Up to Category 4, EN 954-1
PNOZ X3P

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

Approvals

	PNOZ X3P
	◆
	◆
	◆

Unit features

- Positive-guided relay outputs:
  - 3 safety contacts (N/O), instantaneous
  - 1 auxiliary contact (N/C), instantaneous
- 1 semiconductor output
- Connection options for:
  - E-STOP pushbutton
  - Safety gate limit switch
  - Reset button
  - Light barriers
- LED indicator for:
  - Switch status channel 1/2
  - Supply voltage
- Semiconductor output signals:
  - Switch status channel 1/2
- Plug-in connection terminals (either cage clamp terminal or screw terminal)

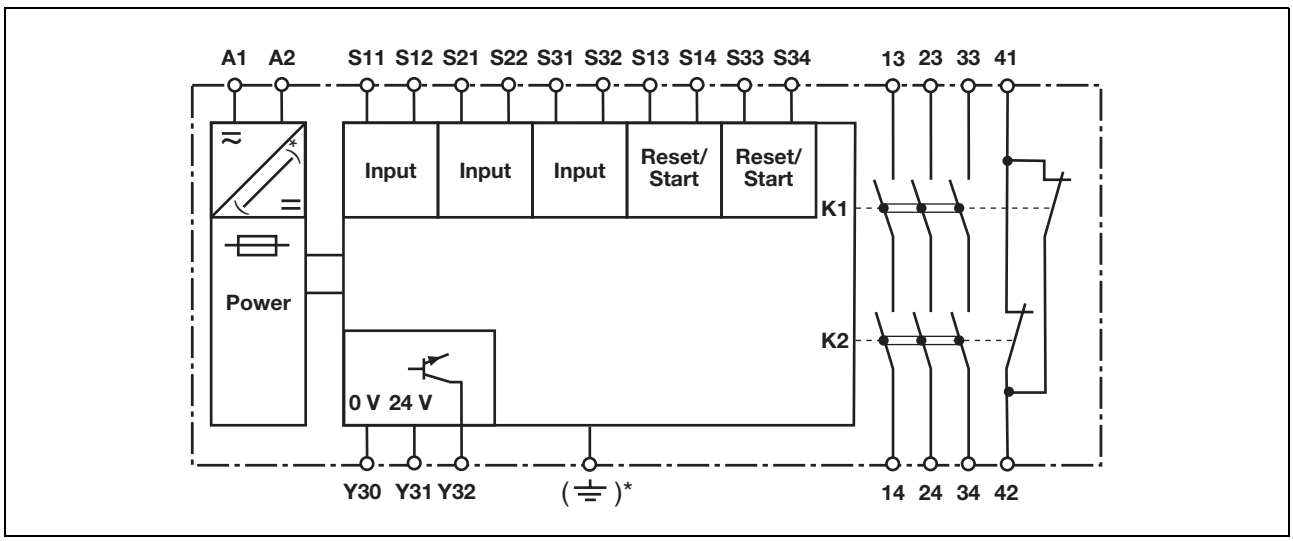
Unit description

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
- Light barriers

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.

Block diagram



*only with U_B 24 - 240 VAC/DC

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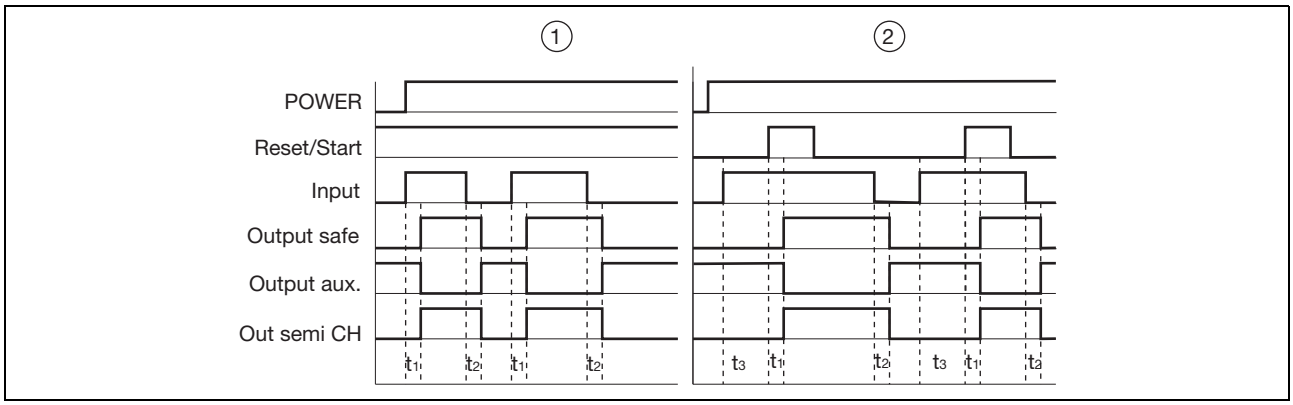
Up to Category 4, EN 954-1
PNOZ X3P

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.
- 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 13-14, 23-24, 33-34
- Output aux: Auxiliary contacts 41-42
- Out semi CH: Semiconductor output switch status channel 1/2
- ①: Automatic reset
- ②: Monitored reset
- t_1: Switch-on delay
- t_2: Delay-on de-energisation
- t_3: Waiting period

Wiring

Please note:

- Information given in the “Technical details” must be followed.
- Outputs 13-14, 23-24, 33-34 are safety contacts, output 41-42 is an 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:

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

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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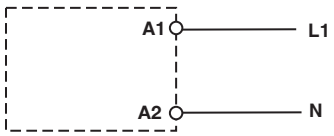
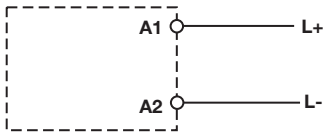
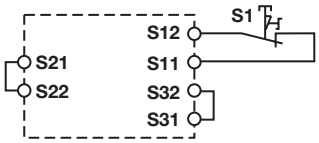
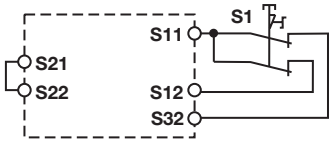
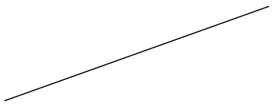
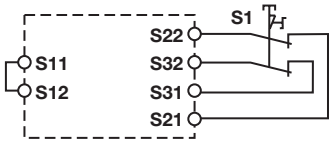
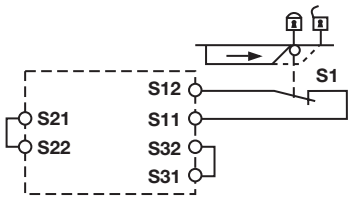
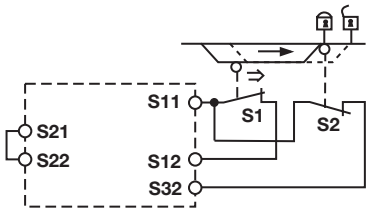
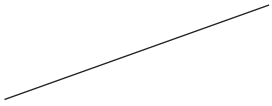
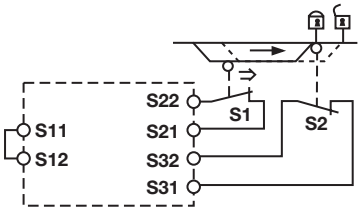
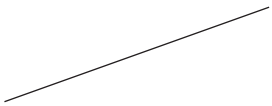
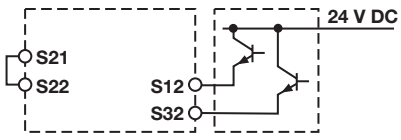
Up to Category 4, EN 954-1
PNOZ X3P

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		

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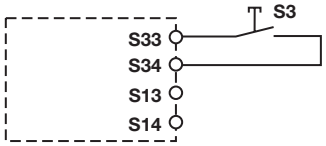
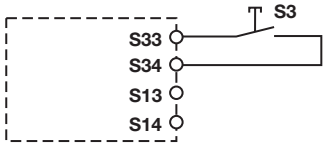
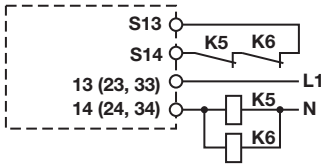
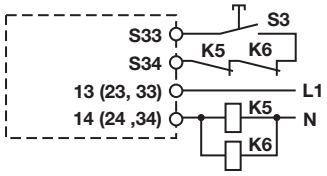
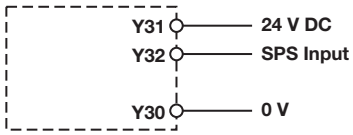
- Reset circuit

Reset circuit	E-STOP wiring (single-channel) Safety gate (single-channel)	E-STOP wiring (dual-channel) Safety gate (dual-channel)
Automatic reset		
Monitored reset		

- Feedback loop

Feedback loop	Automatic reset	Monitored reset
Contacts from external contactors		

- Semiconductor output



- Key

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

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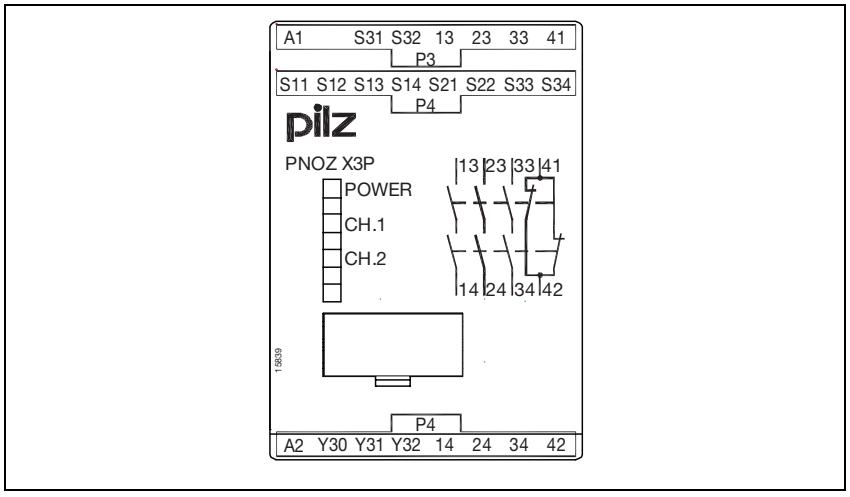
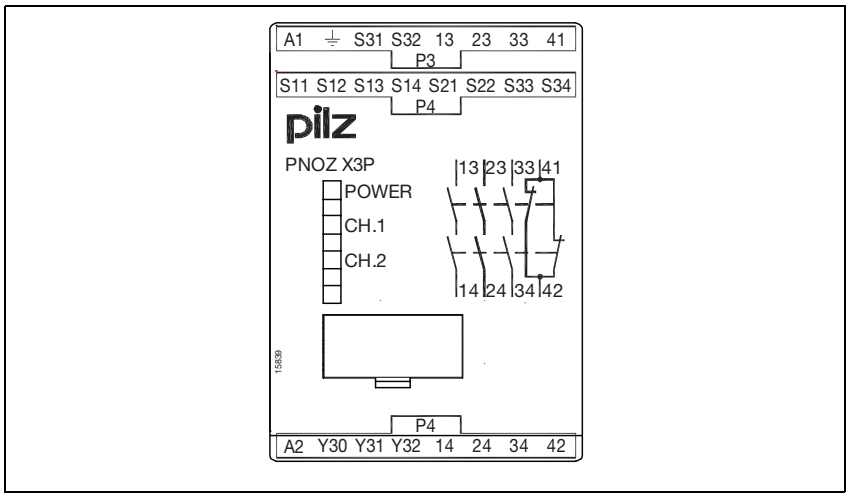
Up to Category 4, EN 954-1
PNOZ X3P

Terminal configuration

U_B 24 VAC/DC



U_B 24 -240 VAC/DC

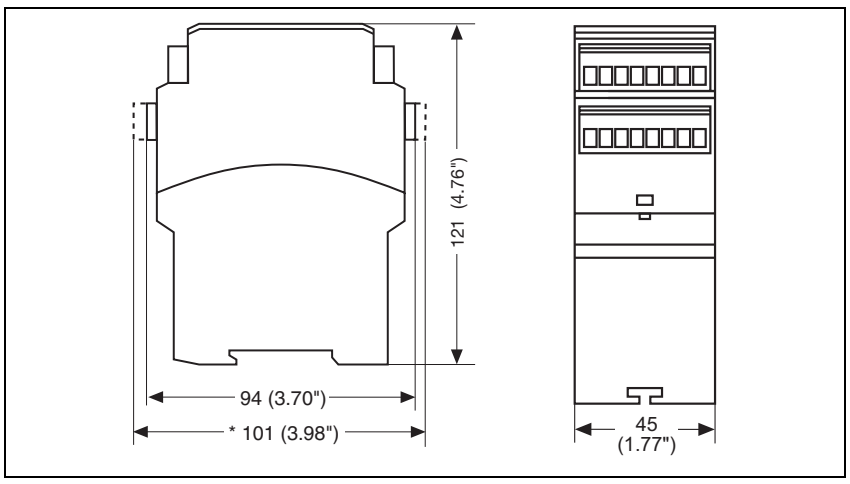


Installation

- 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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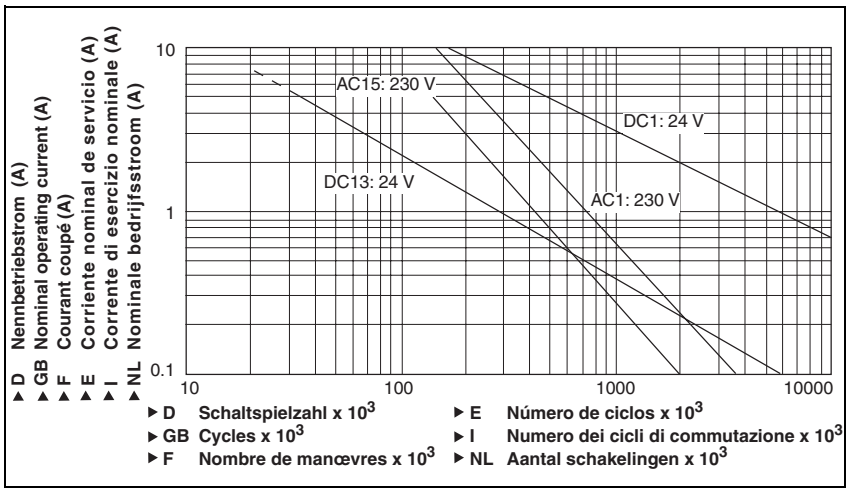
Notice

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



Technical details

Electrical data	
Supply voltage U_B AC	**24 V, 24 - 240 V**
Supply voltage U_B DC	**24 V, 24 - 240 V**
Voltage tolerance	**-15 % / +10 %**
Power consumption at U_B AC	**5.0 VA**
Power consumption at U_B DC	**2.5 W**
Frequency range AC	**50 - 60 Hz**
Residual ripple DC	**160 %** Order no.: 787310, 777310
Voltage and current at	
input circuit: **24.0 V**DC	**40 mA** Order no.: 787310, 777310
	35 mA Order no.: 787313, 777313
reset circuit: **24.0 V**DC	**70.0 mA** Order no.: 787310, 777310
	50.0 mA Order no.: 787313, 777313
feedback loop: **24.0 V**DC	**20.0 mA**
Output contacts in accordance with **EN 954-1**, Category **4**	Safety contacts (N/O): **3**
	Auxiliary contacts (N/C): **1**
Utilisation category in accordance with **EN 60947-4-1**	
AC1: **240 V**	I_{min}: **0.01 A**, I_{max}: **8.0 A**
	P_{max}: **2000 VA**
DC1: **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**	
AC15: **230 V**	I_{max}: **5.0 A**
DC13 (6 cycles/min): **24 V**	I_{max}: **6.0 A**
Contact material	**$AgSnO_2$ + 0.2 µm Au**
External contact fuse protection (**EN 60947-5-1**)	
Blow-out fuse, quick	**10 A**
Blow-out fuse, slow	**6 A**
Circuit breaker	**6 A**, 24 VAC/DC, characteristic B/C
Semiconductor outputs (short circuit proof)	**24 V**DC, **20 mA**
External supply voltage	**24 V**DC
Voltage tolerance	**-20 % / +20 %**

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Max. overall cable resistance R_{lmax} input circuits, reset circuits	
Single-channel at U_B DC	**200 Ohm** Order no.: 787313, 777313 **150 Ohm** Order no.: 787310, 777310
Single-channel at U_B AC	**200 Ohm** Order no.: 787313, 777313 **180 Ohm** Order no.: 787310, 777310
Dual-channel without detect. of shorts across contacts at U_B DC	**400 Ohm** Order no.: 787313, 777313 **300 Ohm** Order no.: 787310, 777310
Dual-channel without detect. of shorts across contacts at U_B AC	**400 Ohm** Order no.: 787313, 777313 **360 Ohm** Order no.: 787310, 777310
Dual-channel with detect. of shorts across contacts at U_B DC	**30 Ohm** Order no.: 787313, 777313 **15 Ohm** Order no.: 787310, 777310
Dual-channel with detect. of shorts across contacts at U_B AC	**30 Ohm**
Times	
Switch-on delay	
with automatic reset typ.	**330 ms** Order no.: 787313, 777313 **250 ms** Order no.: 787310, 777310
with automatic reset max.	**500 ms** Order no.: 787310, 777310 **450 ms** Order no.: 787313, 777313
with automatic reset after power on typ.	**750 ms** Order no.: 787313, 777313 **280 ms** Order no.: 787310, 777310
with automatic reset after power on max.	**550 ms** Order no.: 787310, 777310 **1,000 ms** Order no.: 787313, 777313
with monitored reset typ.	**35 ms**
with monitored reset max.	**50 ms**
Delay-on de-energisation	
with E-STOP typ.	**25 ms** Order no.: 787313, 777313 **15 ms** Order no.: 787310, 777310
with E-STOP max.	**30 ms**
with power failure typ.	**50 ms** Order no.: 787310, 777310
with power failure max.	**70 ms** Order no.: 787310, 777310
with power failure typ. U_B = 24 VAC/DC	**150 ms** Order no.: 787313, 777313
with power failure max. U_B = 24 VAC/DC	**180 ms** Order no.: 787313, 777313
with power failure typ. U_B = 240 VAC/DC	**1,500 ms** Order no.: 787313, 777313
with power failure max. U_B = 240 VAC/DC	**2,200 ms** Order no.: 787313, 777313
Recovery time at max. switching frequency 1/s	
after E-STOP	**50 ms**
after power failure	**200 ms** Order no.: 787313, 777313 **100 ms** Order no.: 787310, 777310
Waiting period with a monitored reset	**300 ms** Order no.: 787310, 777310 **200 ms** Order no.: 787313, 777313
Min. start pulse duration with a monitored reset	**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 61000-6-3** Order no.: 777313, 787313
Vibration in accordance with **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	**-20 - 55 °C**
Storage temperature	**-40 - 85 °C**
Protection type	
Mounting (e.g. cabinet)	**IP54**
Housing	**IP40**
Terminals	**IP 20**

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Up to Category 4, EN 954-1
PNOZ X3P

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**
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	**0.25 - 1.00 mm²**
without crimp connectors or with TWIN crimp connectors	**0.20 - 1.50 mm²**
Torque setting with screw terminals	**0.50 Nm**
Max. cross section of external conductors with cage clamp terminals: flexible without crimp connectors	**0.20 - 1.50 mm²**
Cage clamp terminals	
Terminal points per connection	**2**
Stripping length	**8 mm**
Dimensions (H x W x D)	
with screw terminals	**94.0 mm** x **45.0 mm** x **121.0 mm**
with cage clamp terminals	**101.0 mm** x **45.0 mm** x **121.0 mm**
Weight	**310 g** Order no.: 777313 **300 g** Order no.: 787313 **280 g** Order no.: 777310 **270 g** Order no.: 787310

The standards current on **11/03** 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**	**8.00 A**
2	**8.00 A** Order no.: 787310, 777310 **7.00 A** Order no.: 787313, 777313	**7.00 A**
3	**7.00 A** Order no.: 787310, 777310 **6.00 A** Order no.: 787313, 777313	**6.00 A**

Order reference

Type	Features	Terminals	Order no.
PNOZ X3P C	24 VAC/DC	Cage clamp terminals	787 310
PNOZ X3P	24 VAC/DC	Screw terminals	777 310
PNOZ X3P C	24 - 240 VAC/DC	Cage clamp terminals	787 313
PNOZ X3P	24 - 240 VAC/DC	Screw terminals	777 313

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