PZE X4V

Safety relays

Operating Manual-1003200-EN-08

This document is a translation of the original document.

Introduction

Validity of documentation

This documentation is valid for the product PZE X4V. 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 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.

The delay-on de-energisation safety contacts may only be used up to max. PL d (Cat. 3).

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:
  - 4 safety contacts (N/O), delay-on de-energisation
- LED display for:
  - Switch status channel 1/2
- Connection for feedback loop
- Operation: single-channel
- Unit types with various delay times
- See order reference for unit types

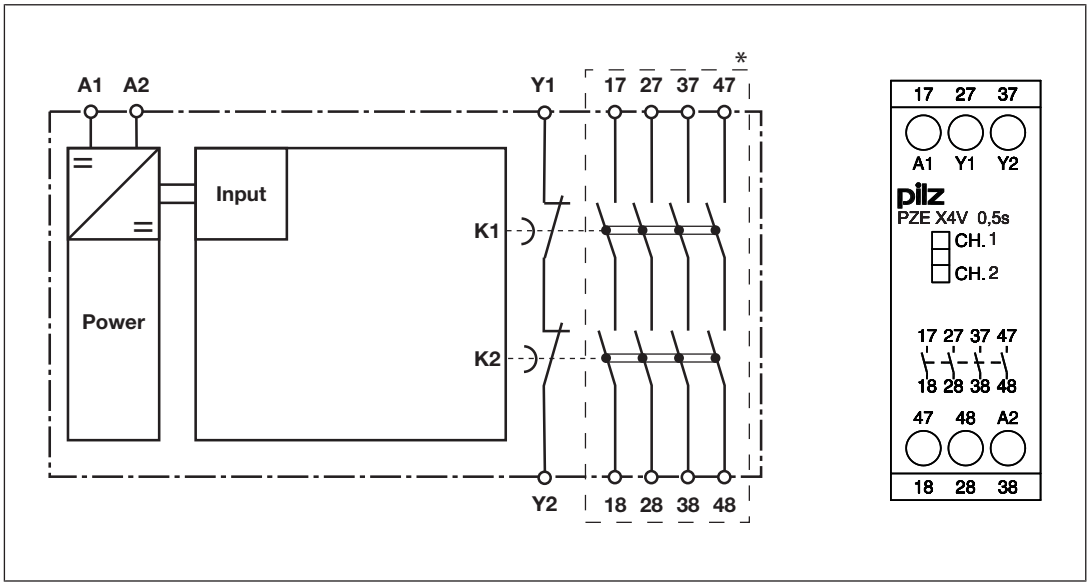
Safety features

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



*Insulation between the non-marked area and the relay contacts: Basic insulation (overvoltage category III), Protective separation (overvoltage category II)

Function description

The contact expansion module is an add-on device with delay-on de-energisation, and it is used to expand a safety circuit. The contact expansion module is driven by a base unit (e. g. emergency stop relay).

- Functional procedure after closing the safety contacts of the base unit:
  - The supply voltage is present at the input (A1) of the contact expansion module.
  - Close the safety contacts 17-18, 27-28, 37-38 and 47-48.
  - The LEDs "CH. 1" and "CH. 2" are lit.
- Functional procedure after opening the safety contacts of the base unit:
  - There is not supply voltage at input (A1) of the contact expansion module.
  - Safety contacts 17-18, 27-28, 37-38 and 47-48 open after the delay time.
  - The LEDs "CH. 1" and "CH. 2" go out.

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).

- If more than 2 units are installed next to each other in the control cabinet, leave a distance of at least 6 mm between the units.

Wiring

Please note:

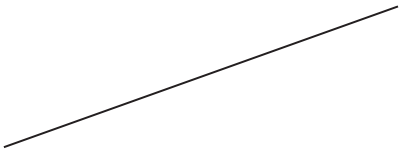
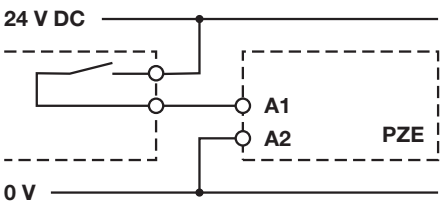
- Information given in the "Technical details [📖 9]" must be followed.
- Outputs 17-18, 27-28, 37-38 and 47-48 are delay-on de-energisation safety contacts.
- To prevent contact welding, a fuse should be connected before the output contacts (see Technical details).
- Calculation of the max. cable runs I_{max} in the input circuit:

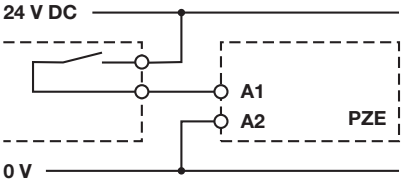
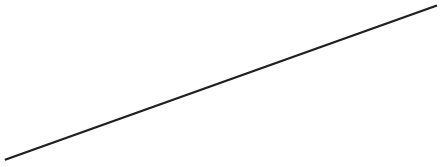
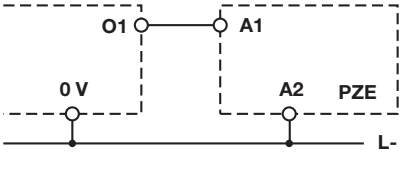
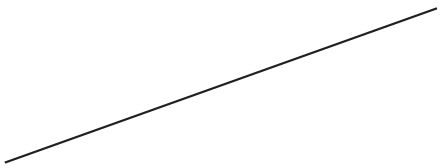
$$I_{max} = \frac{R_{lmax}}{R_l / km}$$

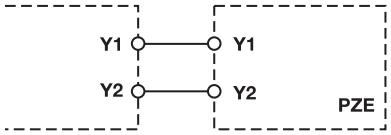
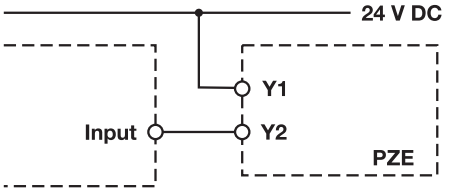
R_{lmax} = max. overall cable resistance (see Technical details)
R_l / km = cable resistance/km

- Use copper wire that can withstand 60/75 °C.
- Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.
- Do not switch low currents using contacts that have been used previously with high currents.

Preparing for operation

Supply voltage	AC	DC
		

Input circuit	Single-channel	Dual-channel
Base unit: Safety relay PNOZ X Driven via safety contacts		
Base unit: Safety relay PNOZmulti Driven via semiconductor outputs (24 VDC)		

Feedback loop	Base unit: Safety relay PNOZ X	Base unit: Safety relay PNOZmulti
Y1, Y2 and Input are inputs on the base unit; they evaluate the feedback loop		

Operation

Status indicators

CH.1
Safety contacts of channel 1 are closed.

CH.2
Safety contacts of channel 2 are closed.

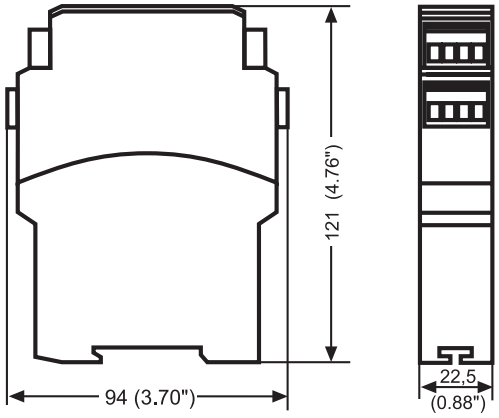
Faults – Interference

By closing or interrupting the input circuit you can check whether the unit switches on or off correctly.

For safety reasons, the unit cannot be started if the following faults are present:

- Contact malfunction: As the contact block is connected to a base unit, reactivation will not be possible if the contacts have welded after the input circuit has opened.
- Open circuit, short circuit or earth fault (e.g. in the input circuit)
- In the case of an error, the delay-on de-energisation safety contacts may open before the delay time has elapsed.

Dimensions in mm



Technical details

Order no. 774580 – 774582

See below for more order numbers

General	**774580**	**774581**	**774582**
Approvals	**CCC, CE, GOST, TÜV, cULus Listed**	**CCC, CE, GOST, TÜV, cULus Listed**	**CCC, CE, GOST, TÜV, cULus Listed**
Electrical data	**774580**	**774581**	**774582**
Supply voltage			
Voltage	**24 V**	**24 V**	**24 V**
Kind	**DC**	**DC**	**DC**
Voltage tolerance	**-15 %/+10 %**	**-15 %/+10 %**	**-15 %/+10 %**
Output of external power supply (DC)	**2,5 W**	**2,5 W**	**2,5 W**
Residual ripple DC	**20 %**	**20 %**	**20 %**
Continuous duty	**100 %**	**100 %**	**100 %**
Max. inrush current impulse			
Current pulse, input circuit	**2,00 A**	**2,00 A**	**2,00 A**
Pulse duration, input circuit	**50,0 ms**	**110,0 ms**	**140,0 ms**
Max. overall cable resistance RImax			
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	**95,0 mA**	**95,0 mA**	**95,0 mA**
Number of output contacts			
Safety contacts (N/O), delayed	**4**	**4**	**4**
Inputs	**774580**	**774581**	**774582**
Number	**1**	**1**	**1**
Relay outputs	**774580**	**774581**	**774582**
Max. short circuit current IK	**1 kA**	**1 kA**	**1 kA**

Relay outputs	774580	774581	774582
Utilisation category			
In accordance with the standard	**EN 60947-4-1**	**EN 60947-4-1**	**EN 60947-4-1**
Safety-contacts, delayed, AC1 at	**240 V**	**240 V**	**240 V**
Min. current	**0,01 A**	**0,01 A**	**0,01 A**
Max. current	**6,0 A**	**6,0 A**	**6,0 A**
Max. power	**1500 VA**	**1500 VA**	**1500 VA**
Safety-contacts, delayed, DC1 at	**24 V**	**24 V**	**24 V**
Min. current	**0,01 A**	**0,01 A**	**0,01 A**
Max. current	**6,0 A**	**6,0 A**	**6,0 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**
Safety contacts, delayed AC15 at	**230 V**	**230 V**	**230 V**
Max. current	**3,0 A**	**3,0 A**	**3,0 A**
Safety contacts delayed DC13 (6 cycles/min) at	**24 V**	**24 V**	**24 V**
Max. current	**4,0 A**	**4,0 A**	**4,0 A**
Utilisation category in accordance with UL			
Voltage	**250 V AC G.U. (same polarity)**	**250 V AC G.U. (same polarity)**	**250 V AC G.U. (same polarity)**
With current	**6,0 A**	**6,0 A**	**6,0 A**
Voltage	**24 V DC G. U.**	**24 V DC G. U.**	**24 V DC G. U.**
With current	**6,0 A**	**6,0 A**	**6,0 A**
Pilot Duty	**B300, R300**	**B300, R300**	**B300, R300**
Contact fuse protection external, safety contacts			
In accordance with the standard	**EN 60947-5-1**	**EN 60947-5-1**	**EN 60947-5-1**
Contact fuse protection external, delayed safety contacts			
Max. melting integral	**66 A²s**	**66 A²s**	**66 A²s**
Blow-out fuse, quick	**6 A**	**6 A**	**6 A**
Blow-out fuse, slow	**4 A**	**4 A**	**4 A**
Blow-out fuse gG	**6 A**	**6 A**	**6 A**
Circuit breaker, 24 V AC/DC, characteristic B/C	**4 A**	**4 A**	**4 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	**774580**	**774581**	**774582**
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	**5,00 A**	**5,00 A**	**5,00 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	**774580**	**774581**	**774582**
Delay time tv	**0,50 s**	**1,00 s**	**2,00 s**
Time accuracy	**-50 %/+50 %**	**-50 %/+50 %**	**-50 %/+50 %**
Supply interruption before de-energisation	**20 ms**	**20 ms**	**20 ms**
Environmental data	**774580**	**774581**	**774582**
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 60947-5-1, EN 61000-6-2**	**EN 60947-5-1, EN 61000-6-2**
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**
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 / II**	**III / II**	**III / II**
Pollution degree	**2**	**2**	**2**
Rated insulation voltage	**250 V**	**250 V**	**250 V**
Rated impulse withstand voltage	**4,00 kV**	**4,00 kV**	**4,00 kV**
Protection type			
Mounting area (e.g. control cabinet)	**IP54**	**IP54**	**IP54**
Housing	**IP40**	**IP40**	**IP40**
Terminals	**IP20**	**IP20**	**IP20**
Mechanical data	**774580**	**774581**	**774582**
Mounting position	**Any**	**Any**	**Any**
Mechanical life	**10,000,000 cycles**	**10,000,000 cycles**	**10,000,000 cycles**

Mechanical data	774580	774581	774582
Material			
Bottom	**PPO UL 94 V0**	**PPO UL 94 V0**	**PPO UL 94 V0**
Front	**ABS UL 94 V0**	**ABS UL 94 V0**	**ABS UL 94 V0**
Top	**PPO UL 94 V0**	**PPO UL 94 V0**	**PPO UL 94 V0**
Conductor cross section with screw terminals			
1 core flexible	**0,20 - 4,00 mm², 24 - 10 AWG**	**0,20 - 4,00 mm², 24 - 10 AWG**	**0,20 - 4,00 mm², 24 - 10 AWG**
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	**0,20 - 2,50 mm², 24 - 14 AWG**	**0,20 - 2,50 mm², 24 - 14 AWG**	**0,20 - 2,50 mm², 24 - 14 AWG**
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**0,20 - 2,50 mm², 24 - 14 AWG**	**0,20 - 2,50 mm², 24 - 14 AWG**	**0,20 - 2,50 mm², 24 - 14 AWG**
Torque setting with screw terminals	**0,50 Nm**	**0,50 Nm**	**0,50 Nm**
Connection type	**Screw terminal**	**Screw terminal**	**Screw terminal**
Mounting type	**Fixed**	**Fixed**	**Fixed**
Dimensions			
Height	**87,0 mm**	**87,0 mm**	**87,0 mm**
Width	**22,5 mm**	**22,5 mm**	**22,5 mm**
Depth	**121,0 mm**	**121,0 mm**	**121,0 mm**
Weight	**185 g**	**190 g**	**205 g**

The standards current on 2009-12 apply.

Order no. 774586, 774583

General	774586	774583
Approvals	**CCC, CE, GOST, TÜV, cULus Listed**	**CCC, CE, GOST, TÜV, cULus Listed**
Electrical data	**774586**	**774583**
Supply voltage		
Voltage	**24 V**	**24 V**
Kind	**DC**	**DC**
Voltage tolerance	**-15 %/+10 %**	**-15 %/+10 %**
Output of external power supply (DC)	**2,5 W**	**2,5 W**
Residual ripple DC	**20 %**	**20 %**
Continuous duty	**100 %**	**100 %**
Max. inrush current impulse		
Current pulse, input circuit	**2,00 A**	**2,00 A**
Pulse duration, input circuit	**50,0 ms**	**225,0 ms**

Electrical data	774586	774583
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	**95,0 mA**	**95,0 mA**
Number of output contacts		
Safety contacts (N/O), delayed	**4**	**4**
Inputs	**774586**	**774583**
Number	**1**	**1**
Relay outputs	**774586**	**774583**
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, delayed, AC1 at	**240 V**	**240 V**
Min. current	**0,01 A**	**0,01 A**
Max. current	**6,0 A**	**6,0 A**
Max. power	**1500 VA**	**1500 VA**
Safety-contacts, delayed, DC1 at	**24 V**	**24 V**
Min. current	**0,01 A**	**0,01 A**
Max. current	**6,0 A**	**6,0 A**
Max. power	**150 W**	**150 W**
Utilisation category		
In accordance with the standard	**EN 60947-5-1**	**EN 60947-5-1**
Safety contacts, delayed AC15 at	**230 V**	**230 V**
Max. current	**3,0 A**	**3,0 A**
Safety contacts delayed DC13 (6 cycles/min) at	**24 V**	**24 V**
Max. current	**4,0 A**	**4,0 A**
Utilisation category in accordance with UL		
Voltage	**250 V AC G.U. (same polarity)**	**250 V AC G.U. (same polarity)**
With current	**6,0 A**	**6,0 A**
Voltage	**24 V DC G. U.**	**24 V DC G. U.**
With current	**6,0 A**	**6,0 A**
Pilot Duty	**B300, R300**	**B300, R300**
Contact fuse protection external, safety contacts		
In accordance with the standard	**EN 60947-5-1**	**EN 60947-5-1**

Relay outputs	774586	774583
Contact fuse protection external, delayed safety 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	**774586**	**774583**
Ith per contact at UB DC		
Conv. therm. current with 1 contact	**6,00 A**	**6,00 A**
Conv. therm. current with 2 contacts	**5,00 A**	**5,00 A**
Conv. therm. current with 3 contacts	**4,50 A**	**4,50 A**
Conv. therm. current with 4 contacts	**4,00 A**	**4,00 A**
Times	**774586**	**774583**
Delay time tv	**0,75 s**	**3,00 s**
Time accuracy	**-50 %/+50 %**	**-50 %/+50 %**
Supply interruption before de-energisation	**20 ms**	**20 ms**
Environmental data	**774586**	**774583**
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 60947-5-1, EN 61000-6-2**
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**
Amplitude	**0,35 mm**	**0,35 mm**
Airgap creepage		
In accordance with the standard	**EN 60947-1**	**EN 60947-1**
Overvoltage category	**III / II**	**III / II**
Pollution degree	**2**	**2**
Rated insulation voltage	**250 V**	**250 V**
Rated impulse withstand voltage	**4,00 kV**	**4,00 kV**
Protection type		
Mounting area (e.g. control cabinet)	**IP54**	**IP54**
Housing	**IP40**	**IP40**
Terminals	**IP20**	**IP20**

Mechanical data	774586	774583
Mounting position	**Any**	**Any**
Mechanical life	**10,000,000 cycles**	**10,000,000 cycles**
Material		
Bottom	**PPO UL 94 V0**	**PPO UL 94 V0**
Front	**ABS UL 94 V0**	**ABS UL 94 V0**
Top	**PPO UL 94 V0**	**PPO UL 94 V0**
Conductor cross section with screw terminals		
1 core flexible	**0,20 - 4,00 mm², 24 - 10 AWG**	**0,20 - 4,00 mm², 24 - 10 AWG**
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	**0,20 - 2,50 mm², 24 - 14 AWG**	**0,20 - 2,50 mm², 24 - 14 AWG**
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**0,20 - 2,50 mm², 24 - 14 AWG**	**0,20 - 2,50 mm², 24 - 14 AWG**
Torque setting with screw terminals	**0,50 Nm**	**0,50 Nm**
Connection type	**Screw terminal**	**Screw terminal**
Mounting type	**Fixed**	**Fixed**
Dimensions		
Height	**87,0 mm**	**87,0 mm**
Width	**22,5 mm**	**22,5 mm**
Depth	**121,0 mm**	**121,0 mm**
Weight	**185 g**	**210 g**

The standards current on 2009-12 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, delayed <30 s	**PL d**	**Cat. 3**	**SIL CL 2**	**2,48E-09**	**SIL 2**	**1,47E-05**	**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.

Supplementary data

CAUTION!

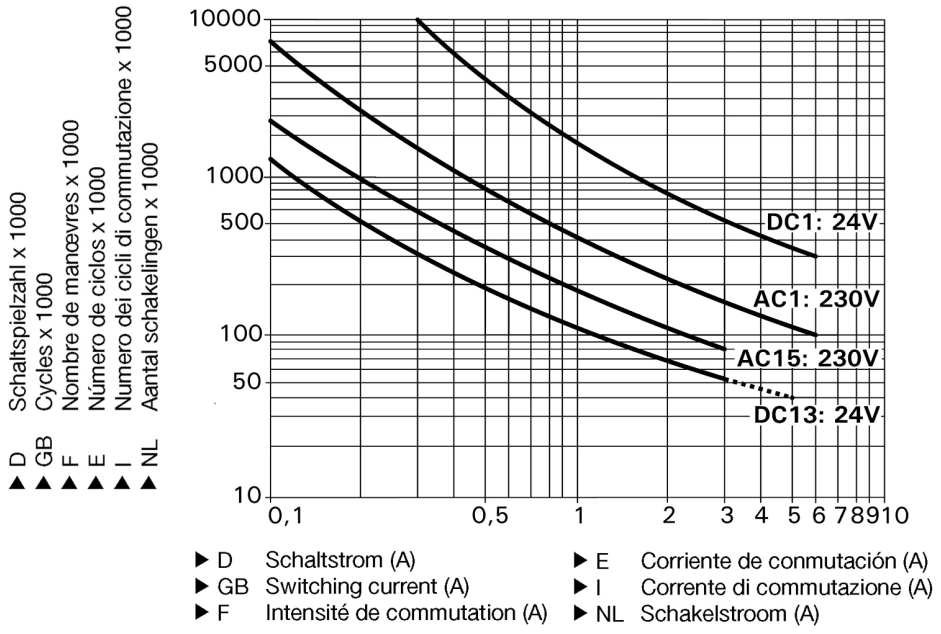
It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

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.

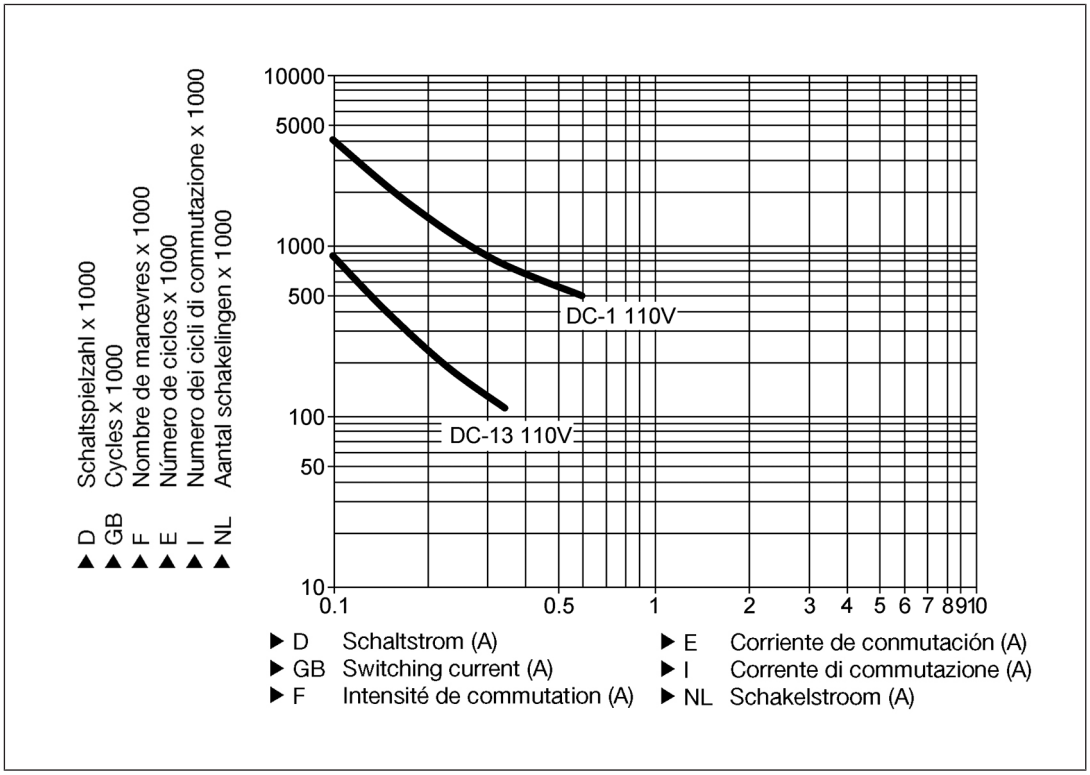
Service life graph

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 capacitive loads, any power surges that occur must be noted. With contactors, use freewheel diodes for spark suppression.

Order reference

Type	Features	Connection type	Order no.
PZE X4V	24 V DC; t_v = 0.5 s	Screw terminals, integral	774580
PZE X4V	24 V DC; t_v = 0.7 s	Screw terminals, integral	774586
PZE X4V	24 V DC; t_v = 1 s	Screw terminals, integral	774581
PZE X4V	24 V DC; t_v = 2 s	Screw terminals, integral	774582
PZE X4V	24 V DC; t_v = 3 s	Screw terminals, integral	774583

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/support/downloads.
Representative: Norbert Fröhlich, Pilz GmbH & Co. KG, Felix-Wankel-Str. 2, 73760 Ostfildern, Germany

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