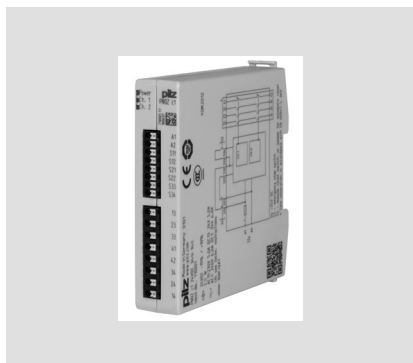


Up to PL e of EN ISO 13849-1 PNOZ c1



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

Unit features

- ▶ Positive-guided relay outputs:
 - 3 safety contacts (N/O), instantaneous
 - 1 auxiliary contact (N/C), instantaneous
- ▶ Connection options for:
 - Emergency stop pushbuttons
 - Safety gate limit switches
 - Reset buttons
 - PSENmech, PSENmag
- ▶ LED for:
 - Supply voltage
 - Switch status channel 1
 - Switch status channel 2

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.

Approvals

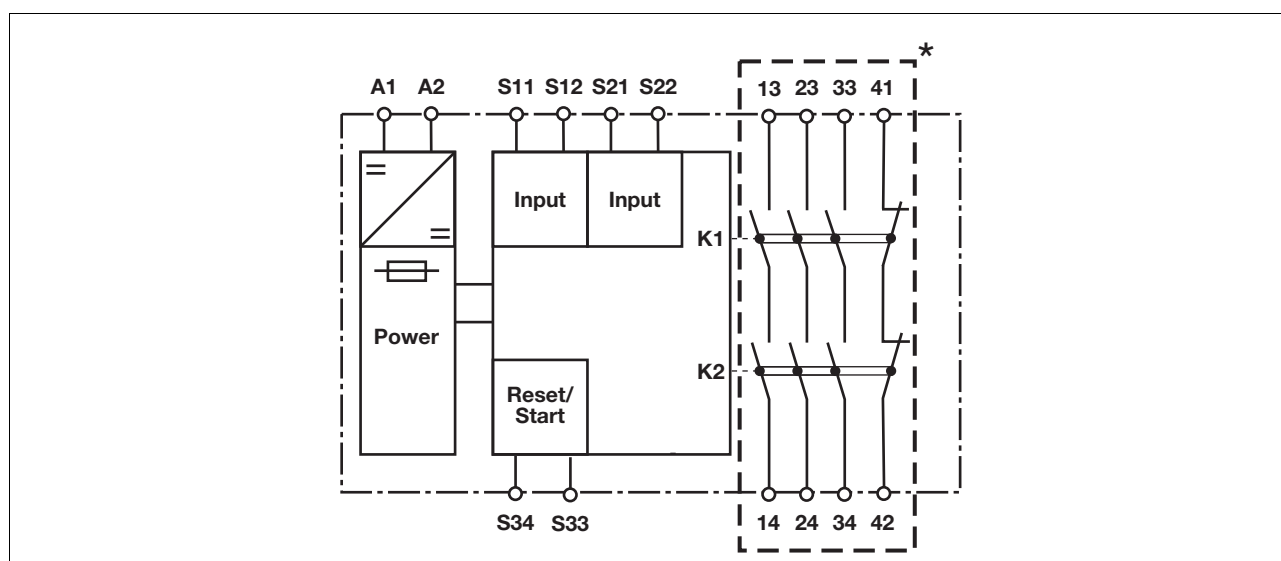
	PNOZ c1
	◆
	◆
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Unit Description

The safety relay provides a safety-related interruption of a safety circuit. 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

Block diagram



*Insulation to the non-marked area:
Safe separation (overvoltage category III),
Insulation of relay contacts against

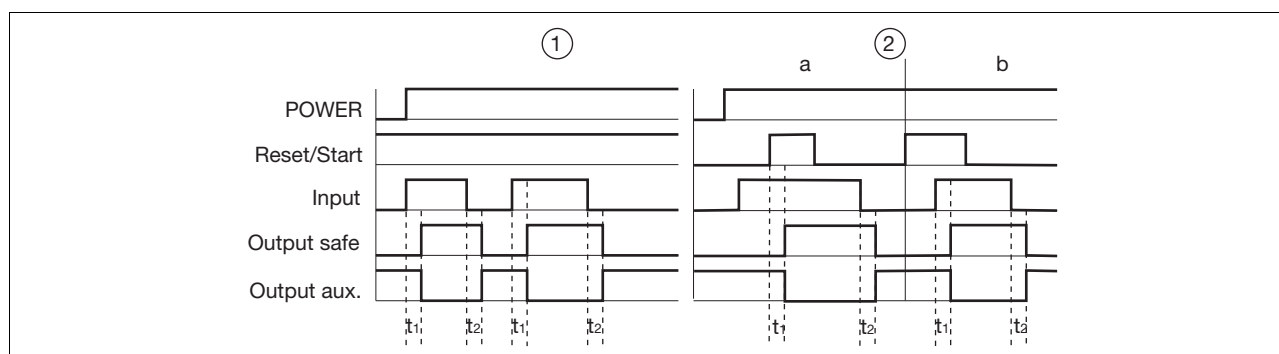
each other: Basic insulation (overvoltage category III), safe separation (overvoltage category II)

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Function description

- ▶ Dual-channel operation with detection of shorts across contacts: redundant input circuit, detects
 - earth faults in the reset and input circuit,
- 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.
- ▶ 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
- ▶ Output safe: Safety contacts 13 -14, 23 -24, 33 -34
- ▶ Output aux: Auxiliary contacts 41 -42
- ▶ ①: Automatic reset
- ▶ ②: Manual reset
- ▶ a: Input circuit closes before reset circuit
- ▶ b: Reset circuit closes before input circuit
- ▶ t₁: Switch-on delay
- ▶ t₂: 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, 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:
- ▶ When connecting magnetically operated, reed proximity switches, ensure that the max. peak inrush current (on the input circuit) does not overload the proximity switch.
- ▶ The power supply must comply with the regulations for extra low voltages with safe electrical separation (SELV, PELV) in accordance with VDE 0100, Part 410.

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

$R_{I_{max}}$ = 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.

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Preparing for operation

► Supply voltage

Supply voltage	AC	DC

► Input circuit

Input circuit	Single-channel	Dual-channel
Emergency stop with detection of shorts across contacts		
Safety Gate with detection of shorts across contacts		

► Reset circuit

Reset circuit/feedback loop	Reset circuit	Feedback loop
Automatic reset		
Manual reset		

► Key

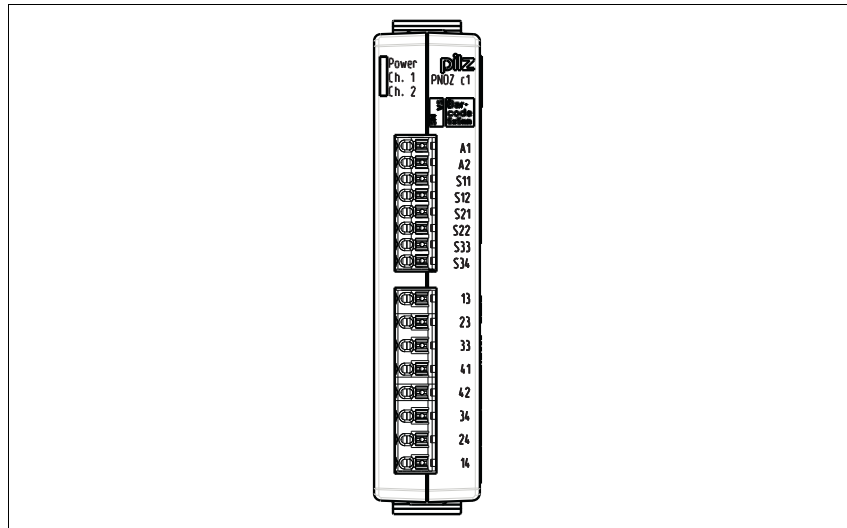
S1/S2	E-STOP/safety gate switch
S3	Reset button
	Switch operated
	Gate open
	Gate closed

NOTICE

The device starts automatically when reset circuit is overridden. Use external circuit measures to prevent an unexpected restart.

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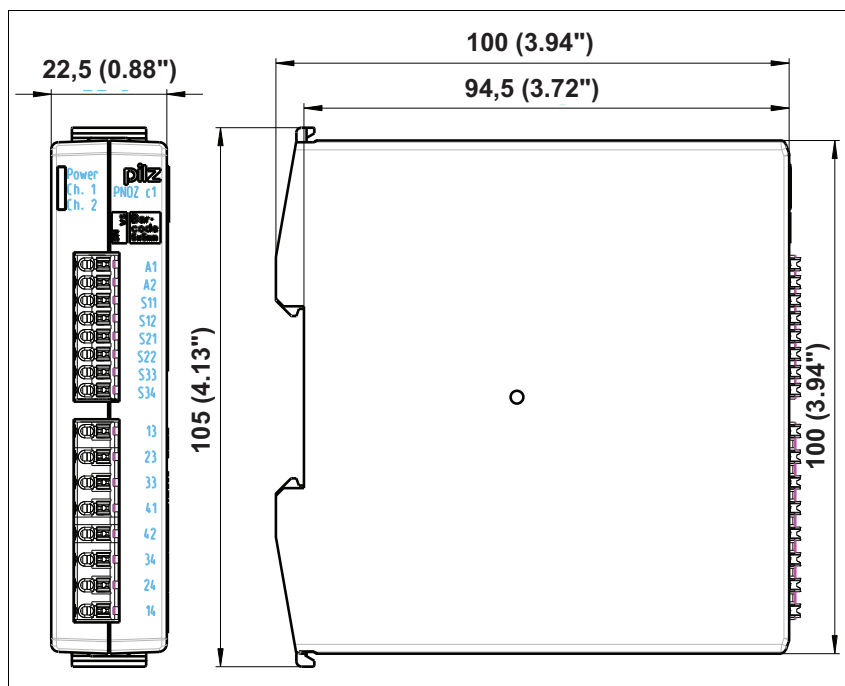
Terminal Configuration



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



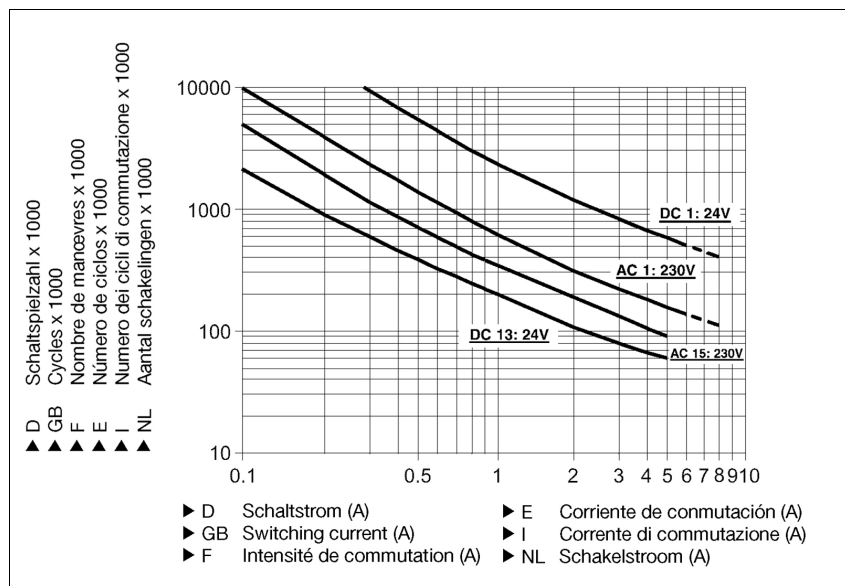
Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

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Service life graph

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.



Example

- Inductive load: 0,2 A
- Utilisation category: AC15
- Contact service life: 2,000,000 cycles

Provided the application requires fewer than 2,000,000 cycles, the PFH value (see technical details) can be used in the calculation.

To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With contactors, use freewheel diodes for spark suppression.

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Technical details

Electrical data

Supply voltage	
Supply voltage U_B DC	24 V
Voltage tolerance	-15 %/+10 %
Power consumption at U_B DC	2.5 W
Residual ripple DC	160 %
Voltage and current at	
Input circuit DC: 24.0 V	30.0 mA
Reset circuit DC: 24.0 V	40.0 mA
Feedback loop DC: 24.0 V	40.0 mA
Number of output contacts	
Safety contacts (S) instantaneous:	3
Auxiliary contacts (N/C):	1
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	$I_{min}: 0.01 A, I_{max}: 6.0 A$ $P_{max}: 1500 VA$
Safety contacts: DC1 at 24 V	$I_{min}: 0.01 A, I_{max}: 6.0 A$ $P_{max}: 150 W$
Auxiliary contacts: AC1 at 240 V	$I_{min}: 0.01 A, I_{max}: 6.0 A$ $P_{max}: 1500 VA$
Auxiliary contacts: DC1 at 24 V	$I_{min}: 0.01 A, I_{max}: 6.0 A$ $P_{max}: 150 W$
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)	$I_{max}: 5.0 A$
Auxiliary contacts: AC15 at 230 V	$I_{max}: 5.0 A$
Auxiliary contacts: DC13 at 24 V (6 cycles/min)	$I_{max}: 5.0 A$
Contact material	AgCuNi + 0.2 µm Au
External contact fuse protection ($I_K = 1 kA$) to EN 60947-5-1	
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
Max. overall cable resistance R_{lmax} input circuits, reset circuits	
dual-channel with detect. of shorts across contacts at U_B DC	15 Ohm
Min. input resistance when switching on	88 Ohm
Safety-related characteristic data	
PL in accordance with EN ISO 13849-1: 2006	PL e (Cat. 4)
Category in accordance with EN 954-1	Cat. 4
SIL CL in accordance with EN IEC 62061	SIL CL 3
PFH in accordance with EN IEC 62061	2.31E-09
SIL in accordance with IEC 61511	SIL 3
PFD in accordance with IEC 61511	2.03E-06
T_M [year] in accordance with EN ISO 13849-1: 2006	20
Times	
Switch-on delay	
with automatic reset typ.	250 ms
with automatic reset max.	450 ms
with automatic reset after power on typ.	250 ms
with automatic reset after power on max.	450 ms
with manual reset typ.	125 ms
with manual reset max.	450 ms

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Times	
Delay-on de-energisation	
with E-STOP typ.	15 ms
with E-STOP max.	30 ms
with power failure typ.	60 ms
with power failure max.	100 ms
Recovery time at max. switching frequency 1/s	
after E-STOP	300 ms
after power failure	300 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	10.0 - 55.0 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	6.00 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	PC
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	0.25 - 1.50 mm ² , 24 - 16 AWG
Spring-loaded terminals: Terminal points per connection	1
Stripping length	9 mm
Dimensions	
Height	105.0 mm
Width	22.5 mm
Depth	100.0 mm
Weight	155 g

No. stands for order number.

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switching frequency and the load on the relay output.

If the service life graphs are not accessible, the stated PFH value can be

used irrespective of the switching frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.

All the units used within a safety function must be considered when calculating the safety characteristic data.

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INFORMATION

A safety function's SIL/PL values are **not** identical to the SIL/PL values of the units that are used and may be different. We recommend that you use the PAScal software tool to calculate the safety function's SIL/PL values.

The standards current on **2011-11** apply.

I _{th} per contact at U _B DC	
Number of contacts	I _{th}
1	6.00 A
2	6.00 A
3	5.00 A

Type	Features	Terminals	Order no.
PNOZ c1	24 V DC	With spring-loaded terminals	710 001