TRIO-PM/1AC/24DC/2500W

Power supply unit

Data sheet
300008_en_00

 2025-03-24

1 Description

The TRIO POWER power supplies for panel mounting are distinguished by their high power density along with their compact design in a robust housing. Critical supply situations during load startup and brief overload situations during operation are reliably managed thanks to the dynamic boost function (1.4 x IN for 5 seconds, maximum).

The power supplies feature flexible mounting options where there is no position-dependent derating due to active cooling. The integrated ORING diode enables direct parallel connection, which also covers higher performance requirements.

Smart diagnostics are supported by optional CAN communication.

Features

- High power density and high efficiency with a compact design
- Customized use through flexible panel mounting options
- Easy power increase thanks to parallel connection with integrated ORING diode
- Smart diagnostics thanks to comprehensive monitoring using LED signaling and optional CAN bus interface
- Robust and reliable due to integrated protective functions
- Worldwide use thanks to the international approval package

Technical data (short form)	
Input voltage range	100 V AC ... 240 V AC -15 % ... +10 % 140 V DC ... 340 V DC -15 %; +10 % 100 V AC ... 240 V AC ±10 % (UL)
Mains buffering time	typ. 10 ms (120 V AC) typ. 10 ms (230 V AC@80% load)
Buffer time	typical 16 ms (120 V AC) typical 16 ms (230 V AC@80% load)
Nominal output voltage (U_N)	24 V DC
Setting range of the output voltage (U_{Set})	24 V DC ... 28 V DC
Output current I_N / $I_{Dyn.Boost}$	104 A / max. 145.8 A (5 s)
Output power P_N / $P_{Dyn.Boost}$	2500 W / max. 3500 W (5 s)
Efficiency (for nominal values)	typ. 92 % (120 V AC) typ. 93.5 % (230 V AC)
Residual ripple	typ. 240 mV_{PP}
MTBF (IEC 61709, SN 29500)	230 V AC / > 500000 h (25 °C) 230 V AC / > 250000 h (40 °C) 230 V AC / > 100000 h (55 °C)
Ambient temperature (operation)	-20 °C ... 70 °C (>55 °C Derating: 3,33 %/K)
Startup type tested	-40 °C
Dimensions (W x H x D)	108 x 41 x 322 mm
Weight	2000 g

All technical specifications are nominal and refer to a room temperature of 25 °C and 70 % relative humidity at 100 m above sea level.

2 Table of contents

3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
Primary-switched power supply unit, TRIO POWER, Screw connection, CAN bus, Panel mounting, input: 1-phase, output: 24 V DC / 104 A, adjustable from 24 V DC ... 28 V DC	TRIO-PM/1AC/24DC/2500W	1635194	1

Documentation	Type	Item No.	Pcs./Pkt.
TRIO-PM...CAN BUS Protocol V1.00	DB EN TRIO-PM...CAN BUS Protocol V1.00	-	-

Accessories	Type	Item no.	Pcs./Pkt.
Data cable with free cable end for communication between Phoenix Contact TRIO-PM/1AC/24DC/2500W (1635194) and other control devices or host computers	TRIO PM CJT-A2008H-2X5P-OE	1697887	1
Universal wall adapter for securely mounting the device in the event of strong vibrations. The universal wall adapter is snapped into the corresponding slot on the side of the device, which screws the device directly to the mounting surface.	UWA 20/13	1697537	1
Ring cable lug, width: 15 mm, color: silver	C-RC 35/M6 DIN	3240105	100
QUINT UPS, IQ Technology, DIN rail mounting, Screw connection, input: 24 V DC, output: 24 V DC / 40 A, charging current: 5 A	QUINT4-UPS/24DC/24DC/40	2907077	1
Plug-in surge arrester, in accordance with Type 2/Class II, for 1-phase power supply networks with separate N and PE (3-conductor system: L1, N, PE), with remote indication contact.	VAL-SPP-T2-275-1+1-UT-R	1466212	1
Pluggable surge protective device, in accordance with Type 2/Class II, for DC power sources with linear operating characteristics, with remote indication contact.	VAL-SEC-T2-2+0-380DC-FM	2907876	1
Pluggable surge protective device, in accordance with Type 2/Class II, for DC power sources with linear operating characteristics, with remote indication contact.	VAL-SEC-T2-2+0-48DC-FM	2907865	1
Surge protective device, two channel with remote indicator contact for 120 V AC, 2-wire plus ground.	VAL-US-120/40/1+1-FM	2910349	1
Surge protective device, single channel with remote indicator contact for 120 V AC	VAL-US-120/40/1+0-FM	2910348	1
Type 2/3 surge protection, consisting of protective plug and base element, with integrated status indicator and remote signaling for single-phase power supply networks. Nominal voltage: 120 V AC/DC	PLT-SEC-T3-120-FM-UT	2907918	5
Electronic circuit breaker E (electronic), 1-position, tripping characteristic: electronic, mounting type: DIN rail: 35 mm, rated current: 16 A	CBMC E4 24DC/1-4A NO	2906031	1

Accessories	Type	Item no.	Pcs./Pkt.
Electronic circuit breaker EG (electronic - galvanic disconnection), 1-position, tripping characteristic: electronic, mounting type: DIN rail: 35 mm, rated current: 32 A	CBMC EG4 24DC/1-8A NO	1065730	1
Electronic circuit breaker E (electronic), 1-position, tripping characteristic: electronic, mounting type: DIN rail: 35 mm, rated current: 40 A	CBMC E4 24DC/1-10A NO	2906032	1
Electronic circuit breaker E (electronic), 1-position, tripping characteristic: electronic, mounting type: DIN rail: 35 mm, rated current: 40 A	CBM E4 24DC/0.5-10A NO-R	2905743	1
Electronic circuit breaker E (electronic), 1-position, tripping characteristic: electronic, mounting type: DIN rail: 35 mm, rated current: 80 A	CBM E8 24DC/0.5-10A NO-R	2905744	1
Electronic circuit breaker E (electronic), 1-position, tripping characteristic: electronic, mounting type: pluggable onto CAPAROC CR… current rail, rated current: 4 A	CAPAROC E4 12-24DC/1-4A	1115657	1
Electronic circuit breaker E (electronic), 1-position, tripping characteristic: electronic, mounting type: pluggable onto CAPAROC CR… current rail, rated current: 10 A	CAPAROC E4 12-24DC/1-10A	1115658	1

You will find the latest accessories for the item at phoenixcontact.com/products.

4 Technical data

Input data

Unless otherwise stated, all data applies for 25°C ambient temperature, 230 V AC input voltage, and nominal output current (I_N).

Input voltage range	100 V AC ... 240 V AC -15 % ... +10 % 100 V AC ... 240 V AC ±10 % (UL) 140 V DC ... 340 V DC -15 %; +10 %
Derating 85 V AC ... 90 V AC 90 V AC ... 180 V AC	 ≤ 1350 W ≤ 1500 W
Electric strength, max.	300 V AC 15 s
Frequency range (f_N)	50 Hz ... 60 Hz ±5 %
Typical national grid voltage	120 V AC / 230 V AC
Network type	Star network (TN, TT, IT (PE))
Current consumption 100 V AC / 230 V AC 85 V AC / 180 V AC 100 V AC ... 240 V AC ±10 % (UL) 120 V DC / 350 V DC	 16.7 A / 11.7 A 20 A / 15 A max. 18 A (UL) 13.8 A / 7.6 A
Discharge current to PE	< 2 mA
Mains buffering time 120 V AC / 230 V AC@80% load	 typ. 10 ms / typ. 10 ms
Buffer time 120 V AC / 230 V AC@80% load	 typical 16 ms / typical 16 ms
Inrush current (115 V AC, 25 °C / 230 V AC, 25 °C)	< 15 A / < 40 A
Inrush current integral (I^2t)	< 3364 A^2s
Device mains fuse , internal (device protection)	25 A

During the first few microseconds, the current flow into the filter capacitors is excluded.

The SCCR (short-circuit current rating) value of the power supply unit corresponds to the SCCR value of the backup fuse.

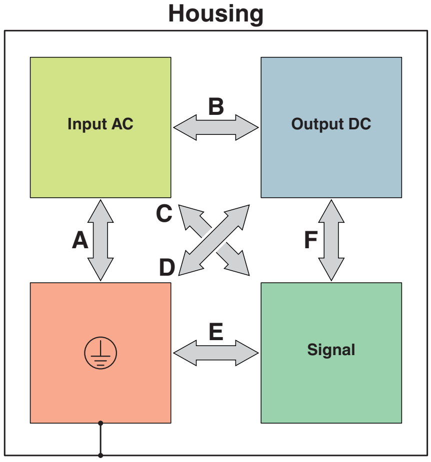
Input protection, AC (to be connected externally upstream)

Input current I_{In} Input protection	Circuit breaker					Neozed fuse or equivalent	Circuit breaker
Characteristics	**A**	**B**	**C**	**D**	**K**	**gG**	**≤ 13 x I_{In} (maximum magnetic tripping)**
20 A	-	✓	✓	✓	✓	✓	✓
63 A	-	✓	✓	✓	✓	✓	✓

Protective circuit

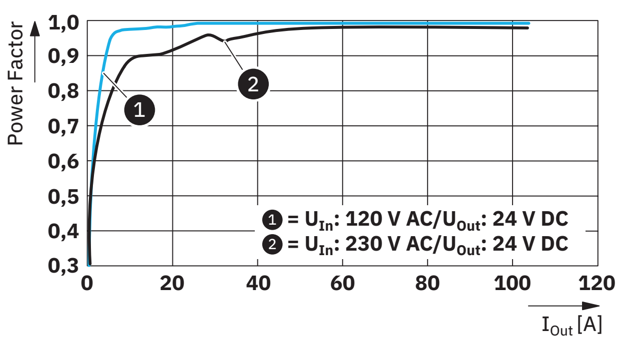
Type of protection	Transient protection

Electric strength of the insulation



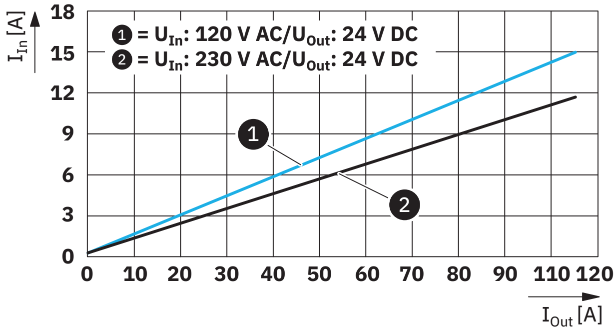
Test voltage	A	B	C	D	E
Type test (IEC/EN 61010-1)	1.5 kV AC	3 kV AC	3 kV AC	1.5 kV AC	1.5 kV AC
Production test	2.1 kV DC	4.2 kV DC	4.2 kV DC	2.1 kV DC	2.1 kV DC

POWER factor



Crest factor	120 V AC	230 V AC
	typ. 1.43	typ. 1.44

Input current vs. output current



Connection data: Input	Connection capacity Terminal block	recommended
Position	1.x	
Position identifier	1.1 (L/+), 1.2 (N/-), 1.3 (⏚)	
Connection method	Screw connection	
Tightening torque	1.13 Nm ... 1.47 Nm / 10 lb_f-in. ... 13 lb_f-in.	
Stripping length	10 mm (Rigid/flexible/ferrule)	
1-conductor rigid	1.3 mm² ... 3 mm²	2.5 mm²
1-conductor flexible	1.3 mm² ... 3 mm²	2.5 mm²
1-conductor flexible with ferrule without plastic sleeve	1.3 mm² ... 3 mm²	2.5 mm²
1-conductor flexible with ferrule with plastic sleeve	1.3 mm² ... 3 mm²	2.5 mm²
AWG (Cu)	18 ... 12	14

Output data	
Nominal output voltage (U_N)	24 V DC
Setting range of the output voltage (U_{Set}) > 24 V DC, constant capacity restricted	 24 V DC ... 28 V DC
Output current I_N / $I_{Dyn.Boost}$ Derating	 104 A / max. 145.8 A (5 s) max. 62.5 A (< 180 V AC)
Output power P_N / $P_{Dyn.Boost}$ Derating	 2500 W / max. 3500 W (5 s) max. 1500 W (< 180 V AC)
Control deviation change in load, static 10 % ... 90 % change in load, dynamic 10 % ... 90 % change in input voltage ±10 %	 < 0.5 % < 5 % < 0.5 %
Short-circuit-proof	yes
No-load proof	yes
Residual ripple	typ. 240 mV_{PP}
Connection in parallel Number	yes, for increased efficiency and redundancy max. 4
Connection in series Number	yes, for increased output voltage (observe SELV limit) max. 2
Feedback voltage resistance	≤ 35 V DC
Protection against overvoltage at the output (OVP)	≤ 35 V DC
Rise time U_{Out} = 10 % ... 90 %	 ≤ 100 ms

Connection data: Output	Connection capacity Terminal block	recommended
Position	2.x	
Position identifier	2.1 (+), 2.2 (-)	
Connection method	Screw connection (Busbar)	
Tightening torque	3 Nm	
Stripping length	10 mm (rigid/flexible/ring cable lug/fork-type cable lug)	
1-conductor rigid	0.2 mm² ... 35 mm²	35 mm²
1-conductor flexible	0.2 mm² ... 35 mm²	35 mm²
AWG (Cu)	6 ... 2	2

LED DC OK – signal state operation (U_N = 24 V DC, I_{Out} = I_N)	
Function	Visualization of the operating state of the DC output voltage (DC OK)
Color	Red, green (multicolor LED)

LED OVP – signal state operation (U_N = 24 V DC, I_{Out} = I_N)	
Function	Visualization of the surge protection operating state (OVP)
Color	Red, green (multicolor LED)

LED OCP – signal state operation (U_N = 24 V DC, I_{Out} = I_N)	
Function	Visualization of the overcurrent protection operating state (OCP)
Color	Red, green (multicolor LED)

LED OTP – signal state operation (U_N = 24 V DC, I_{Out} = I_N)	
Function	Visualization of the overtemperature protection operating state (OTP)
Color	Red, green (multicolor LED)

LED FAN – signal state operation (U_N = 24 V DC, I_{Out} = I_N)	
Function	Visualization of the operating state of the fan (in operation or malfunction)
Color	Red, green (multicolor LED)

LED SCP – signal state operation (U_N = 24 V DC, I_{Out} = I_N)	
Function	Visualization of the short-circuit protection operating state (SCP)
Color	Red, green (multicolor LED)

DC OK switch contact - signal state operation (U_N = 24 V DC, I_{Out} = I_N)	
Position	4.x
Position identifier	4.1 (13), 4.2 (14)
Function	Operating state forwarding
Switch contact (floating)	OptoMOS
Switching voltage	max. 30 V DC (SELV)
Current carrying capacity	max. 10 mA
State condition Contact closed Contact open	 U_{out} < 18 V DC U_{out} > 18 V DC

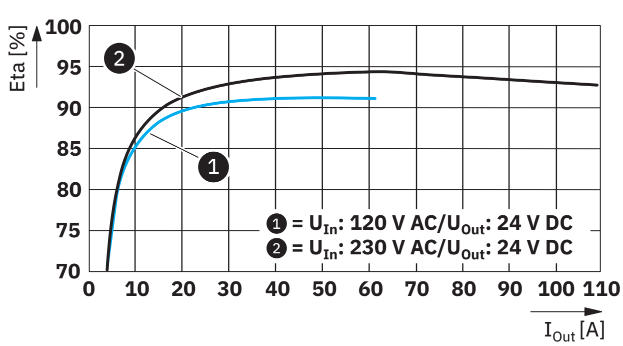
Connection data: Signal, communication	Connection capacity Terminal block	recommended
Position	3.x, 4.x	
Position identifier	3.1 - 3.10, 4.1 - 4.10	
Connection method	2x 10-pos. pin strip	
1-conductor rigid	0.1 mm² ... 0.4 mm²	0.34 mm²
1-conductor flexible	0.1 mm² ... 0.4 mm²	0.34 mm²
1-conductor flexible with ferrule without plastic sleeve	0.1 mm² ... 0.4 mm²	0.34 mm²
1-conductor flexible with ferrule with plastic sleeve	0.1 mm² ... 0.4 mm²	0.34 mm²
AWG (Cu)	30 ... 22	22

Reliability	25 °C	40 °C	55 °C
MTBF (IEC 61709, SN 29500)			
230 V AC	> 500000 h	> 250000 h	> 100000 h

Data interface	
Connection method	10-pos. system connector
Interface designation	CAN bus
Number of interfaces	1
Locking	Locking clip
Transmission physics	wired
Topology	Daisy Chain
Transmission speed	250 kbps
Transmission length	max. 20 m
Supported protocols	CAN 2.0A, CAN 2.0B
Number of bus devices	max. 16
Termination resistor	120 Ω (Terminating the end device)

Power dissipation	120 V AC	230 V AC
No load	< 10 W	< 10 W
Nominal load	< 20 W	< 20 W

Efficiency	120 V AC	230 V AC
	typ. 92 %	typ. 93.5 %



Ambient conditions	
Ambient temperature (operation)	-20 °C ... 70 °C (>55 °C Derating: 3,33 %/K)

The ambient temperature (operation) refers to IEC 61010 surrounding air temperature.

Ambient temperature (start-up type tested)	-40 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	≤ 95 % (at 25 °C, non-condensing)
Installation height	≤ 5000 m (> 2000 m, Derating: 10 %/1000 m)
Vibration (operation) IEC 60068-2-6	 10 Hz ... 18.2 Hz, amplitude ±0.75 mm 18.2 Hz ... 150 Hz, 1g, 90 min.
Shock (operation) IEC 60068-2-27	 11 ms, 15g, per spatial direction
Degree of pollution	2
Climate class EN 60721	 3K3
Overvoltage category EN 61010-1 EN 61010-2-201	 III (≤ 2000 m) / II (≤ 5000 m) III (≤ 2000 m) / II (≤ 5000 m)

General data	
Degree of protection	IP20
Protection class	I
Flammability rating UL 94 Housing, terminal blocks	 V0
Dimensions (W x H x D)	108 x 41 x 322 mm
Weight	2000 g

Standards/specifications	
Safety of power supply units up to 1100 V (insulation distances)	DIN EN 61558-2-16
Electrical safety	IEC 61010-2-201 (SELV)
Safety for equipment for measurement, control, and laboratory use	IEC 61010-1
Protective extra-low voltage	IEC 61010-1 (SELV) IEC 61010-2-201 (PELV)
Safe isolation	IEC 61010-2-201
Limitation of harmonic line currents	EN 61000-3-2
Mains variation/undervoltage	SEMI F47 - 0706

Conformance/Approvals	
UL	UL/C-UL Listed UL 61010-1 UL/C-UL Listed UL 61010-2-201 UL/C-UL Approved UL 62368-1

You will find the latest approvals for the item at phoenixcontact.com/products.

Electromagnetic compatibility Conformance with EMC Directive 2014/30/EU		
Interference emission in accordance with EN 61000-6-3 (residential and commercial) and EN 61000-6-4 (industrial)		
CE basic standard	**Minimum normative requirements**	**Higher requirements in practice covered**
Conducted noise emission EN 55016	EN 61000-6-4 (Class A)	EN 61000-6-4 (Class A)
Noise emission EN 55016	EN 61000-6-4 (Class A)	EN 61000-6-4 (Class A)
Harmonic currents EN 61000-3-2	EN 61000-3-2 (Class A) --	EN 61000-3-2 (Class A) 0 kHz ... 2 kHz
Flicker EN 61000-3-3	not required	EN 61000-3-3 --

Immunity in accordance with EN 61000-6-1 (residential), EN 61000-6-2 (industrial)		
CE basic standard	**Minimum normative requirements**	**Higher requirements in practice covered**
Electrostatic discharge EN 61000-4-2		
Contact discharge	4 kV (Test Level 2) (Test Level 2)	4 kV (Test Level 3) (Test Level 3)
Discharge in air	8 kV (Test Level 3)	8 kV (Test Level 3)
Comments	Criterion B	Criterion A
Electromagnetic HF field EN 61000-4-3		
Frequency range	80 MHz ... 1 GHz	80 MHz ... 1 GHz
Test field strength	10 V/m (Test Level 3)	10 V/m (Test Level 3)
Frequency range	1.4 GHz ... 6 GHz	1 GHz ... 6 GHz
Test field strength	3 V/m (Test Level 2)	10 V/m (Test Level 3)
Comments	Criterion A	Criterion A
Fast transients (burst) EN 61000-4-4		
Input	asymmetrical 2 kV (Test Level 3)	asymmetrical 2 kV (Test Level 3)
Output	asymmetrical 1 kV (Test Level 2)	asymmetrical 2 kV (Test Level 3)
Signal	asymmetrical 1 kV (Test Level 3)	asymmetrical 1 kV (Test Level 3)
Comments	Criterion B	Criterion B

Immunity in accordance with EN 61000-6-1 (residential), EN 61000-6-2 (industrial)		
CE basic standard	**Minimum normative requirements**	**Higher requirements in practice covered**
Surge voltage load (surge) EN 61000-4-5		
Input	symmetrical 1 kV (Test Level 3) asymmetrical 2 kV (Test Level 3)	symmetrical 2 kV (Test Level 4) asymmetrical 4 kV (Test Level 4)
Output	symmetrical 0.5 kV (Test Level 2) asymmetrical 1 kV (Test Level 2)	symmetrical 0.5 kV (Test Level 2) asymmetrical 1 kV (Test Level 2)
Signal	asymmetrical 1 kV (Test Level 2)	asymmetrical 1 kV (Test Level 2)
Comments	Criterion B	Criterion B
Conducted interference EN 61000-4-6		
Input/output/signal	asymmetrical	asymmetrical
Frequency range	0.15 MHz ... 80 MHz	0.15 MHz ... 80 MHz
Voltage	10 V (Test Level 2)	10 V (Test Level 3)
Comments	Criterion A	Criterion A
Voltage dips EN 61000-4-11 Input voltage (230 V AC, 50 Hz)		
Voltage dip	70 %, 25 periods (Class 3)	70 %, 25 periods (Class 3)
Comments	Criterion C	Criterion A
Voltage dip	40 %, 10 periods (Class 3)	40 %, 10 periods (Class 3)
Comments	Criterion C	Criterion B
Voltage dip	0 %, 1 period (Class 3)	0 %, 1 period (Class 3)
Comments	Criterion B	Criterion A

Key	
Criterion A	Normal operating behavior within the specified limits.
Criterion B	Temporary impairment to operational behavior that is corrected by the device itself.
Criterion C	Temporary adverse effects on the operating behavior, which the device corrects automatically or which can be restored by actuating the operating elements.

5 Safety and installation notes

5.1 Symbols used

Instructions and possible hazards are indicated by corresponding symbols in this document.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety measures that follow this symbol to avoid possible personal injuries.

There are different categories of personal injury that are indicated by a signal word.

WARNING
This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

CAUTION: Hot surface
Please note that the surfaces of the power supply can become hot due to internal and external heating.

The following symbols are used to indicate potential damage, malfunctions, or more detailed sources of information.

NOTE
This symbol together with the signal word NOTE and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware/software, or surrounding property.

This symbol and the accompanying text provide the reader with additional information or refer to detailed sources of information.

This symbol and the accompanying text provide additional information on the proper disposal of electronic components.

This symbol and the accompanying text provide additional information on recycling.

This symbol indicates a specialist product that requires specialist knowledge during installation.

5.2 Safety and warning notes

WARNING: Danger to life by electric shock!

- Only skilled persons may install, start up, and operate the device.
- Never carry out work when voltage is present.
- Establish connection correctly and ensure protection against electric shock.
- Cover termination area after installation in order to avoid accidental contact with live parts (e. g., installation in control cabinet).

NOTE

- Use this power supply to convert the electrical energy fed in by the power grid. The AC input voltage and the DC output voltage are electrically isolated. The adjustable DC output voltage U_{Out} is a safe extra-low voltage.
- Protection may be impaired if the equipment is used in a manner not specified by the manufacturer.
- The power supply is maintenance-free. Repairs may only be carried out by the manufacturer. The warranty no longer applies if the housing is opened.
- Observe the national safety and accident prevention regulations.
- Assembly and electrical installation must correspond to the state of the art.
- The power supply is a built-in device and is designed for mounting in a control cabinet or other internal environment.
- A suitable electrical and fire enclosure shall be provided in the end equipment.
- The IP20 degree of protection of the power supply is intended for a clean and dry environment.
- Observe mechanical and thermal limits.
- The L(+)/N(-)/⏚terminal blocks (front) are located on the other end of the integrated fan (back).

- The power supply is approved for connection to TN, TT, and IT power grids (star networks) with protective conductor connection (PE) and a maximum phase-to-phase voltage of 240 V AC.
- Connect the housing to ground via protective conductor device terminal block ⏚.
- Make sure that the wiring on the primary side and the secondary side is adequately dimensioned and protected.
- Use copper cables for operating temperatures of
  >75 °C (ambient temperature <55 °C)
  >90 °C (ambient temperature <75 °C).
- Refer to the corresponding tables (see Section: Technical data) for the connection parameters, such as the necessary stripping length for wiring with and without ferrule.
- Protect the device against foreign bodies penetrating it, e.g., paper clips or metal parts.
- When wiring the floating switch contact, observe the maximum permissible contact load.
- This power supply is mainly used in industrial applications.
  To comply with radiation interference emission limits, one of the following instructions must be observed:
  1. All signal wires must be in close proximity to the grounding plate, such as the grounding plate of the switch cabinet.
  2. All signal wires must pass through a ferrite core. (It is recommended to use a ferrite core with the same specifications as in laboratory tests, with an inductance of 42 ± 25% µH.)
  In both cases, the EUT and the load must be installed on a metal surface with the same potential.

6 High-voltage test (HIPOT)

This protection class I power supply is subject to the Low Voltage Directive and is factory tested. During the HIPOT test (high-voltage test), the insulation between the input circuit and output circuit is tested for the prescribed electric strength values, for example. The test voltage in the high-voltage range is applied at the input and output terminal blocks of the power supply. The operating voltage used in normal operation is a lot lower than the test voltage used.

High-voltage tests can be performed as described.

The test voltage should rise and fall in ramp form. The relevant rise and fall time of the ramp should be at least two seconds.

6.1 High-voltage dielectric test (dielectric strength test)

In order to protect the user, power supplies (as electric components with a direct connection to potentially hazardous voltages) are subject to more stringent safety requirements. For this reason, permanent safe electrical isolation between the hazardous input voltage and the touch-proof output voltage as safety extra-low voltage (SELV) must always be ensured.

In order to ensure permanent safe isolation of the AC input circuit and DC output circuit, high-voltage testing is performed as part of the safety approval process (type test) and manufacturing (routine test).

6.2 High-voltage dielectric test during the manufacturing process

During the power supply manufacturing process, a high-voltage test is performed as part of the dielectric test in accordance with the specifications of IEC/UL/EN 61010-1. Routine manufacturing tests are inspected regularly by a certification authority.

6.3 High-voltage dielectric test performed by the customer

Apart from routine and type tests to guarantee electrical safety, the end user does not have to perform another high-voltage test on the power supply as an individual component. According to EN 60204-1 (Safety of machinery - Electrical equipment of machines) the power supply can be disconnected during the high-voltage test and only installed once the high-voltage test has been completed.

6.3.1 Performing high-voltage testing

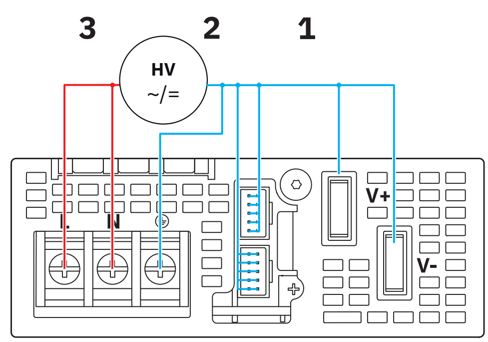
If high-voltage testing of the control cabinet or the power supply as a stand-alone component is planned during final inspection and testing, the following features must be observed.

- The power supply wiring must be implemented as shown in the wiring diagram.
- The maximum permissible test voltages must not be exceeded.

Avoid unnecessary loading or damage to the power supply due to excessive test voltages.

For the relevant applicable test voltages and insulation distances, refer to the corresponding table (see technical data: electric strength of the insulation section).

Figure 1 Potential-related wiring for the high-voltage test



Key

No.	Designation	Color coding	Potential levels
1	DC output circuit	Blue	Potential 2
2	High-voltage tester	--	--
3	AC input circuit	Red	Potential 1

7 Structure

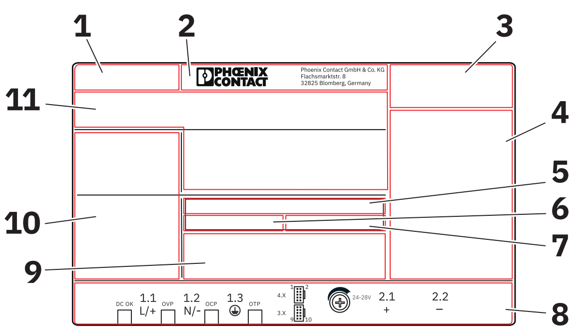
7.1 Rating plate

In accordance with the German Product Safety Law (ProdSG) it is only permissible to make such products available on the market if they meet certain safety standards. It must be ensured at all times that users are not exposed to hazards.

In accordance with ProdSG, every device must therefore be fitted with a rating plate. All relevant information on the safe use of the device must also be included.

The power supply device rating plate is located on the front of the housing.

Figure 2 Rating plate information



Key:

No.	Designation
1	Order designation and item number
2	Identification of the provider
3	Equipment recycling information
4	Signal port definition
5	Barcode for equipment identification
6	Serial number for equipment identification
7	Marking for the V/C level
8	Connection marking
9	Reference to the accompanying product documentation
10	Device approvals
11	Device connection data and permissible ambient conditions

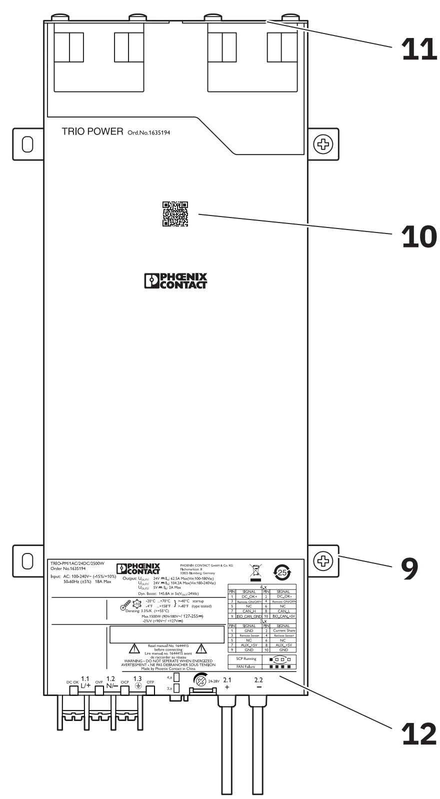
7.2 Connectors and function elements

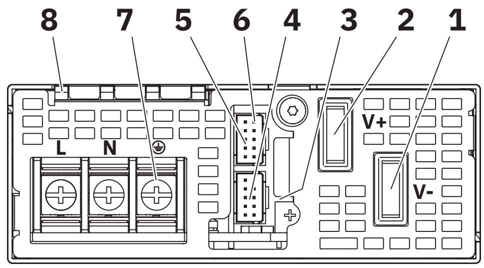
For clear and definitive identification, the connectors are marked with an unambiguous connection marking. The connection marking always comprises two items of information: the position marking (position) and the pole marking (pole identifier).

Example:

Position	Pole identifier	Connection labeling
1.x	x.1 (L/+), x.2 (N/-), x.3 ⏚	Input
2.x	x.1 (+), x.2 (-)	Output
3.x	x.1 ... x.10	Signal, communication
4.x		

Figure 3 Position of the connectors and function elements



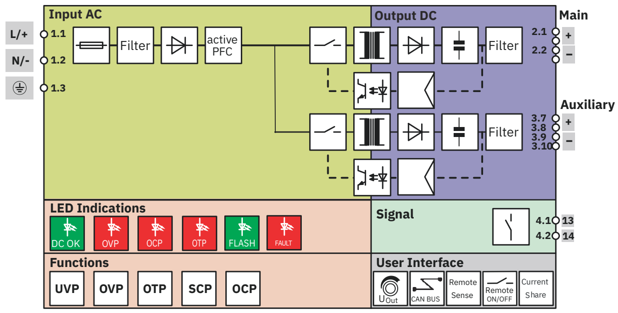


Key:

No.	Designation	Connection labeling
1	Output voltage connection terminal blocks: Output DC (1x negative)	2.1
2	Output voltage connection terminal blocks: Output DC (1x positive)	2.2
3	Potentiometer output voltage	--
4	Signal terminal block 3.x	3.1…3.10
5	Signal terminal block 4.x	4.1…4.10
6	Floating switch contact: 13/14 (N/C contact)	4.1, 4.2
7	Input voltage connection terminal blocks: Input AC L(+)/N(-)/⏚	1.1 ... 1.3
8	LED status indicator (multicolor LED, red, green)	
9	Auxiliary backplane mounting accessories and slots (optional)	--
10	QR code web link	--
11	Forced air cooling, heat dissipation fan	--
12	Product rating plate and signal indication notes	--

7.3 Block diagram

Figure 4 Block diagram



Key:

Symbol	Designation – Input AC, Output DC
	Input fuse, internal device protection
Filter	EMC filter
	Rectification
active PFC	Power factor correction (PFC)
	Switching transistor
	Transmitter with electrical isolation
	Smoothing capacitor
	Optocoupler (electrically isolating)
	Control equipment

Symbol	Designation – Functions
UVP	Undervoltage protection protects the AC input of the power supply against damage in the event of an AC undervoltage.
OVP	Overvoltage protection protects the DC output of the power supply and the connected load against damage in the event of an overvoltage
OTP	Overtemperature protection protects the power supply against damage in the event of impermissibly high intrinsic external heating.
OCP	Overcurrent protection protects the DC output of the power supply against damage in the event of an impermissibly high current load.
SCP	Short-circuit protection protects the DC output of the power supply against damage in the vent of an output-side short circuit.

Symbol	Designation – Signal
	Floating switch contact, signals the operating status of the power supply to a higher-level controller. The floating switch contact is closed in normal operation. $0.95*U_{OutSet} < U_{Out} < 1.05*U_{OutSet}$ and $I_{Out} < I_N$

Symbol	Designation – User interface
U_{OUT}	Potentiometer for setting the output voltage U_{Out}
DC OK	DC OK LED (green) visualizes the operating states of the power supply. In normal operation, the DC output voltage is $0.95*U_{OutSet} < U_{Out} < 1.05*U_{OutSet}$.
FLASH	The DC OK LED (flashing green) visualizes the operating state of the power supply as a pre-alarm signal. The output current supplying power to the load exceeds the device-side threshold of $1.05*U._{OutSet} < U_{Out} < 1.1*U_{OutSet}$ or $0.9*U_{OutSet} < U_{Out} < 0.95*U_{OutSet}$ or IN $< I_{Out} < 1.2*I_N$
FAULT	The DC OK LED (red) visualizes an abnormal status detected on the DC output side of the power supply. $1.1*U_{OutSet} < U_{Out}$ or $U_{Out} < 0.9*U_{OutSet}$ or $I_{Out} > 1.2*I_N$, continuously for 6s

7.4 Dimensions

Figure 5 Dimensions, front view (in mm)

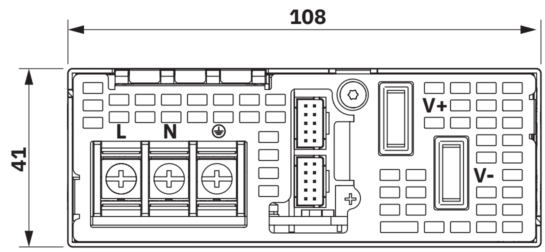


Figure 6 Dimensions, top view (in mm)

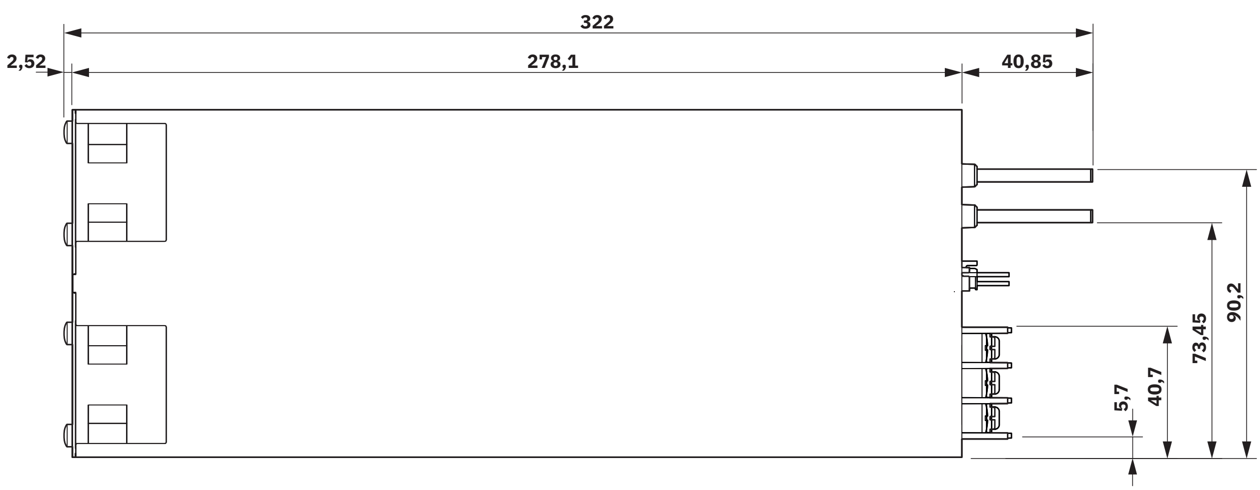
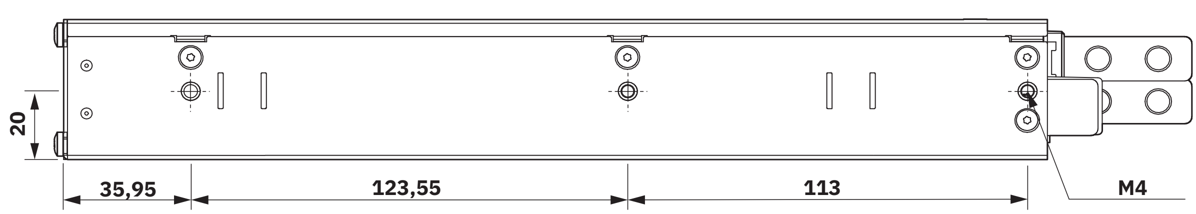


Figure 7 Dimensions, side view (in mm)



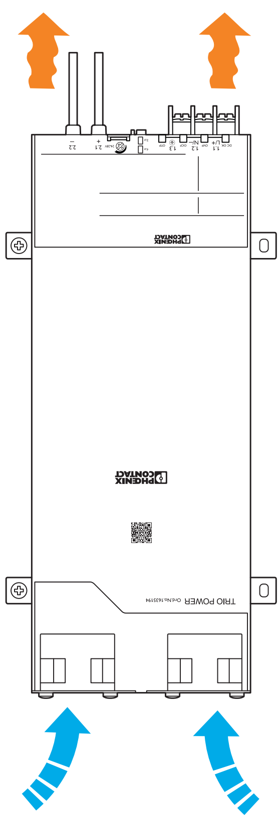
8 Mounting/remove

No installation-position-dependent derating occurs.

8.1 Convection

To ensure adequate ventilation, leave sufficient minimum clearance near the power supply and air inlet/outlet of the installation device. The minimum clearances are rated based on the nominal power supply operation (see section: "Keep-out areas").

Figure 8 Schematic diagram of the convection cooling

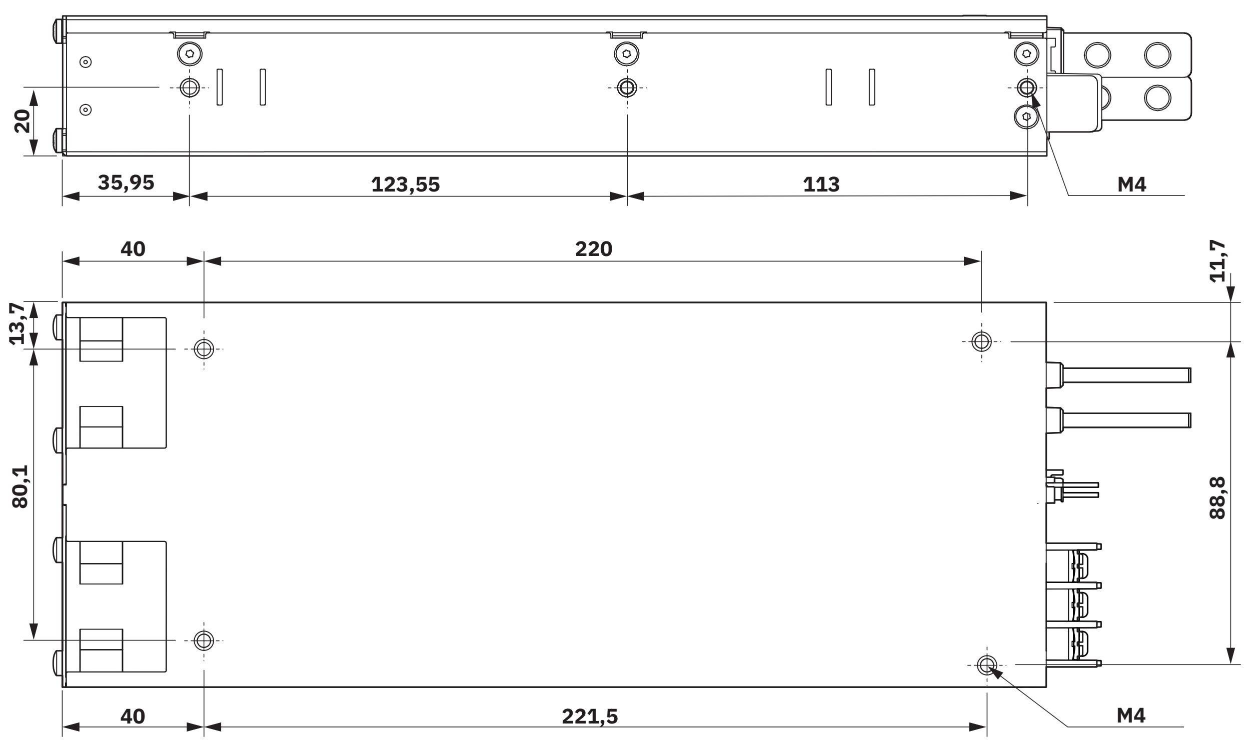


8.2 Mounting position

8.2.1 Mounting versions with own threaded holes

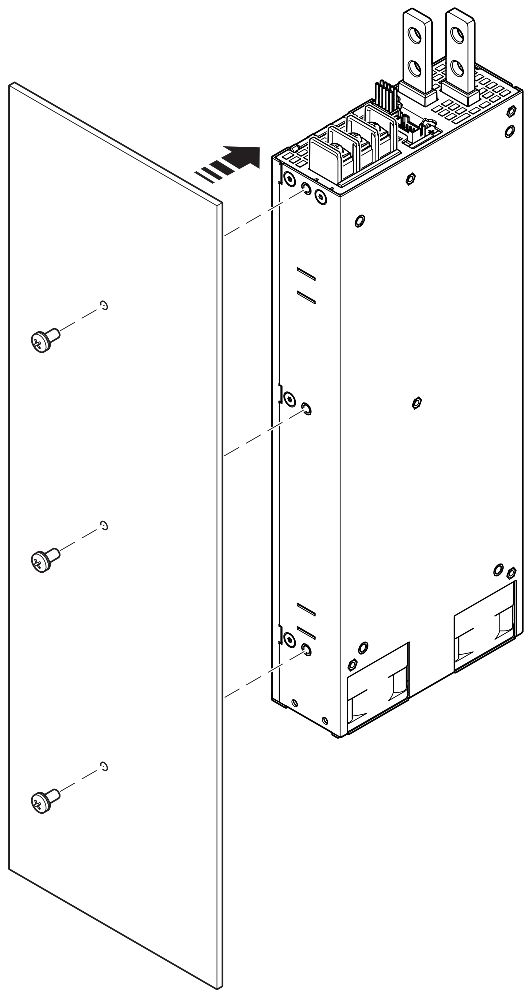
Using own threaded holes, the power supply can be mounted from both the side and rear directions. The distances between the threaded holes are illustrated below.

Figure 9 Power supply mounted using screw holes



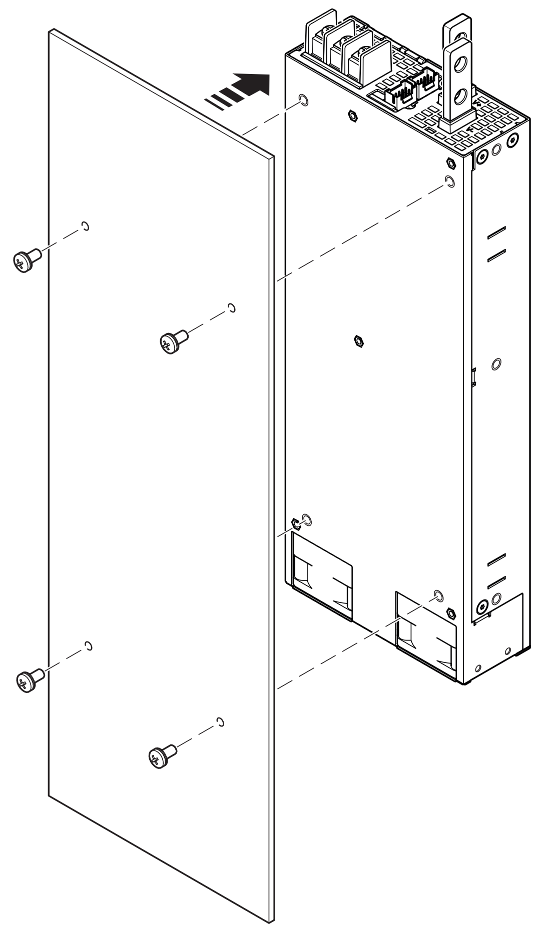
For the side/backplane mounting, M4 screws x 3 with an installation depth < 4 mm are used.

Figure 10 Side-mounted on a mounting plate



For the rear/backplane mounting, M4 screws x 4 with an installation depth < 3 mm are used.

Figure 11 Back-mounted on a mounting plate



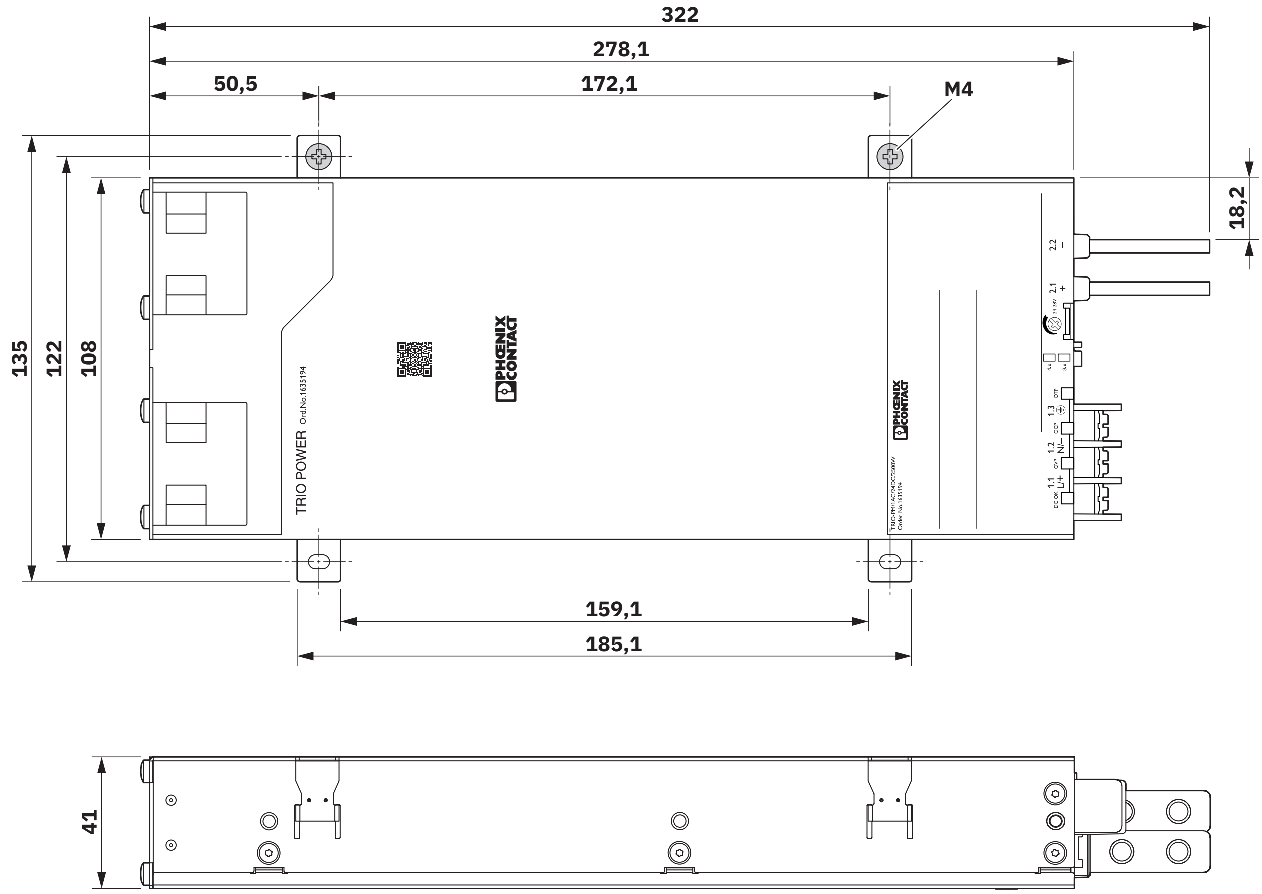
8.2.2 Mounting version with auxiliary accessories

The power supply can be mounted with 4 x auxiliary accessories (UWA 20/13 – item no.: 1697537).

With this mounting version, an access only from the front is necessary.

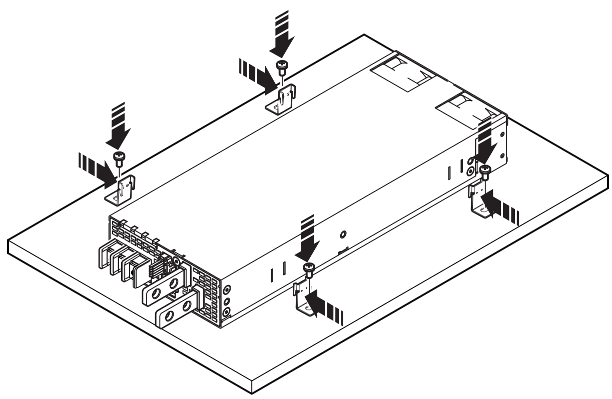
The dimensions of the mounting slots are shown in the figure below.

Figure 12 Power supply slot-mounted using auxiliary accessories



For the front/auxiliary accessories mounting, auxiliary accessories x 4 + M4 screw x 4 are used.

Figure 13 Front side mounted on backplane using auxiliary accessories



8.3 Mounting and removing

8.3.1 Using own threaded holes for mounting

Install using own threaded holes as follows:

1. Thread the M4 screws through the mounting surface with the mounting holes
2. Align the screw with the corresponding threaded hole of the product and tighten the screw (torque 1 Nm ±0.2)

NOTES:

At the bottom of the product, M4 screws can extend a maximum of 3 mm into the product body. On the sides, M4 screws can extend a maximum of 4 mm into the product body. All mounting holes have mounting depth protection to prevent screws from penetrating too deep.

8.3.2 Remove the power supply installed with its own threaded holes

Remove from the mounting surface as follows:

1. Use tools to remove fasteners
2. Remove the product from the mounting surface

8.4 Installation with auxiliary accessories

8.4.1 Install with auxiliary accessories

Install using the installation auxiliary accessories as follows:

1. Insert the four auxiliary accessories into the corresponding position of the product
2. Place the product on the mounting surface of the corresponding threaded holes
3. Install with M4 screws (torque 1 Nm ± 0.2)
4. Check whether the product is secured

8.4.2 Removal of power supply mounted with auxiliary accessories

Remove from the mounting surface as follows:

1. Use tools to remove fasteners
2. Remove the product from the mounting surface

8.5 Installation height

You can operate the power supply without power limitations up to an installation altitude of 2000 m. If the installation height is greater than 2000 m, different technical data will apply due to the difference in air pressure and the associated decrease in convection cooling (see section: Derating).

8.6 Keep-out areas

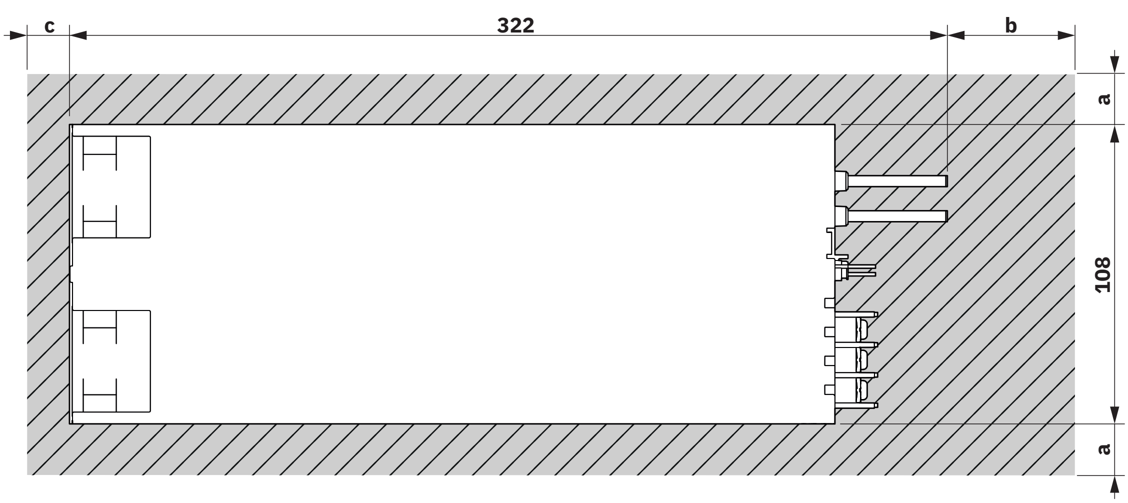
To protect the power supply against thermal overload, observe the required keep-out areas during configuration.

8.6.1 Variable keepout areas

The required dimensions of the keepout areas may vary depending on the planned output power for the application.

Output power P_{Out} = 100 %		Keepout areas, clearance [mm]		
		a	b	c
Passive components	≤ 40 °C	0	50	50
	> 40 °C	0	50	50
Active components		0	50	50

Figure 14 Device dimensions and minimum keep-out areas (in mm)



9 Connection terminal blocks

For the necessary connection parameters for connecting terminal block boards, please refer to the section Technical data.

In addition, you can also find the strip length of the required flexible and rigid connection cables on the mating face of the power supply.

This power supply is a specialist product. Only qualified specialist personnel with electrotechnical expertise may install, start up, and operate this power supply.

WARNING: Observe the national safety regulations for working on electrical systems

In Germany, this work may only be carried out by electrically skilled persons with additional training.

Furthermore, the five basic safety rules apply:

– Disconnect safely
– Ensure power cannot be switched on again
– Verify safe isolation from the supply for all positions
– Ground and short circuit
– Cover or safeguard adjacent live parts

9.1 Screw / bus connectors

The screw/bus connection technology is used for the front connection terminal block board of the power supply. For clear identification, the connection terminal block board is marked with the corresponding connection marking. See section: Connecting terminal blocks and functional elements.

For the necessary connection parameters for the connection terminal blocks, refer to the technical data section.

9.1.1 Connect screw terminal block

To wire the power supply with the connecting cables, proceed as follows:

1. Strip the single connecting cable and secure the wire end with the recommended ferrule as needed.
2. Strip the end of the cable and secure it to the input terminal block and output copper bar using screws. The recommended torque is 1.13-1.47 Nm for the input screw and 3 Nm for the output screw (<M5 screws).
3. Then check that the cable is securely connected to the screw terminal block or copper bar.

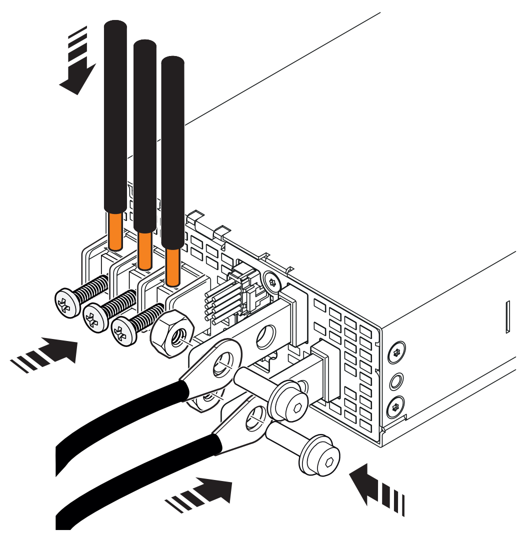
It is recommended that the output cables should be larger than 13.3 mm² and should be secured with the screws and sealing caps provided with the product.

Pay attention to where the cables are secured and ensure that the output V+/V- cannot be short-circuited to prevent power failure or protect the power supply.

NOTE: Observe mechanical loads

Avoid any mechanical loads on the connecting cables, otherwise the electrical contact is at risk. (See section: Securing the connecting cables)

Figure 15 Schematic diagram of connecting cable connection

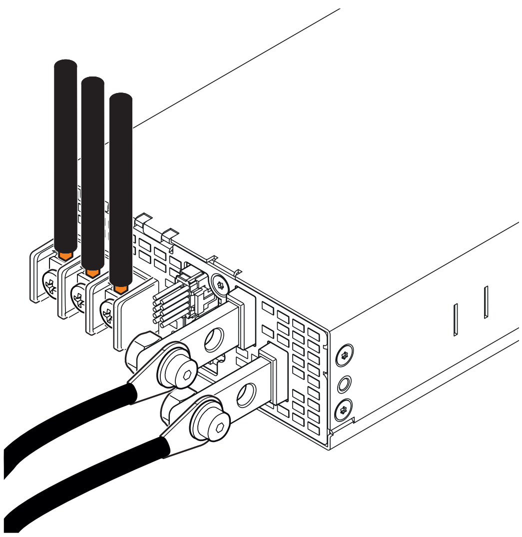


9.1.2 Open screw terminal block

Remove the connecting cable from the screw terminal block by following the steps below:

1. Ensure that the power supply is disconnected from all power sources.
2. To disconnect the terminal block, insert an appropriate screwdriver into the screw to loosen the screw. Then loosen the screw with the appropriate torque, and the connecting cable will be released.
3. Pull the connecting cable out of the connection terminal block. Secure the uninsulated end of the connecting cable using a suitable insulating clamp.
4. Then tighten the attached screws and sealing caps to prevent them from being lost or dropping.

Figure 16 Schematic diagram of connecting cable removal



9.2 Connect and disconnect the signal terminal block (3.x, 4.x)

Follow the steps below to connect and disconnect the signal wire from the signal terminal block:

1. Ensure that the power supply is disconnected from all power sources.
2. Using the terminal block accessories supplied by Phoenix Contact: TRIO PM CJT-A2008H-2x5P-OE, order number: 1697887.
   The terminal has a foolproof bayonet, align it with the signal port on the power supply, and connect it directly.
3. To remove, just press the latch on the signal terminal block and pull it out.

Make sure that you plug the signal cable into the desired connector so that you can use the desired function.

Signal wires can be connected to interface 3.x and 4.x, thus enabling the execution of different functions required at the open wire ends.

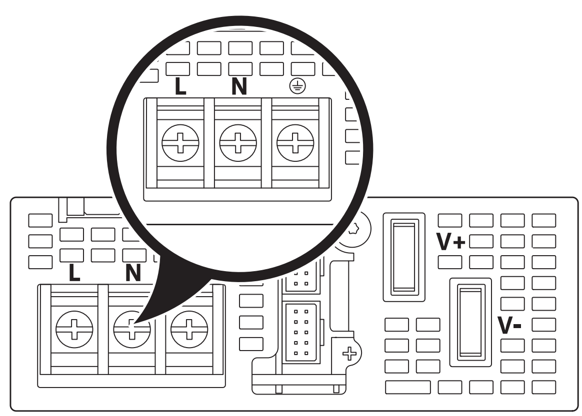
For the definition and allocation of interfaces at both ends of the wires, please refer to the packing slip of the accessory wires.

9.3 AC input terminal blocks

The power supply is designed to be operated on single-phase AC power grids or on two line conductors of three-phase systems. Here, the star network supports various supply system configurations, for example TT, TN, and IT systems. Supply by a DC power grid is also possible.

The power supply is connected on the primary side via the Input AC connection terminal blocks (position 1.x, input).

Figure 17 Position of the AC input terminal blocks

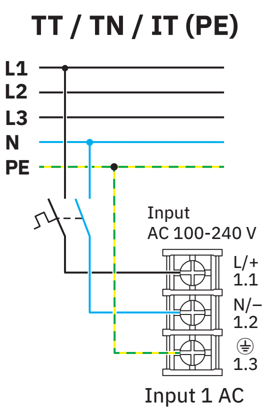


9.4 Primary-side fuse protection and connection

The installation of the power supply must conform to the regulations of EN 61010. It must be possible to switch the power supply off using a suitable disconnection device outside of the power supply. For example, the primary-side line protection is suitable for this (see section: Technical data, input protection).

9.4.1 1AC supply network

Figure 18 Schematic diagram, single-phase fuse protection

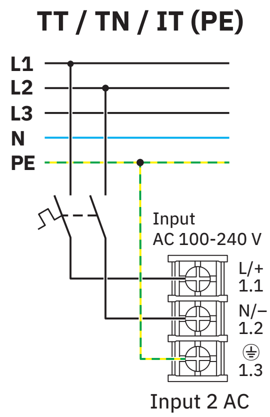


NOTE: Observe the maximum permissible input voltage

The power supply is approved for connection to TN, TT, and IT power grids (PE) with a maximum phase-to-phase voltage of 240 V AC.

9.4.2 3AC supply network (2-phase mode)

Figure 19 Schematic diagram, two-phase fuse protection



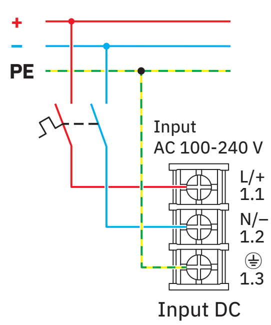
DANGER: Hazardous voltage

When operating the power supply on a three-phase system, observe the maximum permissible phase-to-phase voltage (see section: Technical data, input data).

The primary-side fuse protection in two-phase operation must be cover all poles.

9.4.3 DC supply network

Figure 20 Schematic diagram, two-phase fuse protection



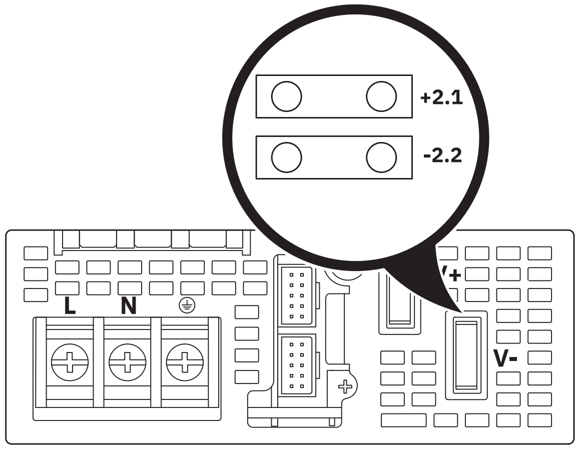
NOTE: Damage possible if an incorrect fuse is used

In DC operation, only use fuses that are approved for DC voltages.

9.5 DC output terminal blocks

Connect the DC load to be supplied to the Output DC connection terminal blocks with two M5 screws (position 2.x, output). By default, the power supply is preset to a nominal output voltage of 24 V DC.

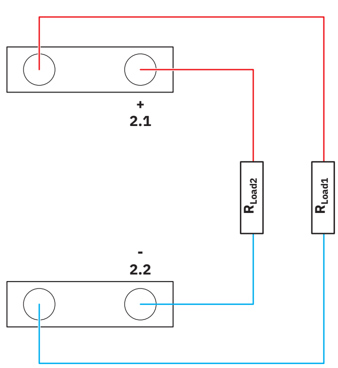
Figure 21 Position of DC output terminals



9.5.1 Wiring principle for DC output terminals

The power supply has connection terminal blocks with positive potential and negative potential for supplying DC loads. Connect the DC loads to be supplied to these connection terminal blocks.

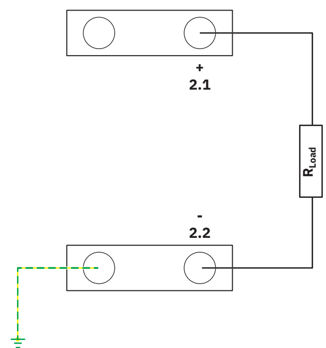
Figure 22 Wiring principle for DC output terminal blocks



9.5.2 Additional negative terminal

As per the Machinery Directive DIN EN 60204-1 (VDE 0113-1), the protection of people against electric shock must always be ensured. For operational reasons, the negative potential of the protective extra-low voltage (PELV) is grounded on the secondary side.

Figure 23 Wiring principle for the additional negative terminal



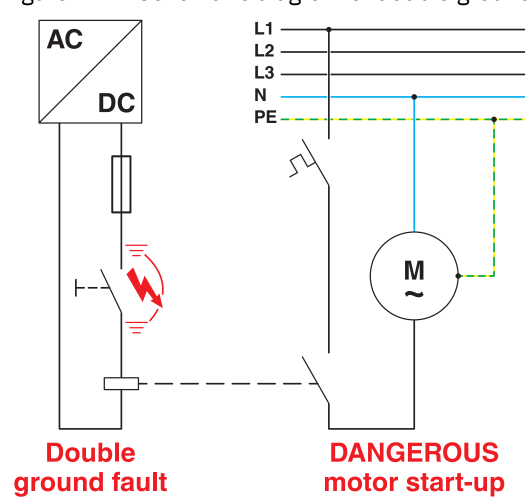
Example: No grounding on the secondary side

WARNING: Machine startup due to ground fault

A ground fault is an impermissible connection to PE. A ground fault occurs when a conductor with damaged insulation touches the grounded housing.

A double ground fault can mean that the short circuit via a button in the control circuit causes an unintentional machine start.

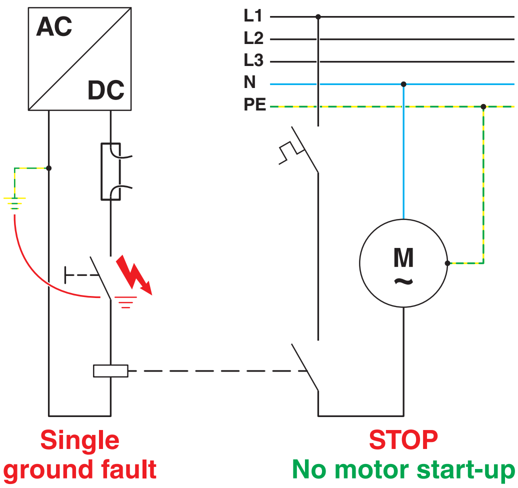
Figure 24 Schematic diagram of double ground fault



Example: Grounding on the secondary side

The secondary-side grounding of the negative potential (additional negative terminal) defines an intentional ground fault. Each additional and unintentional ground fault on the secondary side results in a short circuit of the DC output voltage. The upstream fuse trips. The faulty control circuit is switched off. An impermissible machine start, e.g., due to motor startup, is not possible.

Figure 25 Schematic diagram with secondary-side grounding



9.5.3 Protection of the secondary side

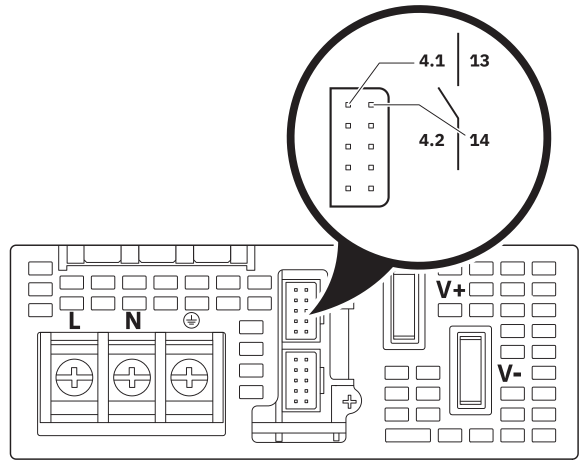
The power supply is electronically short-circuit-proof and no-load-proof. In the event of a fault, the output voltage and the output current are limited.

If sufficiently long connecting cables are used, fuse protection does not have to be provided for each individual load.

9.6 Floating switch contact (DC OK)

Signal terminal block has a floating ground switch contact (position 4.x, signal), used to forward data to the upper-level control system.

Figure 26 Position of floating switch contact (DC OK)



In normal operation of the power supply, the floating switch contact (13/14) acts as a N/O contact (open circuit principle). To report operational readiness to a higher-level controller, the floating switch contact is connected to a 24 V DC voltage, for example.

The following operating states of the power supply open the floating switch contact:

– When the AC input voltage that is being supplied is below the minimum required AC voltage range.
– DC output voltage drop, U_{Out} < 18 V DC

9.6.1 Wiring principle for the floating switch contact (DC OK)

NOTE: Observe maximum contact load

When wiring the floating switch contact, observe the maximum permissible contact load (30 V DC, 100 mA).

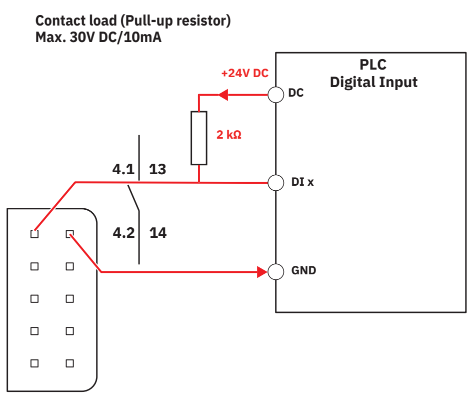
An impermissibly high load on the switch contact can result in malfunctions or irreversible damage. Correct signaling to the higher-level controller is then no longer ensured.

When connecting DC OK+ to the DI interface of the PLC, a 2 kΩ pull-up resistor needs to be bridged between the 24 V DC power supply and the DC OK+ interface.

DC OK- is directly connected to the GND of the PLC.

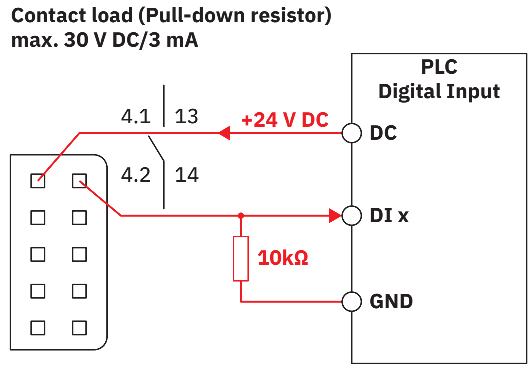
Using this connection method, the maximum contact load is 30 V DC / 10 mA.

Figure 27 Wiring principle for the floating switch contact (DC_OK)



When connecting the DC OK+ signal to the 24 V power supply, a 10 kΩ pull-down resistor needs to be bridged between GND and DC OK-.

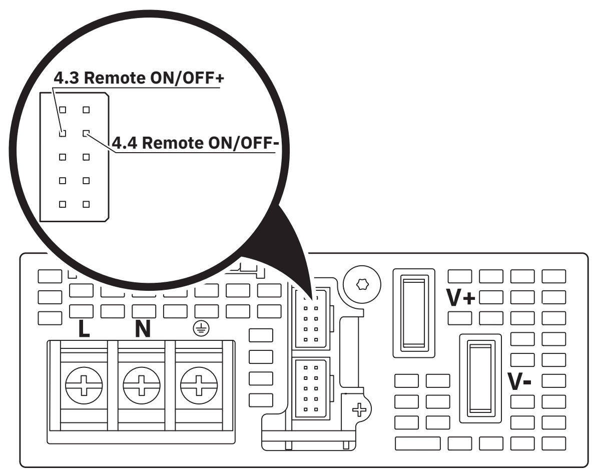
Using this connection method, the maximum contact load is 30 V DC / 3 mA.



9.7 Remote switch contact

The signal terminal block includes remote switch control contacts (pos. 4.3, 4.4) for switching power on/off via an external switch.

Figure 28 Position of the remote switch contact



9.7.1 Remote switch wiring principle

The set of contacts Remote ON/OFF+ and Remote ON/OFF- can control the power supply for isolated on and off operation at the remote end, so that customers can control the power supply on and off under isolated conditions.

Power supply operation and shutdown can be controlled by external level:

– The power supply has an internal pull-up resistor; therefore, it is recommended to use external voltage less than 12 V and to use the isolated 5 V level provided by the power supply.
– If the external voltage is > 12 V, an external resistor needs to be added to ensure the circuit current does not exceed the limit of 15 mA.

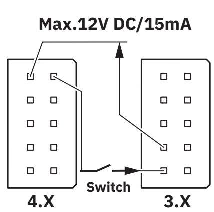
NOTE: Observe maximum contact load

When connecting remote switch contacts, observe the requirements for the maximum allowable contact load (30 V DC, 15 mA).

An impermissibly high load on the contact can result in malfunctions or irreversible damage.

This does not ensure that the upper-level controller can control the power on and off normally.

Figure 29 Remote switch wiring principle



9.8 Communication bus interface

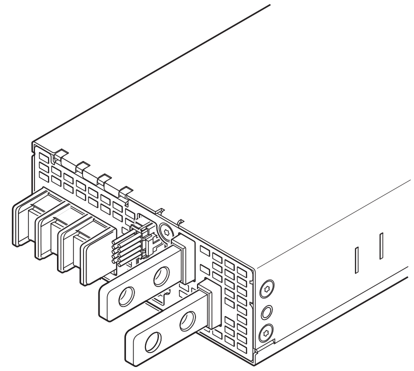
The power supply has a CAN bus interface for communication with the upper-level controller.
(CAN bus master)

A 120 Ω resistor needs to be bridged across CAN_H and CAN_L at both the power supply end and the PLC end.

A maximum of 16 power supply devices can be connected to a CAN bus using a daisy-chain connection.

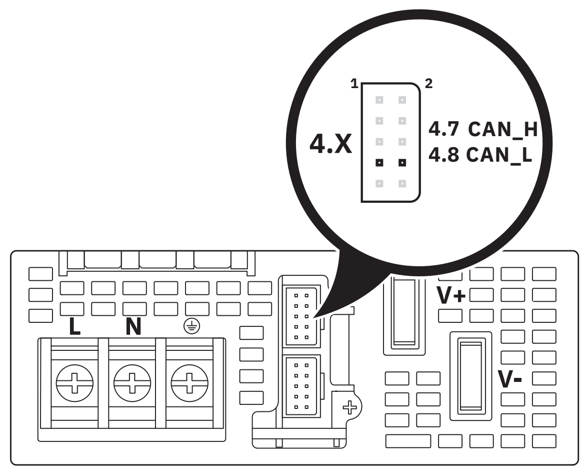
In this case, termination resistors only need to be placed at the last power supply and the PLC, as described above.

Figure 30 CAN communication signal interface and point position



PIN	Signal	Description
4.7	CAN_H	CAN_H signal (active high)
4.8	CAN_L	CAN_L signal (active low)
4.9	CAN_GND	Isolated CAN power ground point
4.10	CAN_+5V	Isolated CAN power supply +5 V

Figure 31 CAN bus interface PIN position layout



The CAN_GND of the controller must be connected to the functional ground to ensure interference-free data transmission between the power module and the upper-level controller.

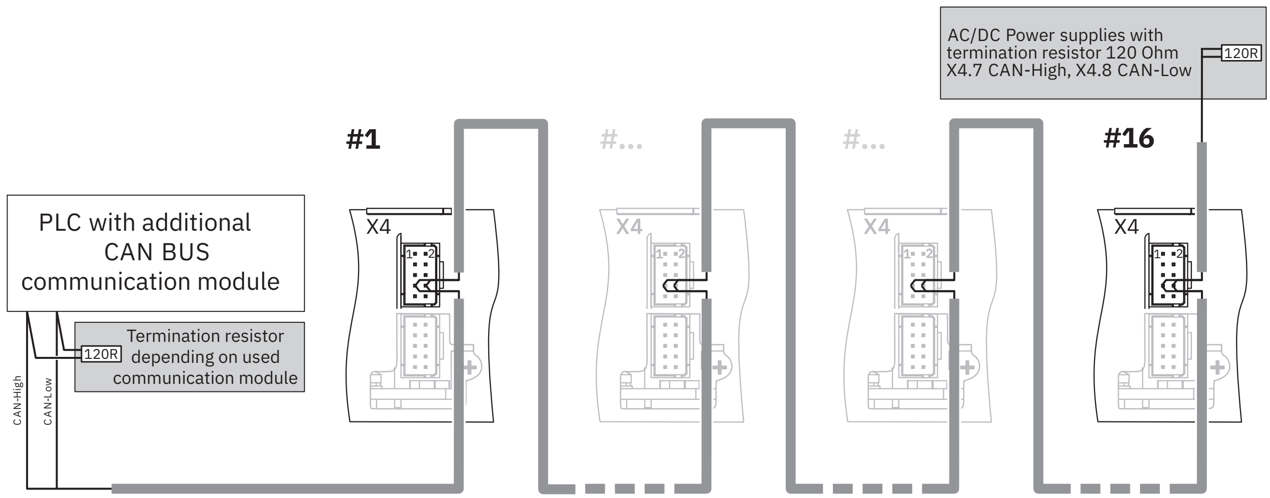
9.8.1 CAN bus protocol

The power supply supports the CAN 2.0A and CAN 2.0B protocols. The linear CAN bus supports a maximum of 16 power supplies. Please refer to the CAN BUS protocol on the Phoenix Contact official website.

The CAN bus communication between the controller and the power supply is realized by connecting the terminal in parallel.

The connection is made using a common connector with a CJT plug as the connection wire for the CAN bus.

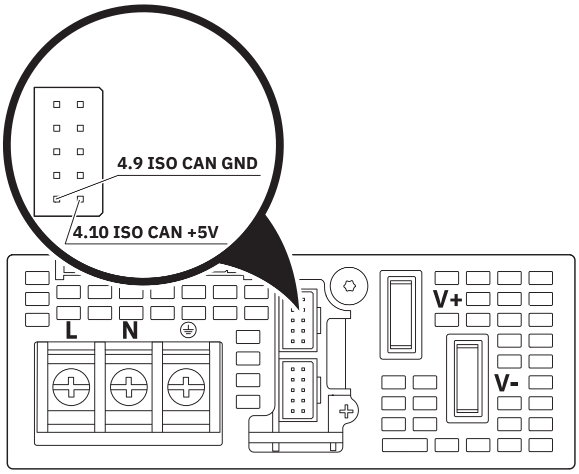
Figure 32 CAN bus communication as a daisy-chain connection (principle diagram)



9.9 Bus power supply interface

The signal terminal block 4.x consists of an isolated 5 V power supply (positions 4.9, 4.10, signal) for powering the CAN bus interface or additional loads.

Figure 33 Bus power supply interface position



During normal power operation, the bus-powered interface (4.9/4.10) can serve as an isolated power source to supply the CAN bus interface or other signal loads.

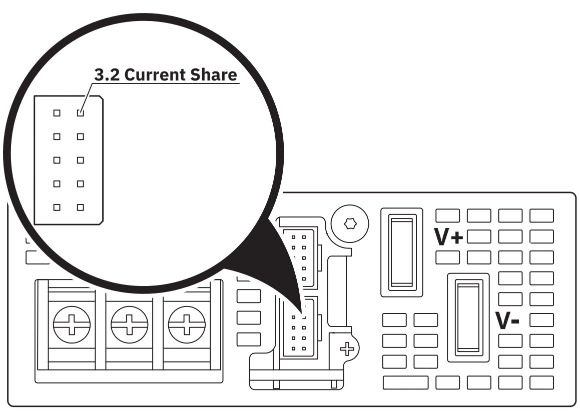
This power supply interface can provide a 5 V voltage for the signal load:

– The supply voltage is an electrically isolated level.
– The maximum load current provided by the power supply circuit must be ≤100 mA.

9.10 Current sharing bus interface

Signal terminal block 3.x includes a current-sharing contact (pos. 3.2) for evenly distributing current among parallel power devices.

Figure 34 Current-sharing busbar interface position



When multiple power supplies operate in parallel connection, the current-sharing bus power supply interface (3.2) of each power supply needs to be connected at a single point. This ensures the regular operation of the current-sharing loop and the current is distributed evenly between the power supplies.

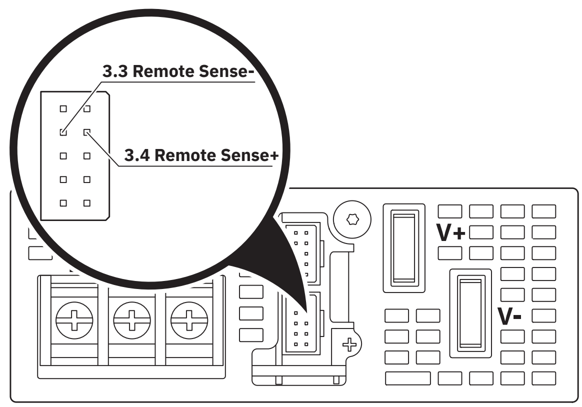
Please note when using the current sharing bus interface:

– For every power source used in parallel, this signal must be connected to the same point.
– For the specific wiring method of this signal interface, please refer to section 12.3 "Parallel Operation".

9.11 Remote compensation interface

Signal terminal block 3.x has a set of signal interfaces for the remote compensation function (positions 3.3, 3.4, signal), which are used to automatically adjust the remote output voltage to the set value when supplying power to the remote side of the power load.

Figure 35 Remote compensation interface position



If the power supply is connected to the load remotely, the remote compensation interface (3.3/3.4) can adjust the voltage on the power supply output port to compensate for the voltage drop on the line, in order to meet the requirement that the remote on-load voltage must reach the set voltage value.

Use of the remote compensation interface must meet the following requirements:

– When a single power load is connected remotely, the maximum voltage drop that can be compensated is 0.5 V.
– When multiple power supplies use the remote compensation function to power the same load at the same time, the current sharing bus signals between the multiple power supplies also need to be connected. For details, see section 12.3 "Parallel connection operation".
– If a remote compensation signal is used separately, twist pair the signal wires.

NOTE: Observe maximum contact load

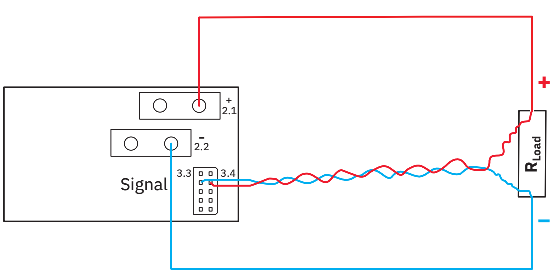
When connecting remote compensation contacts, observe the requirements for the maximum allowable contact load (0.5 V DC, 1000 mA).

An impermissibly high load on the contact can result in malfunctions or irreversible damage.

This does not ensure that the remote compensation function will work properly.

The remote compensation contacts have a protection circuit inside to prevent short circuits and reverse connections, which can cause a voltage drop of 200 mV.

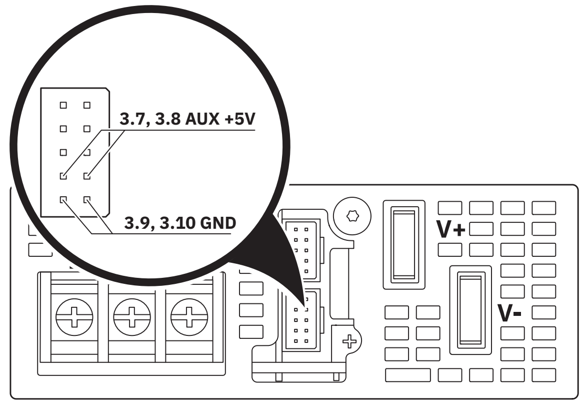
Figure 36 Remote compensation wiring principle



9.12 Auxiliary power supply interface

Signal terminal block 3.x includes an additional isolated 5 V power supply (pos. 3.7, 3.8, 3.9, 3.10) to power any additional load required by the client.

Figure 37 Auxiliary power supply interface position



When the power supply is supplied with AC power, the auxiliary power supply can be used as an additional isolated power supply. When the main circuit output (2.1, 2.2) fails, the auxiliary power supply can continue to operate.

This power supply interface can provide a 5 V voltage for the signal load:

– The supply voltage is an electrically isolated level.
– The maximum load current provided by the power supply circuit must be ≤2 A.

NOTE: Observe maximum contact load

When connecting auxiliary power supply contacts, observe the requirement for the maximum allowable contact load (5 V DC, 2 A).

An impermissibly high load on the contact can result in malfunctions or irreversible damage.

This does not ensure the normal use of the isolated power supply.

10 Function elements

The functional elements of the power supply are located on the front of the housing of the power supply and are categorized as follows:

– Operating element
– Indication element

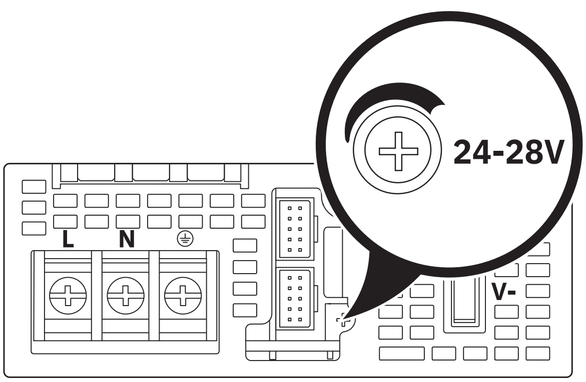
10.1 Operating element – potentiometer U_{Out}

The power supply is operated via a stepless potentiometer on the device front. You can use the potentiometer to set the necessary output voltage for supplying the DC load. The axis of the potentiometer has a groove that is marked with an arrow. Turning the potentiometer clockwise increases the output voltage. Turning the potentiometer counter-clockwise decreases the output voltage. The angle of rotation of the potentiometer setting range ($U_{Out\ min}$ to $U_{Out\ max}$) is approx. 270°.

NOTE: Damage possible, beware of the potentiometer setting range end stops

The potentiometer setting range is limited by end stops. Accidentally over-torquing the end stops can damage the potentiometer. Correct function is then no longer ensured.

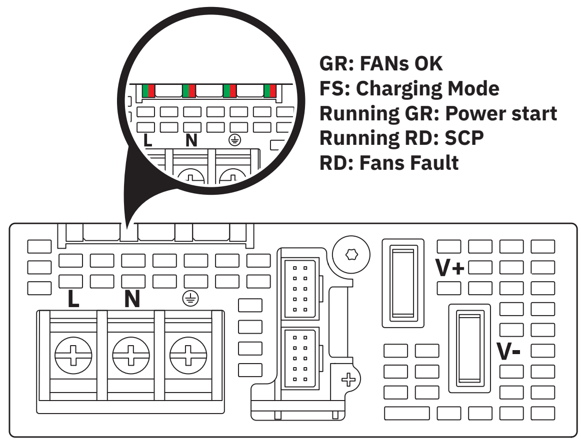
Figure 38 Position of the potentiometer



10.2 Position of four LEDs (multicolor LED)

4 LEDs are available for visual and preventive function monitoring of the power supply. These LEDs are multicolor LED that indicate the six basic operating states of the power supply when displayed simultaneously.

Figure 39 Position of four LEDs (multicolor LED)



Please refer to the following table for the color coding assignment of multicolor LED to the relevant operating states for power fan, short circuit, and charging:

Multicolor LED	Color	Description
○	Off	AC input supply voltage not present
●	Green on (simultaneously)	Fan normal operation
●	Red on (simultaneously)	Fan failure
✹	Green on (simultaneously)	Charging status
▭	Green flow	Power on
▭	Red flow	Short-circuit protection

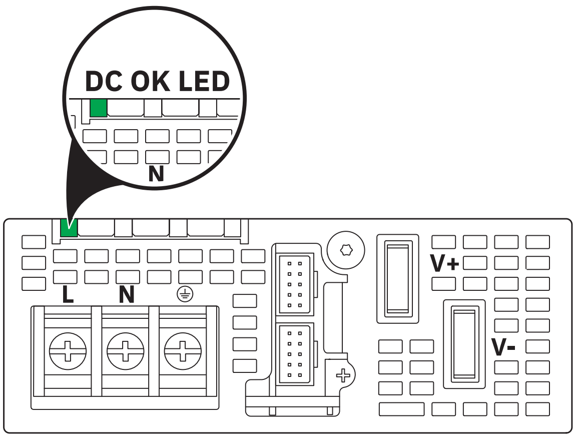
Key:

○ = off, ● = on, ✹ = flashing, ▭ = flowing

10.3 Indication element – DC OK LED (multicolor LED)

A DC OK LED is available for monitoring and display of the regular operation of the power supply. If the input and output voltage and current of the power supply are operating within or beyond the rated range, the LED will have a different color to indicate the regular or irregular operation state of the power supply.

Figure 40 Position of the DC OK LED (multicolor LED)



For the color coding assignment of the multicolor LED to the relevant operating states of the power supply, please refer to the following table:

Multi-color LED	Color	Description
○	Off	AC input supply voltage not present
●	On (green)	$0.95 * U_{OutSet} < U_{Out} < 1.05 * U_{OutSet}$ and $I_{Out} < I_N$
✷	On (green)	$1.05 * U_{OutSet} < U_{Out} < 1.1 * U_{OutSet}$ Or $0.9 * U_{OutSet} < U_{Out} < 0.95 * U_{OutSet}$ or $I_N < I_{Out} < 1.2 * I_N$
●	On (red)	$1.1 * U_{OutSet} < U_{Out}$ or $U_{Out} < 0.9 * U_{OutSet}$ or $I_{Out} > 1.2 * I_N$, continuously for 6s

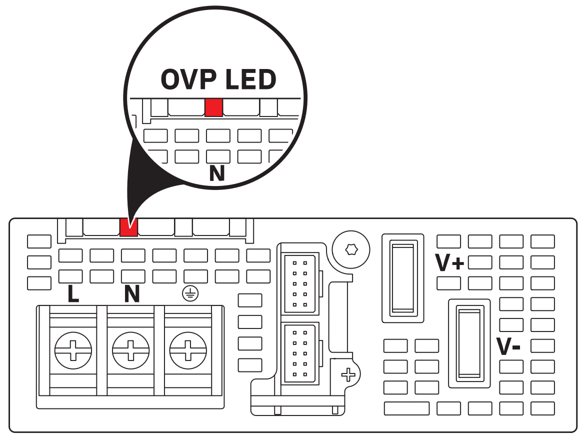
Key:

○ = off, ● = on, ✷ = flashing

10.4 Indication element - OVP LED (multicolor LED)

An OVP LED is available for monitoring and display of the overvoltage and protection of the power supply. If the output voltage of the power supply is normal or exceeds the OVP range, the LED will indicate the regular or irregular protection state of the power supply with different colors.

Figure 41 Position of OVP LED (multicolor LED)



For the color coding assignment of the multicolor LED for OVP status, please refer to the following table:

Multi-color LED	Color	Description
○	Off	AC input supply voltage not present
●	On (green)	$U_{OutSet} < 1.1 * U_{OutSet}$
✷	On (green)	$1.1 * U_{OutSet} < U_{Out} <$ OVP
●	On (red)	OVP $< U_{Out}$

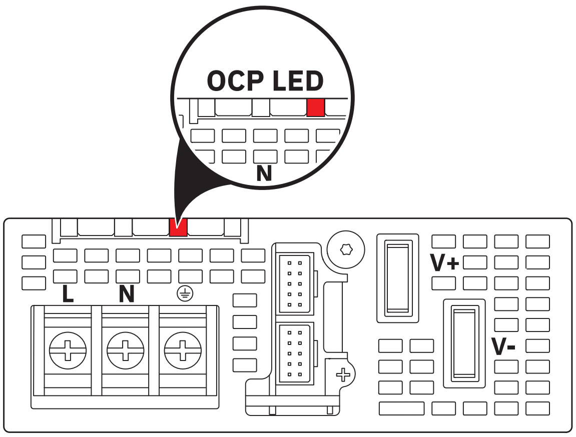
Key:

○ = off, ● = on, ✷ = flashing

10.5 Indication element - OCP LED (multicolor LED)

An OCP LED is available for monitoring and display of the overcurrent and protection of the power supply. If the output current of the power supply is normal or exceeds the OCP range, the LED will indicate the regular or irregular protection state of the power supply with different colors.

Figure 42 Position of OCP LED (multicolor LED)



For the color coding assignment of the multicolor LED for OCP status, please refer to the following table:

Multi-color LED	Color	Description
○	Off	AC input supply voltage not present
●	On (green)	$I_{Out} < 1.2 * I_N$
☀	On (green)	$I_N < I_{Out} < 1.2 * I_N$
●	On (red)	$1.2 * I_N < I_{Out}$, continuously for 6s @ 180 V AC < V_{IN} < 264 V AC or 64 A < I_{Out}, continuously for 6s @ 85 V AC < V_{IN} < 180 V AC

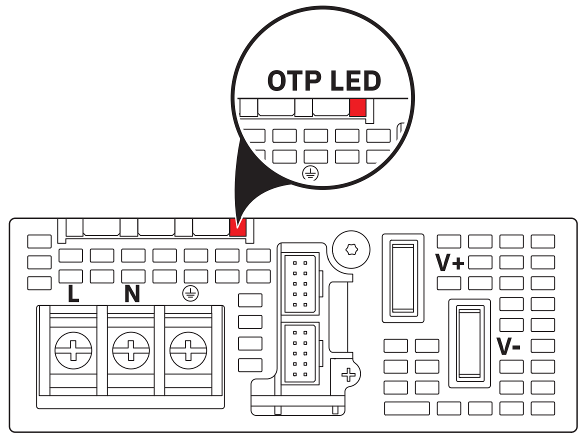
Key:

○ = off, ● = on, ☀ = flashing

10.6 Indication element - OTP LED (multicolor LED)

An OTP LED is available for monitoring and display of the overtemperature and protection of the power supply. If the operating temperature of the power supply is normal or exceeds the OTP range, the LED will indicate the regular or irregular protection state of the power supply with different colors.

Figure 43 Position of OTP LED (multicolor LED)



For the color coding assignment of the multicolor LED for OTP status, please refer to the following table:

Multi-color LED	Color	Description
○	Off	AC input supply voltage not present
●	On (green)	T_{Amb} < OTP - 10°C
☀	On (green)	OTP - 10°C < T_{Amb} < OTP
●	On (red)	OTP < T_{Amb}

Key:

○ = off, ● = on, ☀ = flashing

11 Output characteristic curves

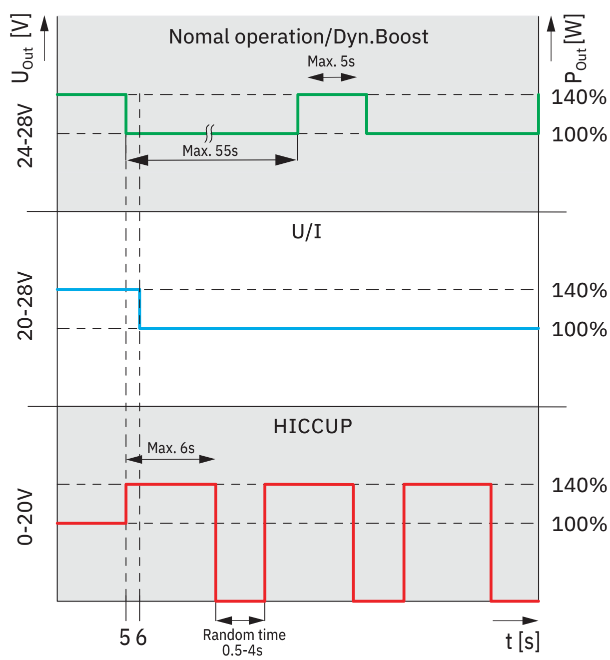
CAUTION: Hot surface
Depending on the ambient temperature and load on the power supply, the housing can become hot.

In normal operation, the power supply constantly supplies the output power in accordance with the device nominal data. On the device side, the dynamic boost is regarded as an extended operating characteristic of normal operation.

The power supply provides the following operating characteristics depending on the load:

– Normal operation/dynamic boost
– Battery charging mode
– HICCUP mode

Figure 44 Output characteristic curves depending on the DC load behavior



11.1 Normal operation/dynamic boost

During normal operation, the DC output voltage supplied by the power supply to the load side ranges from 24 V DC to 28 V DC.

If the DC output current supplying the loads increases due to increased current consumption ($I_{Out} > I_N$), the power supply switches to the dynamic boost.

This operating behavior can occur, for example, when starting up a DC drive or when DC loads are connected in parallel. The power supply can then provide up to 1.4 times the rated power as additional output, for a duration of up to 5 seconds.

Multicolor LED will indicate the current consumption status (I_{Out} >120%) and flashes green. If the mean value of the output current is greater than 90% for 60 seconds, the floating switch contact (13/14) opens (see section: Function element, indication element - DC OK LED).

The maximum available dynamic boost time is directly dependent on the required additional power and can be calculated for the specific application (see section: Example: Boost capability and recovery time).

If the AC input voltage fed during normal operation is less than 180 V AC, the dynamic boost can no longer be provided.

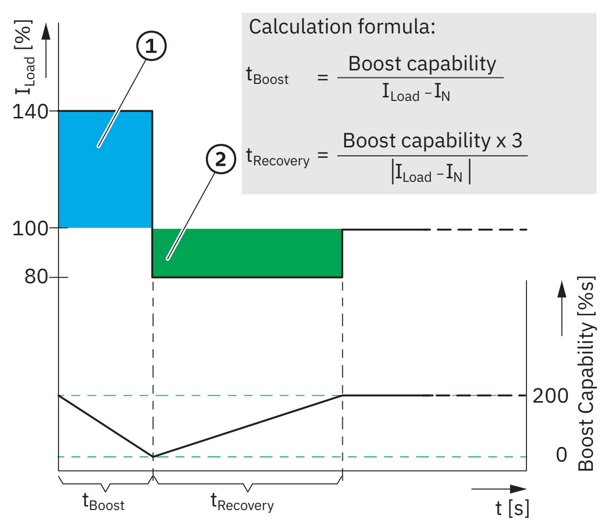
Observe the maximum output ratings of the power supply. The average output power must not exceed nominal power limit (P_N).

11.1.1 Boost capability and recovery time

Depending on the DC load to be supplied, the max. boost time (t_{Boost}) and the corresponding required recovery time ($t_{Recovery}$) need to be calculated for the power supply.

The following data is used as the calculation basis for determining the boost time (t_{Boost}) and the recovery time ($t_{Recovery}$):

Figure 45 General representation and calculation basis, dynamic boost



(1) = Boost capability: 40% x 5s = 200%s
For $I_{OUT} > I_N$: Boost capability is reduced

(2) = For $I_{OUT} < I_N$: Boost capability is gaind by Factor 3

Key:

Designation	Description
t_{Boost}	Min. time [s] within which the boost current is supplied
I_{Boost}	Max. expected boost current (100% ... 140%)
I_N	Nominal current of the power supply (100%)
Boost Capability	Max. boost capability [%s]
$t_{Recovery}$	Recovery time [s]

11.1.2 Example: Calculation of t_{Boost}, $t_{Recovery}$

The following example illustrates the formulas that can be used in principle to calculate t_{Boost} and $t_{Recovery}$.

In this example, it is assumed that your application uses the maximum additional power (40%) for the minimum dynamic boost time (5 s).

Assumptions for the calculation	
Max. boost capability:	200%s
ΔI_{Boost} (max) for $I_{N\,(100\%)}$ = 40%:	I_N x 1.4
I_{Out} in normal operation, 80%:	I_N x 0.8

Calculated values	
t_{Boost}:	5 s
$t_{Recovery}$:	30 s

11.2 Battery charging mode

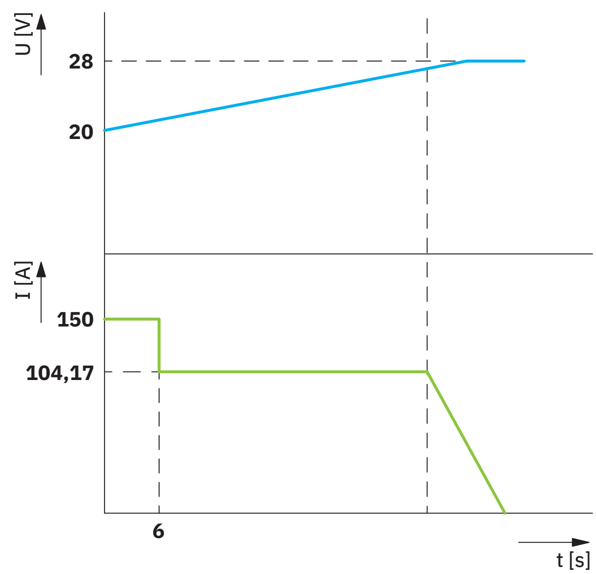
If the DC output current of the power supply on the load side reaches 150 A and lasts for more than 6 seconds, and the output voltage is within the range of ≥19.2 V DC ... <28.8 V DC, the power supply will be forcibly switched to battery charging mode.

The DC load power supply then presents U/I output characteristics.

In battery charging mode, the continuous power consumption is limited to 100%.

At the same time, multicolor LED visualize the detected DC load power supply operating states.

Four LEDs (green) flash simultaneously. The floating switch contact (13/14) is disconnected (see section: Functional element, indication element - four LEDs flashing simultaneously).



NOTES:
In battery charging mode, series or parallel connection of more than one power supply is not possible.

11.3 HICCUP mode

If, for example, a malfunction on the load side causes the DC voltage on the output side to fall below the threshold value $U_N/2$ (U_N = 24 V DC), HICCUP mode starts.

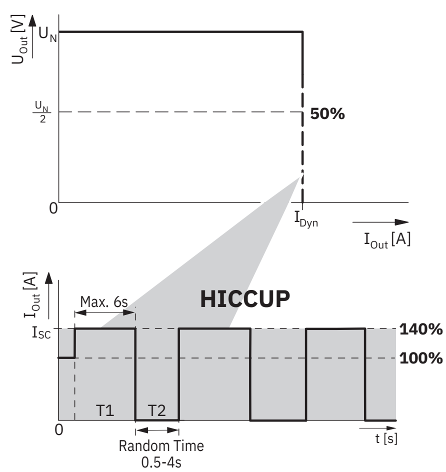
In HICCUP mode, the power supply tries to restore the DC load supply on the output side. The characteristic of the HICCUP output characteristic curve reduces the thermal load of the connecting cables on the output side due to sustained overload.

This procedure is repeated until the cause of the current increase, e.g., overload or short circuit, has been remedied.

The power supply then switches the DC output on again and the DC load is supplied.

At the same time, the multicolor LED indicates the detected operating state for the DC load power supply, SHORT (red) or I_{Out} < 120% * I_N (flashing green) (see Section: Function elements, indication element - DC OK LED)

Figure 46 Schematic diagram of HICCUP output characteristic curve



Key:

Designation	Value	HICCUP description
I_{SC}	max. 125 A	Maximum output current (short-circuit current)
T1	6 s	Pulse time (ON) at I_{SC} (140%)
T2	0.5 s ... 4 s	Variable recovery time (OFF)

12 Connection versions

Depending on how you intend to use your power supply, there are different ways of connecting the DC output side.

A distinction is made between the following modes of use:

- Power increase
- Redundancy operation

12.1 Increasing power

Depending on the respective mode of use, the power is increased either via the series- or parallel connection of two power supplies.

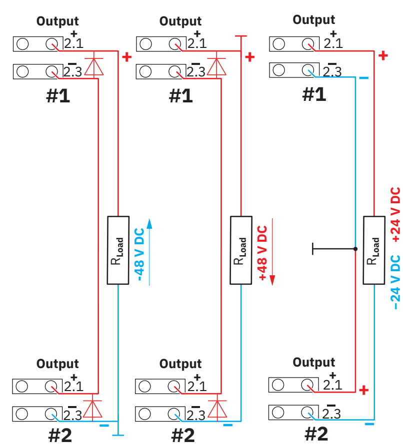
12.1.1 Series operation

To increase the DC output power in dependence of the output voltage, connect two power supplies in series operation. Only use power supplies of the same type and performance class with identical configurations.

Depending on the common output-side ground reference point of the power supplies, the following DC output voltage potentials are possible:

- +48 V DC
- -48 V DC
- ±24 V DC

Figure 47 Schematic diagram, power increase in series operation

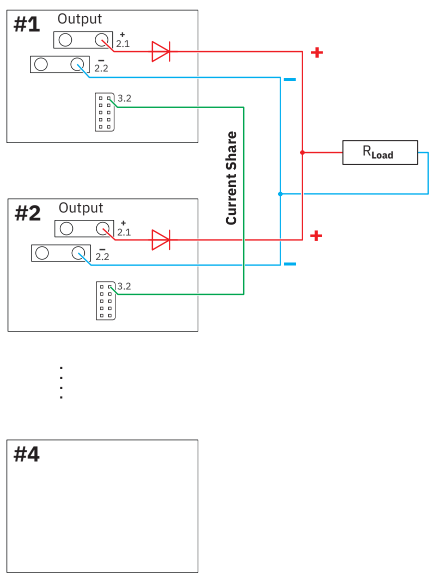


12.1.2 Parallel operation

If n (n≤4) power supply DC outputs are connected in parallel, the output current is increased to n x I_N. Parallel connection can be used for increased power when extending existing systems. If the individual power supply does not cover the current consumption of the most powerful load, parallel connection of power supplies is recommended.

Fundamental prerequisites apply for the parallel operation of power supplies. For further information, please refer to Section 12.3 “Fundamental prerequisites for parallel operation (power increase, redundancy operation)” and Section 9.9 “Current-sharing bus interfaces”.

Figure 48 Schematic diagram, power increase in parallel operation



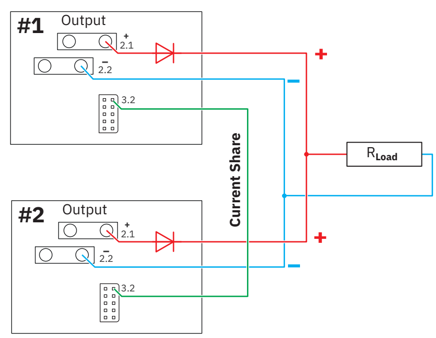
12.2 Redundant operation

Redundant circuits are suitable for the DC supply of systems and system parts which place particularly high demands on operational safety. If the DC load is to be supplied with 1+1 redundancy, two power supplies of the same type and performance class with identical configurations must be used.

In the event of an error, it must be ensured that one of the power supplies is able to provide the total required output power for the DC load to be supplied. The output power required for normal operation is thus provided by two power supplies connected in parallel on the output side. In normal operation, each of the two power supplies will be utilized by up to 50%.

For signal connections of redundant operations, refer to the section "Current sharing bus interfaces".

Figure 49 Schematic diagram of 1+1 redundancy with integrated redundancy



12.3 Fundamental prerequisites for parallel operation (power increase, redundancy operation)

In order to ensure correct parallel operation, observe the following rules:

DC output voltage: On each of the power supplies, set the DC voltage in idle mode such that the voltage values are identical. Take any voltage drops occurring due to long cable lengths into consideration.

Cable lengths: To ensure the symmetrical utilization of he power supplies, the connecting cables for supplying the DC load must be identical in length.

Cable cross sections: The connecting cables for supplying the DC load must be rated for the maximum occurring total current of all power supplies. This also applies for redundancy operation, whereby the individual power supply only supplies 50% of the DC load.

Ambient conditions: Select the installation location of the power supplies such that the prevailing ambient conditions are identical. This is of particular importance if the power supplies are installed in different mounting locations. Large temperature differences between the mounting locations have a negative effect on the operating points of the power supplies. This will result in the operating behavior of the power supplies no longer being identical.

13 Derating

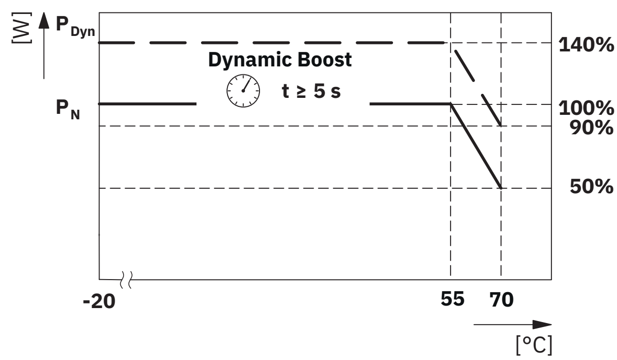
13.1 Ambient temperature

When mounted in the standard mounting position and operated within the permissible temperature range for nominal operation, the power supply provides full output power. If the power supply is operated beyond the temperature range for nominal values, note the reduced output power for the supply of DC loads.

NOTE: Damage due to thermal overload

If the power supply is operated in a different temperature range, only a reduced amount of power can be drawn. Otherwise, the power supply will be thermally loaded disproportionately and the device service life significantly reduced. This thermal load may even damage the power supply such that it is no longer operational.

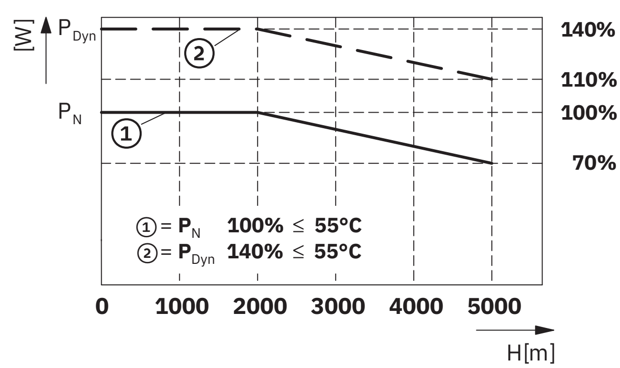
Figure 50 Output power depending on the ambient temperature



13.2 Installation height

The power supply can be operated at an installation height of up to 2000 m without any limitations. Different data applies for installation locations above 2000 m due to the differing air pressure and the reduced convection cooling associated with this.

Figure 51 Output power depending on the installation height



14 Disposal and recycling

Ensure the correct disposal of electronic components

Do not dispose of the power supply as household waste.

Observe the applicable national standards and regulations.

Ensure correct disposal or recycling

Dispose of or recycle packaging material that is no longer needed as household waste.

Observe the applicable national standards and regulations.

15 Help with technical questions

Should you have any technical questions, you can contact our Support team
E-mail: de-ps-support@phoenixcontact.com