

Sensors
<b>Control and Communication</b>
Electronic monitoring relays
Safety Relays
PNOZ X
PNOZsigma
PNOZelog
PNOZmulti
PNOZpower
Configurable control systems
Programmable safety and control systems
Industrial communication
Motion Control
Operating and Monitoring
Software

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## PNOZsigma - Base units

Safe monitoring of E-STOP, safety gate, light grid and two-hand control



**PNOZ s4 48-240VACDC 3 n/o 1 n/c**  
**Order numbers: 750134**

- Type: **PNOZ s4**
- Application options: **Safety gate monitor , Instantaneous E-STOP monitoring , Light barrier mon. Cat.4 , Light barrier mon. Cat.2 w/o tp , Light barrier mon. Cat.2 w/ tp , Limit switch**
- Category in accordance with: **EN 954-1 , EN ISO 13849-1**
- SIL value: --
- Standards: **VDE 0113-1 , EN 954-1 , EN 62061 , EN 60204-1**
- Approvals: **UL/cUL , GOST Russia , CCC , BG**
- Operating modes: **Dual-channel , Without detection of shorts across contacts , Monitored manual reset , Manual start , Single-channel , Automatic start , Self test , Detection of shorts across contacts , Start-up testing**
- Selectable times: --
- Number of instantaneous safety contacts: **3**
- Number of delayed safety contacts: --
- Number of auxiliary contacts: **1**
- Number of delayed auxiliary contacts: --
- Number of semiconductor outputs: **1**
- Stop category: **0**
- Supply voltage [V]: --
- Supply voltage range: **48 - 240 V**
- Supply voltage type: **AC/DC**
- Max. current at DC1: **6,0 A**
- Power consumption AC: --
- Power consumption DC: --
- Height dimension: **96,0 mm**
- Width dimension: **22,5 mm**
- Depth dimension: **120,0 mm**
- Height dimension (inches): **3.78"**
- Width dimension (inches): **0.89"**
- Depth dimension (inches): **4.72"**
- Gross weight: **250 g**
- Net weight: **210 g**

## Up to PL e of EN ISO 13849-1 PNOZ s4



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

### Approvals

PNOZ s4	
	◆
	◆
	◆

### Unit features

- ▶ Positive-guided relay outputs:
  - 3 safety contacts (N/O), instantaneous
  - 1 auxiliary contact (N/C), instantaneous
- ▶ 1 semiconductor output
- ▶ Connection options for:
  - E-STOP pushbutton
  - Safety gate limit switch
  - Reset button
  - Light barriers
  - PSEN
- ▶ 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)

### 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

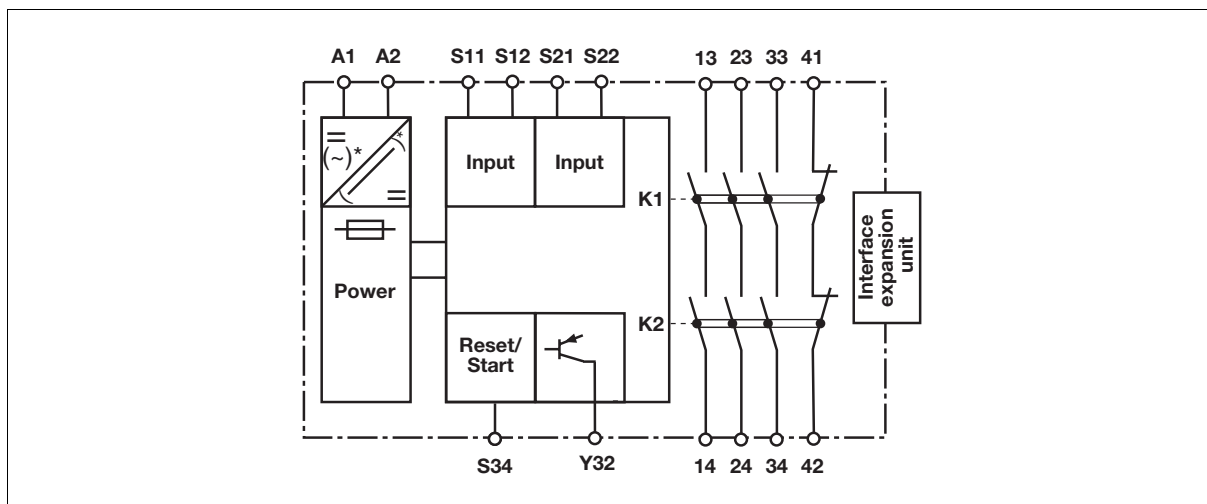
- ▶ E-STOP pushbuttons
- ▶ Safety gates
- ▶ Light barriers

### 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



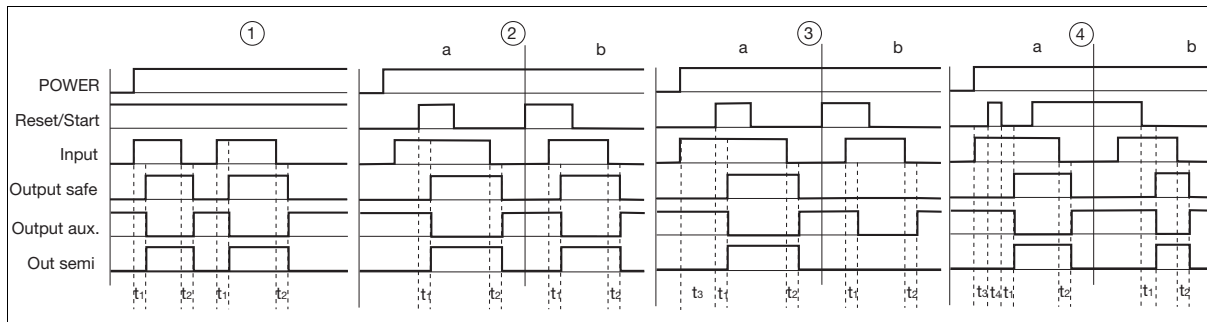
\* only when  $U_B = 48 - 240 \text{ VAC/DC}$

## Up to PL e of EN ISO 13849-1 PNOZ s4

### Function description

- ▶ Single-channel operation: no redundancy in the input circuit, earth faults in the reset and input circuit are detected.
- ▶ Dual-channel operation without detection of shorts across contacts: redundant input circuit, detects
  - earth faults in the reset and input circuit,
  - short circuits in the input circuit and, with a monitored reset, in the reset circuit too.
- ▶ Dual-channel operation with detection of shorts across contacts: redundant input circuit, detects
  - earth faults in the reset and input circuit,
  - short circuits in the input circuit and, with a monitored reset, in the reset circuit too.
- ▶ 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).
- ▶ Reset with start-up test: The unit checks whether safety gates that are closed are opened and then closed again when supply voltage is applied.
- ▶ 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 S34
- ▶ Input: Input circuits S11-S12, S21-S22
- ▶ 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 e of EN ISO 13849-1 PNOZ s4

### Preparing for operation

#### ► Supply voltage

Supply voltage	AC	DC

#### ► Input circuit

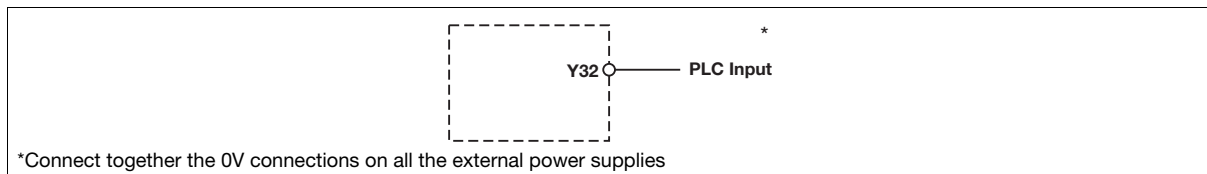
Input circuit	Single-channel	Dual-channel
E-STOP <b>without</b> detection of shorts across contacts		
E-STOP <b>with</b> detection of shorts across contacts		
Safety gate <b>without</b> detection of shorts across contacts		
Safety gate <b>with</b> detection of shorts across contacts		
Light beam device or safety switch <b>with</b> detection of shorts across contacts via ESPE (only when $U_B = 24$ VDC)		

## Up to PL e of EN ISO 13849-1 PNOZ s4

### ▶ Reset circuit/feedback loop

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

### ▶ Semiconductor output

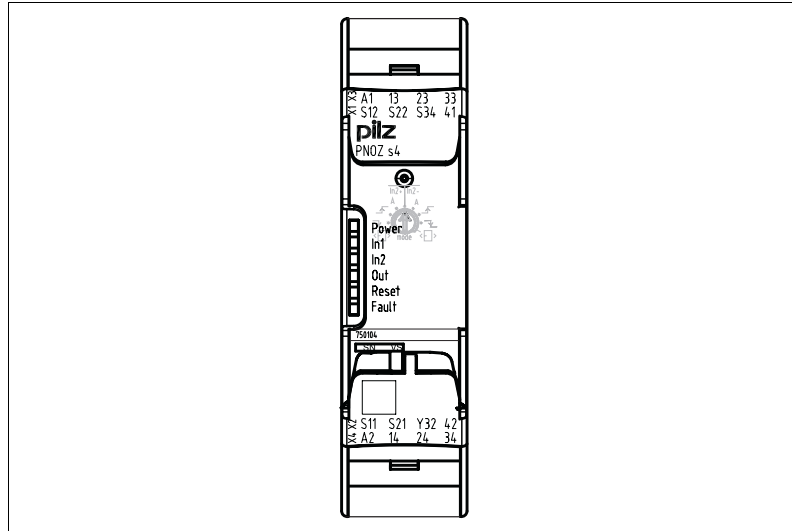


### ▶ Key

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

## Up to PL e of EN ISO 13849-1 PNOZ s4

### 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:

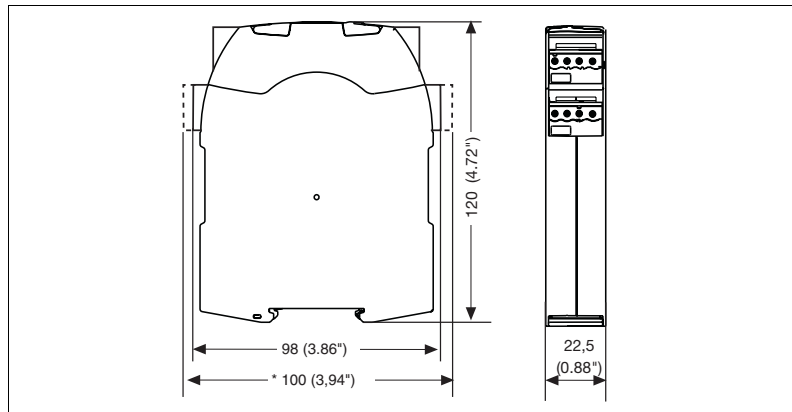
- ▶ Remove the plug terminator at the side of the base unit and at the contact expander module.
- ▶ Connect the base unit and the contact expander module to the supplied connector before mounting the units to the DIN rail.

#### 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



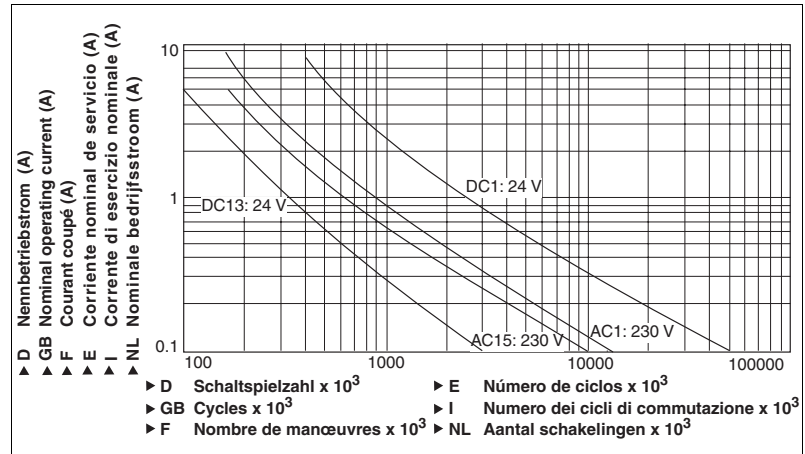
## Up to PL e of EN ISO 13849-1 PNOZ s4

### Notice

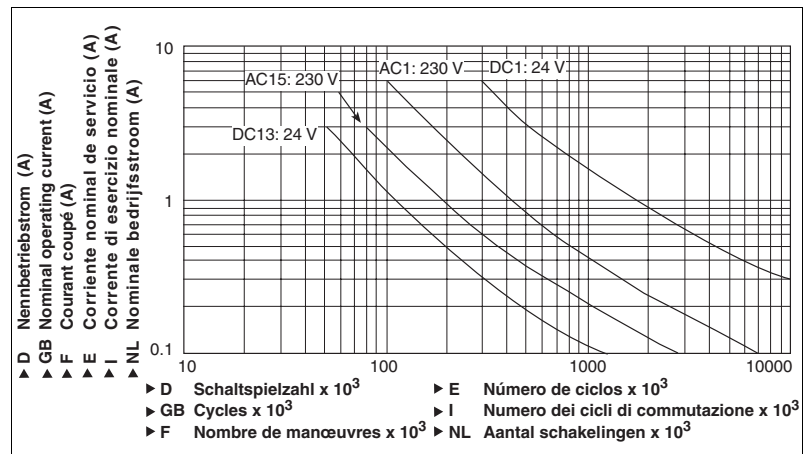
This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

### Service life graph

$U_B$  24 VDC



$U_B$  48-240 VAC/DC



### Technical details

#### Electrical data

Supply voltage	
Supply voltage $U_B$ DC	<b>24 V</b>
Supply voltage $U_B$ AC/DC	<b>48 - 240 V</b>
Voltage tolerance	<b>-15 %/+10 %</b>
Power consumption at $U_B$ AC	<b>5.0 VA</b> Order no.: 750134, 751134
Power consumption at $U_B$ DC	<b>2.5 W</b>
Frequency range AC	<b>50 - 60 Hz</b>
Residual ripple DC	<b>20 %, 160 %</b>
Voltage and current at	
Input circuit DC: <b>24.0 V</b>	<b>50.0 mA</b>
Reset circuit DC: <b>24.0 V</b>	<b>50.0 mA</b>
Feedback loop DC: <b>24.0 V</b>	<b>50.0 mA</b>
Number of output contacts	
Safety contacts (S) instantaneous:	<b>3</b>
Auxiliary contacts (N/C):	<b>1</b>

## Up to PL e of EN ISO 13849-1 PNOZ s4

Electrical data	
Utilisation category in accordance with <b>EN 60947-4-1</b>	
Safety contacts: AC1 at <b>240 V</b>	$I_{\min}$ : <b>0.01 A</b> , $I_{\max}$ : <b>6.0 A</b> Order no.: 750134, 751134 <b>8.0 A</b> Order no.: 750104, 751104 $P_{\max}$ : <b>1500 VA</b> Order no.: 750134, 751134 <b>2000 VA</b> Order no.: 750104, 751104
Safety contacts: DC1 at <b>24 V</b>	$I_{\min}$ : <b>0.01 A</b> , $I_{\max}$ : <b>6.0 A</b> Order no.: 750134, 751134 <b>8.0 A</b> Order no.: 750104, 751104 $P_{\max}$ : <b>150 W</b> Order no.: 750134, 751134 <b>200 W</b> Order no.: 750104, 751104
Auxiliary contacts: AC1 at <b>240 V</b>	$I_{\min}$ : <b>0.01 A</b> , $I_{\max}$ : <b>6.0 A</b> Order no.: 750134, 751134 <b>8.0 A</b> Order no.: 750104, 751104 $P_{\max}$ : <b>1500 VA</b> Order no.: 750134, 751134 <b>2000 VA</b> Order no.: 750104, 751104
Auxiliary contacts: DC1 at <b>24 V</b>	$I_{\min}$ : <b>0.01 A</b> , $I_{\max}$ : <b>6.0 A</b> Order no.: 750134, 751134 <b>8.0 A</b> Order no.: 750104, 751104 $P_{\max}$ : <b>150 W</b> Order no.: 750134, 751134 <b>200 W</b> Order no.: 750104, 751104
Utilisation category in accordance with <b>EN 60947-5-1</b>	
Safety contacts: AC15 at <b>230 V</b>	$I_{\max}$ : <b>3.0 A</b> Order no.: 750134, 751134 <b>6.0 A</b> Order no.: 750104, 751104
Safety contacts: DC13 at <b>24 V</b> (6 cycles/min)	$I_{\max}$ : <b>4.0 A</b> Order no.: 750134, 751134 <b>5.0 A</b> Order no.: 750104, 751104
Auxiliary contacts: AC15 at <b>230 V</b>	$I_{\max}$ : <b>3.0 A</b> Order no.: 750134, 751134 <b>6.0 A</b> Order no.: 750104, 751104
Auxiliary contacts: DC13 at <b>24 V</b> (6 cycles/min)	$I_{\max}$ : <b>4.0 A</b> Order no.: 750134, 751134 <b>5.0 A</b> Order no.: 750104, 751104
Contact material	<b>AgCuNi + 0.2 <math>\mu</math>m Au</b>
External contact fuse protection ( $I_K = 1$ kA) to <b>EN 60947-5-1</b>	
Blow-out fuse, quick	
Safety contacts:	<b>10 A</b> Order no.: 750104, 751104 <b>6 A</b> Order no.: 750134, 751134
Auxiliary contacts:	<b>10 A</b> Order no.: 750104, 751104 <b>6 A</b> Order no.: 750134, 751134
Blow-out fuse, slow	
Safety contacts:	<b>4 A</b> Order no.: 750134, 751134 <b>6 A</b> Order no.: 750104, 751104
Auxiliary contacts:	<b>4 A</b> Order no.: 750134, 751134 <b>6 A</b> Order no.: 750104, 751104
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	<b>4 A</b> Order no.: 750134, 751134 <b>6 A</b> Order no.: 750104, 751104
Auxiliary contacts:	<b>4 A</b> Order no.: 750134, 751134 <b>6 A</b> Order no.: 750104, 751104
Semiconductor outputs (short circuit proof)	<b>24.0 V DC, 20 mA</b>
Max. overall cable resistance $R_{l\max}$ input circuits, reset circuits	
single-channel at $U_B$ DC	<b>30 Ohm</b>
single-channel at $U_B$ AC	<b>30 Ohm</b> Order no.: 750134, 751134
dual-channel without detect. of shorts across contacts at $U_B$ DC	<b>30 Ohm</b> Order no.: 750134, 751134 <b>60 Ohm</b> Order no.: 750104, 751104
dual-channel without detect. of shorts across contacts at $U_B$ AC	<b>30 Ohm</b> Order no.: 750134, 751134
dual-channel with detect. of shorts across contacts at $U_B$ DC	<b>30 Ohm</b>
dual-channel with detect. of shorts across contacts at $U_B$ AC	<b>30 Ohm</b> Order no.: 750134, 751134
Safety-related characteristic data	
<b>Performance level (PL)</b> in accordance with <b>EN ISO 13849-1</b>	
Safety contacts, instantaneous	<b>e</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>4</b>



## Up to PL e of EN ISO 13849-1 PNOZ s4

<b>Safety-related characteristic data</b>	
<b>SIL claim limit (SIL CL) in accordance with EN IEC 62061</b>	
Safety contacts, instantaneous	3
<b>Probability of dangerous failure per hour (PFH<sub>D</sub>) in accordance with EN IEC 62061</b>	
Safety contacts, instantaneous	2.31E-09 1/h
Mission time/Proof test interval in years	20
<b>Times</b>	
Switch-on delay	
with automatic reset typ.	170 ms
with automatic reset max.	300 ms
with automatic reset after power on typ.	350 ms
with automatic reset after power on max.	600 ms
with manual reset typ.	40 ms
on monitored reset with rising edge typ.	35 ms
on monitored reset with rising edge max.	50 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.	10 ms
with E-STOP max.	20 ms
with power failure typ.	40 ms
with power failure max.	60 ms
Recovery time at max. switching frequency 1/s	
after E-STOP	50 ms
after power failure	100 ms
Waiting period with a monitored reset	
with rising edge	120 ms
with falling edge	150 ms Order no.: 750134, 751134 250 ms Order no.: 750104, 751104
Min. start pulse duration with a monitored reset	
with rising edge	30 ms
with falling edge	100 ms
Simultaneity, channel 1 and 2	∞
Supply interruption before de-energisation	20 ms
<b>Environmental data</b>	
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
<b>Mechanical data</b>	
Housing material	
Housing	PC
Front	PC

## Up to PL e of EN ISO 13849-1 PNOZ s4

Mechanical data	
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.: 750104, 750134
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.: 750104, 750134
without crimp connectors or with TWIN crimp connectors	<b>0.20 - 1.50 mm<sup>2</sup> , 24 - 16 AWG</b> Order no.: 750104, 750134
Torque setting with screw terminals	
	<b>0.50 Nm</b> Order no.: 750104, 750134
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	
	<b>0.20 - 2.50 mm<sup>2</sup> , 24 - 12 AWG</b> Order no.: 751104, 751134
Spring-loaded terminals: Terminal points per connection	
	<b>2</b> Order no.: 751104, 751134
Stripping length	
	<b>9 mm</b> Order no.: 751104, 751134
Dimensions	
Height	
	<b>102.0 mm</b> Order no.: 751104, 751134
	<b>96.0 mm</b> Order no.: 750104, 750134
Width	
	<b>22.5 mm</b>
Depth	
	<b>120.0 mm</b>
Weight	
	<b>190 g</b> Order no.: 750104, 751104
	<b>210 g</b> Order no.: 750134, 751134

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

Conventional thermal current		
Number of contacts	$I_{th}$ (A) at $U_B$ DC	$I_{th}$ (A) at $U_B$ AC
1	<b>6.00 A</b> Order no.: 750134, 751134	<b>6.00 A</b> Order no.: 750134, 751134
	<b>8.00 A</b> Order no.: 750104, 751104	
2	<b>6.00 A</b>	<b>6.00 A</b> Order no.: 750134, 751134
3	<b>4.50 A</b> Order no.: 750134, 751134	<b>4.50 A</b> Order no.: 750134, 751134
	<b>5.00 A</b> Order no.: 750104, 751104	

Order reference			
Type	Features	Terminals	Order no.
PNOZ s4	24 VDC	With screw terminals	750 104
PNOZ s4 C	24 VDC	With spring-loaded terminals	751 104
PNOZ s4	48 – 240 VAC/DC	With screw terminals	750 134
PNOZ s4 C	48 – 240 VAC/DC	With spring-loaded terminals	751 134