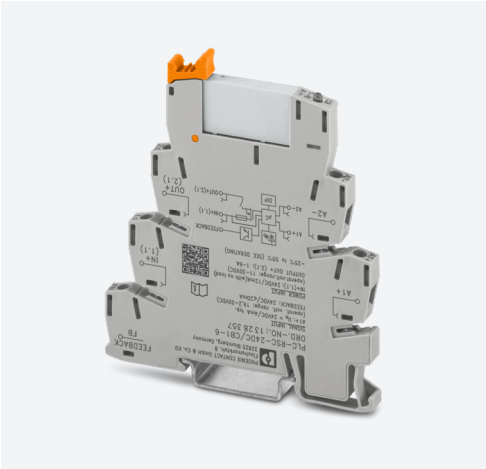
PLC-Rxx- 24DC/1/CB1-6



6.2 mm interface relay terminal block combined with electronic fuse protection for connected 24 V DC load circuits

Data sheet
111081_en_01

 2024-04-15

1 Description

The interface device is designed for use in 24 V DC circuits.

In addition to the switching function, the device is equipped with an additional electronic fuse protection function. In the event of an overload or short circuit in the power circuit, the device switches off quickly and automatically.

The tripping current can be adjusted using DIP switches on the side.

The housing form factor is identical to the PLC-INTERFACE product range. The overall width is 6.2 mm.

Thanks to the appropriate arrangement of the connections and the use of the PLC insertion bridges, it is possible to implement variable channel or block fuse protection in combination with relay or optocoupler plates.

Existing PLC accessories (bridges, marking, V8 system cabling adapters, etc.) can be reused.

Features

- Tripping current can be adjusted from 1 A ... 6 A in increments of 1 A via DIP switches
- The interface block with fuse function is a built-in device
- The contacts can also be used for normal switching functions.

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.

2 Table of contents

3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
Combination of relay interface and electronic fuse protection on overall width: 6.2 mm, individual configuration of the nominal current (1 A ... 6 A), adjustable output characteristic, active signal output, easy system integration, with screw connection	PLC-RSC- 24DC/1/CB1-6	1328357	1
Combination of relay interface and electronic fuse protection on overall width: 6.2 mm, individual configuration of the nominal current (1 A ... 6 A), adjustable output characteristic, active signal output, easy system integration, with Push-in connection	PLC-RPT- 24DC/1/CB1-6	1328360	1

Accessories	Type	Item no.	Pcs./Pkt.
V8 adapter for 8 x PLC-INTERFACE (6.2 mm), controller: PLC system cabling of output cards, connection 1: IDC/FLK pin strip 1x 14-position, connection 2: Plug-in connection (Can be snapped onto 8x PLC-INTERFACE terminals), connection 3: Screw connection 1x 2-position, number of channels: 8, control logic: plusschaltend	PLC-V8/FLK14/OUT	2295554	1
V8 adapter for 8 x PLC-INTERFACE (6.2 mm), controller: PLC system cabling of output cards, connection 1: D-SUB pin strip 1x 15-position, connection 2: Plug-in connection (Can be snapped onto 8x PLC-INTERFACE terminals), connection 3: Screw connection 1x 2-position, number of channels: 8, control logic: plusschaltend	PLC-V8/D15S/OUT	2296058	1
Power terminal block, for the input of up to four potentials, for mounting on NS 35/7.5	PLC-ESK GY	2966508	5
Separating plate, 2 mm thick, required at the start and end of a PLC terminal strip. Furthermore, it is used for: visual separation of groups, safe isolation of different voltages of neighboring PLC relays in acc. with DIN VDE 0106-101, isolation	PLC-ATP BK	2966841	25
Continuous plug-in bridge, length: 500 mm, color: red	FBST 500-PLC RD	2966786	20
Continuous plug-in bridge, length: 500 mm, color: blue	FBST 500-PLC BU	2966692	20
Single plug-in bridge, number of positions: 2, length: 6 mm, color: red	FBST 6-PLC RD	2966236	50
Single plug-in bridge, number of positions: 2, length: 6 mm, color: blue	FBST 6-PLC BU	2966812	50
Plug-in miniature power relay, with power contact, 1 changeover contact, input voltage 24 V DC	REL-MR- 24DC/21	2961105	10

4 Technical data

General data	
Fuse	electronic
Operating mode	100% operating factor
Degree of protection	IP20
Degree of protection (Installation location)	≥ IP54
Mounting position	any
Mounting type	DIN rail mounting in rows with zero spacing
Dimensions W/H/D	6.2 mm / 96 mm / 75 mm (PLC-RSC- 24DC/1/CB1-6) 6.2 mm / 96 mm / 75 mm (PLC-RPT- 24DC/1/CB1-6)
Operating voltage	24 V DC (U_{In+} - U_{A2})
Operating voltage range	19.2 V DC ... 30 V DC (U_{In+} - U_{A2})
Current consumption	12 mA
Tripping current	1 A (adjustable) 2 A (adjustable) 3 A (adjustable) 4 A (adjustable) 5 A (adjustable) 6 A (preset)
Measuring tolerance	± 15 %
Power dissipation	0.06 W (Without load, A1 low) 0.4 W (Without load, A1 high) < 1.6 W (Normal operation)
Insulation	Functional insulation
Overvoltage category	I
Pollution degree	2

Ambient conditions	
Ambient temperature (operation)	-25 °C ... 55 °C (Observe derating in the connected state)
Ambient temperature (storage/transport)	-40 °C ... 70 °C
Permissible humidity (operation)	95 %
Maximum altitude for use above sea level	≤ 2000 m (Without derating)
Operating mode	Indoor use

Switching input	
Nominal switch-on voltage	24 V (U_{A1} - U_{A2})
Switch-on voltage range	11 V ... 30 V (U_{A1} - U_{A2})
Switch-off voltage range	0 V ... 2 V (U_{A1} - U_{A2})
Current consumption	4 mA (24 V)
Switch-on time	36 ms
Switch-off time	10 ms
Switching frequency	≤ 2.5 Hz

Load circuit	
Load output	Power MOSFET switching output (positive switching)
Voltage drop	0.16 V (6 A, U_{In+} - U_{out})
Short-circuit switching capacity	100 A DC 300 A DC (<5 short circuits)
Required backup fuse	Only required if I_{max} of power supply unit > short-circuit switching capacity. Integrated failsafe element
Failsafe element	15 A
Surge voltage protection	> 33 V
Max. capacitive load	12000 µF (Depending on the current setting and the short-circuit current available)
Shutdown time	≤ 15 ms (Short circuit ≥3 x I_N) 0.1 s (Short circuit 2 ... <3 x I_N) 1 s (Short circuit 1.5 ... <2 x I_N) 4 s (Short circuit 1.1 ... <1.5 x I_N)
Undervoltage switch-off	≤ 17.8 V (active) ≥ 19 V (inactive)
Overvoltage switch-off	≥ 30.5 V (active) ≤ 29.5 V (inactive)
Waiting time	5 s (Between the pulses)
Start attempts in hiccup mode	5

Connection data	Screw connection	Push-in connection
Conductor cross section, rigid	0.2 mm² ... 2.5 mm²	0.14 mm² ... 1.5 mm²
Conductor cross section, flexible	0.2 mm² ... 2.5 mm²	0.14 mm² ... 1.5 mm²
Conductor cross section [AWG]	30 ... 12	26 ... 14
Stripping length	8 mm	8 mm
Tightening torque	0.45 Nm ... 0.55 Nm (Usually these terminal blocks must be supported during conductor connection (held by one hand, supported on the housing))	
Conductor cross-section rigid (2 conductors with same cross section)	0.14 mm² ... 1.5 mm²	
Conductor cross section flexible (2 conductors with same cross section)	0.5 mm² ... 1.5 mm² (TWIN ferrule with plastic sleeve)	0.5 mm² ... 1.5 mm² (TWIN ferrule with plastic sleeve)

Acknowledge output	
Output voltage	U_{In+} - 0.7 V (high level)
Current	≤ 20 mA
Normal operation	low
Error	high (Fuse has blown)
Hiccup mode	high (After all 5 start attempts have been completed)

Conformance/approvals	
UL, USA/Canada	UL 2367 UL 60947-1 UL 60947-5-1 CSA C22.2 No. 60947-1 CSA C22.2 No. 60947-5-1

5 Safety regulations and installation notes

5.1 Installation notes

WARNING! Shock and fire hazard

Never perform work on the device when voltage is present.

Check the device for external damage before installation. If the device is defective, it must not be used.

NOTE: Electrostatic discharge!

Take protective measures against electrostatic discharge.

If the DIP switches are not covered by an adjacent module, the PLC-ATP partition plate (item no. 2966841) must be used for ESD protection.

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 IEC/EN 61340-5-1.

- Mount the device on a profile rail TH/35 according to DIN 60715.
- Installation, operation, and maintenance may only be carried out by qualified electricians. Follow the installation instructions as described.
- When installing and operating the device, observe the applicable regulations and safety directives (including national safety directives), as well as the generally recognized technical regulations.
- Observe the safety information, conditions, and limits of use specified in the product documentation. Comply with them.
- The device must not be opened or modified. Do not repair the device yourself, 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.
- To protect the device against mechanical or electrical damage, install it in a suitable housing with an appropriate degree of protection of at least IP54 in accordance with IEC/EN 60529.
- Only use the device in spaces and environments up to pollution degree 2.
- Repeated hard short circuits can reduce the melting integral of the integrated backup fuse.
- UL requirement: Use copper cables approved for at least 75 °C.

5.2 Safety regulations

- In the event of a higher load and inductive load component, implement an output protective circuit (e.g., freewheeling diode) at the load.

6 Installation

6.1 Connection notes

NOTE: Electrical safety

The feed-in power supply must have electrical isolation between the primary and secondary circuit. The devices can be used up to the maximum operating voltage (see technical data).

- Ensure cables are correctly sized for the maximum input/output current.
- To ensure the correct functioning of the devices, the negative pole of the power supply must be connected to terminal block A2-.

To avoid larger potential differences, the GND potentials must be connected to each other via secondary-side grounding (functional ground) when using separate power supplies for the control and load side of the device.

Connect currents ≤ 6 A directly to the corresponding terminal points. In case of higher currents, use the PLC-ESK GY power terminal (Item No.: 2966508).

Identical voltage potentials of adjacent terminal blocks (e.g., A1, A2...) can be bridged with plug-in bridges FBST.... The bridges have to snap in completely.

NOTE: Risk of damage to equipment

Lever out the bridges piece by piece, starting at one end of a bridge.

Partition plate PLC-ATP BK

WARNING: Danger to life by electric shock!

The separator plate serves to electrically isolate the optionally used bridges which are blank at the cut end and can lead to dangerous voltage.

Place the partition plate (Item No. 2966841) always at the start and end of each PLC terminal strip / for voltages greater than 250 V between the same terminal points of adjacent modules (L1, L2, L3) / with safe isolation between adjacent modules / for isolation of adjacent bridges of different potentials / for optical separation of functional groups.

Do not connect adjacent channels to a mix of SELV/PELV and dangerous contact voltages without a partition plate.

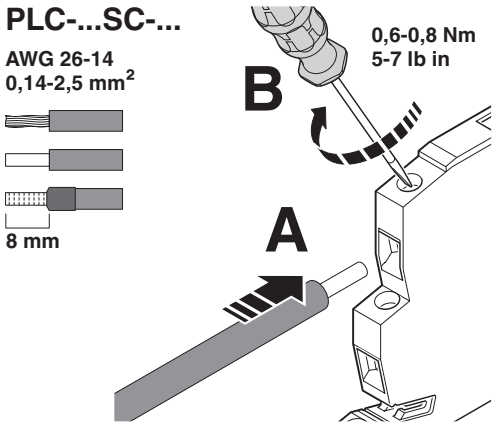
At least one functional insulation level is maintained against adjacent modules along the DIN rail.
If the application demands higher requirements of the insulation (basic or reinforced insulation), then these must be realized through suitable measures (e.g., partition plates or spacing).

6.2 Connecting the cables

WARNING: Danger to life by electric shock!
Never perform work on the device when voltage is present.

Screw connection

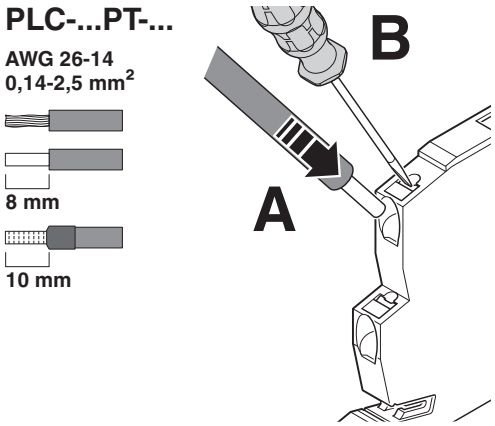
Figure 1 Screw connection



- Strip the wire by approximately 8 mm and crimp ferrules to the end of the wires.
- Insert the wire into the corresponding connection terminal block.
- Use a screwdriver to tighten the screw in the opening above the connection terminal block.

Push-in connection

Figure 2 Push-in connection



If you want to use conductors with ferrule:

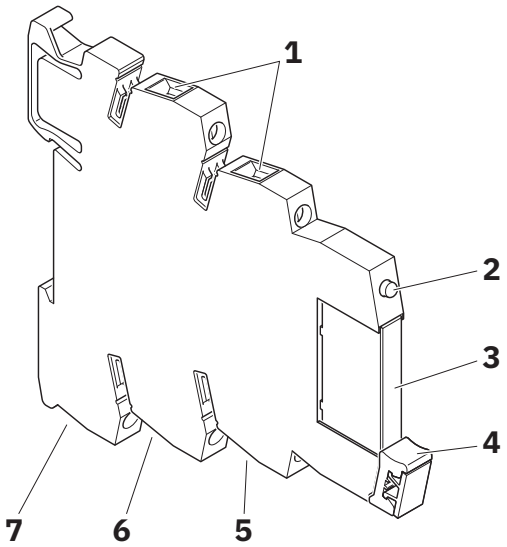
- Strip the wire by approximately 10 mm and crimp ferrules to the end of the wire.
- Insert the wire into the corresponding connection terminal block.
- Push in the pushbutton with a screwdriver to release.

If you want to use conductors without ferrule:

- Push the pushbutton in with a screwdriver.
- Insert the wire into the corresponding connection terminal block.
- Push in the pushbutton with a screwdriver to release.

6.3 Connections, elements, and terminal assignment

Figure 3 Function elements

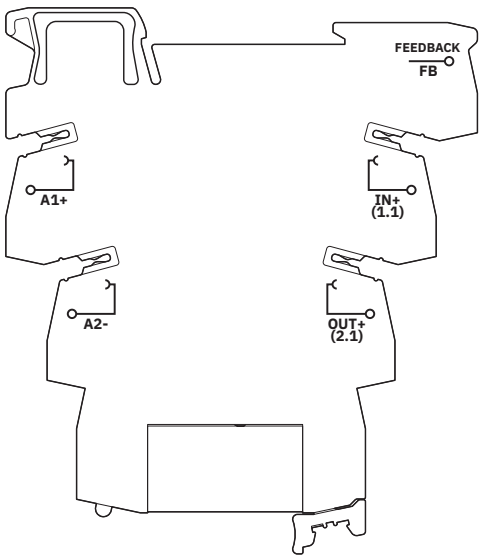


1 Inputs (A1 and A2)
2 LED status indicator
3 Plug-in function electronics
4 Snap-in lever to accommodate the optional ZB 6 device marking label
5 Load output (2.1)
6 Load side feed-in (1.1)
7 Feedback contact

Connections

The figure below shows the distribution of the connections to the corresponding basic terminal block.

Figure 4 Pin assignment



Contact	Description
A1+ and A2-	The devices can be switched on and also switched off again via A1+ and A2- (e.g., of the higher-level controller).
IN+ (1.1)	Central feeding point (connection of the power supply) with corresponding bridge contact
OUT+ (2.1)	Power circuit current output, connection of load
Feedback (FB)	Indicates whether e.g., there was an overload in the power circuit (see “Diagnostics contact” section)

- Parallel connection of two (or more) fuse elements on the output side to increase power is not permitted.
- In order for the device to function correctly, the GND potential must be connected to A2- and 24 V DC to contact IN+ (1.1) on the load side. The signaling works even if no control signal is applied to control input A1+.
- When 24 V DC is applied to the control input (A1+), e.g., from a PLC, the module is activated and the load circuit switches through. The connected load is supplied.

7 Operation

Setting options and tripping behavior

The devices can be connected together using bridges. Connection to the system cabling via V8 adapter is possible.

The device is supplied via A2- (GND) and the feed-in for the load side is supplied with 24 V DC via IN +(1.1).

The tripping current can be set from 1 A ... 6 A via the DIP switches on the left side of the device. The tripping current is set to 6 A by default.

The fuse characteristic of the devices can be set via the DIP switches.

The values of “1”, “2”, and “4” given next to the DIP switches are added up for the desired tripping current (e.g., 5 A = switches “1” and “4” in the “ON” position)

“FUSE MODE” setting:

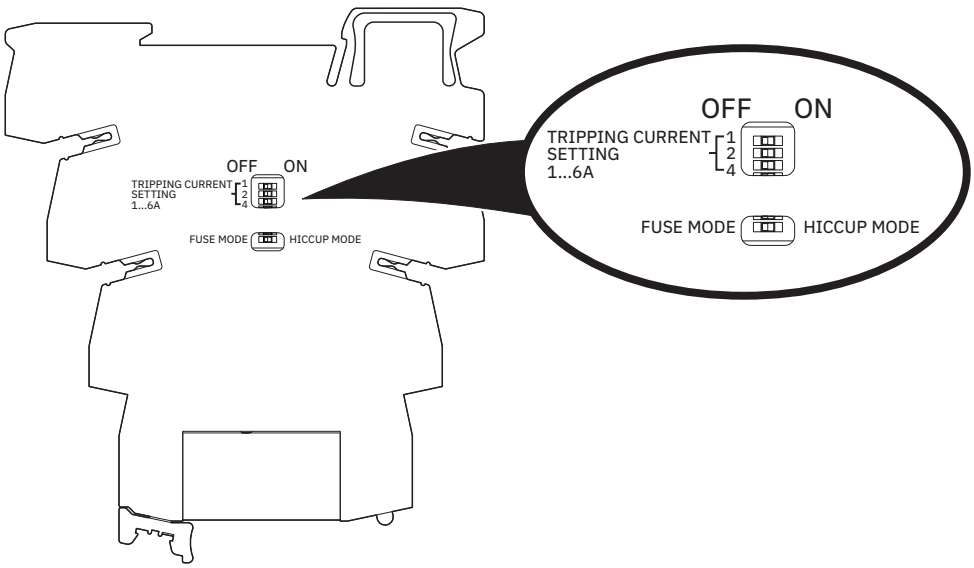
– In the event of an overload (e.g., short circuit), the device switches off the DC output permanently.

The “HICCUP MODE” setting is optimized for the following applications:

– If only a low short-circuit current is permitted.
– If following an overload or short circuit the output voltage should be made available again automatically.
– If connected capacities are to be charged.

Parameter	Description
Current	The tripping current can be changed from 1 A ... 6 A in increments of 1 A. All switches in the “ON” position: tripping current remains at 6 A, maximum All switches in the “OFF” position: device is not switched on and outputs the corresponding signals.
FUSE MODE	When the set tripping current threshold is exceeded, the output switches off. A manual reset is required (for a description, see “Reset”).
HICCUP MODE	When the set tripping current threshold is exceeded, the output switches off. Five cyclic start attempts are then carried out for independent restart, each with a 5 s pause between the pulses. If the start attempts are unsuccessful, the output switches off. A manual reset is required (for a description, see “Reset”).

Figure 5 Setting options



7.1 Tripping characteristics

The fuse switches off electronically in the event of an overcurrent. The plugged-in relay also ensures that the load circuit is physically disconnected from the supply.

Tripping of the fuse

- Remote diagnostics (“FB” feedback contact) can be performed via an active switching output on the device. By bridging several signal outputs of adjacent fuses, a group error message can be realized (loop bridge). The error is indicated visually via an LED (see table under “Analysis options and display”)
- The device trips immediately after the current threshold is exceeded at 1.1 x I_N or max. 4 s tolerance of current peaks (current tolerance band), up to max. 1.4 x I_N.
- Shutdown with memory function (FUSE MODE, restart via reset)
- Autonomous restart (“HICCUP MODE”, cyclic start attempts). HICCUP can be set via DIP switches on the side. After tripping, there are five start attempts with 5 s waiting time between them (cool down), then permanently “OFF”. Manual reset required.
- When a maximum temperature is reached (e.g., at the semiconductor), the output is switched off.
- If the voltage is outside the range or there is an installation or bridging error (e.g., 24 V DC at the power input), the device does not switch on. If the device detects voltages on the load side that are greater than 30.5 V DC ... 35 V DC, an overvoltage switch-off is performed to protect the downstream loads.

Figure 6 Tripping characteristics in FUSE MODE

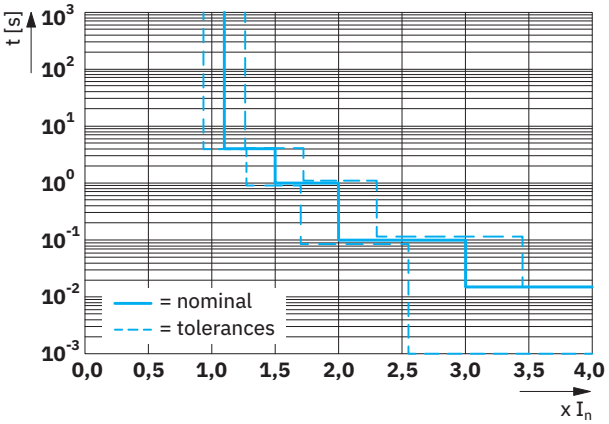
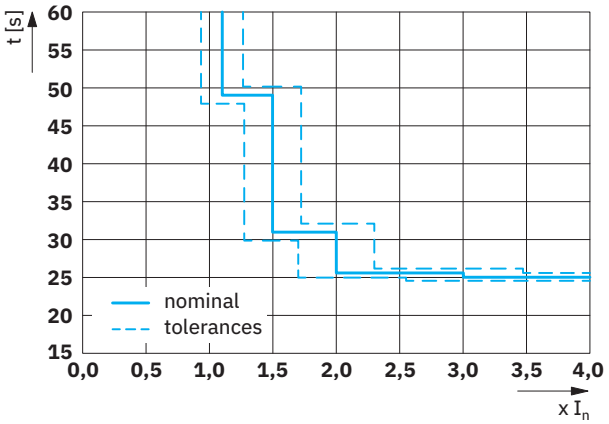


Figure 7 Tripping characteristics in HICCUP MODE



Reset

- Manual reset: Remove relay and contact again, with at least 1 s pause in between. Regardless of the selected fuse characteristics, the device is reset after an overcurrent shutdown on site by removing and plugging in the elementary relay.
- Reset via operating voltage interruption is not possible (the state is saved). Exception: The device was started up without a relay plugged in and is therefore in an error state.

8 Analysis options and display

If ground is applied to A2- and 24 V DC to contact IN+ (1.1), signaling and analysis are functional even when the module is switched off.

LED status indicators

State	LED (green)	LED (yellow)	LED (red)
No voltage connected to the device	Off	Off	Off
Channel switched off, voltage connected to load side	Off	Off	Off
Channel switched on, load is supplied	On	Off	Off
Channel switched on, load is supplied. Capacity is >80% of the set current value	Off	On	Off
Application of 24 V DC (supply on the load side)	Each color lights up briefly once (0.5 s per color).		
Channel switched off, over- or undervoltage detected	Off	Off	On
Channel switched off after overcurrent tripping, FUSE MODE active			
HICCUP not active or start attempts in HICCUP have run out			
Channel switched off, ready to be switched back on after overload or short-circuit tripping	Off	Off	Flashing
Channel switched off after overcurrent tripping, HICCUP active. 5 s cool-down phase after overload or short-circuit tripping.			
Channel switched off, external voltage at the output, possible installation error present	Off	Off	Flashing quickly
DIP switch configuration faulty (all set to “0”)			
No relay plugged in and channel switched on (control signal at A1+) or internal fuse has tripped.	Off	Off	On

Diagnostics contact

If the fuse has tripped, the active switching output (FB) provides a high signal that can be evaluated.

State	Signal at feedback contact (FB)
Channel current OK	Low (GND)
Operating voltage range OK	
Fuse has not tripped	
Fuse tripped after overcurrent (e.g., short circuit)	High (24 V DC)
Voltage outside range	
Installation or bridging error present (e.g., 24 V DC applied to power output)	
Channel switched off, external voltage at the output, possible installation error present	
Device detects voltages at IN+ that are greater than 30.5 V DC ... 35 V DC (overvoltage switch-off), or voltages less than 17.8 V DC	

9 Connection variants

The connection of fuse and interface modules can be adapted to the relevant application. Some examples are described below.

Channel-by-channel fuse protection

- The modules are supplied via plug-in bridges and optionally via the PLC-ESK GY power terminal (item no. 2966508).
- The load circuit is physically isolated within the device by connecting the electronic fuse and an electromechanical relay in series.
- In the event of overcurrent, the power semiconductor of the electronic fuse protection first assumes a high resistance (short circuit or overcurrent is interrupted), and then the relay contact disconnects the load path.
- Since a load is connected to each fuse, shutdown is selective.

Figure 8 Channel-by-channel fuse protection

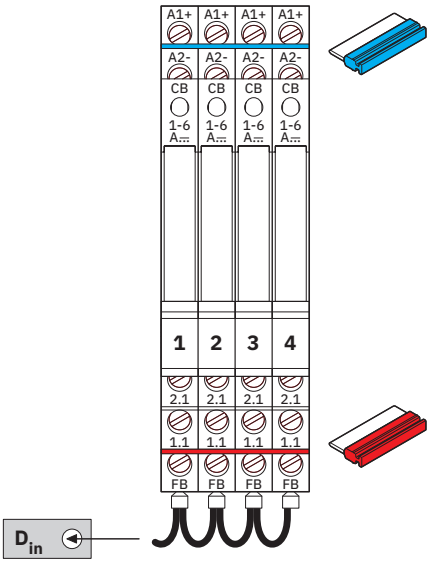
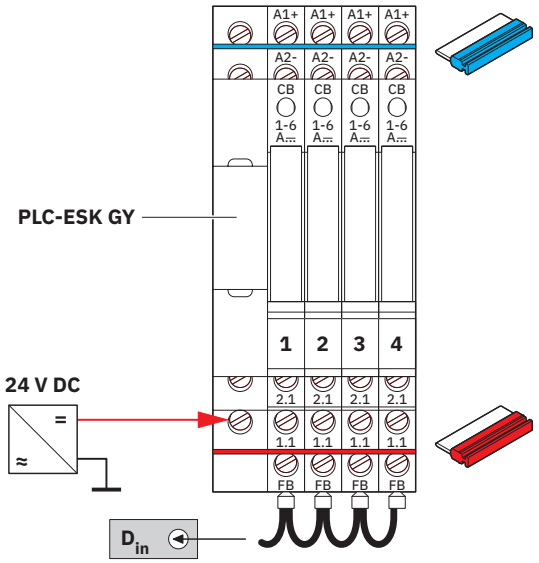


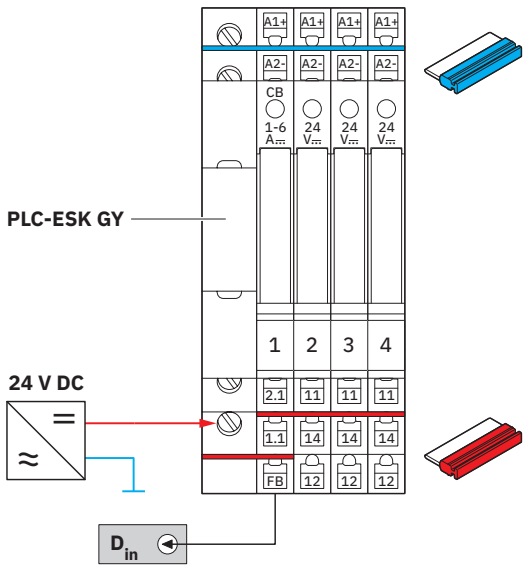
Figure 9 Channel-by-channel fuse protection with feed-in terminal



Block fuse protection

- With block fuse protection, feed-in only takes place via a fuse module, which shuts down a block of downstream interface modules in the event of overcurrent (max. 6 A total current).
- Several individual loads can be switched independently of one another via standard relay modules or optocouplers (using relays or SSR).
- The fuse and relay can be fed in on both sides (left and right) starting from an (optional) PLC-ESK GY power terminal.
- The grouped contacts of the standard relays can be fed in from the output of the fuse via an FBST bridge.
- To avoid undesired contacting or short circuit, a partition plate may be required.

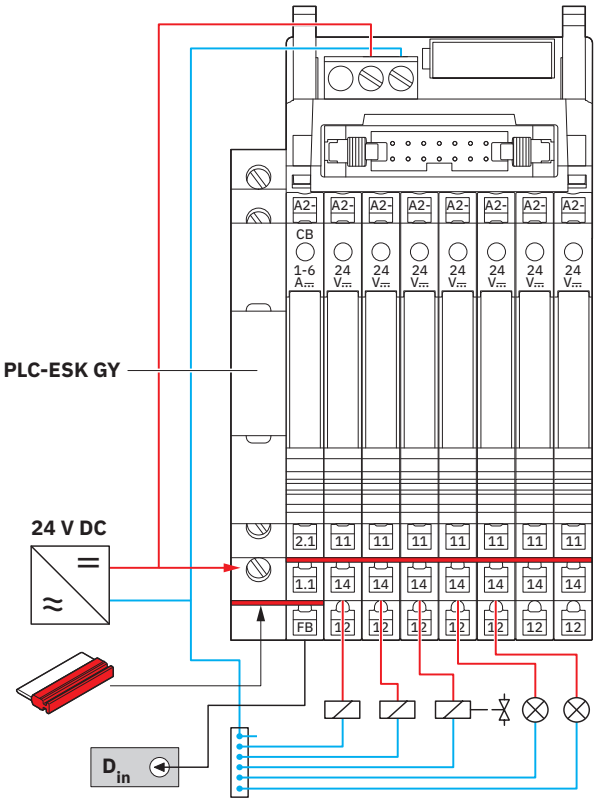
Figure 10 Block fuse protection with feed-in terminal and relay



Connection via V8 adapter

By using a V8 system cabling adapter, a quick and easy connection can be established between the coupling level and the controller, eliminating the need for individual wiring. Individual control and combination of fuse block and single relay is possible.

Figure 11 Connection via V8 adapter



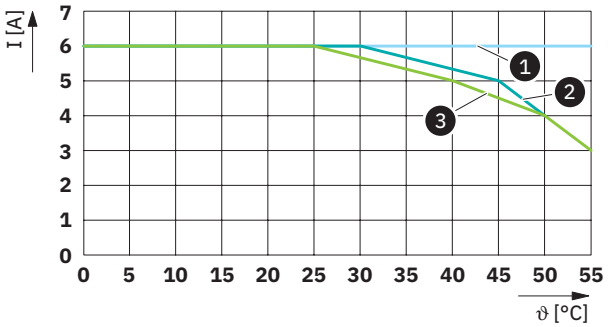
All-pole shutdown

All-pole shutdown (24 V DC and GND) can be implemented by reading in the high-active feedback signal into the controller. A second relay can therefore switch off the GND cable to the load.

10 Derating

The different connection variants affect the derating. The respective values can be read in the following diagram.

Figure 12 Derating



Key	
1	Individual setup (mounting distance 5 cm) or installed in a row without mounting distance with PLC-R... or PLC-O... (excluding PLC-R...CB...)
2	Installed in a row without mounting distance with PLC-R...CB...
3	Installed in a row without mounting distance with PLC-R...CB... and PLC-V8...

11 Maintenance

The circuit breaker is maintenance-free.

The relay can be replaced by the user.