TRIO-UPS-2G/1AC/24DC/20

Uninterruptible power supply



Data sheet
108984_en_00

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1 Description

The TRIO-UPS-2G uninterruptible power supply (UPS) with integrated power supply unit is used to ensure that secure DC power for critical electrical loads continues to be supplied in the event of disturbances in the power supply network, e.g. due to mains breakdown or failure. In the event of such a disturbance, the UPS switches to battery operation without interruption so that connected loads continue to be continuously supplied. In this operating mode, the output voltage is directly dependent on the battery voltage. When mains power is restored, the UPS automatically returns to normal operation. The connected loads are again supplied via the power supply network and the battery is charged at the same time. The TRIO-UPS-2G uninterruptible power supply (UPS) is designed specifically for supplying industrial PCs (IPCs).

Features

- Power supply, loading unit and electronic switchover unit in a device
- Wide-range input AC
- Adjustable output voltage in mains operation
- USB interface for configuration and diagnostics
- Adjustable charging parameters for the use of different types of energy storage
- Comprehensive signaling

Technical data (short form)	
Input voltage range	100 V AC ... 240 V AC (-15 % ... +10 %) 110 V DC ... 250 V DC
Derating	< 90 V AC (2.5 %/V)
Frequency range (f_N)	50 Hz ... 60 Hz (±10 %)
Typical current consumption (for nominal values)	6.4 A (100 V AC) / 2.7 A (240 V AC)
	5.8 A (110 V DC) / 2.5 A (250 V DC)
Nominal output voltage (U_N)	24 V DC
Output current I_N / I_{Dyn}	20 A / 30 A
Residual ripple	< 20 mV
Efficiency (for nominal values) (I_{CHARGE} = 0; I_{OUT} = I_N)	typ. 88 % (100 V AC) / typ. 92 % (240 V AC)
MTBF (IEC 61709, SN 29500)	958219 h (25 °C) 576370 h (40 °C) 265724 h (60 °C)
Ambient temperature (operation)	-25 °C ... 70 °C (> 60 °C Derating: 2,5 %/K)
Ambient temperature (start-up type tested)	-40 °C
Dimensions (W/H/D)	88 mm / 130 mm / 160 mm
Weight	1.61 kg
Battery technology	VRLA-AGM
Nominal voltage (energy storage)	24 V DC
Charging current preset max.	 2.1 A (-25°C ... 40°C) 3 A
Nominal capacity range	4 Ah ... 40 Ah
Capacitance preset	7 Ah

All technical specifications are nominal and refer to a room temperature of 25 °C and 70% relative humidity at 2000 m above sea level.

2 Table of contents

1 Description 1
2 Table of contents 2
3 Ordering data 4
4 Technical data 5
5 Safety regulations and installation notes 11
5.1 Symbols used 11
5.2 Safety and warning notes 11
6 Structure 13
6.1 Function elements 13
6.2 Device dimensions and keep-out areas 13
6.3 Block diagram 14
7 Mounting and removing 15
7.1 Convection 15
7.2 Normal mounting position 15
7.3 Mounting the UPS 15
7.4 Removing the UPS 16
7.5 Rotated mounting position (270° Y-axis) 16
7.6 Wall mounting 16
8 Device connection 17
8.1 Push-in connection technology 17
8.2 Connection parameters 17
8.3 AC input 18
8.4 DC output 19
8.5 Battery 24V 19
8.6 Connection terminal block signaling 20
8.7 Installation of individual components 20
9 Device operation 21
9.1 Setting the operating mode 21
9.2 Remote 24
9.3 Battery start (Bat.-Start) 25
9.4 Software configuration 25
10 Method of operation 25
10.1 Output characteristic curve 25
10.2 Dynamic Boost 26
11 Battery management 26
11.1 Battery presence test 26
11.2 Quality check of battery 26
11.3 Battery charging 26
11.4 Temperature compensation 27

12 Signaling 27
12.1 LED indicators and signal outputs 28
12.2 Signal outputs 29
12.3 Signal inputs 29
13 Interface 29
13.1 USB interface MINI type B 29
14 Derating 30
14.1 Ambient temperature 30
14.2 Installation height 30
15 Parallel operation 30
15.1 Redundant operation 30
15.2 Increasing power 31

3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
TRIO UPS - UPS with integrated power supply for lead AGM energy storage 4 Ah - 40 Ah, USB (Modbus/RTU), DIN rail mounting, Push-in connection, input: 1-phase, output: 24 V DC / 20 A	TRIO-UPS-2G/1AC/24DC/20	1105556	1

Accessories	Type	Item no.	Pcs./Pkt.
Energy storage, VRLA-AGM, 24 V DC, 4 Ah, automatic detection and communication with QUINT UPS-IQ	UPS-BAT/PB/24DC/4AH	1274117	1
Energy storage, VRLA-AGM, 24 V DC, 7 Ah, automatic detection and communication with QUINT UPS-IQ	UPS-BAT/PB/24DC/7AH	1274118	1
Energy storage, VRLA-AGM, 24 V DC, 12 Ah, automatic detection and communication with QUINT UPS-IQ	UPS-BAT/PB/24DC/12AH	1274119	1
Energy storage, VRLA-AGM, 24 V DC, 20 Ah, automatic detection and communication with QUINT UPS-IQ	UPS-BAT/PB/24DC/20AH	1348516	1
Energy storage, VRLA-AGM, 24 V DC, 40 Ah, automatic detection and communication with QUINT UPS-IQ	UPS-BAT/PB/24DC/40AH	1354641	1
Energy storage device, lead AGM, VRLA technology, 24 V DC, 13 Ah, tool-free battery replacement, automatic detection, and communication with QUINT UPS-IQ	UPS-BAT/VRLA-WTR/24DC/13AH	2320416	1
Energy storage device, lead AGM, VRLA technology, 24 V DC, 26 Ah, tool-free battery replacement, automatic detection, and communication with QUINT UPS-IQ	UPS-BAT/VRLA-WTR/24DC/26AH	2320429	1
Used for communication between an industrial PC and Phoenix Contact devices with USB-Mini-B connection.	MINI-SCREW-USB-DATACABLE	2908217	1
2-piece universal wall adapter for securely mounting the device in the event of strong vibrations. The profiles that are screwed onto the side of the device are screwed directly onto the mounting surface. The universal wall adapter is attached on the left/right.	UWA 130	2901664	1
Universal wall adapter for securely mounting the device in the event of strong vibrations. The device is screwed directly onto the mounting surface. The universal wall adapter is attached on the top/bottom.	UWA 182/52	2938235	1



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

4 Technical data

Input data	
Input voltage range	100 V AC ... 240 V AC (-15 % ... +10 %) 110 V DC ... 250 V DC
Derating	< 90 V AC (2.5 %/V)
Frequency range (f_N)	50 Hz ... 60 Hz (±10 %)
Typical current consumption (for nominal values)	6.4 A (100 V AC) / 2.7 A (240 V AC)
	5.8 A (110 V DC) / 2.5 A (250 V DC)
Inrush current limitation (at 25°C)/I^2t , typical	< 10 A / < 0.4 A^2s
Mains buffering (battery mode deactivated) , typ.	≥ 20 ms (120 V AC) / ≥ 20 ms (230 V AC)
Input fuse slow-blow, internal	10 A
Permissible backup fuse	B16
Connection data: Input	
Connection method	Push-in connection
Stripping length	10 mm
1-conductor rigid	1 mm^2 ... 4 mm^2
1-conductor flexible	1 mm^2 ... 2.5 mm^2
1-conductor flexible with ferrule without plastic sleeve	1 mm^2 ... 2.5 mm^2
1-conductor flexible with ferrule with plastic sleeve	1 mm^2 ... 1.5 mm^2
1-conductor rigid (AWG)	16 ... 12
Output data	
Derating	> 60 °C (2.5%/K of P_{Out} nom.)
Crest factor	1.57 (120 V AC) / 1,58 (230 V AC)
Switch-over time	< 3 ms
Residual ripple	< 20 mV
Output data (mains operation)	
Nominal output voltage (U_N)	24 V DC
Setting range (> 24 V constant capacity)	24 V DC ... 28 V DC
Output current I_N / I_{Dyn}	20 A / 30 A
Power dissipation No load Nominal load	 4 W 50 W
Output data (battery operation)	
Nominal output voltage (U_N)	U_{BAT} -0.1 V DC
Output voltage range	18 V DC ... 30 V DC
Output current I_N / I_{Dyn}	20 A / 30 A

Connection data: Output	
Connection method	Push-in connection
Stripping length	15 mm
1-conductor rigid	2.5 mm² ... 10 mm²
1-conductor flexible	2.5 mm² ... 6 mm²
1-conductor flexible with ferrule without plastic sleeve	2.5 mm² ... 6 mm²
1-conductor flexible with ferrule with plastic sleeve	2.5 mm² ... 4 mm²
1-conductor rigid (AWG)	12 ... 8

Charging process	
Battery technology	VRLA-AGM
Charge characteristic curve	IU_0U
Nominal voltage	24 V DC
Nominal capacity range	4 Ah ... 40 Ah
Capacitance	
preset	7 Ah
max. (recommended)	140 Ah
Charging voltage	max. 30 V DC
Charging current	
configurable	0.2 A ... 3 A (-25°C ... 40°C)
reduced	3 A ... 0 A (40 °C ... 65 °C)
preset	2.1 A (-25°C ... 40°C)
max.	3 A

Connection data: Battery	
Connection method	Push-in connection
Stripping length	15 mm
1-conductor rigid	2.5 mm² ... 10 mm²
1-conductor flexible	2.5 mm² ... 6 mm²
1-conductor flexible with ferrule without plastic sleeve	2.5 mm² ... 6 mm²
1-conductor flexible with ferrule with plastic sleeve	2.5 mm² ... 4 mm²
1-conductor rigid (AWG)	12 ... 8

Status and diagnostic indicator / signal output DC OK	
Connection labeling	3.1
Switching output	Transistor output, active
Output voltage	24 V DC
Continuous load current	20 mA
LED status indicator	green

Status and diagnostic indicator / signal output Alarm	
Connection labeling	3.2
Switching output	Transistor output, active
Output voltage	24 V DC
Continuous load current	20 mA
LED status indicator	red

Status and diagnostic indicator / signal output Battery mode	
Connection labeling	3.3
Switching output	Transistor output, active
Output voltage	24 V DC
Continuous load current	20 mA
LED status indicator	yellow

Status and diagnostic indicator / signal output Ready	
Connection labeling	3.4
Switching output	Transistor output, active
Output voltage	24 V DC
Continuous load current	20 mA

Remote control Remote	Digital control input (configurable)
Connection labeling	3.5
Low signal	Connection to SGnd with < 2.7 kΩ
High signal	Open (> 35 kΩ between Remote and SGnd)

Battery-operated start (Bat.-Start)	Low active digital control inputs
Connection labeling	3.6
Low signal	Connection to SGnd with < 2.7 kΩ
High signal	Open (> 200 kΩ between Bat.-Start and SGnd)

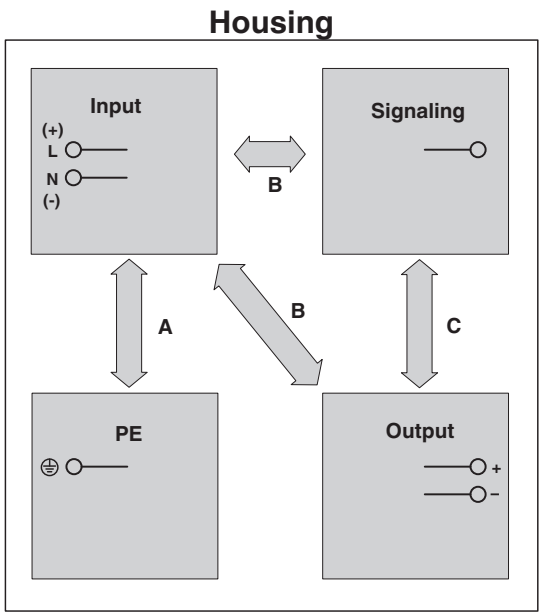
Connection data: Signal	
Connection method	Push-in connection
Stripping length	8 mm
1-conductor rigid	0.2 mm² ... 1.5 mm²
1-conductor flexible	0.2 mm² ... 1.5 mm²
1-conductor flexible with ferrule without plastic sleeve	0.2 mm² ... 1.5 mm²
1-conductor flexible with ferrule with plastic sleeve	0.2 mm² ... 0.75 mm²
1-conductor rigid (AWG)	24 ... 16

Data interface	
Interface designation	USB (Modbus/RTU)
USB classification	MINI-USB Type B
Locking	Screw

Device combinations	
UPS connection in parallel	yes, with diode module uncoupled
UPS connection in series	no
Energy storage device connection in parallel	yes max. 3

General data	
Overvoltage category EN 61010-1	II
Efficiency (for nominal values) (I_{CHARGE} = 0; I_{OUT} = I_N)	typ. 88 % (100 V AC) / typ. 92 % (240 V AC)
MTBF (IEC 61709, SN 29500)	958219 h (25 °C) 576370 h (40 °C) 265724 h (60 °C)
Degree of protection	IP20
Class of protection	I
Side element version	Aluminum
Hood version	PC
Dimensions (W/H/D)	88 mm / 130 mm / 160 mm
Weight	1.61 kg

Electric strength of the insulation



	A	B	C
Type test (IEC/EN 61010-1)	1.5 kV AC	3 kV AC	-
	2.1 kV DC	4.2 kV DC	0.5 kV DC
Production test	2.5 kV DC	2.5 kV DC	-

Ambient conditions	
Ambient temperature (operation)	-25 °C ... 70 °C (> 60 °C Derating: 2,5 %/K)
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	≤ 4000 m
Derating (Output power)	> 2000 m, observe derating
Degree of pollution	2
Vibration (operation)	< 12 ... 13.2 Hz, amplitude ±1 mm, 13.2 ... 100 Hz, 0.7g in accordance with IEC 60068-2-6
Shock	30g, 18 ms according to IEC 60068-2-27
Climatic class	3K3 (in acc. with EN 60721)

Standards/specifications	
Safety for equipment for measurement, control, and laboratory use	IEC 61010-1
Protective extra-low voltage	IEC 61010 (SELV) / (PELV)
Safe isolation	DIN VDE 0100-410
Low-voltage power supplies, DC output	EN 61204-3

Conformance/Approvals	
UL	UL Listed UL 61010 UL/C-UL Listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C



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

Electromagnetic compatibility		
Interference emission in accordance with EN 61000-6-3 (residential areas), EN 61000-6-4 (industrial areas) and EN 61000-6-8 (commercial areas)		
CE basic standard	**Minimum normative requirements**	**Higher requirements in practice (covered)**
Noise emission	EN 61000-6-4	EN 61000-6-3
Conducted noise emission	EN 61000-6-4	EN 61000-6-3
Harmonic currents	not required	EN 61000-3-2
Flicker	not required	EN 61000-3-3

Immunity according to EN 61000-6-2 (industrial)		
CE basic standard	**Minimum normative requirements**	**Higher requirements in practice (covered)**
Electrostatic discharge EN 61000-4-2		
Housing contact discharge	4 kV (Test Level 2)	6 kV (Test Level 3)
Housing air discharge	8 kV (Test Level 3)	8 kV (Test Level 3)
Electromagnetic HF field EN 61000-4-3		
Frequency range	80 MHz ... 1 GHz	80 MHz ... 6 GHz
Test field strength	10 V/m	10 V/m
Frequency range	1.4 GHz ... 6 GHz	1.4 GHz ... 6 GHz
Test field strength	3 V/m	3 V/m
Fast transients (burst) EN 61000-4-4		
Input	2 kV	4 kV
Output	2 kV	2 kV
Signal	1 kV	2 kV
Surge voltage load (surge) EN 61000-4-5		
Input	1 kV (Test Level 3 - symmetrical) 2 kV (Test Level 3 - asymmetrical)	2 kV (Test Level 4 - symmetrical) 4 kV (Test Level 4 - asymmetrical)
Output	0.5 kV (Test Level 2 - symmetrical) 1 kV (Test Level 2 - asymmetrical)	1 kV (Test Level 3 - symmetrical) 2 kV (Test Level 3 - asymmetrical)
Signal	1 kV (Test Level 2 - asymmetrical)	1 kV (Test Level 2 - asymmetrical)
Conducted interference EN 61000-4-6		
Frequency range	0.15 MHz ... 80 MHz	0.15 MHz ... 80 MHz
Voltage	10 V	10 V

5 Safety regulations 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.

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.

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.
- Connect the protective conductor device terminal block ⏚ with ground.
- Cover termination area after installation in order to avoid accidental contact with live parts (e. g., installation in control cabinet).
- This unit receives power from more than one source - Disconnection of AC source and the energy storage is required to de-energize this unit before servicing.
- Keep flames, embers or sparks away from the module.
- When connecting the batteries, observe the polarity and do not short circuit the pole terminals.
- Provide a switch/circuit breaker close to the device at the AC input, DC output and at the battery terminals, which are labeled as the disconnecting device for this device.
- Do not disconnect the fuse and / or battery connection under hazardous location conditions.
- Use copper cables for operating temperatures of >75 °C.



CAUTION: Hot surface

Depending on the ambient temperature and load on the uninterruptible power supply, the housing can become hot.

NOTE

- Observe the national safety and accident prevention regulations.
- Assembly and electrical installation must correspond to the state of the art.
- The uninterruptible power supply is a built-in device. The protection class IP20 of the device is meant to be applied in a clean and dry environment.
- The device must be installed in a control cabinet that can be locked and only opened by specialist staff.
- Horizontal mounting position (normal mounting position)
- Observe mechanical and thermal limits.
- Ensure sufficient convection (minimum gap above/ below: 50 mm). Housing can become hot.
- Ensure that the primary-side wiring and secondary-side wiring are the correct size and have sufficient fuse protection.
- Refer to the corresponding table for the connection parameters, such as the necessary stripping length for wiring with and without ferrule (see section Device connection).
- Protect the device against foreign bodies penetrating it, e.g., paper clips or metal parts.
- To reduce the risk of fire, replace only with same type and rating of fuse.
- To reduce the risk of fire, connect only to a circuit provided with the following maximum branch circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70.
- The uninterruptible power supply is maintenance-free. Repairs may only be carried out by the manufacturer. The warranty no longer applies if the housing is opened.
- The uninterruptible power supply may only be used for its intended use.
- Improper use invalidates the device protection.

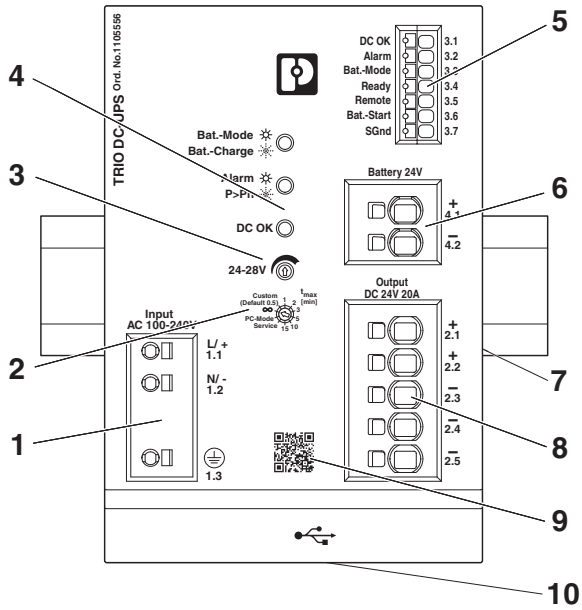
More follows

- Use current-limited source or suitable fuse.
- The switching outputs are active outputs according to SELV. These may only be operated on permitted SELV circuits.
- Keep these instructions in a safe place – this data sheet contains important safety notes which must be observed during installation and maintenance of the UPS devices and batteries.

6 Structure

6.1 Function elements

Figure 1 Position of the function elements



Key

No.	Designation	Connection labeling
1	Connection terminal blocks input voltage: input L/N/⏚	1.1 ... 1.3
2	Rotary selector switch	
3	Potentiometer, output voltage: 24 V DC ... 28 V DC	
4	LED signaling	
5	Connection terminal blocks: Digital input/output (24 V DC / 20 mA)	3.1 ... 3.7
6	Battery terminal blocks	4.1, 4.2
7	Universal DIN rail adapter (rear of housing)	
8	Output voltage of connection terminal blocks: output DC +/+/-/-/-	2.1 ... 2.5
9	QR code web link	
10	USB interface MINI type B (bottom of device)	

6.2 Device dimensions and keep-out areas

Figure 2 Keep-out areas

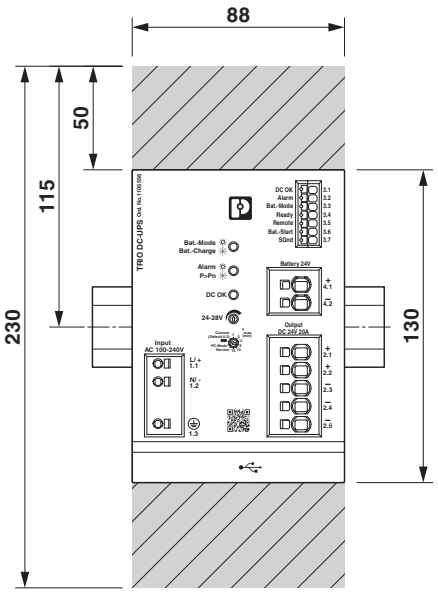
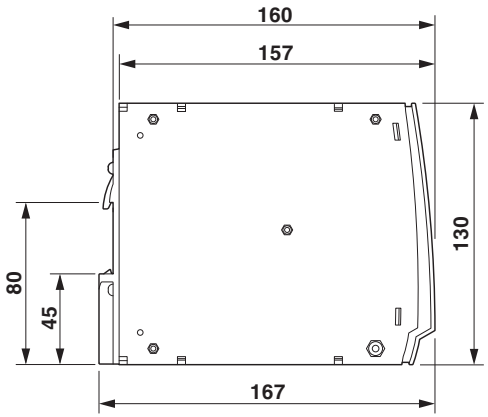
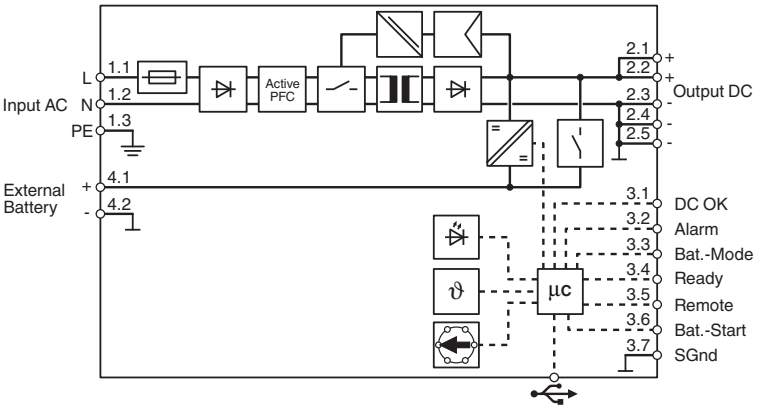


Figure 3 Device dimensions



6.3 Block diagram

Figure 4 Block diagram



Key

Element	Meaning
µC	Microprocessor
	LED
	Temperature sensor
	Selector switch
	Fuse
	Decoupling
aktive PFC	Power factor correction (PFC)
	Switch
	Electrically isolated signal transmission
	Regulation
	Transformer
= =	DC/DC converter with electrical isolation

7 Mounting and removing

NOTE

The device must be installed in a control cabinet that can be locked and only opened by specialist staff.

7.1 Convection

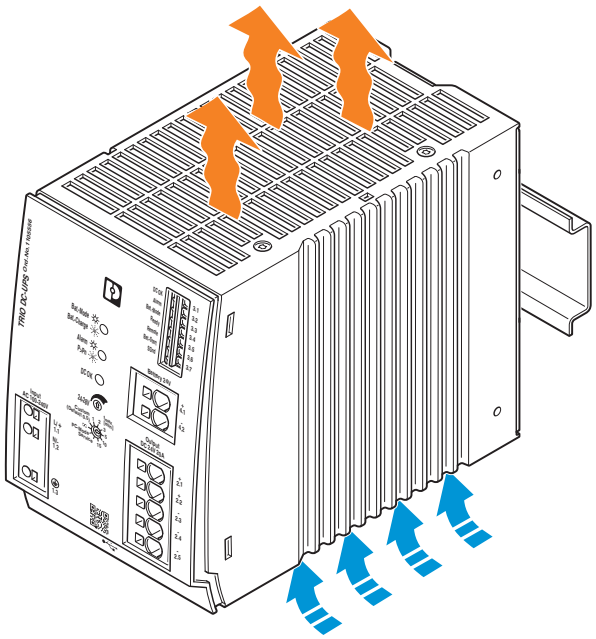
CAUTION: Hot surface

Depending on the ambient temperature and load on the uninterruptible power supply, the housing can become hot.

NOTE: enable convection

In order to ensure sufficient convection, we recommend a minimum vertical distance of 50 mm to the other devices.

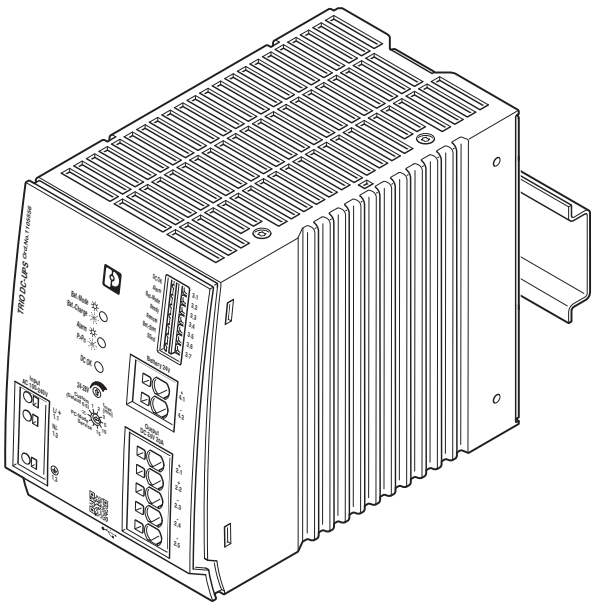
Figure 5 Convection



7.2 Normal mounting position

The device can be snapped onto all DIN rails according to EN 60715 and should only be mounted in the normal mounting position.

Figure 6 Normal mounting position

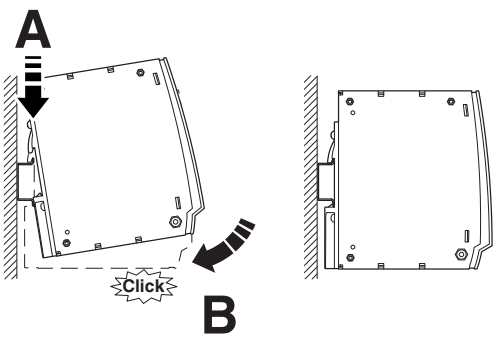


7.3 Mounting the UPS

Proceed as follows to mount the device:

1. In the normal mounting position the device is mounted on the DIN rail from above. Make sure that the universal DIN rail adapter is in the correct position behind the DIN rail (A).
2. Then press the device down until the universal DIN rail adapter audibly latches into place (B).
3. Check that the device is securely attached to the DIN rail.

Figure 7 Snapping onto the DIN rail

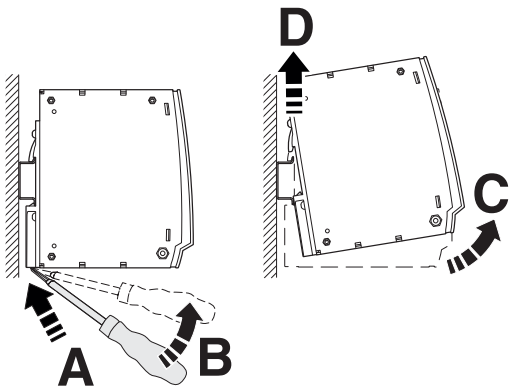


7.4 Removing the UPS

Proceed as follows to remove the device:

1. Take a suitable screwdriver and insert this into the lock hole on the universal DIN rail adapter (A).
2. Release the lock by lifting the screwdriver (B).
3. Carefully swivel the device forward (C) so that the lock slides back into the starting position.
4. Then separate the device from the DIN rail (D).

Figure 8 Removing from the DIN rail



7.5 Rotated mounting position (270° Y-axis)

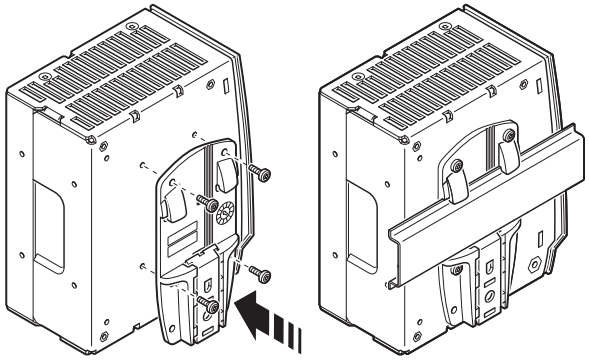
For rotated installation, use the existing universal DIN rail adapter and the Torx screws available.

The maximum tightening torque of the Torx screw (Torx® T10) is 0.7 Nm.

To mount the uninterruptible power supply in a rotated position, fasten the universal DIN rail adapter to the left side of the housing as follows:

1. Remove the screws for the factory-installed universal DIN rail adapter using a suitable screwdriver (Torx 10).
2. Remove the universal DIN rail adapter from the rear of the uninterruptible power supply.
3. Position the universal DIN rail adapter so that the mounting holes match the hole pattern on the left side of the housing.
4. Insert the Torx screws into the appropriate hole pattern on the universal DIN rail adapter so that the necessary drill holes on the device can be accessed.
5. Screw the universal DIN rail adapter onto the device.

Figure 9 Mounting the universal DIN rail adapter



7.6 Wall mounting

The UWA 130 universal wall adapter (Item No. 2901664) is used to attach the uninterruptible power supply directly to the mounting surface.

The use of the universal wall adapter is recommended under extreme ambient conditions, e.g., strong vibrations. Thanks to the tight screw connection between the uninterruptible power supply and the universal wall adapter or the actual mounting surface, an extremely high level of mechanical stability is ensured.

The UWA 130 is attached to the uninterruptible power supply by means of the Torx screws of the universal wall adapter.

The maximum tightening torque of the Torx screw (Torx® T10) is 0.7 Nm.

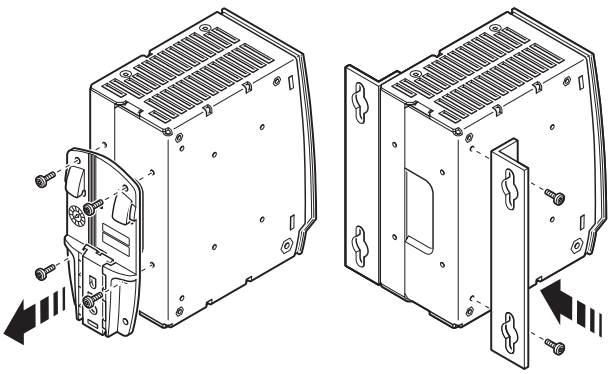
Make sure you use suitable mounting material when attaching to the mounting surface.

7.6.1 Mounting the UWA 130 2-piece universal wall adapter

Proceed as follows to disassemble the universal DIN rail adapter that comes pre-mounted:

1. Remove the screws for the universal DIN rail adapter using a suitable screwdriver (Torx 10).
2. Remove the universal DIN rail adapter from the rear of the uninterruptible power supply.
3. Position the two-piece universal wall adapter on the right and left side of the housing.
4. Insert the Torx screws into the appropriate hole pattern on the universal wall adapter so that the necessary mounting holes of the device can be accessed.
5. Screw the universal wall adapter onto the device.

Figure 10 Mounting the UWA 130 universal wall adapter



8 Device connection

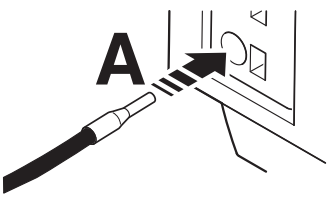
8.1 Push-in connection technology

The connection terminal blocks feature front-side Push-in connection technology. The device wiring is performed by plugging in, without tools.

8.1.1 Plug in connecting cable

The wiring is carried out by simply plugging the connecting cable into the contact opening provided. Insert the connecting cable as far as it will go.

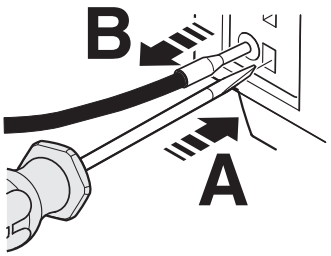
Figure 11 Insert connecting cable (push-in connection technology)



8.1.2 Loosen the connecting cable

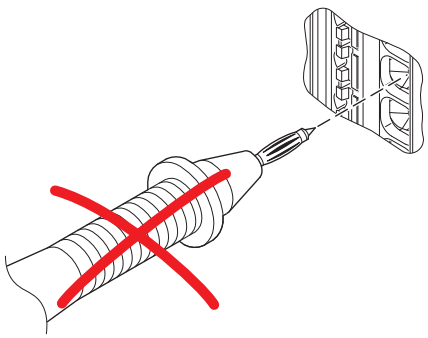
To disconnect the wiring, take a suitable screwdriver and insert it into the opening for release. Then carefully pull the connecting cable out of the contact opening.

Figure 12 Release connecting cable (push-in connection technology)



NOTE: Damage to the Push-in connection terminal blocks is possible

Do not plug test pins into the Push-in connection terminal blocks. The maximum pluggable depth of the Push-in connection terminal blocks is limited. In addition, when the test pin is plugged in, the unlocking button (pusher) is covered to such an extent that unlocking is not possible or only possible to an insufficient extent. If you do not push the unlocking button (pusher) down completely when you are pulling the test pin out, then the Push-in connection terminal block will become damaged.



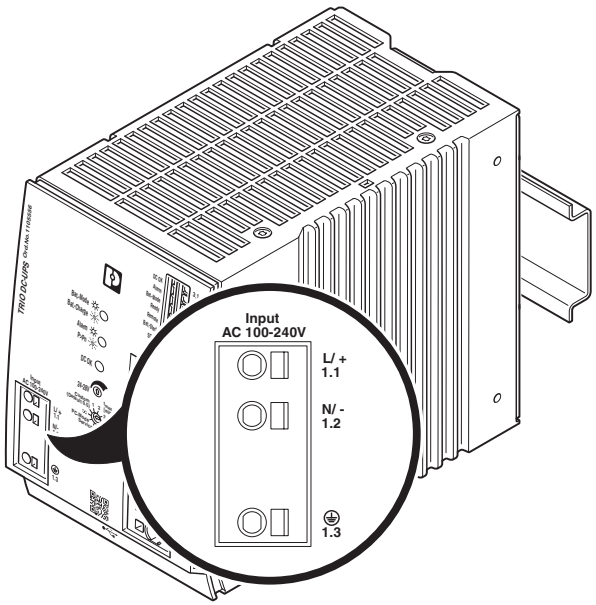
8.2 Connection parameters

For the connection parameters for wiring the power supply, such as the required stripping length with and without ferrule, refer to the technical data section.

8.3 AC input

The supply voltage is connected via "Input AC" connection terminal blocks.

Figure 13 Input voltage connection terminal blocks: Input L/N/⏚ (1.1...1.3)



If loads must not be supplied in the event of a mains voltage dip or failure, they must be connected directly to the input of the uninterruptible power supply as an unbuffered AC load.

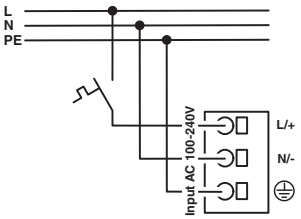
8.3.1 Protection of the primary side

It must be possible to switch the device off using a suitable disconnection device outside the power supply. The protection on the primary side, for example, is suitable for this (see section: Technical data).

An internal, approved AC/DC fuse is available as device protection. Additional device protection is not required.

If an internal fuse trips, this is due to a device fault. In this case, the device must be inspected in the factory. Opening the device or repairing it yourself is prohibited.

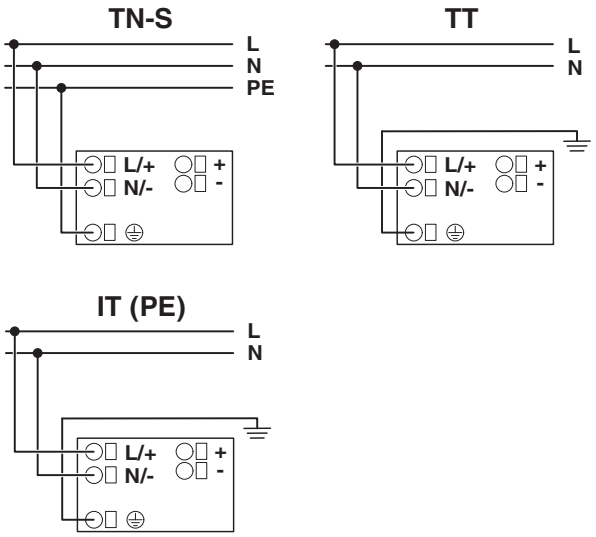
Figure 14 Schematic diagram, switching the input terminals



8.3.2 Mains connection

The uninterruptible power supply can be operated on single-phase AC or DC power grids in accordance with the nominal input voltage. Connection is via the INPUT L+/N-/⏚ connection terminal blocks.

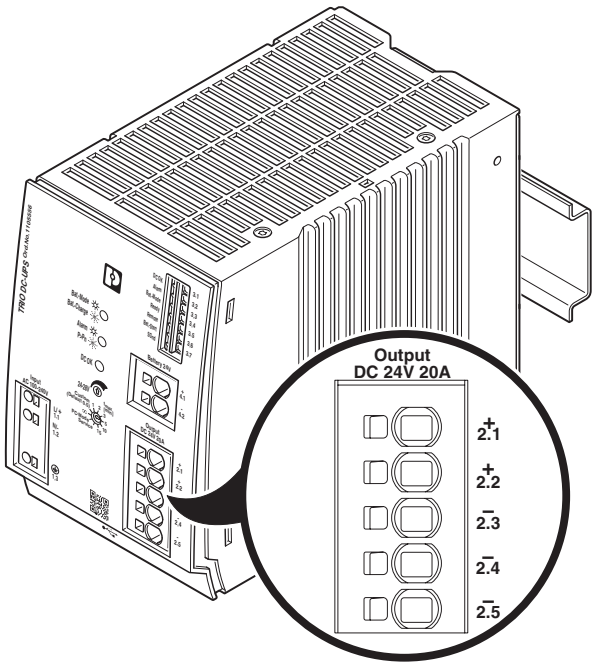
Figure 15 Network types



8.4 DC output

Buffered output voltage is connected via "Output DC" connection terminal blocks.

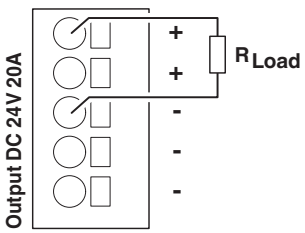
Figure 16 Output voltage connection terminal blocks: Output DC +/- (2.1...2.5)



8.4.1 Protection of the secondary side

The uninterruptible power supply is electronically short-circuit-proof and idling-proof. In the event of an error, the output voltage is limited.
It must be ensured that all output cables are dimensioned appropriately for the maximum output current or have separate protection.
The connecting cables on the secondary side should have large cross sections to keep the voltage drops in the cables as low as possible.

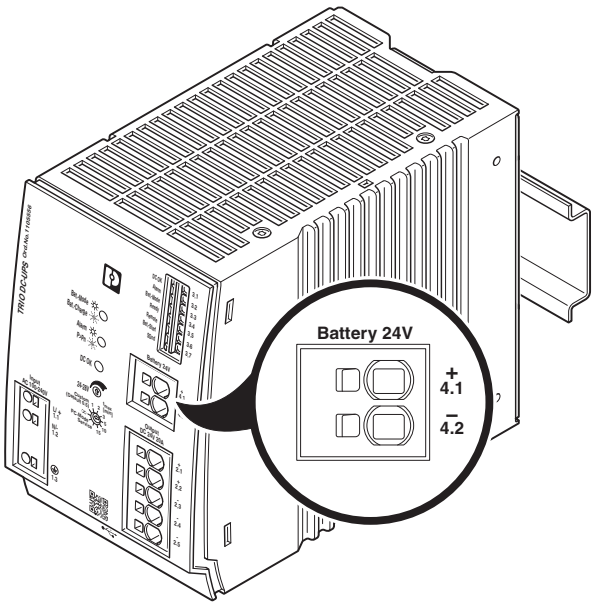
Figure 17 Schematic diagram, switching the output terminals



8.5 Battery 24V

The battery module is connected to the uninterruptible power supply via the "Battery 24V" terminals.

Figure 18 Battery connection terminal blocks 24 V (4.1, 4.2)



NOTE: Risk of short circuit

The fuse of the rechargeable battery module must be removed when installing or replacing the module.

If a battery with IQ technology is used, the LIN cable is not connected.

Prior to commissioning, you must check and configure the battery settings.

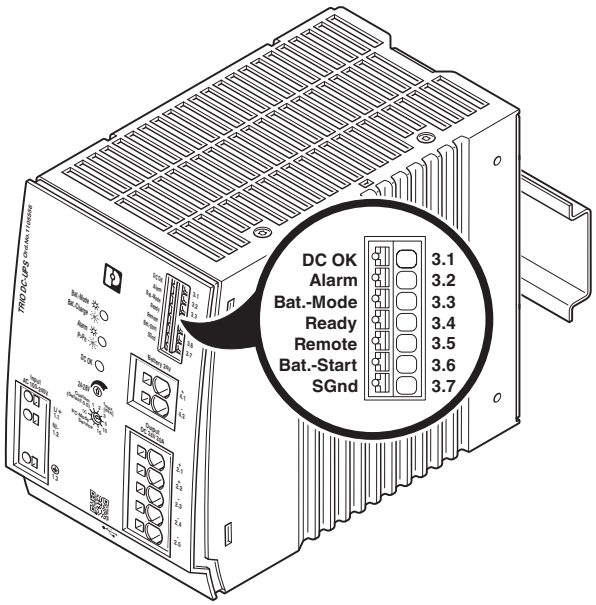
The batteries are sealed, maintenance-free lead AGM batteries that are intended for a limited temperature range. The service life is six to nine years at an ambient temperature of 20°C. To ensure immediate availability, all batteries are delivered fully charged. Startup should be within no more than nine months at 20°C ... 30°C, or six months at 30°C ... 40°C.

8.6 Connection terminal block signaling

The uninterruptible power supply has the signal outputs:

- DC OK
- Alarm (can be inverted via software)
- Bat. Mode (can be inverted and parameterized via software)
- Ready (can be inverted and parameterized via software)

Figure 19 Connection terminal block signaling (3.1...3.7)



The signal outputs are non-isolated (DC output voltage) active outputs. The signal ground (SGnd) or ground connection for the output voltage serves as the reference potential.

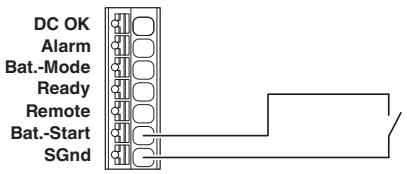
The uninterruptible power supply also features the signal inputs:

- Remote (can be inverted via software)
- Bat.-Start

The signal inputs are activated as soon as they are connected to the signal ground.

Example:

Figure 20 Signal inputs activated



8.7 Installation of individual components

WARNING

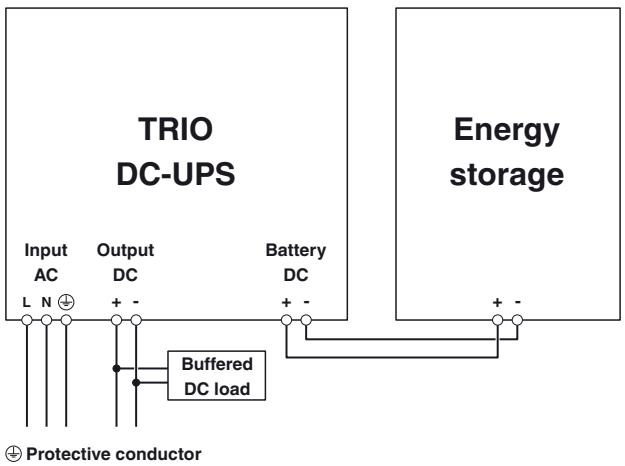
Provide a switch/circuit breaker close to the device at the AC input, DC output and at the battery terminals, which are labeled as the disconnecting device for this device.

NOTE

As so-called wear parts, batteries are not provided with a warranty. Deep discharge and storage beyond the permitted temperature range lead to irreversible damage to batteries.

Follow the documentation for the individual components during installation.

Figure 21 Schematic design



The image is a schematic representation of the design and does not contain all parts.

Observe the installation instructions.

9 Device operation

Basic settings for commissioning can be made directly on the device using the rotary selection switch. Advanced settings can be made via the POWER MANAGEMENT SUITE software.

The latest software version is to be found in the product download area.

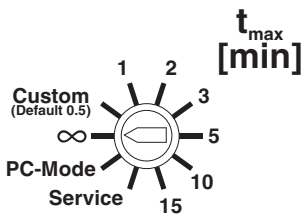
9.1 Setting the operating mode

You can set the following functions via the rotary selector switch on the front of the device:

– Buffer period
– PC mode
– Service mode

Use a suitable screwdriver to set the rotary selector switch.

Figure 22 Rotary selector switch

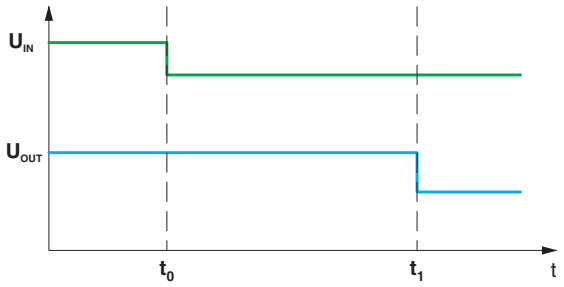


9.1.1 Setting the buffer time

Rotary selector switch setting	Meaning
1, 2, 3, 5, 10, 15	The UPS switches off after the set buffer time.
Custom (default 0.5)	The UPS switches off after the individual buffer time set via the POWER MANAGEMENT SUITE software. If a buffer time is not set, the UPS shuts down after 30 seconds.
∞ (unlimited)	Buffering with the total stored energy. An alarm is generated as soon as the voltage of the energy storage falls below 20.4 V (default).

Refer to the following diagram for information on how the device behaves in buffer mode:

Figure 23

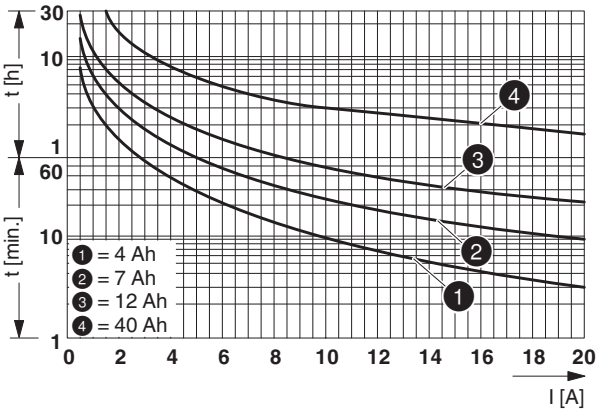


t_0: mains power failure

t_1: after the preset buffer time has expired, the output is switched off

Refer to the following diagram for possible buffer times for varying discharge currents.

Figure 24 Buffer time/discharge current diagram



9.1.2 PC mode

In PC mode, you can individually parameterize the chronological sequence of the UPS functions using the POWER MANAGEMENT SUITE software.

To access the PC mode of the UPS, set the rotary selector switch to PC mode.

The following components are required for the PC mode function:

Data cable MINI-SCREW-USB-DATACABLE (Item No. 2908217)

POWER MANAGEMENT SUITE software (Item No. 1252232)

In the event of a mains failure, one PC can continue to work, perform a controlled shutdown, and restart automatically.

1. Delay time

If the mains supply is not restored during the delay time, the PC is shut down.

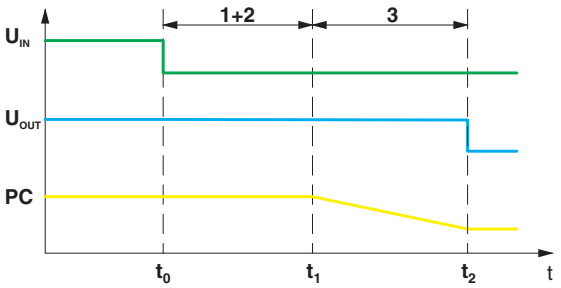
2. Program start

After the delay time has expired, it is possible to start a program.

3. PC shutdown

The time required for PC shutdown is set here.

Figure 25



t_0: mains power failure

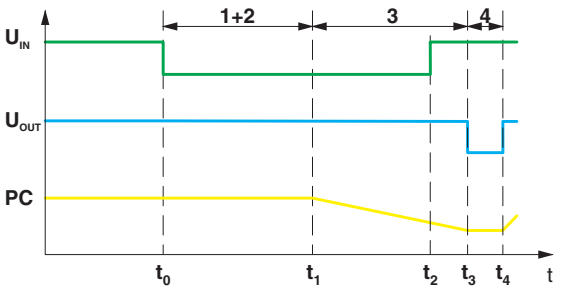
t_1: delay time and program runtime have expired, PC will be shut down

t_2: the PC has shut down, the output will be switched off

4. PC no-load time

Only if the PC is shut down and the mains supply is restored in the meantime is the output voltage interrupted for the reset time and the PC then started automatically.

Figure 26



t_0: mains power failure

t_1: delay time and program runtime have expired, PC will be shut down

t_2: mains restored while PC is shutting down

t_3: the PC has shut down and the output will be switched off, PC no-load time starts

t_4: the PC no-load time has expired, PC is starting back up

If the Remote contact is opened in PC mode, the preset delay time is skipped in the event of a mains failure.

9.1.3 Service mode

When working in a system, it may be necessary to switch the uninterruptible power supply unit over to service mode.

To access the Service mode of the UPS, set the rotary selector switch to Service.

You can enter the service mode only if input voltage is present. If the supply voltage fails while in service mode, the uninterruptible power supply switches to battery operation with unlimited buffer time. The signaling then corresponds to the signaling for battery operation.

In this operating mode, DC battery connection terminal blocks are deactivated using software. The active signal output is always activated when the unit is switched over to service mode.

Energy storage device replacement

WARNING

When connecting the batteries take note of the polarity.

Do not short circuit the pole terminals.

The batteries are maintenance free and may not be opened.

NOTE

When replacing batteries, always use new batteries from the same production batch.

When storing the battery modules, observe the latest startup date and recharge, if necessary. The batteries may only be recharged in an uninterruptible power supply.

To replace the energy storage device, proceed as follows:

1. Set the rotary selector switch to Service.
2. Press the locking lugs on the housing top and open the front cover of the housing.
3. Remove the fuses (see figure: Removing fuse).
4. Remove the cabling of the battery blocks.
5. Remove the batteries.
6. Install the new batteries.
7. Connect the cabling of the battery blocks.
8. Install the fuses (see figure: Inserting fuse).
9. Close the front cover until the locking lugs snap into the top.
10. Secure the housing to prevent it from being opened.
11. Exit Service mode.
12. Set the buffer time or PC mode.

Figure 27 Remove fuse

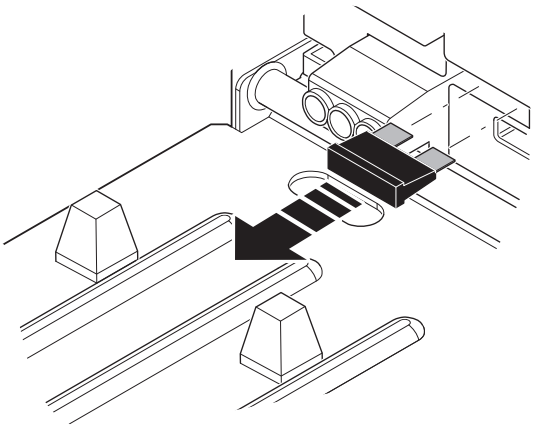
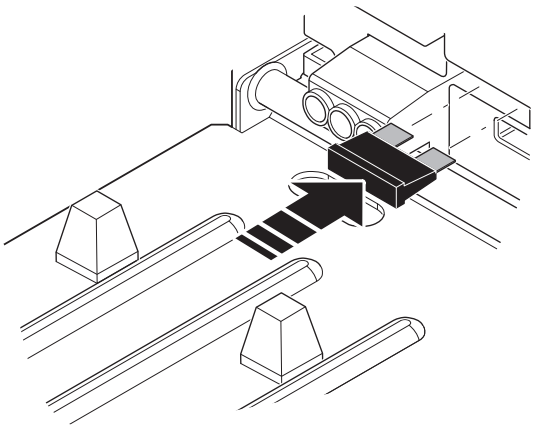


Figure 28 Insert fuse



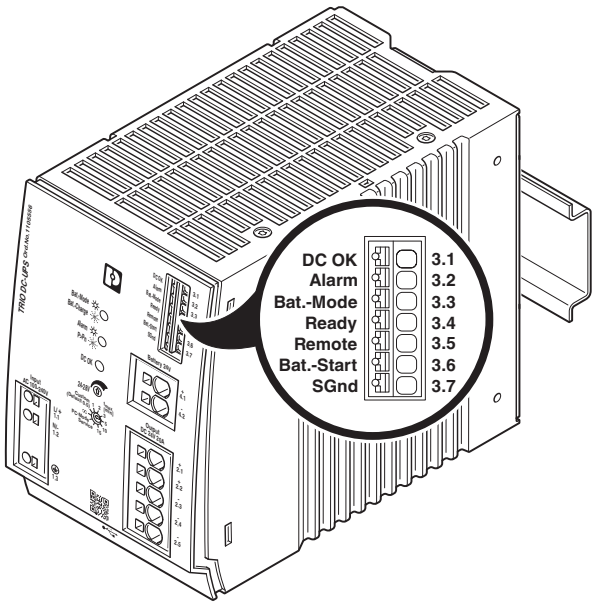
Notes on disposal

Do not dispose of the UPS and battery modules in household waste! They should be disposed of according to the currently applicable national regulations.

You can return used batteries and accumulators to Phoenix Contact or the manufacturer.

9.2 Remote

Figure 29 Signal inputs and outputs



You can use the Remote signal terminal to:

1. Suppress and exit battery operation.
2. Perform controlled shutdown of the PC in battery operation.

To perform these steps, you must connect the Remote signal terminal to the SGnd signal terminal.

This sets the UPS internal Remote signal.

1. Remote deactivates battery operation

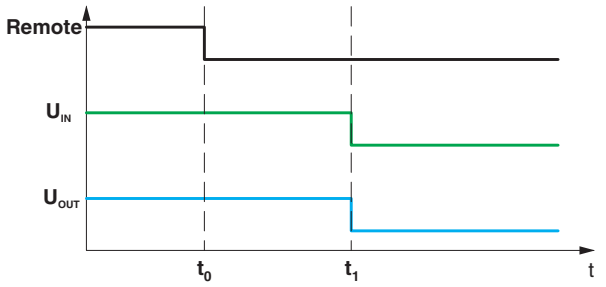
You can deactivate battery operation using this function. This function is always active when a buffer time has been preset.

This function is the default setting in PC mode.

In mains operation, the remote signal is indicated by the flashing green LED (see section: Signaling).

In the event of mains failure, battery operation is not started.

Figure 30

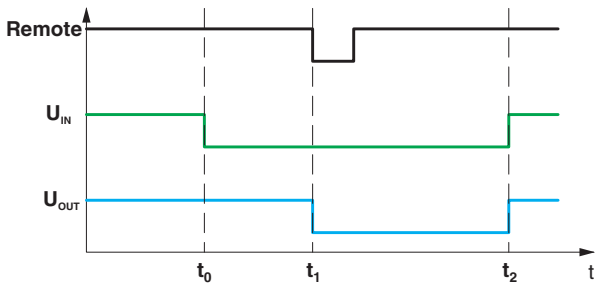


t_0: remote signal is set in mains operation

t_1: no input voltage, output will be switched off

If the Remote signal is set in battery operation, battery operation is exited immediately. The UPS output is switched off. This procedure cannot be reversed. The UPS is only activated once the input voltage is applied.

Figure 31



t_0: no input voltage

t_1: remote signal is set in battery operation, output will be switched off

t_2: input voltage restored, output will be switched on

2. Remote starts immediate PC shutdown only in battery operation

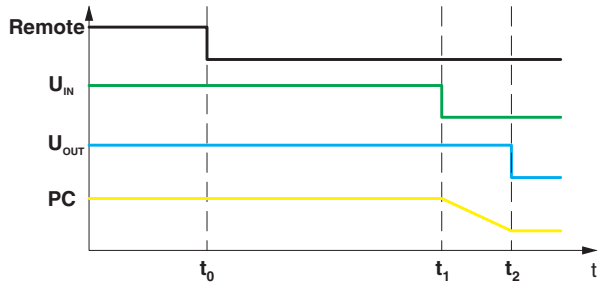
You can shut down the PC immediately upon going into battery operation using the POWER MANAGEMENT SUITE software.

This setting only applies in PC mode.

The remote signal is indicated by the flashing green LED (see section: Signaling).

If the Remote signal is set in mains operation, the PC is shut down when battery operation is entered. The delay time under Item 1 is skipped (see section PC mode).

Figure 32



t_0: remote signal is set in mains operation

t_1: no input voltage, PC shutdown begins immediately

t_2: the PC has shut down, the output will be switched off

Once the PC has shut down in battery operation, the uninterruptible power supply output is switched off. This procedure cannot be reversed. The uninterruptible power supply is not activated until the input voltage is applied.

9.3 Battery start (Bat.-Start)

You can use the Bat.-Start signal terminal to start the UPS without supply voltage on the input side and create an autonomous supply for the load. To do this, you must connect the Bat.-Start signal terminal to the SGnd signal terminal.

The output voltage provided at the load matches the battery voltage.

The maximum duration of the autonomous supply for the load depends on the charging state of the battery.

The signaling corresponds to the signaling for battery operation (see Signaling section).

To exit autonomous operation, you must disconnect the Bat.-Start signal terminal and the SGnd signal terminal.

If PC Mode operating mode is set, then in this case the PC shuts down immediately (see section Remote starts immediate PC shutdown).

9.4 Software configuration

You can request the current device status via the POWER MANAGEMENT SUITE software. Furthermore, you can change the settings of certain parameters within a defined value range and reset them to the default settings. Please refer to the respective setting options in the following table:

Parameter	Value range	Default setting
Field of application		/
Connected nominal battery capacity	1,2 ... 140 Ah	7 Ah
Initial charging current	0.2 ... 3 A	2,1 A
Compensation end-of-charge voltage	25 ... 30 V DC	28 V DC
Conservation end-of-charge voltage	25 ... 30 V DC	27.6 V DC
Temperature compensation	-200 ... 0 mV/K	-42 mV/K
End-of-discharge voltage	18 ... 24 V DC	19.2 V DC
Signaling threshold of alarm - battery voltage	18 ... 30 V	20.4 V DC
Continuous signaling after shutdown	0 ... 600 min	10 min

In addition to parameter setting options, the software also features setting options for signaling, for communication parameters, and for the remote contact.

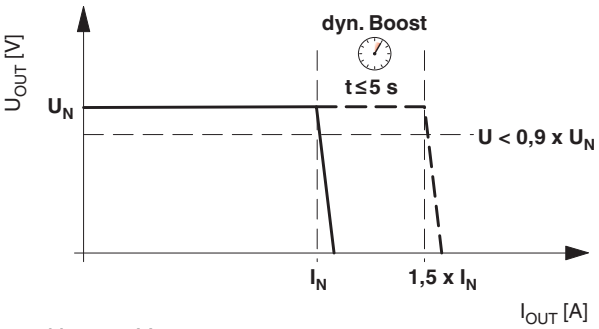
10 Method of operation

10.1 Output characteristic curve

The uninterruptible power supply works in mains operation with a dynamic power reserve – the dynamic boost – in accordance with the U/I characteristic curve shown in the figure. In the event of a secondary-side short circuit or overload, the output current is limited to 1.5 x I_N. The device does not switch off, but instead continues to supply the output current. The secondary voltage is then reduced until the short circuit is eliminated. The U/I characteristic curve with the dynamic power reserve makes it possible to provide high switch-on currents of capacitive loads or inductive loads reliably.

In battery operation, the output current is limited to 1.5 x I_N and switched off in the event of a secondary-side short circuit or overload.
Restart is done by applying the input voltage or using the Bat Start function.

Figure 33 U/I characteristic curve with dynamic load reserve



- U_N = 24 V
- I_N = 20 A
- $I_{dyn.\ BOOST}$ = 30 A
- P_N = 480 W
- $P_{dyn.\ BOOST}$ = 720 W

10.2 Dynamic Boost

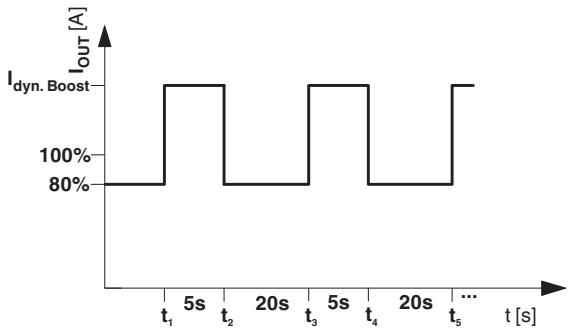
The following example is used to explain how the uninterruptible power supply dynamic boost functions.

Example:

The uninterruptible power supply supplies a connected base load of 80% until time point t_1 (see illustration, schematic diagram of the dynamic boost behavior). If an additional load is activated while the device is in operation, the dynamic boost is requested for the period of time t_1 to t_2. The uninterruptible power supply provides the maximum dynamic power reserve of an additional 70% ($\Delta P_{dyn.\ boost}$ = 1.5 x I_N x U_N - $P_{initial\ load}$).

As such, the requested overall total power corresponds to 150% of the nominal power. This power can be accessed for at least 5 s in the event that the output voltage remains the same. On reaching time point t_2, the dynamic boost is once more returned to the output value of the base load for thermal offloading of the uninterruptible power supply. In this case, the base load amounts to the same value of 80%, as it was prior to time point t_1. If the request to supply the load still exists when the time intervals t_2 to t_3 have expired (at least 4 * t_{Boost}), a new cyclical switching of the dynamic power reserve occurs, to a total of 70%.

Figure 34 Schematic diagram of dynamic boost behavior



The permanent output power P_N is limited at an ambient temperature of 60 °C. Observe all the maximum output powers for the respective operating conditions.

11 Battery management

The TRIO-UPS battery management is divided into two tests that are performed cyclically during normal operation.

11.1 Battery presence test

The battery presence test is used to detect whether a correctly installed battery is present. If this is not the case, the test fails and the green and red LED control lamps come on and stay on.

11.2 Quality check of battery

The battery quality test is a life cycle test.
When the maximum charging time has been exceeded, conclusions can be drawn regarding the maximum service life of the battery, for example. If an event arises, the green and red LED control lamps come on and stay on.

11.3 Battery charging

The device has a maximum charging current of 3 A.

Refer to the following table for the times required to recharge a fully discharged battery.

Item No.	Battery	Recharging times [hr.], [T_A = 25 °C, I_{cmax}]
1274520	UPS-BAT/PB/24DC/ 1.2AH	05:30
1274117	UPS-BAT/PB/24DC/ 4AH	05:30
1274118	UPS-BAT/PB/24DC/ 7AH	05:30
1274119	UPS-BAT/PB/24DC/ 12AH	07:00
1348516	UPS-BAT/PB/24DC/ 20AH	09:00
1354641	UPS-BAT/PB/24DC/ 40AH	16:30

Note: The actual charging times may deviate from the information provided in the table, e.g. due to ambient temperature differences.

11.4 Temperature compensation

The uninterruptible power supply has the function "temperature-compensated charging behavior." The temperature measurement of the surroundings takes places in the UPS.
To achieve the best possible charging behavior, you must install the battery in the direct vicinity of the uninterruptible power supply. For further information, see the section: Software Configuration.

12 Signaling

Various LED indicators are available for visual function monitoring of uninterruptible power supplies. Moreover, active signal outputs can be used to forward this data to a higher-level control system.

The uninterruptible power supply has the function "post signaling." Post-signaling starts after the end of the buffer time in battery operation. The communication interface is active during post-signaling. For further information, see the section: Software Configuration.

Figure 35 LED indicators

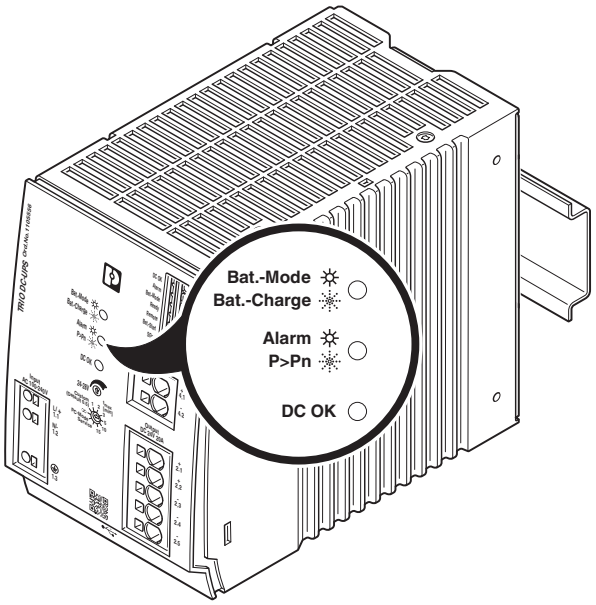
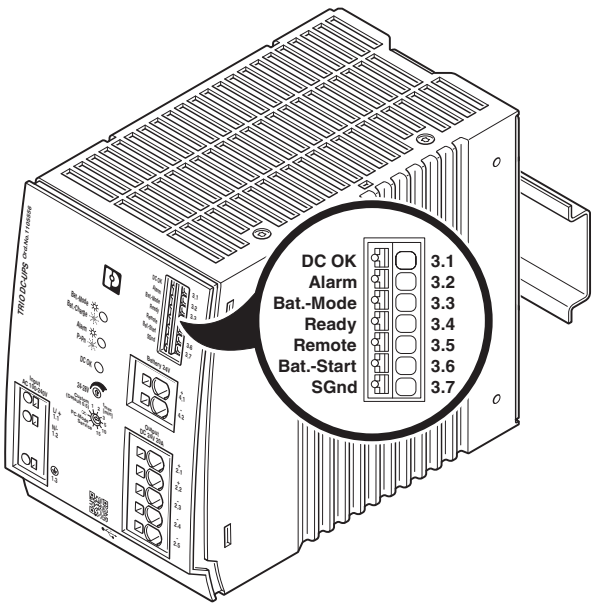


Figure 36 Connection terminal block signaling (3.1...3.7)

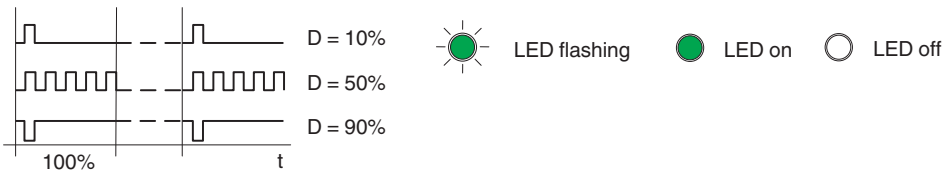


12.1 LED indicators and signal outputs

For UPS signaling and the corresponding states, please refer to the table below.

Figure 37 Signal states

Status LED			Switching output			Note
Green	Yellow	Red	Bat.-Mode	Ready	Alarm (active low)	
○	○	○	low	low	low	Device off
●	●	●	low or high	low	high	Initialization, LED test (~2 sec.) / battery operation, battery failure
	○	○	low	high	high	Mains operation, battery is fully charged
	☀ D = 50%	○	low	low or high	high	Mains operation, battery charging in process
●	●	○	high	low	high	Battery mode
	○	●	low	low	low	Mains operation, battery failure
	○	☀ D = 50%	low	low	low	Mains operation, service mode for battery replacement
	○	○	low	high	high	Mains operation, battery is fully charged, remote contact is connected to SGnd
	☀ D = 50%	○	high	low	high	Mains operation, battery charging in process, remote contact is connected to SGnd
☀ D = 90%	○	●	low	low	low	Mains operation, battery failure, remote contact is connected to SGnd
	○	☀ D = 50%	low	low	low	Mains operation, service mode for battery replacement, remote contact is connected to SGnd
	○	☀ D = 90%	low	high	high	Overload in mains operation, battery is fully charged
○	●	●	high	low	low	Battery operation, battery failure
	○	☀ D = 90%	low	low	high	Overload in battery operation
☀ D = 10%	○	○	low	high	high	Signaling time after cut off in battery mode



12.2 Signal outputs

DC OK

If the output voltage is in the valid range (>90% of the nominal output voltage), the signal output is active.

A digital transistor output is available as a signal contact.

This signal is indicated visually by a green LED.

Alarm

When an alarm is present, the signal output is active (low level). The signal status can be inverted via the POWER MANAGEMENT SUITE software.

A digital transistor output is available as a signal contact.

This signal is indicated visually by a red LED.

Possible alarms include:

– Overload
– Battery fault
– Service mode active

Bat.-Mode

If the connected load is being supplied by the battery, the signal output is active. The signal status can be inverted via the POWER MANAGEMENT SUITE software.

A digital transistor output is available as a signal contact.

This signal is indicated visually by a yellow LED.

You can assign other additional information to this signal output using the POWER MANAGEMENT SUITE software.

Ready

When the connected energy storage system is fully charged, the signal output is active. The signal status can be inverted via the POWER MANAGEMENT SUITE software.

A digital transistor output is available as a signal contact.

You can assign other additional information to this signal output using the POWER MANAGEMENT SUITE software.

12.3 Signal inputs

Remote

You can activate and trigger various functions using the remote signal input. For further information, refer to section “Device operation, Remote”.

You can invert the signal state using the POWER MANAGEMENT SUITE software.

A change made to the remote function using the POWER MANAGEMENT SUITE software is not applied until a corresponding status change of the remote signal input or device restart has been carried out.

Bat.-Start

You can use the Bat.-Start signal terminal to start the UPS without supply voltage on the input side and create an autonomous supply for the load.

For additional information, please refer to the section "Device operation, battery start".

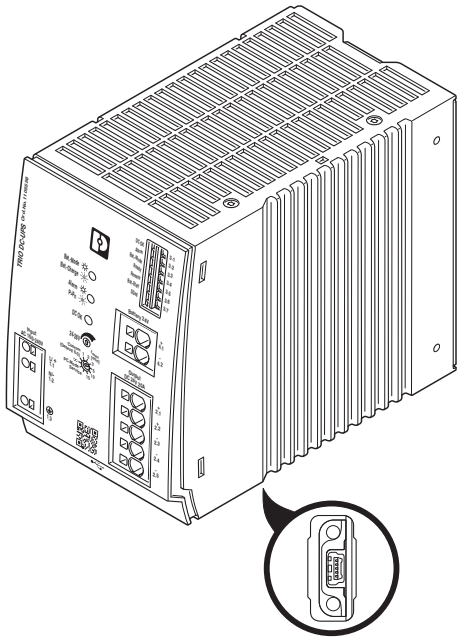
13 Interface

13.1 USB interface MINI type B

The uninterruptible power supply is equipped with a USB Mini type B interface for data transmission.

A data cable is required for communicating with a PC or a higher-level controller.

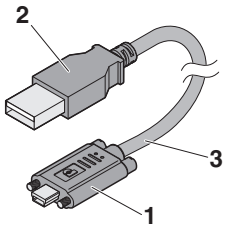
Figure 38 USB interface MINI type B (bottom of device)



13.1.1 MINI-SCREW-USB-DATACABLE

The uninterruptible power supply unit is connected to the USB PC connection with data cable MINI-SCREW-USB-DATACABLE (Item No. 2908217) via USB interface mini type B.

Figure 39 MINI-SCREW-USB-DATACABLE



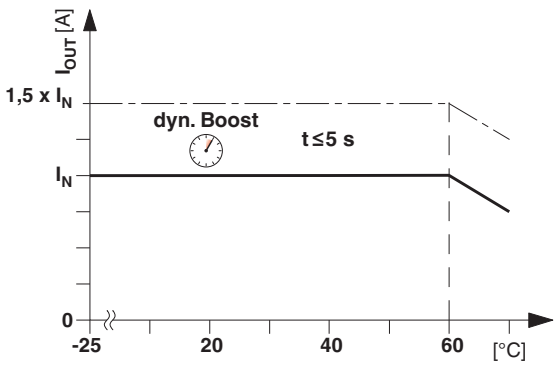
No.	Designation
1	Mini type B USB connector with screw connection
2	USB plug type A
3	Cable length: 3 m

14 Derating

14.1 Ambient temperature

The device provides both the I_N nominal output current and the $I_{dyn.\ BOOST}$ dynamic output current at ambient temperatures up to +60 °C. For ambient temperatures above +60°C, the ambient power must be decreased by 2.5% per Kelvin increase in temperature. For ambient temperatures above +70°C or in the event of a thermal overload, the device does not switch off. The output power will be decreased by enough to allow device protection. Once the device has cooled down, the output power will be increased again.

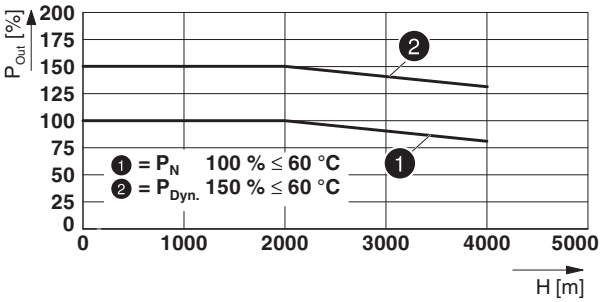
Figure 40 Temperature-dependent derating



14.2 Installation height

The uninterruptible 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 41 Altitude-dependent derating



15 Parallel operation

Devices of the same type can be connected in parallel to increase both redundancy and power. No further adjustments to the default setting are necessary.
To ensure symmetrical current distribution, we recommend that all cable connections from the power supply unit to the busbar are the same length, and have the same conductor cross-section.
Depending on the system, a protective circuit should be installed at each individual device output (e.g. decoupling diode or DC fuse) for parallel connection of more than two devices. This prevents high return currents in the event of a secondary device fault.

15.1 Redundant operation

Redundant circuits are suitable for supplying systems which place particularly high demands on operational reliability. If a fault occurs in the primary circuit of the first uninterruptible power supply unit, the second device automatically takes over the complete power supply without interruption, and vice versa. For this purpose, the power supply units to be connected in parallel must be large enough to ensure that the total current requirements of all loads can be fully met by one power supply unit. External decoupling diodes or ORING modules are required for 100 % redundancy.

Figure 42 Redundancy operation with decoupling via diode module

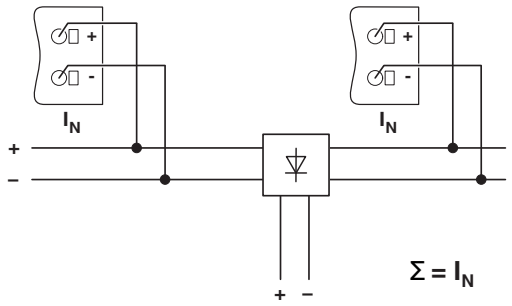
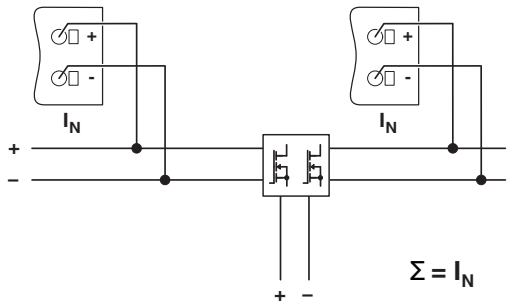


Figure 43 Redundancy operation with decoupling via ORING module



15.2 Increasing power

When two uninterruptible power supplies are connected in parallel, the output current is increased to 2 x I_N. Parallel connection for increased power is used when extending existing systems. If the individual uninterruptible power supply does not cover the current consumption of the most powerful load, parallel connection of uninterruptible power supplies is recommended.

To increase performance, it is imperative that both UPS devices be supplied from the same energy storage system.

Figure 44 Performance increase with decoupling via diode module

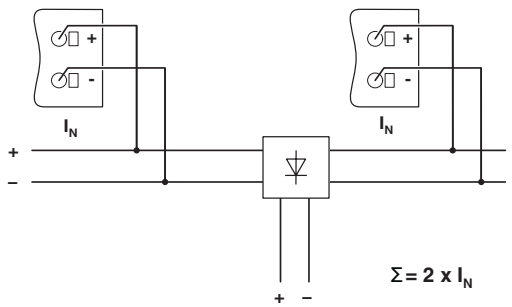


Figure 45 Performance increase with decoupling via ORING module

