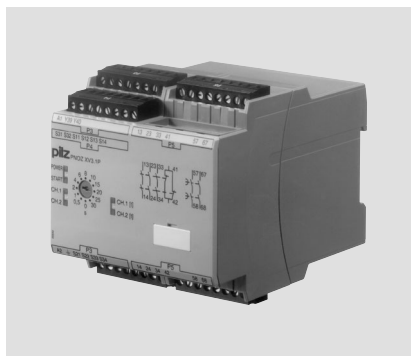


Up to Category 4, EN 954-1 PNOZ XV3.1P



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

Approvals

	PNOZ XV3.1P
	◆
	◆
	◆

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
 - Light barriers
 - 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
- ▶ Light barriers

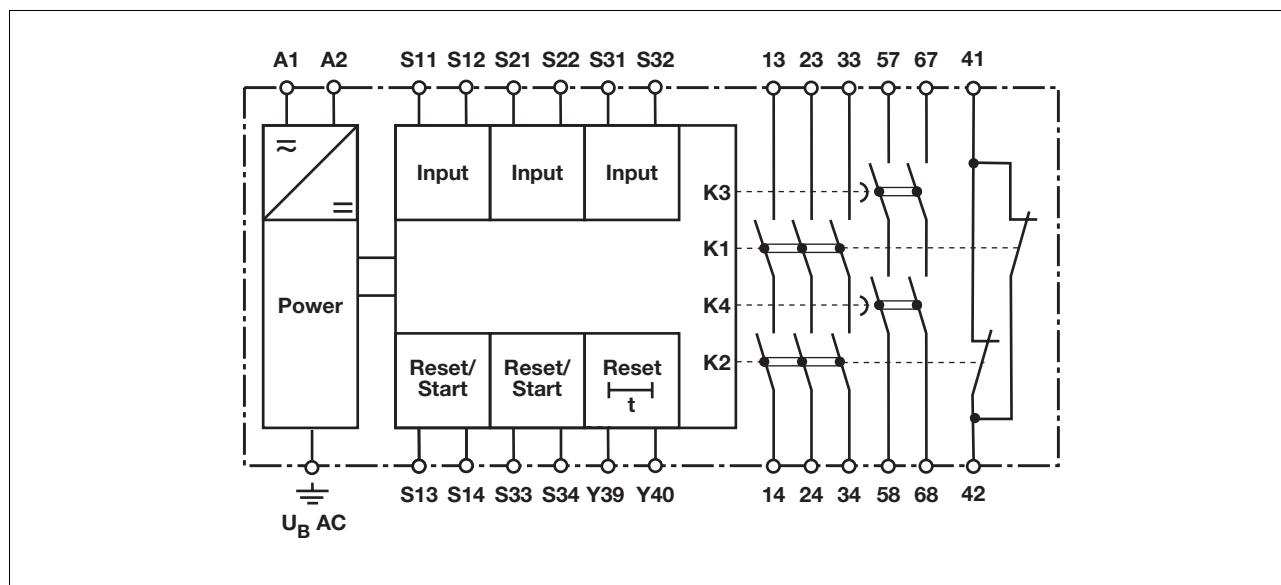
The max. category the safety contacts can achieve in accordance with EN 954-1 is stated in the technical details.

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 transformer is short circuit-proof. An electronic fuse is used on a DC supply.

Block diagram

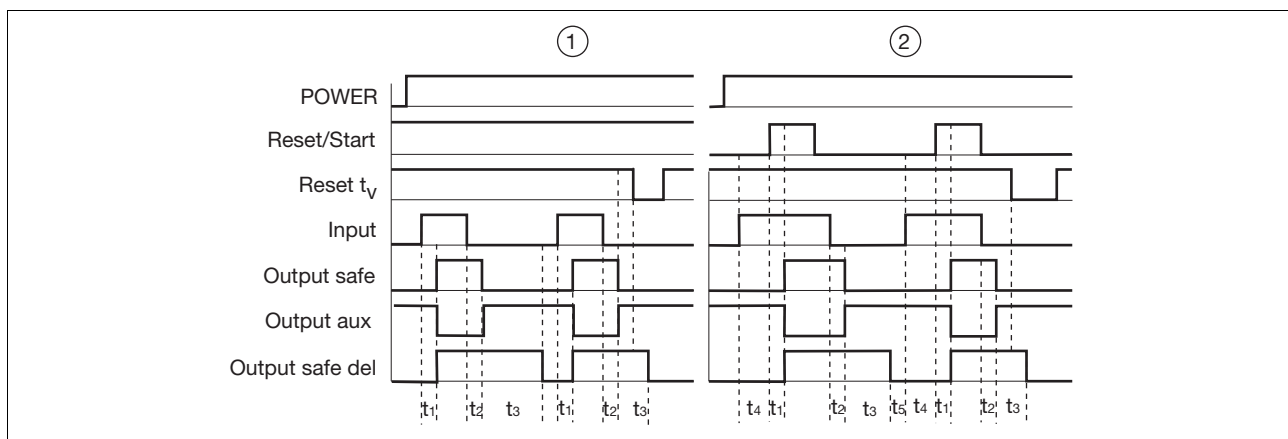


Up to Category 4, EN 954-1 PNOZ XV3.1P

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.
- ▶ 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.
- ▶ 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 expansion 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
- ▶ t₁: Switch-on delay
- ▶ t₂: Delay-on de-energisation
- ▶ t₃: Delay time
- ▶ t₄: Waiting period
- ▶ t₅: Recovery time

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:

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

$R_{l\max}$ = 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.

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

Preparing for operation

► Supply voltage

Supply voltage	AC	DC

► Input circuit

Input circuit	Single-channel	Dual-channel
E-STOP without detection of shorts across contacts		
E-STOP with detection of shorts across contacts		
Safety gate without detection of shorts across contacts		
Safety gate with detection of shorts across contacts		
Light barrier with detection of shorts across contacts via ESPE (only when $U_B = 24 \text{ VDC}$)		

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

► 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 delay time

Reset	Without reset	With reset
Link or N/C contact		

► Feedback loop

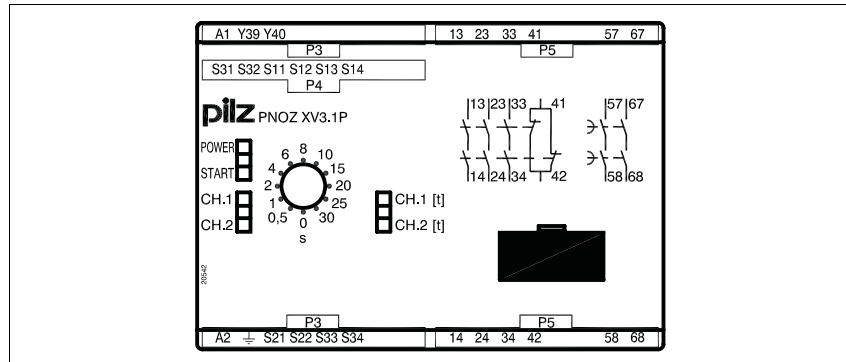
Feedback loop	Automatic reset	Monitored reset
Contacts from external contactors		

► Key

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

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

Terminal configuration

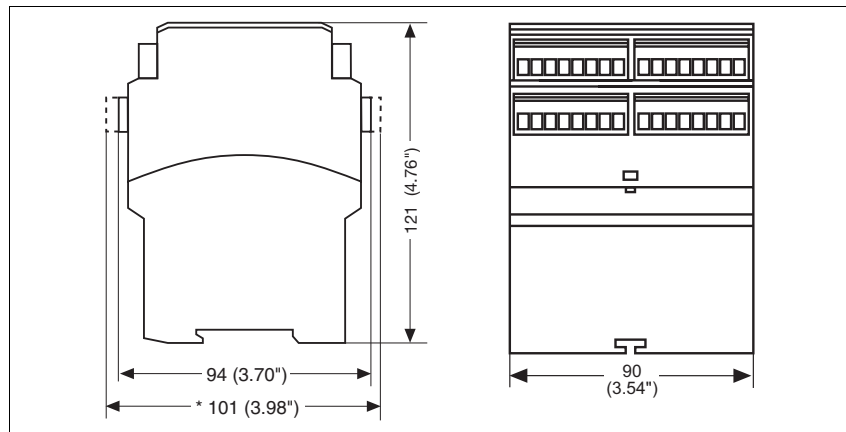


Installation

- ▶ 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

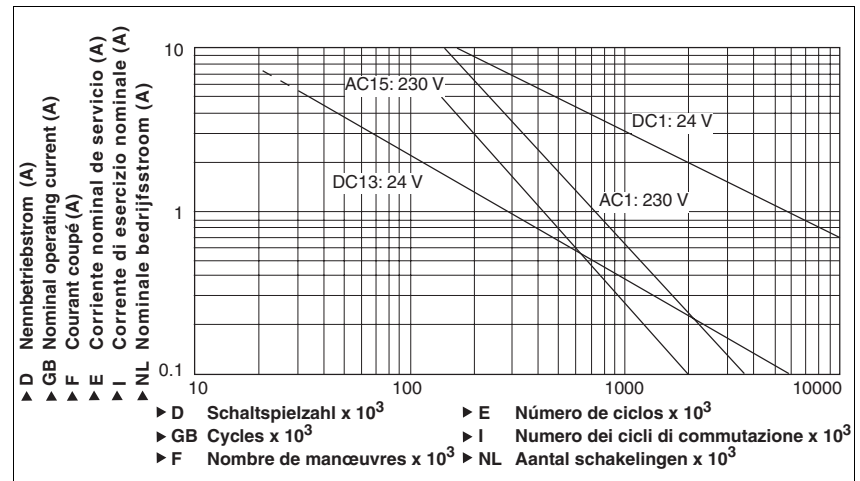


Up to Category 4, EN 954-1 PNOZ XV3.1P

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	24 V
Supply voltage U _B AC/DC	24 - 240 V
Voltage tolerance	-15 %/+10 %
Power consumption at U _B AC	8.5 VA Order no.: 777530, 777532, 777538, 787530, 787532, 787538
Power consumption at U _B DC	4.5 W Order no.: 777520, 777522, 777525, 787520, 787522 5.0 W Order no.: 777530, 777532, 777538, 787530, 787532, 787538
Frequency range AC	50 - 60 Hz
Residual ripple DC	160 %
Voltage and current at	
Input circuit DC: 24.0 V	40.0 mA Order no.: 777530, 777532, 777538, 787530, 787532, 787538 50.0 mA Order no.: 777520, 777522, 777525, 787520, 787522
Reset circuit DC: 24.0 V	40.0 mA
Feedback loop DC: 24.0 V	3.1 mA
Number of output contacts	
Safety contacts (S) instantaneous:	3
Safety contacts (N/O), delayed:	2
Auxiliary contacts (N/C):	1
Category of output contacts in accordance with EN 954-1 , EN ISO 13849-1	
Safety contacts (S) instantaneous:	4
Delay time <30 s	3
Delay time ≥30 s	1 Order no.: 777520, 777530, 777538, 787520, 787530, 787538

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

Electrical data	
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	$I_{min}: 0.01\text{ A}$, $I_{max}: 8.0\text{ A}$ $P_{max}: 2000\text{ VA}$
Safety contacts: DC1 at 24 V	$I_{min}: 0.01\text{ A}$, $I_{max}: 8.0\text{ A}$ $P_{max}: 200\text{ W}$
Safety contacts, delayed: AC1 at 240 V	$I_{min}: 0.01\text{ A}$, $I_{max}: 8.0\text{ A}$ $P_{max}: 2000\text{ VA}$
Safety contacts, delayed: DC1 at 24 V	$I_{min}: 0.01\text{ A}$, $I_{max}: 8.0\text{ A}$ $P_{max}: 200\text{ W}$
Auxiliary contacts: AC1 at 240 V	$I_{min}: 0.01\text{ A}$, $I_{max}: 8.0\text{ A}$ $P_{max}: 2000\text{ VA}$
Auxiliary contacts: DC1 at 24 V	$I_{min}: 0.01\text{ A}$, $I_{max}: 8.0\text{ A}$ $P_{max}: 200\text{ W}$
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	$I_{max}: 5.0\text{ A}$
Safety contacts: DC13 at 24 V (6 cycles/min)	$I_{max}: 7.0\text{ A}$
Safety contacts, delayed: AC15 at 230 V	$I_{max}: 5.0\text{ A}$
Safety contacts, delayed: DC13 at 24 V (6 cycles/min)	$I_{max}: 7.0\text{ A}$
Auxiliary contacts: AC15 at 230 V	$I_{max}: 5.0\text{ A}$
Auxiliary contacts: DC13 at 24 V (6 cycles/min)	$I_{max}: 7.0\text{ A}$
Contact material	AgSnO2 + 0.2 µm Au
External contact fuse protection ($I_K = 1\text{ kA}$) to EN 60947-5-1	
Blow-out fuse, quick	
Safety contacts:	10 A
Safety contacts, delayed:	10 A
Auxiliary contacts:	10 A
Blow-out fuse, slow	
Safety contacts:	6 A
Safety contacts, delayed:	6 A
Auxiliary contacts:	6 A
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	6 A
Safety contacts, delayed:	6 A
Auxiliary contacts:	6 A
Max. overall cable resistance R_{lmax} input circuits, reset circuits	
single-channel at U_B DC	100 Ohm Order no.: 777520, 777522, 777525, 787520, 787522 150 Ohm Order no.: 777530, 777532, 777538, 787530, 787532, 787538
single-channel at U_B AC	150 Ohm Order no.: 777530, 777532, 777538, 787530, 787532, 787538
dual-channel without detect. of shorts across contacts at U_B DC	120 Ohm Order no.: 777520, 777522, 777525, 787520, 787522 200 Ohm Order no.: 777530, 777532, 777538, 787530, 787532, 787538
dual-channel without detect. of shorts across contacts at U_B AC	200 Ohm Order no.: 777530, 777532, 777538, 787530, 787532, 787538
dual-channel with detect. of shorts across contacts at U_B DC	10 Ohm Order no.: 777520, 777522, 777525, 787520, 787522 20 Ohm Order no.: 777530, 777532, 777538, 787530, 787532, 787538
dual-channel with detect. of shorts across contacts at U_B AC	20 Ohm Order no.: 777530, 777532, 777538, 787530, 787532, 787538

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

Times	
Switch-on delay	
with automatic reset typ.	400 ms
with automatic reset max.	550 ms Order no.: 777530, 777532, 777538, 787530, 787532, 787538
	850 ms Order no.: 777520, 777522, 777525, 787520, 787522
with automatic reset after power on typ.	400 ms Order no.: 777520, 777522, 777525, 787520, 787522
	625 ms Order no.: 777530, 777532, 777538, 787530, 787532, 787538
with automatic reset after power on max.	870 ms
on monitored reset with rising edge typ.	35 ms Order no.: 777530, 777532, 777538, 787530, 787532, 787538
	40 ms Order no.: 777520, 777522, 777525, 787520, 787522
on monitored reset with rising edge max.	60 ms Order no.: 777530, 777532, 777538, 787530, 787532, 787538
	70 ms Order no.: 777520, 777522, 777525, 787520, 787522
Delay-on de-energisation	
with E-STOP typ.	15 ms
with E-STOP max.	30 ms
with power failure typ.	110 ms Order no.: 777520, 777522, 777525, 787520, 787522
with power failure max.	150 ms Order no.: 777520, 777522, 777525, 787520, 787522
with power failure typ. U_B DC: 24 V Order no.: 777530, 777532, 777538, 787530, 787532, 787538	90 ms Order no.: 777530, 777532, 777538, 787530, 787532, 787538
with power failure typ. U_B AC/DC: 24 V Order no.: 777530, 777532, 777538, 787530, 787532, 787538	90 ms Order no.: 777530, 777532, 777538, 787530, 787532, 787538
with power failure max. U_B DC: 24 V Order no.: 777530, 777532, 777538, 787530, 787532, 787538	250 ms Order no.: 777530, 777532, 777538, 787530, 787532, 787538
with power failure max. U_B AC/DC: 24 V Order no.: 777530, 777532, 777538, 787530, 787532, 787538	250 ms Order no.: 777530, 777532, 777538, 787530, 787532, 787538
with power failure typ. U_B AC : 240 V	815 ms Order no.: 777530, 777532, 777538, 787530, 787532, 787538
with power failure max. U_B AC : 240 V	1900 ms Order no.: 777530, 777532, 777538, 787530, 787532, 787538
Recovery time at max. switching frequency 1/s after E-STOP	50 ms +tv
after power failure	200 ms Order no.: 777520, 777522, 777525, 787520, 787522
after power failure on universal power supply	2000 ms Order no.: 777530, 777532, 777538, 787530, 787532, 787538
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.: 777520 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.: 777522 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.: 777530 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.: 777532 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 Order no.: 777538 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.: 787520 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.: 787522 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.: 787530 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.: 787532 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 Order no.: 787538
Delay time t_V : fixed	3.00 s Order no.: 777525
Repetition accuracy	2 %
Time accuracy	-15 %/+15 % +50 ms

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

Times	
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
Environmental data	
EMC	EN 60947-5-1, EN 61000-6-2, EN 61000-6-4
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 ² , 24 - 12 AWG Order no.: 777520, 777522, 777525, 777530, 777532, 777538
2 core, same cross section, flexible: with crimp connectors, without insulating sleeve	0.25 - 1.00 mm ² , 24 - 16 AWG Order no.: 777520, 777522, 777525, 777530, 777532, 777538
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm ² , 24 - 16 AWG Order no.: 777520, 777522, 777525, 777530, 777532, 777538
Torque setting with screw terminals	0.50 Nm Order no.: 777520, 777522, 777525, 777530, 777532, 777538
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	0.20 - 1.50 mm ² , 24 - 16 AWG Order no.: 787520, 787522, 787530, 787532, 787538
Spring-loaded terminals: Terminal points per connection	2 Order no.: 787520, 787522, 787530, 787532, 787538
Stripping length	8 mm Order no.: 787520, 787522, 787530, 787532, 787538
Dimensions	
Height	101.0 mm Order no.: 787520, 787522, 787530, 787532, 787538 94.0 mm Order no.: 777520, 777522, 777525, 777530, 777532, 777538
Width	90.0 mm
Depth	121.0 mm
Weight	500 g Order no.: 787520, 787522 510 g Order no.: 777520, 777522, 777525 570 g Order no.: 787530, 787532, 787538 580 g Order no.: 777530, 777532, 777538

The standards current on **2008-07** apply.

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

Conventional thermal current

Number of contacts	I_{th} (A) at U_B DC	I_{th} (A) at U_B AC
1	8.00 A	8.00 A Order no.: 777530, 777532, 777538, 787530, 787532, 787538
2	7.80 A	7.80 A Order no.: 777530, 777532, 777538, 787530, 787532, 787538
3	6.50 A	6.50 A Order no.: 777530, 777532, 777538, 787530, 787532, 787538
4	5.50 A	5.50 A Order no.: 777530, 777532, 777538, 787530, 787532, 787538
5	5.00 A	5.00 A Order no.: 777530, 777532, 777538, 787530, 787532, 787538

Order reference

Type	Features		Terminals	Order no.	
PNOZ XV3.1P C		24 VDC	30 s selectable	Spring-loaded terminals	787 520
PNOZ XV3.1P		24 VDC	30 s selectable	Screw terminals	777 520
PNOZ XV3.1P C		24 VDC	3 s selectable	Spring-loaded terminals	787 522
PNOZ XV3.1P		24 VDC	3 s selectable	Screw terminals	777 522
PNOZ XV3.1P		24 VDC	3 s fixed	Screw terminals	777 525
PNOZ XV3.1P C	24 - 240 VAC/DC		30 s selectable	Spring-loaded terminals	787 530
PNOZ XV3.1P	24 - 240 VAC/DC		30 s selectable	Screw terminals	777 530
PNOZ XV3.1P C	24 - 240 VAC/DC		3 s selectable	Spring-loaded terminals	787 532
PNOZ XV3.1P	24 - 240 VAC/DC		3 s selectable	Screw terminals	777 532
PNOZ XV3.1P C	24 - 240 VAC/DC		300 s selectable	Spring-loaded terminals	787 538
PNOZ XV3.1P	24 - 240 VAC/DC		300 s selectable	Screw terminals	777 538