

## Up to PL e of EN ISO 13849-1 PNOZ XV2P



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

### Approvals

PNOZ XV2P	
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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
- ▶ Delay-on de-energisation, fixed or adjustable
- ▶ Delay time can be cancelled via reset button
- ▶ LED indicator for:
  - Switch status channel 1/2
  - Supply voltage
  - Reset circuit
- ▶ 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

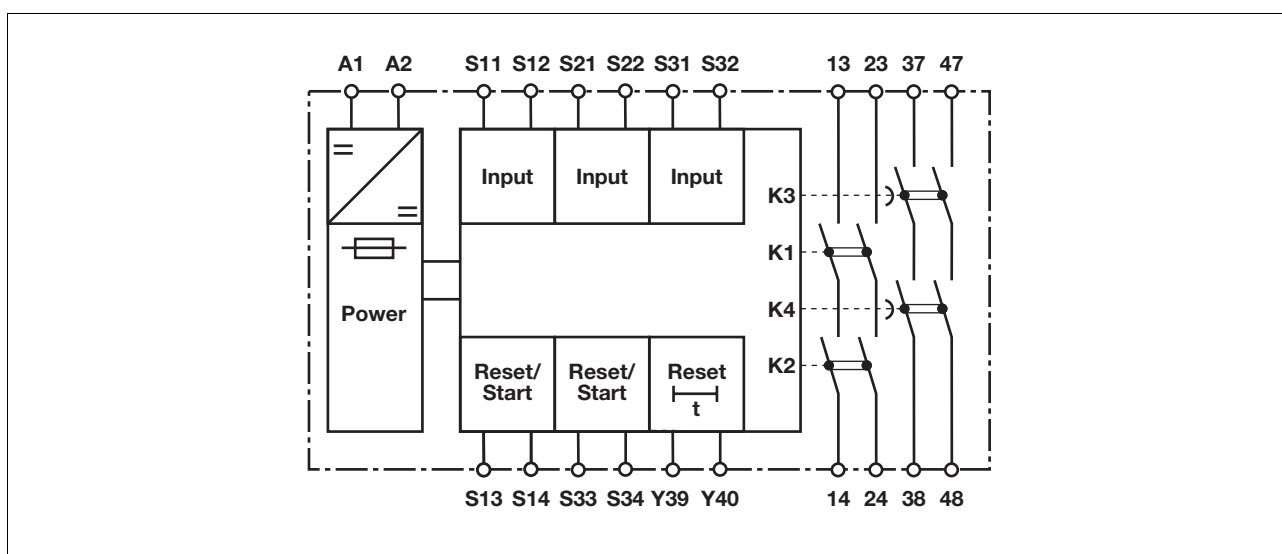
The max. category the safety contacts can achieve in accordance with EN 954-1 and EN ISO 13849-1 is stated in the technical details.

### 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

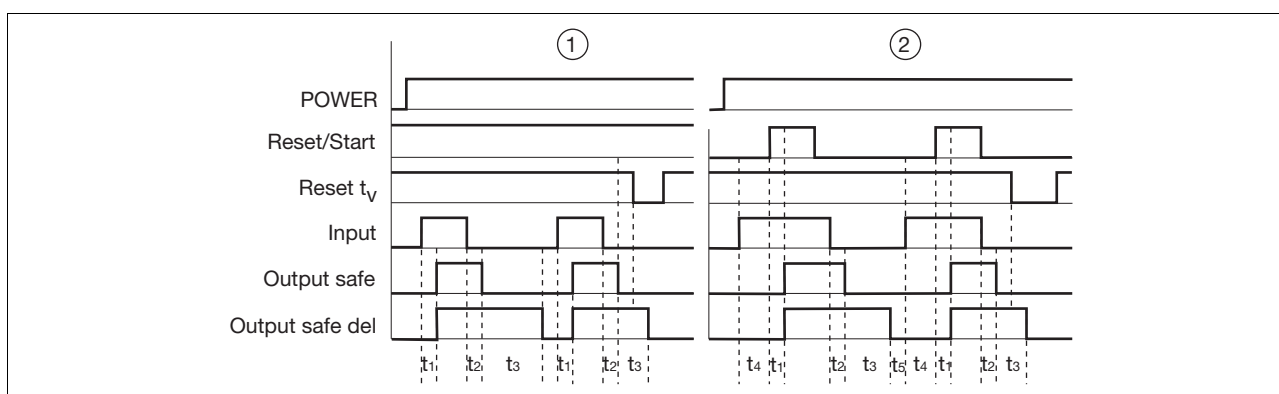


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### Function description

- ▶ 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.
- ▶ 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 instantaneous safety contacts by connecting contact expansion modules or external contactors.

### 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
- ▶  $t_5$ : Recovery time

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

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

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

$R_l / km$  = cable resistance/km

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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		
Monitored reset		

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### ▶ Feedback circuit

Feedback circuit	Automatic reset	Monitored reset
Contacts from external contactors		

### ▶ Reset delay time

Reset	Without reset	With reset
Link or N/C contact		

### ▶ Key

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

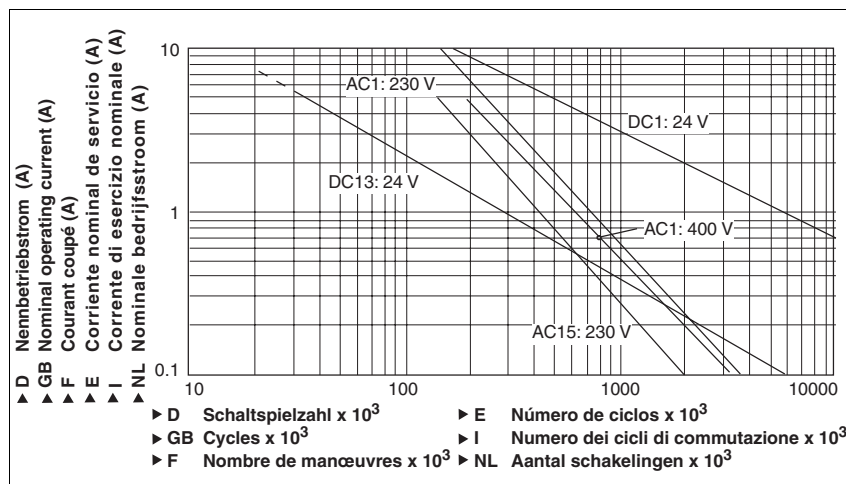


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### Notice

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>4.5 W</b>
Residual ripple DC	<b>160 %</b>
Voltage and current at	
Input circuit DC: <b>24.0 V</b>	<b>35.0 mA</b>
Reset circuit DC: <b>24.0 V</b>	<b>40.0 mA</b>
Feedback loop DC: <b>24.0 V</b>	<b>3.5 mA</b>
Number of output contacts	
Safety contacts (S) instantaneous:	<b>2</b>
Safety contacts (N/O), delayed:	<b>2</b>
Utilisation category in accordance with <b>EN 60947-4-1</b>	
Safety contacts: AC1 at <b>240 V</b>	$I_{min}: 0.01 A, I_{max}: 8.0 A$ $P_{max}: 2000 VA$
Safety contacts: DC1 at <b>24 V</b>	$I_{min}: 0.01 A, I_{max}: 8.0 A$ $P_{max}: 200 W$
Safety contacts, delayed: AC1 at <b>240 V</b>	$I_{min}: 0.01 A, I_{max}: 8.0 A$ $P_{max}: 2000 VA$
Safety contacts, delayed: DC1 at <b>24 V</b>	$I_{min}: 0.01 A, I_{max}: 8.0 A$ $P_{max}: 200 W$
Utilisation category in accordance with <b>EN 60947-5-1</b>	
Safety contacts: AC15 at <b>230 V</b>	$I_{max}: 5.0 A$
Safety contacts: DC13 at <b>24 V</b> (6 cycles/min)	$I_{max}: 7.0 A$
Safety contacts, delayed: AC15 at <b>230 V</b>	$I_{max}: 5.0 A$
Safety contacts, delayed: DC13 at <b>24 V</b> (6 cycles/min)	$I_{max}: 7.0 A$
Contact material	<b>AgSnO2 + 0.2 µm Au</b>

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<b>Electrical data</b>	
External contact fuse protection ( $I_K = 1 \text{ kA}$ ) to <b>EN 60947-5-1</b>	
Blow-out fuse, quick	
Safety contacts:	<b>10 A</b>
Safety contacts, delayed:	<b>10 A</b>
Blow-out fuse, slow	
Safety contacts:	<b>6 A</b>
Safety contacts, delayed:	<b>6 A</b>
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	<b>6 A</b>
Safety contacts, delayed:	<b>6 A</b>
Max. overall cable resistance $R_{lmax}$ input circuits, reset circuits	
single-channel at $U_B$ DC	<b>100 Ohm</b>
dual-channel with detect. of shorts across contacts at $U_B$ DC	<b>10 Ohm</b>
<b>Safety-related characteristic data</b>	
PL in accordance with <b>EN ISO 13849-1</b>	
Safety contacts, instantaneous	<b>PL e (Cat. 4)</b>
Safety contacts, delayed <30 s	<b>PL d (Cat. 3)</b>
Safety contacts, delayed $\geq 30$ s	<b>PL c (Cat. 1)</b>
Category in accordance with <b>EN 954-1</b>	
Safety contacts, instantaneous	<b>Cat. 4</b>
Safety contacts, delayed <30 s	<b>Cat. 3</b>
Safety contacts, delayed $\geq 30$ s	<b>Cat. 1</b>
SIL CL in accordance with <b>EN IEC 62061</b>	
Safety contacts, instantaneous	<b>SIL CL 3</b>
Safety contacts, delayed <30 s	<b>SIL CL 3</b>
Safety contacts, delayed $\geq 30$ s	<b>SIL CL 1</b>
PFH in accordance with <b>EN IEC 62061</b>	
Safety contacts, instantaneous	<b>2.31E-09</b>
Safety contacts, delayed <30 s	<b>2.64E-09</b>
Safety contacts, delayed $\geq 30$ s	<b>2.87E-09</b>
SIL in accordance with <b>IEC 61511</b>	
Safety contacts, instantaneous	<b>SIL 3</b>
Safety contacts, delayed <30 s	<b>SIL 3</b>
Safety contacts, delayed $\geq 30$ s	<b>SIL 2</b>
PFD in accordance with <b>IEC 61511</b>	
Safety contacts, instantaneous	<b>2.03E-06</b>
Safety contacts, delayed <30 s	<b>1.26E-05</b>
Safety contacts, delayed $\geq 30$ s	<b>4.64E-05</b>
$t_M$ in years	<b>20</b>
<b>Times</b>	
Switch-on delay	
with automatic reset typ.	<b>350 ms</b>
with automatic reset max.	<b>650 ms</b>
with automatic reset after power on typ.	<b>385 ms</b>
with automatic reset after power on max.	<b>700 ms</b>
on monitored reset with rising edge typ.	<b>35 ms</b>
on monitored reset with rising edge max.	<b>70 ms</b>
Delay-on de-energisation	
with E-STOP typ.	<b>15 ms</b>
with E-STOP max.	<b>30 ms</b>
with power failure typ.	<b>85 ms</b>
with power failure max.	<b>200 ms</b>
Recovery time at max. switching frequency 1/s	
after E-STOP	<b>50 ms +tv</b>
after power failure	<b>250 ms</b>

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<b>Times</b>	
Delay time $t_V$ : selectable	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 Order no.: 777500 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 Order no.: 777502 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 Order no.: 787500 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 Order no.: 787502
Delay time $t_V$ : fixed	0.50 s Order no.: 777504, 787504 1.00 s Order no.: 777503, 787503
Repetition accuracy	2 %
Time accuracy	-15 %/+15 % +50 ms
Waiting period with a monitored reset with rising edge	300 ms
Min. start pulse duration with a monitored reset with rising edge	30 ms
Simultaneity, channel 1 and 2	∞
Supply interruption before de-energisation	20 ms
<b>Environmental data</b>	
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
Overvoltage category	III
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
<b>Mechanical data</b>	
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.: 777500, 777502, 777503, 777504
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.: 777500, 777502, 777503, 777504
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm <sup>2</sup> , 24 - 16 AWG Order no.: 777500, 777502, 777503, 777504
Torque setting with screw terminals	0.50 Nm Order no.: 777500, 777502, 777503, 777504
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.: 787500, 787502, 787503, 787504
Spring-loaded terminals: Terminal points per connection	2 Order no.: 787500, 787502, 787503, 787504
Stripping length	8 mm Order no.: 787500, 787502, 787503, 787504



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### Mechanical data

Dimensions	
Height	<b>101.0 mm</b> Order no.: 787500, 787502, 787503, 787504 <b>94.0 mm</b> Order no.: 777500, 777502, 777503, 777504
Width	<b>45.0 mm</b>
Depth	<b>121.0 mm</b>
Weight	
	<b>340 g</b> Order no.: 787503, 787504 <b>350 g</b> Order no.: 777503, 777504, 787500, 787502 <b>360 g</b> Order no.: 777500, 777502

The standards current on **03/02** apply.

### Conventional thermal current

$I_{th}$  (A) at  $U_B$  DC

1 contact	<b>8.00 A</b>
2 contacts	<b>7.00 A</b>
3 contacts	<b>5.70 A</b>
4 contacts	<b>5.00 A</b>

### Order reference

Type	Features	Terminals	Order no.
PNOZ XV2P	24 VDC	30 s selectable	Screw terminals 777 500
PNOZ XV2P C	24 VDC	30 s selectable	Spring-loaded terminals 787 500
PNOZ XV2P	24 VDC	3 s selectable	Screw terminals 777 502
PNOZ XV2P C	24 VDC	3 s selectable	Spring-loaded terminals 787 502
PNOZ XV2P	24 VDC	1 s fixed	Screw terminals 777 503
PNOZ XV2P C	24 VDC	1 s fixed	Spring-loaded terminals 787 503
PNOZ XV2P	24 VDC	0.5 s fixed	Screw terminals 777 504
PNOZ XV2P C	24 VDC	0.5 s fixed	Spring-loaded terminals 787 504