




up to Category 2, EN 954-1 PNOZ s2



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

Approvals

PNOZ s2	
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Unit features

- ▶ Positive-guided relay outputs:
 - 3 safety contacts (N/O), instantaneous
 - 1 auxiliary contact (N/C), instantaneous
- ▶ Safe separation of safety contacts 13-14, 23-24, 33-34 from all other circuits
- ▶ 1 semiconductor output
- ▶ Connection options for:
 - E-STOP pushbutton
 - Safety gate limit switch
 - Reset button
- ▶ A connector can be used to connect 1 PNOZsigma contact expander module
- ▶ Operating modes can be set via rotary switch
- ▶ LED indicator for:
 - Supply voltage
 - Input status, channel 1
 - Input status, channel 2
 - Switch status, safety contacts
 - Reset circuit
 - Fault

- ▶ Plug-in connection terminals (either cage clamp terminal or screw terminal)
- ▶ See order reference for unit types

Unit description

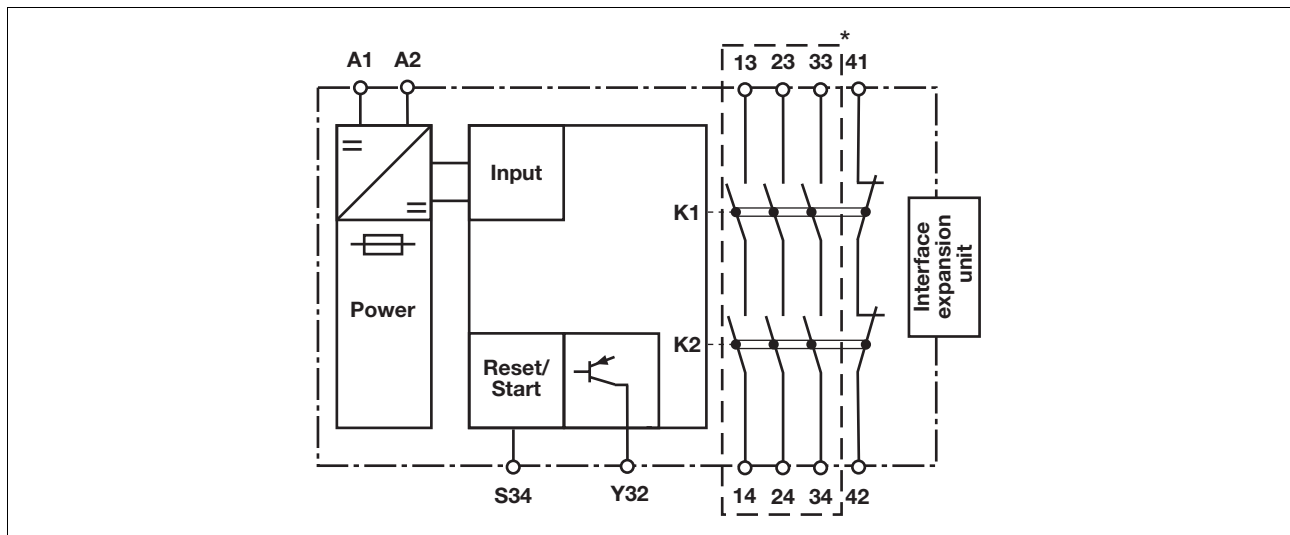
The safety relay meets the requirements of EN 60947-5-1, EN 60204-1 and VDE 0113-1 and may be used in applications with

- ▶ E-STOP pushbuttons
- ▶ Safety gates

Sicherheitseigenschaften

- 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.

Blockschaltbild



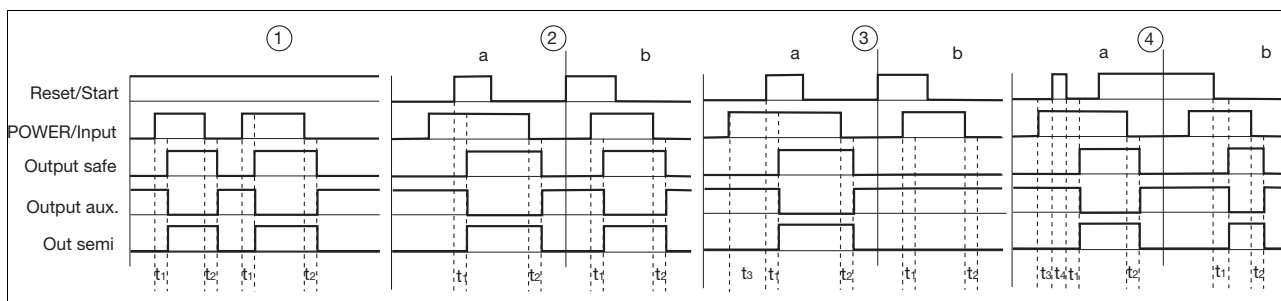
* Safe separation in accordance with EN 60947-1, 6 kV

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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.
- ▶ 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 with falling edge: 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.
- ▶ Monitored reset with rising edge: 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; A connector can be used to connect 1 PNOZsigma contact expander module.

Timing diagram



Key

- ▶ Power: Supply voltage
- ▶ Reset/start: Reset circuit S34
- ▶ Input: Input circuits A1-A2
- ▶ Output safe: Safety contacts 13-14, 23-24, 33-34
- ▶ Output aux.: Auxiliary contacts 41-42
- ▶ Out semi: Semiconductor output
- ▶ ①: Automatic reset
- ▶ ②: Manual reset
- ▶ ③: Monitored reset with rising edge
- ▶ ④: Monitored reset with falling edge
- ▶ a: Input circuit closes before reset circuit
- ▶ b: Reset circuit closes before input circuit
- ▶ t₁: Switch-on delay
- ▶ t₂: Delay-on de-energisation
- ▶ t₃: Waiting period
- ▶ t₄: Waiting period reset circuit was closed

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.

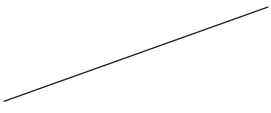
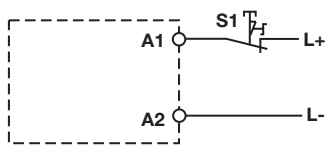
- ▶ Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.

E-STOP relay, safety gate monitor

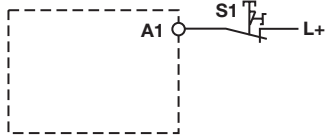

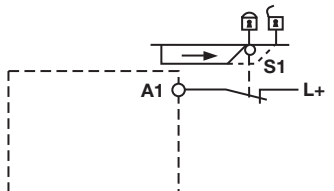
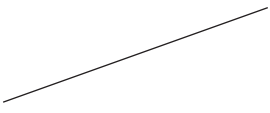
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Preparing for operation

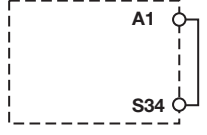
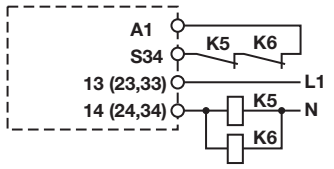
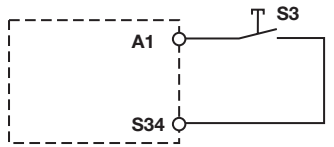
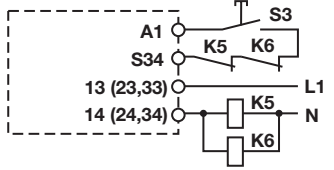
► Supply voltage

Supply voltage	AC	DC
		

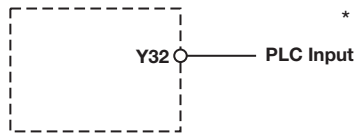
► Input circuit

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

► Reset circuit/feedback loop

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

► Semiconductor output





*Connect together the 0V connections on all the external power supplies

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INFORMATION

The wiring between a base unit and a PNOZsigma expander module occurs exclusively via the connector.

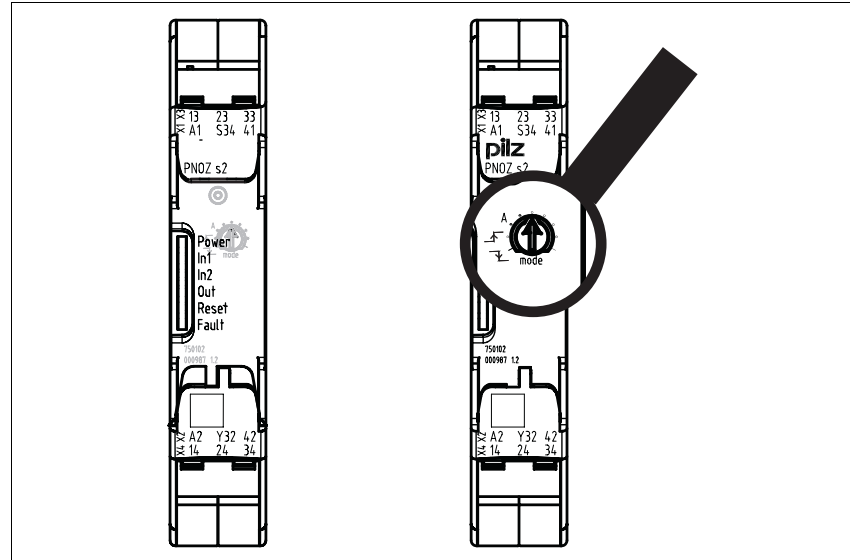
► Key

S1	E-STOP pushbutton
S3	Reset button
	Gate open
	Gate closed

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Terminal configuration

Links: Front view with cover
Right: Front view without cover



Installation

Install base unit without contact expander module:

- ▶ Ensure that the plug terminator is inserted at the side of the unit.

Connect base unit and PNOZsigma contact expander module:

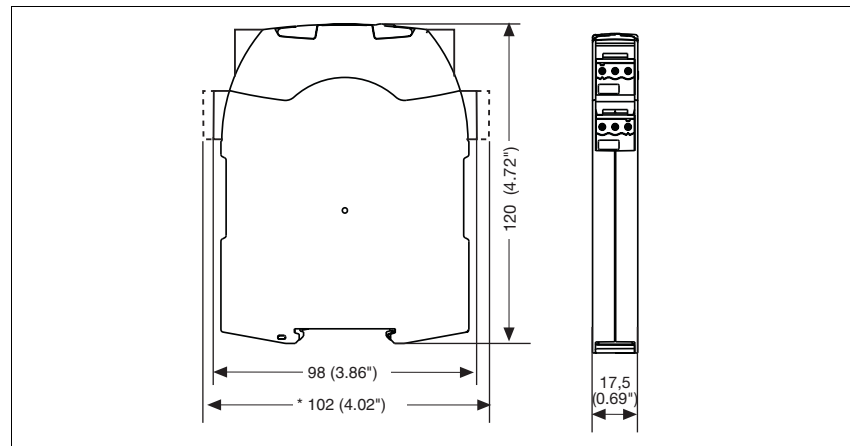
- ▶ Remove the plug terminator at the side of the base unit and at the contact expander module.
- ▶ Connect the base unit and the contact expander module to the supplied connector before mounting the units to the DIN rail.

Installation in control cabinet

- ▶ 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).
- ▶ Push the unit upwards or downwards before lifting it from the DIN rail.

Dimensions

* with spring-loaded terminals

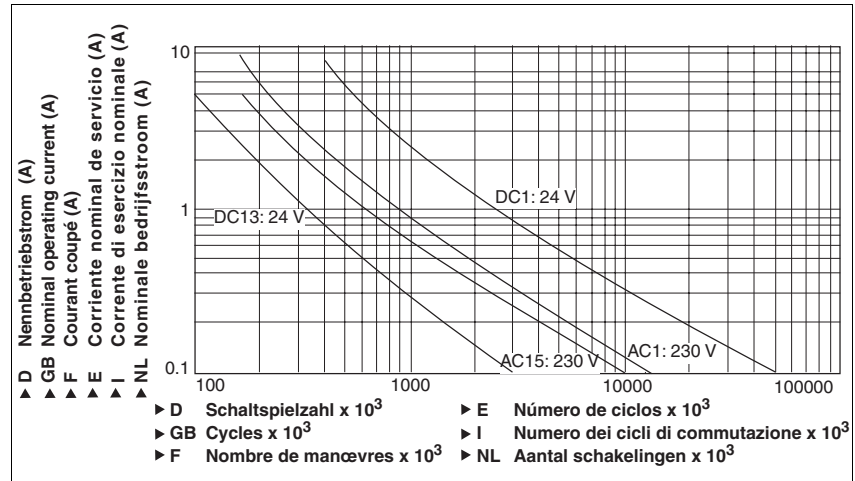


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Notice

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	
Supply voltage U_B DC	24 V
Voltage tolerance	-15 %/+10 %
Power consumption at U_B DC	2.0 W
Residual ripple DC	20 %
Voltage and current at	
Input circuit DC: 24.0 V	75.0 mA
Reset circuit DC: 24.0 V	7.0 mA
Feedback loop DC: 24.0 V	7.0 mA
Number of output contacts	
Safety contacts (S) instantaneous:	3
Auxiliary contacts (N/C):	1
Category of output contacts in accordance with EN 954-1	
Safety contacts (S) instantaneous:	3
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	$I_{max}: 6.0 A$
Safety contacts: DC13 at 24 V (6 cycles/min)	$I_{max}: 5.0 A$
Auxiliary contacts: AC15 at 230 V	$I_{max}: 6.0 A$
Auxiliary contacts: DC13 at 24 V (6 cycles/min)	$I_{max}: 5.0 A$
Contact material	AgCuNi + 0.2 µm Au

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Electrical data	
External contact fuse protection ($I_K = 1 \text{ kA}$) 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, 20 mA
Max. overall cable resistance R_{lmax} input circuits, reset circuits single-channel at U_B DC	30 Ohm
Safety-related characteristic data	
Probability of dangerous failure per hour (PFH _D)	
Safety contacts, instantaneous	2.50E-09 1/h
SIL claim limit (SIL CL)	
Safety contacts, instantaneous	3
Performance level (PL)	
Safety contacts, instantaneous	d
Proof test interval in years	20
Times	
Switch-on delay	
with automatic reset typ.	75 ms
with automatic reset max.	250 ms
with automatic reset after power on typ.	75 ms
with automatic reset after power on max.	250 ms
with manual reset typ.	75 ms
with manual reset max.	250 ms
on monitored reset with rising edge typ.	75 ms
on monitored reset with rising edge max.	250 ms
on monitored reset with falling edge typ.	55 ms
on monitored reset with falling edge max.	70 ms
Delay-on de-energisation	
with E-STOP typ.	50 ms
with E-STOP max.	70 ms
with power failure typ.	50 ms
with power failure max.	70 ms
Recovery time at max. switching frequency 1/s after E-STOP	100 ms
after power failure	100 ms
Waiting period with a monitored reset	
with rising edge	100 ms
with falling edge	110 ms
Min. start pulse duration with a monitored reset	
with rising edge	100 ms
with falling edge	100 ms
Supply interruption before de-energisation	10 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	EN 60947-1
Rated insulation voltage	250 V

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Environmental data	
Rated impulse withstand voltage	6.0 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	PC
Front	PC
Max. cross section of external conductors with screw terminals	
1 core flexible	0.25 - 2.50 mm², 24 - 12 AWG Order no.: 750102
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.25 - 1.00 mm², 24 - 16 AWG Order no.: 750102
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm², 24 - 16 AWG Order no.: 750102
Torque setting with screw terminals	0.50 Nm Order no.: 750102
Max. cross section of external conductors with cage clamp terminals/spring-loaded terminals: Flexible without crimp connectors	0.20 - 2.50 mm², 24 - 12 AWG Order no.: 751102
Cage clamp terminals/spring-loaded terminals: Terminal points per connection	2 Order no.: 751102
Stripping length	9 mm Order no.: 751102
Dimensions	
Height	102.0 mm Order no.: 751102 96.0 mm Order no.: 750102
Width	17.5 mm
Depth	120.0 mm
Weight	170 g

The standards current on **2006-04** apply.

Conventional thermal current	
I_{th} (A) at U_B DC	
1 contact	8.00 A
2 contacts	6.00 A
3 contacts	5.00 A

Order reference			
Type	Features	Terminals	Order no.
PNOZ s2	24 VDC	With screw terminal	750 102
PNOZ s2 C	24 VDC	With spring-loaded terminal	751 102