Up to Category 4, EN 954-1

PNOZ X8P

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

Approvals

	PNOZ X8P
c(UL)us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

▸ Positive-guided relay outputs:
  – 3 safety contacts (N/O), instanta-
    neous
  – 2 auxiliary contacts (N/C), in-
    stantaneous
▸ 2 semiconductor outputs
▸ Connection options for:
  – E-STOP pushbutton
  – Safety gate limit switch
  – Reset button
▸ LED indicator for:
  – Switch status channel 1/2
  – Supply voltage
▸ Semiconductor outputs signal:
  – Switch status channel 1/2
  – Supply voltage is present
▸ Plug-in connection terminals (either
  cage clamp terminal or screw termi-
  nal)
▸ See order reference for unit types

Unit description

The safety relay meets the require-
ments of EN 60204-1 and IEC 60204-
1 and may be used in applications with
▸ E-STOP pushbuttons

▸ Safety gates

Safety features
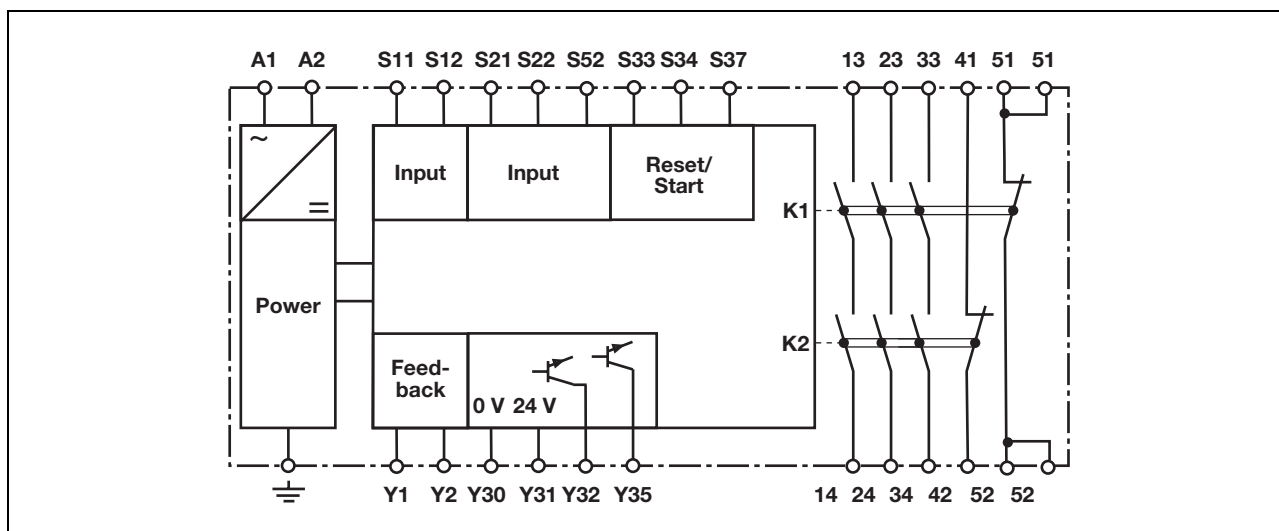
The relay conforms to the following
safety criteria:
▸ The circuit is redundant with built-in
  self-monitoring.
▸ The safety function remains effecti-
  ve in the case of a component failu-
  re.
▸ The correct opening and closing of
  the safety function relays is tested
  automatically in each on-off cycle.
▸ The tranformer is short circuit-
 proof. An electronic fuse is used on
  a DC supply.

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 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.

- 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.

- 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 contacts by connecting contact expander modules or external contactors/relays.

Timing diagram
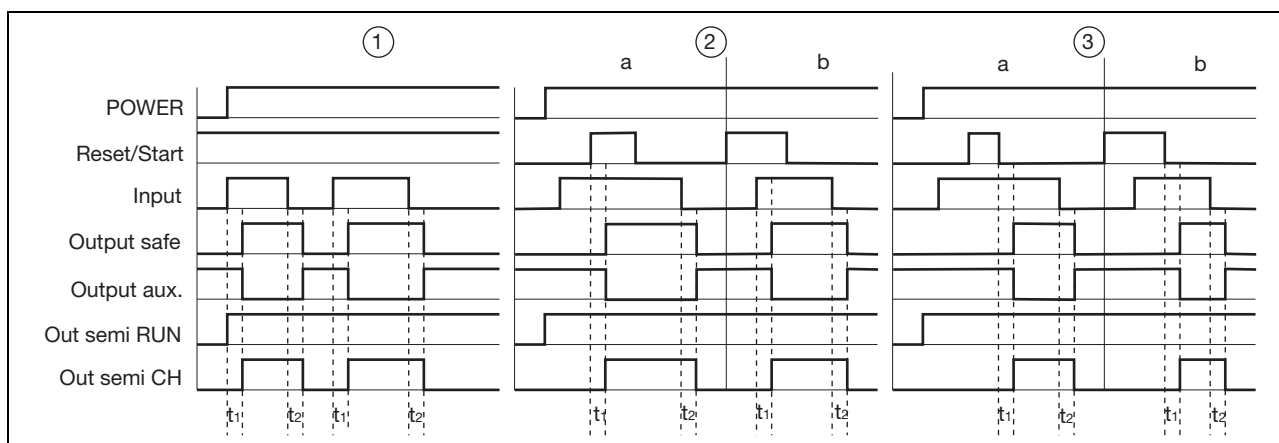
Key

- Power: Supply voltage
- Reset/start: Reset circuit S33-S34, Y1-S37
- Input: Input circuits S21-22, S11-S12, S52
- Output safe: Safety contacts 13-14, 23-24, 33-34

- Output aux: Auxiliary contacts 41-42, 51-52
- 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

Wiring

Please note:
- Information given in the "Technical details" must be followed.
- Outputs 13-14, 23-24, 33-34 are safety contacts, outputs 41-42, 51-52 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:
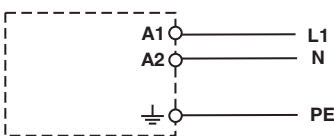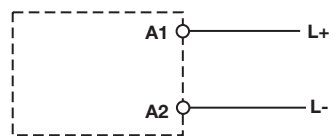
$$I_{max} = \frac{R_{lmax}}{R_l / km}$$

R_{lmax} = max. overall cable resistance (see technical details)
R_l /km = cable resistance/km
- Use copper wire that can withstand 60/75 °C.
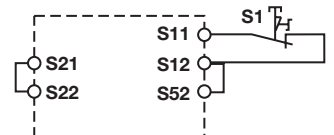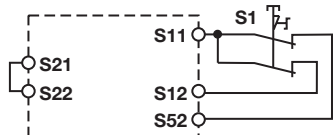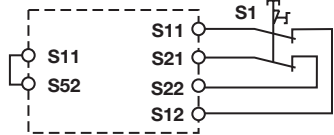- Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.
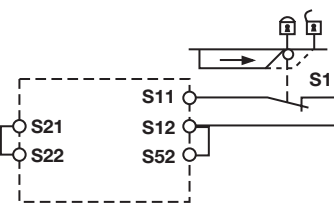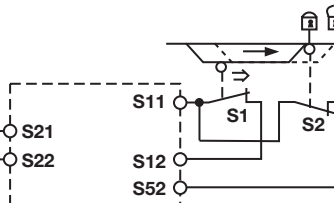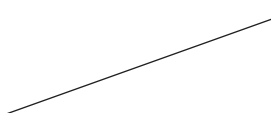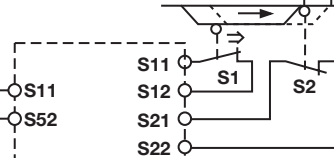
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Preparing for operation

▸ Supply voltage
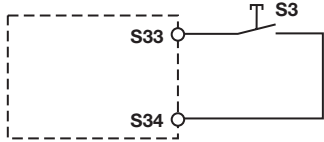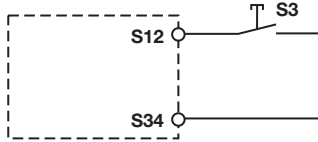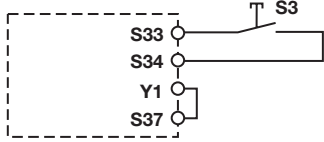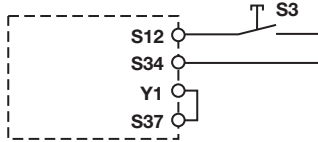
Supply voltage	AC	DC

▸ Input circuit
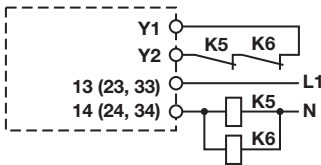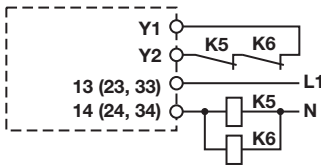
Input circuit	Single-channel	Dual-channel
E-STOP **without** detection of shorts across contacts		
E-STOP **with** detection of shorts across contacts		
Safety gate **without** detection of shorts across contacts		
Safety gate **with** detection of shorts across contacts		

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▶ Reset circuit

Reset circuit	E-STOP/safety gate wiring (single and dual-channel, without shorts across contacts)	E-STOP/safety gate wiring (dual-channel with shorts across contacts)
Automatic reset	S33 / S34	S12 / S34
Manual reset	S3 / S33 / S34	S3 / S12 / S34
Monitored reset	S3 / S33 / S34 / Y1 / S37	S3 / S12 / S34 / Y1 / S37

▶ Feedback loop

Feedback loop	Automatic reset	Monitored reset
Contacts from external contactors	Y1 / Y2 / K5 K6 / 13 (23, 33) L1 / 14 (24, 34) K5 N / K6	Y1 / Y2 / K5 K6 / 13 (23, 33) L1 / 14 (24, 34) K5 N / K6

▶ Semiconductor output

Y31 — 24 V DC
Y32 — SPS Input
Y35 — SPS Input
Y30 — 0 V
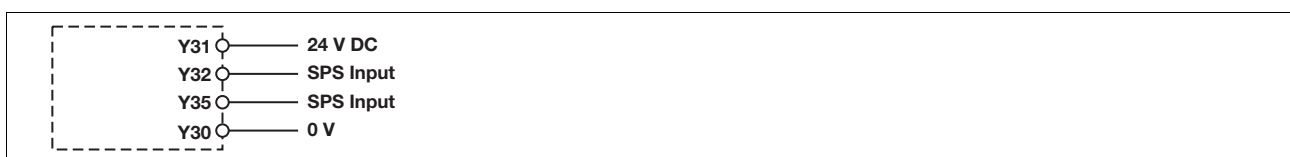
▶ Key

S1	E-STOP pushbutton
S3	Reset button
⇑	Switch operated
🔓	Gate open
🔒	Gate closed

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Terminal configuration
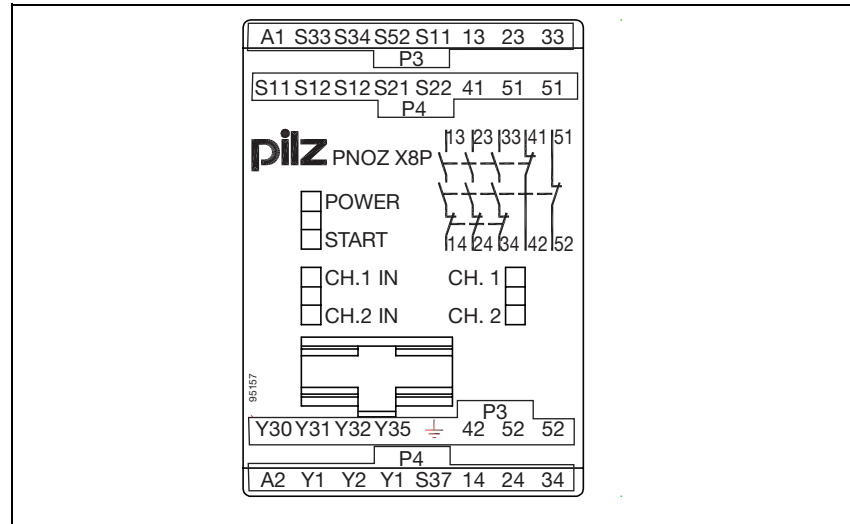
Installation

▸ 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 cage clamp terminals
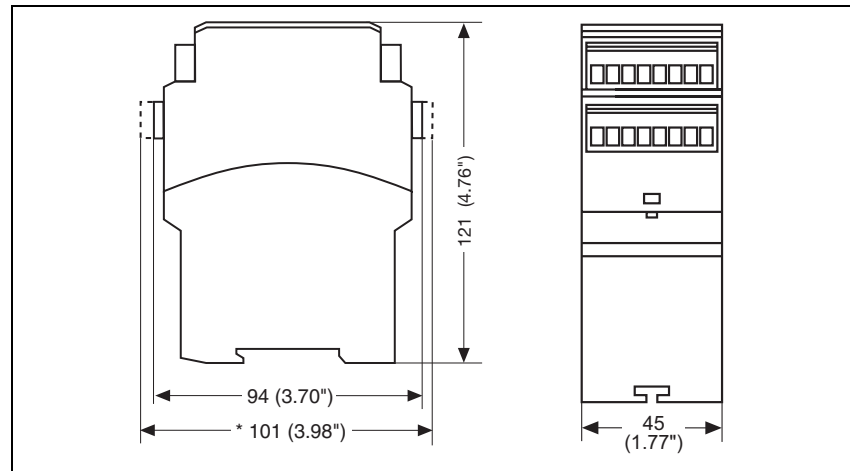
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Notice

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

▶ D	Schaltspielzahl x 10³	▶ E Número de ciclos x 10³
▶ GB	Cycles x 10³	▶ I Numero dei cicli di commutazione x 10³
▶ F	Nombre de manœvres x 10³	▶ NL Aantal schakelingen x 10³

Technical details

Electrical data

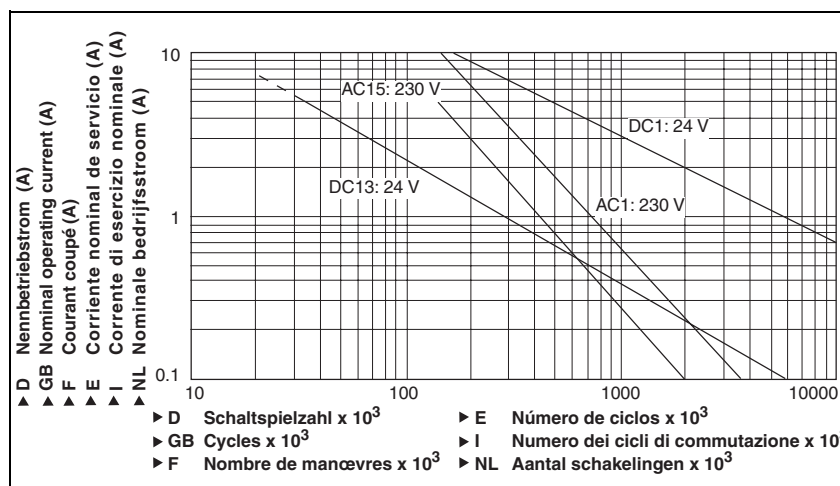|	
Supply voltage	
Supply voltage U_B AC	**24 V**, **110 V**, **115 V**, **120 V**, **230 V**
Supply voltage U_B DC	**24 V**
Voltage tolerance	**-15 %/+10 %**
Power consumption at U_B AC	**6.5 VA** Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
Power consumption at U_B DC	**2.5 W** Order no.: 777760, 787760
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.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770 **45.0 mA** Order no.: 777760, 787760
Reset circuit DC: **24.0 V**	**50.0 mA** Order no.: 777760, 787760 **60.0 mA** Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
Feedback loop DC: **24.0 V**	**50.0 mA** Order no.: 777760, 787760 **60.0 mA** Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
Output contacts in accordance with **EN 954-1** Category **4**	Safety contacts (N/O): **3**
	Auxiliary contacts (N/C): **2**
Utilisation category in accordance with **EN 60947-4-1**	
Safety contacts: AC1 at **240 V**	I_{min}: **0.01 A** , I_{max}: **8.0 A** P_{max}: **2000 VA**
Safety contacts: DC1 at **24 V**	I_{min}: **0.01 A** , I_{max}: **8.0 A** P_{max}: **200 W**
Auxiliary contacts: AC1 at **240 V**	I_{min}: **0.01 A** , I_{max}: **8.0 A** P_{max}: **2000 VA**
Auxiliary contacts: DC1 at **24 V**	I_{min}: **0.01 A** , I_{max}: **8.0 A** P_{max}: **200 W**
Utilisation category in accordance with **EN 60947-5-1**	
Safety contacts: AC15 at **230 V**	I_{max}: **5.0 A**
Safety contacts: DC13 at **24 V** (6 cycles/min)	I_{max}: **7.0 A**
Auxiliary contacts: AC15 at **230 V**	I_{max}: **5.0 A**
Auxiliary contacts: DC13 at **24 V** (6 cycles/min)	I_{max}: **7.0 A**

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Electrical data	
Contact material	AgSnO2 + 0.2 µm Au
External contact fuse protection to **EN 60947-5-1**	
Blow-out fuse, quick	
Safety contacts:	**10 A**
Auxiliary contacts:	**10 A**
Blow-out fuse, slow	
Safety contacts:	**6 A**
Auxiliary contacts:	**6 A**
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	**6 A**
Auxiliary contacts:	**6 A**
Semiconductor outputs (short circuit proof)	**24.0 V** DC, **50 mA**
External supply voltage	**24.0 V** DC
Voltage tolerance	**-20 %/+20 %**
Max. overall cable resistance R_{lmax} input circuits, reset circuits	
single-channel at U_B DC	**100 Ohm** Order no.: 777760, 787760
single-channel at U_B AC	**100 Ohm** Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
dual-channel without detect. of shorts across contacts at U_B DC	**200 Ohm** Order no.: 777760, 787760
dual-channel without detect. of shorts across contacts at U_B AC	**200 Ohm** Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
dual-channel with detect. of shorts across contacts at U_B DC	**16 Ohm** Order no.: 777760, 787760
dual-channel with detect. of shorts across contacts at U_B AC	**28 Ohm** Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770

Times	
Switch-on delay	
with automatic reset typ.	**160 ms** Order no.: 777760, 787760
	175 ms Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
with automatic reset max.	**200 ms** Order no.: 777760, 787760
	220 ms Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
with automatic reset after power on typ.	**185 ms** Order no.: 777760, 787760
	200 ms Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
with automatic reset after power on max.	**220 ms** Order no.: 777760, 787760
	250 ms Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
with manual reset typ.	**190 ms**
with manual reset max.	**250 ms**
with monitored reset typ.	**130 ms**
with monitored reset max.	**180 ms**
Delay-on de-energisation	
with E-STOP typ.	**15 ms**
with E-STOP max.	**30 ms**
with power failure typ.	**100 ms** Order no.: 777760, 787760
	160 ms Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
with power failure max.	**150 ms** Order no.: 777760, 787760
	220 ms Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
Recovery time at max. switching frequency 1/s	
after E-STOP	**50 ms**
after power failure	**180 ms** Order no.: 777760, 787760
	250 ms Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
Min. start pulse duration with a monitored reset	**30 ms**

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Times	
Simultaneity, channel 1 and 2	**150 ms**
Supply interruption before de-energisation	**35 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	**VDE 0110-1**
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**
Max. cross section of external conductors with screw terminals	
1 core flexible	**0.25 - 2.50 mm² , 24 - 12 AWG** Order no.: 777760, 777764, 777765, 777766, 777768, 777770
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	**0.25 - 1.00 mm² , 24 - 16 AWG** Order no.: 777760, 777764, 777765, 777766, 777768, 777770
without crimp connectors or with TWIN crimp connectors	**0.20 - 1.50 mm² , 24 - 16 AWG** Order no.: 777760, 777764, 777765, 777766, 777768, 777770
Torque setting with screw terminals	**0.50 Nm** Order no.: 777760, 777764, 777765, 777766, 777768, 777770
Max. cross section of external conductors with cage clamp terminals: Flexible without crimp connectors	**0.20 - 1.50 mm² , 24 - 16 AWG** Order no.: 787760, 787764, 787765, 787766, 787768, 787770
Cage clamp terminals: Terminal points per connection	**2** Order no.: 787760, 787764, 787765, 787766, 787768, 787770
Stripping length	**8 mm** Order no.: 787760, 787764, 787765, 787766, 787768, 787770
Dimensions	
Height	**101.0 mm** Order no.: 787760, 787764, 787765, 787766, 787768, 787770
	94.0 mm Order no.: 777760, 777764, 777765, 777766, 777768, 777770
Width	**45.0 mm**
Depth	**121.0 mm**
Weight	**310 g** Order no.: 787760
	320 g Order no.: 777760
	410 g Order no.: 787764, 787765, 787766, 787768, 787770
	420 g Order no.: 777764, 777765, 777766, 777768, 777770

The standards current on apply.

Max. continuous current		
Number of contacts	I_{max} (A) at U_B DC	I_{max} (A) at U_B AC
1	**8.00 A** Order no.: 777760, 787760	**8.00 A** Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
2	**8.00 A** Order no.: 777760, 787760	**7.30 A** Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770
3	**7.00 A** Order no.: 777760, 787760	**6.00 A** Order no.: 777764, 777765, 777766, 777768, 777770, 787764, 787765, 787766, 787768, 787770

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Order reference

Type	Features		Terminals	Order no.
PNOZ X8P C		24 VDC	Cage clamp terminals	787 760
PNOZ X8P		24 VDC	Screw terminals	777 760
PNOZ X8P C	110 VAC		Cage clamp terminals	787 764
PNOZ X8P	110 VAC		Screw terminals	777 764
PNOZ X8P C	115 VAC		Cage clamp terminals	787 765
PNOZ X8P	115 VAC		Screw terminals	777 765
PNOZ X8P C	120 VAC		Cage clamp terminals	787 766
PNOZ X8P	120 VAC		Screw terminals	777 766
PNOZ X8P C	230 VAC		Cage clamp terminals	787 768
PNOZ X8P	230 VAC		Screw terminals	777 768
PNOZ X8P C	24 VAC		Cage clamp terminals	787 770
PNOZ X8P	24 VAC		Screw terminals	777 770

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