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PNOZ X10.1

PILZ
THE SPIRIT OF SAFETY

- Safety relays

Operating Manual-20005-EN-09

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SD means Secure Digital

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Introduction

Validity of documentation

This documentation is valid for the product PNOZ X10.1. 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 safety relay PNOZ X10.1 provides a safety-related interruption of a safety circuit.

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

- E-STOP pushbuttons
- Safety gates
- Light grids and safety switches with detection of shorts across contacts

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 manual,
- Use of the product outside the technical details (see Technical details [15]).

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 it is necessary to perform a safety assessment in accordance with the Machinery Directive.

Functional safety is guaranteed for the product as a single component. However, this does not guarantee the functional safety of the overall plant/machine. In order to achieve the required safety level for the overall plant/machine, define the safety requirements for the plant/machine and then define how these must be implemented from a technical and organisational standpoint.

Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, maintained and decommissioned by competent persons.

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
  - 4 auxiliary contacts (N/C), instantaneous
- Connection options for:
  - E-STOP pushbuttons
  - Safety gate limit switches
  - Start buttons
  - Light grids and safety switches with detection of shorts across contacts
- LED display for:
  - Supply voltage
  - Input state channel 1/2
  - Switch status channel 1/2
  - Switch status start relay
- See order reference for unit types

Safety features

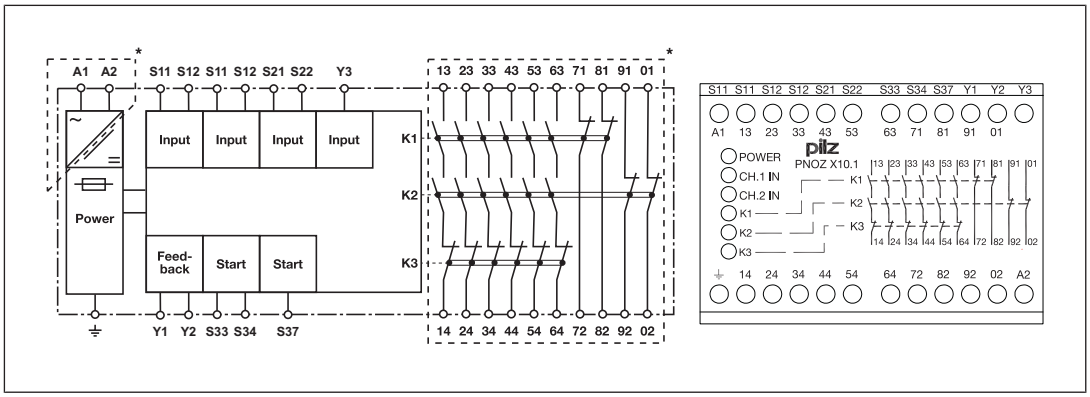
The safety relay meets the following safety requirements:

- 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

Types: AC

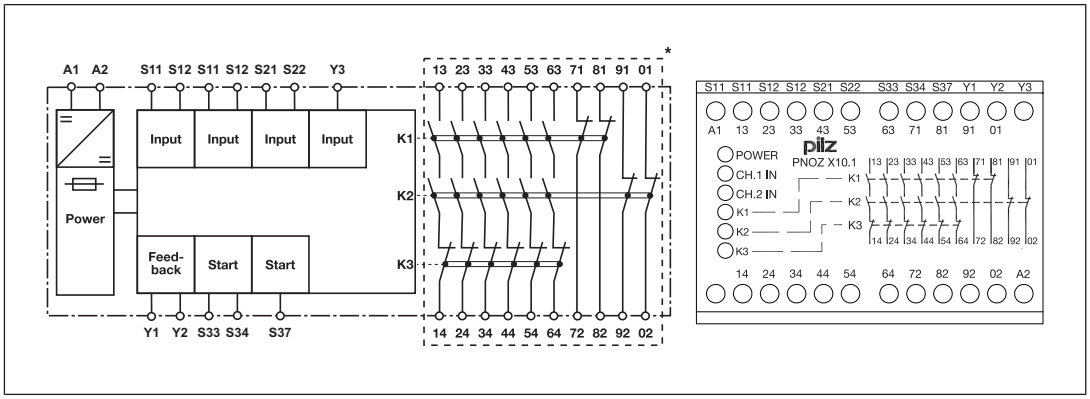
- U_B: 24 VAC; Order no. 774740
- U_B: 42 VAC; Order no. 774741
- U_B: 110 - 120 VAC; Order no. 774745
- U_B: 230 - 240 VAC; Order no. 774746



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

Type: DC

- U_B: 24 VDC; Order no. 774749



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

Function Description

The safety relay PNOZ X10.1 provides a safety-oriented interruption of a safety circuit. When supply voltage is supplied the "POWER" LED is lit. The unit is ready for operation when the feedback loop Y1-Y2 and the start circuit S12-S34 are closed.

- Input circuit is closed (e.g. E-STOP pushbutton not operated):
  - LEDs "CH.1 IN", "CH.2 IN" and "K3" go out.
  - LEDs "K1" and "K2" light as soon as relays K1 and K2 are in operating position
  - LED "K3" goes out as soon as relay K3 is in rest position.
  - Safety contacts 13-14, 23-24, 33-34, 43-44, 53-54 and 63-64 are closed, auxiliary contacts 71-72, 81-82, 91-92 and 01-02 are opened. The unit is active.
- Input circuit is opened (e.g. E-STOP pushbutton operated):
  - The LEDs "CH.1 IN" and "CH.2 IN" go out.
  - LEDs "K1" and "K2" go out as soon as relays K1 and K2 are in rest position.
  - Safety contacts 13-14, 23-24, 33-34, 43-44, 53-54 and 63-64 are opened redundantly, auxiliary contacts 71-72, 81-82, 91-92 and 01-02 are closed.

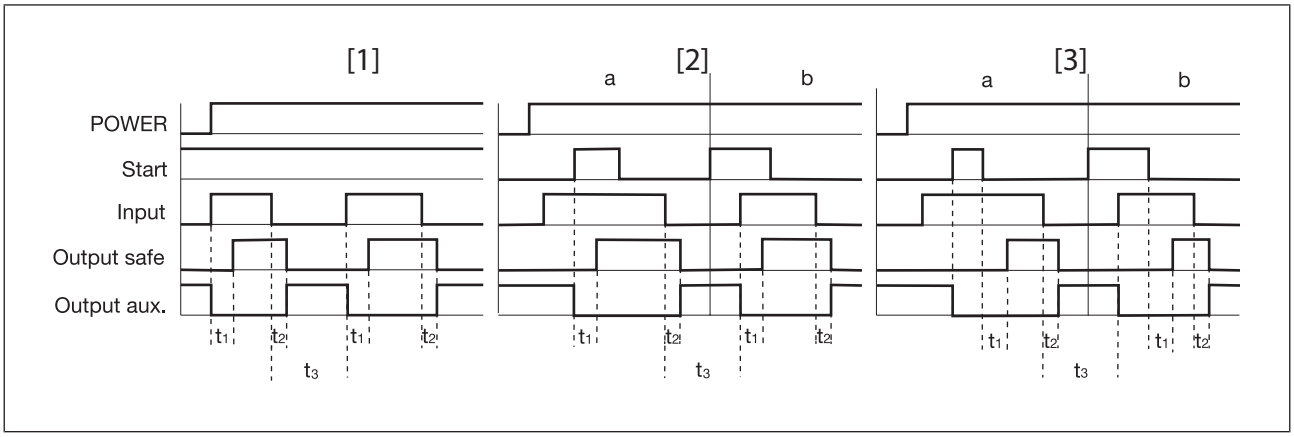
Operating modes

- Single-channel operation: No redundancy in the input circuit, earth faults in the start and input circuit are detected.
- Dual-channel operation with detection of shorts across contacts: Redundant input circuit, PNOZ X10.1 detects
  - earth faults in the start and input circuit,
  - short circuits in the input circuit,
  - shorts across contacts in the input circuit.

- Dual-channel operation without detection of shorts across contacts: Redundant input circuit, detects PNOZ X10.1
  - earth faults in the start and input circuit,
  - short circuits in the input circuit.
- Automatic start: Unit is active once the input circuit has been closed.
- Manual start: Unit is active once the input circuit and the start circuit are closed.
- Monitored start: Unit is active once
  - the input circuit is closed and then the start circuit is closed and opened again.
  - the start circuit is closed and then opened again once the input circuit is closed.

  The LED "K3" lights when the start circuit is closed and goes out when the start circuit is opened.
- Increase in the number of available contacts by connecting contact expander modules or external contactors/relays.

Timing diagram



Legend

- Power: Supply voltage
- Start: Start circuit
- Input: Input circuit
- Output safe: Safety contacts
- Output aux: Auxiliary contacts
- [1]: Automatic start
- [2]: Manual start
- [3]: Monitored start
- a: Input circuit closes before start circuit
- b: Start circuit closes before input circuit
- t_1: Switch-on delay
- t_2: Delay-on de-energisation
- t_3: Recovery time

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 (35 mm).
- When installed vertically: Secure the unit by using a fixing element (e.g. retaining bracket or end angle).

Wiring

Please note:

- Information given in the "Technical details [📖 15]" must be followed.
- Outputs 13-14, 23-24, 33-34, 43-44, 53-54, 63-64 are safety contacts; outputs 71-72, 81-82, 91-92, 01-02 are auxiliary contacts (e.g. for display).
- Do **not** use auxiliary contacts 71-72, 81-82, 91-92, 01-02 for safety circuits!
- Do not connect undesignated terminals.
- To prevent contact welding, a fuse should be connected before the output contacts (see Technical details [📖 15]).
- 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 [📖 15])
R_l / km = cable resistance/km

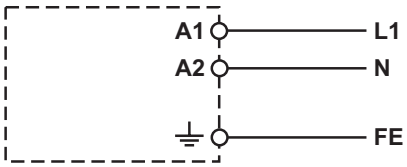
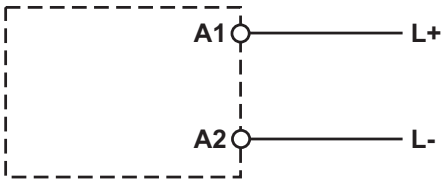
- Use copper wire that can withstand 60/75 °C.
- Do not switch low currents using contacts that have been used previously with high currents.
- Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.
- When connecting magnetically operated, reed proximity switches, ensure that the max. peak inrush current (on the input circuit) does not overload the proximity switch.
- On 24 VDC devices:
  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.
- Ensure the wiring and EMC requirements of EN 60204-1 are met.

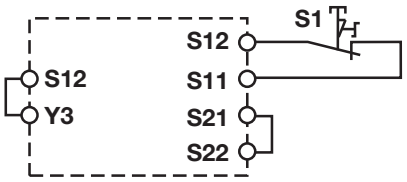
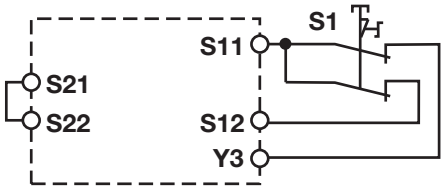
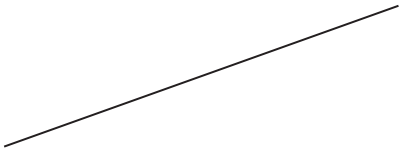
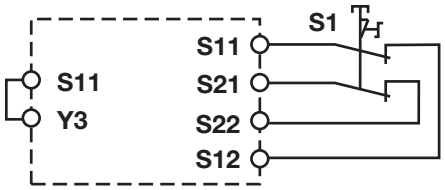
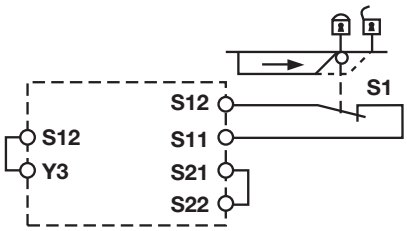
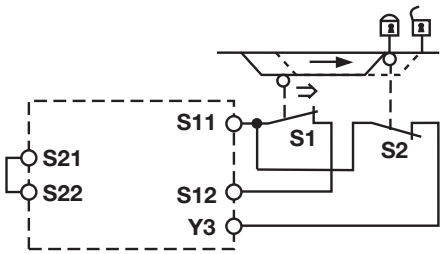
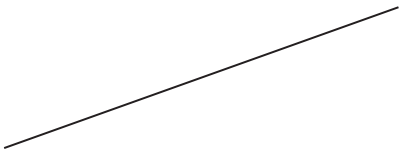
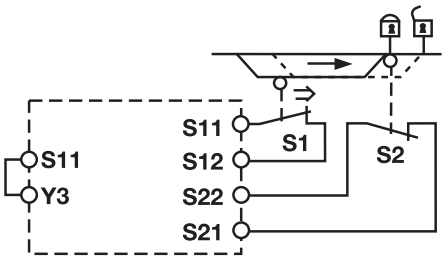
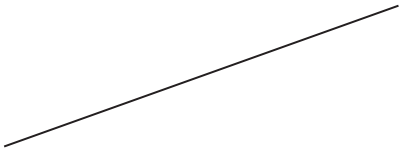
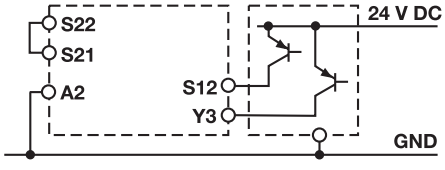
Important for detection of shorts across contacts:

As this function for detecting shorts across contacts is not failsafe, it is tested by Pilz during the final control check. If there is a danger of exceeding the cable runs, we recommend the following test after the installation of the device:

1. Unit ready for operation (output contacts closed)
2. Short circuit the test terminals S12, S22 for detecting shorts across the inputs.
3. The unit's fuse must be triggered and the output contacts must open. Cable lengths in the scale of the maximum length can delay the fuse triggering for up to 2 minutes.
4. Reset the fuse: remove the short circuit and switch off the supply voltage for approx. 1 minute.

Preparing for operation

Supply voltage	AC	DC
		

Input circuit	Single-channel	Dual-channel
E-STOP **without** detection of shorts across contacts		
E-STOP **with** detection of shorts across contacts		
Safety gate **without** detection of shorts across contacts		
Safety gate **with** detection of shorts across contacts		
Light guards or safety switch, detection of shorts across contacts via ESPE (only when U_B = 24 VDC)		

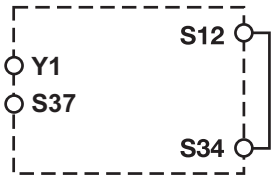
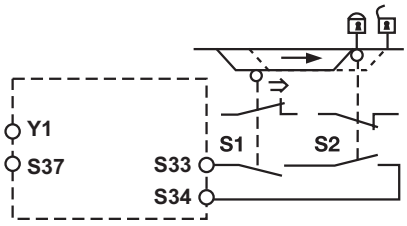
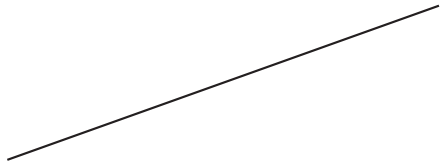
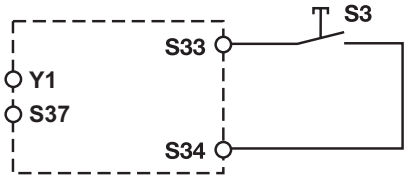
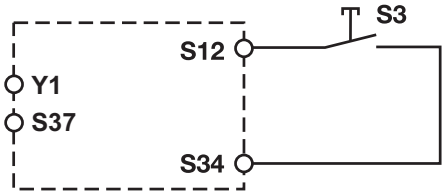
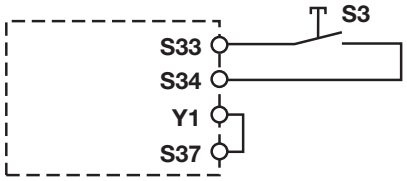
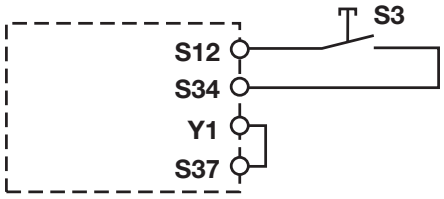
NOTICE

With single-channel wiring the safety level of your machine/plant may be lower than the safety level of the unit (see Safety characteristic data [📖 25]).

NOTICE

Operation with a light guard or safety switch

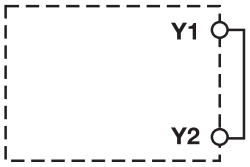
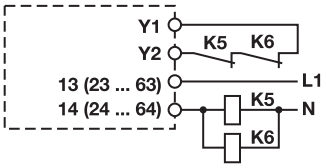
It must not be possible to switch off the supply voltage for the PNOZ X10.1 separately from the supply voltage for the light guard or safety switch.

Start circuit	Single-channel, dual-channel without detection of shorts across contacts	Dual-channel with detection of shorts across contacts
Automatic start		
Automatic start with start-up test	 Simultaneity S1 and S2: 150 ms	
Manual start		
Monitored start		

NOTICE

In the event of an automatic start or manual start with bridged start contact (fault):

The unit starts up automatically when the safeguard is reset, e.g. when the E-STOP pushbutton is released. Use external circuit measures to prevent an unexpected restart.

Feedback loop	Without feedback loop monitoring	With feedback loop monitoring
Link or contacts from external contactors		

Legend

- S1/S2: E-STOP/safety gate switch
- S3: Reset button
- : Switch operated
- : Gate open
- : Gate closed

INFORMATION

With automatic start and manual start, Y1 and S37 must not be linked.

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

Status indicators

LEDs indicate the status and errors during operation:

LED on

POWER
Supply voltage is present.

CH.1 IN
Channel 1 input circuit is closed.

CH.2 IN
Channel 2 input circuit is closed.

K1
Relay K1 (channel 1) is in the operating position.

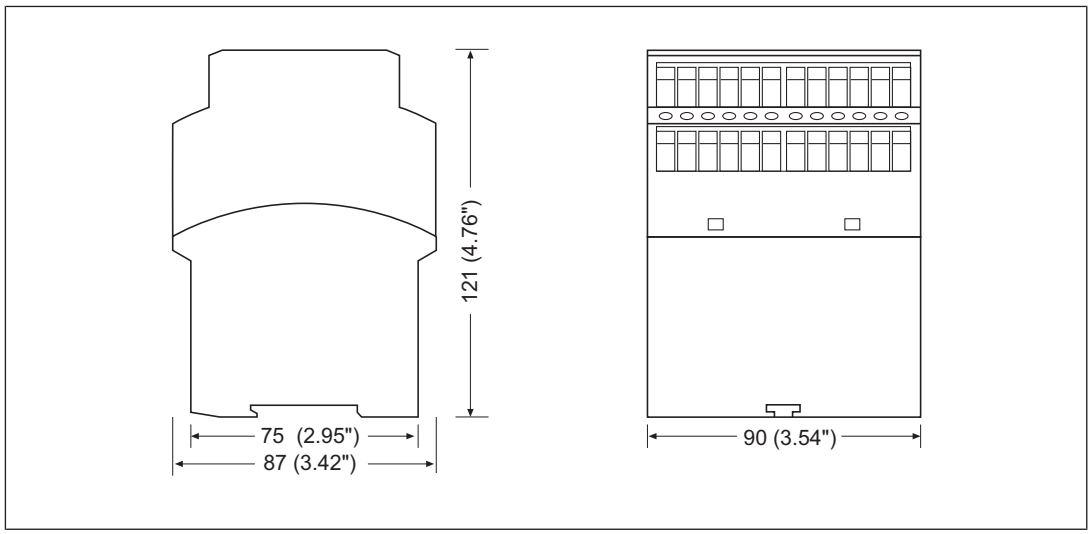
K2
Relay K2 (channel 2) is in the operating position.

K3
Start button is closed.

Faults – Interference

- Earth fault: The supply voltage fails and the safety contacts open. Once the cause of the respective fault has been rectified and the supply voltage is switched off for approx. 1 minute, the unit is ready for operation again.
- Contact malfunctions: If the contacts have welded, reactivation will not be possible after the input circuit has opened.
- LED "POWER" does not light: Short circuit or no supply voltage.

Dimensions in mm



Technical details

Order no. 774740 – 774745

See below for more order numbers

General	774740	774741	774745
Approvals	CCC, CE, EAC (Eurasian), TÜV, cULus Listed	CCC, CE, EAC (Eurasian), TÜV, cULus Listed	CCC, CE, EAC (Eurasian), TÜV, cULus Listed
Electrical data	**774740**	**774741**	**774745**
Supply voltage			
Voltage	24 V	42 V	110 - 120 V
Kind	AC	AC	AC
Voltage tolerance	-15 %/+10 %	-15 %/+10 %	-15 %/+10 %
Output of external power supply (AC)	10 VA	10 VA	10 VA
Frequency range AC	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Duty cycle	100 %	100 %	100 %
Inputs	**774740**	**774741**	**774745**
Number	2	2	2
Voltage at			
Input circuit DC	24 V	24 V	24 V
Start circuit DC	24 V	24 V	24 V
Feedback loop DC	24 V	24 V	24 V
Current at			
Input circuit DC	50 mA	50 mA	50 mA
Start circuit DC	100 mA	100 mA	100 mA
Feedback loop DC	100 mA	100 mA	100 mA
Min. input resistance at power-on	89 Ohm	89 Ohm	89 Ohm
Max. overall cable resistance RImax			
Single-channel at UB AC	45 Ohm	45 Ohm	45 Ohm
Dual-channel without detection of shorts across contacts at UB AC	90 Ohm	90 Ohm	90 Ohm
Dual-channel with detection of shorts across contacts at UB AC	15 Ohm	15 Ohm	15 Ohm
Relay outputs	**774740**	**774741**	**774745**
Number of output contacts			
Safety contacts (N/O), instantaneous	6	6	6
Auxiliary contacts (N/C)	4	4	4
Max. short circuit current IK	1 kA	1 kA	1 kA

Relay outputs	774740	774741	774745
Utilisation category			
In accordance with the standard	**EN 60947-4-1**	**EN 60947-4-1**	**EN 60947-4-1**
Utilisation category of safety contacts			
AC1 at	**400 V**	**400 V**	**400 V**
Min. current	**0,01 A**	**0,01 A**	**0,01 A**
Max. current	**5 A**	**5 A**	**5 A**
Max. power	**2000 VA**	**2000 VA**	**2000 VA**
AC1 at	**240 V**	**240 V**	**240 V**
Min. current	**0,01 A**	**0,01 A**	**0,01 A**
Max. current	**8 A**	**8 A**	**8 A**
Max. power	**2000 VA**	**2000 VA**	**2000 VA**
DC1 at	**24 V**	**24 V**	**24 V**
Min. current	**0,01 A**	**0,01 A**	**0,01 A**
Max. current	**8 A**	**8 A**	**8 A**
Max. power	**200 W**	**200 W**	**200 W**
Utilisation category of auxiliary contacts			
AC1 at	**240 V**	**240 V**	**240 V**
Min. current	**0,01 A**	**0,01 A**	**0,01 A**
Max. current	**8 A**	**8 A**	**8 A**
Max. power	**2000 VA**	**2000 VA**	**2000 VA**
DC1 at	**24 V**	**24 V**	**24 V**
Min. current	**0,01 A**	**0,01 A**	**0,01 A**
Max. current	**8 A**	**8 A**	**8 A**
Max. power	**200 W**	**200 W**	**200 W**
Utilisation category			
In accordance with the standard	**EN 60947-5-1**	**EN 60947-5-1**	**EN 60947-5-1**
Utilisation category of safety contacts			
AC15 at	**230 V**	**230 V**	**230 V**
Max. current	**5 A**	**5 A**	**5 A**
DC13 (6 cycles/min) at	**24 V**	**24 V**	**24 V**
Max. current	**7 A**	**7 A**	**7 A**
Utilisation category of auxiliary contacts			
AC15 at	**230 V**	**230 V**	**230 V**
Max. current	**5 A**	**5 A**	**5 A**
DC13 (6 cycles/min) at	**24 V**	**24 V**	**24 V**
Max. current	**7 A**	**7 A**	**7 A**

Relay outputs	774740	774741	774745
Utilisation category in accordance with UL			
Voltage	**240 V AC G. P.**	**240 V AC G. P.**	**240 V AC G. P.**
With current	**8 A**	**8 A**	**8 A**
Voltage	**24 V DC Resistive**	**24 V DC Resistive**	**24 V DC Resistive**
With current	**5 A**	**5 A**	**5 A**
Pilot Duty	**B300, R300**	**B300, R300**	**B300, R300**
External contact fuse protection, safety contacts			
In accordance with the standard	**EN 60947-5-1**	**EN 60947-5-1**	**EN 60947-5-1**
Max. melting integral	**240 A²s**	**240 A²s**	**240 A²s**
Blow-out fuse, quick	**10 A**	**10 A**	**10 A**
Blow-out fuse, slow	**6 A**	**6 A**	**6 A**
Blow-out fuse, gG	**10 A**	**10 A**	**10 A**
Circuit breaker 24V AC/DC, characteristic B/C	**6 A**	**6 A**	**6 A**
External contact fuse protection, auxiliary contacts			
Max. melting integral	**240 A²s**	**240 A²s**	**240 A²s**
Blow-out fuse, quick	**10 A**	**10 A**	**10 A**
Blow-out fuse, slow	**6 A**	**6 A**	**6 A**
Blow-out fuse, gG	**10 A**	**10 A**	**10 A**
Circuit breaker 24 V AC/DC, characteristic B/C	**6 A**	**6 A**	**6 A**
Contact material	**AgSnO2 + 0,2 µm Au**	**AgSnO2 + 0,2 µm Au**	**AgSnO2 + 0,2 µm Au**
Conventional thermal current while loading several contacts	**774740**	**774741**	**774745**
Ith per contact at UB AC; AC1: 240 V, DC1: 24 V			
Conv. therm. current with 1 contact	**8 A**	**8 A**	**8 A**
Conv. therm. current with 2 contacts	**7 A**	**7 A**	**7 A**
Conv. therm. current with 3 contacts	**5,6 A**	**5,6 A**	**5,6 A**
Conv. therm. current with 4 contacts	**4,9 A**	**4,9 A**	**4,9 A**
Conv. therm. current with 5 contacts	**4,4 A**	**4,4 A**	**4,4 A**
Conv. therm. current with 6 contacts	**4 A**	**4 A**	**4 A**

Times	774740	774741	774745
Switch-on delay			
With automatic start typ.	**180 ms**	**180 ms**	**180 ms**
With automatic start max.	**250 ms**	**250 ms**	**250 ms**
With automatic start after power on typ.	**230 ms**	**230 ms**	**230 ms**
With automatic start after power on max.	**320 ms**	**320 ms**	**320 ms**
With manual start typ.	**200 ms**	**200 ms**	**200 ms**
With manual start max.	**250 ms**	**250 ms**	**250 ms**
With monitored start typ.	**150 ms**	**150 ms**	**150 ms**
With monitored start max.	**200 ms**	**200 ms**	**200 ms**
Delay-on de-energisation			
With E-STOP typ.	**20 ms**	**20 ms**	**20 ms**
With E-STOP max.	**30 ms**	**30 ms**	**30 ms**
With power failure typ.	**300 ms**	**300 ms**	**300 ms**
With power failure max.	**400 ms**	**400 ms**	**400 ms**
Recovery time at max. switching frequency 1/s			
After E-STOP	**50 ms**	**50 ms**	**50 ms**
After power failure	**450 ms**	**450 ms**	**450 ms**
Min. start pulse duration with a monitored start	**50 ms**	**50 ms**	**50 ms**
Supply interruption before de-energisation	**150 ms**	**150 ms**	**150 ms**
Environmental data	**774740**	**774741**	**774745**
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**
Climatic suitability			
Humidity	**93 % r. h. at 40 °C**	**93 % r. h. at 40 °C**	**93 % r. h. at 40 °C**
Condensation during operation	**Not permitted**	**Not permitted**	**Not permitted**
EMC	**EN 60947-5-1, EN 61000-6-2, EN 61326-3-1**	**EN 60947-5-1, EN 61000-6-2, EN 61326-3-1**	**EN 60947-5-1, EN 61000-6-2, EN 61326-3-1**
Vibration			
In accordance with the standard	**EN 60068-2-6**	**EN 60068-2-6**	**EN 60068-2-6**
Frequency	**10 - 55 Hz**	**10 - 55 Hz**	**10 - 55 Hz**
Amplitude	**0,35 mm**	**0,35 mm**	**0,35 mm**

Environmental data	774740	774741	774745
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 kV**	**4 kV**	**4 kV**
Protection type			
Housing	**IP40**	**IP40**	**IP40**
Terminals	**IP20**	**IP20**	**IP20**
Mounting area (e.g. control cabinet)	**IP54**	**IP54**	**IP54**
Mechanical data	**774740**	**774741**	**774745**
Mounting position	**Any**	**Any**	**Any**
Mechanical life	**10,000,000 cycles**	**10,000,000 cycles**	**10,000,000 cycles**
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**
Connection type	**Screw terminal**	**Screw terminal**	**Screw terminal**
Mounting type	**Fixed**	**Fixed**	**Fixed**
Conductor cross section with screw terminals			
1 core flexible	**0,2 - 4 mm², 24 - 10 AWG**	**0,2 - 4 mm², 24 - 10 AWG**	**0,2 - 4 mm², 24 - 10 AWG**
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	**0,2 - 2,5 mm², 24 - 14 AWG**	**0,2 - 2,5 mm², 24 - 14 AWG**	**0,2 - 2,5 mm², 24 - 14 AWG**
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**0,2 - 2,5 mm², 24 - 14 AWG**	**0,2 - 2,5 mm², 24 - 14 AWG**	**0,2 - 2,5 mm², 24 - 14 AWG**
Torque setting with screw terminals	**0,6 Nm**	**0,6 Nm**	**0,6 Nm**
Dimensions			
Height	**87 mm**	**87 mm**	**87 mm**
Width	**90 mm**	**90 mm**	**90 mm**
Depth	**121 mm**	**121 mm**	**121 mm**
Weight	**730 g**	**730 g**	**730 g**

Where standards are undated, the 2017-01 latest editions shall apply.

Order no. 774746 – 774749

General	774746	774749
Approvals	**CCC, CE, EAC (Eurasian), TÜV, cULus Listed**	**CCC, CE, EAC (Eurasian), TÜV, cULus Listed**
Electrical data	**774746**	**774749**
Supply voltage		
Voltage	**230 - 240 V**	**24 V**
Kind	**AC**	**DC**
Voltage tolerance	**-15 %/+10 %**	**-15 %/+10 %**
Output of external power supply (AC)	**10 VA**	–
Output of external power supply (DC)	–	**5,5 W**
Frequency range AC	**50 - 60 Hz**	–
Residual ripple DC	–	**160 %**
Duty cycle	**100 %**	**100 %**
Inputs	**774746**	**774749**
Number	**2**	**2**
Voltage at		
Input circuit DC	**24 V**	**24 V**
Start circuit DC	**24 V**	**24 V**
Feedback loop DC	**24 V**	**24 V**
Current at		
Input circuit DC	**50 mA**	**50 mA**
Start circuit DC	**100 mA**	**100 mA**
Feedback loop DC	**100 mA**	**100 mA**
Min. input resistance at power-on	**89 Ohm**	**89 Ohm**
Max. overall cable resistance Rl-max		
Single-channel at UB DC	–	**45 Ohm**
Single-channel at UB AC	**45 Ohm**	–
Dual-channel without detection of shorts across contacts at UB DC	–	**90 Ohm**
Dual-channel without detection of shorts across contacts at UB AC	**90 Ohm**	–
Dual-channel with detection of shorts across contacts at UB DC	–	**15 Ohm**
Dual-channel with detection of shorts across contacts at UB AC	**15 Ohm**	–
Relay outputs	**774746**	**774749**
Number of output contacts		
Safety contacts (N/O), instant-aneous	**6**	**6**
Auxiliary contacts (N/C)	**4**	**4**
Max. short circuit current IK	**1 kA**	**1 kA**

Relay outputs	774746	774749
Utilisation category		
In accordance with the standard	**EN 60947-4-1**	**EN 60947-4-1**
Utilisation category of safety contacts		
AC1 at	**400 V**	**400 V**
Min. current	**0,01 A**	**0,01 A**
Max. current	**5 A**	**5 A**
Max. power	**2000 VA**	**2000 VA**
AC1 at	**240 V**	**240 V**
Min. current	**0,01 A**	**0,01 A**
Max. current	**8 A**	**8 A**
Max. power	**2000 VA**	**2000 VA**
DC1 at	**24 V**	**24 V**
Min. current	**0,01 A**	**0,01 A**
Max. current	**8 A**	**8 A**
Max. power	**200 W**	**200 W**
Utilisation category of auxiliary contacts		
AC1 at	**240 V**	**240 V**
Min. current	**0,01 A**	**0,01 A**
Max. current	**8 A**	**8 A**
Max. power	**2000 VA**	**2000 VA**
DC1 at	**24 V**	**24 V**
Min. current	**0,01 A**	**0,01 A**
Max. current	**8 A**	**8 A**
Max. power	**200 W**	**200 W**
Utilisation category		
In accordance with the standard	**EN 60947-5-1**	**EN 60947-5-1**
Utilisation category of safety contacts		
AC15 at	**230 V**	**230 V**
Max. current	**5 A**	**5 A**
DC13 (6 cycles/min) at	**24 V**	**24 V**
Max. current	**7 A**	**7 A**
Utilisation category of auxiliary contacts		
AC15 at	**230 V**	**230 V**
Max. current	**5 A**	**5 A**
DC13 (6 cycles/min) at	**24 V**	**24 V**
Max. current	**7 A**	**7 A**

Relay outputs	774746	774749
Utilisation category in accordance with UL		
Voltage	**240 V AC G. P.**	**240 V AC G. P.**
With current	**8 A**	**8 A**
Voltage	**24 V DC Resistive**	**24 V DC Resistive**
With current	**5 A**	**5 A**
Pilot Duty	**B300, R300**	**B300, R300**
External contact fuse protection, safety contacts		
In accordance with the standard	**EN 60947-5-1**	**EN 60947-5-1**
Max. melting integral	**240 A²s**	**240 A²s**
Blow-out fuse, quick	**10 A**	**10 A**
Blow-out fuse, slow	**6 A**	**6 A**
Blow-out fuse, gG	**10 A**	**10 A**
Circuit breaker 24V AC/DC, characteristic B/C	**6 A**	**6 A**
External contact fuse protection, auxiliary contacts		
Max. melting integral	**240 A²s**	**240 A²s**
Blow-out fuse, quick	**10 A**	**10 A**
Blow-out fuse, slow	**6 A**	**6 A**
Blow-out fuse, gG	**10 A**	**10 A**
Circuit breaker 24 V AC/DC, characteristic B/C	**6 A**	**6 A**
Contact material	**AgSnO2 + 0,2 µm Au**	**AgSnO2 + 0,2 µm Au**
Conventional thermal current while loading several contacts	**774746**	**774749**
Ith per contact at UB AC; AC1: 240 V, DC1: 24 V		
Conv. therm. current with 1 contact	**8 A**	–
Conv. therm. current with 2 contacts	**7 A**	–
Conv. therm. current with 3 contacts	**5,6 A**	–
Conv. therm. current with 4 contacts	**4,9 A**	–
Conv. therm. current with 5 contacts	**4,4 A**	–
Conv. therm. current with 6 contacts	**4 A**	–

Conventional thermal current while loading several contacts	**774746**	**774749**
Ith per contact at UB DC; AC1: 240 V, DC1: 24 V		
Conv. therm. current with 1 contact	–	**8 A**
Conv. therm. current with 2 contacts	–	**8 A**
Conv. therm. current with 3 contacts	–	**7 A**
Conv. therm. current with 4 contacts	–	**6,1 A**
Conv. therm. current with 5 contacts	–	**5,4 A**
Conv. therm. current with 6 contacts	–	**5 A**
Times	**774746**	**774749**
Switch-on delay		
With automatic start typ.	**180 ms**	**190 ms**
With automatic start max.	**250 ms**	**250 ms**
With automatic start after power on typ.	**230 ms**	**200 ms**
With automatic start after power on max.	**320 ms**	**300 ms**
With manual start typ.	**200 ms**	**200 ms**
With manual start max.	**250 ms**	**250 ms**
With monitored start typ.	**150 ms**	**165 ms**
With monitored start max.	**200 ms**	**220 ms**
Delay-on de-energisation		
With E-STOP typ.	**20 ms**	**20 ms**
With E-STOP max.	**30 ms**	**30 ms**
With power failure typ.	**300 ms**	**300 ms**
With power failure max.	**400 ms**	**400 ms**
Recovery time at max. switching frequency 1/s		
After E-STOP	**50 ms**	**50 ms**
After power failure	**450 ms**	**450 ms**
Min. start pulse duration with a monitored start	**50 ms**	**50 ms**
Supply interruption before de-energisation	**150 ms**	**150 ms**
Environmental data	**774746**	**774749**
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**

Environmental data	774746	774749
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 61326-3-1**	**EN 60947-5-1, EN 61000-6-2, EN 61326-3-1**
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 / II**	**III / II**
Pollution degree	**2**	**2**
Rated insulation voltage	**250 V**	**250 V**
Rated impulse withstand voltage	**4 kV**	**4 kV**
Protection type		
Housing	**IP40**	**IP40**
Terminals	**IP20**	**IP20**
Mounting area (e.g. control cabinet)	**IP54**	**IP54**
Mechanical data	**774746**	**774749**
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**
Connection type	**Screw terminal**	**Screw terminal**
Mounting type	**Fixed**	**Fixed**
Conductor cross section with screw terminals		
1 core flexible	**0,2 - 4 mm², 24 - 10 AWG**	**0,2 - 4 mm², 24 - 10 AWG**
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	**0,2 - 2,5 mm², 24 - 14 AWG**	**0,2 - 2,5 mm², 24 - 14 AWG**
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**0,2 - 2,5 mm², 24 - 14 AWG**	**0,2 - 2,5 mm², 24 - 14 AWG**
Torque setting with screw terminals	**0,6 Nm**	**0,6 Nm**
Dimensions		
Height	**87 mm**	**87 mm**
Width	**90 mm**	**90 mm**
Depth	**121 mm**	**121 mm**
Weight	**730 g**	**550 g**

Where standards are undated, the 2017-01 latest editions shall apply.

Safety characteristic data



NOTICE

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

Operating Mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN 62061 SIL CL	EN 62061 PFH_D [1/h]	IEC 61511 SIL	IEC 61511 PFD	EN ISO 13849-1: 2015 T_M [year]
–	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.

Supplementary data

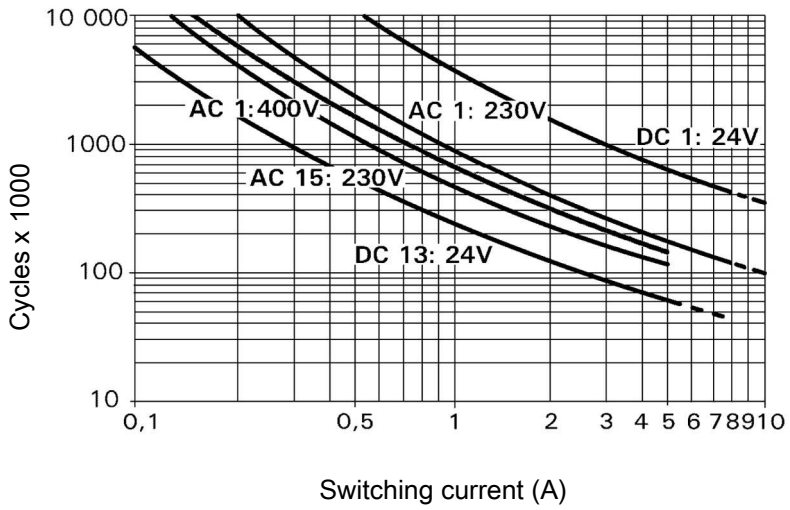
CAUTION!

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.



Example

- Inductive load: 0.2 A
- Utilisation category: AC15
- Contact service life: 4 000 000 cycles

Provided the application to be implemented requires fewer than 4 000 000 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 DC contactors, use flywheel diodes for spark suppression.

Order reference

Product type	Features	Connection type	Order no.
PNOZ X10.1	24 VAC	Screw terminals	774 740
PNOZ X10.1	42 VAC	Screw terminals	774 741
PNOZ X10.1	110 - 120 VAC	Screw terminals	774 745
PNOZ X10.1	230 - 240 VAC	Screw terminals	774 746
PNOZ X10.1	24 VDC	Screw terminals	774 749

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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