

## Up to PL d of EN ISO 13849-1 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 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
  - ▶ Error
- ▶ Plug-in connection terminals (either spring-loaded 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

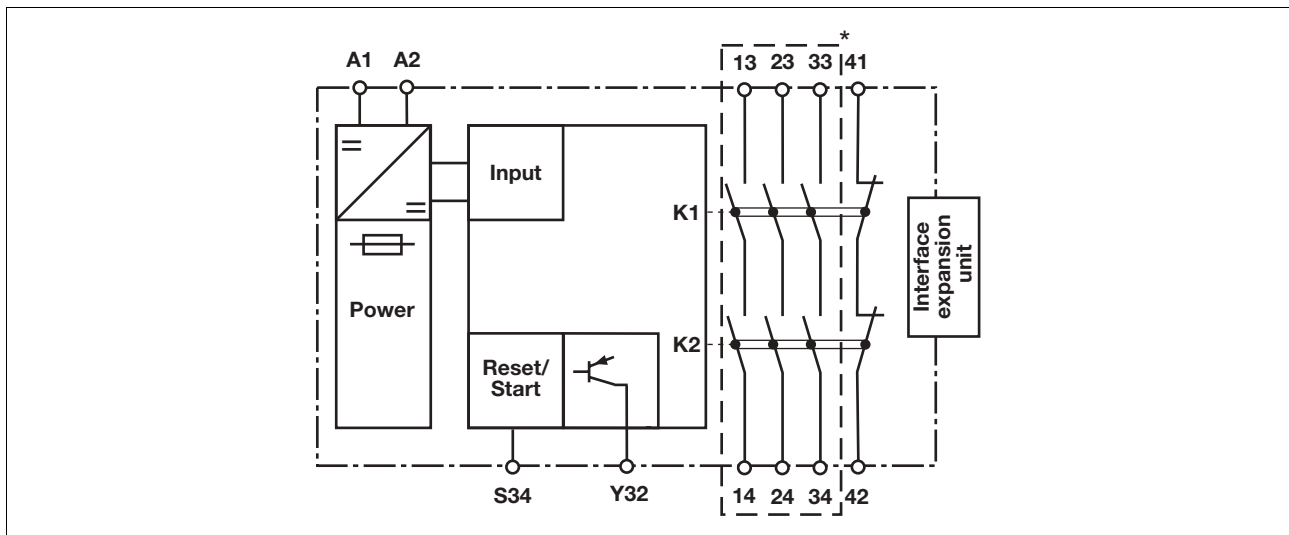
- ▶ E-STOP pushbuttons
- ▶ Safety gates

### 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



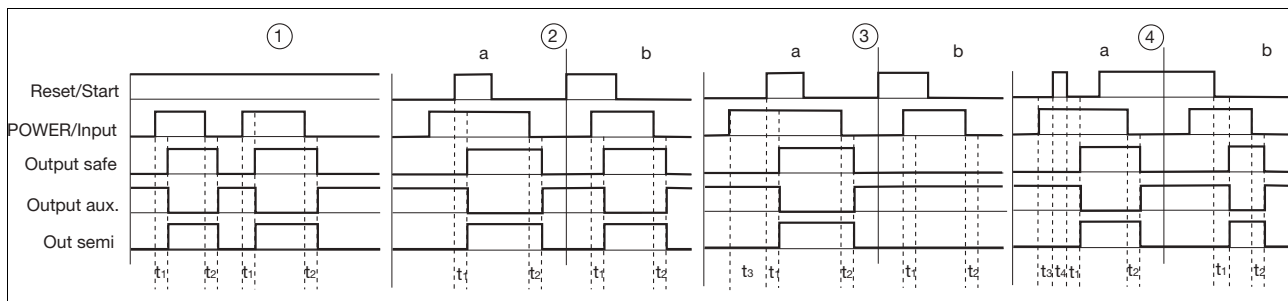
\* Safe separation in accordance with EN 60947-1, 6 kV

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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 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, 33-34
- ▶ Output aux.: Auxiliary contacts 41-42
- ▶ Out semi: Semiconductor output Y32
- ▶ 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
- ▶ t<sub>1</sub>: Switch-on delay
- ▶ t<sub>2</sub>: Delay-on de-energisation
- ▶ t<sub>3</sub>: Waiting period
- ▶ t<sub>4</sub>: 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.

## Up to PL d of EN ISO 13849-1 PNOZ s2

### 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/feedback loop

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



#### ► Semiconductor output

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

## Up to PL d of EN ISO 13849-1 PNOZ s2

► Key

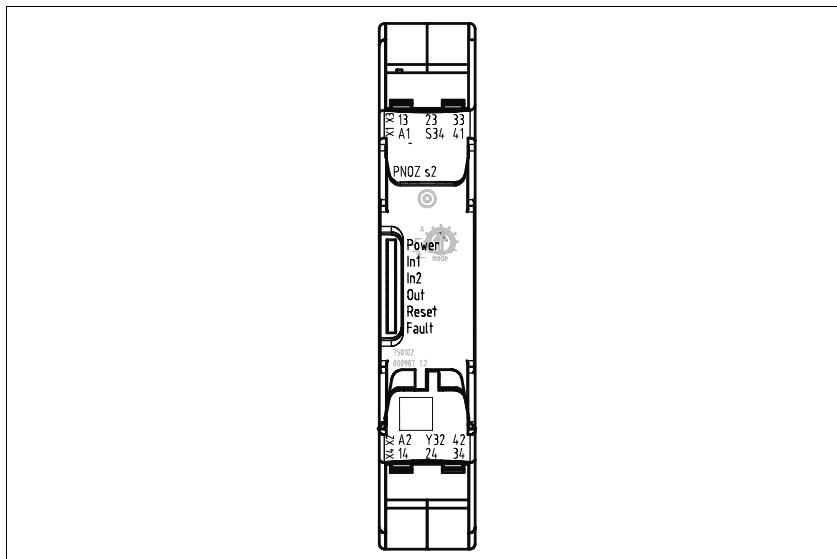
S1	E-STOP pushbutton
S3	Reset button
	Gate open
	Gate closed

### 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:

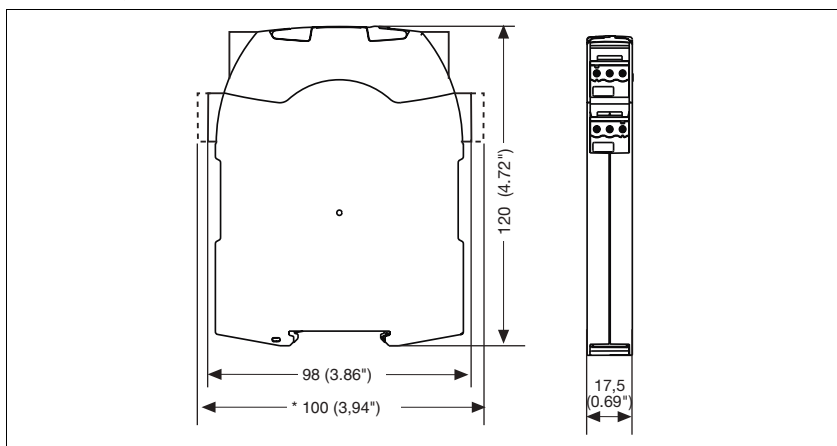
- ▶ Remove the plug terminator at the side of the base unit and at the contact expander module.
- ▶ Connect the base unit and the contact expander module to the supplied connector before mounting the units to the DIN rail.

#### 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

\*with spring-loaded terminals

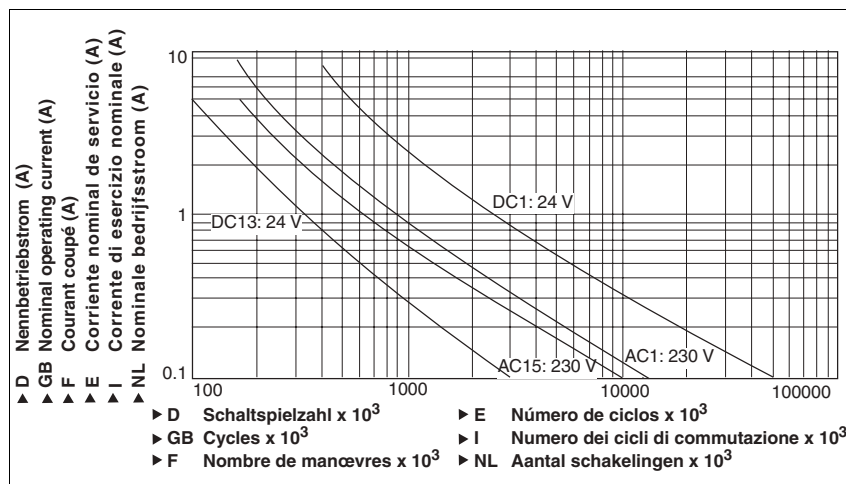


## Up to PL d of EN ISO 13849-1 PNOZ s2

### 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	<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>75.0 mA</b>
Reset circuit DC: <b>24.0 V</b>	<b>7.0 mA</b>
Feedback loop DC: <b>24.0 V</b>	<b>7.0 mA</b>
Number of output contacts	
Safety contacts (S) instantaneous:	<b>3</b>
Auxiliary contacts (N/C):	<b>1</b>
Utilisation category in accordance with <b>EN 60947-4-1</b>	
Safety contacts: AC1 at <b>240 V</b>	$I_{min}: 0.01 A, I_{max}: 8.0 A$ $P_{max}: 2000 VA$
Safety contacts: DC1 at <b>24 V</b>	$I_{min}: 0.01 A, I_{max}: 8.0 A$ $P_{max}: 200 W$
Auxiliary contacts: AC1 at <b>240 V</b>	$I_{min}: 0.01 A, I_{max}: 8.0 A$ $P_{max}: 2000 VA$
Auxiliary contacts: DC1 at <b>24 V</b>	$I_{min}: 0.01 A, I_{max}: 8.0 A$ $P_{max}: 200 W$
Utilisation category in accordance with <b>EN 60947-5-1</b>	
Safety contacts: AC15 at <b>230 V</b>	$I_{max}: 6.0 A$
Safety contacts: DC13 at <b>24 V</b> (6 cycles/min)	$I_{max}: 5.0 A$
Auxiliary contacts: AC15 at <b>230 V</b>	$I_{max}: 6.0 A$
Auxiliary contacts: DC13 at <b>24 V</b> (6 cycles/min)	$I_{max}: 5.0 A$
Contact material	<b>AgCuNi + 0.2 µm Au</b>

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<b>Electrical data</b>	
External contact fuse protection ( $I_k = 1 \text{ kA}$ ) to <b>EN 60947-5-1</b>	
Blow-out fuse, quick	
Safety contacts:	<b>10 A</b>
Auxiliary contacts:	<b>10 A</b>
Blow-out fuse, slow	
Safety contacts:	<b>6 A</b>
Auxiliary contacts:	<b>6 A</b>
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	<b>6 A</b>
Auxiliary contacts:	<b>6 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>	
<b>Performance level (PL)</b> in accordance with <b>EN ISO 13849-1</b>	
Safety contacts, instantaneous	<b>d</b>
<b>Category</b> of output contacts in accordance with <b>EN 954-1</b> , <b>EN ISO 13849-1</b>	
Safety contacts (S) instantaneous:	<b>2</b>
<b>SIL claim limit (SIL CL)</b> in accordance with <b>EN IEC 62061</b>	
Safety contacts, instantaneous	<b>3</b>
Probability of dangerous failure per hour ( <b>PFH<sub>D</sub></b> ) in accordance with <b>EN IEC 62061</b>	
Safety contacts, instantaneous	<b>2.50E-09 1/h</b>
Mission time/Proof test interval in years	<b>20</b>
<b>Times</b>	
Switch-on delay	
with automatic reset typ.	<b>75 ms</b>
with automatic reset max.	<b>250 ms</b>
with automatic reset after power on typ.	<b>75 ms</b>
with automatic reset after power on max.	<b>250 ms</b>
with manual reset typ.	<b>75 ms</b>
with manual reset max.	<b>250 ms</b>
on monitored reset with rising edge typ.	<b>75 ms</b>
on monitored reset with rising edge max.	<b>250 ms</b>
on monitored reset with falling edge typ.	<b>55 ms</b>
on monitored reset with falling edge max.	<b>70 ms</b>
Delay-on de-energisation	
with E-STOP typ.	<b>50 ms</b>
with E-STOP max.	<b>70 ms</b>
with power failure typ.	<b>50 ms</b>
with power failure max.	<b>70 ms</b>
Recovery time at max. switching frequency 1/s	
after E-STOP	<b>100 ms</b>
after power failure	<b>100 ms</b>
Waiting period with a monitored reset	
with rising edge	<b>100 ms</b>
with falling edge	<b>110 ms</b>
Min. start pulse duration with a monitored reset	
with rising edge	<b>100 ms</b>
with falling edge	<b>100 ms</b>
Supply interruption before de-energisation	<b>10 ms</b>
<b>Environmental data</b>	
EMC	<b>EN 60947-5-1, EN 61000-6-2, EN 61000-6-4</b>

## Up to PL d of EN ISO 13849-1 PNOZ s2

Environmental data	
Vibration to <b>EN 60068-2-6</b>	
Frequency	<b>10 - 55 Hz</b>
Amplitude	<b>0.35 mm</b>
Climatic suitability <b>EN 60068-2-78</b>	
Airgap creepage in accordance with <b>EN 60947-1</b>	
Pollution degree	<b>2</b>
Rated insulation voltage	<b>250 V</b>
Rated impulse withstand voltage	<b>6.0 kV</b>
Ambient temperature	<b>-10 - 55 °C</b>
Storage temperature	<b>-40 - 85 °C</b>
Protection type	
Mounting (e.g. cabinet)	<b>IP54</b>
Housing	<b>IP40</b>
Terminals	<b>IP20</b>
Mechanical data	
Housing material	
Housing	<b>PC</b>
Front	<b>PC</b>
Cross section of external conductors with screw terminals	
1 core flexible	<b>0.25 - 2.50 mm<sup>2</sup>, 24 - 12 AWG</b> Order no.: 750102
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	<b>0.25 - 1.00 mm<sup>2</sup>, 24 - 16 AWG</b> Order no.: 750102
without crimp connectors or with TWIN crimp connectors	<b>0.20 - 1.50 mm<sup>2</sup>, 24 - 16 AWG</b> Order no.: 750102
Torque setting with screw terminals	<b>0.50 Nm</b> Order no.: 750102
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	
Spring-loaded terminals: Terminal points per connection	<b>2</b> Order no.: 751102
Stripping length	<b>9 mm</b> Order no.: 751102
Dimensions	
Height	<b>102.0 mm</b> Order no.: 751102 <b>96.0 mm</b> Order no.: 750102
Width	<b>17.5 mm</b>
Depth	<b>120.0 mm</b>
Weight	<b>170 g</b>

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

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

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