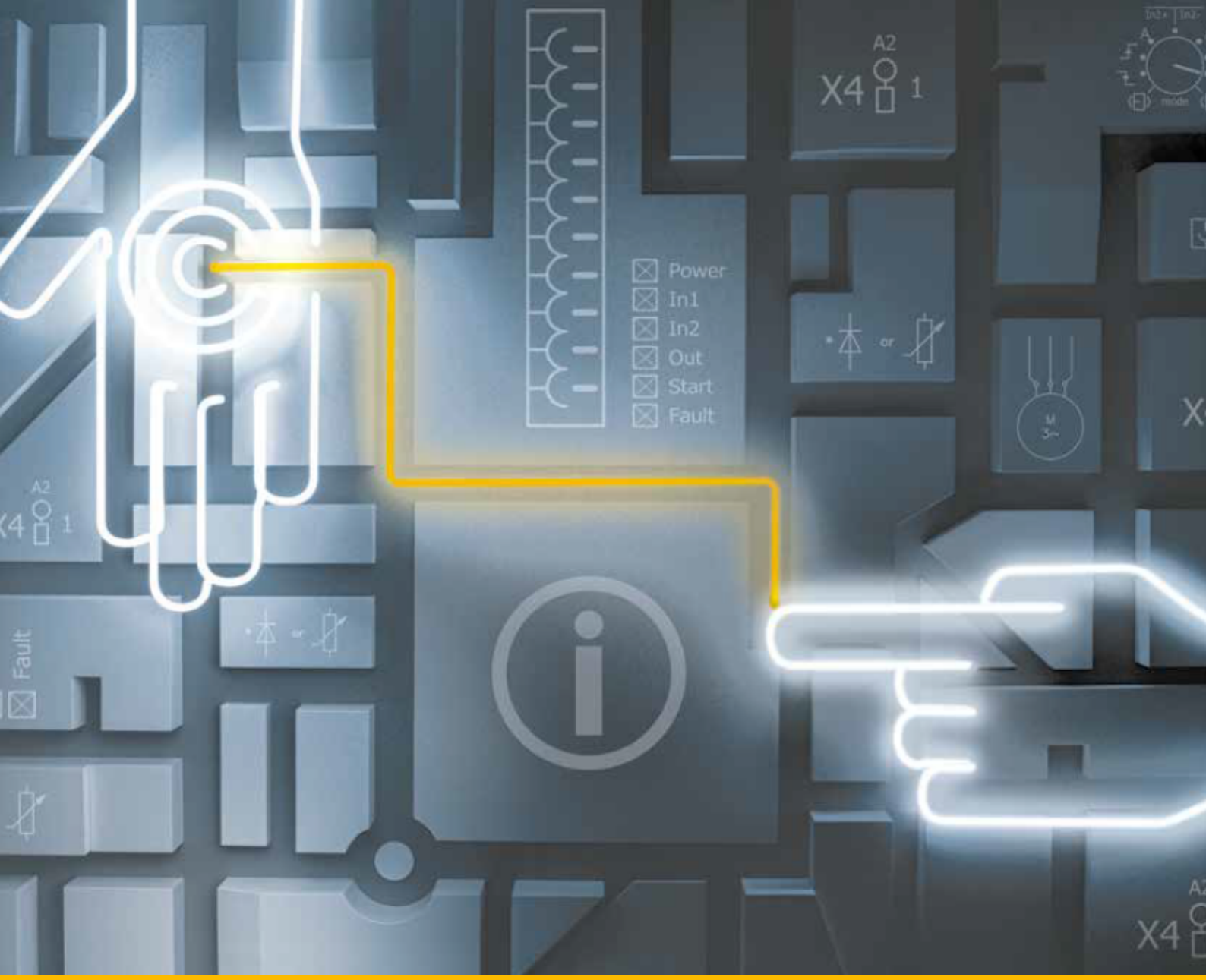

PNOZ X3

PILZ
THE SPIRIT OF SAFETY

Operating Manual-20547-EN-18
- Safety relays






This document is a translation of the original document.

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 X3. 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 X3 provides a safety-related interruption of a safety circuit.

The safety relay meets the requirements of EN 60947-5-1 and EN 60204-1 and may be used in applications with:

- E-STOP pushbuttons
- Safety gates

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 chapter entitled Technical Details [16]).



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 unit, a risk assessment is required in accordance with the Machinery Regulation.

Connecting additional units may result in further risks. Take the necessary measures to protect against corruption.

The product as an individual component fulfils the functional safety requirements in accordance with EN ISO 13849 and EN IEC 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, decommissioned and maintained 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. In order to inspect, assess and handle products, devices, systems, plant and machinery, this person must be familiar with 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 stated 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

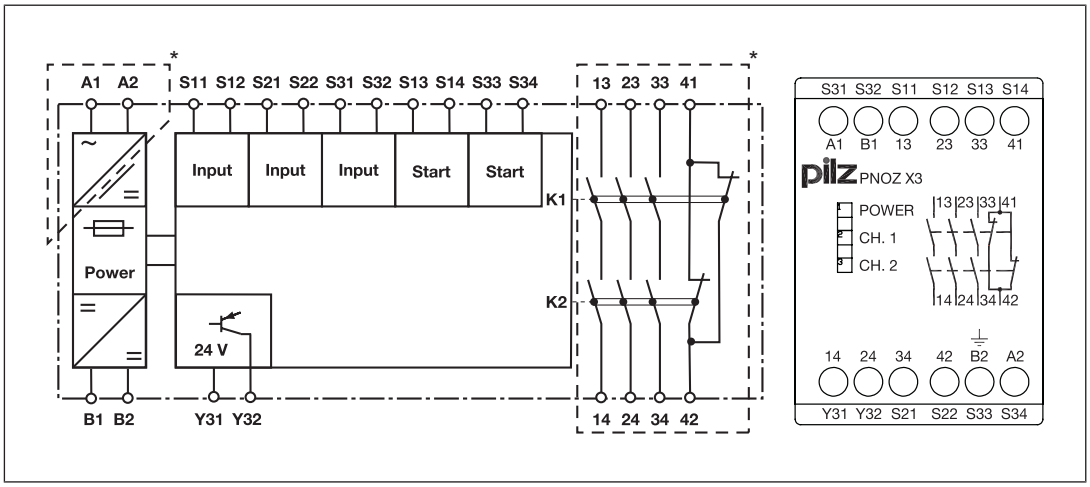
- Positive-guided relay outputs:
  - 3 safety contacts (N/O), instantaneous
  - 1 auxiliary contact (N/C), instantaneous
- 1 semiconductor output
- Connection options for:
  - E-STOP pushbutton
  - Safety gate limit switch
  - Start button
- LED display for:
  - Supply voltage
  - Switch status of the safety contacts
- Semiconductor output signals:
  - Switch state of the safety contacts
- 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



*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 X3 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 start circuit S13-S14 is closed.

- Input circuit is closed (e.g. E-STOP pushbutton not operated):
  - Safety contacts 13-14, 23-24 and 33-34 are closed, auxiliary contact 41-42 is open. The unit is active.
  - The LEDs "CH.1" and "CH.2" are lit.
  - A high signal is present at the semiconductor output switch state Y32.
- Input circuit is opened (e.g. E-STOP pushbutton operated):
  - Safety contacts 13-14, 23-24 and 33-34 are opened redundantly, auxiliary contact 41-42 is closed.
  - The LEDs "CH.1" and "CH.2" go out.
  - A low signal is present at the semiconductor output switch state Y32.

Operating modes

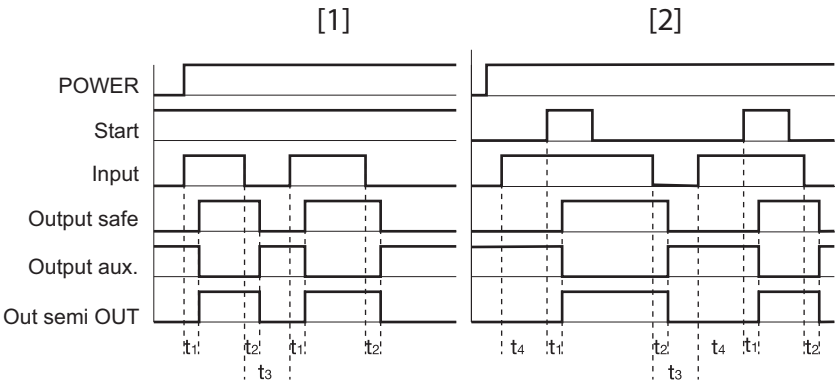
- Single-channel operation: No redundancy in the input circuit, earth faults in the start and input circuit are detected.
- Dual-channel operation with detection of shorts across contacts: Redundant input circuit, PNOZ X3 detects
  - earth faults in the start and input circuit,
  - short circuits in the input circuit,
  - shorts across contacts in the input circuit.
- Automatic start: Unit is active once the input circuit has been closed.
- Monitored start: Unit is active once the input circuit is closed and once the start circuit is closed after the waiting period has elapsed (see Technical details [📖 16]).
- Increase in the number of available contacts by connecting contact expandsion modules or external contactors/relays.



NOTICE

The device does not recognise short circuits or shorts across contacts in the start/feedback loop. Take suitable measures, such as fault exclusion through protected or separate installation.

Timing diagram



Legend

- Power: Supply voltage
- Start: Start circuit
- Input: Input circuit
- Output safe: Safety contacts
- Output aux: Auxiliary contact
- Out semi OUT: Semiconductor output switch state
- [1]: Automatic start
- [2]: Monitored start
- t_1: Switch-on delay
- t_2: Delay-on de-energisation
- t_3: Recovery time
- t_4: Waiting period with a monitored start

Installation

NOTICE

Protection against manipulation

Protect the product from unauthorised access.

- 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).
- With AC supply voltage: When installing more than 2 units next to each other in the control cabinet, a distance of at least 6mm must be maintained between the units.

Wiring

Please note:

- Information given in the "Technical details [16]" must be followed.
- 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!
- Delivery condition: Link between S11-S12 (dual-channel input circuit)
- To prevent contact welding, a fuse should be connected before the output contacts (see Technical details [16]).
- Calculation of the max. cable length I_{max} in the input circuit:

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

R_{lmax} = max. overall cable resistance (see Technical details [16])
R_l / km = cable resistance/km

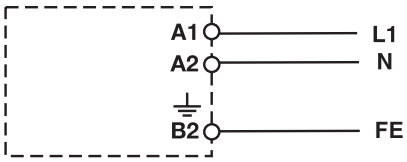
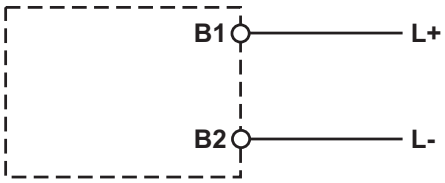
- Use copper wiring with a temperature stability of 60/75 °C.
- To prevent EMC interferences (particularly common-mode interferences) the measures described in EN 60204-1 must be executed. This includes the separate routing of cables of the control circuits (input, start and feedback loop) from other cables for energy transmission or the shielding of cables, for example.
- Do not switch low currents using contacts that have been used previously with high currents.
- Adequate protection circuit 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.
- With a 24 VDC supply voltage via terminals B1, B2, the power supply must comply with the regulations for extra low voltages with safe electrical separation (SELV, PELV).
- When operated with AC voltage: Connect terminal B2 to the functional earth.
- Semiconductor output supply voltage: Connect surge protection elements between the Y31 and B2 connections and any DC distribution network (not SELV/PELV) fed from outside of the electrical installation area.

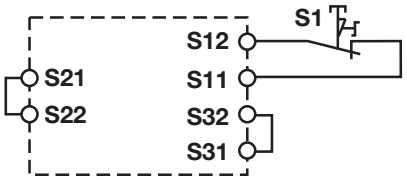
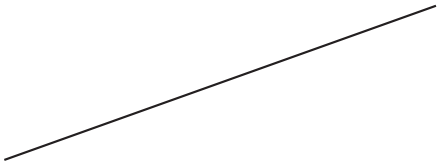
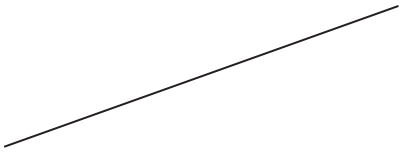
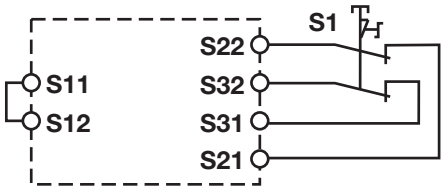
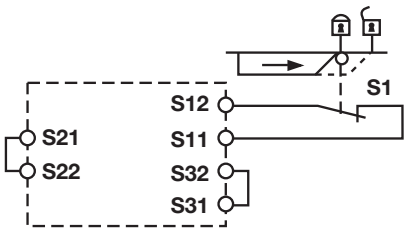
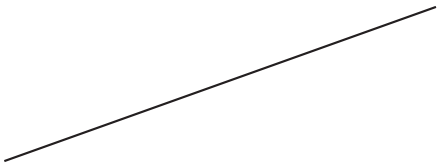
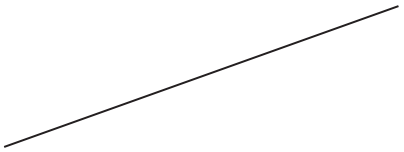
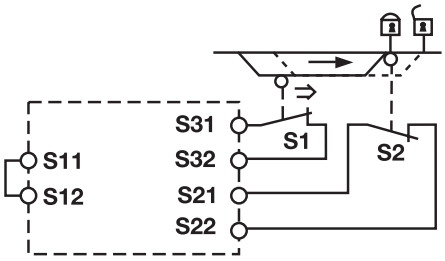
Important for detection of shorts across contacts:

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 length, we recommend the following test once the unit is installed:

1. Unit ready for operation (output contacts closed)
2. Short circuit the test terminals S22, S32 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.

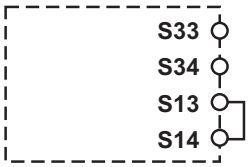
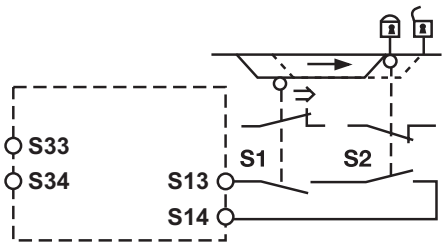
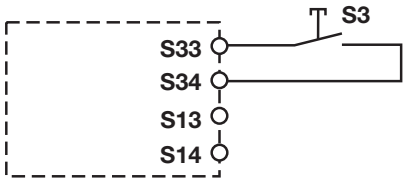
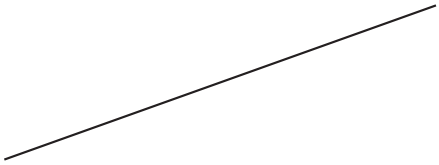
Preparing for operation

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		

NOTICE

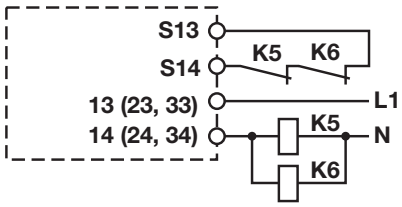
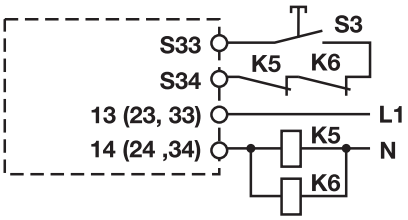
With single-channel wiring, the safety level of your plant/machine may be lower than the safety level of the unit (see Safety characteristic data [📖 33]). To achieve the stated safety level, appropriate measures must be taken on single-channel applications to exclude faults in the input circuit. Examples of such measures are: protected cable routing and positive-opening contacts in the E-STOP pushbutton.

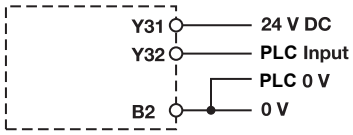
Start circuit	E-STOP wiring Safety gate without start-up test	Safety gate with start-up test
Automatic start		
Monitored start		

NOTICE

In the event of an automatic start:

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	Automatic start	Monitored start
Contacts from external contactors		

Semiconductor output


Legend

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



INFORMATION

With automatic start, S33 and S34 must not be linked; with monitored start, S13 and S14 must not be linked.

Operation



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.

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 Regulation, 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 3/PL e, at least 1x per month
- For SIL 2/PL d, at least 1x per year

Status indicators

LEDs indicate the status and errors during operation:



LED on



POWER

Supply voltage is present.



CH.1
Safety contacts of channel 1 are closed.

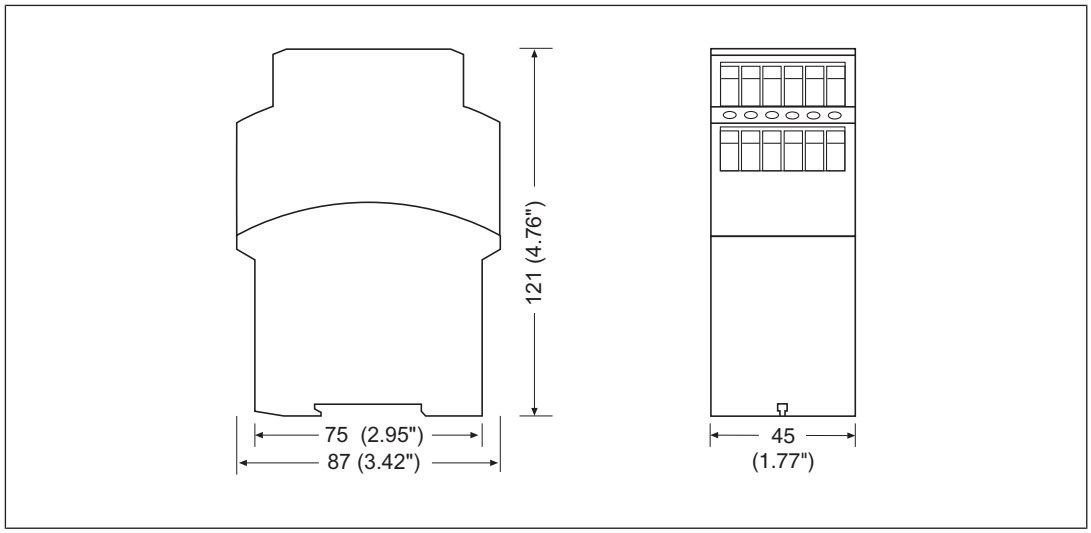


CH.2
Safety contacts of channel 2 are closed.

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, Product ID 774310, 774311, 774312

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

General	774310	774311	774312
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed	CCC, CE, EAC, TÜV, UKCA, cULus Listed	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	**774310**	**774311**	**774312**
Supply voltage			
Voltage	24 V	42 V	48 V
Kind	AC	AC	AC
Voltage tolerance	-15 %/+10 %	-15 %/+10 %	-15 %/+10 %
Output of external power supply (AC)	5 VA	5 VA	5 VA
Frequency range AC	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
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	160 %	160 %	160 %
Duty cycle	100 %	100 %	100 %
Inputs	**774310**	**774311**	**774312**
Quantity	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	35 mA	35 mA	35 mA
Feedback loop DC	20 mA	20 mA	20 mA
Min. input resistance at power-on	130 Ohm	130 Ohm	130 Ohm
Max. overall cable resistance RImax			
Single-channel at UB DC	150 Ohm	150 Ohm	150 Ohm
Single-channel at UB AC	180 Ohm	180 Ohm	180 Ohm
Dual-channel with detection of shorts across contacts at UB DC	15 Ohm	15 Ohm	15 Ohm
Dual-channel with detection of shorts across contacts at UB AC	30 Ohm	30 Ohm	30 Ohm

Semiconductor outputs	774310	774311	774312
Quantity	1	1	1
Voltage	24 V	24 V	24 V
Current	20 mA	20 mA	20 mA
External supply voltage	24 V	24 V	24 V
Voltage tolerance	-20 %/+20 %	-20 %/+20 %	-20 %/+20 %
Residual current at "0" signal	0,1 mA	0,1 mA	0,1 mA
Max. internal voltage drop	4 V	4 V	4 V
Conditional rated short circuit current	100 A	100 A	100 A
Lowest operating current	0 mA	0 mA	0 mA
Utilisation category in accordance with EN 60947-1	DC-12	DC-12	DC-12
Relay outputs	**774310**	**774311**	**774312**
Number of output contacts			
Safety contacts (N/O), instantaneous	3	3	3
Auxiliary contacts (N/C)	1	1	1
Max. short circuit current IK	1 kA	1 kA	1 kA
Utilisation category			
in accordance with the standard	EN 60947-4-1	EN 60947-4-1	EN 60947-4-1
Utilisation category of safety 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	2.000 VA	2.000 VA	2.000 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

Relay outputs	774310	774311	774312
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	**6 A**	**6 A**	**6 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	**6 A**	**6 A**	**6 A**
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	774310	774311	774312
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	**7,5 A**	**7,5 A**	**7,5 A**
Conv. therm. current with 3 contacts	**6,5 A**	**6,5 A**	**6,5 A**
Ith per contact at UB DC; AC1: 240 V, DC1: 24 V			
Conv. therm. current with 1 contact	**8 A**	**8 A**	**8 A**
Conv. therm. current with 2 contacts	**8 A**	**8 A**	**8 A**
Conv. therm. current with 3 contacts	**7 A**	**7 A**	**7 A**
Times	**774310**	**774311**	**774312**
Switch-on delay			
with automatic start typ.	**250 ms**	**250 ms**	**250 ms**
with automatic start max.	**500 ms**	**500 ms**	**500 ms**
with automatic start after power on typ.	**280 ms**	**280 ms**	**280 ms**
with automatic start after power on max.	**550 ms**	**550 ms**	**550 ms**
with monitored start typ.	**35 ms**	**35 ms**	**35 ms**
with monitored start max.	**50 ms**	**50 ms**	**50 ms**
Delay-on de-energisation			
with E-STOP typ.	**15 ms**	**15 ms**	**15 ms**
with E-STOP max.	**30 ms**	**30 ms**	**30 ms**
with power failure typ.	**50 ms**	**50 ms**	**50 ms**
with power failure max.	**70 ms**	**70 ms**	**70 ms**
Recovery time at max. switching frequency 1/s			
after E-STOP	**50 ms**	**50 ms**	**50 ms**
after power failure	**100 ms**	**100 ms**	**100 ms**
Waiting period with a monitored start	**300 ms**	**300 ms**	**300 ms**
Min. start pulse duration with a monitored start	**30 ms**	**30 ms**	**30 ms**
Supply interruption before de-energisation	**20 ms**	**20 ms**	**20 ms**
Simultaneity, channel 1 and 2 max.	∞	∞	∞

Environmental data	774310	774311	774312
Climatic suitability	EN 60068-2-78	EN 60068-2-78	EN 60068-2-78
Ambient temperature			
Temperature range	-20 - 55 °C	-20 - 55 °C	-20 - 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
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	3	3	3
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	**774310**	**774311**	**774312**
Mounting position	Any	Any	Any
Mechanical life	10,000,000 cycles	10,000,000 cycles	10,000,000 cycles
Material			
Bottom	PPO UL 94 V1	PPO UL 94 V1	PPO UL 94 V1
Front	ABS UL 94 V0	ABS UL 94 V0	ABS UL 94 V0
Top	PPO UL 94 V1	PPO UL 94 V1	PPO UL 94 V1
Connection type	Screw terminal	Screw terminal	Screw terminal
Mounting type	Fixed	Fixed	Fixed

Mechanical data	774310	774311	774312
Conductor cross section with screw terminals			
1 core flexible	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**
Torque setting with screw terminals	**0,8 Nm**	**0,8 Nm**	**0,8 Nm**
Stripping length with screw terminals	**6 mm**	**6 mm**	**6 mm**
Dimensions			
Height	**87 mm**	**87 mm**	**87 mm**
Width	**45 mm**	**45 mm**	**45 mm**
Depth	**121 mm**	**121 mm**	**121 mm**
Weight	**375 g**	**375 g**	**375 g**

Technical details, Product ID 774314, 774315, 774316

General	774314	774315	774316
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed	CCC, CE, EAC, TÜV, UKCA, cULus Listed	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	**774314**	**774315**	**774316**
Supply voltage			
Voltage	110 V	115 V	120 V
Kind	AC	AC	AC
Voltage tolerance	-15 %/+10 %	-15 %/+10 %	-15 %/+10 %
Output of external power supply (AC)	5 VA	5 VA	5 VA
Frequency range AC	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
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	160 %	160 %	160 %
Duty cycle	100 %	100 %	100 %
Inputs	**774314**	**774315**	**774316**
Quantity	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	35 mA	35 mA	35 mA
Feedback loop DC	20 mA	20 mA	20 mA
Min. input resistance at power-on	130 Ohm	130 Ohm	130 Ohm
Max. overall cable resistance RImax			
Single-channel at UB DC	150 Ohm	150 Ohm	150 Ohm
Single-channel at UB AC	180 Ohm	180 Ohm	180 Ohm
Dual-channel with detection of shorts across contacts at UB DC	15 Ohm	15 Ohm	15 Ohm
Dual-channel with detection of shorts across contacts at UB AC	30 Ohm	30 Ohm	30 Ohm
Semiconductor outputs	**774314**	**774315**	**774316**
Quantity	1	1	1
Voltage	24 V	24 V	24 V

Semiconductor outputs	774314	774315	774316
Current	20 mA	20 mA	20 mA
External supply voltage	24 V	24 V	24 V
Voltage tolerance	-20 %/+20 %	-20 %/+20 %	-20 %/+20 %
Residual current at "0" signal	0,1 mA	0,1 mA	0,1 mA
Max. internal voltage drop	4 V	4 V	4 V
Conditional rated short circuit current	100 A	100 A	100 A
Lowest operating current	0 mA	0 mA	0 mA
Utilisation category in accordance with EN 60947-1	DC-12	DC-12	DC-12
Relay outputs	**774314**	**774315**	**774316**
Number of output contacts			
Safety contacts (N/O), instantaneous	3	3	3
Auxiliary contacts (N/C)	1	1	1
Max. short circuit current IK	1 kA	1 kA	1 kA
Utilisation category			
in accordance with the standard	EN 60947-4-1	EN 60947-4-1	EN 60947-4-1
Utilisation category of safety 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	2.000 VA	2.000 VA	2.000 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

Relay outputs	774314	774315	774316
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	**6 A**	**6 A**	**6 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	**6 A**	**6 A**	**6 A**
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	774314	774315	774316
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	**7,5 A**	**7,5 A**	**7,5 A**
Conv. therm. current with 3 contacts	**6,5 A**	**6,5 A**	**6,5 A**
Ith per contact at UB DC; AC1: 240 V, DC1: 24 V			
Conv. therm. current with 1 contact	**8 A**	**8 A**	**8 A**
Conv. therm. current with 2 contacts	**8 A**	**8 A**	**8 A**
Conv. therm. current with 3 contacts	**7 A**	**7 A**	**7 A**
Times	**774314**	**774315**	**774316**
Switch-on delay			
with automatic start typ.	**250 ms**	**250 ms**	**250 ms**
with automatic start max.	**500 ms**	**500 ms**	**500 ms**
with automatic start after power on typ.	**280 ms**	**280 ms**	**280 ms**
with automatic start after power on max.	**550 ms**	**550 ms**	**550 ms**
with monitored start typ.	**35 ms**	**35 ms**	**35 ms**
with monitored start max.	**50 ms**	**50 ms**	**50 ms**
Delay-on de-energisation			
with E-STOP typ.	**15 ms**	**15 ms**	**15 ms**
with E-STOP max.	**30 ms**	**30 ms**	**30 ms**
with power failure typ.	**50 ms**	**50 ms**	**50 ms**
with power failure max.	**70 ms**	**70 ms**	**70 ms**
Recovery time at max. switching frequency 1/s			
after E-STOP	**50 ms**	**50 ms**	**50 ms**
after power failure	**100 ms**	**100 ms**	**100 ms**
Waiting period with a monitored start	**300 ms**	**300 ms**	**300 ms**
Min. start pulse duration with a monitored start	**30 ms**	**30 ms**	**30 ms**
Supply interruption before de-energisation	**20 ms**	**20 ms**	**20 ms**
Simultaneity, channel 1 and 2 max.	∞	∞	∞

Environmental data	774314	774315	774316
Climatic suitability	EN 60068-2-78	EN 60068-2-78	EN 60068-2-78
Ambient temperature			
Temperature range	-20 - 55 °C	-20 - 55 °C	-20 - 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
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	3	3	3
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	**774314**	**774315**	**774316**
Mounting position	Any	Any	Any
Mechanical life	10,000,000 cycles	10,000,000 cycles	10,000,000 cycles
Material			
Bottom	PPO UL 94 V1	PPO UL 94 V1	PPO UL 94 V1
Front	ABS UL 94 V0	ABS UL 94 V0	ABS UL 94 V0
Top	PPO UL 94 V1	PPO UL 94 V1	PPO UL 94 V1
Connection type	Screw terminal	Screw terminal	Screw terminal
Mounting type	Fixed	Fixed	Fixed

Mechanical data	774314	774315	774316
Conductor cross section with screw terminals			
1 core flexible	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**
Torque setting with screw terminals	**0,8 Nm**	**0,8 Nm**	**0,8 Nm**
Stripping length with screw terminals	**6 mm**	**6 mm**	**6 mm**
Dimensions			
Height	**87 mm**	**87 mm**	**87 mm**
Width	**45 mm**	**45 mm**	**45 mm**
Depth	**121 mm**	**121 mm**	**121 mm**
Weight	**375 g**	**375 g**	**375 g**

Technical details, Product ID 774318, 774319

General	774318	774319
Certifications	CCC, CE, EAC, TÜV, UKCA, cU-Lus Listed	CCC, CE, EAC, TÜV, UKCA, cU-Lus Listed
Electrical data	**774318**	**774319**
Supply voltage		
Voltage	230 V	240 V
Kind	AC	AC
Voltage tolerance	-15 %/+10 %	-15 %/+10 %
Output of external power supply (AC)	5 VA	5 VA
Frequency range AC	50 - 60 Hz	50 - 60 Hz
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	160 %	160 %
Duty cycle	100 %	100 %
Inputs	**774318**	**774319**
Quantity	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	35 mA	35 mA
Feedback loop DC	20 mA	20 mA
Min. input resistance at power-on	130 Ohm	130 Ohm
Max. overall cable resistance Rl-max		
Single-channel at UB DC	150 Ohm	150 Ohm
Single-channel at UB AC	180 Ohm	180 Ohm
Dual-channel with detection of shorts across contacts at UB DC	15 Ohm	15 Ohm
Dual-channel with detection of shorts across contacts at UB AC	30 Ohm	30 Ohm
Semiconductor outputs	**774318**	**774319**
Quantity	1	1
Voltage	24 V	24 V
Current	20 mA	20 mA
External supply voltage	24 V	24 V
Voltage tolerance	-20 %/+20 %	-20 %/+20 %

Semiconductor outputs	774318	774319
Residual current at "0" signal	**0,1 mA**	**0,1 mA**
Max. internal voltage drop	**4 V**	**4 V**
Conditional rated short circuit current	**100 A**	**100 A**
Lowest operating current	**0 mA**	**0 mA**
Utilisation category in accordance with EN 60947-1	**DC-12**	**DC-12**
Relay outputs	**774318**	**774319**
Number of output contacts		
Safety contacts (N/O), instantaneous	**3**	**3**
Auxiliary contacts (N/C)	**1**	**1**
Max. short circuit current IK	**1 kA**	**1 kA**
Utilisation category		
in accordance with the standard	**EN 60947-4-1**	**EN 60947-4-1**
Utilisation category of safety contacts		
AC1 at	**240 V**	**240 V**
Min. current	**0,01 A**	**0,01 A**
Max. current	**8 A**	**8 A**
Max. power	**2.000 VA**	**2.000 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	**6 A**	**6 A**

Relay outputs	774318	774319
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	**6 A**	**6 A**
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	**774318**	**774319**
Ith per contact at UB AC; AC1: 240 V, DC1: 24 V		
Conv. therm. current with 1 contact	**8 A**	**8 A**
Conv. therm. current with 2 contacts	**7,5 A**	**7,5 A**
Conv. therm. current with 3 contacts	**6,5 A**	**6,5 A**

Conventional thermal current while loading several contacts	774318	774319
Ith per contact at UB DC; AC1: 240 V, DC1: 24 V		
Conv. therm. current with 1 contact	**8 A**	**8 A**
Conv. therm. current with 2 contacts	**8 A**	**8 A**
Conv. therm. current with 3 contacts	**7 A**	**7 A**
Times	**774318**	**774319**
Switch-on delay		
with automatic start typ.	**250 ms**	**250 ms**
with automatic start max.	**500 ms**	**500 ms**
with automatic start after power on typ.	**280 ms**	**280 ms**
with automatic start after power on max.	**550 ms**	**550 ms**
with monitored start typ.	**35 ms**	**35 ms**
with monitored start max.	**50 ms**	**50 ms**
Delay-on de-energisation		
with E-STOP typ.	**15 ms**	**15 ms**
with E-STOP max.	**30 ms**	**30 ms**
with power failure typ.	**50 ms**	**50 ms**
with power failure max.	**70 ms**	**70 ms**
Recovery time at max. switching frequency 1/s		
after E-STOP	**50 ms**	**50 ms**
after power failure	**100 ms**	**100 ms**
Waiting period with a monitored start	**300 ms**	**300 ms**
Min. start pulse duration with a monitored start	**30 ms**	**30 ms**
Supply interruption before de-energisation	**20 ms**	**20 ms**
Simultaneity, channel 1 and 2 max.	∞	∞
Environmental data	**774318**	**774319**
Climatic suitability	**EN 60068-2-78**	**EN 60068-2-78**
Ambient temperature		
Temperature range	**-20 - 55 °C**	**-20 - 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 61326-3-1**	**EN 60947-5-1, EN 61000-6-2, EN 61326-3-1**

Environmental data	774318	774319
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	**3**	**3**
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	**774318**	**774319**
Mounting position	**Any**	**Any**
Mechanical life	**10,000,000 cycles**	**10,000,000 cycles**
Material		
Bottom	**PPO UL 94 V1**	**PPO UL 94 V1**
Front	**ABS UL 94 V0**	**ABS UL 94 V0**
Top	**PPO UL 94 V1**	**PPO UL 94 V1**
Connection type	**Screw terminal**	**Screw terminal**
Mounting type	**Fixed**	**Fixed**
Conductor cross section with screw terminals		
1 core flexible	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**1 - 2,5 mm², 18 - 14 AWG**	**1 - 2,5 mm², 18 - 14 AWG**
Torque setting with screw terminals	**0,8 Nm**	**0,8 Nm**
Stripping length with screw terminals	**6 mm**	**6 mm**
Dimensions		
Height	**87 mm**	**87 mm**
Width	**45 mm**	**45 mm**
Depth	**121 mm**	**121 mm**
Weight	**375 g**	**375 g**

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: 2023 PL	EN ISO 13849-1: 2023 Category	EN IEC 62061 SIL CL/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2023 T_M [year]
–	PL e	Cat. 4	SIL 3	2,31E-09	SIL 3	2,03E-06	20

Explanatory notes for the safety-related characteristic data:

- 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 products used and may differ from these.

Supplementary data



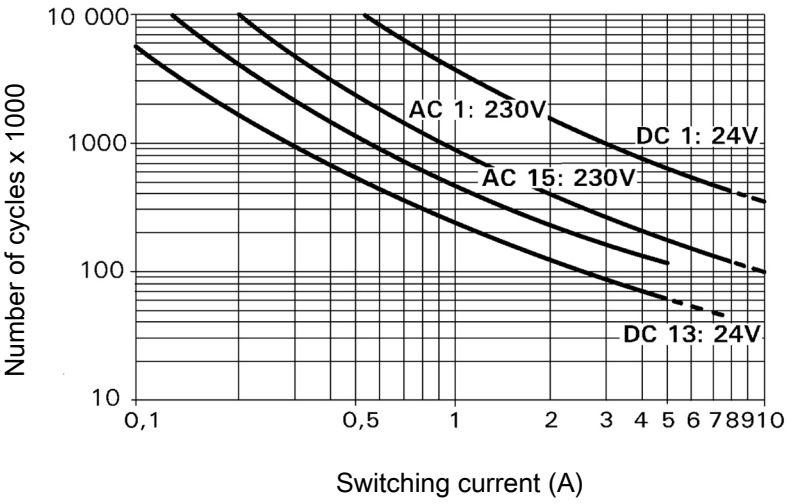
CAUTION!

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.



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	Product ID
PNOZ X3	24 VAC; 24 VDC	Screw terminals	774310
PNOZ X3	42 VAC; 24 VDC	Screw terminals	774311
PNOZ X3	48 VAC; 24 VDC	Screw terminals	774312
PNOZ X3	110 VAC; 24 VDC	Screw terminals	774314
PNOZ X3	115 VAC; 24 VDC	Screw terminals	774315
PNOZ X3	120 VAC; 24 VDC	Screw terminals	774316
PNOZ X3	230 VAC; 24 VDC	Screw terminals	774318
PNOZ X3	240 VAC; 24 VDC	Screw terminals	774319

EU/EC declaration of conformity

These products meet the requirements of the directive 2006/42/EC on machinery up to and including 19 January 2027, and the EU regulation 2023/1230 of the European Parliament and of the Council from 20 January 2027. The full EU and EC declaration of conformity is available to download at www.pilz.com/manuals.

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

UKCA-Declaration of Conformity

These products comply 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/manuals.

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THE SPIRIT OF SAFETY

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