

## Up to PL e of EN ISO 13849-1 PNOZ s7.1



Contact expansion module for increasing the number of available contacts

### Approvals

|  | PNOZ s7.1 |
|--|-----------|
|  | ◆         |
|  | ◆         |
|  | ◆         |

### Unit features

- ▶ Positive-guided relay outputs:
  - 3 safety contacts (N/O), instantaneous
- ▶ Safe separation of safety contacts 13-14, 23-24, 33-34 from all other circuits
- ▶ Supply voltage for expansion modules
- ▶ LED for:
  - Supply voltage at B1 and B2
  - Input status, channel 1
  - Input status, channel 2
  - Switch status of the safety contacts
  - Error
- ▶ Plug-in connection terminals (either spring-loaded terminals or screw terminals)

### Unit description

The unit meets the requirements of EN 60947-5-1, EN 60204-1 and VDE 0113-1. The contact expansion module is used to increase the number of instantaneous safety contacts available on a base unit. Base units are all safety relays with feedback loop monitoring.

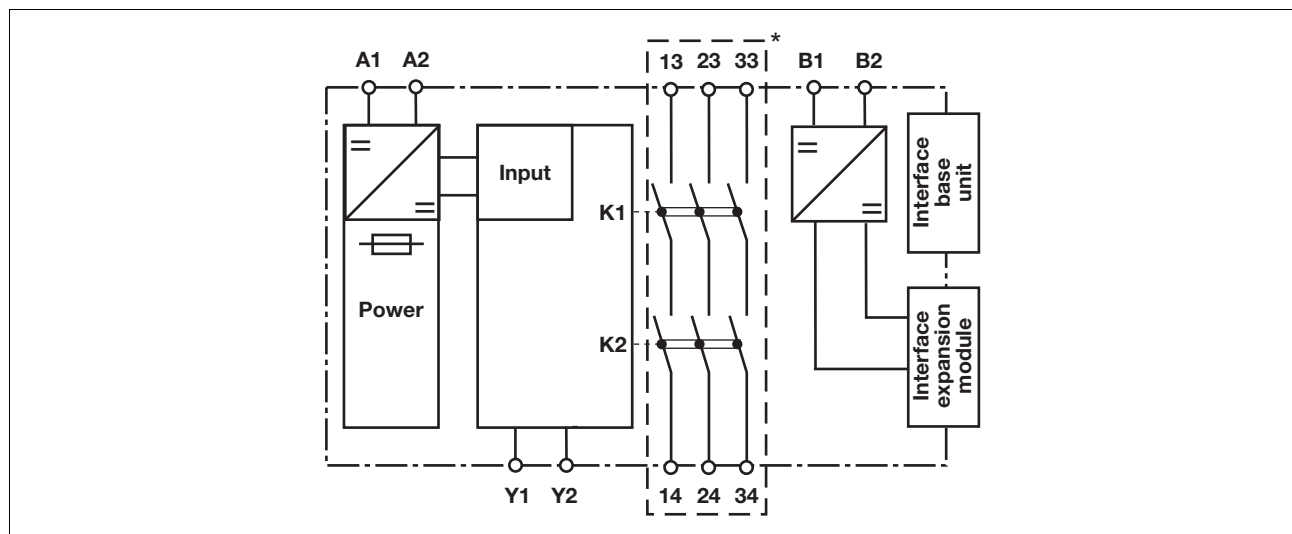
The category that can be achieved in accordance with EN 954-1 and EN ISO 13849-1 depends on the category of the base unit. The contact expansion module may not exceed this.

### Safety features

The unit meets the following safety requirements:

- ▶ The contact expansion module expands an existing circuit. As the output relays are monitored via the base unit's feedback loop, the safety functions on the existing circuit are transferred to the contact expansion module.
- ▶ The safety function remains effective in the case of a component failure.
- ▶ Earth fault in the feedback loop: Detected, depending on the base unit that is used.
- ▶ Earth fault in the input circuit: The output relays de-energise and the safety contacts open.

### Block diagram



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

## Up to PL e of EN ISO 13849-1 PNOZ s7.1

### Function description

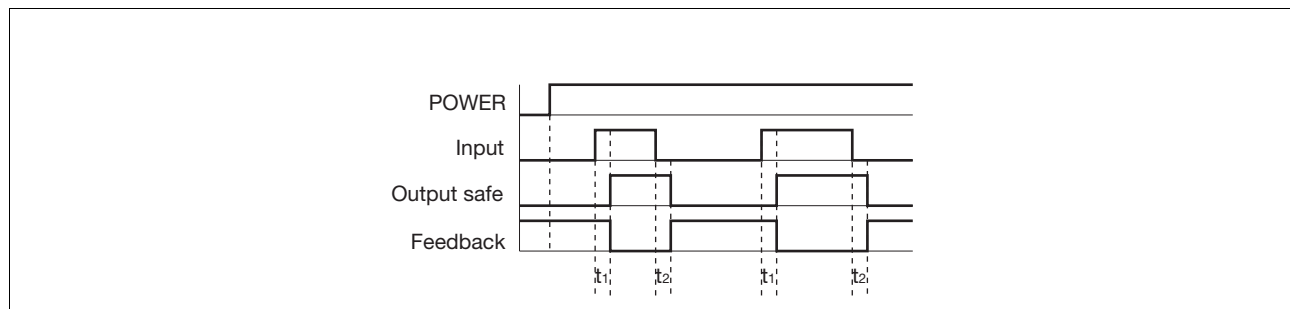
with PNOZsigma base unit:

- ▶ Dual-channel operation via PNOZsigma connector

without PNOZsigma base unit:

- ▶ Single-channel operation: one input circuit affects the output relays
- with PNOZsigma s7.2 expander units:
  - ▶ Dual-channel operation and supply voltage via PNOZsigma connector

### Timing diagram



### Key

- ▶ Power: Supply voltage
- ▶ Input: Input circuits
- ▶ Output safe: Safety contacts 13-14, 23-24, 33-34
- ▶ Feedback: Feedback loop 51-52
- ▶  $t_1$ : Switch-on delay
- ▶  $t_2$ : Delay-on de-energisation

### Wiring

Please note:

- ▶ Information given in the “Technical details” must be followed.
- ▶ Outputs 13-14, 23-24, 33-34 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.

## Up to PL e of EN ISO 13849-1 PNOZ s7.1

### Preparing for operation

#### ► Supply voltage

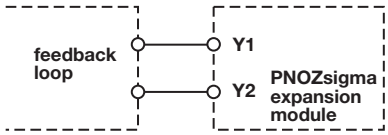
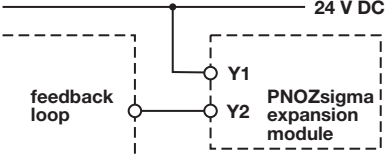
| Supply voltage                                    | AC | DC |
|---------------------------------------------------|----|----|
| Base unit:<br>Safety relay PNOZsigma              |    |    |
| Base unit:<br>Safety relay PNOZ X                 |    |    |
| Supply voltage for expansion modules<br>PNOZsigma |    |    |

#### ► Input circuit

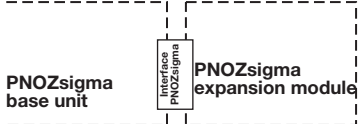
| Input circuit                                                                      | Single-channel | Dual-channel |
|------------------------------------------------------------------------------------|----------------|--------------|
| Base unit:<br>Safety relay PNOZsigma                                               |                |              |
| Base unit:<br>Safety relay PNOZ X                                                  |                |              |
| Base unit:<br>Safety relay PNOZelog Driven via semicon-<br>ductor outputs (24 VDC) |                |              |

Up to PL e of EN ISO 13849-1  
PNOZ s7.1

► Reset circuit/feedback loop

| Reset circuit/feedback loop                                                             | Base unit: Safety relay PNOZ X                                                    | Base unit: Safety relay PNOZelog                                                    |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| The inputs that evaluate the feedback loop will depend on the base unit and application |  |  |

► Connection to PNOZsigma base unit

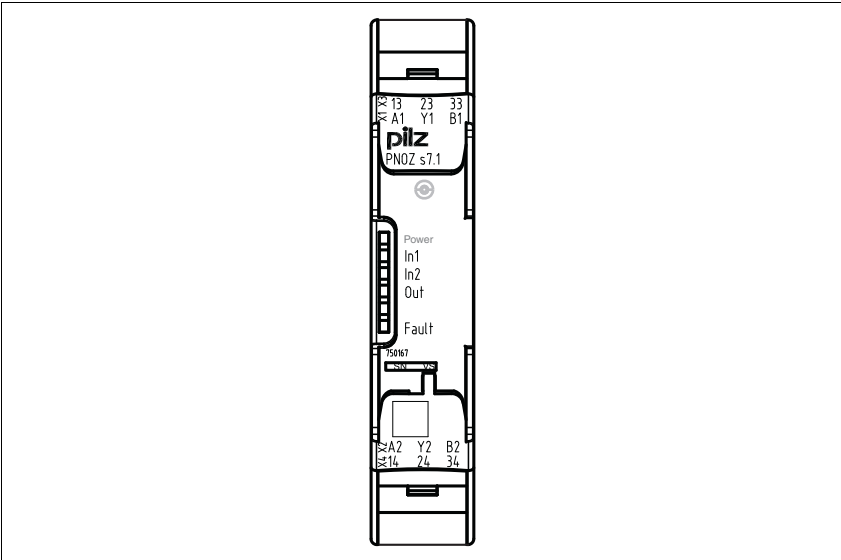
|                                                                 | Base unit: Safety relay PNOZsigma                                                  |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------|
| The feedback loop is connected and evaluated via the connector. |  |

**INFORMATION**

If a base unit and a contact expansion module from the PNOZsigma range are linked via the connector, no additional wiring is necessary.  
Do not connect A1 und Y1/Y2 to the expansion module!

Up to PL e of EN ISO 13849-1  
PNOZ s7.1

Terminal configuration



Installation

Install contact expansion module without base unit:

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

Connect base unit and contact expansion module PNOZ s7.1:

- ▶ Remove the plug terminator at the side of the base unit and at the left of the contact expansion module

- ▶ Connect the base unit and the contact expansion module using the connector supplied, before mounting the units to the DIN rail.

Connect contact expansion module PNOZ s7.1 to PNOZsigma contact expansion modules

- ▶ Connect the contact expansion modules using the connector supplied.

Control cabinet installation

- ▶ 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.

|                                                                                                                                                                            |                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Expansion options                                                                                                                                                          | Please note the max. power consumption of the contact expansion modules (see Technical data PNOZ s7.1). |
| <p>①: Base unit</p> <p>②: Contact expansion module PNOZ s7.1</p> <p>③: Contact expansion module PNOZ s7.2</p> <p>④: Contact expansion module PNOZ s7.2 with terminator</p> |                                                                                                         |

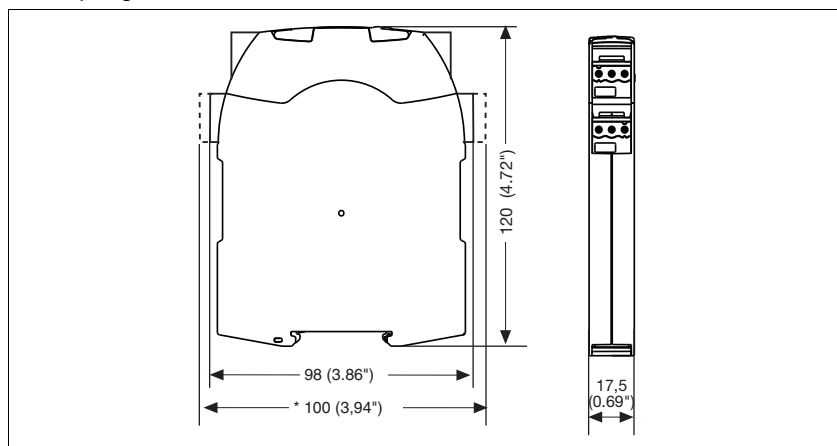
## Up to PL e of EN ISO 13849-1 PNOZ s7.1

|                                                                                                                                                                                                                                                                      |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <p>①: Base unit</p> <p>②: Contact expansion module PNOZ s7.1</p> <p>③: Contact expansion module PNOZ s7.2</p> <p>④: Contact expansion module PNOZ s7, s8, s9, s10, s11 as terminator</p>                                                                             |  |
| <p>①: Contact expansion module PNOZ s7.1 with terminator</p> <p>②: Contact expansion module PNOZ s7.2</p> <p>③: Contact expansion module PNOZ s7.2 with terminator</p>                                                                                               |  |
| <p>①: Contact expansion module PNOZ s7.1 with terminator</p> <p>②: Contact expansion module PNOZ s7.2</p> <p>③: Contact expansion module PNOZ s7, s8, s9, s10, s11 as terminator</p>                                                                                 |  |
| <p>①: Base unit</p> <p>②: Contact expansion module PNOZ s7.1</p> <p>③: Contact expansion module PNOZ s7.2</p> <p>④: Contact expansion module PNOZ s7.1</p> <p>⑤: Contact expansion module PNOZ s7.2</p> <p>⑥: Contact expansion module PNOZ s7.2 with terminator</p> |  |

## Up to PL e of EN ISO 13849-1 PNOZ s7.1

### Dimensions

\*with spring-loaded terminals



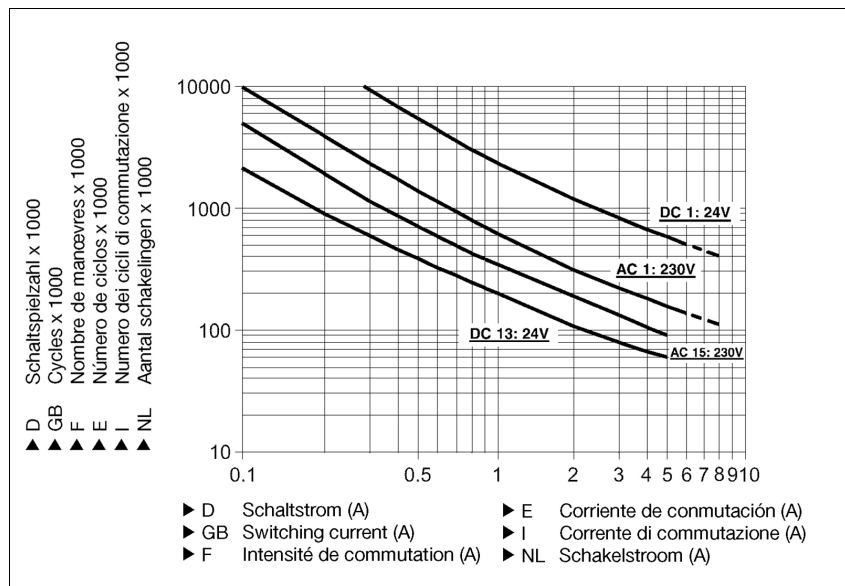
## Up to PL e of EN ISO 13849-1 PNOZ s7.1

### NOTICE

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

### Service life graph

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.



### Example

- Inductive load: 0,2 A
- Utilisation category: AC15
- Contact service life: 2,000,000 cycles

Provided the application requires fewer than 2,000,000 cycles, the PFH value (see technical details) can be used in the calculation.

To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With contactors, use freewheel diodes for spark suppression.

### Technical details

#### Electrical data

|                                      |                    |
|--------------------------------------|--------------------|
| Supply voltage                       |                    |
| Supply voltage $U_B$ DC              | <b>24 V</b>        |
| Voltage tolerance                    | <b>-20 %/+20 %</b> |
| Power consumption at $U_B$ DC        | <b>2.0 W</b>       |
| Max. output of all expansion modules | <b>20 W</b>        |
| Residual ripple DC                   | <b>20 %</b>        |
| Voltage and current at               |                    |
| Input circuit DC: <b>24.0 V</b>      | <b>70.0 mA</b>     |
| Number of output contacts            |                    |
| Safety contacts (S) instantaneous:   | <b>3</b>           |

## Up to PL e of EN ISO 13849-1 PNOZ s7.1

| Electrical data                                                                                                  |                                                                                    |
|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Utilisation category in accordance with <b>EN 60947-4-1</b>                                                      |                                                                                    |
| Safety contacts: AC1 at <b>240 V</b>                                                                             | $I_{min}: 0.01 \text{ A}$ , $I_{max}: 6.0 \text{ A}$<br>$P_{max}: 1500 \text{ VA}$ |
| Safety contacts: DC1 at <b>24 V</b>                                                                              | $I_{min}: 0.01 \text{ A}$ , $I_{max}: 6.0 \text{ A}$<br>$P_{max}: 150 \text{ W}$   |
| Utilisation category in accordance with <b>EN 60947-5-1</b>                                                      |                                                                                    |
| Safety contacts: AC15 at <b>230 V</b>                                                                            | $I_{max}: 5.0 \text{ A}$                                                           |
| Safety contacts: DC13 at <b>24 V</b> (6 cycles/min)                                                              | $I_{max}: 5.0 \text{ A}$                                                           |
| Contact material                                                                                                 | <b>AgCuNi + 0.2 µm Au</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>                                                                        |
| Blow-out fuse, slow                                                                                              |                                                                                    |
| Safety contacts:                                                                                                 | <b>6 A</b>                                                                         |
| Circuit breaker 24 VAC/DC, characteristic B/C                                                                    |                                                                                    |
| Safety contacts:                                                                                                 | <b>6 A</b>                                                                         |
| Max. overall cable resistance $R_{lmax}$<br>input circuits, reset circuits<br>single-channel at $U_B \text{ DC}$ | <b>30 Ohm</b>                                                                      |
| Safety-related characteristic data                                                                               |                                                                                    |
| PL in accordance with <b>EN ISO 13849-1: 2006</b>                                                                | <b>PL e (Cat. 4)</b>                                                               |
| Category in accordance with <b>EN 954-1</b>                                                                      | <b>Cat. 4</b>                                                                      |
| SIL CL in accordance with <b>EN IEC 62061</b>                                                                    | <b>SIL CL 3</b>                                                                    |
| PFH in accordance with <b>EN IEC 62061</b>                                                                       | <b>2.31E-09</b>                                                                    |
| SIL in accordance with <b>IEC 61511</b>                                                                          | <b>SIL 3</b>                                                                       |
| PFD in accordance with <b>IEC 61511</b>                                                                          | <b>2.03E-06</b>                                                                    |
| $T_M$ [year] in accordance with <b>EN ISO 13849-1: 2006</b>                                                      | <b>20</b>                                                                          |
| Times                                                                                                            |                                                                                    |
| Switch-on delay<br>with automatic reset after power on typ.                                                      | <b>30 ms</b>                                                                       |
| with automatic reset after power on max.                                                                         | <b>50 ms</b>                                                                       |
| Delay-on de-energisation<br>with E-STOP typ.                                                                     | <b>18 ms</b>                                                                       |
| with E-STOP max.                                                                                                 | <b>30 ms</b>                                                                       |
| with power failure typ.                                                                                          | <b>18 ms</b>                                                                       |
| with power failure max.                                                                                          | <b>30 ms</b>                                                                       |
| Supply interruption before de-energisation                                                                       | <b>5 ms</b>                                                                        |
| Environmental data                                                                                               |                                                                                    |
| EMC                                                                                                              | <b>EN 60947-5-1, EN 61000-6-2, EN 61000-6-4</b>                                    |
| Vibration to <b>EN 60068-2-6</b>                                                                                 |                                                                                    |
| Frequency                                                                                                        | <b>10.0 - 55.0 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>                                                                           |
| Overvoltage category                                                                                             | <b>III</b>                                                                         |
| Rated insulation voltage                                                                                         | <b>250 V</b>                                                                       |
| Rated impulse withstand voltage                                                                                  | <b>6.00 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>                                                                        |

## Up to PL e of EN ISO 13849-1 PNOZ s7.1

| 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. 750167 |
| 2 core, same cross section, flexible:                                                                     |                                                      |
| with crimp connectors, without insulating sleeve                                                          | 0.25 - 1.00 mm <sup>2</sup> , 24 - 16 AWG No. 750167 |
| without crimp connectors or with TWIN crimp connectors                                                    | 0.20 - 1.50 mm <sup>2</sup> , 24 - 16 AWG No. 750167 |
| Torque setting with screw terminals                                                                       | 0.50 Nm No. 750167                                   |
| 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. 751167 |
| Spring-loaded terminals: Terminal points per connection                                                   | 2 No. 751167                                         |
| Stripping length                                                                                          | 9 mm No. 751167                                      |
| Dimensions                                                                                                |                                                      |
| Height                                                                                                    | 100.0 mm No. 751167<br>98.0 mm No. 750167            |
| Width                                                                                                     | 17.5 mm                                              |
| Depth                                                                                                     | 120.0 mm                                             |
| Weight                                                                                                    | 170 g                                                |

No. stands for order number.

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switching frequency and the load on the relay output.

If the service life graphs are not accessible, the stated PFH value can be

used irrespective of the switching frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.

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

### INFORMATION

A safety function's SIL/PL values are **not** identical to the SIL/PL values of the units that are used and may be different. We recommend that you use the PAScal software tool to calculate the safety function's SIL/PL values.

The standards current on **2007-10** apply.

| Conventional thermal current while loading several contacts |                                                  |
|-------------------------------------------------------------|--------------------------------------------------|
| Number of contacts                                          | I <sub>th</sub> per contact at U <sub>B</sub> DC |
| 1                                                           | 6.00 A                                           |
| 2                                                           | 5.50 A                                           |
| 3                                                           | 4.50 A                                           |

| Order reference |          |                              |           |
|-----------------|----------|------------------------------|-----------|
| Type            | Features | Terminals                    | Order no. |
| PNOZ s7.1 C     | 24 VDC   | With spring-loaded terminals | 751 167   |
| PNOZ s7.1       | 24 VDC   | With screw terminals         | 750 167   |