PNOZ s7.1

Safety relays
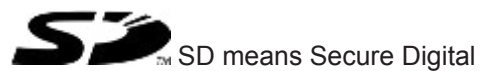
Safety relay PNOZ s7.1

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 ISO 13849-1 depends on the category of the base unit. The contact expansion module may not exceed this.

For your safety

▶ Only install and commission the unit if you have read and understood these operating instructions and are familiar with the applicable regulations for health and safety at work and accident prevention.
Ensure VDE and local regulations are met, especially those relating to safety.

▶ Any guarantee is rendered invalid if the housing is opened or unauthorised modifications are carried out.

Unit features

▶ 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

  – Fault

▶ Plug-in connection terminals (either spring-loaded terminal or screw terminal)

Safety features

The unit meets the following safety requirements:

▶ The contact expander 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 expander 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/terminal configuration
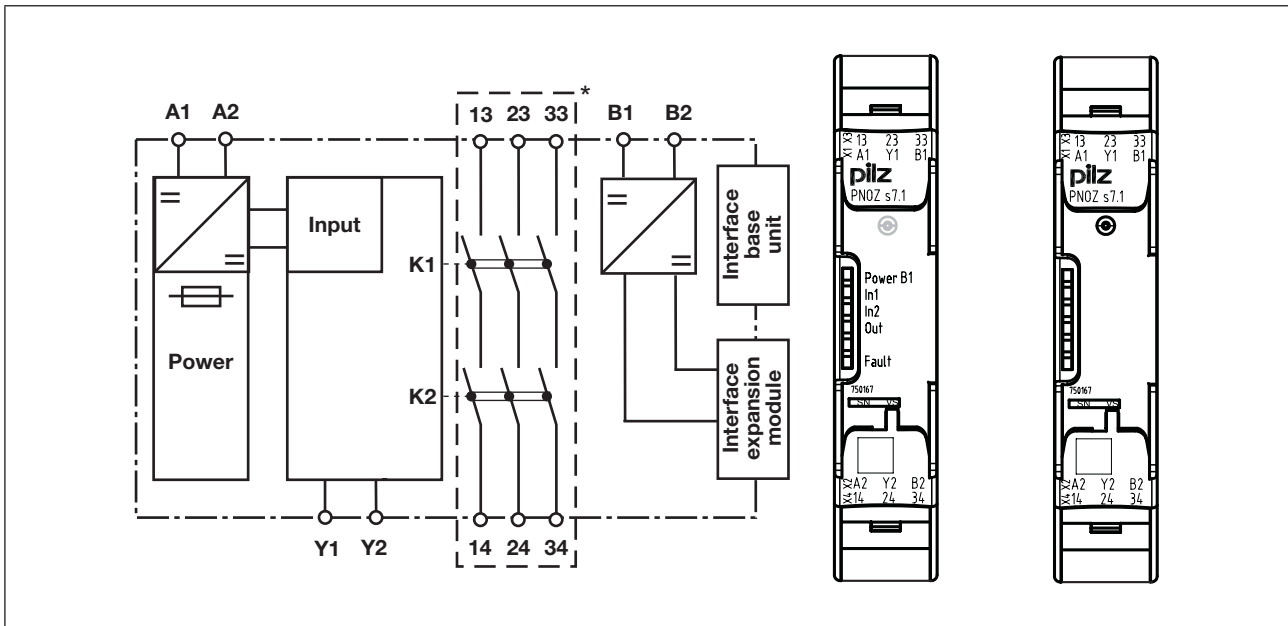
Centre: Front view with cover, right: Front view without cover

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

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

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.

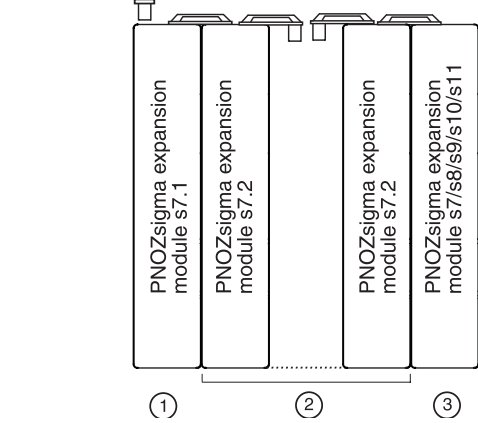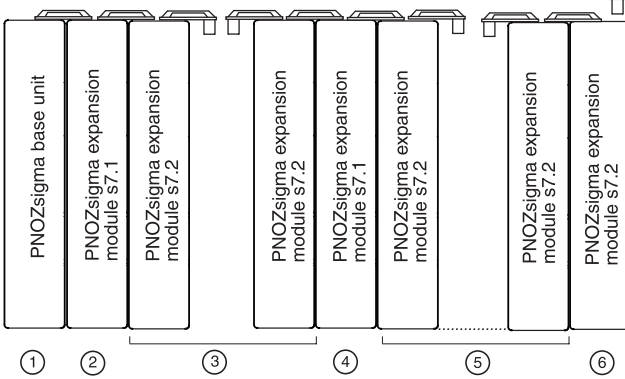**Connect contact expansion module PNOZ s7.1 to PNOZsigma contact expansion modules**

▶ 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).
①: Base unit ②: Contact expansion module PNOZ s7.1 ③: Contact expansion module PNOZ s7.2 ④: Contact expansion module PNOZ s7.2 with terminator	① PNOZsigma base unit ② PNOZsigma expansion module s7.1 ③ PNOZsigma expansion module s7.2 — PNOZsigma expansion module s7.2 ④ PNOZsigma expansion module s7.2
①: Base unit ②: Contact expansion module PNOZ s7.1 ③: Contact expansion module PNOZ s7.2 ④: Expansion module PNOZ s7, s8, s9, s10, s11 as a terminator	① PNOZsigma base unit ② PNOZsigma expansion module s7.1 ③ PNOZsigma expansion module s7.2 — PNOZsigma expansion module s7.2 ④ PNOZsigma expansion module s7/s8/s9/s10/s11
①: Contact expansion module PNOZ s7.1 with terminator ②: Contact expansion module PNOZ s7.2 ③: Contact expansion module PNOZ s7.2 with terminator	① PNOZsigma expansion module s7.1 PNOZsigma expansion module s7.2 ② PNOZsigma expansion module s7.2 ③ PNOZsigma expansion module s7.2

Expansion options	Please note the max. power consumption of the contact expansion modules (see technical data PNOZ s7.1).
①: Contact expansion module PNOZ s7.1 with terminator ②: Contact expansion module PNOZ s7.2 ③: Expansion module PNOZ s7, s8, s9, s10, s11 as a terminator	PNOZsigma expansion module s7.1 · PNOZsigma expansion module s7.2 · PNOZsigma expansion module s7.2 · PNOZsigma expansion module s7/s8/s9/s10/s11 ① ② ③
①: Base unit ②: Contact expansion module PNOZ s7.1 ③: Contact expansion module PNOZ s7.2 ④: Contact expansion module PNOZ s7.1 ⑤: Contact expansion module PNOZ s7.2 ⑥: Contact expansion module PNOZ s7.2 with terminator	PNOZsigma base unit · PNOZsigma expansion module s7.1 · PNOZsigma expansion module s7.2 · PNOZsigma expansion module s7.2 · PNOZsigma expansion module s7.1 · PNOZsigma expansion module s7.2 · PNOZsigma expansion module s7.2 · PNOZsigma expansion module s7.2 ① ② ③ ④ ⑤ ⑥

Wiring

Please note:

▸ Information given in the "Technical details" must be followed.

▸ The output contacts 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 length 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.

Preparing for operation

▶ Supply voltage

Supply voltage	AC	DC
Base unit: PNOZsigma safety relay		PNOZs expansion module — Interface PNOZsigma — PNOZs expansion module
Base unit: PNOZ X safety relay		24 V DC / A1 A2 PNOZsigma expansion module / 0 V
Supply voltage for expansion modules PNOZsigma		24 V DC / B1 B2 PNOZsigma expansion module / 0 V
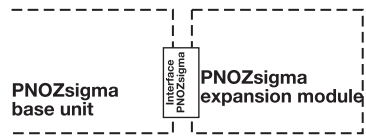
▶ Input circuit

Input circuit	Single-channel	Dual-channel
Base unit: Safety relay PNOZsigma		PNOZsigma base unit — Interface PNOZsigma — PNOZsigma expansion module
Base unit: Safety relay PNOZ X	24 V DC / A1 A2 PNOZsigma expansion module / 0 V	
Base unit: Safety relay PNOZelog Driven via semiconductor outputs (24 V DC)	O1 / A1 PNOZsigma expansion module / 0 V / A2 / L-	

▶ 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	feedback loop / Y1 Y2 PNOZsigma expansion module	24 V DC / feedback loop / Y1 Y2 PNOZsigma expansion module

▸ Connection to PNOZsigma base unit

	Base unit: Safety relay PNOZsigma
The feedback loop is connected and evaluated via the connector.	PNOZsigma base unit Interface PNOZsigma PNOZsigma expansion module

> **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!

Operation

LEDs indicate the status and errors during operation:

⌖   LED on

Status indicators

⌖   **In1**
Channel 1 actuated.

⌖   **In2**
Channel 2 actuated.

⌖   **In1, In2, Out**
Safety contacts are closed.

⌖   **Power B1**
Supply voltage applied for the expansion modules.

Fault indicators

⌖   **Fault**
Diagnostics: Plug terminator not connected

   ▸ Remedy: Insert plug terminator, switch supply voltage off and then on again.

Faults - malfunctions

▸ Contact malfunctions: If the contacts have welded, reactivation will not be possible after the input circuit has opened.

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.
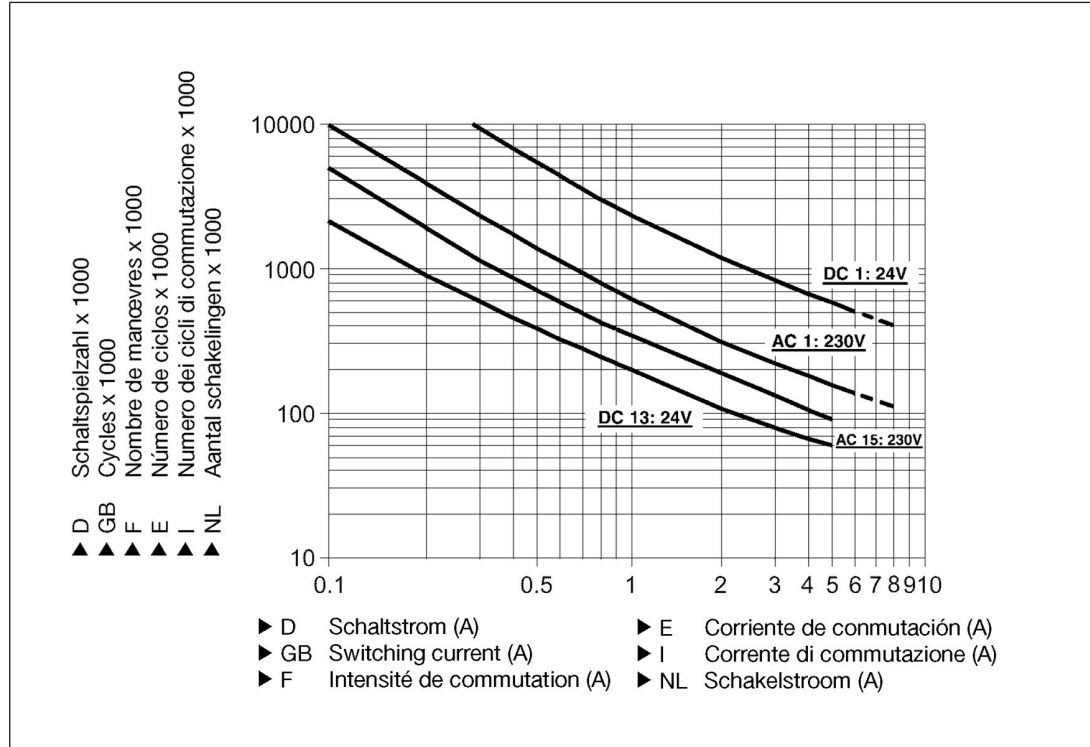
Example

▸ 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

General	750167	751167
Approvals	**CCC, CE, GOST, TÜV, cULus Listed**	**CCC, CE, GOST, TÜV, cULus Listed**
Electrical data	**750167**	**751167**
Supply voltage		
Voltage	**24 V**	**24 V**
Type	**DC**	**DC**
Voltage tolerance	**-20 %/+20 %**	**-20 %/+20 %**
Output of external power supply (DC)	**2,0 W**	**2,0 W**
Residual ripple DC	**20 %**	**20 %**
Continuous duty	**100 %**	**100 %**
Max. power of all expansion modules	**20 W**	**20 W**
Max. overall cable resistance Rl-max		
Single-channel at UB DC	**30 Ohm**	**30 Ohm**
Voltage at		
Input circuit DC	**24,0 V**	**24,0 V**
Current at		
Input circuit DC	**70,0 mA**	**70,0 mA**
Number of output contacts		
Instantaneous safety contacts (N/O)	**3**	**3**
Inputs	**750167**	**751167**
Number	**1**	**1**
Relay outputs	**750167**	**751167**
Max. short circuit current IK	**1 kA**	**1 kA**
Utilisation category		
In accordance with the standard	**EN 60947-4-1**	**EN 60947-4-1**
Safety contacts, AC1 at	**240 V**	**240 V**
Max. current	**6,0 A**	**6,0 A**
Min. current	**0,01 A**	**0,01 A**
Max. power	**1500 VA**	**1500 VA**
Safety contacts, DC1 at	**24 V**	**24 V**
Max. current	**6,0 A**	**6,0 A**
Min. current	**0,01 A**	**0,01 A**
Max. power	**150 W**	**150 W**
Utilisation category		
In accordance with the standard	**EN 60947-5-1**	**EN 60947-5-1**
Safety contacts, AC15 at	**230 V**	**230 V**
Max. current	**5,0 A**	**5,0 A**
Safety contacts, DC13 (6 cycles/min) at	**24 V**	**24 V**
Max. current	**5,0 A**	**5,0 A**

Relay outputs	750167	751167
Contact fuse protection, external safety contacts		
In accordance with the standard	EN 60947-5-1	EN 60947-5-1
Blow-out fuse, quick	10 A	10 A
Blow-out fuse, slow	6 A	6 A
Circuit breaker, 24V AC/DC, characteristic B/C	6 A	6 A
Contact material	AgCuNi + 0,2 µm Au	AgCuNi + 0,2 µm Au
Conventional thermal current while loading several contacts	**750167**	**751167**
Ith per contact at UB DC		
Conv. therm. current with 1 contact	6,00 A	6,00 A
Conv. therm. current with 2 contacts	5,50 A	5,50 A
Conv. therm. current with 3 contacts	4,50 A	4,50 A
Times	**750167**	**751167**
Switch-on delay		
With automatic reset after power on typ.	30 ms	30 ms
With automatic reset after power on max.	50 ms	50 ms
Delay-on de-energisation		
With E-STOP typ.	18 ms	18 ms
With E-STOP max.	30 ms	30 ms
With power failure typ.	18 ms	18 ms
With power failure max.	30 ms	30 ms
Supply interruption before de-energisation	5 ms	5 ms
Environmental data	**750167**	**751167**
Climatic suitability	EN 60068-2-78	EN 60068-2-78
Ambient temperature		
Temperature range	-10 - 55 °C	-10 - 55 °C
Storage temperature		
Temperature range	-40 - 85 °C	-40 - 85 °C
EMC	EN 60947-5-1, EN 61000-6-2, EN 61000-6-4	EN 60947-5-1, EN 61000-6-2, EN 61000-6-4
Vibration		
In accordance with the standard	EN 60068-2-6	EN 60068-2-6
Frequency	10,0 - 55,0 Hz	10,0 - 55,0 Hz
Max. amplitude	0,35 mm	0,35 mm
Airgap creepage		
In accordance with the standard	EN 60947-1	EN 60947-1
Overvoltage category	III	III
Pollution degree	2	2
Rated insulation voltage	250 V	250 V
Rated impulse withstand voltage	6,00 kV	6,00 kV

Environmental data	750167	751167
Protection type		
Mounting (e.g. cabinet)	**IP54**	**IP54**
Housing	**IP40**	**IP40**
Terminals	**IP20**	**IP20**
Mechanical data	**750167**	**751167**
Mounting position	**Any**	**Any**
Mechanical life	**10,000,000 cycles**	**10,000,000 cycles**
Material		
Bottom	**PC**	**PC**
Front	**PC**	**PC**
Top	**PC**	**PC**
Cross section of external conductors with screw terminals		
1 core flexible	**0,25 - 2,50 mm², 24 - 12 AWG**	–
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	**0,25 - 1,00 mm², 24 - 16 AWG**	–
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**0,20 - 1,50 mm², 24 - 16 AWG**	–
Torque setting with screw terminals	**0,50 Nm**	–
Connection type	**Screw terminal**	**Cage clamp terminal**
Mounting type	**plug in**	**plug in**
Cross section of external conductors with spring-loaded terminals: flexible with/without crimp connector	–	**0,20 - 2,50 mm², 24 - 12 AWG**
Spring-loaded terminals: Terminal points per connection	–	**2**
Stripping length	–	**9 mm**
Dimensions		
Height	**98,0 mm**	**100,0 mm**
Width	**17,5 mm**	**17,5 mm**
Depth	**120,0 mm**	**120,0 mm**
Weight	**170 g**	**170 g**

The standards current on 2009-12 apply.

Safety characteristic data

Operating mode	EN ISO 13849-1: 2006 PL	EN ISO 13849-1: 2006 Category	EN IEC 62061 SIL CL	EN IEC 62061 PFH$_D$ [1/h]	IEC 61511 SIL	IEC 61511 PFD	EN ISO 13849-1: 2006 T$_M$ [year]
Safety contacts, instantaneous	PL e	Cat. 4	SIL CL 3	2,31E-09	SIL 3	2,03E-06	20

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.

> **ATTENTION!**
>
> 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.

Order reference

Order reference					
Product type	**Features**			**Terminals**	**Order no.**
PNOZ s7.1		24 V DC		Screw terminals	750 167
PNOZ s7.1 C		24 V DC		Spring-loaded terminals	751 167

EC declaration of conformity

This product/these products meet the requirements of the directive 2006/42/EC for machinery of the European Parliament and of the Council. The complete EC Declaration of Conformity is available on the Internet at www.pilz.com/downloads.
Representative: Norbert Fröhlich, Pilz GmbH & Co. KG, Felix-Wankel-Str. 2, 73760 Ostfildern, Germany

▶ ...
In many countries we are
represented by our subsidiaries
and sales partners.

Please refer to our homepage
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