PSR-PC32

SIL coupling relay



Data sheet
107175_en_03

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1 Description

Intended Use

The SIL coupling relay is used to adjust the power and for electrical isolation in high- and low-demand applications. The coupling relay safely interrupts circuits.

The category 3 device is designed for installation in zone 2 potentially explosive areas.

Possible signal generators

- Failsafe controllers
- Digital field sensors

Contact switching type

- 1 undelayed enabling current path up to 250 V AC/DC
- 1 undelayed enabling current path up to 60 V AC/DC
- 1 undelayed confirmation current path

The enabling current paths drop out without delay as per stop category 0 in accordance with EN 60204-1.

Control

- 1- or 2-channel
- Automatic start

Achievable safety integrity

- Suitable for high- and low-demand applications up to SIL 3 in accordance with IEC 61508, IEC 61511, and IEC 50156

Additional features

- Wide-range input 24 V AC/DC ... 230 V AC/DC
- Easy proof test:
  - Visually on the device
  - Evaluation of the force-guided N/C contact
- Corrosion protection due to conformal coating of the PCB
- Optional pluggable screw or Push-in terminal blocks
- 17.5 mm housing width

Approvals

Observe these notes

WARNING: Risk of electric shock
Observe the safety regulations and installation notes in the corresponding section.

Make sure you always use the latest documentation.
It can be downloaded from the product at phoenixcontact.com/products.

This document is valid for the products listed in the “Ordering data” chapter.
This document meets the same requirements as the original operating instructions with respect to the contents.

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3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
Coupling relay for SIL 3 high and low-demand applications, couples digital signals to the I/O, 24 V ... 230 V wide-range input, 2 enabling current paths (1x up to 60 V, 1x up to 250 V) 1 confirmation current path, safe state off applications, plug-in screw terminal block	PSR-PC32-2NO-1NC-24-230UC-SC	2700581	1
Coupling relay for SIL 3 high and low-demand applications, couples digital signals to the I/O, 24 V ... 230 V wide-range input, 2 enabling current paths (1x up to 60 V, 1x up to 250 V) 1 confirmation current path, safe state off applications, pluggable Push-in terminal block	PSR-PC32-2NO-1NC-24-230UC-SP	2700582	1

Accessories	Type	Item no.	Pcs./Pkt.
Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6.0 mm², lateral entry, trapezoidal crimp	CRIMPFOX 6	1212034	1

4 Technical data

Hardware/firmware version	
Hardware/firmware version (2700581)	02/-- , 03/--
Hardware/firmware version (2700582)	≥ 02/--

The technical data and safety characteristics are valid as of the specified HW/FW version.

Control inputs: A1/A2	
Rated control circuit supply voltage U_S	24 V AC/DC ... 230 V AC/DC -15 % ... +10 %
Rated control supply current I_S	75 mA (24 V DC) 34 mA (48 V DC) 97 mA (42 V AC) 28 mA (120 V AC) 16 mA (230 V AC)
Power consumption at U_S	1.8 W (with DC) 2.1 W (with AC)
Input voltage range "0" signal	0 V ... 5 V
Apparent power	typ. 4.1 VA
Inrush current	typ. 16 A (Δt < 100 µs at U_s)
Filter time	10 ms (24 V DC, A1 in the event of voltage dips at U_s) max. 1.5 ms (at A1-A2; test pulse width; at 24 V DC) Test pulse rate = 5 x Test pulse width
Frequency range	50 Hz ... 60 Hz (with AC)
Max. permissible overall conductor resistance	150 Ω
Protective circuit	Surge protection Varistor 275 V

Diagnostic supply voltage: 24V/GND	
Diagnostic supply voltage U_D	24 V DC -15 % / +10 %
Input current at U_D	< 5 mA
Inrush current at U_D	< 5 mA (typ.)
Protective circuit	Surge protection 33 V suppressor diode Serial protection against polarity reversal

Relay outputs: Enabling current paths (13/14, 93/94)	
Number of outputs	2 (safety-related)
Output description	2 NO contacts each in series, without delay, floating
Contact material	$AgSnO_2$
Switching voltage (see section “Relay data”)	min. 12 V AC/DC max. 250 V AC/DC (13/14) max. 60 V AC/DC (93/94)
Limiting continuous current (see section “Relay data”)	6 A (observe derating)
Inrush current	min. 3 mA max. 6 A
Sq. Total current $I_{TH}^2 = I_1^2 + I_2^2 + ... + I_N^2$	72 A^2 (observe derating)
Switching frequency	max. 0.1 Hz
Service life electrical	See section “Electrical service life”
Mechanical service life	10x 10^6 cycles
Switching power	min. 60 mW
Switching capacity (360/h cycles)	4 A (24 V (DC13)) 5 A (230 V (AC 15))
Output fuse	6 A gL/gG 4 A gL/gG (for low-demand applications)

Relay outputs: Confirmation current path (31/32)	
Number of outputs	1 (safety-related)
Output description	2 N/C contacts in series, without delay, floating/non-floating, depending on the application
Contact material	AgCuNi, + Au
Switching voltage	min. 3.3 V DC max. 26.4 V DC
Limiting continuous current	100 mA
Inrush current	min. 1 mA max. 100 mA
Switching frequency	max. 0.1 Hz
Mechanical service life	10x 10^6 cycles
Switching power	min. 3.3 mW
Protective circuit	Suppressor diode 38.6 V (31/GND and 32/GND)
Output fuse	150 mA fast blow

Times	
Typical starting time with U_s	< 100 ms (with U_s when controlled via A1)
Typical release time with U_s	< 200 ms (with U_s when controlled via A1)
Recovery time	< 500 ms

General data	
Relay type	Electromechanical relay with force-guided contacts in accordance with IEC/EN 61810-3
Nominal operating mode	100% operating factor
Degree of protection	IP20
Min. degree of protection of inst. location	IP54
Mounting type	DIN rail mounting
Mounting position	vertical or horizontal
Assembly note	See derating curve
Type of housing	PA zinc yellow (RAL 1018)
Operating voltage display	1 x LED (yellow)
Status display	1 x LED (green), 1 x LED (yellow)
Rated insulation voltage	250 V AC
Degree of pollution	2
Overvoltage category	II, III (See the section “Insulation coordination”)
Maximum power dissipation for nominal condition	5.7 W (at I_L^2 = 72 A²)
Note on power dissipation	See “Calculating the power dissipation”

Dimensions / weight	Screw connection	Push-in connection
W x H x D	17.5 x 112.2 x 114.5 mm	17.5 x 117.4 x 114.5 mm
Weight	157.28 g	226.5 g

Connection data	Screw connection	Push-in connection
Conductor cross-section rigid	0.2 mm² … 2.5 mm²	0.2 mm² … 1.5 mm²
Conductor cross-section flexible	0.2 mm² … 2.5 mm²	0.2 mm² … 1.5 mm²
Conductor cross-section AWG	24 … 12	24 … 16
Conductor cross-section flexible, with ferrule without plastic sleeve	-	0.25 mm² … 1.5 mm² (only together with CRIMPFOX 6)
Conductor cross-section flexible, with ferrule with plastic sleeve	-	0.25 mm² … 1.5 mm² (only together with CRIMPFOX 6)
Stripping length	7 mm	8 mm
Screw thread	M3	-
Tightening torque	0.5 Nm … 0.6 Nm	-

Ambient conditions	
Ambient temperature (operation)	-40 °C … 70 °C (observe derating)
Ambient temperature (storage/transport)	-40 °C … 85 °C
Max. permissible relative humidity (operation)	75 % (on average, 85% infrequently, non-condensing)
Max. permissible humidity (storage/transport)	75 % (on average, 85% infrequently, non-condensing)
Maximum altitude	≤ 2000 m (Above sea level)
Information on operating height	See the “Using PSR devices at altitudes greater than 2000 m above sea level” section
Shock	15g
Vibration (operation)	10 Hz … 150 Hz, 2g

Approvals and manufacturer's declarations	
The latest documents can be found at:	www.phoenixcontact.com/product/2700581 www.phoenixcontact.com/product/2700582
IECEx (IECEx UL 22.0037X)	Ex ec nC IIC T4 Gc
ATEX (UL 22 ATEX 2912X)	Ⓔx II 3G Ex ec nC IIC T4 Gc
UL, USA/Canada (E140324)	cULus
UL Ex, USA / Canada (E360692)	Class I, Zone 2, AEx ec nC IIC T4 / Ex ec nC IIC Gc T4 X Class I, Div. 2, Groups A, B, C, D, T4
CCC / China-Ex (2022122304115695)	Ex ec nC IIC T4 Gc
Environmental simulation test (ISA-S71.04)	G3

Safety data	
Stop category according to IEC 60204	0

Safety parameters in accordance to IEC 61508 - high demand	
Equipment type	Type A
HFT	1
SIL	3 (< 15% of the overall SIL)
Systematic Capabiltiy (SC)	3
PFH_D	1.00×10^{-9} (4 A DC13; 5 A AC15; 8760 switching cycles/ year)
Demand rate	< 12 Months
Proof test interval	240 Months
Mission time	240 Months

For use in high-demand applications, the diagnostics function must be implemented via the confirmation current path.

SIL examination as a 1oo1 structure alternative illustration	
Equipment type	Type A
HFT	0
SIL	3 (< 15% of the overall SIL)
Systematic Capabiltiy (SC)	3
Safe Failure Fraction (SFF)	99.99 %
λSD	0 FIT
λSU	3135.22 FIT
λDD	62.35 FIT
λDU	1 FIT
λTotal	3198.57 FIT
MTBF	22.44 Years (includes errors which are not part of the safety function; MTTR = 8 h)
PFH_D	1.00×10^{-9}

For use in high-demand applications, the diagnostics function must be implemented via the confirmation current path.

Safety parameters according to IEC 61508 - low demand	
Equipment type	Type A
HFT	1
SIL	3 (< 15% of the overall SIL)
Systematic Capabiltiy (SC)	3
PFD_{avg}	1.32×10^{-4}
Proof test interval	72 Months
Mission time	240 Months

SIL examination as a 1oo1 structure alternative illustration	
Equipment type	Type A
HFT	0
SIL	3 (< 15% of the overall SIL)
Systematic Capabiltiy (SC)	3
Safe Failure Fraction (SFF)	99.85 %
λSD	0 FIT
λSU	3577.81 FIT
λDD	0 FIT
λDU	5.5 FIT
λTotal	3583.32 FIT
MTBF	22.51 Years (includes errors which are not part of the safety function; MTTR = 8 h)
PFD_{avg}	2.41×10^{-5} (for proof test interval = 1 year)

Safety parameters for EN 50156-2	
SIL	3 (Reference IEC 61508)

5 Notes regarding documentation

5.1 Identification of warning notes



This symbol indicates hazards that could lead to personal injury.

There are three signal words indicating the severity of a potential injury.

DANGER Indicates a hazard with a high risk level. If this hazardous situation is not avoided, it will result in death or serious injury.

WARNING Indicates a hazard with a medium risk level. If this hazardous situation is not avoided, it could result in death or serious injury.

CAUTION Indicates a hazard with a low risk level. If this hazardous situation is not avoided, it could result in minor or moderate injury.



This symbol together with the **NOTE** signal word warns the reader of actions that might cause property damage or a malfunction.



Here you will find additional information or detailed sources of information.

5.2 Validity

This data sheet is valid for the described product(s) from the hardware/firmware version specified in the technical data.

5.3 Target group

This data sheet is therefore aimed at:

– Qualified personnel who plan and design safety equipment for machines and systems and are familiar with regulations governing occupational safety and accident prevention.
– Qualified personnel who install and operate safety equipment in machines and systems.

Qualified personnel:

Qualified personnel are people who, because of their education, experience, and instruction and their knowledge of relevant standards, regulations, accident prevention, and service conditions, have been authorized by those responsible for the safety of the system to carry out any required operations and who are able to recognize and avoid any possible dangers.

Requirements:

Knowledge of the following topics is required:

– Handling safety components
– Valid EMC regulations
– Valid regulations governing occupational safety and accident prevention

6 Safety regulations and installation notes

WARNING: Death, serious personal injury or damage to equipment

Depending on the application, incorrect handling of the device may pose serious risks for the user or cause damage to equipment.

- Observe all the safety notes and warning instructions provided in this chapter and elsewhere in this document.

Safety notes for installation and mounting in other languages:
PACKB.SAFETY NOTES INSTALLATION MOUNTING
They can be downloaded from the product page at www.phoenixcontact.com/products.

Electrostatic discharge

The device contains components that can be damaged or destroyed by electrostatic discharge.

- When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) in accordance with EN 61340-5-1 and IEC 61340-5-1.

Direct/indirect contact

- Protection against direct and indirect contact according to VDE 0100 Part 410 must be ensured for all components connected to the system.

In the event of an error, parasitic voltages must not occur (single-fault tolerance).

Power supply units for power supply

- Safeguard the input voltage of the controlling devices (controller or sensor) externally.
- Make sure that the power supply unit is able to supply **four times** the nominal current of the external fuse, to ensure that it trips in the event of an error.

Power supply units for 24 V supply (diagnostic supply voltage)

- Only use power supply units with safe isolation and SELV/PELV.
- Protect the 24 V area with a suitable external fuse.
- Make sure that the power supply unit is able to supply **four times** the nominal current of the external fuse, to ensure that it trips in the event of an error.
- Make sure that the output voltage of the voltage supply does not exceed 32 V even in the event of error.

Startup, mounting, and modifications

Startup, mounting, modifications, and upgrades may only be carried out by qualified personnel.

- Before working on the device, disconnect the power.
- Ensure that the device is disconnected from the power supply.
- Carry out wiring according to the application. Refer to the “Application examples” section for this.

Reliable operation is only ensured if the device is installed in housing protected from dust and humidity.

- Install the device in housing protected from dust and humidity (min. IP54).

Mismatching and polarity reversal of connections

- Take measures to prevent mismatching, polarity reversal, and manipulation of connections.

In operation

During operation, parts of electrical switching devices carry hazardous voltages.

- Protective covers must not be removed when operating electrical switching devices.

Inductive loads can lead to welded relay contacts.

- Connect a suitable and effective protective circuit to inductive loads.
- Implement the protective circuit parallel to the load and not parallel to the switch contact.

Magnetic fields can influence the device. The magnetic field strength of the environment must not exceed 30 A/m.

- Do not use the device in the vicinity of strong magnetic fields (e.g., caused by transformers or magnetic iron).

Error removal within the process safety time

When an error is detected by the higher-level controller, it is assumed that the safety function can no longer be performed.

The error must be removed within 72 hours or within the process safety time if required by the application.

EMC notes

Noise emission may occur when operating relay modules. Wireless reception may be disrupted in residential areas.

The device is a Class A product.

- Observe the requirements for noise emission for electrical and electronic equipment (EN 61000-6-4).
- Implement appropriate precautions against noise emission.

Faulty devices

The devices may be damaged following an error. Correct operation can no longer be ensured.

- Replace any defective devices.

Only the manufacturer or their authorized representative may perform the following activities. Otherwise the warranty is invalidated.

– Repairs to the device
– Opening the housing

Replacing the device

- Dispose of the device in the following circumstances:

– At the end of its mission time

See “Technical data” section.

– At the end of its electrical service life

See section “Electrical service life”.

– In the event of a fault

6.1 Safety of machines or systems

Draw up and implement a safety concept

The machine or system manufacturer and the operator are responsible for the safety of the machine or system and the application in which the machine or system is used. In order to use the device described in this document, you must have drawn up an appropriate safety concept for your machine or system. This includes a risk assessment in accordance with the directives and standards specified in the EC Declaration of Conformity, as well as other standards.

Risk assessment, validation and function test

- Before using the device, perform a risk assessment on the machine or system.
- Validate your entire safety system.
- Carry out a new validation every time you make a safety-related modification.
- Perform function tests on a regular basis.

Achievable safety integrity

The functional safety is ensured for the device as a single component. However, this does not guarantee functional safety for the entire machine or system. In order to be able to achieve the desired safety level for the entire machine or system, define the safety requirements for the machine or system as well as how to implement them from both a technological and an organizational perspective.

6.2 Security/protection against corruption

Any accidental or intentional change to the wiring of the device may compromise the integrity of the safety function.

- As the system operator, ensure that safety-related wiring is protected against unauthorized changes.

Appropriate measures include, for example:

– Organizational guidelines
– Access restrictions
– Protected cable installation

- Validate the safety function before starting up for the first time and every time a change is made.

If a security vulnerability exists for products, solutions, or services from Phoenix Contact, it will be published on the PSIRT (Product Security Incident Response Team) website:
www.phoenixcontact.com/psirt
You can also report potential security vulnerabilities there.

6.3 Installation in potentially explosive area

WARNING: Explosion hazard when used in potentially explosive areas

Please make sure that the following notes and instructions are observed.

- The category 3 device is designed for installation in zone 2 potentially explosive areas. It satisfies the requirements of the following standards. Comprehensive details are to be found in the EU Declaration of Conformity which is enclosed and also available on our website in the latest version:

  EN/IEC 60079-0, EN/IEC 60079-7, EN/IEC 60079-15
- Installation, operation, and maintenance may only be carried out by qualified electricians. Follow the installation instructions as described.
- When installing and operating the device, the applicable regulations and safety directives (including national safety directives), as well as general technical regulations, must be observed. The safety-relevant data is listed in this document.
- Observe the specified conditions for use in potentially explosive areas! Also observe the requirements of EN/IEC 60079-14.
- It is not permissible to open or modify the device. Do not repair the device yourself but replace it with an equivalent device. Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from violation.
- Do not subject the device to mechanical and/or thermal loads that exceed the specified limits.
- The device must be stopped and immediately removed from the Ex area if it is damaged or was subject to an impermissible load or stored incorrectly or if it malfunctions.
- **With nominal switching voltages greater than 60 V SELV/PELV and simultaneous load currents greater than 2 A, the electrical service life is reduced to 20000 switching cycles. Replace the device in good time before the end of the electrical service life.**

6.4 Specific conditions of use

- Install the device in such a way that a degree of protection of at least IP54 is achieved in accordance with EN/IEC 60529.
  To this end, a suitable, approved housing that meets the requirements of EN/IEC 60079-0, GB/T 3836.1 must be used.
- Only devices that are designed for operation in Ex zone 2 and are suitable for the conditions at the installation location may be connected to circuits in zone 2.
- In potentially explosive areas, only connect and disconnect cables and plug-in connections (e.g., connector, SD card, DIN rail connector) when the power is disconnected.
- For safe operation, lockable plug-in connections (e.g., connector, SD card, DIN rail connector) must be fully inserted and have a functional interlock (e.g., locking clip, screw connection).
- Insert the interlock. Repair any damaged plug-in connections immediately.
- Only connect one cable to each terminal point.

6.5 Ambient temperature in potentially explosive area

- Observe the derating curves.
- Observe the special temperature conditions according to the rating plate.

Bild 1 Rating plate (laser printing)

Input	A1/A2 24 V DC, 79mA - 230 V AC, 19mA				
Output	93/94 NO-contact	13/14 NO-contact		93/94 NO-contact	31/32 NC-contact
	60V AC, 24V DC 6A Resistive B300, R300	250V AC, 24V DC 6A Resistive B300, R300	250V AC, 24V DC 2A Resistive B300, R300	60V AC, 24V DC 2A Resistive B300, R300	24V DC 100mA Resistive
Surrounding Air Temperature	-40 °C to 50 °C		-40 °C to 60 °C		

6.6 Installation in areas with a danger of dust explosions

WARNING: Explosion hazard

The device is not designed for use in atmospheres with a danger of dust explosions.

7 UL notes

7.1 UL Ordinary Location

– Only use copper connecting cables providing the permitted temperature range (60°C/75°C).
– Tighten the screws on the screw terminal blocks with 5 ... 7 lb in (0.5 ... 0.6 Nm).

7.2 UL Hazardous Location

– WARNING - Do not disconnect the terminal blocks when energized!
– Device must be mounted in a **tool only accessible** enclosure certified for use in Class I, Zone 2, Groups IIC and rated IP54 in accordance with IEC 60529 when used in Class I, Zone 2 environment.

8 Transport, storage, and unpacking

8.1 Transport

The device is delivered in cardboard packaging.

- Observe the instructions on how to handle the package indicated on the packaging.

Suitable transport packaging

- Only transport the device in its original packaging or in packaging suitable for transport.

Technical data and environmental conditions

- For transport, observe the humidity and air pressure specifications, and the temperature range.
  See Section “Technical data”.

8.2 Storage

Suitable storage location

The storage location must meet the following requirements:

– Dry
– Protected against unauthorized access
– Protected against harmful environmental influences such as UV light

Technical data and environmental conditions

- For storage, observe the humidity and air pressure specifications, and the temperature range.
  See Section “Technical data”.

8.3 Unpacking

The device is delivered in packaging together with a packing slip.

Observing the packing slip

- Read the entire packing slip carefully.
- Retain the packing slip.

Checking the delivery

- Check the delivery for damage and completeness.
- Submit any claims for transport damage immediately.

Scope of supply

Refer to the ordering data for the standard scope of supply for the product.
See Section “Ordering data”.

9 Function description

9.1 One or two-channel activation

The external enable signal of the failsafe controller is switched at A1.

The external enable signal of the failsafe controller can also be switched at A2 as an option.

9.2 Automatic start

The device starts automatically once it has received the external enable signal of the failsafe controller.

9.3 Safe shutdown

Once the external enable signal of the failsafe controller has been deactivated, the enabling current paths open and the contacts fall into the safe state.

When the enabling current paths are open, the device is in the safe state.

The confirmation current path closes.

9.4 Diagnostics / proof test

The proof test required by standards can be carried out in two ways:

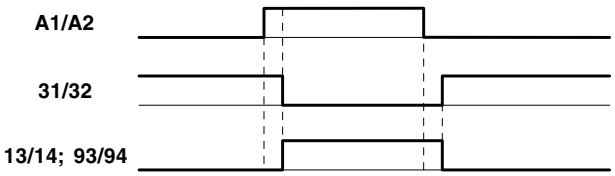
1. Visually on the device via the diagnostics LEDs
2. Evaluation of the failsafe controller via readback of the confirmation current path

See “Proof test” section and “Diagnostics” section.

10 Function and time diagrams

10.1 Time diagram for automatic start

Bild 2 Time diagram for automatic start

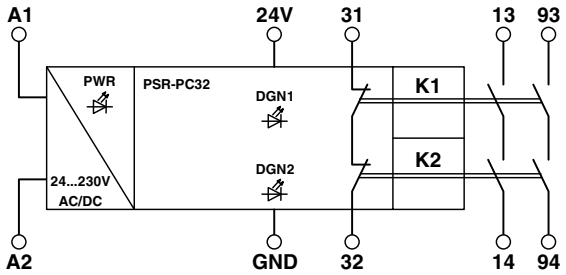


Key:

A1/A2	Control
31/32	Confirmation current path
13/14, 93/94	Undelayed enabling current paths

11 Block diagram

Bild 3 Block diagram



Key:

A1	24 V AC/DC ... 230 V AC/DC control
A2	0 V control
24V	24 V DC diagnostic supply voltage
GND	0 V diagnostic supply voltage
31/32	Confirmation current path, undelayed
13/14	Enabling current path, without delay, up to 250 V AC/DC
93/94	Enabling current path, without delay, up to 60 V AC/DC
K1/K2	Channel 1/Channel 2

WARNING: Loss of safety function/dangerous contact voltage

Enabling current path 93/94 is designed for a maximum rated voltage of 60 V AC/DC. If a higher voltage is applied at enabling current path 93/94, this may result in device failure, malfunction, and dangerous contact voltage in the SELV/PELV area.

- Make sure that the maximum permissible rated voltage for enabling current path 93/94 is not exceeded.

NOTE: Loss of diagnostic function

If a diagnostic supply voltage U_D is applied at terminal blocks 24V/GND, confirmation current path 31/32 is **not** an electrically isolated current path. Due to wiring the confirmation current path, the diagnostic function is lost.

- Do **not** connect confirmation current path 31/32 if a diagnostic supply voltage U_D is applied at terminal blocks 24V/GND.

NOTE: Module damage due to surge voltages

Surge voltages for the diagnostic supply voltage U_D can destroy the device.

- Only use power supply units with safe isolation and SELV / PELV.
- Make sure that the diagnostic supply voltage U_D does not exceed 32 V even in the event of an error.

11.1 Insulation coordination

The following table shows the device-specific insulation values:

	A1/A2	13/14	93/94	31/32, 24V/GND	Housing
A1/A2	-	6 kV	6 kV	6 kV	4 kV
13/14	-	-	6 kV	6 kV	4 kV
93/94	-	-	-	2,5 kV	4 kV
31/32, 24V/GND	-	-	-	-	4 kV
Housing	4 kV	4 kV	4 kV	4 kV	-

Interpretation

The selection of the suitable insulation method (basic insulation or safe isolation) depends largely on the overvoltage category of the application.
The following table shows the dependencies between insulation method and overvoltage category:

Overvoltage category	Insulation type	
	Basic insulation	Safe isolation
II	2,5 kV	4 kV
III	4 kV	6 kV

Basic insulation

A mixture of SELV/PELV and low voltage is strictly prohibited. Only switch 250 V AC at one of the enable contacts if the adjacent contact/enabling current path carries the same potential.

Safe isolation/reinforced insulation

Reinforced insulation (e.g., thanks to greater air clearances and creepage distances between conductive paths) is designed for one overvoltage category higher than basic insulation. This means that SELV/PELV circuits of U ≤ 25 V AC or U ≤ 60 V DC and circuits with higher voltages can be mixed.

12 Derating

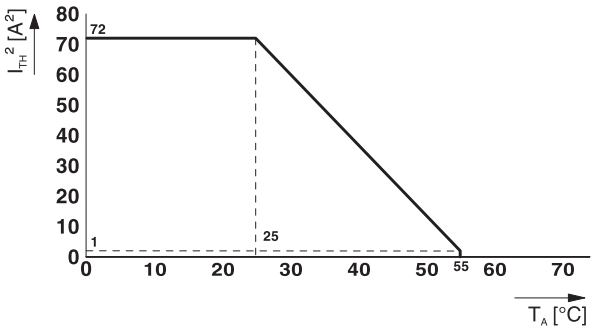
The temperature is measured at a 5 cm clearance below or to the side of the device.

12.1 Vertical or horizontal mounting position without spacing

The derating curve applies for the following conditions:

– Mounting on a vertical or horizontal DIN rail
– Devices mounted next to each other without spacing
– For enabling current path 13/14

Bild 4 Derating curve - vertical or horizontal mounting position, without spacing

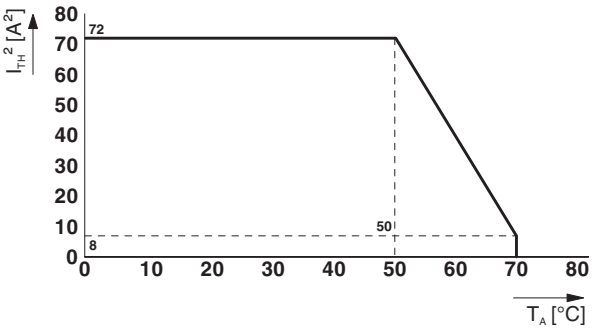


12.2 Horizontal mounting position with spacing

The derating curve applies for the following conditions:

– Mounting on a horizontal DIN rail
– Devices mounted next to each other with ≥ 9 mm spacing

Bild 5 Derating curve - horizontal mounting position, with spacing

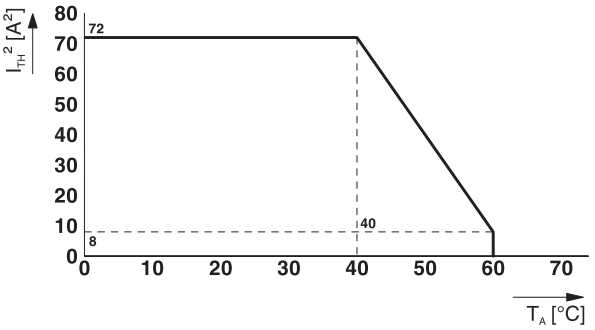


12.3 Vertical mounting position with spacing

The derating curve applies for the following conditions:

– Mounting on a vertical DIN rail
– Devices mounted next to each other with ≥ 9 mm spacing

Bild 6 Derating curve - vertical mounting position, with spacing



12.4 UL note

Observe the following information with regard to maintaining UL approval.

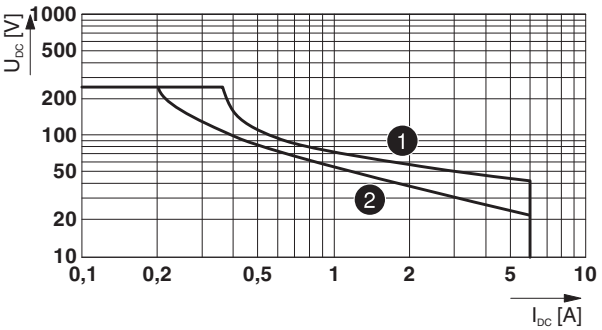
INPUT	Ambient temperature	Mounting	OUTPUT
24 V AC/DC ... 230 V AC/DC, max. 80 mA	25 °C	Horizontal without spacing between the devices	**NO contacts:** 250 V AC (13/14), 60 V AC (93/94) 24 V DC, 6 A, resistive, B300, R300
	55 °C		**NO contacts:** 250 V AC (13/14), 60 V AC (93/94) 24 V DC, 1 A (via one enabling current path), resistive, B300, R300
	50 °C	Horizontal with 9 mm spacing between the devices	**NO contacts:** 250 V AC (13/14), 60 V AC (93/94) 24 V DC, 6 A, resistive, B300, R300
	60 °C		**NO contacts:** 250 V AC (13/14), 60 V AC (93/94) 24 V DC, 2 A, resistive, B300, R300
	40 °C	Vertical, with 9 mm spacing between the devices	**NO contacts:** 250 V AC (13/14), 60 V AC (93/94) 24 V DC, 6 A, resistive, B300, R300
	60 °C		**NO contacts:** 250 V AC (13/14), 60 V AC (93/94) 24 V DC, 2 A, resistive, B300, R300

13 Relay data

13.1 Load limit curve at DC load

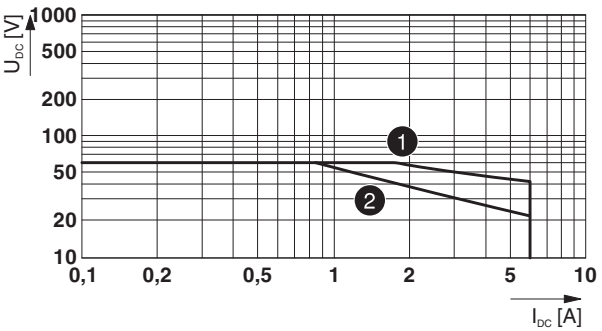
Ohmic and inductive load for enabling current path 13/14

Bild 7 Relay load curve - ohmic and inductive load, enabling current path 13/14



Ohmic and inductive load for enabling current path 93/94

Bild 8 Relay load curve - ohmic and inductive load, enabling current path 93/94

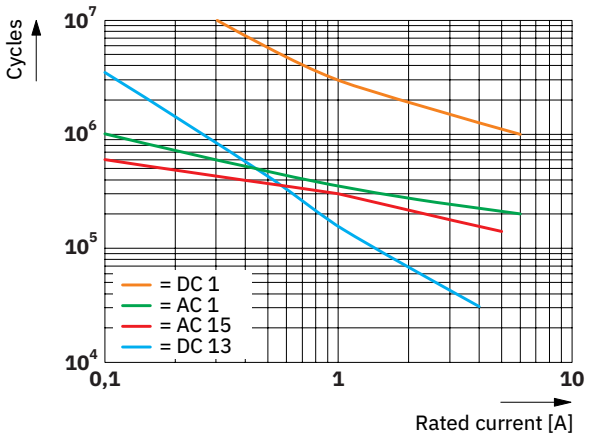


Key:

❶	Ohmic load	L/R = 0 ms
❷	Inductive load	L/R = 40 ms

13.2 Electrical service life

Bild 9 Electrical service life for high-demand applications



Behavior of the electrical service life

The service life curves indicate the number of switching cycles after which wear-related failures must be expected.

They depend on the utilization category and the expected load current.

Example:

Let's assume:

– Inductive load = 1 A
– Utilization category = AC15

This results in a contact service life of 300000 switching cycles.

WARNING: Loss of functional safety

At the end of the electrical service life, there is an increased risk of loss of functional safety.

- Replace the device in good time before the end of the electrical service life.

WARNING: Explosion hazard when used in potentially explosive areas

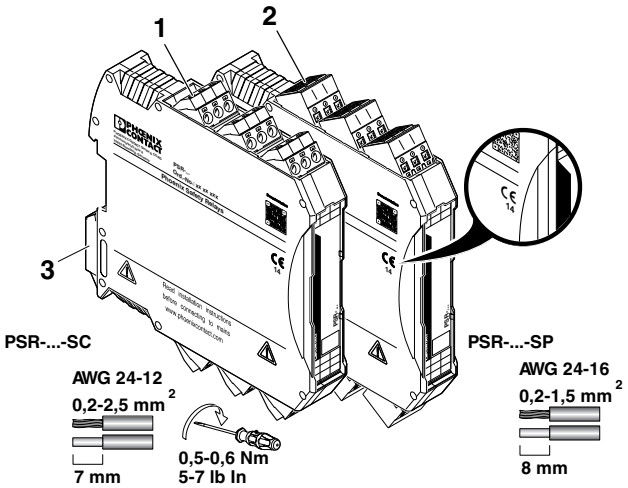
With nominal switching voltages greater than 60 V SELV/PELV and simultaneous load currents greater than 2 A, the electrical service life is reduced to 20000 switching cycles.

- Replace the device in good time before the end of the electrical service life.

14 Operating and indication elements

14.1 Connection versions

Bild 10 Connection versions



1 COMBICON plug-in screw terminal block
2 Pluggable COMBICON Push-in terminal block
3 Metal lock for fixing to DIN rail

The year the device was constructed can be found underneath the CE designation on the housing.

XX/XX = Calendar week / year

14.2 Connection assignment



24V	24 V DC diagnostic supply voltage
GND	0 V diagnostic supply voltage
31/32	Confirmation current path, undelayed
93/94	Enabling current path, without delay, up to 60 V AC/DC
PWR	Power LED (yellow)
DGN1	Diagnostics LED (green)
DGN2	Diagnostics LED (yellow)

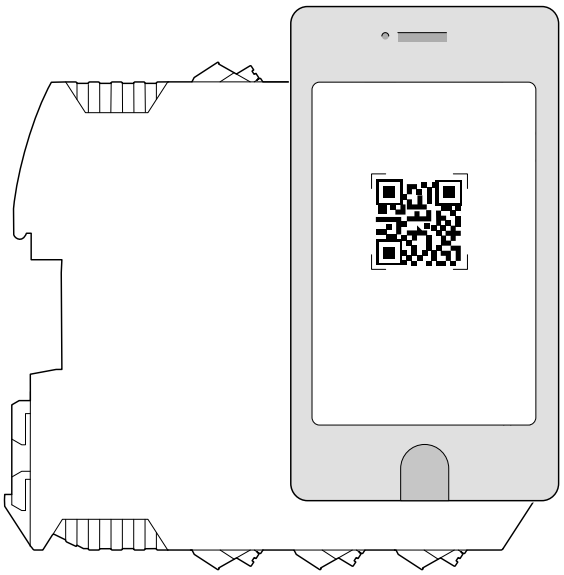
93/94	Enabling current path, without delay, up to 60 V AC/DC
13/14	Enabling current path, without delay, up to 250 V AC/DC
A1	24 V AC/DC ... 230 V AC/DC control
A2	0 V control

14.3 Digital nameplate

The digital nameplate provides the option of obtaining product-specific data related to a specific serial number.

If you scan the QR code (digital nameplate) on the device, you can, for example, retrieve documents on the production status as well as clearly identify the hardware and firmware status of the device at hand.

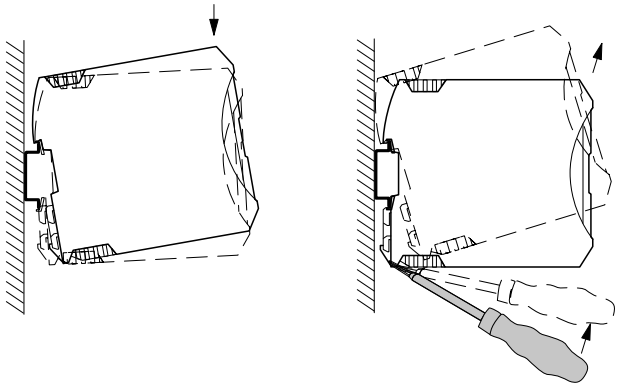
Bild 11 Scan QR code



15 Mounting and removing

- Mount the device on a 35 mm DIN rail in accordance with EN 60715.
- To remove the device, use a screwdriver to release the snap-on foot.

Bild 12 Mounting and removing



16 Wiring

- Connect the cables to the connection terminal blocks using a screwdriver.

Bild 13 Connecting the cables for PSR-...-SC (screw terminal block)

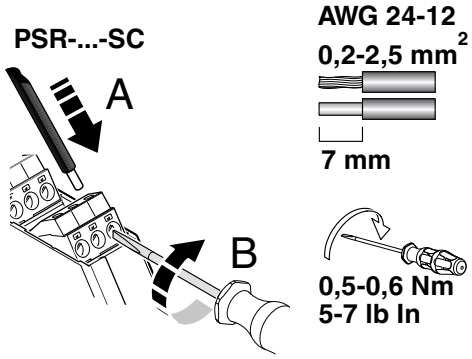
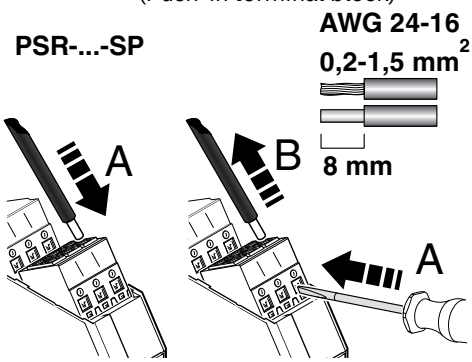


Bild 14 Connecting the cables for PSR-...-SP (Push-in terminal block)



It is recommended that ferrules are used to connect stranded cables.

Use the CRIMPFOX 6 crimping tool from Phoenix Contact.

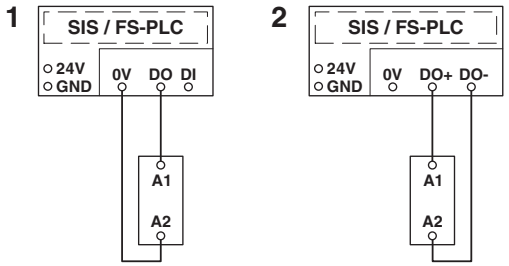
The tool enables the reliable processing of ferrules and easy removal of conductors with ferrules from the connection terminal blocks.

For compliance with UL approval, use copper wire that is approved up to 60°C/75°C.

16.1 Signal generator connection versions

- Connect suitable signal generators to A1/A2.

Bild 15 Signal generator connection versions



1 1-channel control via failsafe controller

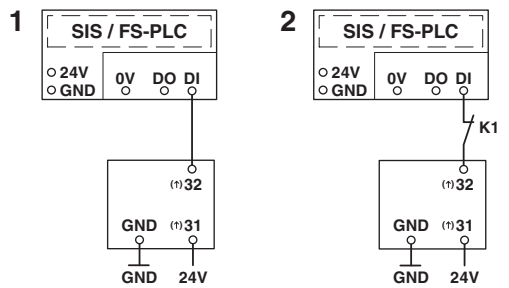
2 2-channel control via failsafe controller

16.2 Feedback circuit connection versions

To carry out the diagnostic function via the confirmation current path, proceed as follows:

- Connect the 24 V DC diagnostic supply voltage to terminal block 21.
- Read the confirmation current path back to a digital input of the failsafe controller via terminal block 22.
- Place the relevant N/C contact in the path from 21/22 to the digital input of the failsafe controller to monitor external contactors or extension devices with force-guided contacts.

Bild 16 Feedback circuit connection versions



1 Confirmation current path without monitored contact extension

2 Confirmation current path with monitored contact extension

17 Startup

- Apply the external enable signal (24 V AC/DC ... 230 V AC/DC) to terminal block A1.

PWR LED lights up.

The enabling current paths 13/14 and 93/94 close.

Confirmation current path 31/32 opens.

18 Calculating the power dissipation

The total power dissipation of the safety relay is based on the input power dissipation and the contact power dissipation for the same and for different load currents.

Input power dissipation

P_{Input} = 1.8 W (for DC)

P_{Input} = 2.1 W (with AC)

Contact power dissipation

With the same load currents:

$P_{Contact} = n \bullet I_L^2 \bullet 50\ m\Omega$

With different load currents:

$P_{Contact} = (I_{L1}^2 + I_{L2}^2 + ... + I_{Ln}^2) \bullet 50\ m\Omega$

Total power dissipation

$P_{Total} = P_{Input} + P_{Contact}$

therefore

$P_{Total} = P_{Input} + n \bullet I_L^2 \bullet 50\ m\Omega$

or

$P_{Total} = P_{Input} + (I_{L1}^2 + I_{L2}^2 + ... + I_{Ln}^2) \bullet 50\ m\Omega$

Key:

P	Power dissipation
n	Number of enabling current paths used
I_L	Contact load current

19 Proof test

To verify the device function, proceed according to one of the following diagnostic options.

WARNING: Loss of functional safety due to malfunction

If the proof test contains errors, the device no longer functions correctly.

- Replace the device.

19.1 Visually on the device via the diagnostics LEDs

1. Deactivate A1.
2. Apply the diagnostic supply voltage (24 V DC) to the terminal blocks 24V/GND.

Expectation: The LED DGN1 lights up green.

NOTE: Loss of diagnostic function

If a diagnostic supply voltage U_D is applied at terminal blocks 24V/GND, confirmation current path 31/32 is **not** an electrically isolated current path. Due to wiring the confirmation current path, the diagnostic function is lost.

- Do **not** connect confirmation current path 31/32 if a diagnostic supply voltage U_D is applied at terminal blocks 24V/GND.

19.2 Evaluation of the failsafe controller via readback of the confirmation current path

1. Deactivate A1.
2. Apply the diagnostic supply voltage (24 V DC) to terminal blocks 31/GND.
3. Read the confirmation current path via terminal block 32 back into a digital input of the failsafe controller.

Expectation: The failsafe controller receives a 24 V signal from terminal block 32.

20 Diagnostics

20.1 Diagnostics via LEDs

PWR-LED	DGN1-LED	DGN2-LED	State	Notes
Yellow on	Off	Off	All relays are picked up.	A1 is activated. **No** diagnostic supply voltage is applied at terminal blocks 24V/GND.
Yellow on	Off	Yellow on	All relays are picked up.	A1 is activated. A diagnostic supply voltage is applied at terminal blocks 24V/GND.
Off	Green on	Off	No relay has picked up.	A1 is **not** activated. A diagnostic supply voltage is applied at terminal blocks 24V/GND.
Off	Off	Yellow on	Internal error	A1 is **not** activated. A diagnostic supply voltage is applied at terminal blocks 24V/GND.

20.2 Diagnostics via the controller

PWR	Terminal 31	Terminal 32	State	Notes
Yellow on	0 V	0 V	All relays are picked up.	A1 is activated. **No** diagnostic supply voltage is applied at terminal blocks 31/GND.
Yellow on	24 V	0 V	All relays are picked up.	A1 is activated. A diagnostic supply voltage is applied at terminal blocks 31/GND.
Off	24 V	24 V	No relay has picked up.	A1 is **not** activated. A diagnostic supply voltage is applied at terminal blocks 31/GND.
Off	24 V	0 V	Internal error	A1 is **not** activated. A diagnostic supply voltage is applied at terminal blocks 31/GND.

21 Application examples

21.1 High-demand application with failsafe controller

Application description:

The application example illustrates the safe disconnection of a load in high-demand mode. The safe coupling relay is controlled via a single channel using a failsafe controller. The device starts automatically.

Assumptions, information, and marginal conditions:

– It is assumed that errors in the cable installation have been eliminated
– Integration of the confirmation current path in the safe controller
– The digital output (DO) of the failsafe controller meets SIL 3 requirements in accordance with IEC 61508.

Achievable safety integrity:

– Suitable for high-demand mode applications up to SIL 3 in accordance with IEC 61508, and IEC 50156

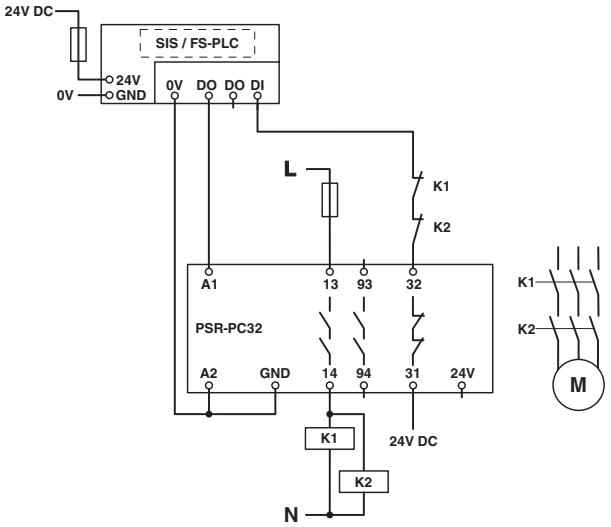
WARNING: Loss of functional safety

The switch-on pulses sent by the controller (light test) can lead to brief, unwanted activation of the safety relay.

- Deactivate the light pulses/light tests, unless they are safety-related.

Cross-circuits in the cable installation can be prevented through design measures, such as protected cable installation.

Bild 17 High-demand application with failsafe controller



Key:

SIS	Safety Instrumented System (safe control)
FS-PLC	Failsafe controller
DC	Diagnostic Coverage according to IEC 61508 (line/load diagnostics at DO)
DI	Digital input
DO	Digital output

Device data converted into a 1oo1 structure	
Device type	A
HFT	0
SIL	3
SFF	99,99 %
λ_{SD}	0 FIT
λ_{SU}	3135.22 FIT
λ_{DD}	62.35 FIT
λ_{DU}	1 FIT
λ_{Total}	3198.57 FIT
MTBF	22.44 years
PFH_D	1.00×10^{-09} (for T1 = 1 year)

21.2 Low-demand application with field sensor

Application description:

The application example illustrates evaluation of a suitable sensor or relay contact in low demand mode.

The safe coupling relay is controlled by a single channel. The device starts automatically.

If the signal of the sensor or of the relay contact is present, the fail-safe controller receives a 24 V signal via the enabling current path of the safe coupling relay.

If the signal of the sensor or of the relay contact is absent, the enabling current path opens and the digital input of the fail-safe controller does not receive any more signals.

Assumptions, information, and marginal conditions:

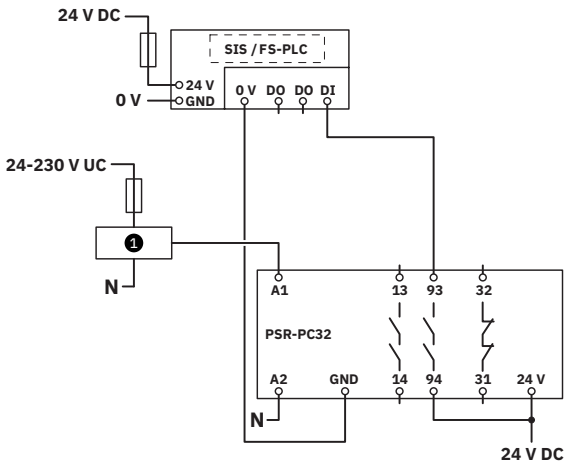
- It is assumed that errors in the cable installation have been eliminated
- Suitable sensor required
- Diagnostic supply voltage is present
- Error message about the diagnostic LEDs
- The digital input (DI) of the fail-safe controller meets the SIL 3 requirements in accordance with IEC 61508.

Achievable safety integrity:

- Suitable for low-demand applications up to SIL 3 in accordance with IEC 61508, IEC 61511, and EN 50156

Cross-circuits in the cable installation can be prevented through design measures, such as protected cable installation.

Bild 18 Low-demand application with field sensor



Key:

SIS	Safety Instrumented System (safe control)
FS-PLC	Failsafe controller
DC	Diagnostic coverage according to IEC 61508
DI	Digital input
DO	Digital output
❶	Suitable sensor or relay contact

Device data converted into a 1oo1 structure	
Device type	A
HFT	0
SIL	3
SFF	99.85 %
λ_{SD}	0 FIT
λ_{SU}	3577.81 FIT
λ_{DD}	0 FIT
λ_{DU}	5.5
λ_{Total}	3583.32 FIT
MTBF	22.51 years
PFD_{avg}	2.41×10^{-05} (for T1 = 1 year)

22 Device replacement, device defect, and repair

22.1 Device replacement

The device can be replaced, if necessary.

If you need to replace the device, proceed as described in the following section:

– Mounting and removal
– Wiring

Observe the device type and version

The new device must meet the following requirements:

– Same device type
– Same or later version

22.2 Device defect and repair

Do not open the housing

Repairs may only be carried out by Phoenix Contact. Do not open the housing. If the housing is opened, the function of the device can no longer be ensured.

Faulty devices

- Please contact Phoenix Contact.

23 Maintenance, decommissioning, and disposal

23.1 Maintenance

The device requires no maintenance during the permissible mission time. Refer to the technical data for the mission time of the device.

If necessary, carry out proof tests within the specified proof test interval.

See “Technical data” section.

Depending on the application and connected I/O devices, you should test the function of the I/O devices and the safety chain regularly.

Observe the relevant manufacturer specifications for carrying out maintenance on connected I/O devices.

23.2 Decommissioning and disposal

Carry out decommissioning according to the requirements of the machine or system manufacturer.

When decommissioning the system or parts of the system, ensure the following for the devices used.

The device continues to be used only as intended:

- Observe the storage and transport requirements.

See “Transport, storage, and unpacking” section.

The device is not used any more:

The symbol with the crossed-out trash can indicates that this item must be collected and disposed of separately from other waste.
Phoenix Contact or public collection sites will take the item back for free disposal. For information on the available disposal options, visit www.phoenixcontact.com.

Packaging disposal

- Dispose of packaging materials that are no longer needed (cardboard packaging, paper, bubble wrap sheets, pillow bags, etc.) with household waste in accordance with the currently applicable national regulations.

24 Attachment

24.1 Using PSR devices at altitudes > 2000 m amsl

The following section describes the special conditions for using PSR devices at altitudes > 2000 m amsl.
Observe the relevant device-specific data (technical data, derating, etc.) according to the product documentation for the individual device.

Using the device at altitudes **> 2000 m amsl up to max. 4500 m amsl** is possible under the following conditions:

1. Limit the rated control circuit supply voltage (U_S) in accordance with the table below. Observe the technical data for the device.

U_S according to the technical data for the device	U_S when used at altitudes > 2000 m amsl
< 150 V AC/DC	U_S according to the technical data for the device still valid
> 150 V AC/DC	Limited to max. 150 V AC/DC

2. Limit the maximum switching voltage in accordance with the table below. Observe the technical data for the device.

Max. switching voltage according to the technical data for the device	Max. switching voltage when used at altitudes > 2000 m amsl
< 150 V AC/DC	Max. switching voltage according to the technical data for the device still valid
> 150 V AC/DC	Limited to max. 150 V AC/DC

PSR-PC32: observe maximum switching voltage for enabling current path 93/94

PSR-PC32: Order No. 2700581, 2700582

- Limit the maximum switching voltage for enabling current path 93/94 to 50 V AC/DC.

3. Reduce the maximum ambient temperature for operation by the corresponding factor in accordance with the table below.
4. If derating is specified, offset all the points of the derating curve by the corresponding factor in accordance with the table below.

Altitude amsl	Temperature derating factor
2000 m	1
2500 m	0.953
3000 m	0.906
3500 m	0.859
4000 m	0.813
4500 m	0.766

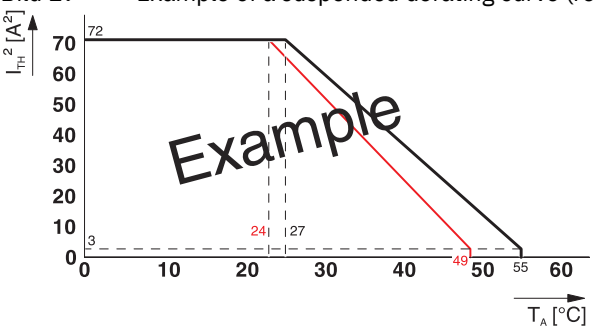
Example calculation for 3000 m

The following calculation and the illustrated derating curve are provided as examples.
Perform the actual calculation and offset the derating curve for the device used according to the technical data and the “Derating” section.

27 °C • 0.906 ≈ 24 °C

55 °C • 0.906 ≈ 49 °C

Bild 19 Example of a suspended derating curve (red)



24.2 Revision history

Version	Date	Contents
00	2016-10-13	First publication
01	2018-10-19	Technical data chapter edited; Approval data added; Safety regulations and installation instructions chapter edited; New chapter added: Notes on documentation, Specific terms of use for ATEX/IECEx, UL information; Calculating the power dissipation chapter edited
02	2024-11-11	Approval logos updated; accessories added to ordering data; changes in “Technical data” section: data for control inputs and diagnostic supply voltage separated, relay outputs: references to “Relay data” section added, switching frequency changed, electrical service life added, general data: standard for relay type updated, housing color updated, standards for air clearances and creepage distances updated, rated surge voltage/insulation updated; connection data: reference to CRIMPFOX 6 added; data for conformity/approvals updated; safety characteristics: systematic capability (SC) added; notes in “Safety regulations and installation notes” section edited; “Specific terms and conditions of use for ATEX/IECEx” section removed; harmonized sections “Installation in potentially explosive areas” and “Special conditions” added; “Transport, storage, and unpacking“ section added; “Insulation coordination” section added; “Relay data” section including “Electrical service life” section added; note about crimping tool added to “Wiring” section; “Device replacement, device defects, and repairs” section added; “Maintenance, decommissioning, and disposal” section added
03	2026-10-08	Section technical data: Hardware/Firmware version updated; input voltage range for "0" signal added; filter time updated; frequency range added; max. permissible overall conductor resistance added; inrush current at U_D added; min. switching voltage for confirmation current path updated to DC, attributes for confirmation current path added: switching frequency, mechanical service life, protective circuit, attribute typ. response time changed to typ. inrush time, attributes air and creepage distances removed, overvoltage category updated, weight added, information on approvals and manufacturer's declarations updated; section safety regulations and installation notes updated; subchapter security / protection against corruption added; section insulation coordination updated; section digital nameplate added