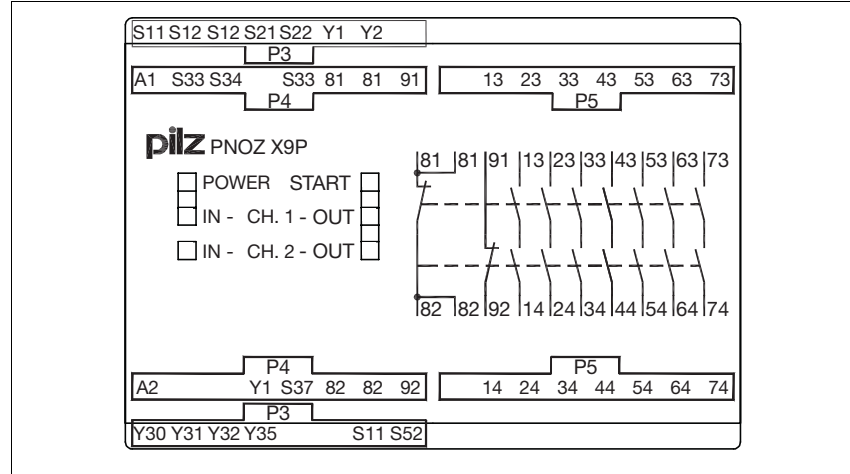
### ▶ Key

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

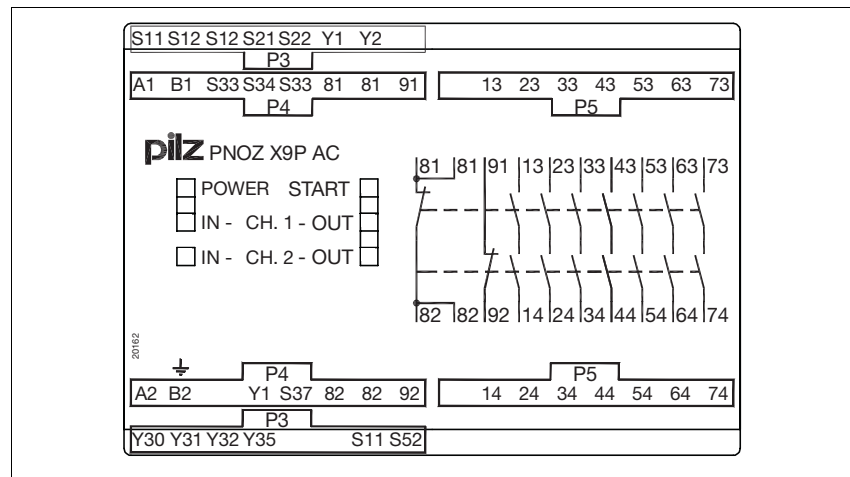
## Up to PL e of EN ISO 13849-1 PNOZ X9P

### Terminal configuration

$U_B = 12 \text{ VDC}/24 \text{ VDC}$



$U_B = 24 \text{ VDC}/100 - 240 \text{ VAC}$

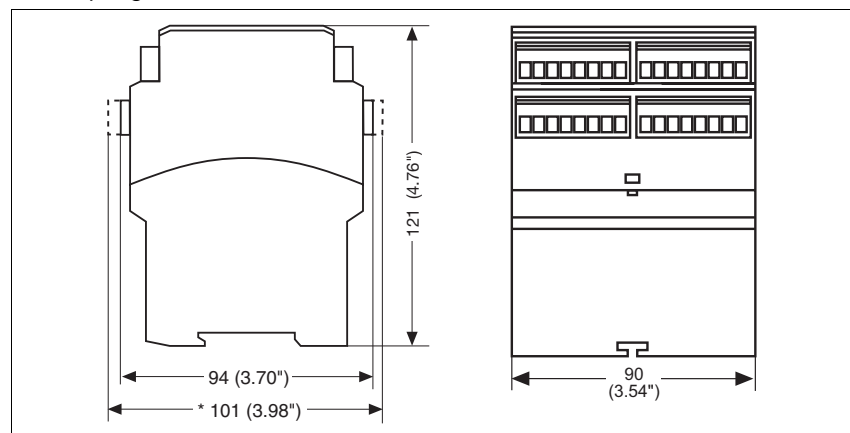


### Installation

- ▶ 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

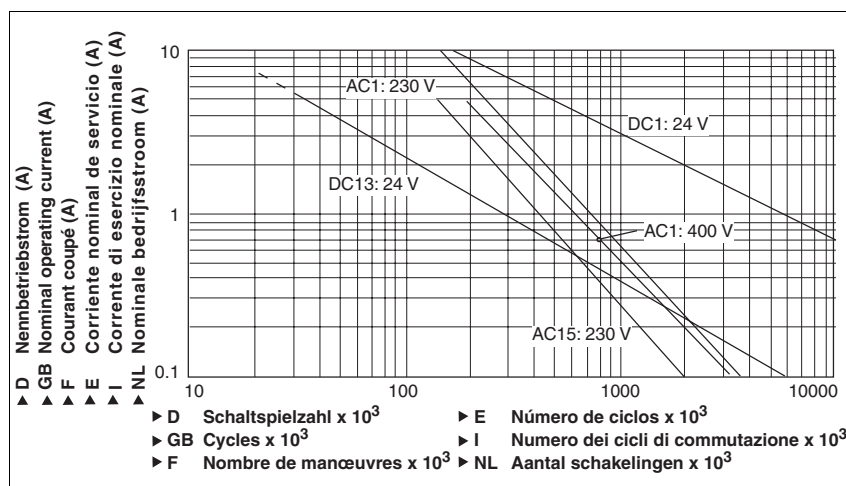


## Up to PL e of EN ISO 13849-1 PNOZ X9P

### 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 <sub>B</sub> AC	<b>100 - 240 V</b>
Supply voltage U <sub>B</sub> DC	<b>12 V, 24 V</b>
Voltage tolerance	-15 %/+10 % Order no.: 777606, 777609, 787606, 787609 -20 %/+20 % Order no.: 777607
Power consumption at U <sub>B</sub> AC	<b>8.5 VA</b> Order no.: 777606, 787606
Power consumption at U <sub>B</sub> DC	<b>5.5 W</b> Order no.: 777606, 777609, 787606, 787609 <b>7.0 W</b> Order no.: 777607
Frequency range AC	<b>50 - 60 Hz</b>
Residual ripple DC	<b>160 %</b>
Voltage and current at	
Input circuit DC: <b>12.0 V</b> Order no.: 777607	<b>130.0 mA</b> Order no.: 777607
<b>24.0 V</b> Order no.: 777606, 777609, 787606, 787609	<b>50.0 mA</b> Order no.: 777606, 777609, 787606, 787609
Reset circuit DC: <b>12.0 V</b> Order no.: 777607	<b>100.0 mA</b> Order no.: 777606, 777609, 787606, 787609
<b>24.0 V</b> Order no.: 777606, 777609, 787606, 787609	<b>200.0 mA</b> Order no.: 777607
Feedback loop DC: <b>12.0 V</b> Order no.: 777607	<b>100.0 mA</b> Order no.: 777606, 777609, 787606, 787609
<b>24.0 V</b> Order no.: 777606, 777609, 787606, 787609	<b>200.0 mA</b> Order no.: 777607
Number of output contacts	
Safety contacts (S) instantaneous:	<b>7</b>
Auxiliary contacts (N/C):	<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>8.0 A</b> P <sub>max</sub> : <b>2000 VA</b>
Safety contacts: DC1 at <b>24 V</b>	I <sub>min</sub> : <b>0.01 A</b> , I <sub>max</sub> : <b>8.0 A</b> P <sub>max</sub> : <b>200 W</b>
Auxiliary contacts: AC1 at <b>240 V</b>	I <sub>min</sub> : <b>0.01 A</b> , I <sub>max</sub> : <b>8.0 A</b> P <sub>max</sub> : <b>2000 VA</b>
Auxiliary contacts: DC1 at <b>24 V</b>	I <sub>min</sub> : <b>0.01 A</b> , I <sub>max</sub> : <b>8.0 A</b> P <sub>max</sub> : <b>200 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>7.0 A</b>
Auxiliary contacts: AC15 at <b>230 V</b>	I <sub>max</sub> : <b>5.0 A</b>
Auxiliary contacts: DC13 at <b>24 V</b> (6 cycles/min)	I <sub>max</sub> : <b>7.0 A</b>
Contact material	<b>AgSnO2 + 0.2 µm Au</b>

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Electrical data	
External contact fuse protection ( $I_K = 1 \text{ kA}$ ) to EN 60947-5-1	
Blow-out fuse, quick	
Safety contacts:	<b>10 A</b>
Auxiliary contacts:	<b>10 A</b>
Blow-out fuse, slow	
Safety contacts:	<b>6 A</b>
Auxiliary contacts:	<b>6 A</b>
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	<b>6 A</b>
Auxiliary contacts:	<b>6 A</b>
Semiconductor outputs (short circuit proof)	<b>12.0 V</b> Order no.: 777607 <b>24.0 V</b> Order no.: 777606, 777609, 787606, 787609 DC, <b>20 mA</b>
External supply voltage	<b>12.0 V</b> Order no.: 777607 <b>24.0 V</b> Order no.: 777606, 777609, 787606, 787609 DC
Voltage tolerance	<b>-20 %/+20 %</b>
Max. overall cable resistance $R_{lmax}$ input circuits, reset circuits single-channel at $U_B$ DC	<b>45 Ohm</b> Order no.: 777606, 777609, 787606, 787609 <b>8 Ohm</b> Order no.: 777607
single-channel at $U_B$ AC	<b>45 Ohm</b> Order no.: 777606, 787606
dual-channel without detect. of shorts across contacts at $U_B$ DC	<b>15 Ohm</b> Order no.: 777607 <b>90 Ohm</b> Order no.: 777606, 777609, 787606, 787609
dual-channel without detect. of shorts across contacts at $U_B$ AC	<b>90 Ohm</b> Order no.: 777606, 787606
dual-channel with detect. of shorts across contacts at $U_B$ DC	<b>15 Ohm</b> Order no.: 777606, 777609, 787606, 787609 <b>8 Ohm</b> Order no.: 777607
dual-channel with detect. of shorts across contacts at $U_B$ AC	<b>15 Ohm</b> Order no.: 777606, 787606
Safety-related characteristic data	
PL in accordance with EN ISO 13849-1	<b>PL e (Cat. 4)</b>
Category in accordance with EN 954-1	<b>Cat. 4</b>
SIL CL in accordance with EN IEC 62061	<b>SIL CL 3</b>
PFH in accordance with EN IEC 62061	<b>2.31E-09</b>
SIL in accordance with IEC 61511	<b>SIL 3</b>
PFD in accordance with IEC 61511	<b>2.03E-06</b>
$t_M$ in years	<b>20</b>
Times	
Switch-on delay with automatic reset typ.	<b>130 ms</b> Order no.: 777607 <b>200 ms</b> Order no.: 777606, 777609, 787606, 787609
with automatic reset max.	<b>200 ms</b> Order no.: 777607 <b>250 ms</b> Order no.: 777606, 777609, 787606, 787609
with automatic reset after power on typ.	<b>150 ms</b> Order no.: 777607 <b>220 ms</b> Order no.: 777606, 777609, 787606, 787609
with automatic reset after power on max.	<b>220 ms</b> Order no.: 777607 <b>300 ms</b> Order no.: 777606, 777609, 787606, 787609
with manual reset typ.	<b>150 ms</b> Order no.: 777607 <b>200 ms</b> Order no.: 777606, 777609, 787606, 787609
with manual reset max.	<b>200 ms</b> Order no.: 777607 <b>250 ms</b> Order no.: 777606, 777609, 787606, 787609
on monitored reset with falling edge typ.	<b>100 ms</b> Order no.: 777607 <b>150 ms</b> Order no.: 777606, 777609, 787606, 787609
on monitored reset with falling edge max.	<b>150 ms</b> Order no.: 777607 <b>220 ms</b> Order no.: 777606, 777609, 787606, 787609

## Up to PL e of EN ISO 13849-1 PNOZ X9P

Times	
Delay-on de-energisation	
with E-STOP typ.	<b>20 ms</b>
with E-STOP max.	<b>30 ms</b>
with power failure typ.	<b>170 ms</b> Order no.: 777606, 777609, 787606, 787609
	<b>60 ms</b> Order no.: 777607
with power failure max.	<b>250 ms</b> Order no.: 777606, 777609, 787606, 787609
	<b>80 ms</b> Order no.: 777607
with power failure typ. $U_B$ AC: <b>100 V, 100 V</b>	<b>165 ms</b> Order no.: 777606, 787606
with power failure max. $U_B$ AC: <b>100 V, 100 V</b>	<b>200 ms</b> Order no.: 777606, 787606
with power failure typ. $U_B$ AC : <b>240 V</b>	<b>320 ms</b> Order no.: 777606, 787606
with power failure max. $U_B$ AC : <b>240 V</b>	<b>450 ms</b> Order no.: 777606, 787606
Recovery time at max. switching frequency 1/s after E-STOP	<b>50 ms</b>
after power failure	<b>100 ms</b> Order no.: 777607
	<b>300 ms</b> Order no.: 777606, 777609, 787606, 787609
after power failure on universal power supply	<b>500 ms</b> Order no.: 777606, 787606
Min. start pulse duration with a monitored reset with falling edge	<b>30 ms</b> Order no.: 777607
	<b>50 ms</b> Order no.: 777606, 777609, 787606, 787609
Simultaneity, channel 1 and 2	<b>150 ms</b> Order no.: 777606, 777609, 787606, 787609
	<b>50 ms</b> Order no.: 777607
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>4.0 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>
Cross section of external conductors with screw terminals	
1 core flexible	<b>0.25 - 2.50 mm<sup>2</sup>, 24 - 12 AWG</b> Order no.: 777606, 777607, 777609
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	<b>0.25 - 1.00 mm<sup>2</sup>, 24 - 16 AWG</b> Order no.: 777606, 777607, 777609
without crimp connectors or with TWIN crimp connectors	<b>0.20 - 1.50 mm<sup>2</sup>, 24 - 16 AWG</b> Order no.: 777606, 777607, 777609
Torque setting with screw terminals	<b>0.50 Nm</b> Order no.: 777606, 777607, 777609
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	<b>0.20 - 1.50 mm<sup>2</sup>, 24 - 16 AWG</b> Order no.: 787606, 787609
Spring-loaded terminals: Terminal points per connection	<b>2</b> Order no.: 787606, 787609
Stripping length	<b>8 mm</b> Order no.: 787606, 787609



## Up to PL e of EN ISO 13849-1 PNOZ X9P

### Mechanical data

Dimensions	
Height	<b>101.0 mm</b> Order no.: 787606, 787609 <b>94.0 mm</b> Order no.: 777606, 777607, 777609
Width	<b>90.0 mm</b>
Depth	<b>121.0 mm</b>
Weight	<b>570 g</b> Order no.: 787609 <b>575 g</b> Order no.: 787606 <b>580 g</b> Order no.: 777607, 777609 <b>585 g</b> Order no.: 777606

The standards current on **2006-06** apply.

### Conventional thermal current

Number of contacts	$I_{th}$ (A) at $U_B$ DC	$I_{th}$ (A) at $U_B$ AC
1	<b>8.00 A</b>	<b>8.00 A</b> Order no.: 777606, 787606
2	<b>8.00 A</b>	<b>8.00 A</b> Order no.: 777606, 787606
3	<b>8.00 A</b>	<b>8.00 A</b> Order no.: 777606, 787606
4	<b>7.00 A</b>	<b>7.00 A</b> Order no.: 777606, 787606
5	<b>6.00 A</b>	<b>6.00 A</b> Order no.: 777606, 787606
6	<b>5.50 A</b>	<b>5.50 A</b> Order no.: 777606, 787606
7	<b>5.00 A</b>	<b>5.00 A</b> Order no.: 777606, 787606

### Order reference

Type	Features	Terminals	Order no.
PNOZ X9P C	110 - 240 VAC 24 VDC	Spring-loaded terminals	787 606
PNOZ X9P	110 - 240 VAC 24 VDC	Screw terminals	777 606
PNOZ X9P C	24 VDC	Spring-loaded terminals	787 609
PNOZ X9P	24 VDC	Screw terminals	777 609
PNOZ X9P	12 VDC	Screw terminals	777 607