



PNOZ s22

PILZ
THE SPIRIT OF SAFETY

► Safety relays

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Where unavoidable, for reasons of readability, the masculine form has been selected when formulating this document. We do assure you that all persons are regarded without discrimination and on an equal basis.

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SD means Secure Digital

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Introduction

Validity of documentation

This documentation is valid for the product PNOZ s22. 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.

Using the documentation

This document is intended for instruction. Only install and commission the product if you have read and understood this document. The document 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.

Safety**Intended use**


The unit meets the requirements of EN 60947-5-1 and EN 60204-1. The contact expansion module is used to increase the number of instantaneous safety contacts available on a base unit. Base units are

- ▶ Speed monitor PNOZ s30
- ▶ PNOZmulti Mini base units PNOZ mm0.1p, PNOZ mm0.2p

The max. achievable safety level depends on the base unit. The expansion module may not exceed this. The safety-related characteristic values stated under [safety-related characteristic data](#) [ 17] can only be achieved if the base unit also exhibits these safety characteristic values.

Improper use

The following is deemed improper use in particular

- ▶ Any component, technical or electrical modification to the product,
- ▶ Use of the product outside the areas described in this operating manual,
- ▶ Use of the product outside the technical details (see [Technical details](#) [ 12]).

**NOTICE****EMC-compliant electrical installation**

The product is designed for use in an industrial environment. The product may cause interference if installed in other environments. If installed in other environments, measures should be taken to comply with the applicable standards and directives for the respective installation site with regard to interference.

Safety regulations

Safety assessment

Before using a device, a safety assessment in accordance with the Machinery Directive is required.

The product as an individual component fulfils the functional safety requirements in accordance with EN ISO 13849 and EN 62061. However, this does not guarantee the functional safety of the overall plant/machine. To achieve the relevant safety level of the overall plant/machine's required safety functions, each safety function needs to be considered separately.

Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, maintained and decommissioned by persons who are competent to do so.

A competent person is a qualified and knowledgeable person who, because of their training, experience and current professional activity, has the specialist knowledge required. To be able to inspect, assess and operate devices, systems and machines, the person has to be informed of the state of the art and the applicable national, European and international laws, directives and standards.

It is the company's responsibility only to employ personnel who

- ▶ Are familiar with the basic regulations concerning health and safety / accident prevention,
- ▶ Have read and understood the information provided in the section entitled Safety
- ▶ Have a good knowledge of the generic and specialist standards applicable to the specific application.

Warranty and liability

All claims to warranty and liability will be rendered invalid if

- ▶ The product was used contrary to the purpose for which it is intended,
- ▶ Damage can be attributed to not having followed the guidelines in the manual,
- ▶ Operating personnel are not suitably qualified,
- ▶ Any type of modification has been made (e.g. exchanging components on the PCB boards, soldering work etc.).

Disposal

- ▶ In safety-related applications, please comply with the mission time T_M in the safety-related characteristic data.
- ▶ When decommissioning, please comply with local regulations regarding the disposal of electronic devices (e.g. Electrical and Electronic Equipment Act).

For your safety

The unit meets all the necessary conditions for safe operation. However, please note the following:

- ▶ 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

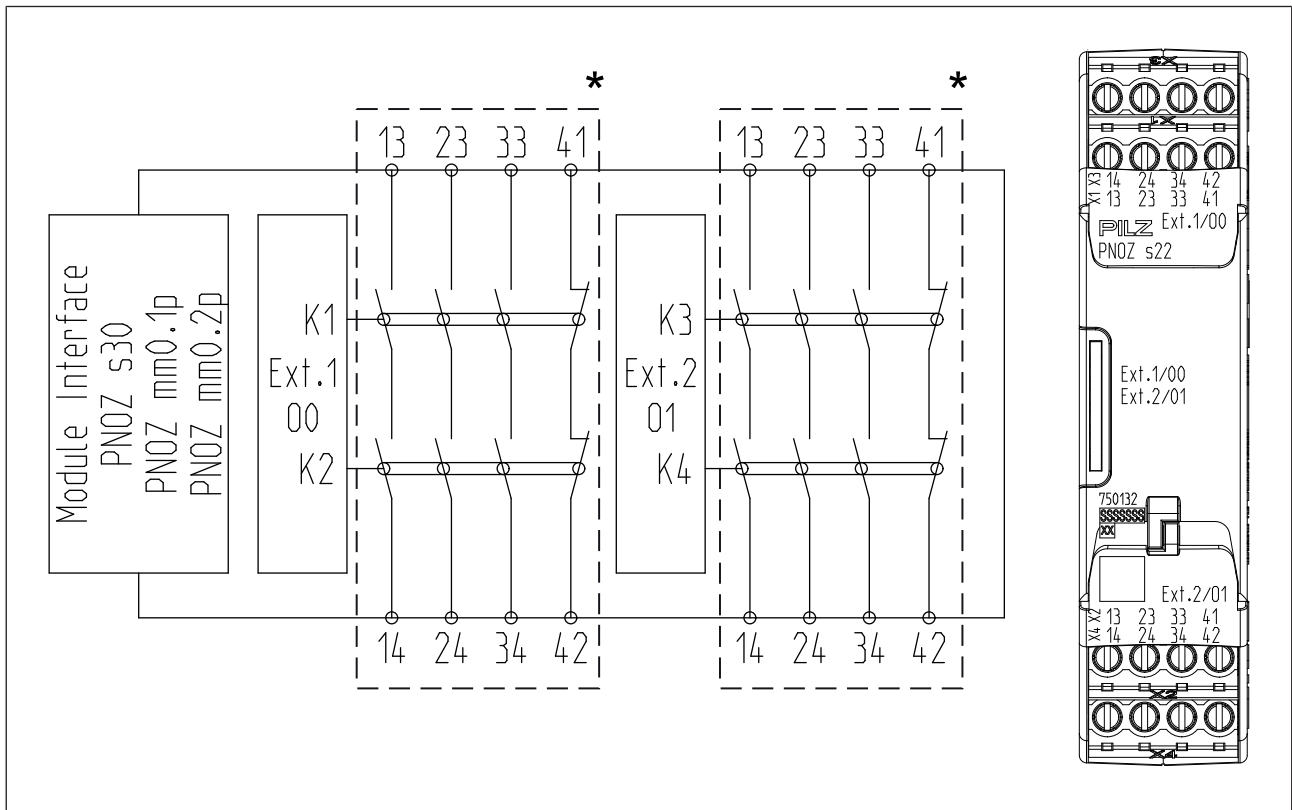
- ▶ Positive-guided relay outputs:
 - 6 safety contacts (N/O), instantaneous
 - 2 auxiliary contacts (N/C), instantaneous
- ▶ 3 safety contacts and 1 auxiliary contact each; these can be controlled separately
- ▶ LED indicator for:
 - Input state of channel Ext.1/O0
 - Input state of channel Ext.2/O1
- ▶ Plug-in connection terminals (either spring-loaded terminal or screw terminal)
- ▶ See order reference for unit types

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/terminal configuration



*Safe separation from non-marked area in accordance with EN 60947-1, 6 kV, basic insulation between all safety contacts.

Function description

- ▶ Dual-channel operation and supply voltage via PNOZsigma connector
- ▶ 3 safety contacts and 1 auxiliary contact each; these can be controlled separately

Installation

Connect the contact expansion block to the PNOZ s30 or base unit PNOZ mm0.1p/ PNOZ mm0.2p

- ▶ Connect the contact expansion block 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.
- ▶ 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.

Wiring

Please note:

- ▶ Information given in the "[Technical details \[12\]](#)" must be followed.
- ▶ The wiring guidelines in the base units' operating instructions must be taken into account.
- ▶ Outputs 13-14, 23-24, 33-34 are safety contacts; output 41-42 is an auxiliary contact (e.g. for display).
- ▶ Auxiliary contact 41-42 should **not** be used for safety circuits!
- ▶ To prevent contact welding, a fuse should be connected before the output contacts (see [Technical details \[12\]](#)).
- ▶ Use copper wiring with a temperature stability of 75 °C.
- ▶ To prevent EMC interferences (particularly common-mode interferences) the measures described in EN 60204-1 must be executed. This includes the separate routing of cables of the control circuits (input, start and feedback loop) from other cables for energy transmission or the shielding of cables, for example.
- ▶ Adequate protection must be provided on all output contacts with capacitive and inductive loads.

Preparing for operation

Connection

| | AC | DC |
|--|----|----|
| Supply voltage/input circuit/feedback loop | / | |

| Connection to speed monitor PNOZ s30/PNOZmulti Mini base unit | Base unit: Speed monitor PNOZ s30 | Base unit: Small control system PNOZmulti Mini |
|--|-----------------------------------|--|
| The feedback loop is connected and evaluated via the connector | | |

Operation

When the relay outputs are switched on, the mechanical contact on the relay cannot be tested automatically. Depending on the operational environment, measures to detect the non-opening of switching elements may be required under some circumstances.

When the product is used in accordance with the European Machinery Directive, a check must be carried out to ensure that the safety contacts on the relay outputs open correctly. Open the safety contacts (switch off output) and start the device again, so that the internal diagnostics can check that the safety contacts open correctly

- ▶ for SIL CL 3/PL e at least 1x per month
- ▶ for SIL CL 2/PL d at least 1x per year



NOTICE

The safety functions should be checked after initial commissioning and each time the plant/machine is changed. The safety functions may only be checked by qualified personnel.

LEDs indicate the status and errors during operation:



LED on

Status indicators



EXT.1/O0

Channel Ext.1/O0 activated.



EXT.2/O1

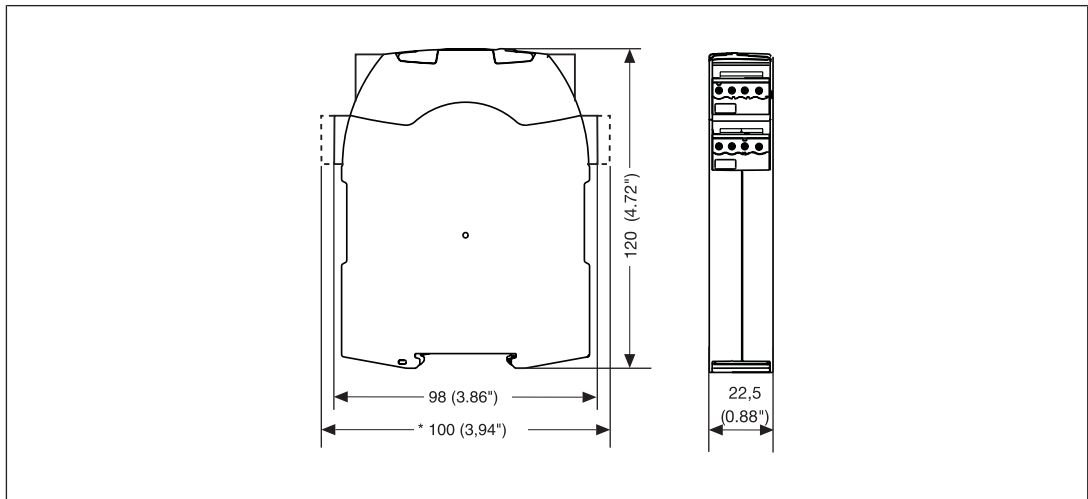
Channel Ext.2/O1 activated.

Faults - malfunctions

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

Dimensions in mm

*with spring-loaded terminals



Technical details

| General | 750132 | 751132 |
|---|---------------------------------------|---------------------------------------|
| Certifications | CCC, CE, EAC, TÜV, UKCA, cULus Listed | CCC, CE, EAC, TÜV, UKCA, cULus Listed |
| Electrical data | 750132 | 751132 |
| Supply voltage | | |
| Voltage | 24 V | 24 V |
| Kind | DC | DC |
| Power consumption | 1,5 W | 1,5 W |
| Duty cycle | 100 % | 100 % |
| Relay outputs | 750132 | 751132 |
| Number of output contacts | | |
| Safety contacts (N/O), instantaneous | 6 | 6 |
| Auxiliary contacts (N/C) | 2 | 2 |
| Max. short circuit current I _K | 1 kA | 1 kA |
| Utilisation category | | |
| In accordance with the standard | EN 60947-4-1 | EN 60947-4-1 |

| Relay outputs | 750132 | 751132 |
|---|--------------------------------------|--------------------------------------|
| Utilisation category of safety con- tacts | | |
| AC1 at | 240 V | 240 V |
| Min. current | 0,003 A | 0,003 A |
| Max. current | 6 A | 6 A |
| Min. output | 0,04 VA | 0,04 VA |
| Max. power | 1500 VA | 1500 VA |
| DC1 at | 24 V | 24 V |
| Min. current | 0,003 A | 0,003 A |
| Max. current | 6 A | 6 A |
| Min. output | 0,04 W | 0,04 W |
| Max. power | 150 W | 150 W |
| Utilisation category of auxiliary con- tacts | | |
| AC1 at | 240 V | 240 V |
| Min. current | 0,003 A | 0,003 A |
| Max. current | 6 A | 6 A |
| Min. output | 0,04 VA | 0,04 VA |
| Max. power | 1500 VA | 1500 VA |
| DC1 at | 24 V | 24 V |
| Min. current | 0,003 A | 0,003 A |
| Max. current | 6 A | 6 A |
| Min. output | 0,04 W | 0,04 W |
| Max. power | 150 W | 150 W |
| Utilisation category | | |
| In accordance with the standard | EN 60947-5-1 | EN 60947-5-1 |
| Utilisation category of safety con- tacts | | |
| AC15 at | 230 V | 230 V |
| Max. current | 3 A | 3 A |
| DC13 (6 cycles/min) at | 24 V | 24 V |
| Max. current | 4 A | 4 A |
| Utilisation category of auxiliary con- tacts | | |
| AC15 at | 230 V | 230 V |
| Max. current | 4 A | 4 A |
| DC13 (6 cycles/min) at | 24 V | 24 V |
| Max. current | 4 A | 4 A |
| Utilisation category in accordance with UL | | |
| Voltage | 240 V AC G.U. (same polarity) | 240 V AC G.U. (same polarity) |
| With current | 6 A | 6 A |
| Voltage | 24 V DC G. U. | 24 V DC G. U. |
| With current | 6 A | 6 A |

| Relay outputs | 750132 | 751132 |
|--|---|---|
| External contact fuse protection, safety contacts | | |
| In accordance with the standard | EN 60947-5-1 | EN 60947-5-1 |
| Max. melting integral | 66 A²s | 66 A²s |
| Blow-out fuse, quick | 6 A | 6 A |
| Blow-out fuse, slow | 4 A | 4 A |
| Blow-out fuse, gG | 6 A | 6 A |
| Circuit breaker 24V AC/DC, characteristic B/C | 4 A | 4 A |
| External contact fuse protection, auxiliary contacts | | |
| Max. melting integral | 66 A²s | 66 A²s |
| Blow-out fuse, quick | 6 A | 6 A |
| Blow-out fuse, slow | 4 A | 4 A |
| Blow-out fuse, gG | 6 A | 6 A |
| Circuit breaker 24 V AC/DC, characteristic B/C | 4 A | 4 A |
| Contact material | AgCuNi + 0,2 µm Au | AgCuNi + 0,2 µm Au |
| Conventional thermal current while loading several contacts | 750132 | 751132 |
| I _{th} per contact at UB DC; AC1: 240 V, DC1: 24 V | | |
| Conv. therm. current with 1 contact | 6 A | 6 A |
| Conv. therm. current with 2 contacts | 5 A | 5 A |
| Conv. therm. current with 3 contacts | 4 A | 4 A |
| Times | 750132 | 751132 |
| Switch-on delay | | |
| With automatic start typ. | 11 ms | 11 ms |
| With automatic start max. | 20 ms | 20 ms |
| Delay-on de-energisation | | |
| With E-STOP typ. | 12 ms | 12 ms |
| With E-STOP max. | 20 ms | 20 ms |
| Environmental data | 750132 | 751132 |
| 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 |
| Climatic suitability | | |
| Humidity | 93 % r. h. at 40 °C | 93 % r. h. at 40 °C |
| Condensation during operation | Not permitted | Not permitted |
| EMC | EN 60947-5-1, EN 61000-6-2, EN 61000-6-4, EN 61326-3-1 | EN 60947-5-1, EN 61000-6-2, EN 61000-6-4, EN 61326-3-1 |

| Environmental data | 750132 | 751132 |
|---|---|--|
| Vibration | | |
| In accordance with the standard | EN 60068-2-6 | EN 60068-2-6 |
| Frequency | 10 - 55 Hz | 10 - 55 Hz |
| 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 kV | 6 kV |
| Protection type | | |
| Housing | IP40 | IP40 |
| Terminals | IP20 | IP20 |
| Mounting area (e.g. control cabinet) | IP54 | IP54 |
| Mechanical data | 750132 | 751132 |
| Mounting position | Any | Any |
| Mechanical life | 10,000,000 cycles | 10,000,000 cycles |
| Material | | |
| Bottom | PC | PC |
| Front | PC | PC |
| Top | PC | PC |
| Connection type | Screw terminal | Spring-loaded terminal |
| Mounting type | plug-in | plug-in |
| Conductor cross section with screw terminals | | |
| 1 core flexible | 0,25 - 2,5 mm², 24 - 12 AWG | – |
| 2 core with the same cross section, flexible with crimp connectors, no plastic sleeve | 0,25 - 1 mm², 24 - 16 AWG | – |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | 0,2 - 1,5 mm², 24 - 16 AWG | – |
| Torque setting with screw terminals | 0,5 Nm | – |
| Stripping length with screw terminals | 8 mm | – |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | – | 0,2 - 2,5 mm², 24 - 12 AWG |
| Spring-loaded terminals: Terminal points per connection | – | 2 |
| Stripping length with spring-loaded terminals | – | 9 mm |

| Mechanical data | 750132 | 751132 |
|------------------------|----------------|----------------|
| Dimensions | | |
| Height | 98 mm | 100 mm |
| Width | 22,5 mm | 22,5 mm |
| Depth | 120 mm | 120 mm |
| Weight | 265 g | 265 g |

Where standards are undated, the 2022-09 latest editions shall apply.

The values for conventional thermal current stated in the technical details apply when the contacts from Ext.1/O0 **and** Ext.2/O1 are under load simultaneously.

Conventional thermal current when either the contacts from Ext.1/O0 **or** the contacts from Ext.2/O1 are under load:

| Number of contacts in total | I_{th} [A] per contact |
|------------------------------------|--|
| 1 | 6 A |
| 2 | 6 A |
| 3 | 5 A |

Safety characteristic data



NOTICE

You must comply with the safety characteristic data in order to achieve the required safety level for your plant/machine.

| | | | | | | | |
|-----------------------|-----------------------------|-----------------------------|----------------------------|------------------------------|---------------------|---------------------|-----------------------------|
| Operating mode | EN ISO 13849-1: 2015 | EN ISO 13849-1: 2015 | EN IEC 62061 | EN IEC 62061 | EN/IEC 61511 | EN/IEC 61511 | EN ISO 13849-1: 2015 |
| | PL | Category | SIL CL/ maximum SIL | PFH_D [1/h] | SIL | PFD | T_M [year] |

Safety contacts, instantaneous

| | | | | | | |
|-------------|---------------|--------------|-----------------|--------------|-----------------|-----------|
| PL e | Cat. 4 | SIL 3 | 2,31E-09 | SIL 3 | 2,03E-06 | 20 |
|-------------|---------------|--------------|-----------------|--------------|-----------------|-----------|



NOTICE

The safety-related characteristic data applies per channel of the contact expansion block. The safety-related characteristic data of the base unit and all other devices that are used must be taken into account when calculating the safety function. We recommend that you use the PAScal software tool to calculate the safety function's SIL/PL values.

Explanatory notes for the safety-related characteristic data:

- ▶ Safety characteristic data in accordance with EN IEC 62061 and EN/IEC 61511 was calculated based on EN/IEC 61508.
- ▶ T_M is the maximum mission time in accordance with EN ISO 13849-1. The value also applies as the retest interval in accordance with EN/IEC 61508-6 and EN/IEC 61511 and as the proof test interval and mission time in accordance with EN IEC 62061.

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.

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 switch frequency and the load of the relay output. If the service life graphs are not accessible, the stated PFH value can be used irrespective of the switch 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.

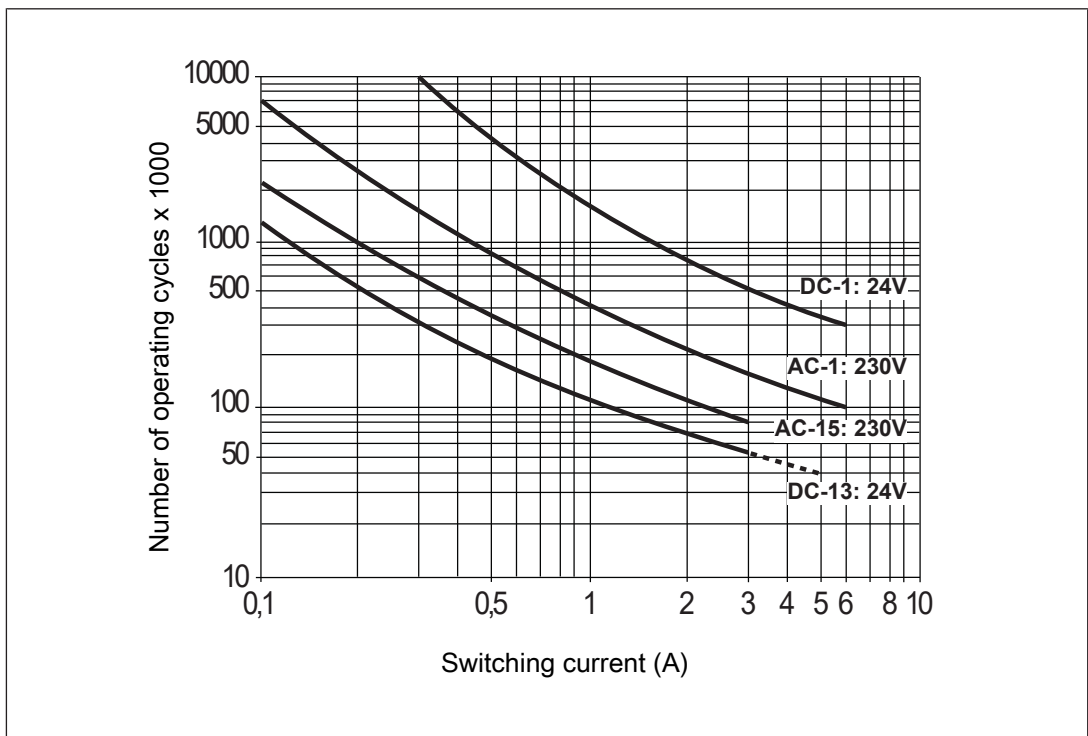


Fig.: Service life graphs at 24 VDC and 230 VAC

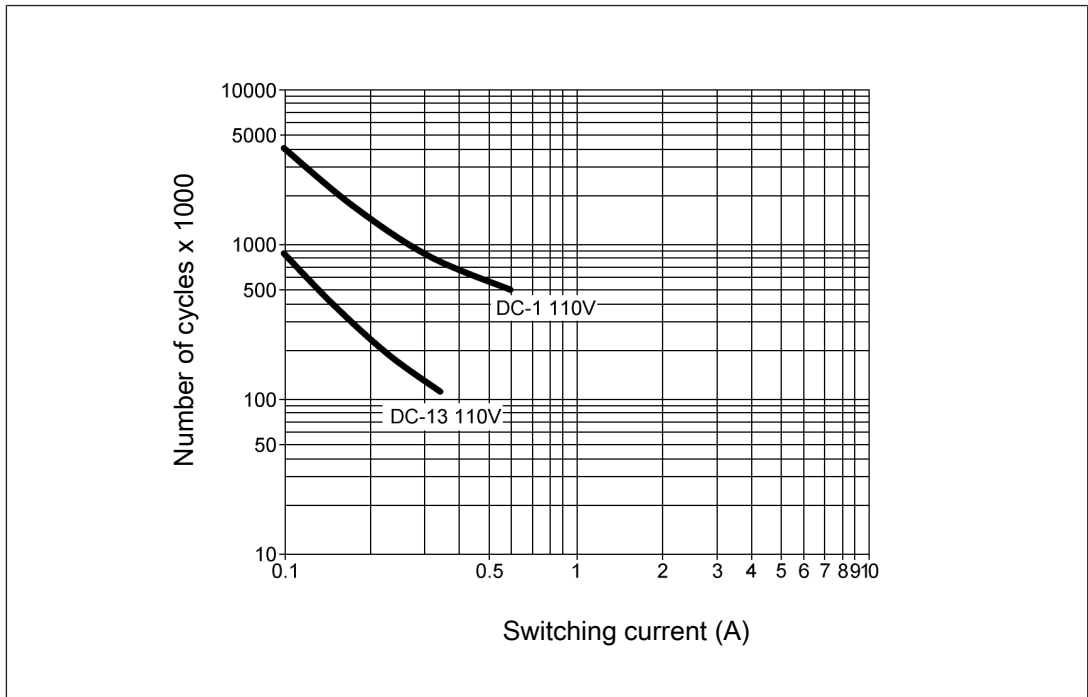


Fig.: Service life graphs at 110 VDC

Example

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

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value (see [Technical details \[12\]](#)) can be used in the calculation.

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

Permitted operating height in accordance with EN 60664-1

The values stated in the technical details apply to the use of the device in operating heights up to max. 2000 m above sea level. When used in greater heights, constraints have to be taken into account:

- ▶ Permitted maximum operating height 5000 m
- ▶ Reduction of rated insulation voltage and rated impulse withstand voltage for applications with safe separation:

| Maximum operation height | Rated insulation voltage | Overvoltage category | Max. rated impulse withstand voltage |
|--------------------------|--------------------------|----------------------|--------------------------------------|
| 3000 m | 150 V | II | 2.5 kV |
| | 100 V | III | 2.5 kV |
| 4000 m | 150 V | II | 2.5 kV |
| | 100 V | III | 2.5 kV |
| 5000 m | 150 V | II | 2.5 kV |
| | 100 V | III | 2.5 kV |

- ▶ Reduction of rated insulation voltage and rated impulse withstand voltage for applications with basic insulation:

| Maximum operation height | Rated insulation voltage | Overvoltage category | Max. rated impulse withstand voltage |
|--------------------------|--------------------------|----------------------|--------------------------------------|
| 3000 m | 250 V | II | 2.5 kV |
| | 150 V | III | 2.5 kV |
| 4000 m | 250 V | II | 2.5 kV |
| | 150 V | III | 2.5 kV |
| 5000 m | 250 V | II | 2.5 kV |
| | 150 V | III | 2.5 kV |

- ▶ From an operating height of 2000 m the max. permitted ambient temperature is reduced by 0.5 °C/100 m

| Operating height | Permitted ambient temperature |
|------------------|-------------------------------|
| 3000 m | 50 °C |
| 4000 m | 45 °C |
| 5000 m | 40 °C |

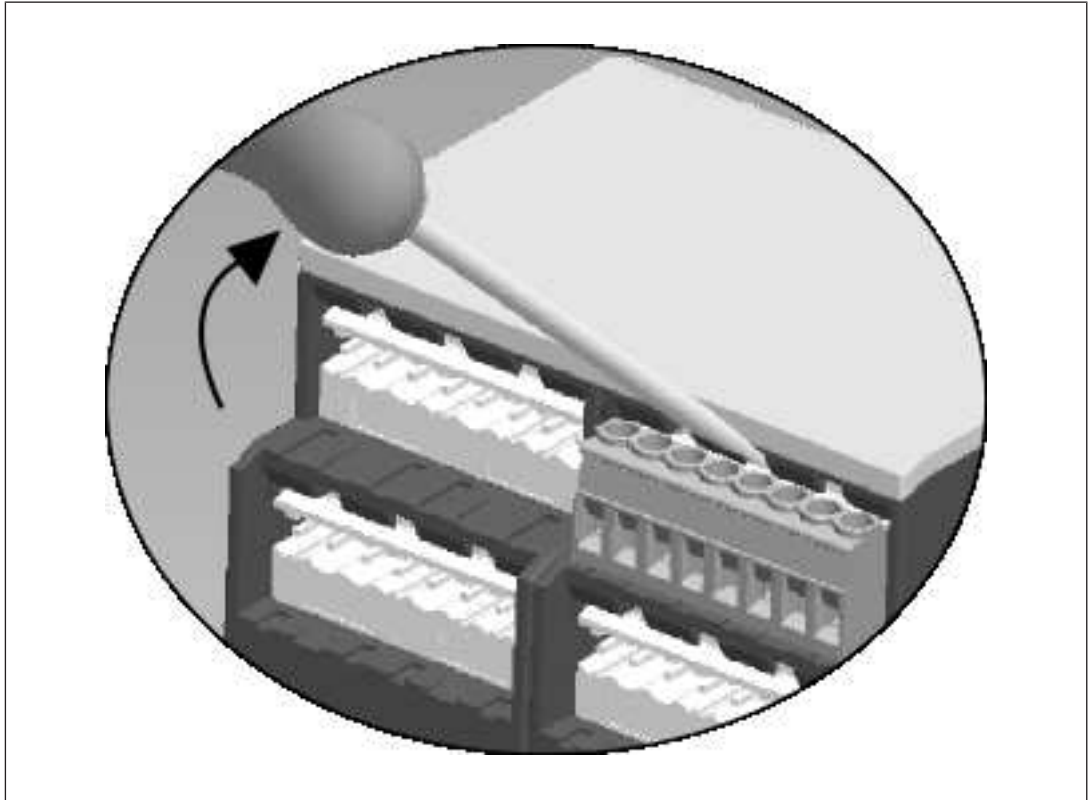
Remove plug-in terminals

Procedure

► Insert a suitable screwdriver into the housing recess behind the terminal.

Do **not** remove the terminals by pulling the cables!

► Lever the terminal out.



Order reference

| Product type | Features | Connection type | Order no. |
|--------------|----------|-------------------------|-----------|
| PNOZ s22 | 24 V DC | Screw terminals | 750132 |
| PNOZ s22 C | 24 V DC | Spring-loaded terminals | 751132 |

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.

Authorised representative: Norbert Fröhlich, Pilz GmbH & Co. KG, Felix-Wankel-Str. 2, 73760 Ostfildern, Germany

UKCA-Declaration of Conformity

This product(s) complies with following UK legislation: Supply of Machinery (Safety) Regulation 2008.

The complete UKCA Declaration of Conformity is available on the Internet at www.pilz.com/downloads.

Representative: Pilz Automation Technology, Pilz House, Little Colliers Field, Corby, Northamptonshire, NN18 8TJ United Kingdom, eMail: mail@pilz.co.uk

► Support

Technical support is available from Pilz round the clock.

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