QUINT4-INV/24DC/1AC/600VA/ USB

DC/AC inverter

Data sheet
108987_en_00

1 Description

The QUINT-INV DC/AC inverter is used for generating AC electricity in DC applications.
The output AC voltage RMS value can be configured via software from a total of nine values in two ranges. The range will be selected via the signal terminal during device startup.
The QUINT-INV can be connected in parallel to generate a redundant system, to increase power, or to generate a 3-phase grid.

- Can be used worldwide thanks to manual selection of AC output voltage via signal terminal
- Pure sine curve at the output
- Comprehensive signaling
- Parallel connection possible (increased performance and redundancy, 3 AC)
- Integrated USB interface
- High efficiency

Technical data (short form)	
Nominal input voltage	24 V DC
Input voltage range	20 V DC ... 30 V DC
Current consumption	typ. 23 A / max. 28 A
Apparent power	600 VA
Real power	480 W
Nominal output voltage / Nominal output current , 100% load	120 V AC / 5 A (100 V AC / 6 A...130 V AC / 4,6 A)
	230 V AC / 2.6 A (200 V AC / 3 A...240 V / 2,5 A)
Output voltage tolerance (no soft start)	±2 %
Nominal output frequency	60 Hz / 50 Hz
Output frequency tolerance	±0.5 %
Form of output voltage	Pure sine
Efficiency (Nominal load)	> 86 % (120 V AC) / > 87 % (230 V AC)
MTBF (IEC 61709, SN 29500)	532525 h (40 °C)
Ambient temperature (operation)	-25 °C ... 60 °C
Dimensions (W/H/D)	180 / 130 / 125 mm
Weight	2.5 kg

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

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3 Ordering data

Description	Type	Order No.	Pcs./Pkt.
Inverter, QUINT, DIN rail mounting, input:24 V DC, output:1AC / 600 VA, Pure sine.	QUINT4-INV/24DC/1AC/ 600VA/USB	1067325	1

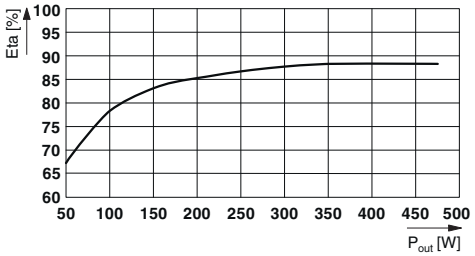
Accessories	Type	Order No.	Pcs./Pkt.
Used for communication between an industrial PC and Phoenix Contact devices with USB-Mini-B connection.	MINI-SCREW-USB-DATACABLE	2908217	1
2-piece universal wall adapter for securely mounting the device in the event of strong vibrations. The profiles that are screwed 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
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
Type 2/3 surge protection, consisting of protective plug and base element with screw connection. For single-phase power supply network with integrated status indicator and remote signaling. Nominal voltage 230 V AC/DC.	PLT-SEC-T3-230-FM-UT	2907919	5

Our range of accessories is being continually extended, our current range can be found in the download area.

4 Technical data

Input data	
Nominal input voltage	24 V DC
Input voltage range	20 V DC ... 30 V DC
Current consumption	typ. 23 A / max. 28 A
Connection data, input	
Connection method	Screw connection
Conductor cross section, rigid	0.2 mm² ... 6 mm²
Conductor cross section, flexible	0.2 mm² ... 4 mm²
Conductor cross section / flexible with ferrule with plastic sleeve	0.2 mm² ... 4 mm²
Conductor cross section / flexible with ferrule without plastic sleeve	0.2 mm² ... 4 mm²
Conductor cross section AWG/kcmil	30 ... 10
Stripping length	8 mm
Tightening torque	0.5 Nm ... 0.6 Nm
Output data	
Apparent power	600 VA
Real power	480 W
Power factor (cos phi)	0.8
Nominal output voltage / Nominal output current , 100% load	120 V AC / 5 A (100 V AC / 6 A...130 V AC / 4,6 A)
	230 V AC / 2.6 A (200 V AC / 3 A...240 V / 2,5 A)
Output voltage tolerance (no soft start)	±2 %
Nominal output frequency	60 Hz / 50 Hz
Output frequency tolerance	±0.5 %
Form of output voltage	Pure sine
Crest factor	2.8
Total harmonic distortion factor (THD)	< 3 % (linear load)
	< 8 % (non-linear load)
Overload capacity	105 % (Permanent)
	120 % / 150 % (20 s / 5 s, then shutdown)
Electronic current limitation	> 2,5 x I_N (> 200 ms)

Efficiency (Nominal load)	120 V AC	230 V AC
	> 86 %	> 87 %



Power dissipation	120 V AC	230 V AC
No load	typ. 21 W	typ. 21 W
Nominal load	typ. 72 W	typ. 66 W

Output connection data	
Connection method	Screw connection
Conductor cross section, rigid	0.2 mm² ... 6 mm²
Conductor cross section, flexible	0.2 mm² ... 4 mm²
Conductor cross section flexible, with ferrule with plastic sleeve	0.2 mm² ... 4 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 4 mm²
Conductor cross section AWG/kcmil	30 ... 10
Stripping length	8 mm
Tightening torque	0.5 Nm ... 0.6 Nm

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

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

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

Status and diagnostic indicator / signal output P>P_n	
Connection labeling	3.4
Switching output	Transistor output, active
Continuous load current	20 mA
LED status indicator	green
Status and diagnostic indicator / signal input Start 230V	
Connection labeling	3.6
Low signal	Connection to SGnd with < 2.7 kΩ
High signal	Open (> 200 kΩ between Start and SGnd)
Status and diagnostic indicator / signal input Start 120V	
Connection labeling	3.7
Low signal	Connection to SGnd with < 2.7 kΩ
High signal	Open (> 200 kΩ between Start and SGnd)
Status and diagnostic indicator / signal output Out 1	
Connection labeling	3.5
Switching output	Transistor output, active
Status and diagnostic indicator / signal input Remote	
Connection labeling	3.8
Low signal	Connection to SGnd with < 2.7 kΩ
High signal	Open (> 35 kΩ between remote and SGnd)
Signal ground SGnd	
Connection labeling	3.9
Function	Signal ground
Reference potential	For signal inputs and signal outputs
Signal connection data	
Connection method	Screw connection
Conductor cross section, rigid	0.2 mm^2 ... 1.5 mm^2
Conductor cross section, flexible	0.2 mm^2 ... 1.5 mm^2
Conductor cross section flexible, with ferrule with plastic sleeve	0.2 mm^2 ... 1.5 mm^2
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm^2 ... 1.5 mm^2
Conductor cross section AWG/kcmil	30 ... 12
Stripping length	8 mm
Tightening torque	0.5 Nm ... 0.6 Nm

Data interface USB (Modbus/RTU)	
Connection labeling	5.1
Interface designation	USB (Modbus/RTU)
USB classification	MINI-USB Type B
Transmission physics	USB 2.0
Locking	Screw
Electrical isolation	yes

Data interface Parallel Port	
Connection labeling	5.2
Interface designation	Parallel Port
Connection method	RJ45
Locking	Locking clip
Electrical isolation	yes

Device combinations	
Connection in parallel	yes , max. 3
Connection in series	no

General data	
Overvoltage category according to EN 61010-2-201	II
MTBF (IEC 61709, SN 29500)	532525 h (40 °C)
Degree of protection / Protection class	IP20 / I
Dimensions (W/H/D)	180 / 130 / 125 mm
Weight	2.5 kg

Ambient conditions	
Ambient temperature (operation)	-25 °C ... 60 °C
Derating (Output power)	> 50 °C: 2,5 % / K
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Humidity, non-condensing	≤ 95 %
Installation height	≤ 3000 m
Derating (Output power)	> 2,000 m: 0.6 % / 100 m
Degree of pollution	2
Vibration (operation)	5 Hz ... 100 Hz, 0.7g (EN 60068-2-6)
Shock	20g in all directions (EN 60068-2-27)

Approvals	
UL	UL/C-UL Recognized UL 1778 UL/C-UL Listed UL 61010-1 UL/C-UL Listed UL 61010-2-201

Current approvals/permissions for the product can be found in the download area under phoenixcontact.net/products

Electromagnetic compatibility / Conformance with EMC Directive 2014/30/EU		
Noise emission in accordance with EN 61000-6-4		
Conducted noise emission	EN 61000-6-4	
Noise emission	EN 61000-6-4	

Immunity in accordance with EN 61000-6-2		
CE basic standard	**EN 61000-6-2 requirement**	**Tested**
Electrostatic discharge EN 61000-4-2		
Housing contact discharge	± 6 kV	± 6 kV
Housing air discharge	± 8 kV	± 8 kV
Comments	Criterion B	Criterion A
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
Comments	Criterion A	Criterion A
Fast transients (burst) EN 61000-4-4		
Input	± 2 kV	± 2 kV
DC input	± 2 kV	± 2 kV
Output	± 2 kV	± 2 kV
Signal	± 2 kV	± 2 kV
Signal USB	--	± 2 kV
Comments	Criterion B	Criterion A (B for USB)
Surge voltage load (surge) EN 61000-4-5		
Input	± 1 kV (symmetrical) ± 2 kV (asymmetrical)	± 1 kV (symmetrical) ± 2 kV (asymmetrical)
Output	± 1 kV (symmetrical) ± 2 kV (asymmetrical)	± 2 kV (symmetrical) ± 4 kV (asymmetrical)
Signal	1 kV (asymmetrical)	1 kV (asymmetrical)
Comments	Criterion B	Criterion A
Conducted interference EN 61000-4-6		
Frequency range	0.15 MHz ... 80 MHz	0.15 MHz ... 80 MHz
Signal	10 V	10 V
Comments	Criterion A	Criterion A
Power frequency magnetic field EN 61000-4-8		
Frequency	50 Hz , 60 Hz	50 Hz , 60 Hz
Signal	30 A/m	30 A/m
Comments	Criterion A	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.

5 Safety regulations and installation notes

5.1 Symbols used

Instructions and dangers are labeled with the corresponding symbols in this installation note.

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.

This indicates that the device can be hot and should not be touched without taking care.

5.2 Important safety and warning instructions

WARNING: Danger to life by electric shock!

- Only skilled persons may install, start up, and operate the device.
- For indoor use only.
- 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.
- Ensure that the primary-side wiring and secondary-side wiring are the correct size and have sufficient fuse protection.
- Cover termination area after installation in order to avoid accidental contact with live parts (e. g., installation in control cabinet).
- Keep flames, embers or sparks away from the module.
- Provide a switch/circuit breaker close to the device at the DC input and the AC output respectively, which are marked as the disconnecting device for this device.

CAUTION: Hot surface

The housing can become hot, depending on the ambient temperature and device load.

NOTE

- Observe the national safety and accident prevention regulations.
- Assembly and electrical installation must correspond to the state of the art.
- The inverter is a built-in device. The IP20 degree of protection of the device is intended for use 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.
- Use in a CONTROLLED ENVIRONMENT - the unit is intended for installation in a temperature-regulated, indoor area that is relatively free of conductive contaminants.
- The housing can become hot, depending on the ambient temperature and device load.
- Observe the mechanical and thermal limits of the device.
- Ensure sufficient convection. Information on minimum clearances to other devices is listed in the section: Device dimensions and keep-out areas.
- Ensure that the location is sufficiently ventilated.
- Mount the device horizontally (standard mounting position).
- Use copper cables with an operating temperature of >75°C (ambient temperature<55°C) and > 90°C (ambient temperature< 75°C).
- For the connection parameters, such as the required stripping length for wiring with and without ferrule, refer to the technical data.
- 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.
- To reduce the risk of fire, replace fuses only with those that have the same type and rating. Relevant fuses can be found in the accessories in the ordering data.
- The device is maintenance-free. Repairs may only be carried out by the manufacturer. Opening the housing invalidates the warranty.
- The inverter may only be used for its intended use.
- Improper use invalidates the device protection.
- Provide an easily reached switch/ fuse for wiring input terminal close to the device at one pole of the DC input, which is marked as the disconnecting device for this device (30 V DC, 50 A, slow blow).
- Ensure that no hazardous voltage in normal mode or single fault case applies to all signal terminals and communication interfaces.
- Source connected to the inverter input must be SELV circuits that can be either battery circuits or secondary circuits derived from mains circuits of overvoltage category CAT II up to 300 V and have to be separated from mains circuits by double or reinforced insulation.
- A suitable electrical and fire enclosure which provides adequate mechanical rigidity shall be provided by the end product.
- When using a battery, follow the battery manufacturer's instructions and ensure that the input data of the inverter are observed.

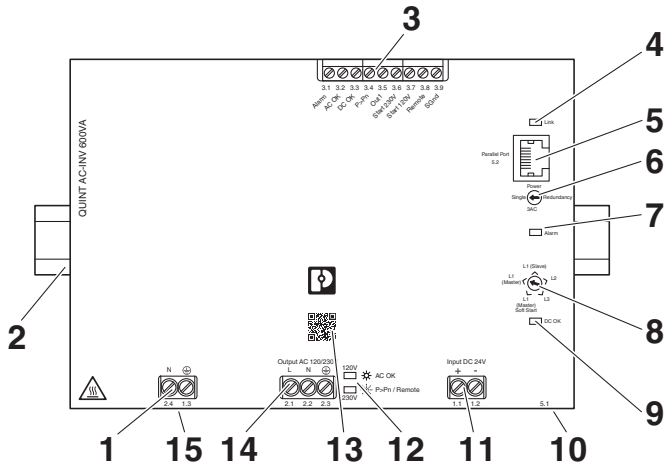
More follows

- The switching outputs are active outputs according to SELV. These may only be operated on permitted SELV circuits.
- The permanent output power P_N is limited at an ambient temperature of 60°C. Observe the maximum output powers for the respective operating conditions.
- Keep these instructions in a safe place – this data sheet contains important safety notes which must be observed during installation and maintenance of the device.

6 Design

6.1 Function elements

Figure 1 Position of the function elements

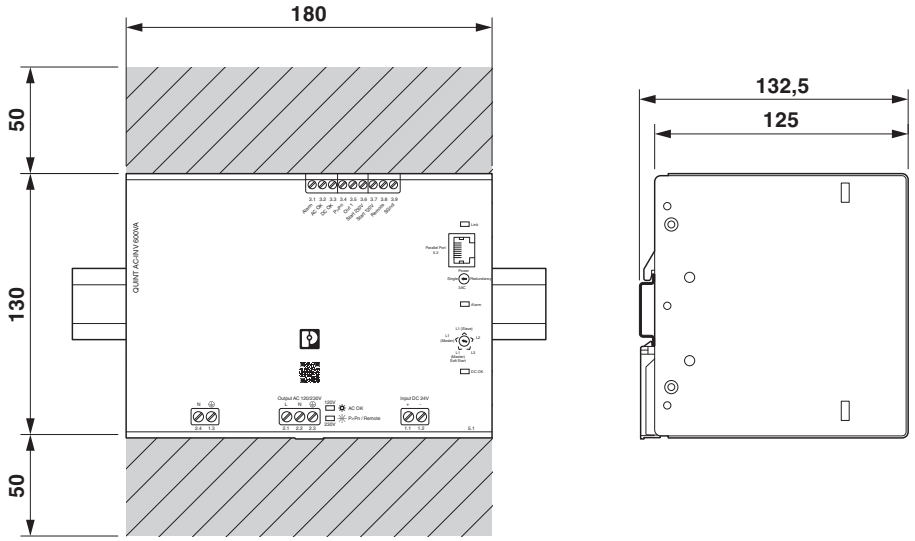


Key

No.	Designation	Connection labeling
1	PE/N bridge connection terminal blocks	2.4, 1.3
2	Universal DIN rail adapter (rear of housing)	
3	Signaling connection terminal blocks	3.1 ... 3.9
4	LED parallel run	
5	Communication interface parallel run	5.2
6	Rotary selector switch parallel run mode: Operating mode	
7	LED status indicator Alarm	
8	Rotary selector switch parallel run mode: Phase	
9	DC OK LED	
10	Communication interface (device underside)	5.1
11	Connection terminal blocksinput voltage: Input DC +/-	1.1, 1.2
12	LED AC OK / P>Pn / Remote	
13	QR code web link	
14	Output voltage connection terminal blocks: Output AC L/N/⏚	2.1 ... 2.3
15	PE/N bridge	

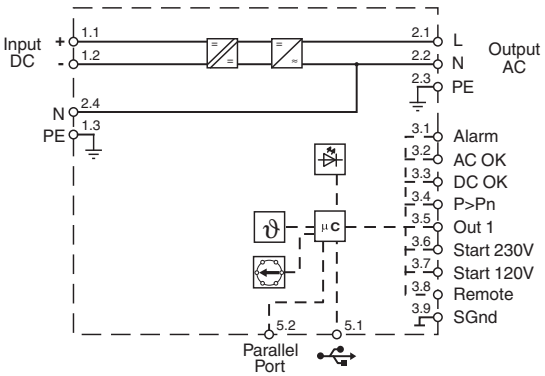
6.2 Device dimensions and keep-out areas

Figure 2 Device dimensions and keep-out areas



6.3 Block diagram

Figure 3 Block diagram



Key

Element	Designation
	DC/DC converter with electrical isolation
	Inverter
	Microcontroller
	LED
	Temperature sensor
	Rotary selector switch

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

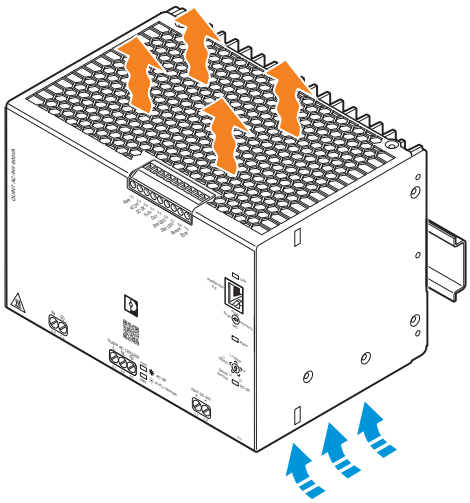
The housing can become hot, depending on the ambient temperature and device load.

NOTE: enable convection

To ensure sufficient convection, maintain an adequate minimum clearance between the inverter and above/below the installed devices.

For information on the required minimum clearances, refer to the section: Device dimensions and keep-out areas.

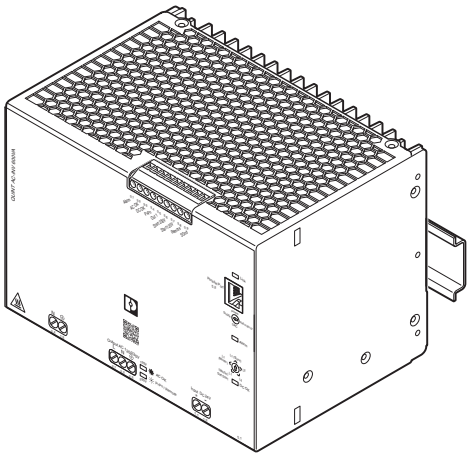
Figure 4 Convection



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 5 Normal mounting position

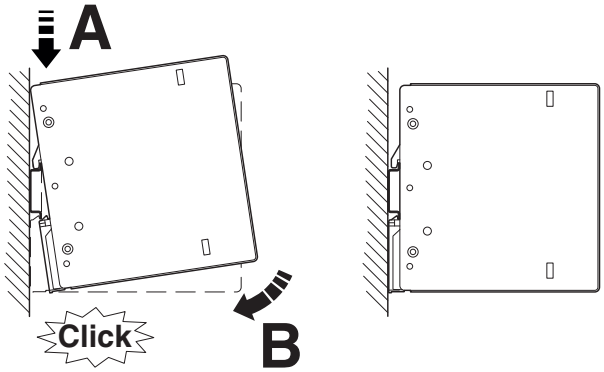


7.3 Mounting the inverter

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 6 Snapping onto the DIN rail

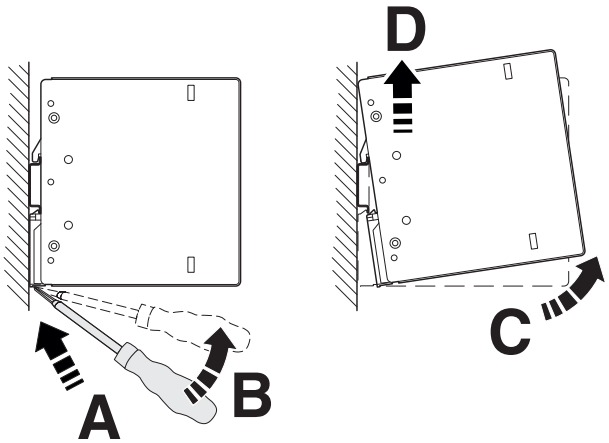


7.4 Removing the inverter

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 7 Removing from the DIN rail



7.5 Wall mounting

The UWA 182/52 universal wall adapter (Order No. 2938235) or UWA 130 universal wall adapter (Order No. 2901664) is used to attach the device 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 maximum tightening torque of the Torx screw (Torx® T10) is 0.9 Nm.

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

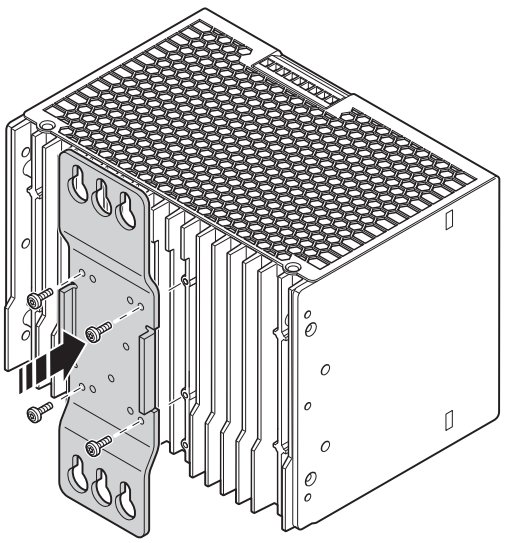
7.5.1 Mounting the UWA 182/52 universal wall adapter

The UWA 182/52 universal wall adapter (Order No. 2938235) is attached to the device by means of the Torx screws of the universal DIN rail 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 device.
3. Position the universal wall adapter in such a way that the keyholes or oval tapers face up. The mounting surface for the device is the raised section of the universal wall adapter.
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 8 Mounting the UWA 182/52 universal wall adapter



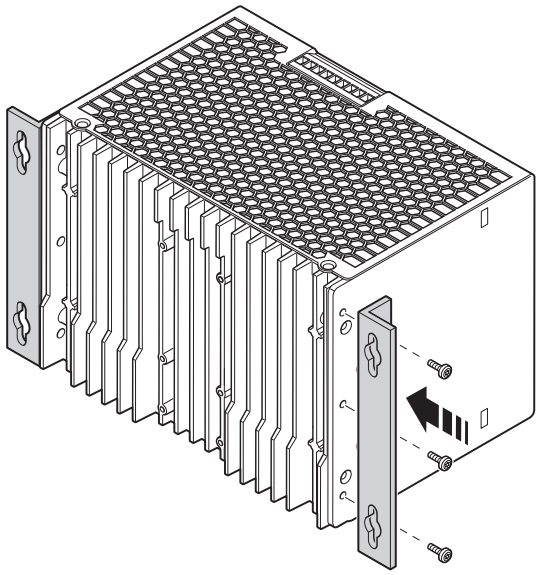
7.5.2 Mounting the UWA 130 2-piece universal wall adapter

The UWA 130 universal wall adapter (Order No. 2901664) is attached to the device using the Torx screws provided.

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 device.
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 two-piece universal wall adapter onto the device.

Figure 9 Mounting the UWA 130 universal wall adapter



8 Device connection

8.1 Connection parameters

Figure 10 Connection parameters

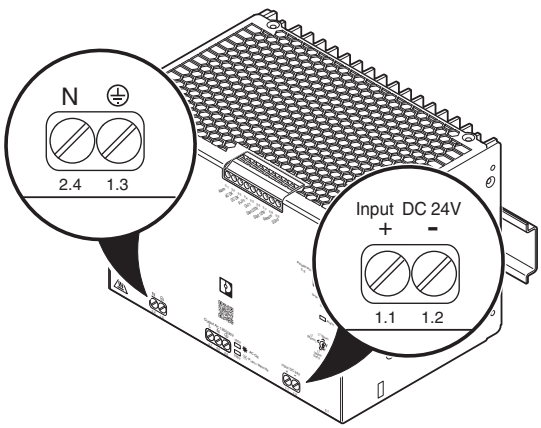
		[mm²]	[mm²]	[mm²]	[mm²]	AWG (Cu)	L [mm]	[Nm]	[lb in]
Input DC 1.1...1.2	Screw	0.2-6	0.2-4	0.2-4	0.2-4	30-10	8	0.5-0,6	5-7
Output AC 2.1...2.3		0.2-6	0.2-4	0.2-4	0.2-4	30-10	8	0.5-0.6	5-7
N 2.4, PE 1.3		0.2-6	0.2-4	0.2-4	0.2-4	30-10	8	0.5-0.6	5-7
Signals 3.1...3.9		0.2-1.5	0.2-1.5	0.2-1.5	0.2-1.5	30-12	8	0.5-0.6	5-7

9 Device connection terminal blocks

9.1 DC input

The supply voltage is connected via the connection terminal blocks: Input DC 24 V.

Figure 11 Input voltage connection terminal blocks: Input DC +/- (1.1, 1.2) and N/⏚ (2.4, 1.3)



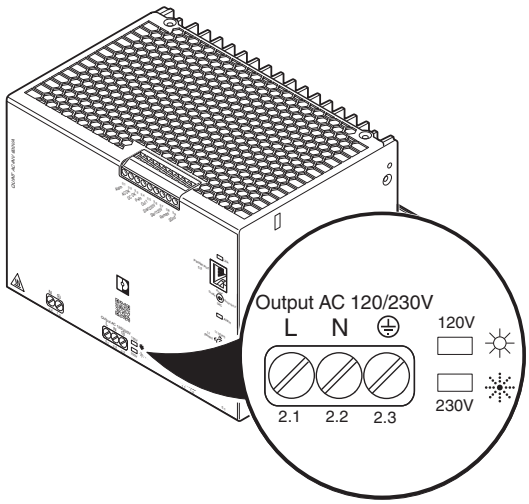
The neutral conductor of the AC output is connected to PE via the pre-installed bridge in terminals 2.4 and 1.3.

Remove the bridge to change the output voltage supply system configuration.

9.2 AC output

Buffered output voltage is connected via connection terminal blocks: Output AC 120 / 230 V.

Figure 12 Output voltage connection terminal blocks: Output AC L/N/⏚ (2.1...2.3)



9.2.1 Protection of the secondary side

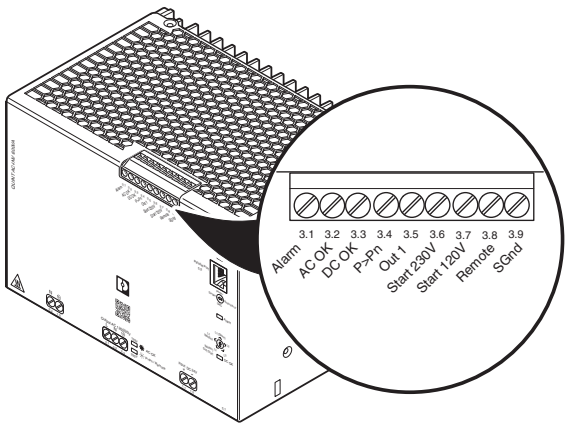
The inverter is electronically short-circuit-proof and idling-proof.
Ensure that all output cables are dimensioned appropriately for the maximum output current or have separate protection.

9.3 Connection terminal block signaling

The inverter has the signal outputs:

- Alarm (can be inverted via software)
- AC OK (can be inverted and parameterized via software)
- DC OK (can be inverted and configured via software)
- $P > P_n$ (can be inverted and parameterized via software)
- Out1

Figure 13 Connection terminal block signaling (3.1...3.9)



The device also features the signal inputs:

- Remote
- Start 120 V: inverter startup in the 120 V range, digital input
- Start 230 V: inverter startup in the 230 V range, digital input

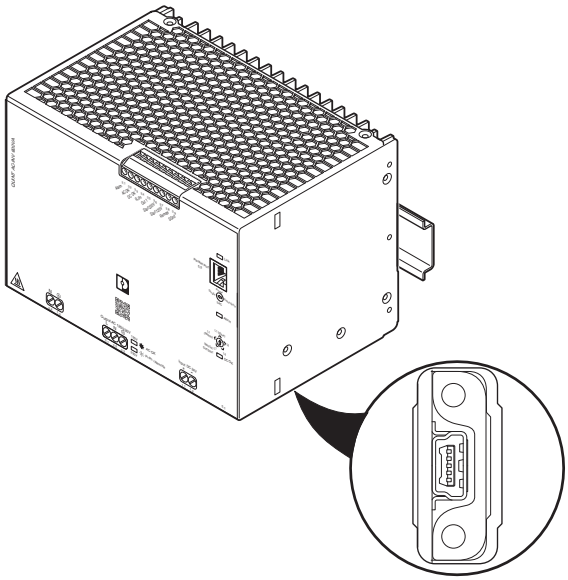
10 Interface

10.1 USB mini type B

The device 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.

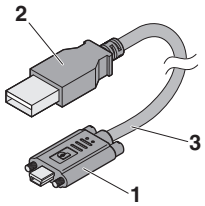
Figure 14 Service USB interface Mini type B (device bottom) (5.1)



10.1.1 MINI-SCREW-USB-DATACABLE

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

Figure 15 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

11 Device operation

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

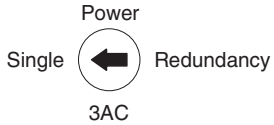
The latest software version is to be found in the product download area.

11.1 Setting the operating mode

You can set the operating mode via the upper rotary selector switch on the front of the device:

- Single operation (switch position: Single)
- Parallel operation for power increase (switch position: Power)
- Parallel operation for redundancy (switch position: Redundancy)
- Parallel operation for creating a 3AC grid (switch position: 3AC)

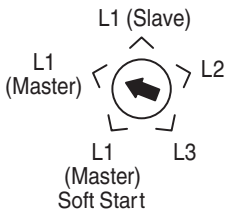
Figure 16 Rotary selector switch parallel run mode: Operating mode



You can set the device hierarchy via the lower rotary selector switch on the front of the device:

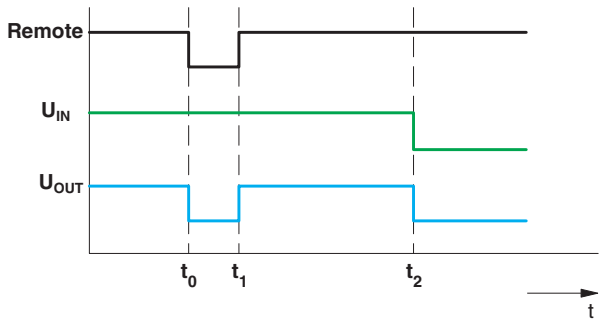
- Master device in the mode power increase, redundancy, or 3AC (switch position: L1 (Master))
- Slave device in the mode power increase or redundancy (switch position: L1 (Slave))
- 1st slave device in the mode 3AC (switch position: L2)
- 2nd slave device in the mode 3AC (switch position: L3)
- Master device in the mode 3AC with “inclined” start characteristic curve (switch position: L1 (Master) Soft Start).
  Only applicable in 3AC operation at 230 V output voltage. In this switch position, the output voltage drops briefly during startup.

Figure 17 Rotary selector switch parallel run mode: Phase



11.2 Remote

You can use the Remote signal terminal to switch the inverter output on and off.
To do this, you must connect the Remote signal terminal to the SGnd signal terminal.



t_0: Remote signal is set, output will be switched off

t_1: the remote signal will be reset, output will be switched back on

t_2: No input voltage, output will be switched off

11.3 Start 120 V / Start 230 V

You can use the Start 120 V or Start 230 V signal terminals to start the inverter.

- Start 120 V: The output voltage is 120 V / 60 Hz
- Start 230 V: The output voltage is 230 V / 50 Hz

To exit operation, you must disconnect signal terminal Start 120 V or signal terminal Start 230 V from signal terminal SGnd.

12 Method of operation

12.1 Device start

When a valid input voltage is applied and one of the Start terminals are connected to SGnd, the device starts. During the subsequent LED test, all LEDs on the front of the device are switched on for a short time. Afterward, any inverters connected in parallel will be synchronized and the output switched on.

The inverter always works in one of two voltage ranges with one of two nominal frequencies:

– 100 V or 200 V range
– 50 Hz or 60 Hz

In order to start in the 100 V range, signal terminal 3.7 Start 120 V must be connected with the signal terminal 3.9 SGnd (see section: Device operation).

In order to start in the 200 V range, signal terminal 3.6 Start 230 V must be connected with the signal terminal 3.9 SGnd (see section: Device operation).

If the Start 120 V or Start 230 V signal terminal is already connected to SGnd, the device starts when a valid input voltage is applied.

Note that when starting in a parallel system the respective start signal terminal of the individual inverters are connected with SGnd simultaneously (time offset < 5 seconds).

To exit operation, you must disconnect signal terminal Start 120 V or signal terminal Start 230 V from signal terminal SGnd.

12.2 Output voltage setting options

You can use the POWER MANAGEMENT SUITE software to set one of the following nominal voltages or nominal frequencies per voltage range:

– 100 V range:
  – 100 V, 110 V, 120 V (= default), or 130 V
    50 Hz or 60 Hz (= default)
– 200 V range:
  – 200 V, 210 V, 220 V, 230 V (= default), or 240 V
    50 Hz (= default) or 60 Hz

12.3 Input voltage setting options

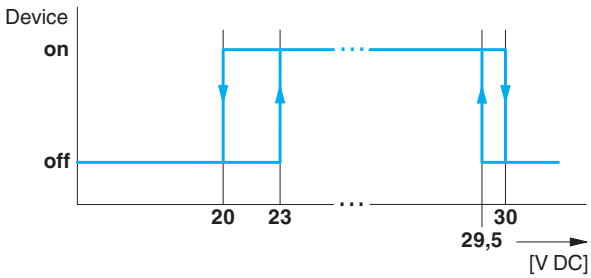
You can set the following DC input voltage parameters via the POWER MANAGEMENT SUITE software:

– Lower DC input voltage limit: 20 V DC...26.5 V DC, default: 20 V DC
– Upper DC input voltage limit: 28 V DC...30 V DC, default: 30 V DC
– Activation threshold: 20.5 V DC...27 V DC, default: 23 V DC

Note that the activation threshold must be at least 0.5 V higher than the lower DC input voltage limit. This creates a hysteresis when switching on with increasing DC input voltage.

For the upper DC input voltage limit, a hysteresis of 0.5 V is taken into consideration automatically with decreasing DC input voltage.

Figure 18 Input voltage range: Default

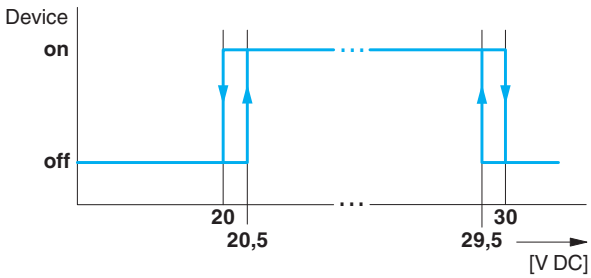


12.3.1 Application example: Operation on an AC/DC power supply

The inverter DC input voltage is generated via an AC/DC power supply.

– Lower DC input voltage limit: 20 V DC
– Upper DC input voltage limit: 30 V DC
– Activation threshold: 20.5 V DC

Figure 19 Application example: Operation on an AC/DC power supply



This example illustrates the broadest possible working range of the inverter.

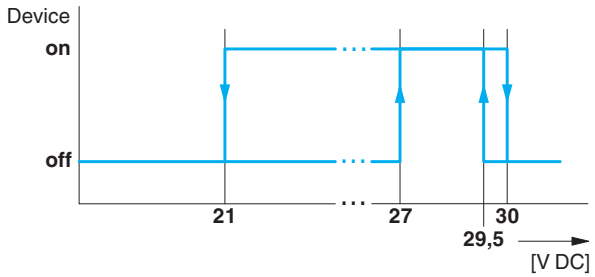
12.3.2 Application example: Operation on a battery

The inverter DC input voltage is supplied via a battery with 24 V nominal voltage.

A battery has the property that the battery terminal voltage increases again at low voltage and the resulting load shedding (for protection against deep discharge). This increase can amount to several volts. Set the activation threshold correspondingly high.

- Lower DC input voltage limit: 21 V DC
- Upper DC input voltage limit: 30 V DC
- Activation threshold: 27 V DC

Figure 20 Application example: Operation on a battery



In this setting example, it is ensured that the inverter first switches on at a battery voltage of 27 V DC and, for deep discharge protection, switches off at 21 V DC.

13 Parallel operation

You can connect up to three inverters in parallel in order to increase the power or for redundant load supply. The settings are made via the rotary selector switches on the front of the device (see section: Setting the operating mode).

The device adopts the rotary selector switch settings when starting up. Changes to these settings during ongoing operation will not affect the function of the inverters.

In parallel operation, connect the individual inverters via the parallel running communication interfaces using RJ45 twisted pair patch cables.
Connect the outputs of the inverters together directly. The output power is split symmetrically across the individual inverters in each parallel operating mode.

Observe the following points when carrying out parallel connection:

1. Set the operating mode of the individual inverters via the rotary selector switches.
2. Use the same cable cross sections for wiring.
3. Use the same cable lengths up to the AC convergence point.
4. Operate the inverters in the same temperature conditions.
5. Comply with the national safety regulations. In particular, comply with the regulations on grounding the neutral conductor. In the delivery state, this is ensured through the pre-installed bridge in terminals 2.4 and 1.3.

During parallel operation, the following settings are transferred from the master device to the slave device. The settings of the slave device are ignored here:

- Remote signal terminal operation
- Settings via the POWER MANAGEMENT SUITE configuration software. Changes to the settings can only be made using the master device and are permanently transferred to the slave devices. Parameters can be read off from all devices.

The following alarm messages are available in parallel operation:

- Parallel mode is not possible:
  This combination of master or slave devices is impermissible.
- No redundancy:
  The device fails in redundant operation or the total power is too high in redundant operation. This means that in the case of a device fault, the load cannot be supplied using a device.
- System error:
  Each alarm in parallel operation is displayed as a sum message. All alarm signal outputs can be used.

13.1 Increasing power

Parallel connection for increased power is used when extending existing systems. If the individual inverter does not cover the current consumption of the most powerful load, parallel connection of inverters is recommended. The output power is doubled by using two inverters connected in parallel.

Information on the device settings is to be found in the section Setting the operating mode section.

13.2 Redundant operation

Redundant operation of inverters is suitable for supplying systems and system parts which place particularly high demands on operational safety.
In the event of a fault, it must be ensured that one of the individual inverters is able to provide the total required power for the load.

Information on the device settings is to be found in the section Setting the operating mode section.

13.3 3AC operation

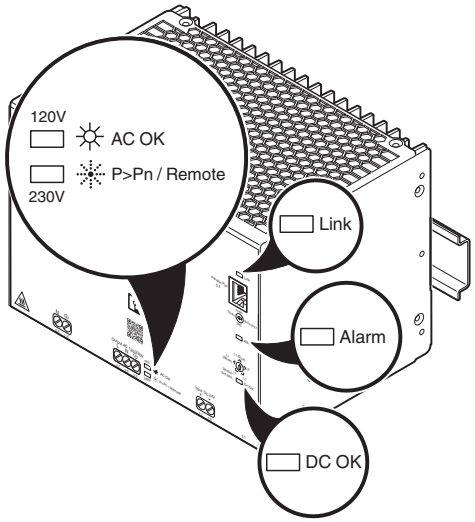
3AC operation is suitable for supplying systems and system parts that require symmetrical 3-phase control.

Information on the device settings is to be found in the section Setting the operating mode section.

14 Signaling

Various LED indicators are available for visual function monitoring of the inverter. Active signal outputs can be used to forward this data to a higher-level control system.

Figure 21 LED indicators



14.1 LED indicators and signal outputs

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

Figure 22 LED indicators and signal outputs

Status LED			Switching output				Note
DC OK	120V / 230V	Alarm	AC OK	DC OK	P>Pn	Alarm (active low)	
○	○	○	low	low	low	low	Device off
●	●	●	low	low	low	high	Initialization, LED test (~3 sec.)
●	○	○	low	high	low	high	Device start
	○	●	low	high	low	low	Device start, alarm / output off, alarm
	●	○	high	high	low	high	Output on
		●	high	high	low	low	Output on, alarm
	☀ D = 50%	○	high	high	high	high	Output on, overload
		●	high	high	high	low	Output on, overload, alarm
	☀ D = 85%	○	low	high	low	high	Output off, remote contact connected to SGnd
		●	low	high	low	low	Output off, remote contact connected to SGnd, alarm
☀ D = 50%	○	○	low	low	low	high	Device start, input voltage too low / too high
		●	low	low	low	low	Device start, input voltage too low / too high, alarm

14.2 Signal outputs

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:

– Shutdown when overloaded
– Internal device error
– Impermissible device start

Possible alarms in the parallel system include:

– Impermissible settings in the devices
– No redundancy present (in general, the total load is too large)
– System error

AC OK

If the load is being supplied, the signal output is active (high 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 green LED.

Either the 120 V or 230 V LED lights up permanently (depending on the detected voltage range).

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

DC OK

If the input voltage is in the valid range, the signal output is active (closed). 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 green LED.

Either the 120 V or 230 V LED lights up permanently (depending on the detected voltage range).

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

P>Pn

If the output power exceeds the maximum permitted output power, the signal output is active (high 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 green LED.

Either the 120 V or 230 V LED flashes (depending on the detected voltage range).

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

Out 1

This output does not have a preset assignment.

A digital transistor output is available as a signal contact.

You can assign various information to this signal output using the POWER MANAGEMENT SUITE configuration software.

14.3 Signal inputs

Remote

You can use the Remote signal terminal to switch the inverter output on and off. For further information, refer to the “Remote device operation” section.

This signal is indicated visually by a green LED.

Either the 120 V or 230 V LED flashes (depending on the detected voltage range).

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.

Start 120 V / Start 230 V

You can use the Start 120 V or Start 230 V signal terminals to start the inverter.

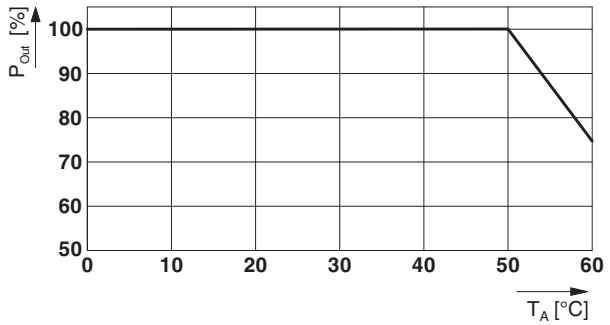
For further information on this, refer to the section: Device operation, Start 120 V / Start 230 V.

15 Derating

15.1 Ambient temperature

At an ambient temperature of up to 50°C, the inverter supplies continuous nominal power. When operating the inverter at an ambient temperature of >50°C, a power derating of 2.5%/K should be ensured.

Figure 23 Temperature-dependent derating



15.2 Installation height

The inverter can be operated at an installation altitude 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.

A power derating of 0.6%/100 m should be observed for installation heights between 2000 and 3000 m.

Figure 24 Altitude-dependent derating