

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



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

### Approvals

PNOZ s1	
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### 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)

- ▶ E-STOP pushbuttons
- ▶ Safety gates

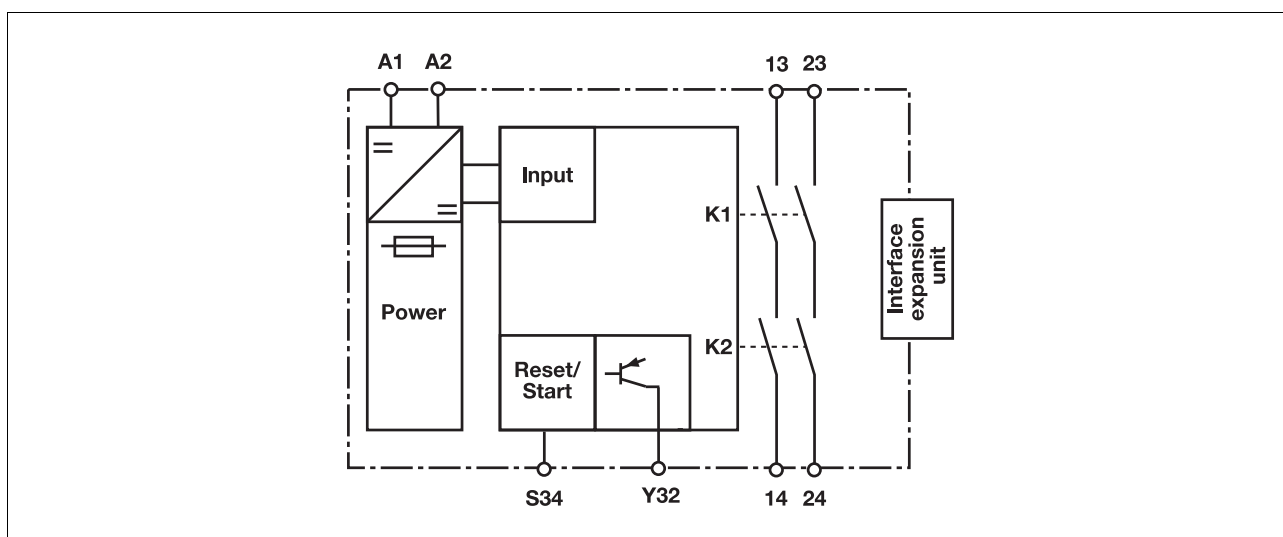
### Safety features

- 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.

### 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

### Block diagram

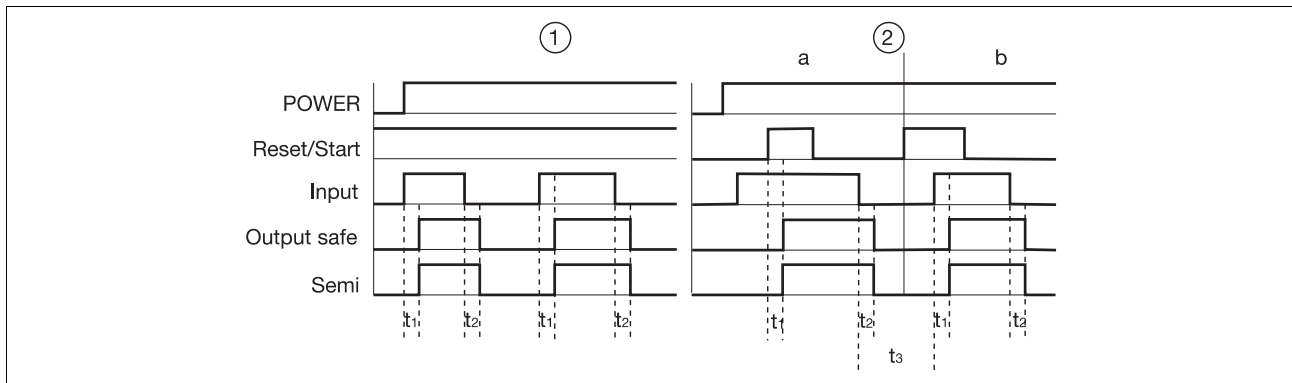


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### Function description

- ▶ 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 output Y32
- ▶ ①: Automatic reset
- ▶ ②: Manual reset
- ▶ a: Input circuit closes before reset circuit
- ▶ b: Reset circuit closes before input circuit
- ▶ t<sub>1</sub>: Switch-on delay
- ▶ t<sub>2</sub>: Delay-on de-energisation
- ▶ t<sub>3</sub>: 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  $I_{max}$  in the input circuit:

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

$R_{I_{max}}$  = 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

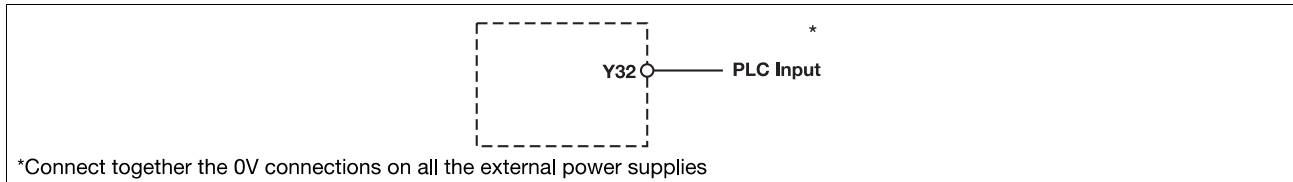
Input circuit	Single-channel	Dual-channel
E-STOP <b>without</b> detection of shorts across contacts		
Safety gate <b>without</b> detection of shorts across contacts		

#### ► Reset circuit




Reset circuit	Reset circuit	Feedback circuit
Automatic reset		
Manual reset		

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### ▶ Semiconductor output



### ▶ Key

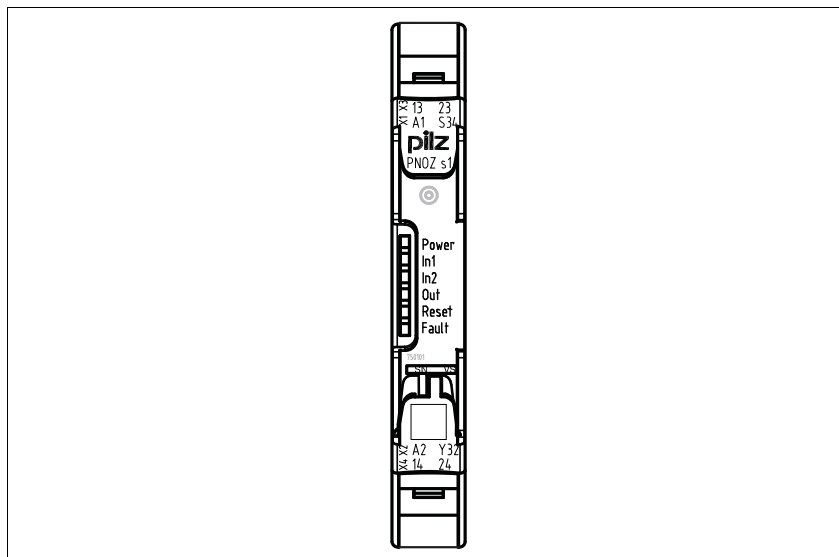
S1	E-STOP pushbutton
S3	Reset button
	Switch operated
	Gate open
	Gate closed

### 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.

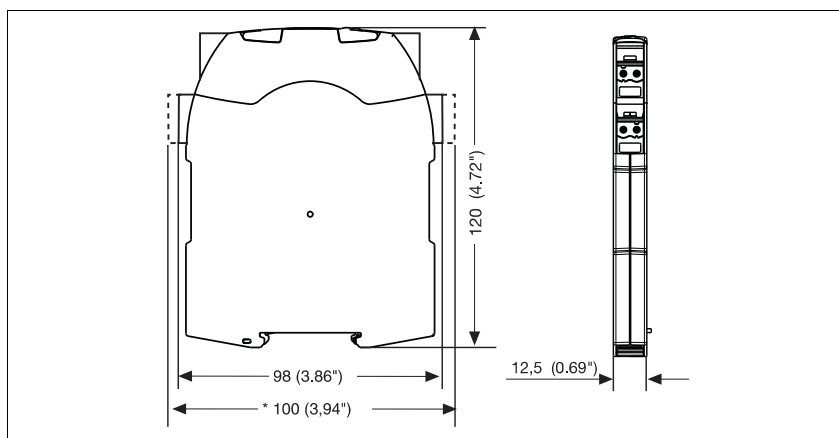
#### Connect base unit and PNOZsigma contact expander module:

- ▶ 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 (35 mm).
- ▶ When installed vertically: Secure the unit by using a fixing element (e.g. retaining bracket or end angle).
- ▶ Push the unit upwards or downwards before lifting it from the DIN rail.

### Dimensions



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

### 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	
<b>Electrical data</b>	
Supply voltage	
Supply voltage $U_B$ DC	<b>24 V</b>
Voltage tolerance	<b>-15 %/+10 %</b>
Power consumption at $U_B$ DC	<b>2.0 W</b>
Residual ripple DC	<b>20 %</b>
Voltage and current at	
Input circuit DC: <b>24.0 V</b>	<b>60.0 mA</b>
Reset circuit DC: <b>24.0 V</b>	<b>20.0 mA</b>
Feedback loop DC: <b>24.0 V</b>	<b>20.0 mA</b>
Number of output contacts	
Safety contacts (S) instantaneous:	<b>2</b>
Utilisation category in accordance with <b>EN 60947-4-1</b>	
Safety contacts: AC1 at <b>240 V</b>	$I_{min}: 0.02 A, I_{max}: 3.0 A$ $P_{max}: 720 VA$
Safety contacts: DC1 at <b>24 V</b>	$I_{min}: 0.02 A, I_{max}: 3.0 A$ $P_{max}: 72 W$
Utilisation category in accordance with <b>EN 60947-5-1</b>	
Safety contacts: AC15 at <b>230 V</b>	$I_{max}: 1.5 A$
Safety contacts: DC13 at <b>24 V</b> (6 cycles/min)	$I_{max}: 1.5 A$
Contact material	<b>AgSnO2</b>
External contact fuse protection ( $I_k = 1 kA$ ) to <b>EN 60947-5-1</b>	
Blow-out fuse, quick	
Safety contacts:	<b>4 A</b>
Blow-out fuse, slow	
Safety contacts:	<b>2 A</b>
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	<b>2 A</b>
Semiconductor outputs (short circuit proof)	<b>24.0 V DC, 20 mA</b>
Max. overall cable resistance $R_{lmax}$ input circuits, reset circuits single-channel at $U_B$ DC	<b>30 Ohm</b>
<b>Safety-related characteristic data</b>	
PL in accordance with <b>EN ISO 13849-1</b>	<b>PL c (Cat. 3)</b>
Category in accordance with <b>EN 954-1</b>	<b>Cat. 3</b>
SIL CL in accordance with <b>EN IEC 62061</b>	<b>SIL CL 2</b>
PFH in accordance with <b>EN IEC 62061</b>	<b>2.00E-07</b>
SIL in accordance with <b>IEC 61511</b>	<b>SIL 2</b>
PFD in accordance with <b>IEC 61511</b>	<b>5.95E-03</b>
$t_M$ in years	<b>20</b>
<b>Times</b>	
Switch-on delay	
with automatic reset typ.	<b>100 ms</b>
with automatic reset max.	<b>150 ms</b>
with automatic reset after power on typ.	<b>100 ms</b>
with automatic reset after power on max.	<b>150 ms</b>
with manual reset typ.	<b>50 ms</b>
with manual reset max.	<b>60 ms</b>

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Times	
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
Overvoltage category	III
Rated insulation voltage	250 V
Rated impulse withstand voltage	4.00 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
Front	PC
Cross section of external conductors with screw terminals	
1 core flexible	0.25 - 2.50 mm <sup>2</sup> , 24 - 12 AWG No. 750101
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.25 - 1.00 mm <sup>2</sup> , 24 - 16 AWG No. 750101
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm <sup>2</sup> , 24 - 16 AWG No. 750101
Torque setting with screw terminals	0.50 Nm No. 750101
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	0.20 - 2.50 mm <sup>2</sup> , 24 - 12 AWG No. 751101
Spring-loaded terminals: Terminal points per connection	2 No. 751101
Stripping length	9 mm No. 751101
Dimensions	
Height	100.0 mm No. 751101 98.0 mm No. 750101
Width	12.5 mm
Depth	120.0 mm
Weight	105 g

No. stands for order number.

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

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

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### Conventional thermal current

$I_{th}$  (A) at  $U_B$  DC

1 contact	<b>3.00 A</b>
2 contacts	<b>3.00 A</b>

### 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