



PNOZ c2

Safety relays

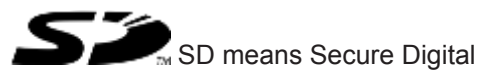


pilz

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Introduction

Validity of documentation

This documentation is valid for the product PNOZ c2. It is valid until new documentation is published.

This operating manual explains the function and operation, describes the installation and provides guidelines on how to connect the product.

Retaining the documentation

This documentation is intended for instruction and should be retained for future reference.

Definition of symbols

Information that is particularly important is identified as follows:



DANGER!

This warning must be heeded! It warns of a hazardous situation that poses an immediate threat of serious injury and death and indicates preventive measures that can be taken.



WARNING!

This warning must be heeded! It warns of a hazardous situation that could lead to serious injury and death and indicates preventive measures that can be taken.



CAUTION!

This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.



NOTICE

This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken. It also highlights areas within the text that are of particular importance.

**INFORMATION**

This gives advice on applications and provides information on special features.

Intended use

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 dual-channel positive switching OSSDs such as

- ▶ periodically tested light guard type 2 in accordance with EN 61496-1
- ▶ Light guard type 4 EN 61496-1
- ▶ safe sensors with semiconductor outputs

The safety relay provides a safety-related interruption of a safety circuit.

The following is deemed improper use in particular:

- ▶ Any component, technical or electrical modification to a product
- ▶ Use of a product outside the areas described in the product documentation
- ▶ Any use that is not in accordance with the documented technical details.

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.
- ▶ Note for overvoltage category III: If voltages higher than low voltage (>50 VAC or >120 VDC) are present on the unit, connected control elements and sensors must have a rated insulation voltage of at least 250 V.

Unit features

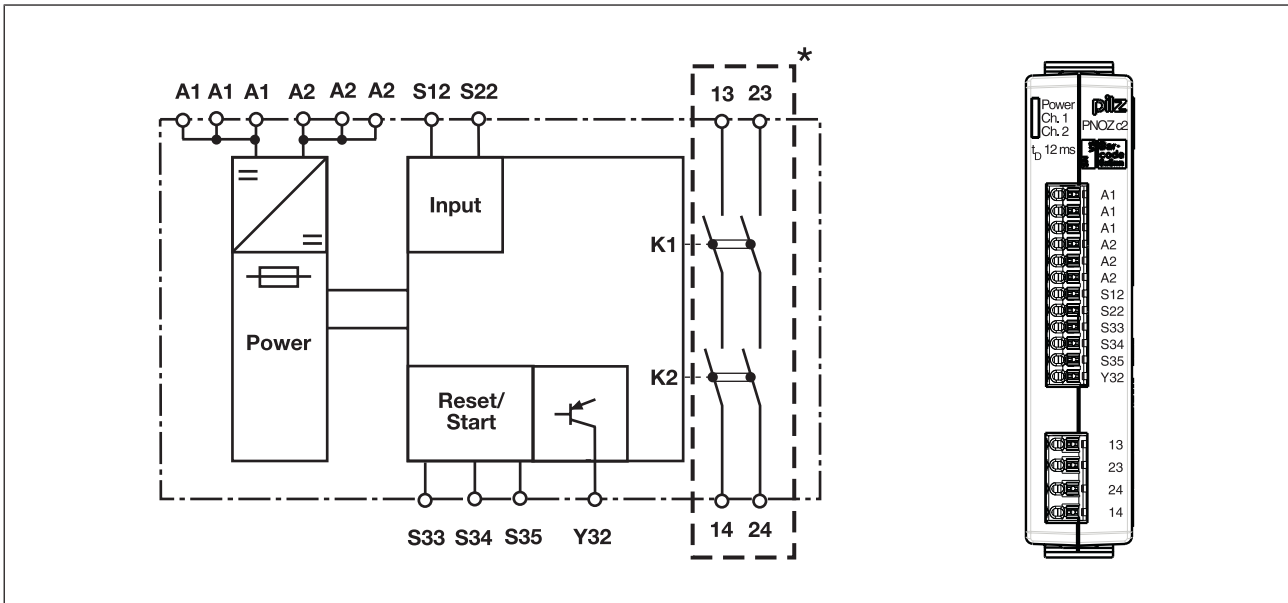
- ▶ Positive-guided relay outputs:
 - 2 safety contacts (N/O), instantaneous
- ▶ 1 semiconductor output (auxiliary output)
- ▶ Connection options for:
 - Type 2 or Type 4 light guards
 - safe sensors with semiconductor outputs (OSSD)
 - Start button
- ▶ LED display for:
 - Supply voltage
 - Switch status channel 1
 - Switch status channel 2

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.

Block diagram/terminal configuration



*Insulation to the non-marked area: Protective separation (overvoltage category III),
Insulation of relay contacts against each other: Basic insulation (overvoltage category III),
protective separation (overvoltage category II)

Function description

When the supply voltage is supplied, the "POWER" LED illuminates. The unit is ready for operation when the start circuit is closed or when a start contact is opened and closed again in the start circuit.

- ▶ High signal at input circuit (e.g. light guard not interrupted): The safety contacts are closed and the semiconductor output transmits.
- ▶ Low signal at the input circuit (e.g. light guard is interrupted): The safety contacts are open and the semiconductor output is de-energised.
- ▶ Dual-channel operation without detection of shorts across contacts: redundant input circuit, detects earth faults in the start and input circuit.
- ▶ Automatic start: Unit becomes active as soon as there is a high signal at the input circuit.
- ▶ Monitored start: Unit is active once there is a high signal at the input circuit and then the start circuit is closed.
- ▶ Increase in the number of available instantaneous safety contacts by connecting contact expander modules or external contactors.

Installation

- ▶ The unit 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).

Wiring

Please note:

- ▶ Information given in the "Technical details" must be followed.
- ▶ Outputs 13-14 and 23-24 are safety contacts, the semiconductor output Y32 is an auxiliary output (e.g. for display).
- ▶ Semiconductor output Y32 should **not** be used for safety circuits!
- ▶ To prevent contact welding, a fuse should be connected before the output contacts (see Technical details).
- ▶ Use copper wire that can withstand 60/75 °C.
- ▶ Do **not** connect capacitive load.
- ▶ The power supply must comply with the regulations for extra low voltages with protective electrical separation (SELV, PELV) in accordance with VDE 0100, Part 410.



INFORMATION

The voltage at the inputs S12, S22 has to be at least 24 V DC less the lower tolerance value of the supply voltage (s. technical details). When the voltage is too low, increase the supply voltage until at least the lower tolerance value is reached at the inputs.

Preparing for operation

Supply voltage	AC	DC
	/	
Input circuit	Single-channel	Dual-channel
Light guard or safe sensor with detection of shorts across contacts and short circuit proof OSSDs	/	



NOTICE

It must **not** be possible to disconnect the supply voltage of PNOZ c2 and the supply voltage for the safe sensor or light guard separately.

* When operating with a light guard: Use the free connections A1 and A2 for connecting the supply voltage of the sender.

Start circuit/feedback loop	Start circuit	Feedback loop
automatic start		
monitored start		



NOTICE

The unit automatically starts when the start circuit S33-S35 is overridden. Use external circuit measures to prevent an unexpected restart.

Semiconductor output

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

Operation

The unit is ready for operation when the Power LED is permanently lit.

LEDs indicate the status and errors during operation:

Status indicators



Power

Supply voltage is present.



CH.1

Safety contacts of channel 1 are closed.



CH.2

Safety contacts of channel 2 are closed.

Faults - malfunctions

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

Technical details

General	710002
Approvals	CCC, CE, EAC (Eurasian), TÜV, cULus Listed
Electrical data	710002
Supply voltage	
Voltage	24 V
Kind	DC
Voltage tolerance	-20 %/+20 %
Output of external power supply (DC)	3,0 W
Residual ripple DC	20 %
Continuous duty	100 %
Max. inrush current impulse	
Current pulse, A1	2,00 A
Pulse duration, A1	4,0000 ms
Current pulse, input circuit	0,20 A
Pulse duration, input circuit	70,0 ms
Current pulse, feedback loop	0,15 A
Pulse duration, feedback loop	1,0 ms
Current pulse, start circuit	0,15 A
Pulse duration, start circuit	1,0 ms
Voltage at	
Input circuit DC	24,0 V
Start circuit DC	24,0 V
Feedback loop DC	24,0 V

Electrical data	710002
Current at	
Input circuit DC	30,0 mA
Start circuit DC	40,0 mA
Feedback loop	40,0 mA
Number of output contacts	
Safety contacts (N/O), instantaneous	2
Inputs	710002
Number	2
Semiconductor outputs	710002
Number	1
Voltage	24,0 V
Current	20 mA
Relay outputs	710002
Max. short circuit current IK	1 kA
Utilisation category	
In accordance with the standard	EN 60947-4-1
Safety contacts, AC1 at	240 V
Max. current	3,0 A
Min. current	0,01 A
Max. power	750 VA
Safety contacts, DC 1 at	24 V
Max. current	4,0 A
Min. current	0,01 A
Max. power	100 W
Utilisation category	
In accordance with the standard	EN 60947-5-1
Safety contacts, AC15 at	230 V
Max. current	1,5 A
Safety contacts DC13 (6 cycles/min) at	24 V
Max. current	1,5 A
Utilisation category in accordance with UL	
Voltage	240 V AC G.U. (same polarity)
With current	3,0 A
Voltage	24 V DC G. U.
With current	4,0 A
Pilot Duty	B300, R300
Contact fuse protection external, safety contacts	
In accordance with the standard	EN 60947-5-1
Max. melting integral	66 A²s
Blow-out fuse, quick	4 A
Blow-out fuse, slow	3,15 A
Blow-out fuse, gG	4 A
Circuit breaker, 24V AC/DC, characteristic B/C	3 A
Conventional thermal current	4,0 A
Contact material	AgCuNi + 0,2 µm Au

Times	710002
Switch-on delay	
With automatic start typ.	200 ms
With automatic start max.	550 ms
With monitored start with rising edge typ.	20 ms
With monitored start with rising edge max.	50 ms
Delay-on de-energisation	
With E-STOP typ.	5 ms
With E-STOP max.	12 ms
Recovery time at max. switching frequency 1/s	
After E-STOP	300 ms
Waiting period with a monitored start	
With rising edge	300 ms
Min. start pulse duration with a monitored start	
With rising edge	30 ms
Supply interruption before de-energisation	20 ms
Simultaneity, channel 1 and 2	∞
Environmental data	710002
Climatic suitability	EN 60068-2-78
Ambient temperature	
Temperature range	-10 - 55 °C
Storage temperature	
Temperature range	-40 - 85 °C
EMC	EN 60947-5-1, EN 61000-6-2, EN 61000-6-4
Vibration	
In accordance with the standard	EN 60068-2-6
Frequency	10,0 - 55,0 Hz
Amplitude	0,35 mm
Airgap creepage	
In accordance with the standard	EN 60947-1
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	250 V
Rated impulse withstand voltage	6,00 kV
Protection type	
Mounting area (e.g. control cabinet)	IP54
Housing	IP40
Terminals	IP20
Mechanical data	710002
Mounting position	Any
Mechanical life	10,000,000 cycles
Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal
Mounting type	Fixed

Mechanical data	710002
Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector	0,25 - 1,50 mm², 24 - 16 AWG
Spring-loaded terminals: Terminal points per connection	1
Stripping length	9 mm
Dimensions	
Height	105,0 mm
Width	22,5 mm
Depth	100,0 mm
Weight	160 g

The standards current on 2012-12 apply.

Safety characteristic data

Operating mode	EN ISO 13849-1: 2008 PL	EN ISO 13849-1: 2008 Category	EN IEC 62061 SIL CL	EN IEC 62061 PFH _D [1/h]	IEC 61511 SIL	IEC 61511 PFD	EN ISO 13849-1: 2008 T _M [year]
Safety contacts, instantaneous	PL e	Cat. 4	SIL CL 3	2,31E-09	SIL 3	2,03E-06	20



INFORMATION

All the units used within a safety function must be considered when determining the safety characteristic data of the overall system. As well as these safety characteristic data, the systematic and structural characteristic data have to be taken into account.



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.

Supplementary data



CAUTION!

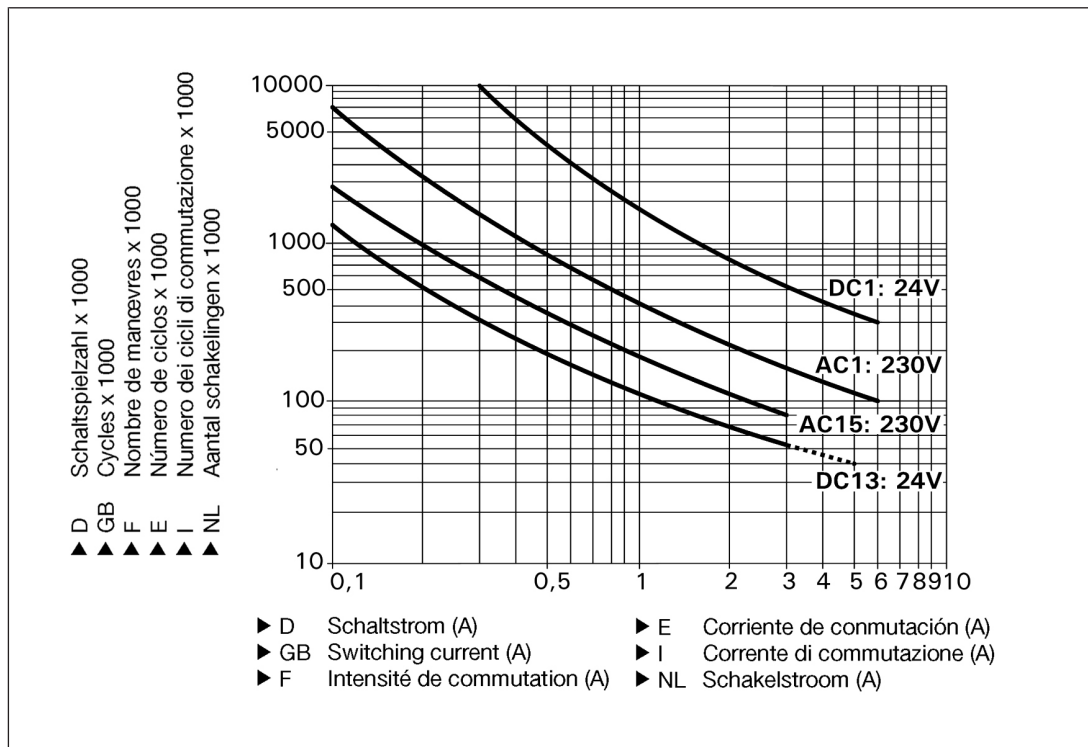
It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

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.

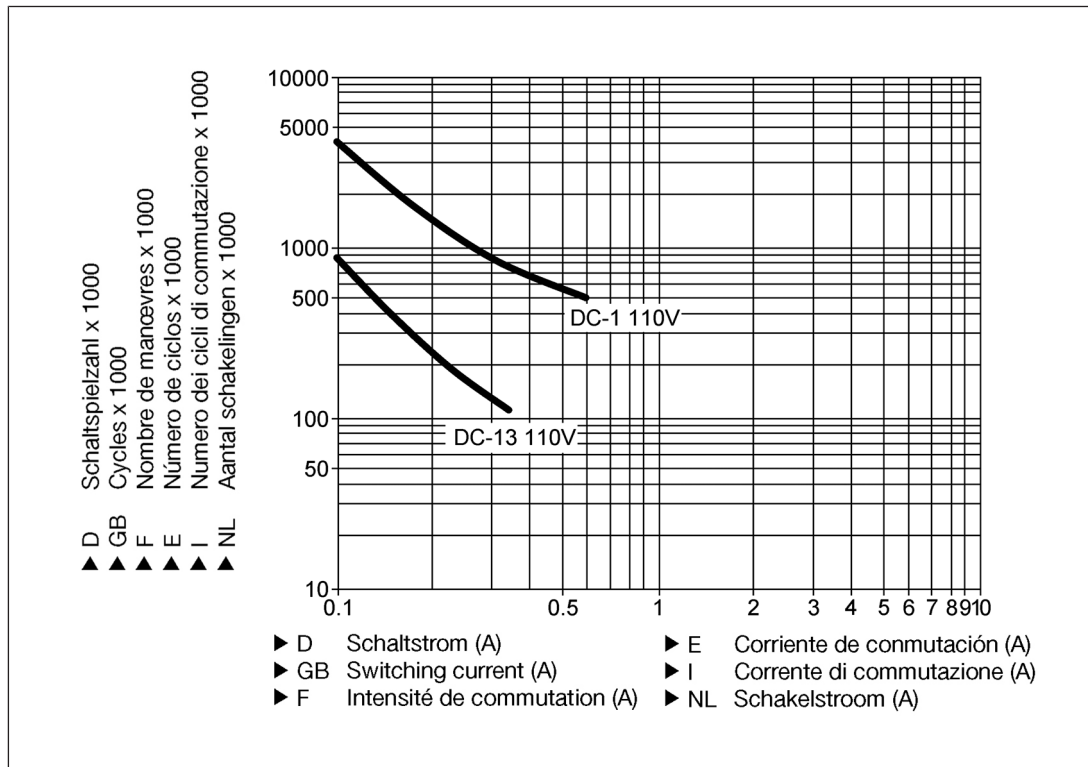
Service life graph

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.

Service life graphs at 24 V DC and 230 V AC



Service life graphs at 110 V DC

**Example**

- ▶ Inductive load: 0.2 A
- ▶ Utilisation category: AC15
- ▶ Contact service life: 1 000 000 cycles

Provided the application requires fewer than 1 000 000 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 DC contactors, use flywheel diodes for spark suppression.

Order reference

Type	Features	Terminals	Order no.
PNOZ c2	24 VDC	With spring-loaded terminals	710 002

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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