



PNOZ s7

Safety relays

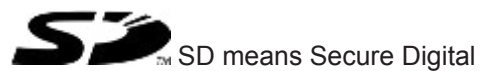


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PNOZ s7 safety relay

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

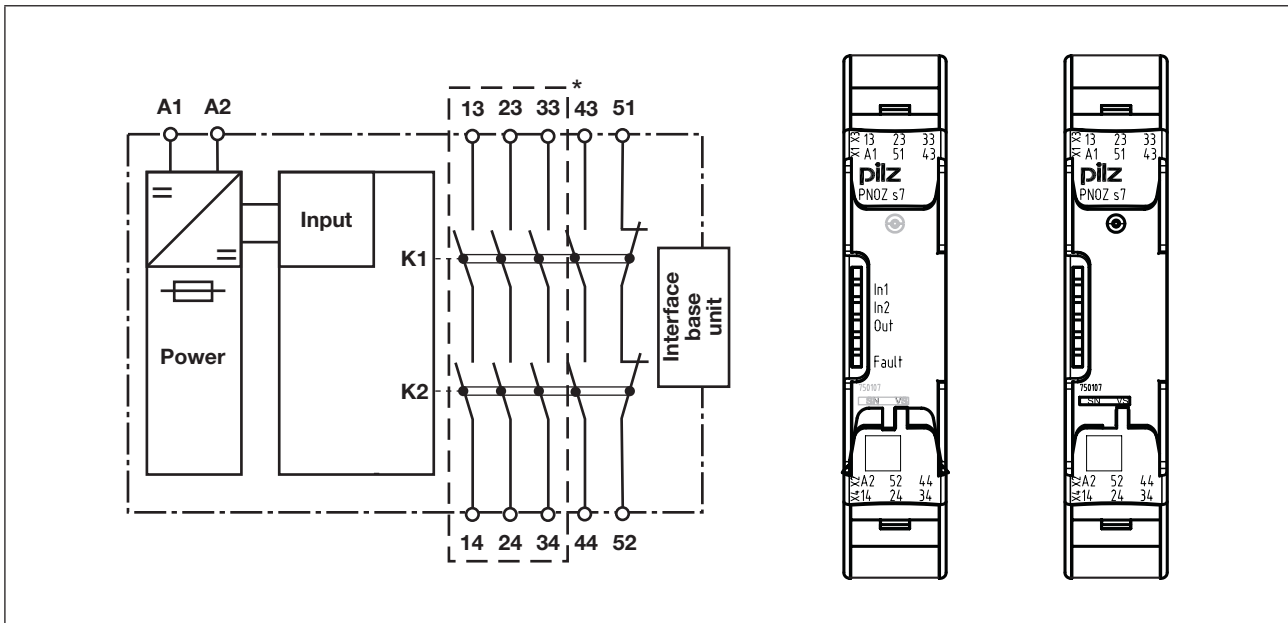
- ▶ Positive-guided relay outputs:
 - 4 safety contacts (N/O), instantaneous
 - 1 auxiliary contact (N/C), instantaneous
- ▶ Safe separation of safety contacts 13-14, 23-24, 33-34 from all other circuits
- ▶ LED for:
 - Input status, channel 1
 - Input status, channel 2
 - Switch status of the safety 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

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 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 expansion module using the connector supplied, before mounting the units to the DIN rail.

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.

Wiring

Please note:

- ▶ Information given in the "Technical details" must be followed.
- ▶ Outputs 13-14, 23-24, 33-34, 43-44 are safety contacts; outputs 51 -52 are auxiliary contacts (e.g. for display).
- ▶ Auxiliary contact 51-52 should **not** be used for safety circuits!
- ▶ To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- ▶ Calculation of the max. cable length 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.

Preparing for operation

- ▶ Supply voltage

Supply voltage	AC	DC
	/	

- ▶ Input circuit

Input circuit	Single-channel	Dual-channel
Base unit: Safety relay PNOZ X		/
Base unit: PNOZelog safety relay driven via semiconductor outputs (24 VDC)		/

▶ Feedback loop

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

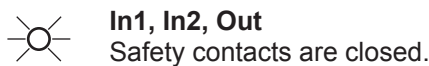
If a base unit and a contact expansion module from the PNOZsigma range are linked via the connector, no additional wiring is necessary.
Do not connect A1 to the contact expander module!

Operation

LEDs indicate the status and errors during operation:



Status indicators



Error indicators



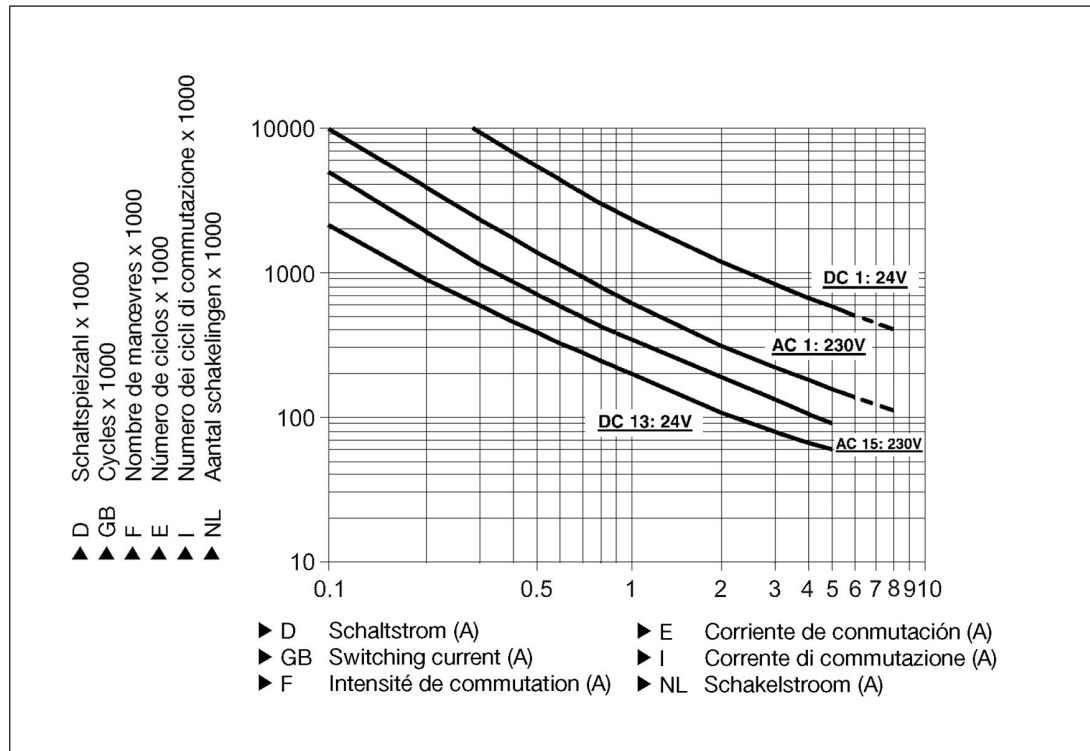
- ▶ Remedy: Insert plug terminator, switch supply voltage off and then on again.

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	750107	751107	751187
Approvals	CCC, CE, GOST, KOS-HA, TÜV, cULus Listed	CCC, CE, GOST, KOS-HA, TÜV, cULus Listed	CCC, CE, GOST, KOS-HA, TÜV, cULus Listed
Electrical data	750107	751107	751187
Supply voltage			
Voltage	24 V	24 V	24 V
Type	DC	DC	DC
Voltage tolerance	-20 %/+20 %	-20 %/+20 %	-20 %/+20 %
Output of external power supply (DC)	2,0 W	2,0 W	2,0 W
Residual ripple DC	20 %	20 %	20 %
Continuous duty	100 %	100 %	100 %
Max. overall cable resistance R _{lmax}			
Single-channel at UB DC	30 Ohm	30 Ohm	30 Ohm
Voltage at			
Input circuit DC	24,0 V	24,0 V	24,0 V
Current at			
Input circuit DC	70,0 mA	70,0 mA	70,0 mA
Number of output contacts			
Instantaneous safety contacts (N/O)	4	4	4
Auxiliary contacts (N/C)	1	1	1
Inputs	750107	751107	751187
Number	1	1	1
Relay outputs	750107	751107	751187
Max. short circuit current I _K	1 kA	1 kA	1 kA
Utilisation category			
In accordance with the standard	EN 60947-4-1	EN 60947-4-1	EN 60947-4-1
Auxiliary contacts, AC1 at	240 V	240 V	240 V
Min. current	0,01 A	0,01 A	0,01 A
Max. current	2,0 A	2,0 A	2,0 A
Max. power	500 VA	500 VA	500 VA
Auxiliary contacts, DC1 at	24 V	24 V	24 V
Min. current	0,01 A	0,01 A	0,01 A
Max. current	2,0 A	2,0 A	2,0 A
Max. power	50 W	50 W	50 W
Safety contacts, AC1 at	240 V	240 V	240 V
Max. current	6,0 A	6,0 A	6,0 A
Min. current	0,01 A	0,01 A	0,01 A
Max. power	1500 VA	1500 VA	1500 VA

Relay outputs	750107	751107	751187
Safety contacts, DC1 at	24 V	24 V	24 V
Max. current	6,0 A	6,0 A	6,0 A
Min. current	0,01 A	0,01 A	0,01 A
Max. power	150 W	150 W	150 W
Utilisation category			
In accordance with the standard	EN 60947-5-1	EN 60947-5-1	EN 60947-5-1
Auxiliary contacts, AC15 at	230 V	230 V	230 V
Max. current	2,0 A	2,0 A	2,0 A
Auxiliary contacts, DC13 (6 cycles/min) at	24 V	24 V	24 V
Max. current	2,0 A	2,0 A	2,0 A
Safety contacts, AC15 at	230 V	230 V	230 V
Max. current	5,0 A	5,0 A	5,0 A
Safety contacts, DC13 (6 cycles/min) at	24 V	24 V	24 V
Max. current	5,0 A	5,0 A	5,0 A
Contact fuse protection, external safety contacts			
In accordance with the standard	EN 60947-5-1	EN 60947-5-1	EN 60947-5-1
Blow-out fuse, quick	10 A	10 A	10 A
Blow-out fuse, slow	6 A	6 A	6 A
Circuit breaker, 24V AC/DC, characteristic B/C	6 A	6 A	6 A
Contact fuse protection, external auxiliary contacts			
Blow-out fuse, quick	4 A	4 A	4 A
Blow-out fuse, slow	2 A	2 A	2 A
Circuit breaker, 24 V AC/DC, characteristic B/C	2 A	2 A	2 A
Contact material	AgCuNi + 0,2 µm Au	AgCuNi + 0,2 µm Au	AgCuNi + 0,2 µm Au
Conventional thermal current while loading several contacts	750107	751107	751187
Ith per contact at UB DC			
Conv. therm. current with 1 contact	6,00 A	6,00 A	6,00 A
Conv. therm. current with 2 contacts	5,50 A	5,50 A	5,50 A
Conv. therm. current with 3 contacts	4,50 A	4,50 A	4,50 A
Conv. therm. current with 4 contacts	4,00 A	4,00 A	4,00 A

Times	750107	751107	751187
Switch-on delay			
With automatic reset after power on typ.	30 ms	30 ms	30 ms
With automatic reset after power on max.	50 ms	50 ms	50 ms
Delay-on de-energisation			
With E-STOP typ.	18 ms	18 ms	18 ms
With E-STOP max.	30 ms	30 ms	30 ms
With power failure typ.	18 ms	18 ms	18 ms
With power failure max.	30 ms	30 ms	30 ms
Environmental data	750107	751107	751187
Climatic suitability	EN 60068-2-78	EN 60068-2-78	EN 60068-2-78
Ambient temperature			
Temperature range	-10 - 55 °C	-10 - 55 °C	-10 - 55 °C
Storage temperature			
Temperature range	-40 - 85 °C	-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	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	EN 60068-2-6
Frequency	10,0 - 55,0 Hz	10,0 - 55,0 Hz	10,0 - 55,0 Hz
Max. amplitude	0,35 mm	0,35 mm	0,35 mm
Airgap creepage			
In accordance with the standard	EN 60947-1	EN 60947-1	EN 60947-1
Overvoltage category	III	III	III
Pollution degree	2	2	2
Rated insulation voltage	250 V	250 V	250 V
Rated impulse withstand voltage	6,00 kV	6,00 kV	6,00 kV
Protection type			
Mounting (e.g. cabinet)	IP54	IP54	IP54
Housing	IP40	IP40	IP40
Terminals	IP20	IP20	IP20
Mechanical data	750107	751107	751187
Mounting position	Any	Any	Any
Mechanical life	10,000,000 cycles	10,000,000 cycles	10,000,000 cycles
Material			
Bottom	PC	PC	PC
Front	PC	PC	PC
Top	PC	PC	PC

Mechanical data	750107	751107	751187
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	Cage clamp terminal
Mounting type	plug in	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	0,20 - 2,50 mm², 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	–	2	2
Stripping length	–	9 mm	9 mm
Dimensions			
Height	98,0 mm	100,0 mm	100,0 mm
Width	17,5 mm	17,5 mm	17,5 mm
Depth	120,0 mm	120,0 mm	120,0 mm
Weight	170 g	170 g	170 g

The standards current on 2009-12 apply.

Safety characteristic data

Operating mode	EN ISO 13849-1: 2006	EN ISO 13849-1: 2006	EN IEC 62061	EN IEC 62061	IEC 61511	IEC 61511	EN ISO 13849-1: 2006
	PL	Category	SIL CL	PFH_D [1/h]	SIL	PFD	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		24 VDC		Screw terminals	750 107
PNOZ s7 C		24 VDC		Spring-loaded terminals	751 107
PNOZ s7 C (coated version)		24 VDC		Spring-loaded terminals	751 187

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.

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