Up to PL c of EN ISO 13849-1
PNOZ s1



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

Approvals

	PNOZ s1
c UL us LISTED	◆
	◆
	◆

Unit features

- Relay outputs:
  - 2 safety contacts (N/O), instantaneous
- 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
- LED indicator for:
  - Supply voltage
  - Input status, channel 1
  - Input status, channel 2
  - Switch status, safety contacts
  - Reset circuit
  - Error
- Plug-in connection terminals (either spring-loaded terminal or screw terminal)

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

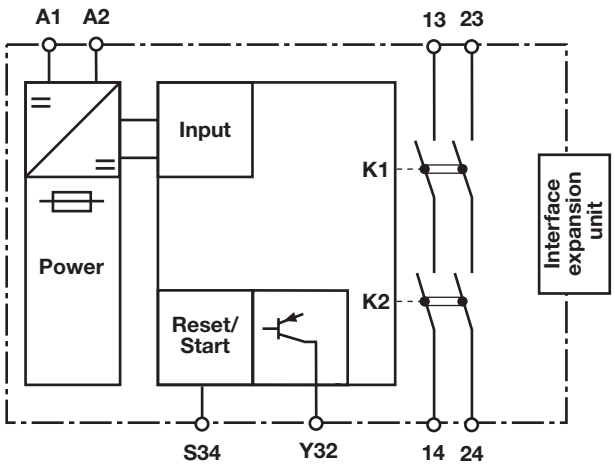
- E-STOP pushbuttons
- Safety gates

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 unit has an electronic fuse.

Block diagram

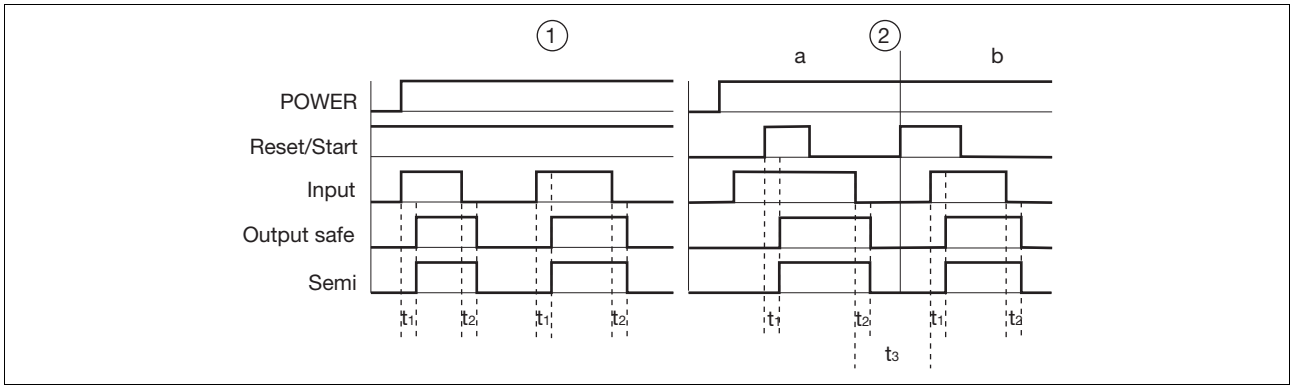


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Function description

- Single-channel operation: no redundancy in the input circuit, earth faults in the reset and input circuit are detected.
- 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 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
- Semi: Semiconductor outputY32
- ①: Automatic reset
- ②: Manual 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
- t_3: Recovery time

Wiring

Please note:

- Information given in the “Technical details” must be followed.
- Outputs 13-14, 23-24 are safety contacts.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Calculation of the max. cable runs l_{max} in the input circuit:

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

R_{lmax} = max. overall cable resistance (see technical details)
R_l /km = cable resistance/km

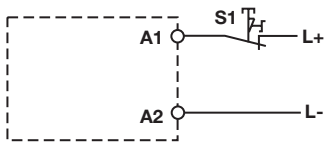
- Use copper wire that can withstand 60/75 °C.
- Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.

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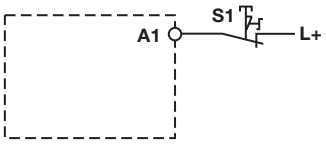
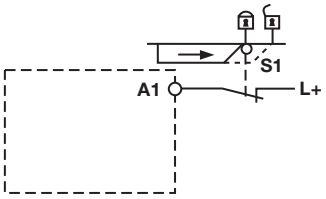
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Preparing for operation

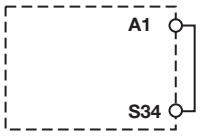
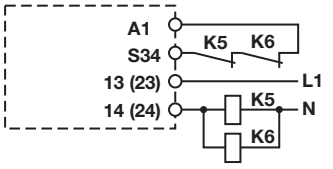
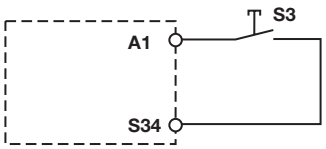
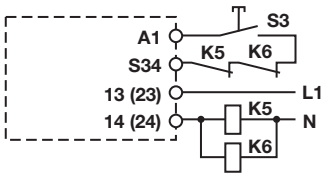
▸ Supply voltage

Supply voltage	AC	DC
		

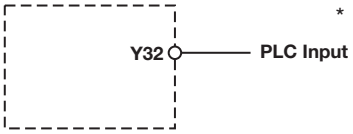
▸ Input circuit

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

▸ Reset circuit

Reset circuit	Reset circuit	Feedback loop
Automatic reset		
Manual reset		

▸ Semiconductor output



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

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- Key

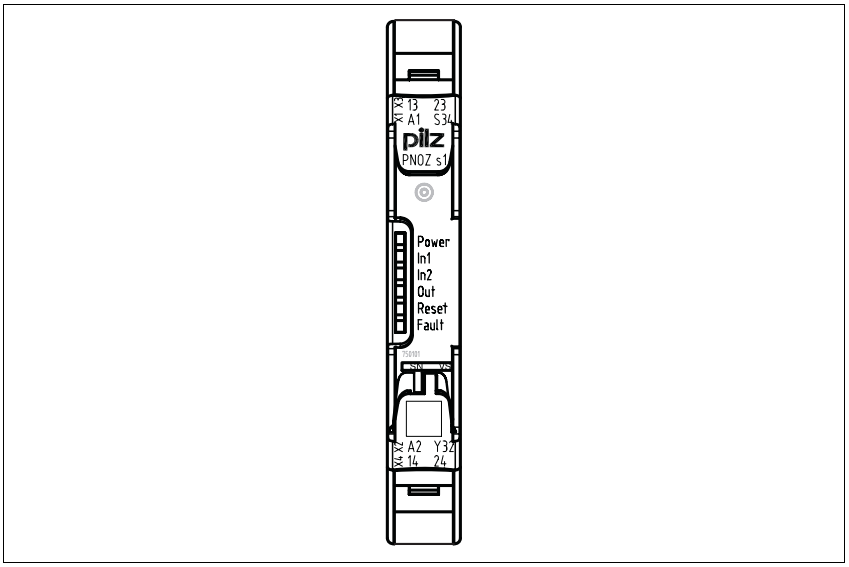
S1	E-STOP pushbutton
S3	Reset button
	Switch operated
	Gate open
	Gate closed

INFORMATION
If a base unit and a contact expansion module from the PNOZsigma range are linked via the connector, no additional wiring is necessary.

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Terminal configuration



Installation

Install base unit without contact expander module:

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

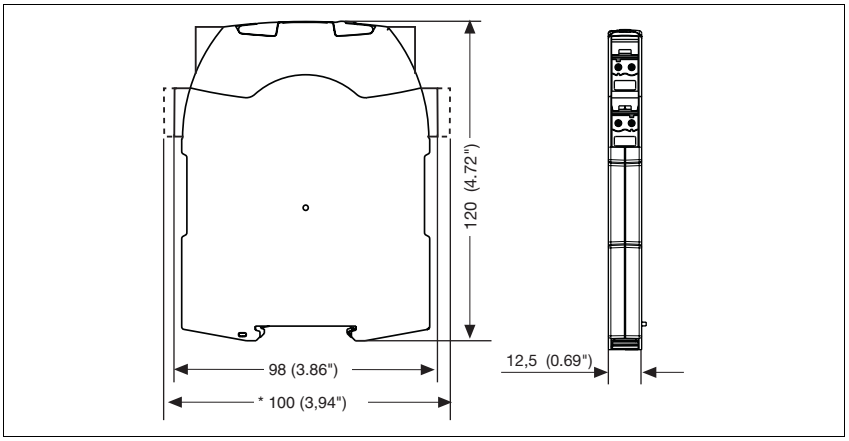
Connect base unit and PNOZsigma contact expander module:

- 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



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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.

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**	**60.0 mA**
Reset circuit DC: **24.0 V**	**20.0 mA**
Feedback loop DC: **24.0 V**	**20.0 mA**
Number of output contacts	
Safety contacts (S) instantaneous:	**2**
Utilisation category in accordance with **EN 60947-4-1**	
Safety contacts: AC1 at **240 V**	I_{min}: **0.02 A** , I_{max}: **3.0 A** P_{max}: **720 VA**
Safety contacts: DC1 at **24 V**	I_{min}: **0.02 A** , I_{max}: **3.0 A** P_{max}: **72 W**
Utilisation category in accordance with **EN 60947-5-1**	
Safety contacts: AC15 at **230 V**	I_{max}: **1.5 A**
Safety contacts: DC13 at **24 V** (6 cycles/min)	I_{max}: **1.5 A**
Contact material	**AgSnO2**
External contact fuse protection (I_K = 1 kA) to **EN 60947-5-1**	
Blow-out fuse, quick	
Safety contacts:	**4 A**
Blow-out fuse, slow	
Safety contacts:	**2 A**
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	**2 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	
Performance level (PL) in accordance with **EN ISO 13849-1**	
Safety contacts, instantaneous	**c**
Category of output contacts in accordance with **EN 954-1**, **EN ISO 13849-1**	
Safety contacts (S) instantaneous:	**2**
SIL claim limit (SIL CL) in accordance with **EN IEC 62061**	
Safety contacts, instantaneous	**2**
Probability of dangerous failure per hour **(PFH_D)** in accordance with **EN IEC 62061**	
Safety contacts, instantaneous	**2.00E-07 1/h**
Mission time/Proof test interval in years	**20**

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Times	
Switch-on delay	
with automatic reset typ.	**100 ms**
with automatic reset max.	**150 ms**
with automatic reset after power on typ.	**100 ms**
with automatic reset after power on max.	**150 ms**
with manual reset typ.	**50 ms**
with manual reset max.	**60 ms**
Delay-on de-energisation	
with E-STOP typ.	**30 ms**
with E-STOP max.	**40 ms**
with power failure typ.	**30 ms**
with power failure max.	**40 ms**
Recovery time at max. switching frequency 1/s	
after E-STOP	**100 ms**
after power failure	**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 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	**PC**
Front	**PC**
Cross section of external conductors with screw terminals	
1 core flexible	**0.25 - 2.50 mm² , 24 - 12 AWG** Order no.: 750101
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	**0.25 - 1.00 mm² , 24 - 16 AWG** Order no.: 750101
without crimp connectors or with TWIN crimp connectors	**0.20 - 1.50 mm² , 24 - 16 AWG** Order no.: 750101
Torque setting with screw terminals	**0.50 Nm** Order no.: 750101
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	**0.20 - 2.50 mm² , 24 - 12 AWG** Order no.: 751101
Spring-loaded terminals: Terminal points per connection	**2** Order no.: 751101
Stripping length	**9 mm** Order no.: 751101
Dimensions	
Height	**100.0 mm** Order no.: 751101 **98.0 mm** Order no.: 750101
Width	**12.5 mm**
Depth	**120.0 mm**
Weight	**105 g**

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

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Conventional thermal current

I_{th} (A) at U_B DC	
1 contact	**3.00 A**
2 contacts	**3.00 A**

Order reference

Type	Features		Terminals	Order no.
PNOZ s1		24 VDC	With screw terminal	750 101
PNOZ s1 C		24 VDC	With spring-loaded terminal	751 101