



Installation and operation manual

Solar inverter M88H_121 (ST, product version J)



Europe



United Kingdom



This manual applies to the following inverter models:

- **M88H_121 (with AC and DC terminal block, Delta part number RPI883M121200, Product Version J)**

with firmware versions:

DSP: 1.36 / RED: 1.03 / COM: 1.18 or higher

The Delta part number can be found on the type plate of the inverter. The Product Version is shown by the last letters of the serial number, which is also located on the type plate. The firmware versions are listed on the display in the **Inverter Info** menu.

The Delta manuals undergo continuous revision in order to provide you with complete information regarding the installation and operation of our inverters. Therefore, before starting installation work, **always** consult www.solar-inverter.com to check whether a newer version of the Quick Installation Guide or of the comprehensive Installation and Operation Manual is available.

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This manual is intended for installers.

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All information and specifications can be modified without prior notice.

All translations of this manual not authorized by Delta Electronics (Netherlands) B.V. must include the annotation: "Translation of the original operation manual".

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1. About This Manual

1.1 Purpose of This Manual

This manual is part of the inverter and supports the installation, commissioning and operation of the inverter.

Read this manual **before** working on the inverter.

Always follow the safety instructions and work instructions in this manual. This will ensure that the inverter can be safely installed, commissioned and operated.

Store this manual in a safe place in the vicinity of the inverter so that it is always quickly available when working on the inverter.

Delta Electronics is not responsible for damage resulting from failure to follow the safety and operating instructions set out in this manual.

1.2 Target audience of this manual

This manual is intended for installers who are trained and approved for the installation, commissioning and operation of solar inverters in mains-connected solar systems.

1.3 How to use this manual

The structure of this manual, in addition to the symbols and text markings used, is described in the section **1. About This Manual**. This latter means that the contents are marked according to their meaning. Thus operations, names of buttons and display texts can be recognized even by their specific formatting.

The section **2. Basic safety instructions** identifies the safety risks associated with using the inverter. You **must** read this section in order to ensure safe handling of the installation, maintenance and operation of the inverter.

The purposes for which the inverter may be used are described in the section **3. Intended purpose**. This section also describes purposes for which the use of the inverter is not allowed, even though in some cases they are similar to the purposes for which the inverter may be used.

The section **4. Product overview** gives a brief description of the position and use of the most important components of the inverter. In section you will see for instance where the cables for the mains and the solar modules are connected.

The section **5. Planning the installation** describes the planning of the installation and contains information about effective preparations for installation of the inverter and avoiding delays in its installation. This includes where necessary descriptions of the operating behavior of the inverter. In this section you will learn for instance what you must consider in selecting, calculating and laying the cables.

The section **6. Installing the inverter** gives detailed step-by-step instructions. This section contains a description, for example, of how the sequence of work steps for connecting the cables is organized and how you can perform these steps directly. So that this proceeds smoothly, you must first read the section **4. Product overview** and **5. Planning the installation** to ensure you have prepared everything.

The section **7. Commissioning** describes exclusively the commissioning procedure on the display which starts automatically as soon as the inverter is supplied with power for the first time.

All other setting options are listed in the section **8. Settings**. This section describes only the settings that can be changed directly on the display. Setting options for performance by Delta Service Software are on the other hand not described.

The section **9. Measurements and statistics** describes how measured values and statistics can be called up on to the display, and what the information displayed means.

Possible faults for which the cause and measures for rectification are listed in the section **10. Error events and troubleshooting**. Follow the instructions without fail. Do not attempt yourself to remedy faults that are marked "Contact Delta Support".

Maintenance work that you can perform yourself are described in the section **11. Maintenance**. All other maintenance work may be performed only after consultation with Delta Customer Service.

Section **12. Replacing the inverter** guides you step-by-step through the work steps for the replacement of the complete inverter or of the power module.

If you wish to take the inverter out of operation and put it into storage, you will find all the necessary information for doing so in section **13. Decommissioning**.

A list of the most important technical data can be found in the **14. Technical data** section. If you require technical values over and above this, please contact Delta Customer Service.

1 About This Manual

Warning notices and warning symbols

1.4 Warning notices and warning symbols

This manual uses the following warning notices and symbols for describing potential dangers and the measures necessary for reducing these dangers.

Always follow the instructions in the warning notices.

Warning levels

 **DANGER**
Indicates a dangerous situation that will **always** lead to death or severe injuries if not avoided.

 **WARNING**
Indicates a dangerous situation that **can lead** to death or severe injuries if not avoided.

 **CAUTION**
Indicates a dangerous situation that **can lead** to light or medium injuries if not avoided.

 **NOTICE**
Indicates possible **material damage** that can be caused to other objects by the inverter.

 A note provides information on efficient use of the inverter.

If necessary, the warning labels are also marked with warning symbols indicating the source of the danger.



High electrical voltages or currents



Hot surfaces



Heavy weight



General danger

1.5 Writing and labeling conventions

Some sections in this manual are specially labeled.

Labeling of work instructions

Work instructions that must be performed in a specific sequence are numbered accordingly. Numbered sequences of work steps must **always** be performed in the specified sequence.

1. First step
 - Where necessary, the result of the work step is described here. This is used for checking that the work step has been completed correctly.
2. Second step
3. Third step
 - Work step is now finished.

If the work instructions consist of only a single step or the work steps can be performed in any desired sequence then the work steps are labeled as follows:

- ▶ Step
- ▶ Step

Labeling of inverter components

Buttons



Text on the inverter display

Inverter info.

LEDs

ALARM LED

LED	Meaning
	LED stays on.
	LED flashes.
	LED is off.

2. Basic safety instructions

DANGER



Electric shock

Potentially fatal voltages are present at the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 100 seconds.

Therefore, always carry out the following steps before working on the inverter:

1. Disconnect the inverter from all AC and DC voltage sources and make sure that none of the connections can be accidentally restored. How you are to proceed thereby is described in the respective work instructions.
2. Wait at least 100 seconds until the internal capacitors have discharged.

DANGER



Electric shock

Potentially fatal voltages are present at the inverter DC connections. When light falls on the solar modules, they immediately start to generate electricity. This also happens when light does not fall directly on the solar modules.

- ▶ Never disconnect the inverter from the solar modules when it is under load.
- ▶ Disconnect the connection to the mains so that the inverter cannot supply energy to the mains.
- ▶ Disconnect the inverter from all AC and DC voltage sources. Ensure that none of the connections can be restored accidentally.
- ▶ Ensure that the DC cables cannot be touched accidentally.

WARNING



Electric shock

When the cover is removed from the wiring box, this exposes voltage-carrying parts and protection conforming to IP65 is no longer guaranteed.

- ▶ Remove the cover only when absolutely necessary.
- ▶ Do not remove the cover if water or dirt might enter the inverter.
- ▶ After work is completed, ensure that the cover is properly replaced and screwed in. Check that the cover is properly sealed.

NOTICE



Incorrectly dimensioned solar system.

An solar system of the wrong size may cause damage to the inverter.

- ▶ When calculating the module string, always pay attention to technical data of the inverter (input voltage range, maximum current and maximum input power), see chapter "Technical Data".

- To comply with the IEC 62109-5.3.3 safety requirements and avoid injury or material damage, the inverter must be installed and operated in accordance with the safety and operating instructions set out in this manual. Delta Electronics is not responsible for damage resulting from failure to follow the safety and operating instructions set out in this manual.
- The inverter may be installed and commissioned only by installers who have been trained and certified for the installation and operation of mains-based solar inverters.
- All repair work on the inverter must be carried out by Delta Electronics. Otherwise, the warranty will be void.
- Warning instructions and warning symbols attached to the inverter by Delta Electronics must not be removed.
- The inverter has a high leakage current value. The grounding cable **must** be connected before commencing operation.
- Do not disconnect any cables while the inverter is under load due to risk of a fault arc.
- To prevent damage due to lightning strikes, follow the provisions that apply in your country.
- The surface of the inverter can get very hot during operation. Wear safety gloves when you touch the inverter (apart from at the display).
- The inverter is very heavy. For hoisting and moving, use a mechanical lifting device (e.g. crane or block and tackle). At least three persons are required for manual hoisting and moving.
- Only equipment in accordance with SELV (EN 60950) may be connected to the RS485 interfaces.
- All connections must be sufficiently insulated in order to ensure the IP65 degree of protection. Unused connections must be closed using cover caps.

3 Intended purpose

3. Intended purpose

The inverter may be used only for the specified intended purpose.

The intended purpose of the inverter is defined as follows:

- Use in stationary solar systems that are connected to the public mains. For conversion of the DC power that is generated by the solar modules of the solar system into AC power which is fed into the local power mains.
- Use in conformity with the power specifications and environmental conditions specified by the manufacturer.

The following uses are regarded as not for the intended purposes:

- Use in stand-alone mode, i.e. without a connection to the public mains. The inverter has functions for preventing operating in stand-alone mode.
- Use in mobile solar systems.

4. Product overview

4.1 Scope of supply



Check the delivery for completeness and all components for damage before starting installation work.

Do not use any damaged components.

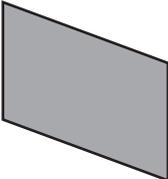


Keep the packaging.

Part	Description	Part	Description
M88H_121 inverter with wiring box	1 	Mounting plate	1 
	For closing the upper cable feed-throughs on the junction box when the power module is removed. The cover caps are fitted to the mounting plate.		
Cover caps	2 		1 
	For feeding the AC cable into the junction box		For grounding the inverter housing; with spring washer, washer and toothed lock washer; mounted on the inverter.
Cable gland for AC feed-through	1 	M6 grounding screw	1 
	For feeding the DC cable into the junction box		For covering the air inlets and preventing the entry of small animals.
Cable gland for DC feed-through	2 	Screening plate for the lateral air inlet	2 

4 Product overview

Scope of supply

Part	Description	Part	Description
Cable gland for the communication connection	1 For fastening the communication cables to the junction box 	Quick installation guide and basic safety instructions	1  <small>Installationskurzanleitung</small> <small>Handbuch M88H_121 (ST)</small> 
M6 mounting screw	4 For fastening the wiring box to the mounting plate; with spring washer and washer 	Display cover	1 To protect the display against damage 

4.2 Overview of components and connections

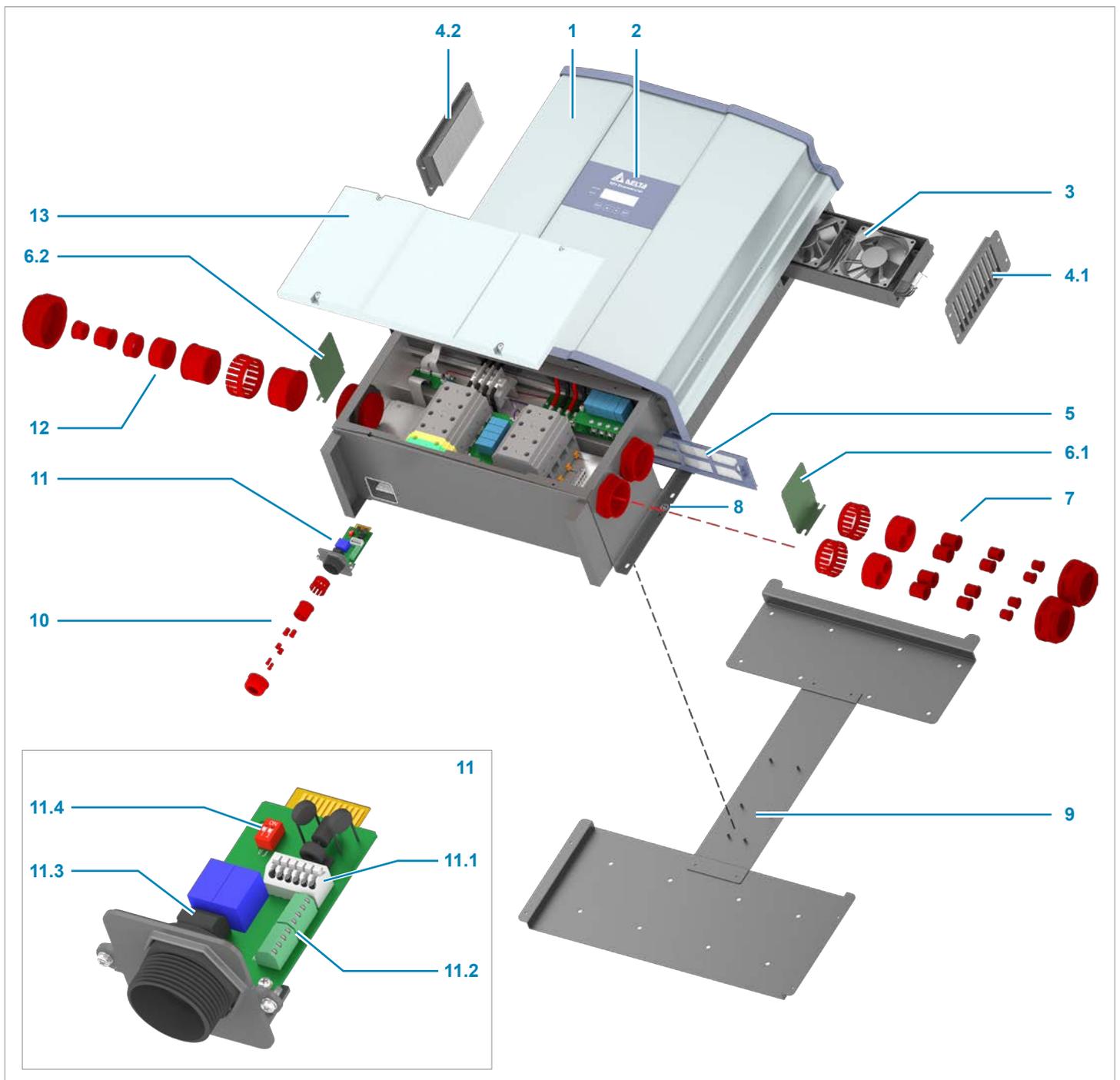


Fig. 4.1: Overview of components and connections

- | | | | |
|------|---|----|--|
| 1 | Power module | 8 | Grounding connection |
| 2 | Display, buttons, and LED | 9 | Mounting plate |
| 3 | Fan module | 10 | Cable gland for the communication connection |
| 4 | Filter for air outlet (2x) | 11 | Communication card |
| 5 | Filter for air inlet | 12 | AC cable gland |
| 6 | Cover panel for the air inlet (2x) | 13 | Cover panel for the wiring box |
| 7 | DC cable gland (2x) | | |
| 11.1 | RS485 connection | | |
| 11.2 | Digital inputs | | |
| 11.3 | Dry contacts | | |
| 11.4 | DIP switch for VCC and RS485 termination resistor | | |

4 Product overview

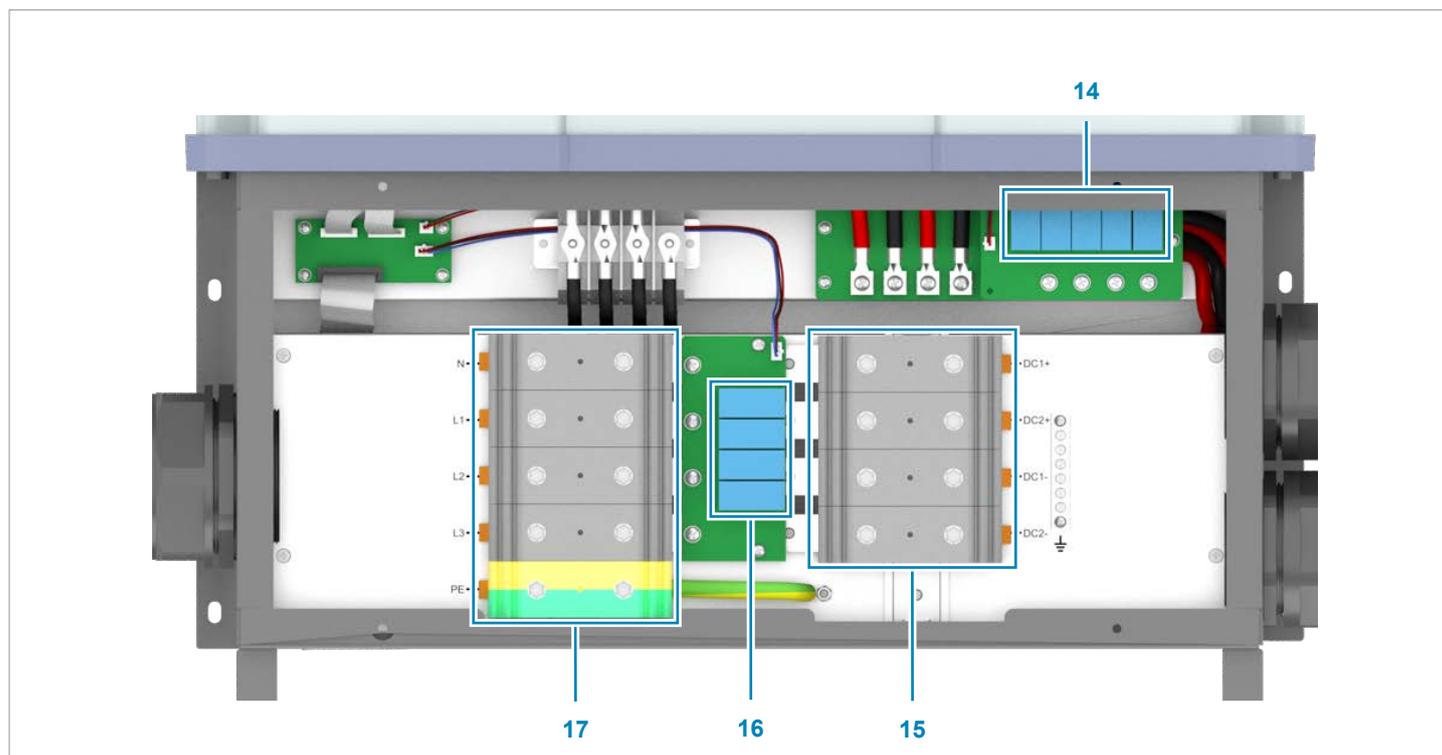


Fig. 4.2: Overview of components in the junction box

14 DC surge protection devices

16 AC surge protection devices

15 DC terminal block

17 AC terminal block

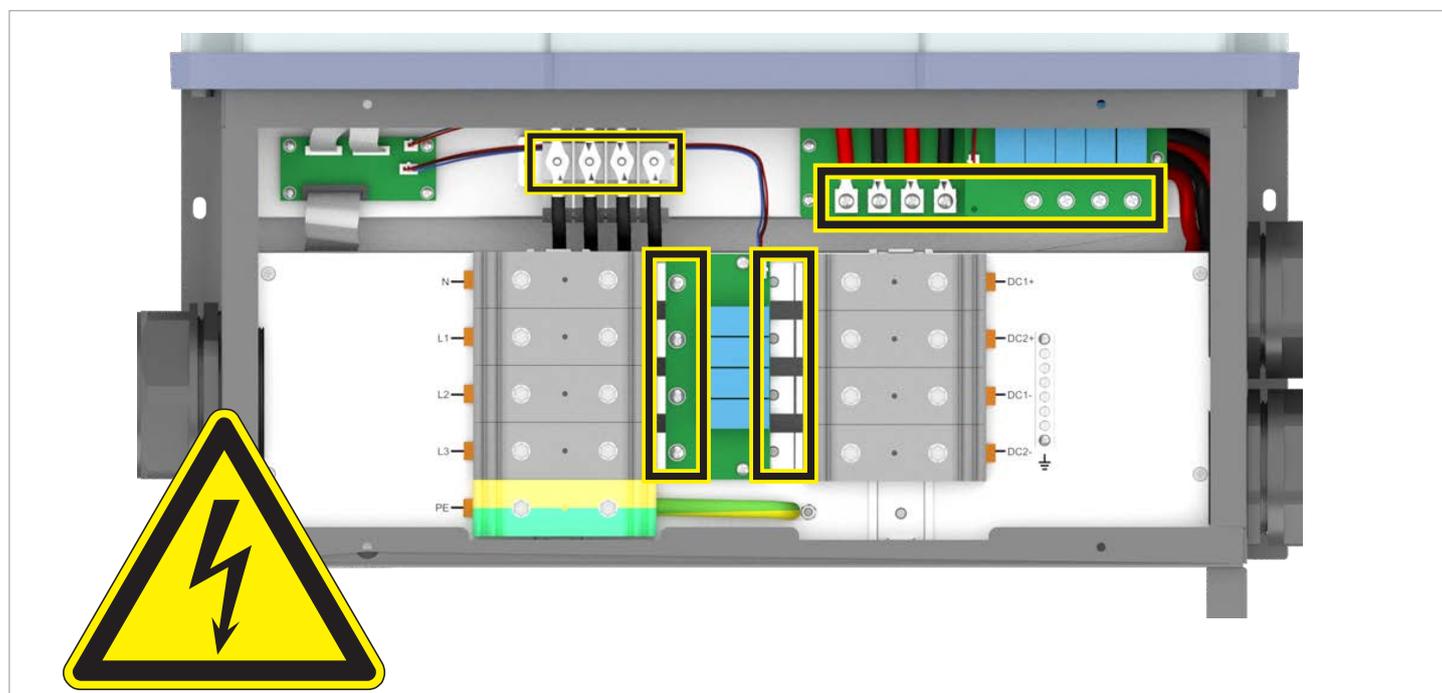


Fig. 4.3: Hazard zones with potentially life-threatening currents and voltages

! DANGER



Electric shock

The insulation plate in the interior of the terminal box does **not** have to be removed for cabling work. All connections are accessible, even when the insulation plate is installed.

4.3 Display, buttons, status LEDs

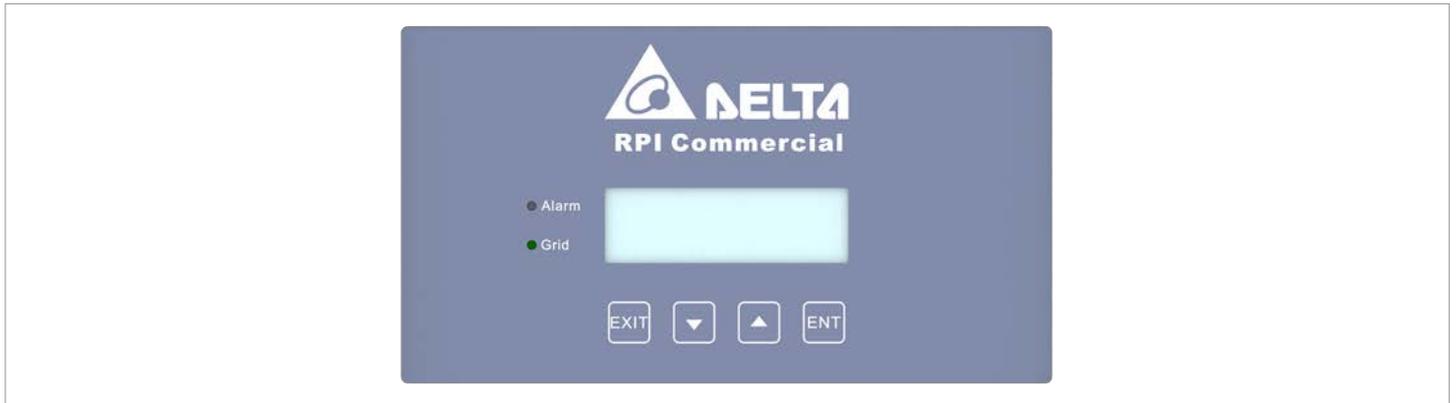


Fig. 4.4: Overview of display, buttons, and status LEDs

Label	Designation	Use
Status LEDs		
GRID	Mains	Green LED; lights up when the inverter is supplying power to the mains.
ALARM	Alarm	Red LED; displays a warning, an error or a fault.
Buttons		
	Exit	Exit the current menu. Cancel the setting for a parameter. Changes are not applied.
	Down	Move downwards in the menu. Reduce the value of a configurable parameter.
	Up	Move upwards in the menu. Increase the value of a configurable parameter.
	Enter	Select menu item. Open a configurable parameter for editing. Cancel the setting for a parameter. Changes are adopted.

4 Product overview

DC-side components

4.4 DC-side components

The solar modules are connected to the inverter via the DC-side components.

4.4.1 DC cable feed-throughs

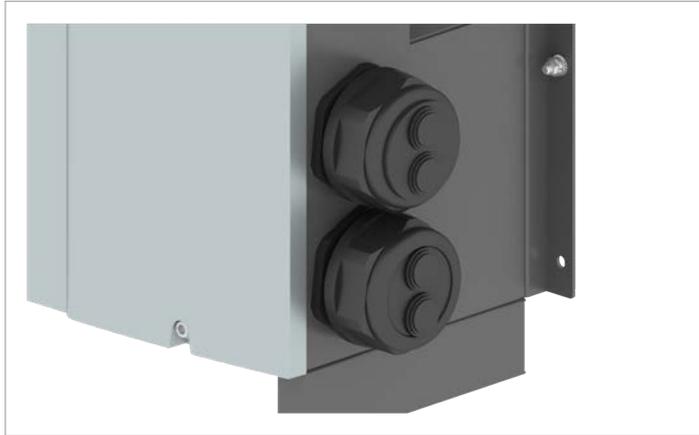


Fig. 4.5: Position of the DC cable feed-throughs

The inverter has 2 DC cable glands with 2 cable feed-throughs each.

Min./max. Cable diameter 12.4 ... 25.7 mm

4.4.2 DC terminal block

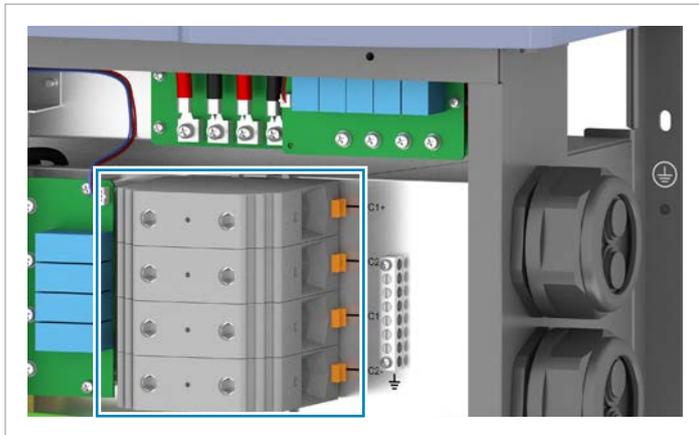


Fig. 4.6: Position of the DC terminal block

Two solar module strings can be connected to the DC terminal block.

Type	Phoenix Contact UKH 150
Min./max. Wire cross-section	
• Copper (rigid)	35 ... 150 mm ²
• copper (flexible)	50 ... 150 mm ²
• aluminum	120 / 150 mm ² (sector-shaped, single conductor);
	other cross-sections can be used only with Al-Cu crimp connectors

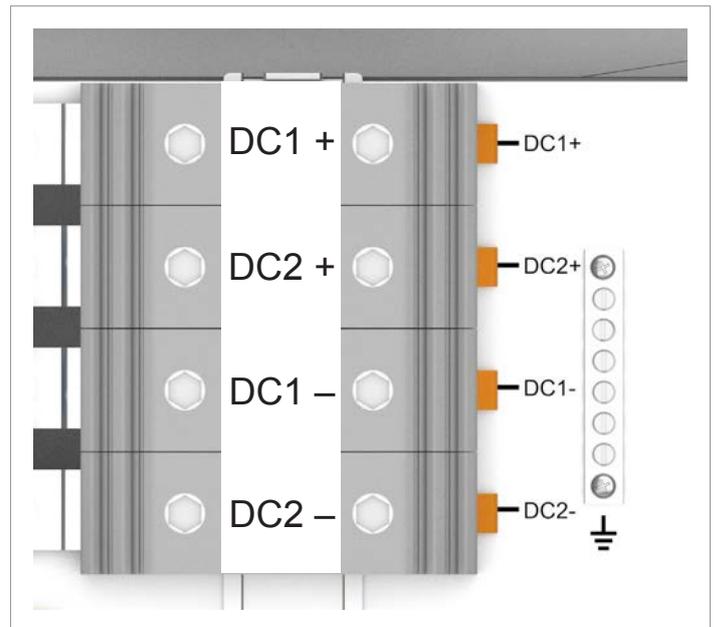


Fig. 4.7: Pin assignment for the DC terminal block

4.4.3 DC surge protection devices



Fig. 4.8: Position of the DC surge protection devices

The inverter is equipped with exchangeable surge protection devices type 2 on the DC side. The surge protection devices protect the inverter from excessively high voltages.

Manufacturer	Sichuan Zhongguang Lightning Protection Technologies Co., Ltd
Type	Type 2 OCM as per EN 50539-11
Current I_n	10 kA (8/20 μ s)
Current I_{max}	20 kA (8/20 μ s)
Voltage U_p	1,175 V _{DC}
	895 V _{AC,RMS}

4.5 AC-side components

The inverter is connected to the public mains via the AC-side components.

4.5.1 AC cable feed-through

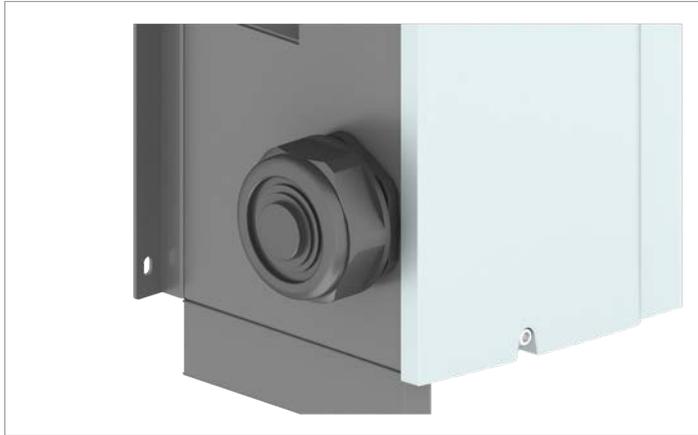


Fig. 4.9: Position of the AC cable feed-through

The inverter has 1 AC cable gland with 1 cable feed-through. The M88H_121 is shipped with two different AC cable glands. These are designed for different cable diameters. If the AC cable gland that was delivered with your inverter does not match the cable diameter that you are using, you can order a new AC cable gland from Delta.

Min./max. Cable diameter:

Variant A	39.8 ... 65.8 mm
Variant B	23.9 ... 65.9 mm

4.5.2 AC terminal block

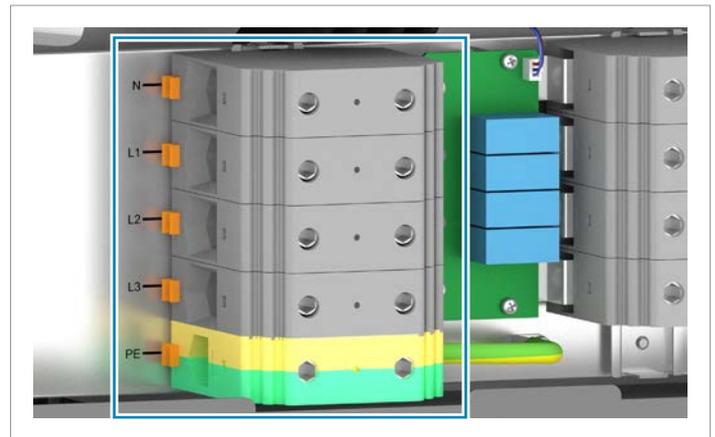


Fig. 4.10: Position of the AC terminal block

A three-phase with or without a neutral conductor can be connected to the AC terminal block.

Type	Phoenix Contact UKH 150
Min./max. Wire cross-section	
• Copper (rigid)	35 ... 150 mm ²
• copper (flexible)	50 ... 150 mm ²
• aluminum	120 / 150 mm ² (sector-shaped, single conductor);
	other cross-sections can be used only with Al-Cu crimp connectors

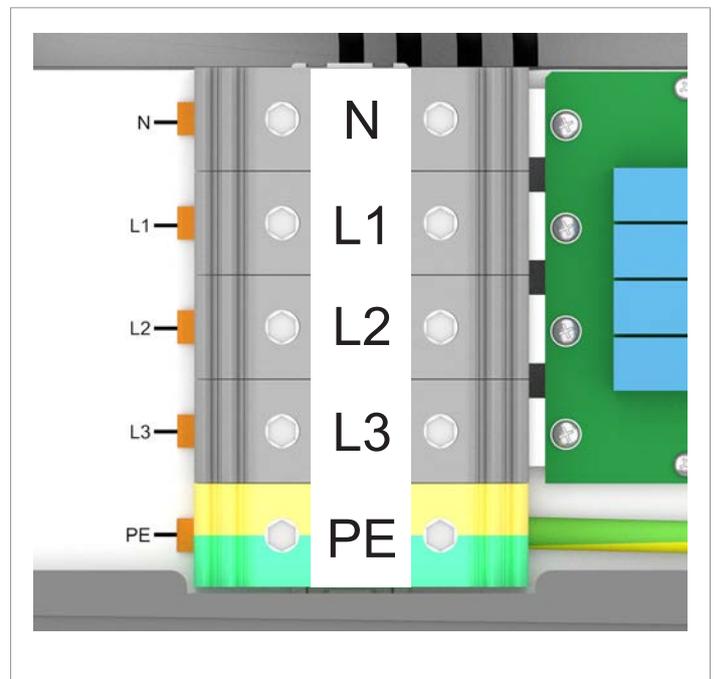


Fig. 4.11: Phase assignment at the AC terminal block

4 Product overview

Communication connection

4.5.3 AC surge protection devices

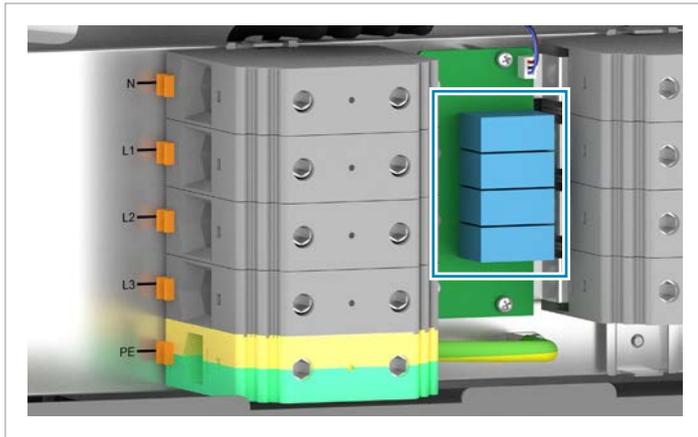


Fig. 4.12: Position of the AC surge protection devices

The inverter is equipped with exchangeable surge protection devices type 2 on the AC side. The surge protection devices protect the inverter from excessively high voltages.

Manufacturer	Sichuan Zhongguang Lightning Protection Technologies Co., Ltd
Type	Type 2 OCM as per EN 50539-11
Current I_n	10 kA (8/20 μ s)
Current I_{max}	20 kA (8/20 μ s)
Voltage U_p	1,175 V _{DC}
	895 V _{AC RMS}

4.6 Communication connection

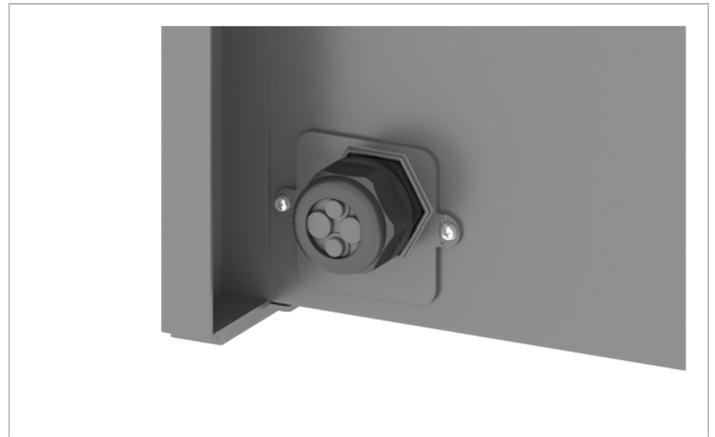


Fig. 4.13: Position of the communications connection

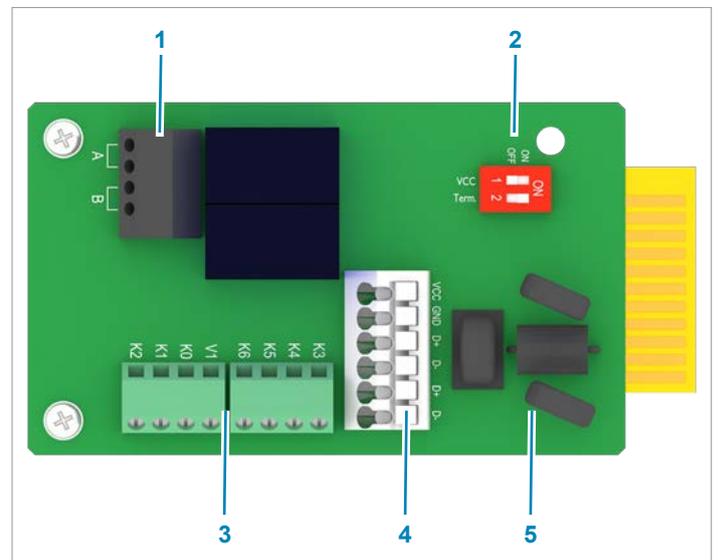


Fig. 4.14: Components of the communications card

- 1 Dry contacts (terminal block)
- 2 DIP switch for the RS485 termination resistor
- 3 Digital inputs and external power-off (terminal block)
- 4 RS485 and VCC (terminal block)
- 5 Protection against electromagnetic interference (EMI)

The inverter has 1 cable gland for the communications connection with the following cable feed-throughs:

- 2 cable feed-throughs for 10 mm cable diameter
- 2 cable feed-throughs for 7.2 mm and 8.7 mm cable diameter (for 8.7 mm cable diameter the small rubber insert must be removed)

Available connections

Connection
2x RS485 (DATA+ and DATA-)
1x VCC (12 V, 0.5 A)
6x digital inlets (for instance for connecting a ripple control receiver)
2x dry contacts (for instance for connecting an alarm unit)
1x external power-off (EPO)

4.7 Grounding connection



Fig. 4.15: Position of the grounding connection on the inverter

The inverter housing is grounded via the grounding connection. M6 screw, spring washer, washer, and toothed lock washer are already mounted on the inverter.

4.8 Cooling system

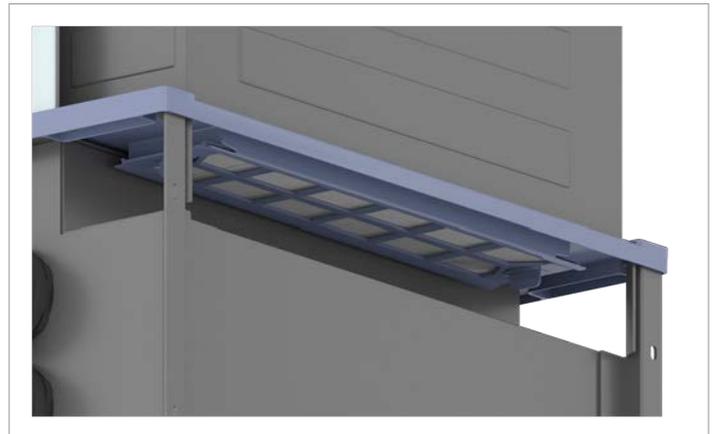


Fig. 4.16: Position of the air inlet

Ambient air is sucked into the air inlet by the fans, passed through the inverter for cooling and the heated air is then expelled to the environment via the air outlets.



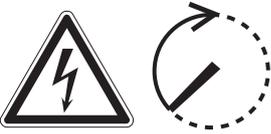
Fig. 4.17: Position of the air outlets and the fan module

There is one air outlet located at the top of each of the left and right sides. The fan module must be pulled out to the right.

4 Product overview

Information on the type plate

4.9 Information on the type plate

Information on the type plate	Description
	This inverter does not contain a transformer.
 100 seconds	Danger to life through electric shock Potentially fatal voltage exists within the inverter during operation. This voltage persists even 100 seconds after disconnection of the all the voltage sources.
	Before working on the inverter, read the supplied manual and follow the instructions contained therein.
	The housing of the inverter must be grounded if this is required by local regulations.
	CE mark. By applying this mark, Delta declares that the inverter satisfies the provisions of the applicable EU directives.
	WEEE mark The inverter must not be disposed of as standard household waste, but in accordance with the applicable electronic waste disposal regulations of your country or region.
	This regulatory symbol does not apply to the EU because the noise level lies below the EU guidelines (see “14. Technical data”, page 228).
Solar Inverter	This is a solar inverter.
Model: M88H_121	Delta model name
DC input	
200~1000 V DC	DC input voltage range
MPPT 600-800 V DC	MPP input voltage range for the rated DC power (symmetrical arrangement of the DC inputs)
1000 V DC max	Maximum DC input voltage
70 A*2 max	Maximum DC input current (70A at DC1 and DC2 respectively)
I _{sc} : 90A*2 max	Maximum DC short-circuit current I _{sc} (90A at DC1 and DC2 respectively)
AC output	
230/400, 277/480 V AC	AC nominal voltage
3P3W or 3P4W	The inverter can be connected to 3-phase grids without neutral conductors (3P3W, 3 phases + PE) and 3-phase grids with neutral conductors (3P4W, 3 phases + N + PE).
50/60 Hz	AC nominal frequency
106 A max	Maximum AC current
cosφ 0.8 ind ~ 0.8 cap	Setting range of the displacement factor cos φ
400 V AC: 66 kW/66 kV A nom, 73 kW/73 kV A max	Rated active power/rated apparent power, maximum active power/maximum apparent power at AC rated voltage = 400V _{AC}

4 Product overview

Information on the type plate

Information on the type plate	Description
480 V AC: 80 kW/80 kV A nom, 88 kW/88 kV A max	Rated active power/rated apparent power, maximum active power/maximum apparent power at AC rated voltage = $480 V_{AC}$
Further information	
IP code: IP65 (electronics)	Degree of protection for the internal electronics as per EN 60529
Protective Class I	Safety class as per EN 61140
Over Voltage Category: AC: III / DC: II	AC and DC overvoltage category as per IEC 62109-1
Authorized representative	Authorized representative for this product in the EU:
Delta Electronics (Netherlands) B.V.	Delta Electronics (Netherlands) B.V.
Zandsteen 15, 2132 MZ Hoofdorpp	Zandsteen 15
The Netherlands	2132 MZ Hoofddorp
	Netherlands

5 Planning the installation

Installation location

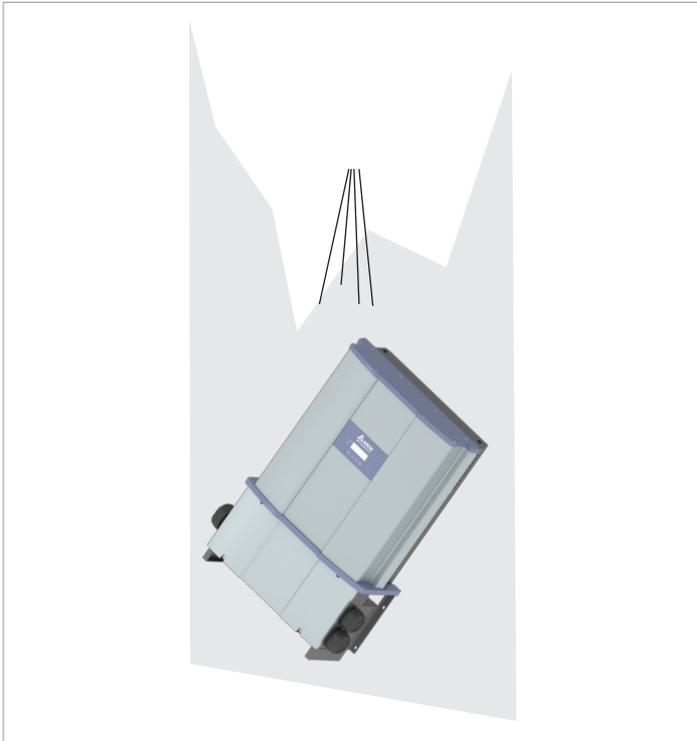
5. Planning the installation



This chapter describes only **planning** of the installation work. The **execution** of the installation work and the associated dangers are described in "6. Installing the inverter", page 57.

5.1 Installation location

5.1.1 Requirements for the wall and mounting system



- ▶ The inverter is very heavy. The wall and mounting system must be able to bear the heavy weight of the inverter.
- ▶ Always use the mounting plate supplied with the inverter.

- ▶ Use mounting materials (dowels, screws etc.) that are suitable for the wall or the mounting system, as well as the heavy weight of the inverter.
- ▶ Mount the inverter on a vibration-free wall to avoid malfunctions.
- ▶ When using the inverter in residential areas or in buildings with animals, possible noise emissions can be disturbing. Therefore, carefully choose the place of installation.
- ▶ Mount the inverter on a fireproof wall.

5.1.2 Installation height

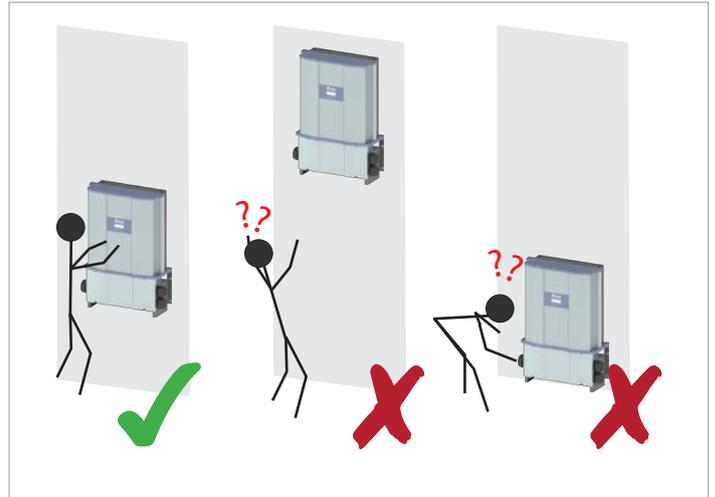


Fig. 5.18: Installation height - the display must be legible and accessible for operation

- ▶ Attach the inverter so that the information on the display can be read and the buttons can be operated without any problems.

5.1.3 Installation position

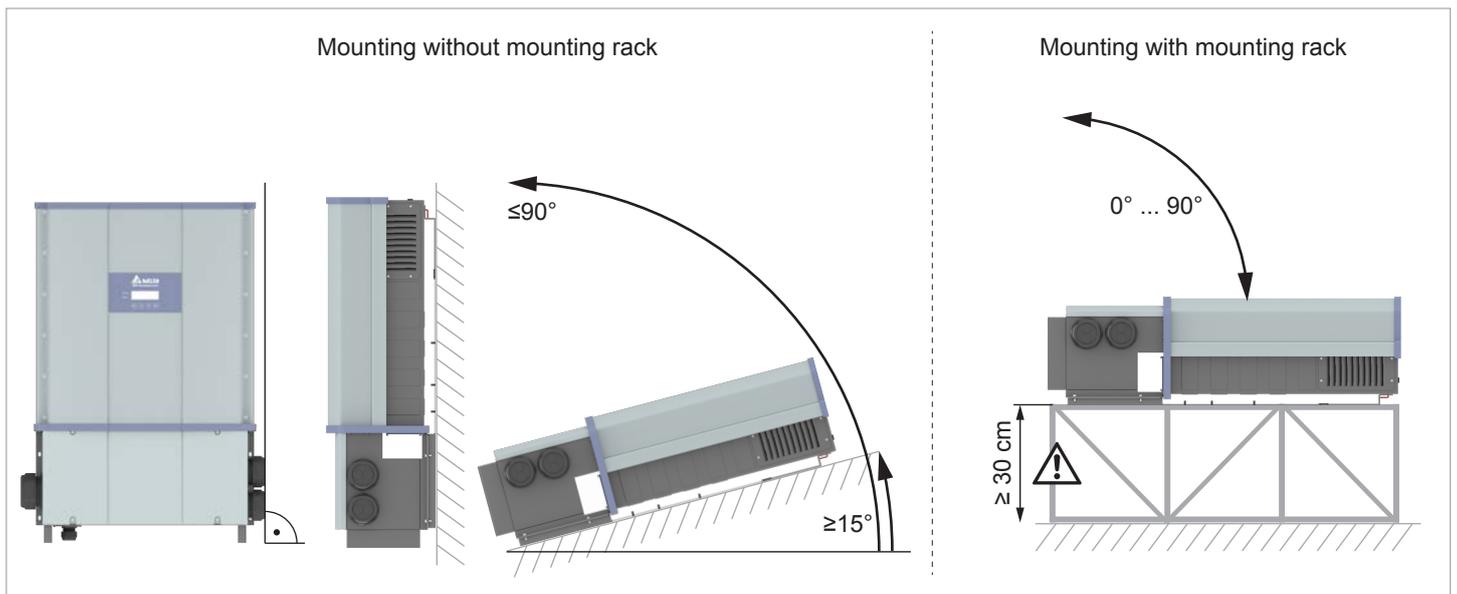


Fig. 5.19: Installation positions

Mount the inverter exclusively in the installation positions shown in “Fig. 5.19: Installation positions”, page 23.

5 Planning the installation

Installation location

5.1.4 Outdoor installations

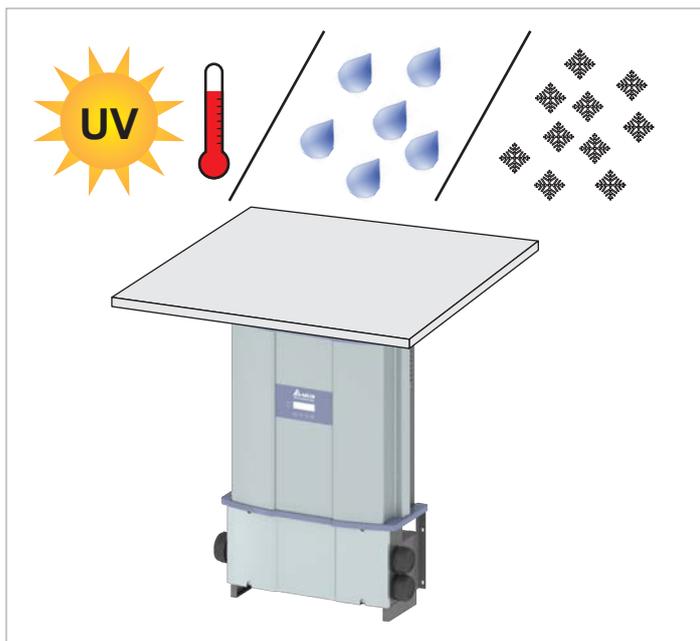


Fig. 5.20: For outdoor installations, protect the inverter against sun, rain, snow and direct UV radiation

The inverter has a protection degree of IP65 and can be installed indoors and outdoors. Nevertheless the inverter should be protected by a roof against direct UV radiation, solar radiation, rain and snow.

For example, the power of the inverter will be reduced if it is too heavily heated by solar radiation. This is normal operating behavior for the inverter and is necessary to protect the internal electronics.

5.2 Installation clearances and air circulation

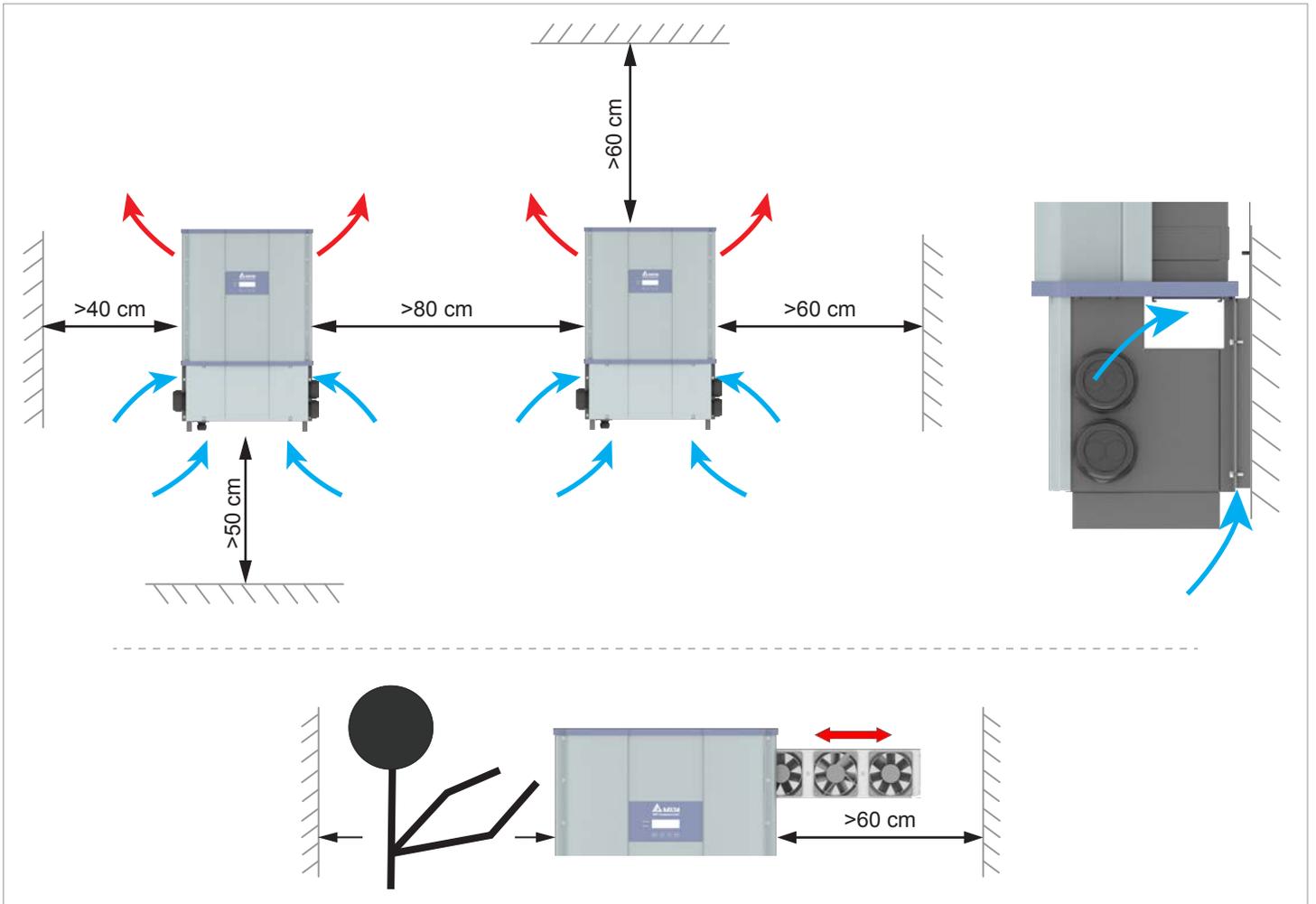


Fig. 5.21: Installation clearances and air circulation

- ▶ Ensure sufficient air circulation. Hot air must be able to dissipate upwards. Leave enough space around each inverter.
- ▶ Do not install inverters above one another so that they do not heat each other.
- ▶ Note the *Operating temperature range without derating* and the *Operating temperature range*.

When the *Operating temperature range without derating* is exceeded the inverter reduces the AC power fed into the mains.

When the *Operating temperature range* is exceeded the inverter stops feeding AC power into the mains.

This is normal operating behavior for the inverter and is necessary to protect the internal electronics.

- ▶ In areas with many trees or fields, pollen and other parts of plants can clog the air inlets and air outlets, obstructing the air flow.

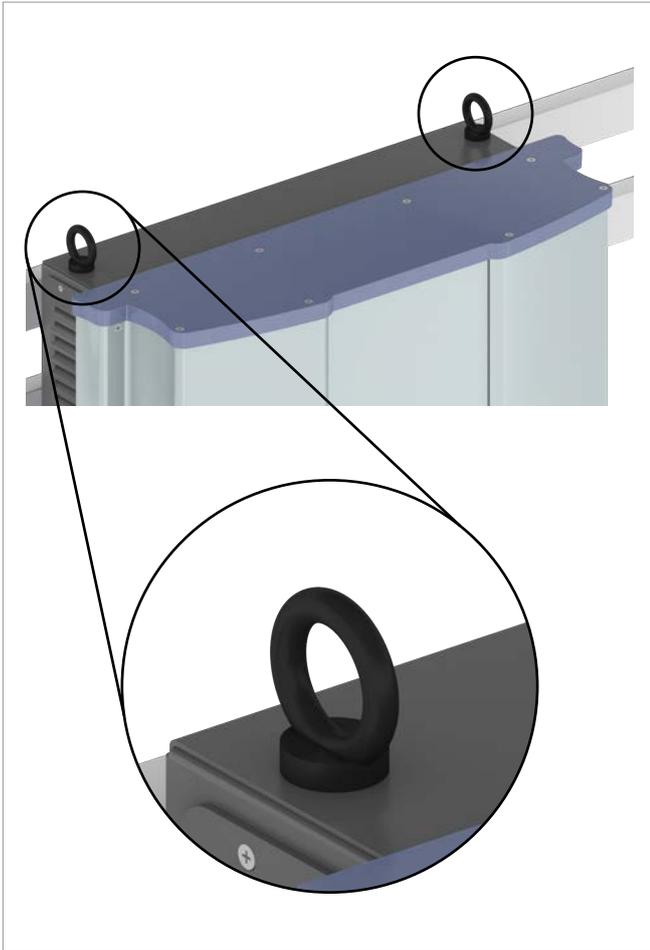
If this is the case, clean the air filter regularly, see Chapter "11. Maintenance", page 162.

5 Planning the installation

Lifting and transporting the inverter

5.3 Lifting and transporting the inverter

- ▶ Screw eyebolts onto the upper side of the inverter. The screw eyebolts are not included in the scope of delivery.



- ▶ Lift the inverter with a block and tackle or crane.



5.4 Characteristic curves

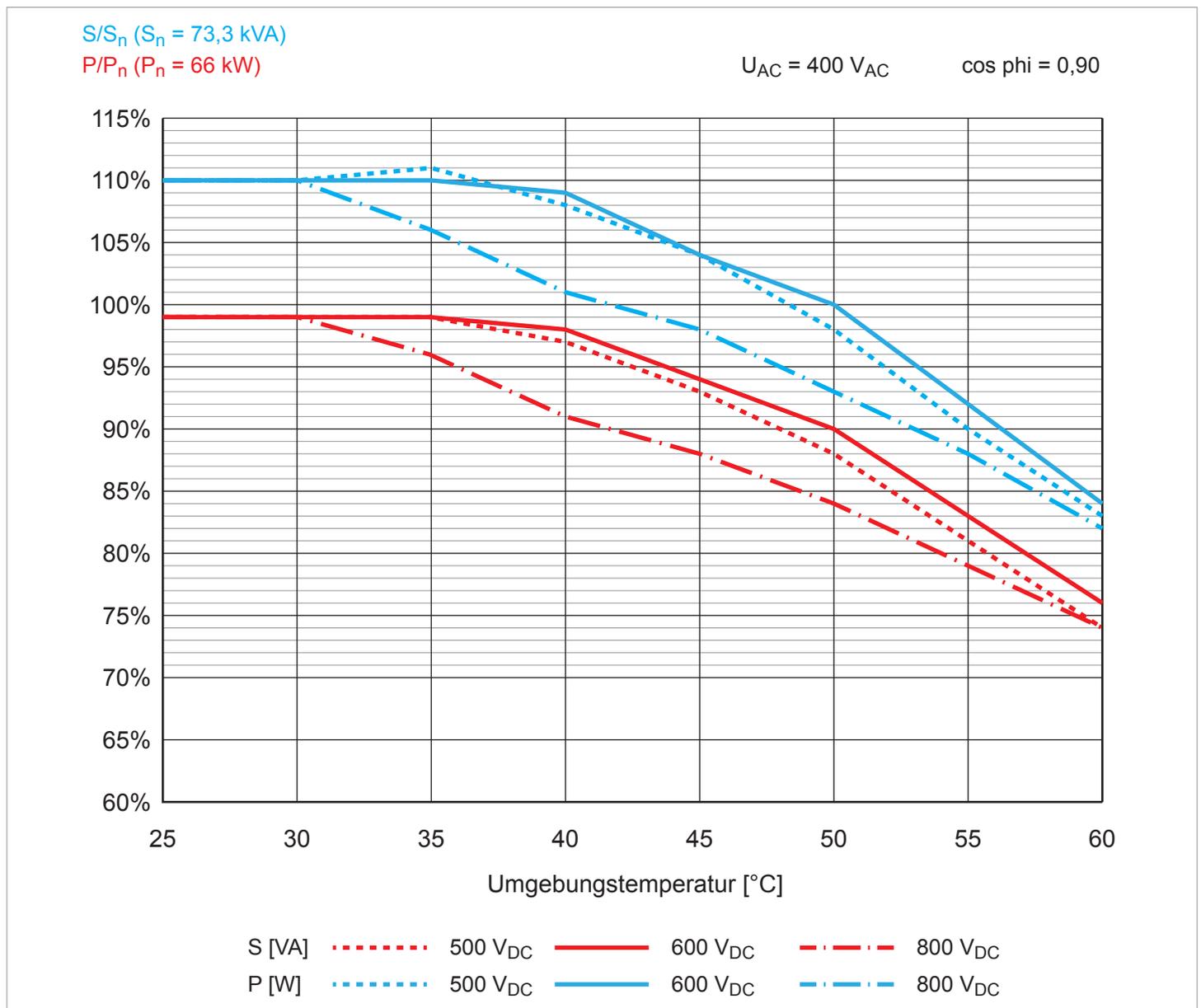


Fig. 5.22: Characteristic curve "Power derating depending on the ambient temperature, $\cos \phi = 0,90$, AC voltage = 400 V_{AC} "

5 Planning the installation

Characteristic curves

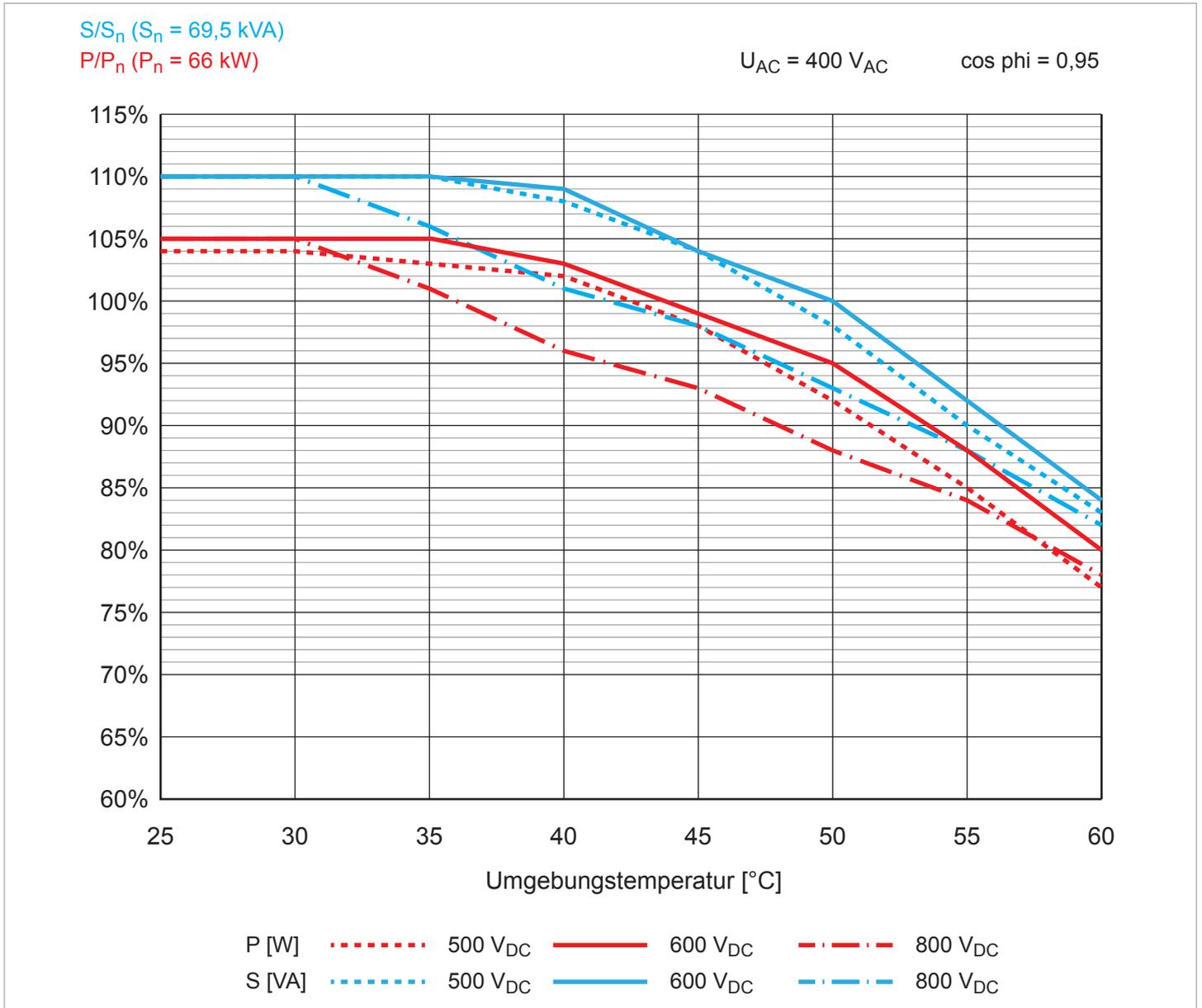


Fig. 5.23: Characteristic curve "Power derating depending on the ambient temperature, $\cos \phi = 0,95$, AC voltage = 400 V_{AC} "

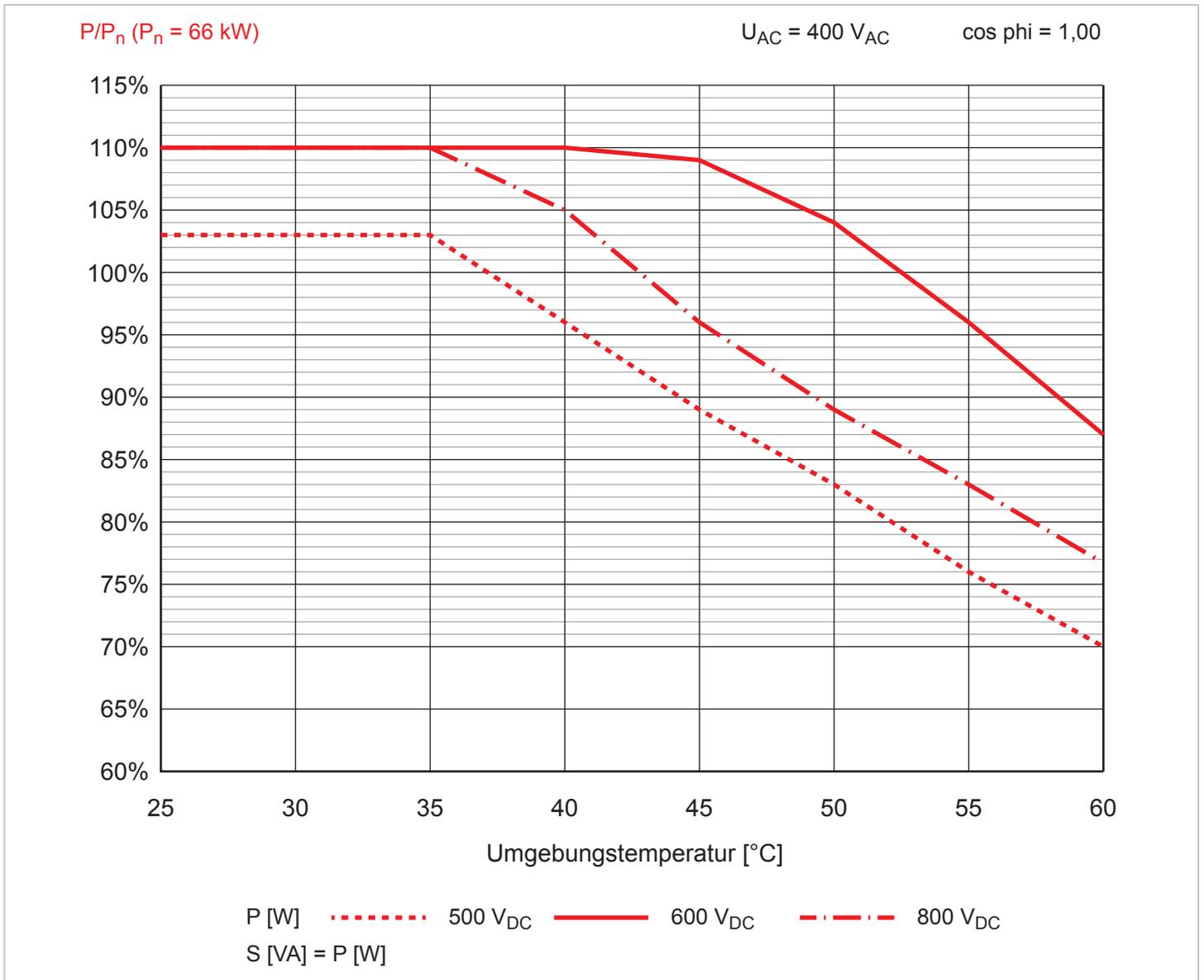


Fig. 5.24: Characteristic curve "Power derating depending on the ambient temperature, $\cos \phi = 1,0$, AC voltage = 400 V_{AC} "

5 Planning the installation

Characteristic curves

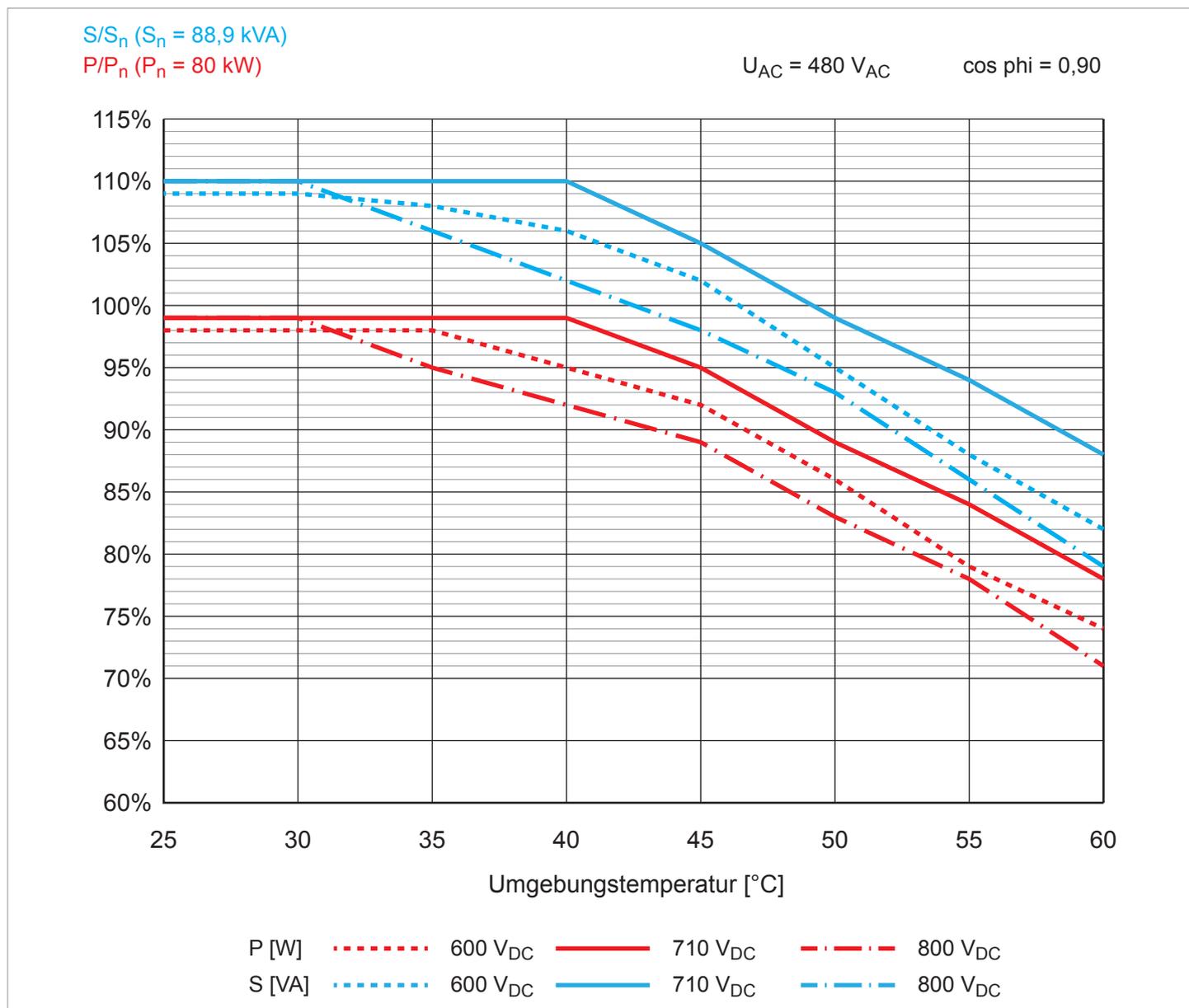


Fig. 5.25: Characteristic curve "Power derating depending on the ambient temperature, $\cos \phi = 0,90$, AC voltage = 480 V_{AC} "

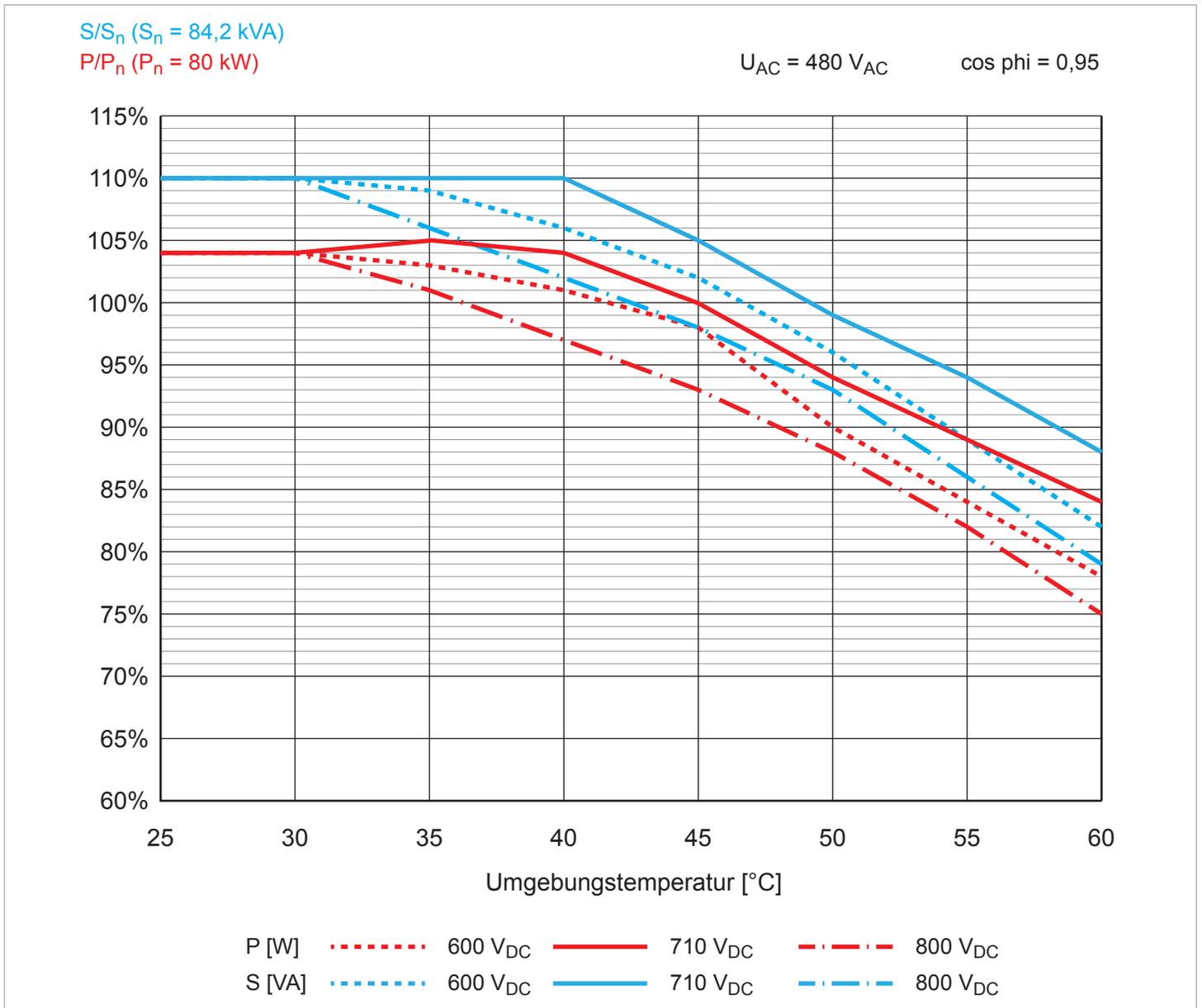


Fig. 5.26: Characteristic curve "Power derating depending on the ambient temperature, $\cos \phi = 0,95$, AC voltage = 480 V_{AC} "

5 Planning the installation

Characteristic curves

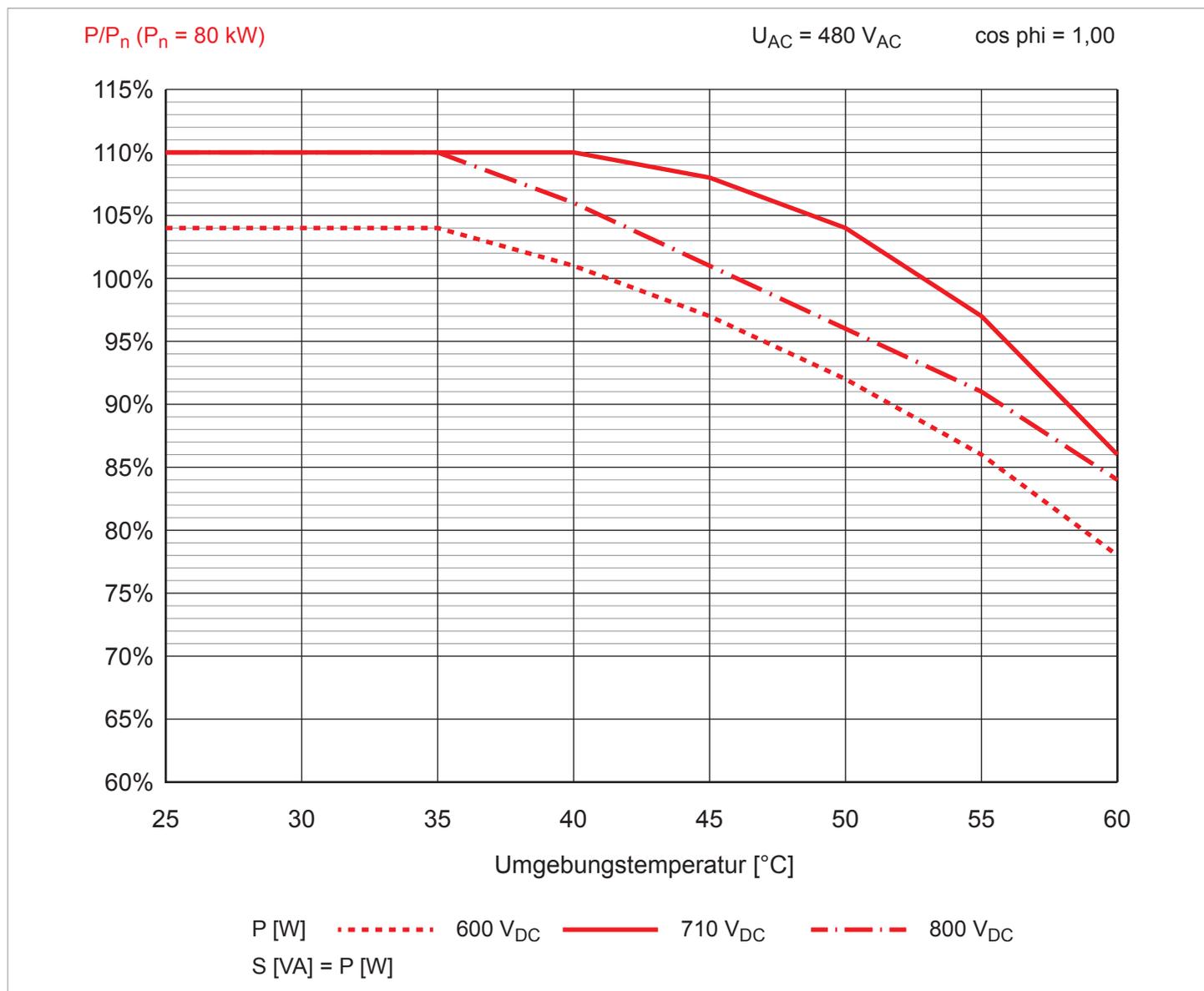


Fig. 5.27: Characteristic curve "Power derating depending on the ambient temperature, $\cos \phi = 1,0$, AC voltage = 480 V_{AC} "

5.5 Dimensions

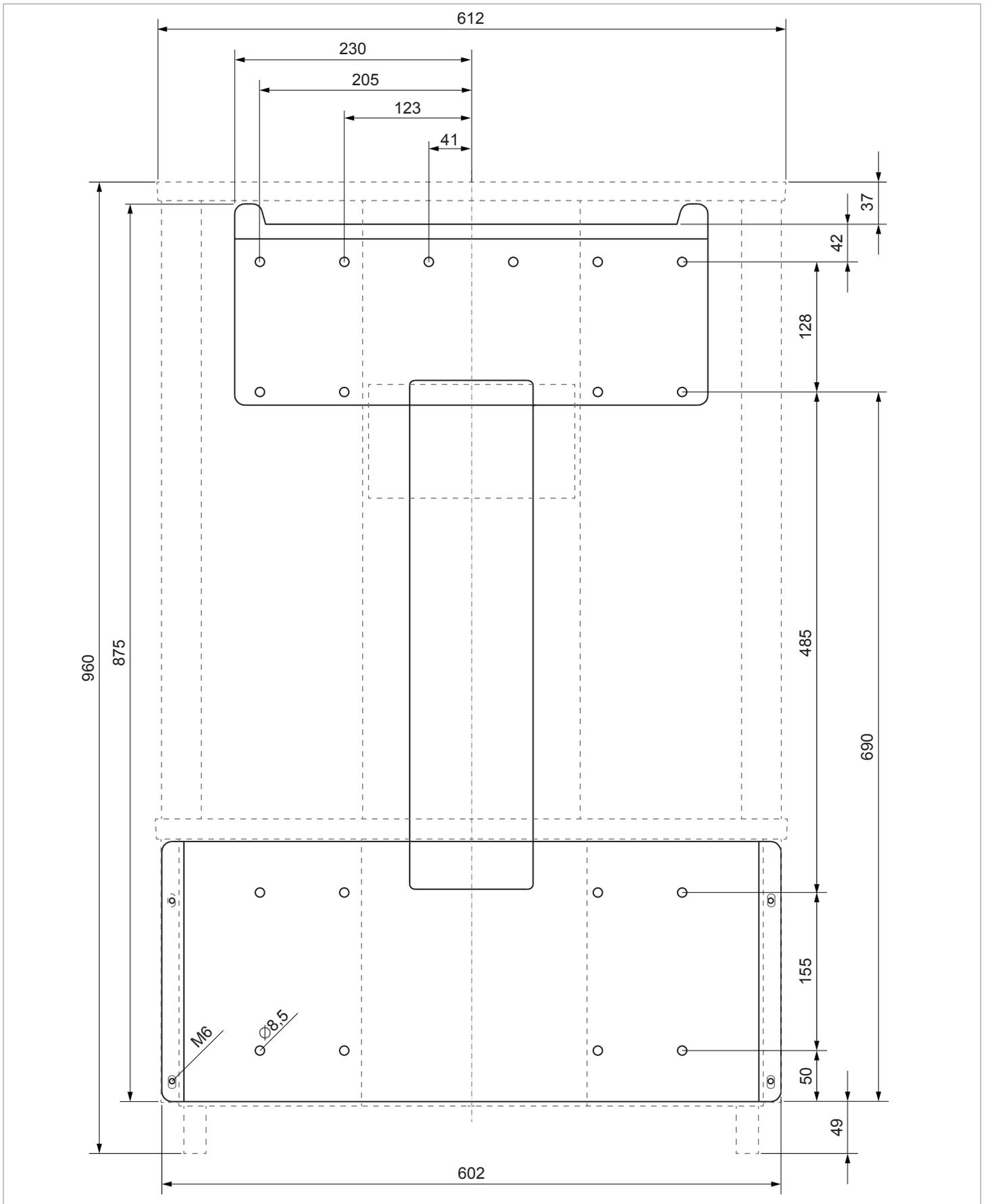


Fig. 5.28: Dimensions, viewed from the front (data in mm)

5 Planning the installation

Dimensions

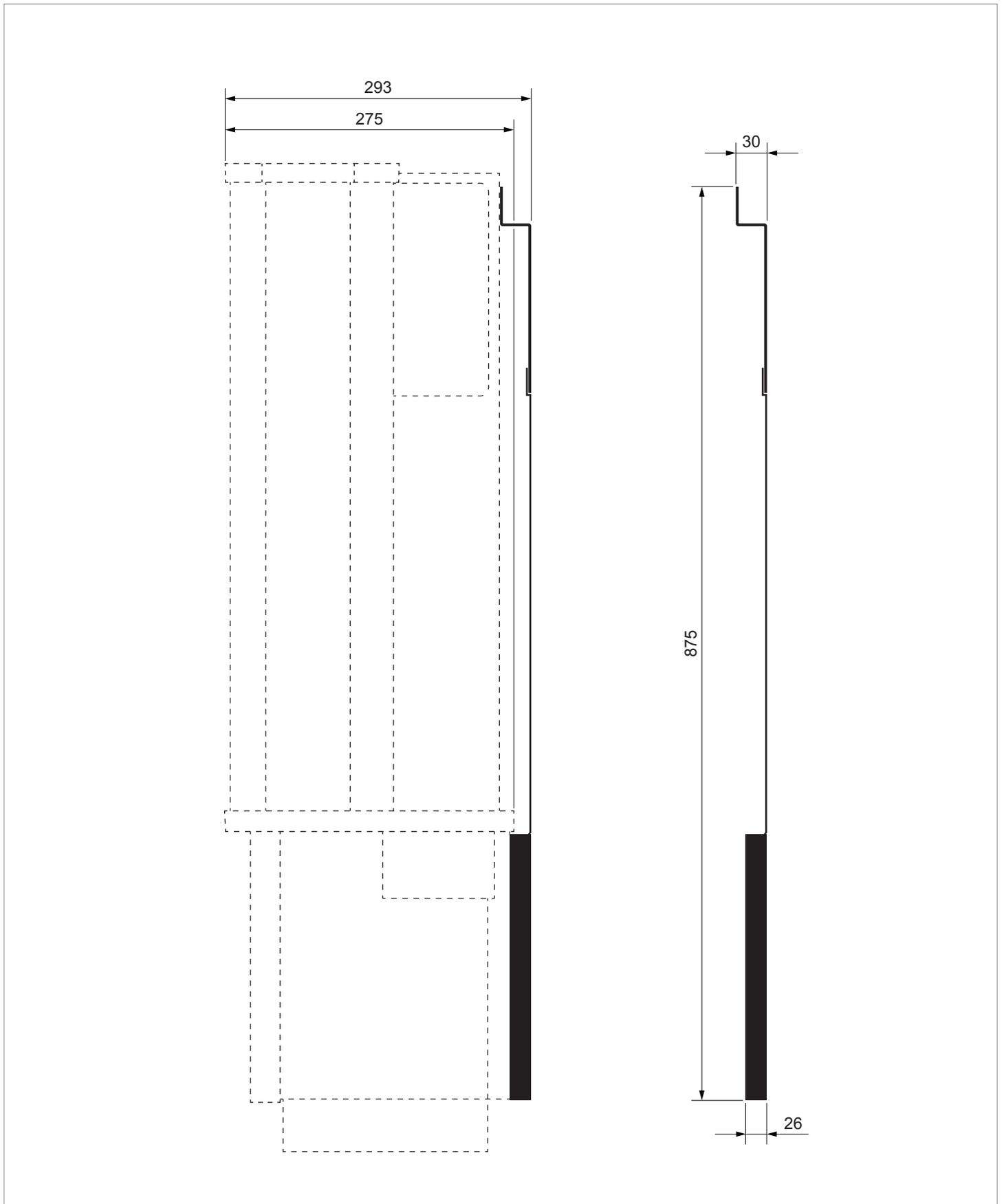


Fig. 5.29: Dimensions, viewed from the right (data in mm)

5.6 AC connection (grid)

NOTICE



Ingress of moisture

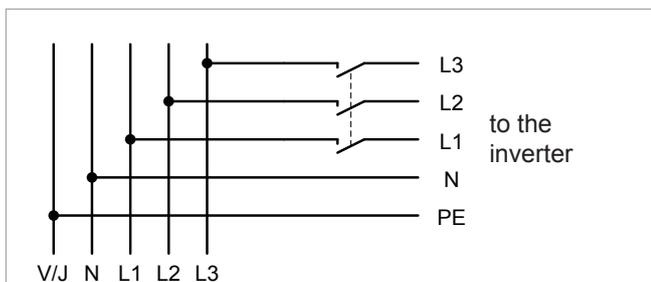
If the wiring box cover is removed, the degree of protection is no longer IP65.

- ▶ Do not remove the cover unless the inverter is in a dry environment.

5.6.1 Important safety instructions

- ▶ Always follow the specific regulations of your country or region.
- ▶ Always follow the specific regulations of your energy provider.
- ▶ Install all stipulated safety and protective devices (such as automatic circuit breakers and/or surge protection devices).
- ▶ Protect the inverter with a suitable upstream circuit breaker:

Upstream line protection	125 A
--------------------------	-------



- ▶ Selection of the protective devices for the network cable to the transformer of the mains feed-in point: Always take into account the impedance between the PE of the inverter and the system and/or operational ground of the distribution network. This applies in particular for TT and IT networks.

5.6.2 Residual current circuit breaker

Due to its design, the inverter cannot supply the mains with DC residual current. This means that the inverter meets the requirements of DIN VDE 0100-712.

Possible error events were assessed by Delta in accordance with the current installation standards. The assessments showed that no hazards arise from operating the inverter in combination with an upstream, type A residual current circuit breaker (FI circuit breaker, RCD). There is no need to use a type B residual current circuit breaker.

Minimum tripping current of the type A residual current circuit breaker	≥300 mA
---	---------



The required tripping current of the residual current circuit breaker depends first and foremost on the quality of the solar modules, the size of the PV system, and the ambient conditions (e.g. humidity). The tripping current must not, however, be less than the specified minimum tripping current.

5.6.3 Integrated residual current monitoring unit

The integrated, universal current-sensitive residual current monitoring unit (RCMU) is certified in accordance with VDE 0126 1-1:2013-08 §6.6.2.

5.6.4 AC surge protection devices

The inverter is equipped with exchangeable surge protection devices type 2 on the AC side. The surge protection devices protect the inverter from excessively high voltages.

Type 2 OCM as per EN 61643-11

Rated current I_n	10 kA (8/20 μ s)
---------------------	----------------------

Maximum current I_{max}	20 kA (8/20 μ s)
---------------------------	----------------------

Voltage U_p	895 V _{AC}
---------------	---------------------

5.6.5 Grounding the inverter

The inverter must be grounded via the PE conductor. To do this, connect the PE conductor of the AC cable to the AC plug pin provided for that purpose.

5.6.6 Permissible grounding systems

DANGER



Electric shock

In IT grids, a twofold insulation fault can lead to high residual currents on the inverter housing.

- ▶ Ground the housing of the inverter via the grounding connection.
- ▶ Set up a permanent insulation monitoring system.
- ▶ The first time an insulation fault occurs, this insulation fault must be rectified **immediately!**

Grounding system	TN-S	TN-C	TN-C-S	TT	IT
Allowed	Yes	Yes	Yes	Yes	Yes

5 Planning the installation

AC connection (grid)

5.6.7 Requirements for the mains voltage

3P3W	Voltage range	3P4W	Voltage range
L1-L2	400 V _{AC} ± 30%	L1-N	230 V _{AC} ± 30%
L1-L3	400 V _{AC} ± 30%	L2-N	230 V _{AC} ± 30%
L2-L3	400 V _{AC} ± 30%	L3-N	230 V _{AC} ± 30%
L1-L2	480 V _{AC} ± 20%	L1-N	277 V _{AC} ± 20%
L1-L3	480 V _{AC} ± 20%	L2-N	277 V _{AC} ± 20%
L2-L3	480 V _{AC} ± 20%	L3-N	277 V _{AC} ± 20%

5.6.8 Special tools required

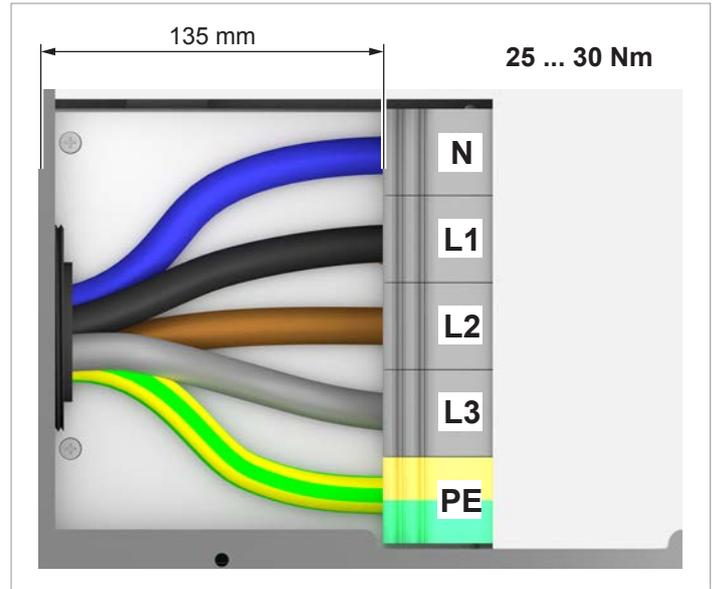
Use an insulated torque wrench with an Allen key bit for the contact screws.



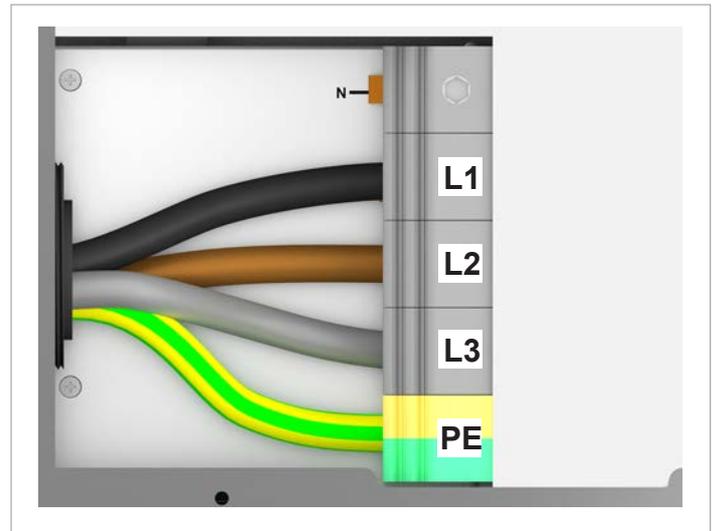
5.6.9 AC cable

See “5.8 Selecting the cables”, page 45 for notes on selecting the AC cable.

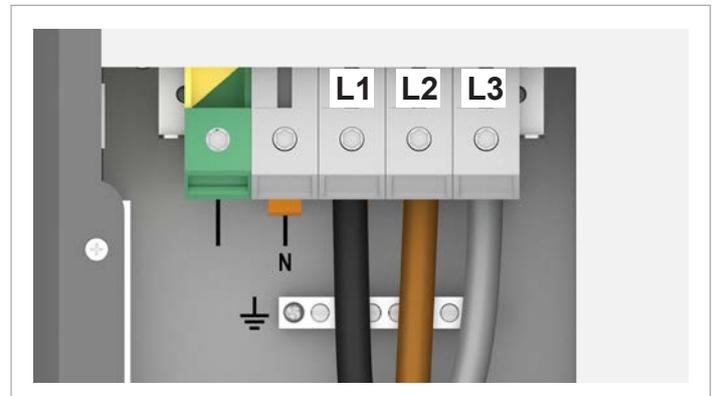
5.6.10 Wiring examples



Wiring example 1: With PE conductor, with neutral conductor



Wiring example 2: With PE conductor, without neutral conductor



Wiring example 3: Without PE conductor, without neutral conductor

5.7 DC connection (solar modules)

NOTICE

**Overheating of the DC connections.**

Exceeding the maximum current can cause overheating of the DC connections and result in a fire.

- ▶ Always take into account the maximum current of the DC connections when planning the installation.
-

**Incorrectly dimensioned solar system.**

An solar system of the wrong size may cause damage to the inverter.

- ▶ Always pay attention to the technical specifications of the inverter (input voltage range, maximum current and maximum input power) when calculating the number of solar modules. See “14. Technical data”, page 228.
-

5 Planning the installation

DC connection (solar modules)

5.7.1 Symmetrical and asymmetrical configuration of the DC inputs

The inverter has a separate MPP tracker for each DC input (DC1 and DC2). An MPP tracker is an automatic function that continuously searches for the operating point with the highest possible instantaneous power.

The two MPP trackers work independently, i.e. the optimum working point is set separately for DC1 and DC2. This allows the solar module strings connected to DC1 and DC2 to be differently aligned or differently dimensioned. A typical application example is a building with a gable roof where the parts of the roof are oriented to the east and west.

Variant 1: Symmetrical design of the DC inputs

The total input power is evenly divided (50%/50%) between DC1 and DC2.

Variant 2: Asymmetrical design of the DC inputs

If the solar module strings are connected symmetrically to DC1 and DC2, i.e. so that all solar modules reach their daily maximum power at the same time, the maximum permissible overall input power can be distributed in the region 60%/40% to 40%/60% at DC1 and DC2. A distribution of 55%/45% or 47%/53% may occur for example.

The percentages always relate to the instantaneous input power. This means that different alignment of the solar module strings on the two roofs can be installed to cater for up to 60% of the maximum input power. The fact that the solar module strings at DC1 and DC2 achieve their maximums at different times allows the system to avoid exceeding the maximum overall power.

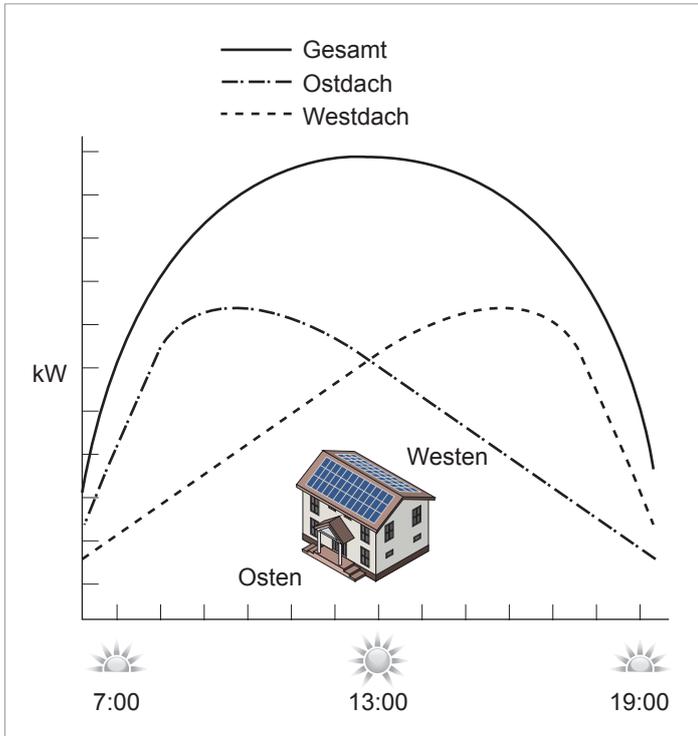
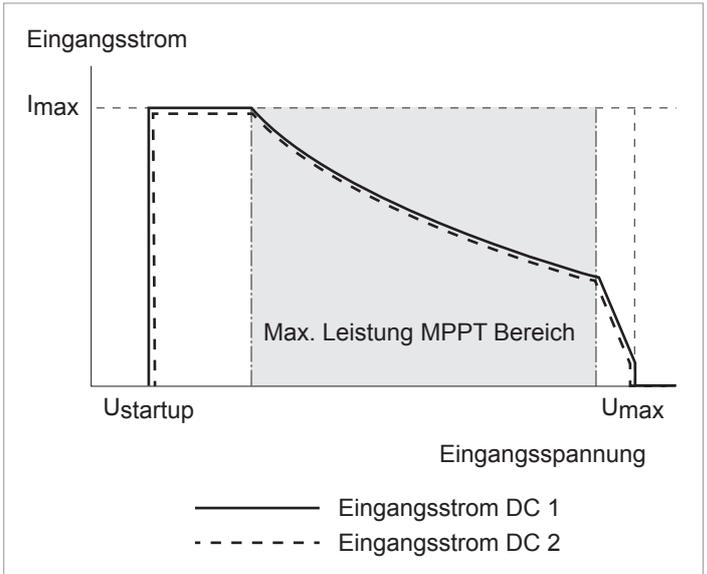


Fig. 5.30: Concept for a system with 2 MPP trackers and asymmetric configuration of the DC inputs

Symmetrical design



Asymmetrical design

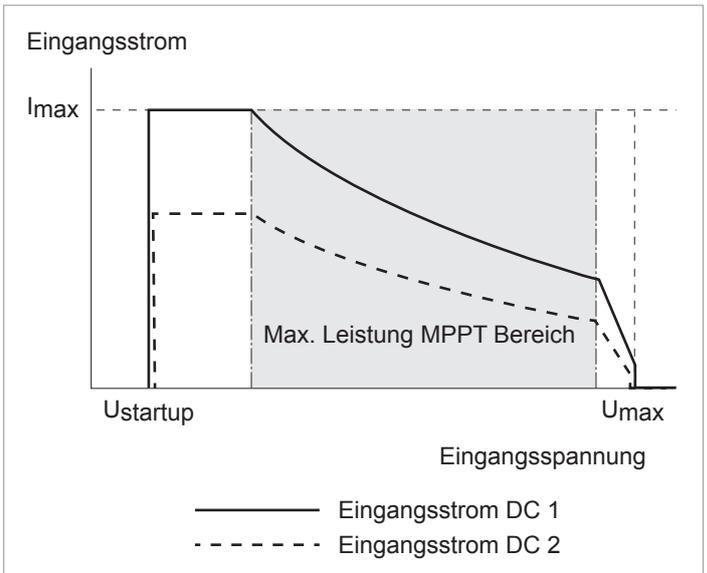


Fig. 5.31: I-U characteristic curves for symmetric and asymmetric configuration of the DC inputs (illustration of principle)



See "14. Technical data", page 228 for currents and voltages.

5.7.2 Connecting two DC strings

The inverter can be used with separate DC inputs or with DC inputs connected in parallel. The variant that can (or must) be used depends on whether the solar modules are grounded or not.



Both DC inputs must always be connected!

Separately connected DC inputs

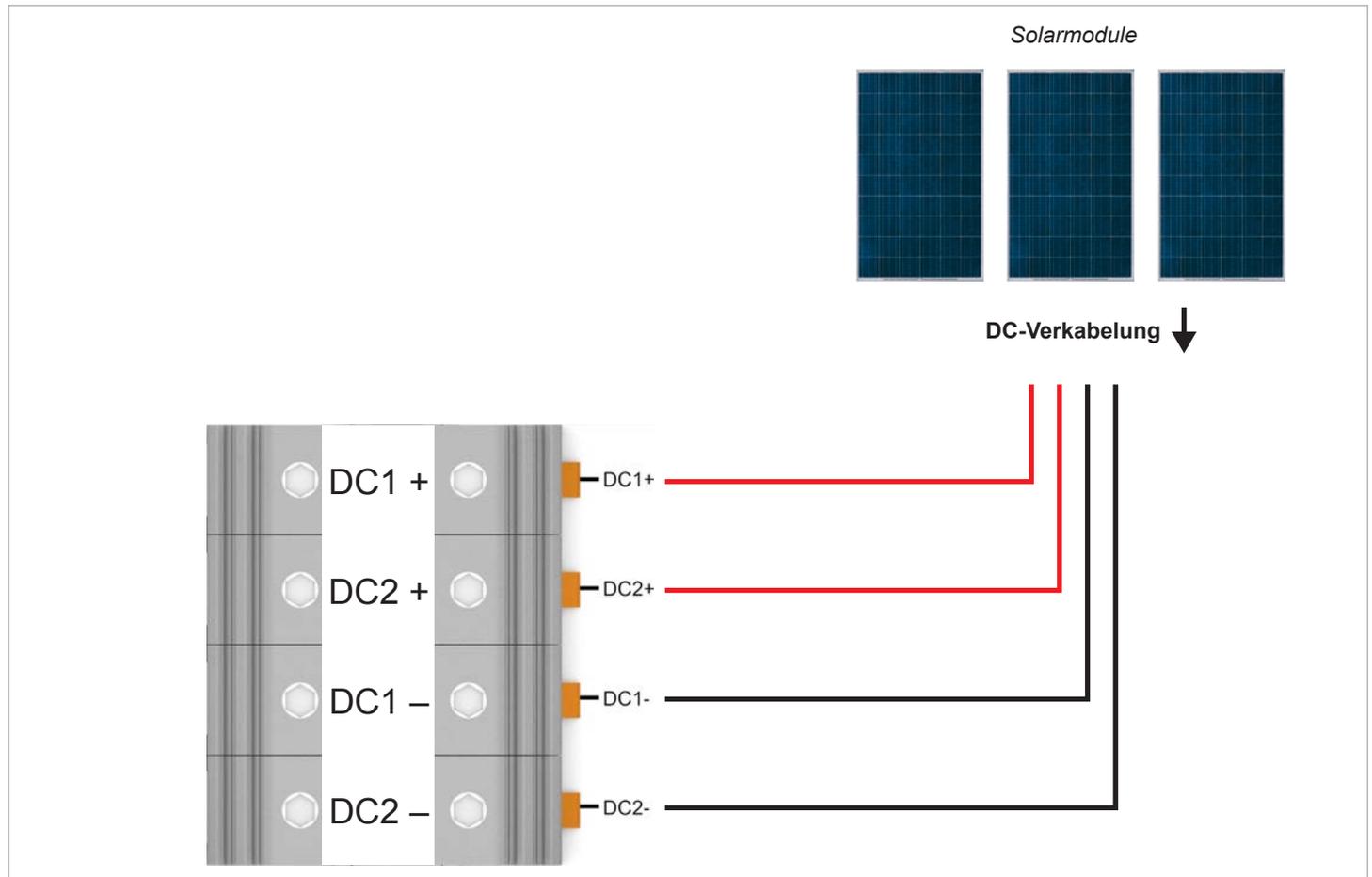


Fig. 5.32: Connecting two DC strings, separately connected

The solar module strings for DC1 and DC2 are connected separately. One MPP tracker regulates the solar module strings at DC1, another MPP tracker regulates the solar module strings at DC2.

This allows implementation of symmetric and asymmetric configurations at the DC inputs.

This DC cabling variant **cannot** be used with grounded solar modules.

5 Planning the installation

DC connection (solar modules)

Parallel-connected DC inputs

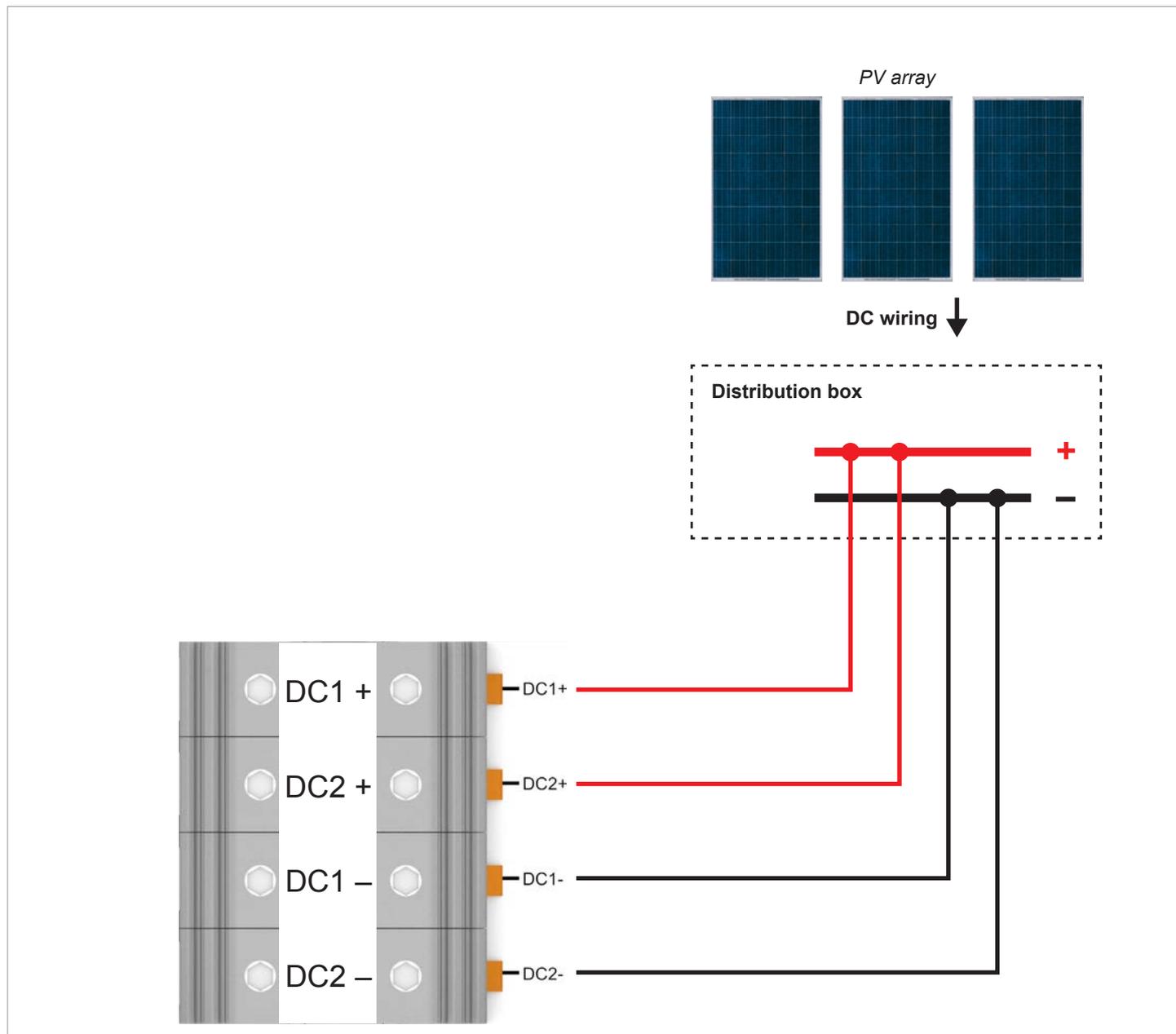


Fig. 5.33: Connecting two DC strings, connected in parallel

The solar module strings are combined at a distribution box and the DC cables are then connected to DC1 and DC2. MPP tracker 1 controls all the solar module strings, MPP tracker 2 is not used.

This allows implementation of symmetric configurations only at the DC inputs.

This DC cabling variant **is mandatory by law** for use with grounded solar modules.

5.7.3 Connecting a single DC string

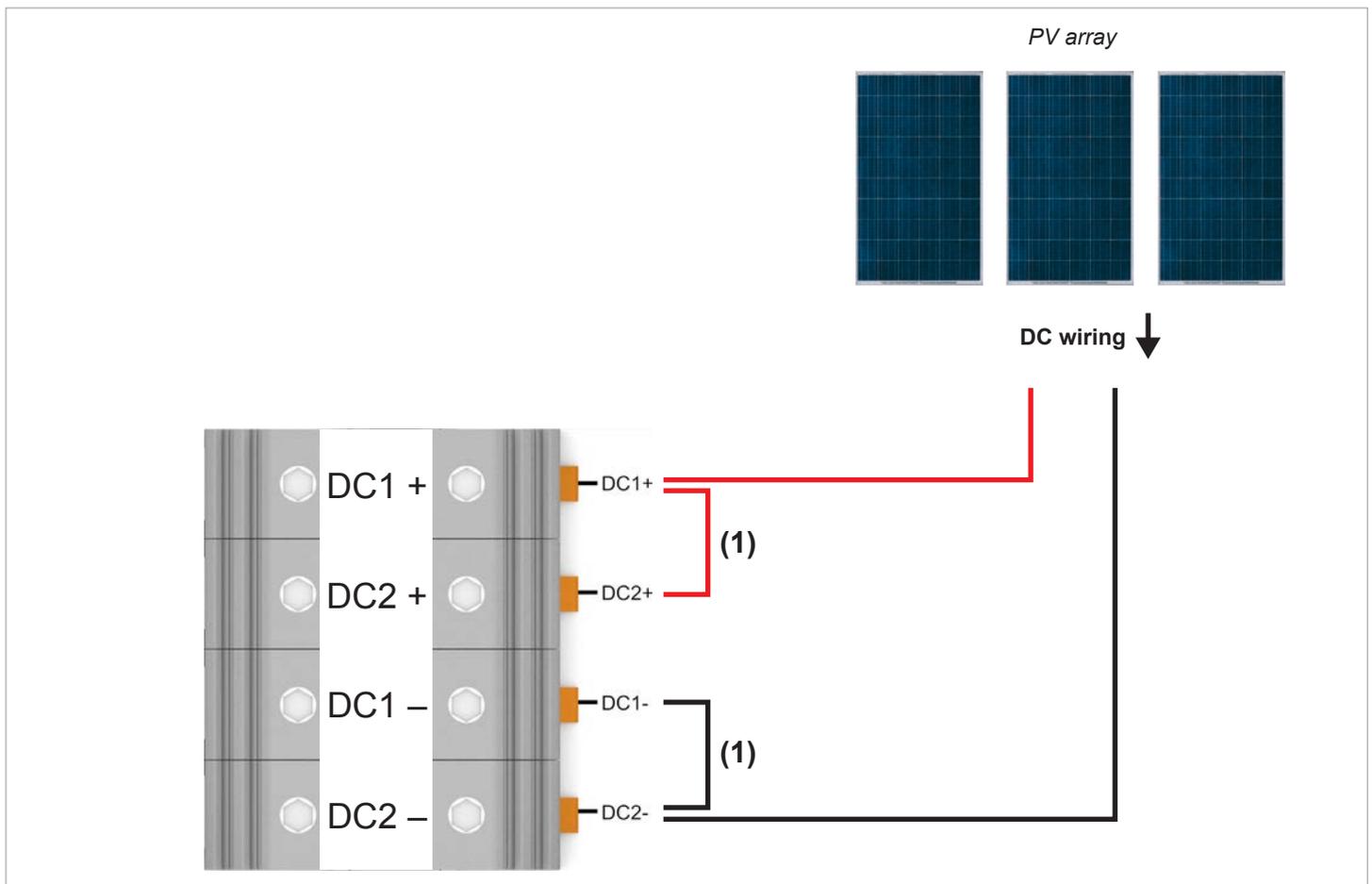


Fig. 5.34: Connecting a single DC string

The M88H_121 (ST) is designed by default for operation with 2 DC string, which are connected to DC1 or DC2.

As an alternative, the M88H_121 (ST) can be connected with only DC string.



Fig. 5.35: Connecting a single DC string with insertion bridges

In addition, **2 insertion bridges (1)** from Phoenix-Contact are required for this purpose (Phoenix order number EB 2-31/UKH - 0201388 for UKH 150). The insertion bridges are **not** included in the scope of delivery and must be ordered separately from commercial outlets



Insertion bridge from Phoenix Contact

5 Planning the installation

DC connection (solar modules)

5.7.4 Connection to solar modules that are not grounded

The DC inputs can be connected to the DC inputs separately or in parallel when using non-grounded solar modules.

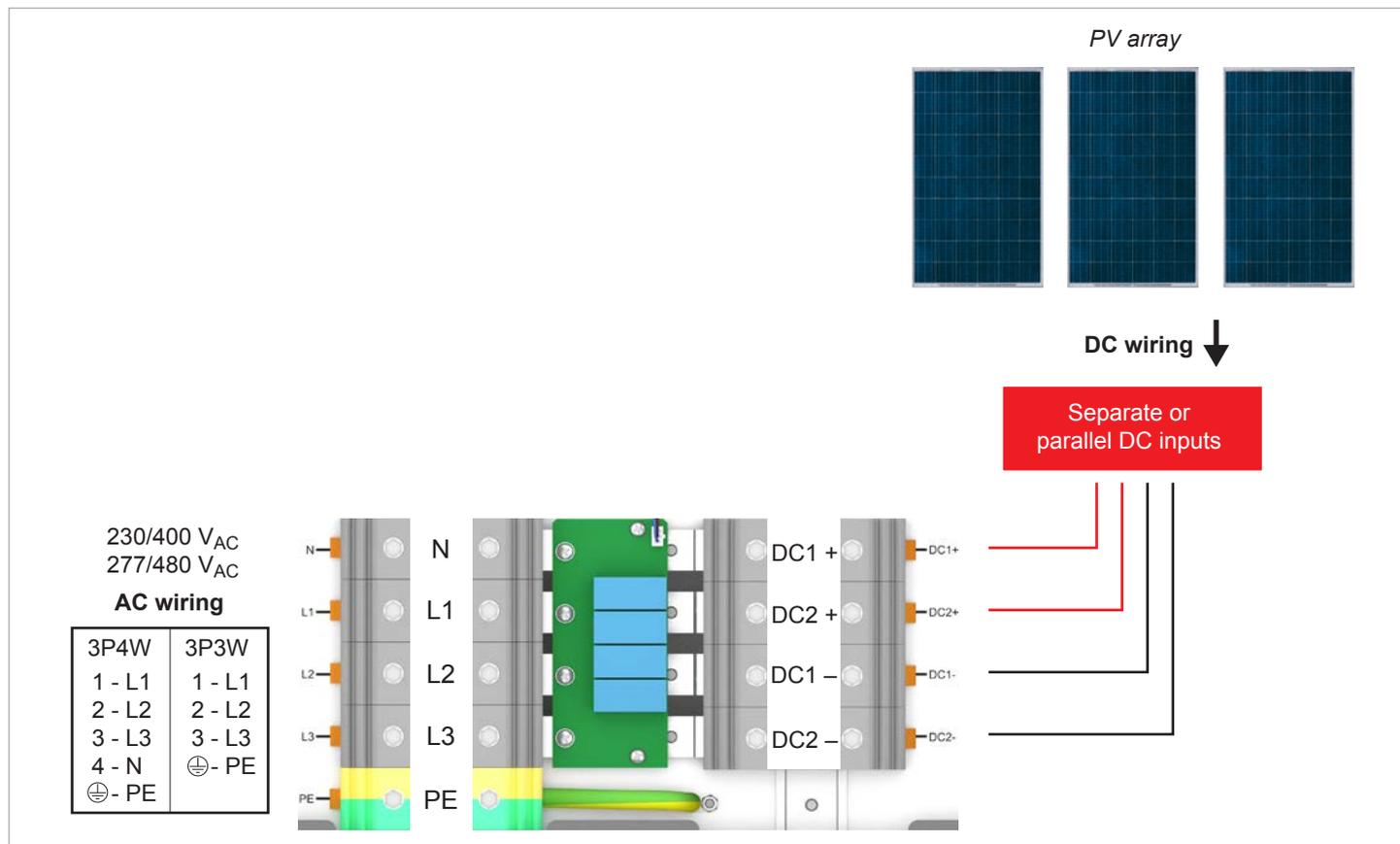


Fig. 5.36: System design when using non-grounded solar modules

5.7.5 Connecting grounded solar modules

The DC inputs must be connected in parallel when using grounded solar modules.

An isolation transformer must be connected between the mains and the AC connection of each inverter.

The insulation monitoring can be set on the inverter display after commissioning, see [“8.3.2 Insulation”](#), page 110.

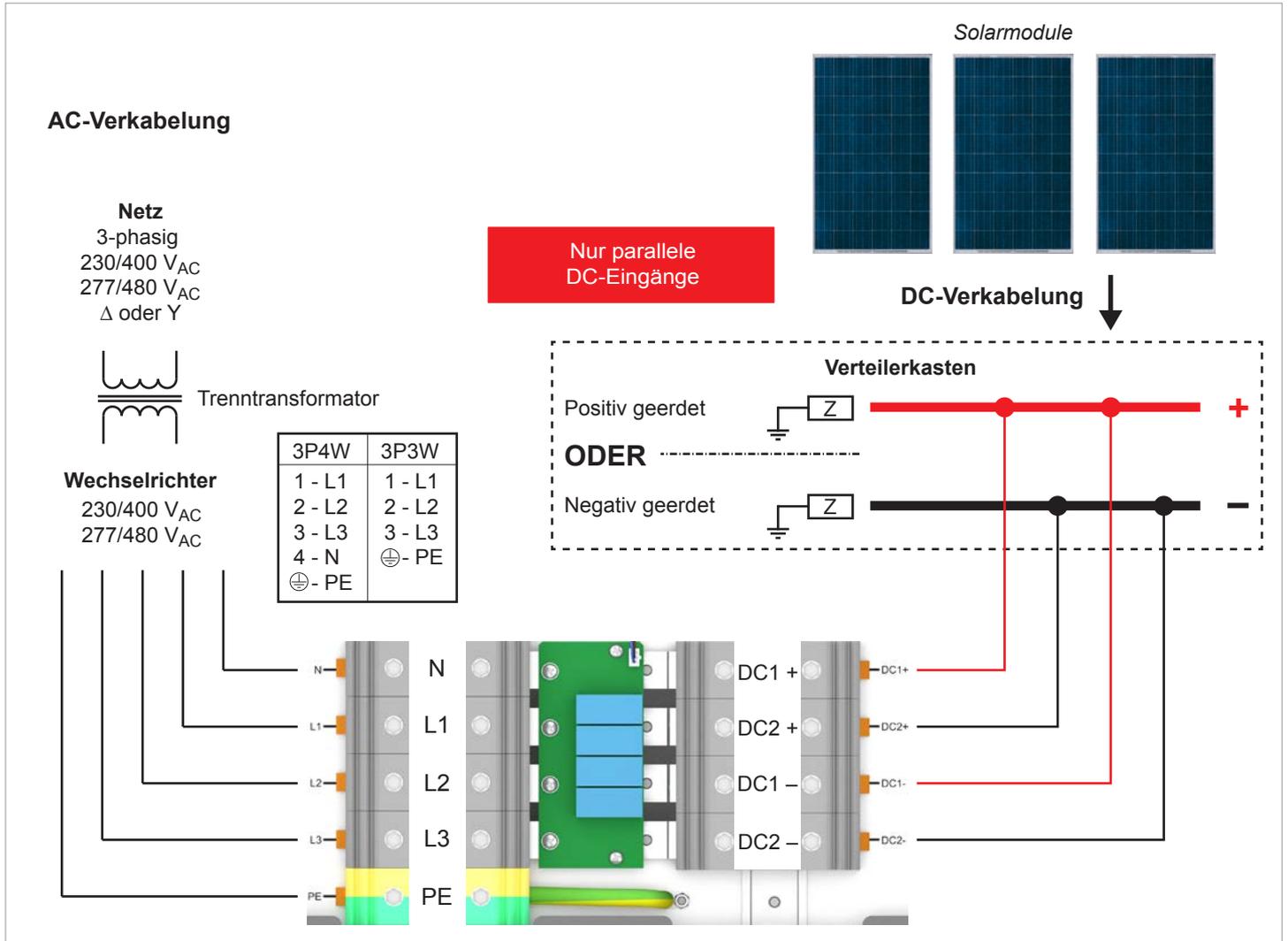


Fig. 5.37: System design when using grounded solar modules

5 Planning the installation

DC connection (solar modules)

5.7.6 Polarity of the solar module strings on the DC terminal block

Connect the negative pole of the solar module string to DC−, connect the positive pole to DC+.

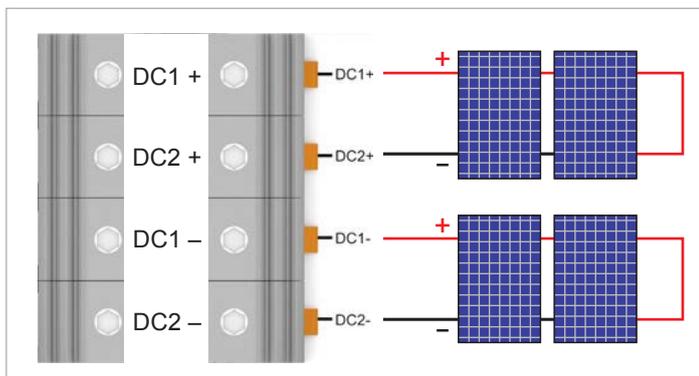


Fig. 5.38: Polarity when connecting two DC strings

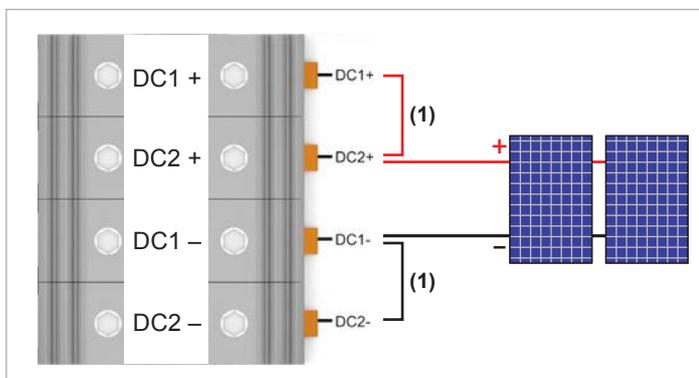


Fig. 5.39: Polarity when connecting a single DC string

An additional **2 insertion bridges (1)** from Phoenix-Contact are required when connecting a single DC string (Phoenix order number EB 2-31/UKH - 0201388 for UKH 150). The insertion bridges are **not** included in the scope of delivery and must be ordered separately from commercial outlets



Insertion bridge from Phoenix Contact

When selecting protective devices (such as fuses), always cater for the *maximum current rating* of the solar modules.

When selecting protective devices, always comply with the local safety regulations.

5.8 Selecting the cables

5.8.1 AC and DC terminal blocks - general information

The section describes the general technical characteristics of the AC and DC terminal blocks. The special features which apply to the installation of the inverter are explained in the following sections.

AC and DC terminal blocks are of the same type.



The specifications in this section have been defined by Phoenix Contact. Check if the technical specifications have change before starting installation work, see www.phoenixcontact.com.

NOTICE



Danger of a cable fire.

Bending and twisting causes damage to the inner structure of the conductor, which leads to punctiform increase in electrical resistance. This can result in an overheating of the conductor and destruction of the insulation.

- ▶ When bending and twisting cables or conductors, always comply with the manufacturer's instructions.

AC and DC terminal block specifications

Designation	Phoenix Contact UKH 150
Connection type	Screws with hexagon socket head
Screw thread	M10
Rated current I_N	309 A
Rated voltage U_N	1000 V
Attaching the conductor	
Type of attachment	M10 screws with hexagon socket head
Tightening torque	25 ... 30 Nm

Specification for copper cable

Min./max. Wire cross-section

Without wire end sleeve

- rigid cable ¹⁾ 35 ... 150 mm²
- flexible cable ²⁾ 50 ... 150 mm²

with wire end sleeve

- Flexible cable ¹⁾ (wire end sleeve without plastic sleeve) 50 ... 150 mm²
- flexible cable ¹⁾ (wire end sleeve with plastic sleeve) 50 ... 150 mm²

Maximum wire cross section Maximaler Drahtquerschnitt when using the insertion bridges on the DC side ³⁾

- rigid cable ¹⁾ 150 mm²
- flexible cable ²⁾ without wire end sleeve 120 mm²
- flexible cable ²⁾ with wire end sleeve Not possible

Stripping length

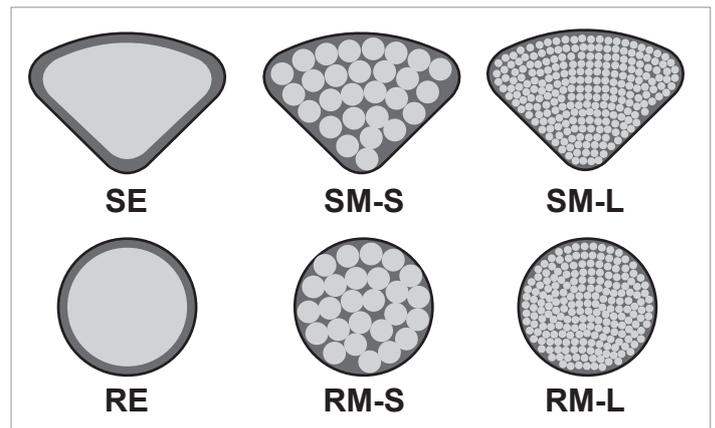
40 mm

1) rigid = Class 1 and 2 cables according to EN 60228

2) flexible = Class 5 and 6 cables according to EN 60228

3) See description in „5.7.3 Connecting a single DC string“, page 41 und „5.7.6 Polarity of the solar module strings on the DC terminal block“, page 44.

Specification for aluminum cable



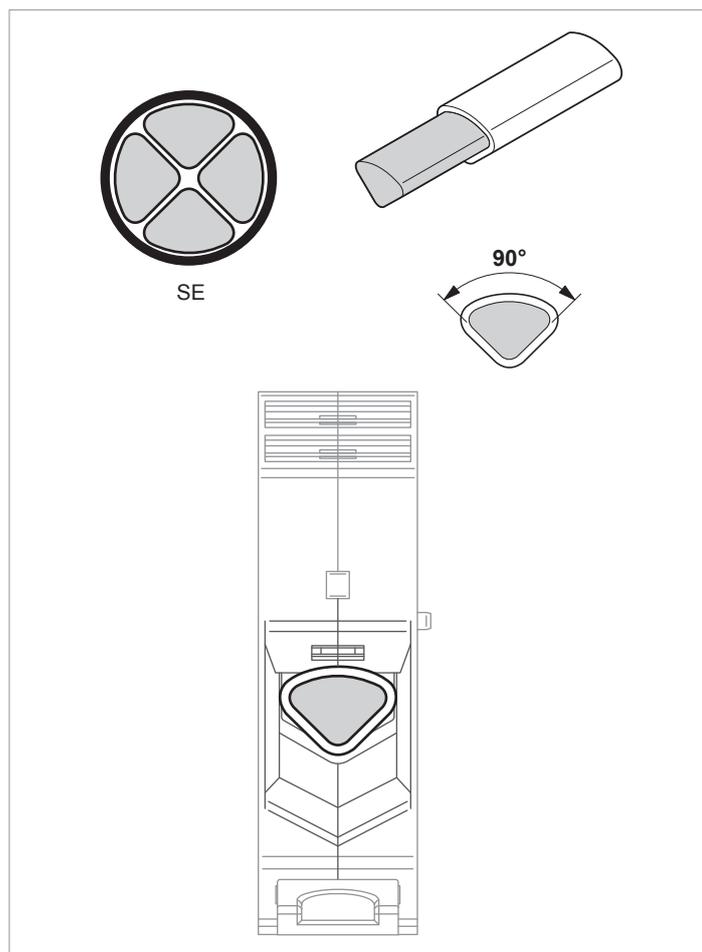
- SE sector-shaped, solid conductor
- SM-S sector-shaped, multi-conductor, rigid wires
- SM-L sector-shaped, multi-conductor, (stranded wires)
- RE round, solid conductor
- RM-S round, multi-conductor, rigid wires
- RM-L round, multi-conductor, (stranded wires)

The terminals have been specially developed for direct connection of sector-shaped, solid (SE) aluminum cables:

Min./max. Conductor cross-section	120 / 150 mm ²
Stripping length	40 mm

5 Planning the installation

Selecting the cables



If other types of aluminum cables are used, Al-Cu crimped connectors (such as those from Klauke, Elpress or Mecatracton) must be used, see [“5.8.4 Special instructions for the use of aluminum cables”](#), page 47.

5.8.2 AC cable

AC cable gland



The inverter has 1 AC cable gland with 1 cable feed-through.

Min./max. Cable diameter 23.9 ... 65.9 mm

Notes on calculating the cable cross-section

Consider the following factors when calculating the cable diameter:

- Cable material
- Temperature conditions
- Cable length
- Installation type
- Voltage drop
- Loss of power in the cable

Always follow the installation regulations for AC cables applicable in your country.

France: Follow the installation instructions of UTE 15-712-1. This standard contains the requirements for minimum cable diameters and for avoiding overheating due to high currents.

Germany: Follow the installation instructions of UTE VDE 0100-712. This standard contains the requirements for minimum cable diameters and for avoiding overheating due to high currents.

5.8.3 DC cables

DC cable gland



The inverter has 2 DC cable glands with 2 cable feed-throughs each.

Min./max. Cable diameter 12.4 ... 25.7 mm

5.8.4 Special instructions for the use of aluminum cables



The instructions contained in this section refer specifically to the use of aluminum cables with this inverter. These instructions supplement the specifications of the manufacturer of the terminal blocks.

Handling aluminum conductors during installation work

The special properties of aluminum must be taken in to consideration when using aluminum:

- Aluminum "flows", i.e. it gives way under pressure.
- A thin non-conductive oxide layer forms within a few minutes on de-insulation, which increases the contact resistance between the conductor and clamping point.
- The specific conductivity and hence the current carrying capacity is approximately one third less than that of copper.

NOTICE



Extreme temperature rise at the clamping point

If the contact resistance between the aluminum conductor and clamping point is too high, the clamping point can become very hot and even catch fire in extreme cases.

To ensure a safe and reliable contact, **always** perform the following work steps:

- ▶ Use a conductor cross-section at least one number larger due to the lower current-carrying capacity.
- ▶ Keep the installation location as free as possible from moisture or corrosive atmospheres.
- ▶ Connect the aluminum cables quickly.
- ▶ Mechanically clean the stripped end of the aluminum conductor (using for instance a knife blade to scrape off the oxide layer), then immediately dip the aluminum conductor into acid-free and alkaline-free (= neutral) Vaseline and straight away insert it into the terminal block.
- ▶ Tighten the clamping screw in the clamping body with the maximum permissible tightening torque.

Instructions regarding selection and utilization of Al-Cu crimped connectors

Observe the following instructions when using aluminum cables with Al-Cu crimped connectors (such as those from Klauke, Elpress or Mecatraktion) and heat-shrink sleeving.

- ▶ Select crimp connectors suitable for the type of cable that is used.
- ▶ Comply with the installation instructions issued by the manufacturer of the crimp connectors.
- ▶ Secure the cables with an external strain relief element.

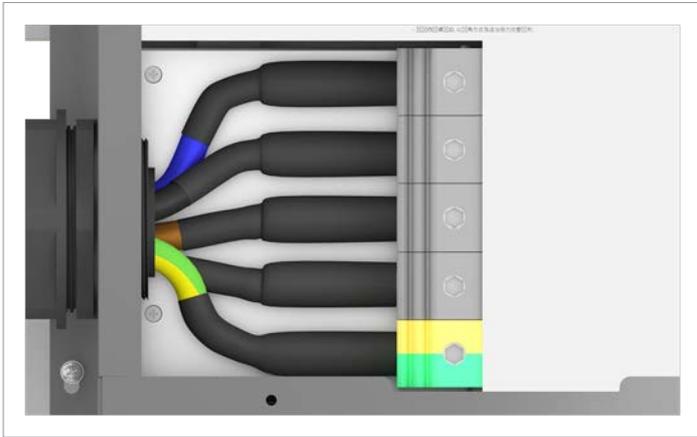
5 Planning the installation

Selecting the cables



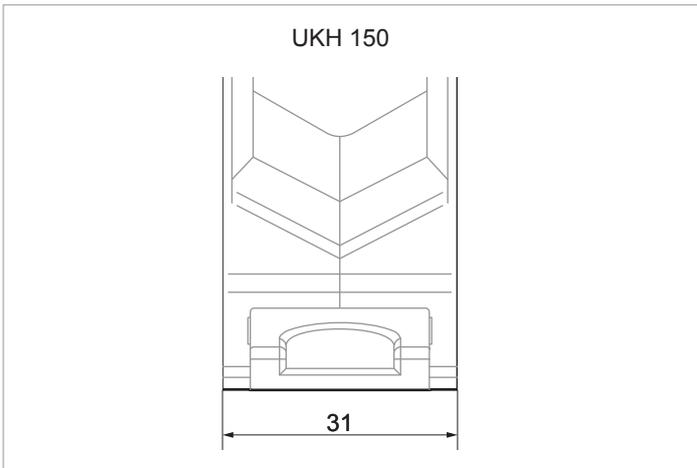
Additional Al-Cu crimped connectors and heat-shrink sleeving are required with non-sector-shaped, solid aluminum cables

- ▶ Use original tools from the manufacturer of the crimp connectors for assembling the aluminum cables.



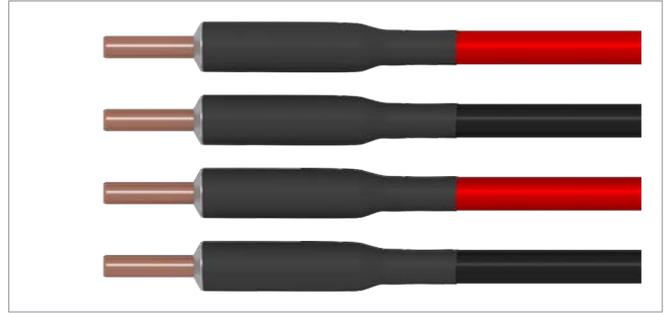
AC cabling using aluminum cables, crimp connectors and heat-shrink sleeving

- ▶ The external diameter of the crimped connectors plus heat-shrink sleeving must be smaller than the width of a clamping point on the terminal block.



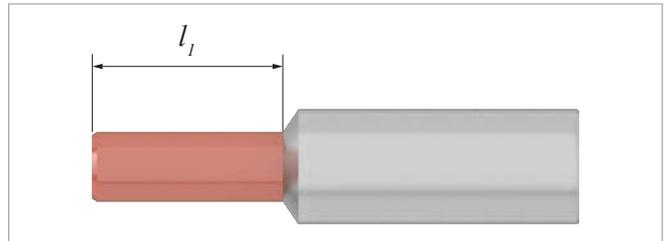
Width of a clamping point on the terminal block

- ▶ Pull on the heat-shrink sleeving so that the aluminum part of the crimped connector is completely covered.



Pull the heat-shrink sleeving over the complete aluminum part

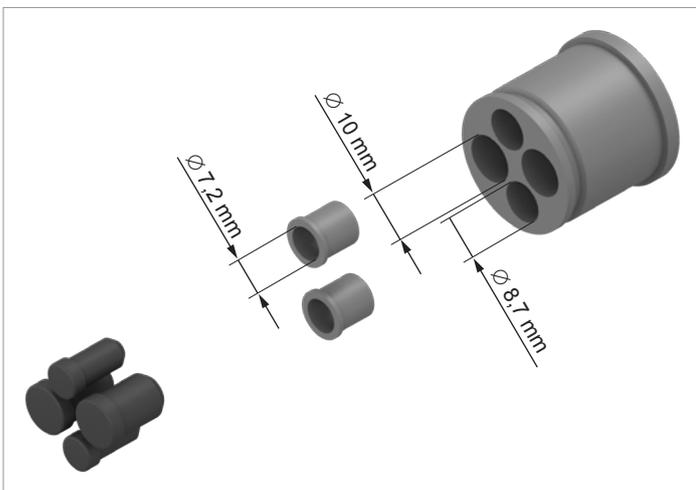
- ▶ The length of the copper bolt on the Al-Cu crimped connector must be approximately equal to the stripping length specified for copper cable by the manufacturer of the terminal block (see “5.8.1 AC and DC terminal blocks - general information”, page 45):



Type	Stripping length	l_1 Copper bolts
UKH 150	40 mm	≈ 40 mm

5.8.5 Communications cables

Cable gland



The inverter has 1 cable gland for the communications cable with 2x2 cable feed-throughs.

Cable requirements

- Shielded twisted-pair cable (CAT5 or CAT6)
- Cable diameter: 7.2 / 8.7 / 10.0 mm
- Wire cross-section: 0.25 ... 1.5 mm²

The communications cable is required for connection to the following units:

- Data logger
- External alarm unit
- Ripple control receiver
- External power-off
- PC

5.9 Routing the cables

This section describes the optimum routing for the cables in the region of the inverter.



When bending and twisting cables or conductors, always comply with the manufacturer's instructions, so as to avoid breakage of the conductors or the insulation.

5.9.1 AC cable

Fasten the cable with a strain relief element.

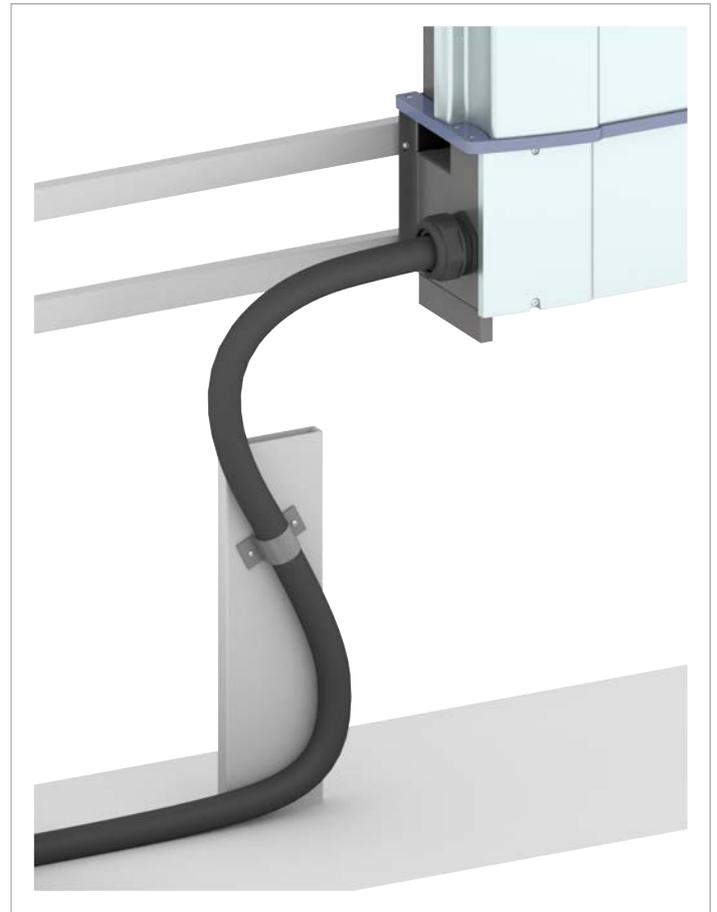


Fig. 5.40: Recommended feeding of the AC cable on the inverter

5.9.2 Communications cables

Lay the cable with a suitable clearance to the AC and DC cables to prevent interference in the data connection.

5 Planning the installation

Connecting a data logger

5.10 Connecting a data logger

NOTICE



Unwanted currents.

Unwanted currents can flow when multiple inverters are connected via RS485.

- ▶ Do not use GND and VCC.
- ▶ If the cable shield is used for providing lightning protection then the housing of only one inverter in the RS485 chain should be grounded.

The inverter can be connected to a data logger via RS485, e.g. for monitoring the PV system or changing the inverter settings.

The SUNSPEC protocol with Modbus RTU is used for data transmission.

Multiple inverters can be connected in series to a data logger.

The following instructions must be complied with to ensure a stable data connection.

Connecting a single inverter to a data logger

Switch on the RS485 termination resistor.

Lay the cable with a suitable clearance to the AC and DC cables to prevent interference in the data connection.

Connecting multiple inverters to a data logger

Switch on the RS485 termination resistor at the last inverter in the chain.

If the data logger does not have an integrated RS485 termination resistor then also switch on the RS485 termination resistor at the first inverter in the chain.

Switch off the RS485 termination resistor at all other inverters in the chain.

Set a different inverter ID for each inverter. Otherwise the data logger cannot identify the individual inverters.

Set the same RS485 Baud rate at all inverters.

Cable requirements

See “[5.8.5 Communications cables](#)”, page 49 for notes on selecting the AC cable.

5.11 Connecting an external alarm unit

The inverter has two multifunction relays allowing connection of an acoustic or visual alarm unit to each.

An event can be assigned to the dry contacts on the inverter display after commissioning, see “[8.3.6 Dry contacts](#)”, page 125.

Event	Description
Disable	The function is disabled.
On Grid	The inverter is connected to the mains.
Fan Fail	The fans are defective.
Insulation	The insulation test has failed.
Alarm	An error event message, fault message or warning has been sent.
Error	An error event message has been sent.
Fault	A fault message has been sent.
Warning	A warning message has been sent.

The default setting for both relays is **Disable**.

Cable requirements

See “[5.8.5 Communications cables](#)”, page 49 for notes on selecting the AC cable.

5.12 Connecting a ripple control receiver

An external ripple control receiver can be connected to the digital inputs.

Pin assignments

Pin	Designation	Short circuit	Assigned action
1	V1	-	-
2	K0	V1 + K0	External power-off (EPO)
3	K1	V1 + K1	Maximum active power limited to 0%
4	K2	V1 + K2	Maximum active power limited to 30 %
5	K3	V1 + K3	Maximum active power limited to 60 %
6	K4	V1 + K4	Maximum active power limited to 100 %
7	K5	V1 + K5	Reserved
8	K6	V1 + K6	Reserved

Cable requirements

See [“5.8.5 Communications cables”](#), page 49 for notes on selecting the AC cable.

5.13 External power-off

The inverter has a multifunction relay allowing an external shut-down of the inverter to be triggered.

Pin assignments

Pin	Designation	Short circuit	Assigned action
1	V1	-	-
2	K0	V1 + K0	External power-off (EPO)
3	K1	V1 + K1	Maximum active power limited to 0%
4	K2	V1 + K2	Maximum active power limited to 30%
5	K3	V1 + K3	Maximum active power limited to 60%
6	K4	V1 + K4	Maximum active power limited to 100%
7	K5	V1 + K5	Reserved
8	K6	V1 + K6	Reserved

After commissioning, the relays for the external power-off (EPO, External Power Off) can be defined on the display of the inverter as having normally closed or normally open contacts, see [“8.3.9 EPO Emergency power-off \(external shutdown\)”](#), page 129.

Cable requirements

See [“5.8.5 Communications cables”](#), page 49 for notes on selecting the AC cable.

5 Planning the installation

Using external mains and system protection

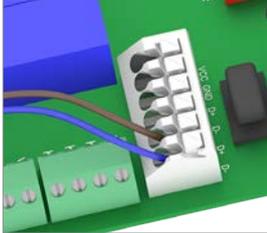
5.14 Using external mains and system protection

1. The German standard VDE-AR-N 4105, Section 6.1, requires external mains and system protection with a coupling switch for PV system larger than 30 kVA.
2. Alternatively, VDE-AR-N 4105, Section 6.4.1, allows the use of an inverter with an internal coupling switch when this switch disconnects the inverter from the mains in less than 100 ms.

This inverter satisfies the requirements of (2), no external mains and system protection is required.

5.15 Connecting a PC

If you wish to use a PC with the Delta Service Software for setting up the inverter you will need a USB/RS485 adapter in order to connect the PC to the inverter.

Inverter	USB/RS485 adapter
	
DATA+ Terminal 3 or 5	D+
DATA- Terminal 4 or 6	D-

5.16 Tools and materials required

This sections lists the necessary tools and materials not included in the scope of delivery.

5.16.1 For mounting the inverter

Part	Quantity	Description
Attachment screws	6 to 12	<p>The mounting plate must be attached using 6 to 12 M6 screws.</p> <p>Additional mounting materials may be required depending on the installation position of the inverter (e.g. brick wall, concrete wall, metal frame etc.): Dowels, washers, lock washers, nuts etc.</p> <p>Always take the conditions at the installation location into account when selecting the mounting materials.</p> <p>Galvanic corrosion can occur when using mounting materials made of different materials.</p>

5.16.2 For connecting the inverter to the mains (AC)

Part	Quantity	Description
AC cable		<p>For selection of the AC cables see “5.8 Selecting the cables”, page 45.</p>
Wire end-sleeves (optional)	4 - 5	<p>For copper cables. The copper cable that is used govern whether wire end-sleeves must be used. For further information, see “5.8 Selecting the cables”, page 45.</p> <p>Attach the wire end-sleeves to the wires using a crimping tool.</p> 
Al-Cu crimp connectors (optional)	4 - 5	<p>For use with round or round crimped aluminum cables. For further information, see “5.8 Selecting the cables”, page 45.</p> 
Heat shrink sleeves (optional)	-	<p>For use with Al-Cu crimp connectors</p> 

5 Planning the installation

Tools and materials required

Part	Quantity	Description
		For crimping Al-Cu crimp connectors. (e.g. manual crimping tool Klauke K 18, cordless hydraulic crimping tool Klauke EK 120/42 or corresponding tool from other manufacturers)
Original crimp tool from the manufacturer of the Al-Cu crimp connectors	optional	

5.16.3 For connecting the inverter to the solar modules

Part	Quantity	Description
DC cables	-	See “5.8.3 DC cables” , page 47 for notes on selecting the DC cable

5.16.4 For grounding the inverter housing

Part	Quantity	Description
Grounding cable with cable lug	-	Typically a yellow-green copper cable with a conductor cross-section of at least 6 mm ² . Observe the local regulations relating to grounding cable requirements.

5.16.5 For connection of a data logger

Part	Quantity	Description
Cable	-	For selection of the communications cable see “5.9.2 Communications cables” , page 49.

5.16.6 For connection of an external alarm unit

Part	Quantity	Description
Cable	-	For selection of the communications cable see “5.9.2 Communications cables” , page 49.

5.16.7 For connection of a ripple control receiver and an external power-off

Part	Quantity	Description
Cable	-	For selection of the communications cable see “5.9.2 Communications cables” , page 49.

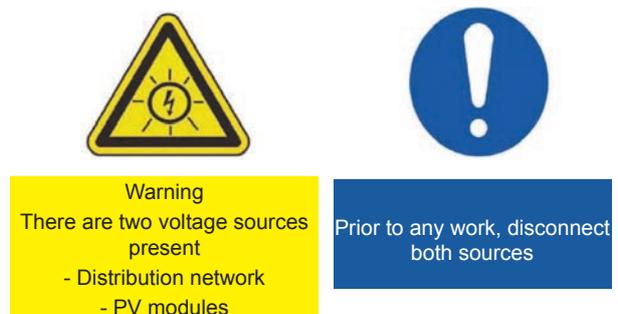
5.16.8 For connection of a PC

Part	Quantity	Description
		For connection of a PC to the inverter.
USB-RS485 adapter	1	
2-core cable	1	Bell wire. Both ends open.
Delta Service Software	1	For changing the inverter settings. Available from Delta. Many settings can also be changed directly at the inverter display, see “8. Settings” , page 100.

5.16.9 Other parts

Part	Quantity	Description
		Observe the local regulations regarding the application of warning labels.
		

Warning stickers -



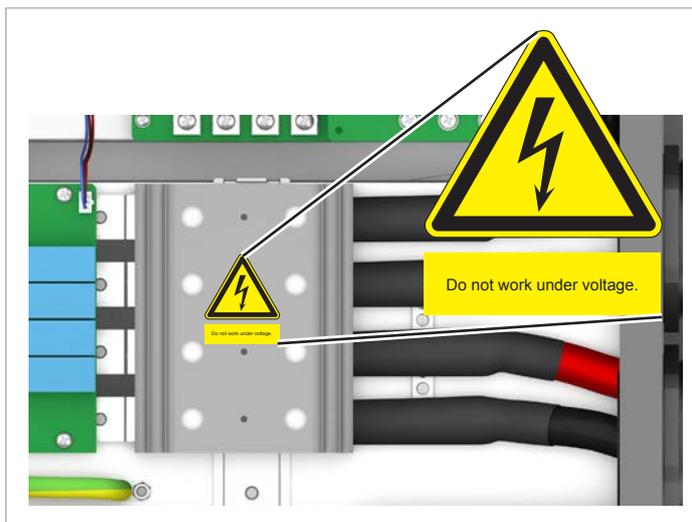
5 Planning the installation

Tools and materials required

Part	Quantity	Description
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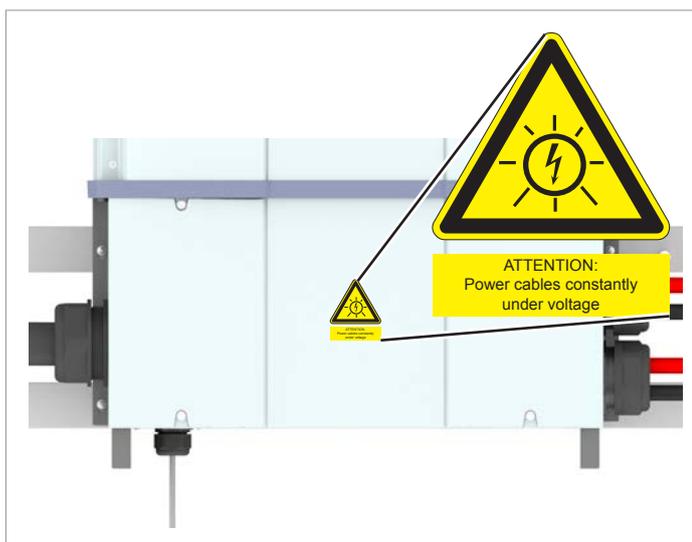
France

As required by UTE 15-712-1 the following warning labels must be attached:



Warning stickers

Warning label on the DC terminal block



Warning label on the terminal box cover

6. Installing the inverter



- ▶ Read chapter “5. Planning the installation”, page 22 and this chapter in full before you start installation.

6.1 Safety instructions

DANGER



Electric shock

Potentially fatal voltages are present at the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 100 seconds.

Therefore, always carry out the following steps before working on the inverter

1. Disconnect the inverter from all AC and DC voltage sources and make sure that none of the connections can be accidentally restored.
2. Ensure that the DC cables cannot be touched accidentally.
3. Wait at least 100 seconds until the internal capacitors have discharged.

DANGER



Electric shock

Potentially fatal voltages are present at the inverter DC connections. When light falls on the solar modules, they immediately start to generate electricity. This also happens when light does not fall directly on the solar modules.

- ▶ Never disconnect the inverter from the solar modules when it is under load.
- ▶ Disconnect the inverter from all AC and DC voltage sources. Ensure that none of the connections can be restored accidentally.
- ▶ Ensure that the DC cables cannot be touched accidentally.

WARNING



Heavy weight

The inverter is very heavy.

- ▶ The inverter must be lifted and carried by at least 3 people or using appropriate lifting gear.



Ingress of moisture

When the cover is removed from the wiring box, this exposes voltage-carrying parts and protection conforming to IP65 is no longer guaranteed.

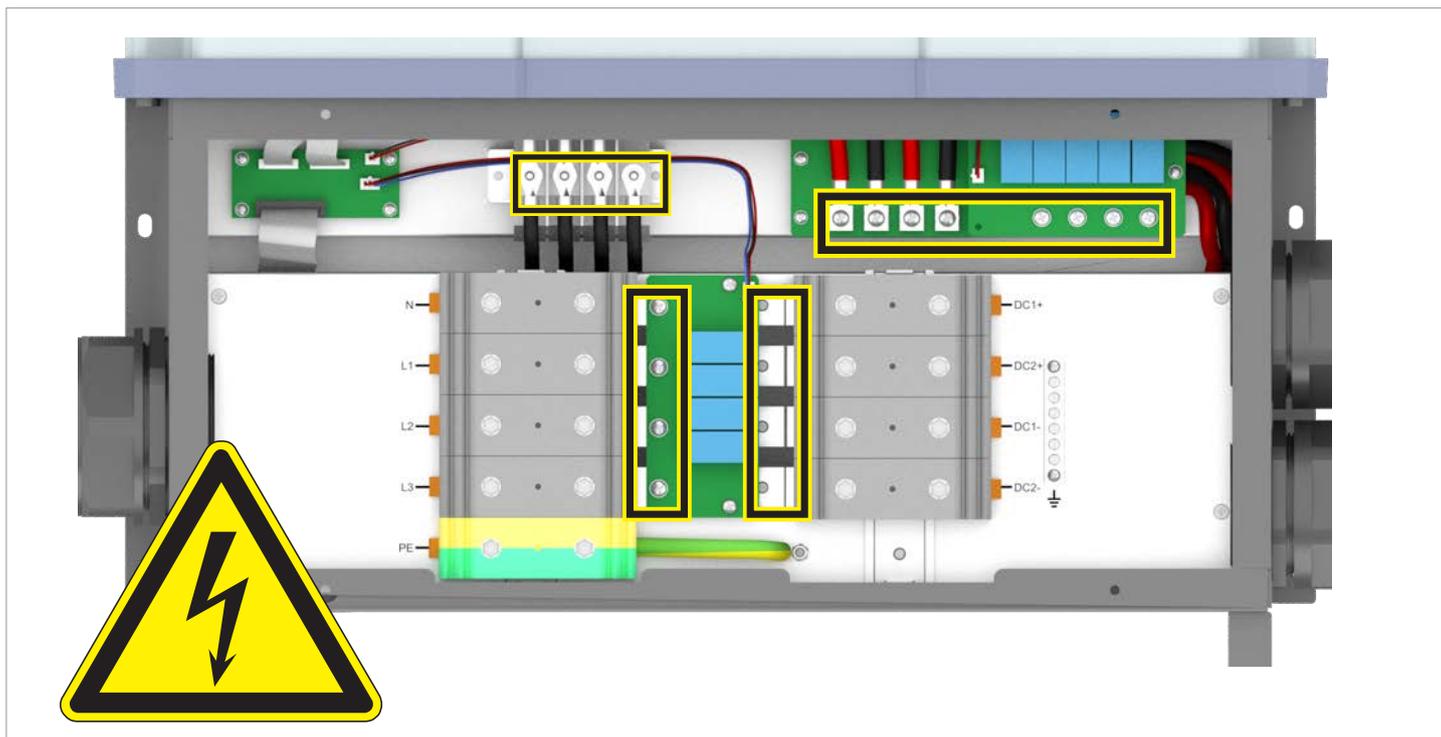
- ▶ Remove the cover only when absolutely necessary.
- ▶ Do not remove the cover if water might enter the inverter.
- ▶ After work is completed, ensure that the cover is properly replaced and screwed in. Check that the cover is properly sealed.



Ingress of moisture.

- ▶ All sealing caps removed during installation should be stored for later use (such as transport or storage).

6 Installing the inverter



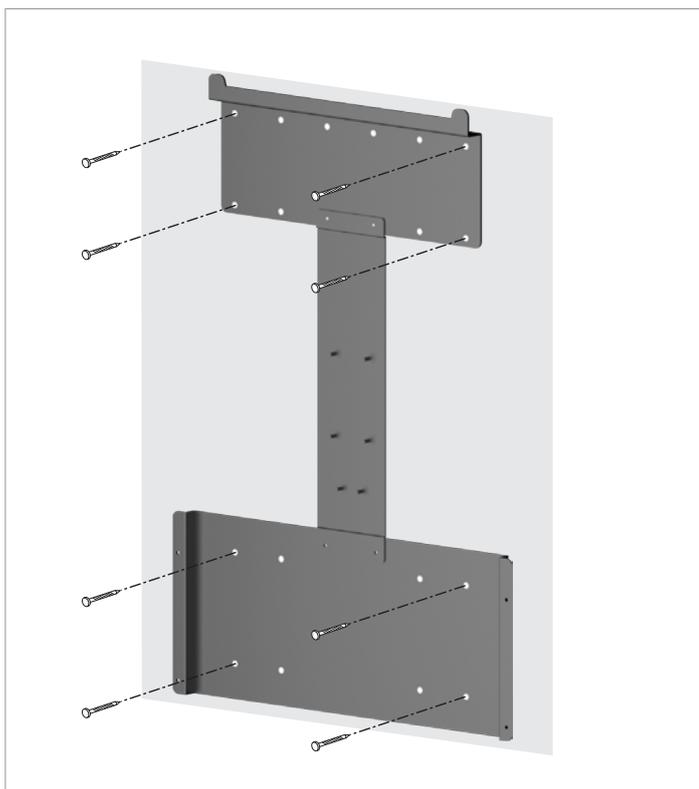
Hazard zones with potentially life-threatening currents and voltages

6.2 Sequence of installation steps

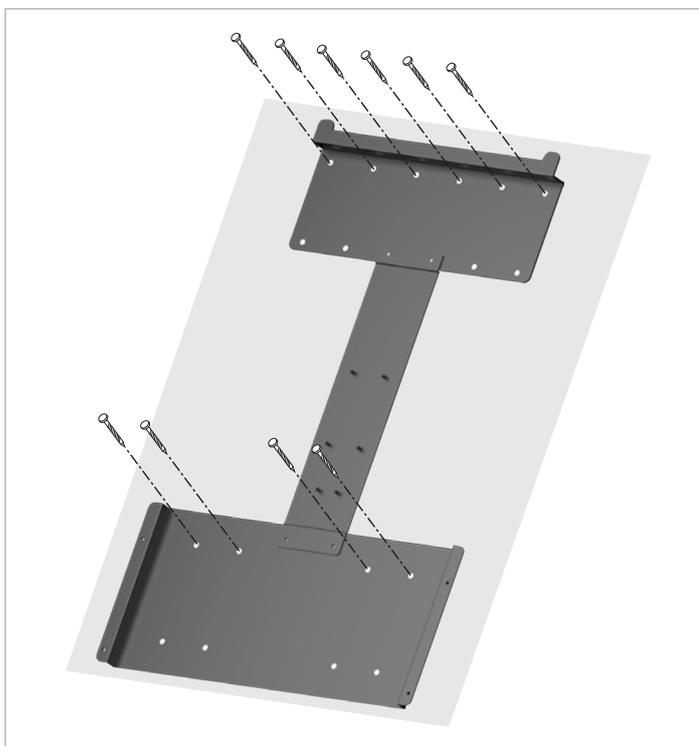
The sequence of the subsections in this chapter corresponds to the recommended sequence of the installation steps.

1. Mounting the inverter
2. Grounding the inverter housing
3. Connecting the communications card
4. Connecting to the mains (AC)
5. Connecting to the solar modules (DC)
6. Attaching the warning labels

6.3 Mounting the inverter



Positioning of the mounting screws for vertical installation



Positioning of the mounting screws for vertical installation

1. For **vertical** mounting of the inverter, attach the mounting plate to the wall / the mounting system with 8 M8 screws in accordance with the illustration on the left.

Be sure to use these 8 fixing points in any event when using more than 8 screws.

For **tilted** or **horizontal** mounting of the inverter, attach the mounting plate to the wall / the mounting system with 10 M8 screws in accordance with the illustration on the left.

Be sure to use these 10 fixing points in any event when using more than 10 screws.

6 Installing the inverter

Mounting the inverter



2. Mount the inverter on the mounting plate.

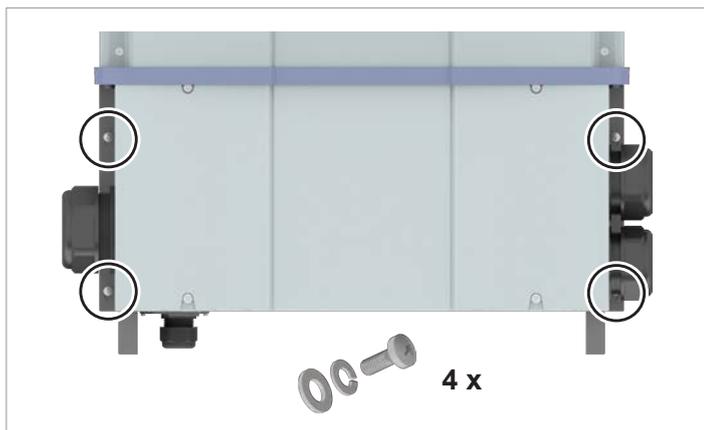


3. Check that the inverter is correctly mounted on the mounting plate.



6 Installing the inverter

Mounting the inverter



4. Screw the inverter to the mounting plate with 4 M5 screws, spring washer and washer. The screws are supplied in the scope of delivery.



5. If desired, mount the cover panels for the side air inlets.

6 Installing the inverter

Grounding the inverter housing

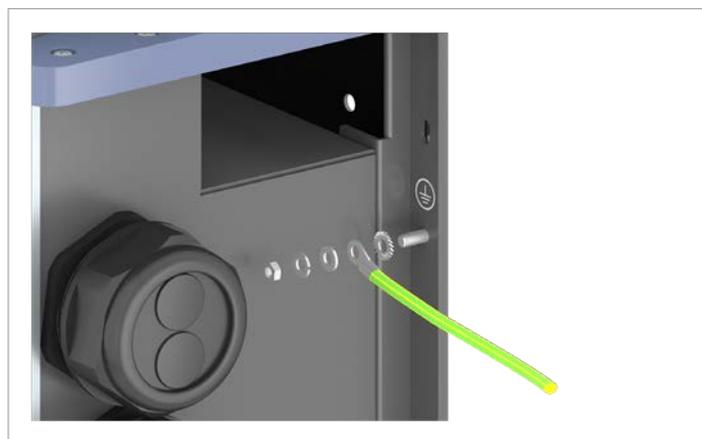
6.4 Grounding the inverter housing

WARNING



High current

- ▶ Always observe the local regulations relating to grounding cable requirements.
- ▶ To increase the safety of the system, always ground the inverter housing even when this is not required by the local regulations.
- ▶ Always ground the inverter housing **before** connecting the inverter to the mains and solar modules.



1. Bolt the grounding cable onto the inverter. Nut, spring washer, washer, and toothed lock washer are already mounted on the inverter.



2. Perform a continuity check of the grounding connection. If there is insufficient conductive connection, scratch away the paint from the inverter housing under the toothed lock washer to achieve a better electrical contact.

6.5 Attaching warning labels to the inverter

All countries

- ▶ Attach all necessary warning labels to the inverter. Always follow the local regulations.

Some examples of warning labels are listed below.

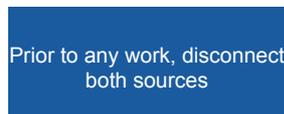
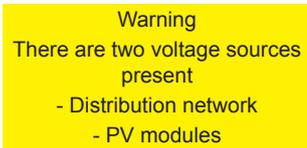


Fig. 6.41: Examples of warning labels

France

As required by UTE 15-712-1 the following warning labels must be attached:



Fig. 6.42: Warning label on the DC terminal block

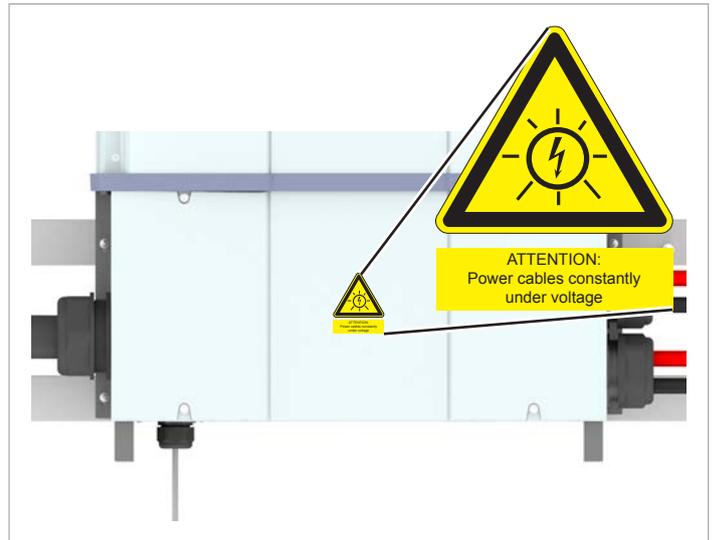


Fig. 6.43: Warning label on the terminal box cover

6 Installing the inverter

Connecting the communications card

6.6 Connecting the communications card



The connections for RS485, the dry contacts, the digital inputs and the external shutdown (EPO) are all on the communications card. This means that the installation work can be combined.



Ingress of moisture.

- ▶ All sealing caps removed during installation should be stored for later use (such as transport or storage).

6.6.1 Introduction

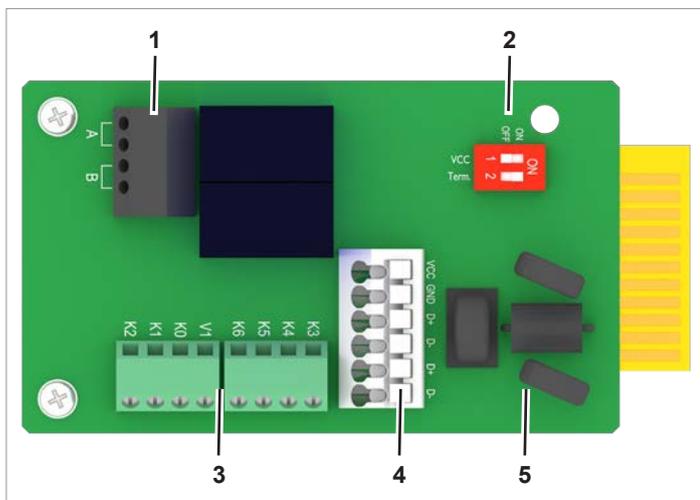


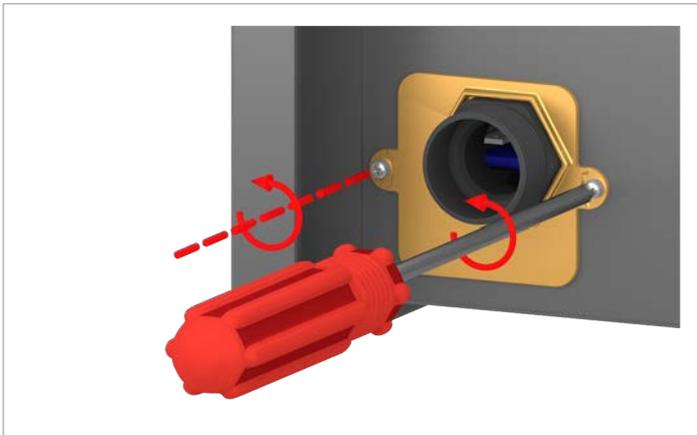
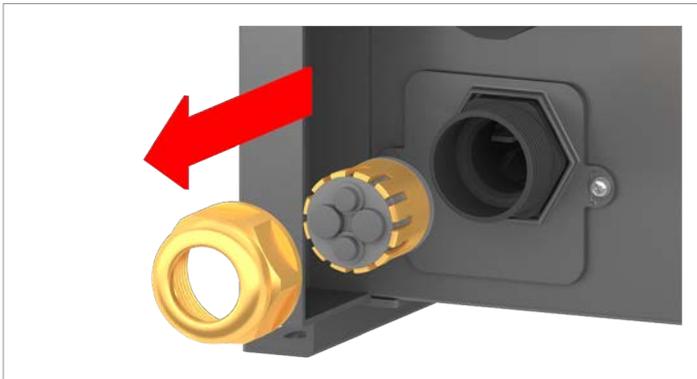
Fig. 6.1: Components of the communications card

- 1 2 x dry contacts (terminal box)
- 2 DIP switch for RS485 termination resistor and VCC
- 3 Digital inputs and external power-off (terminal block)
- 4 RS485 (terminal block)
- 5 Protection against electromagnetic interference (EMI)

Cable requirements

- Shielded twisted-pair cable (CAT5 or CAT6)
- Cable diameter: 7.2 / 8.7 / 10.0 mm
- Wire cross-section: 0.25 ... 1, 5 mm²

6.6.2 Initial steps

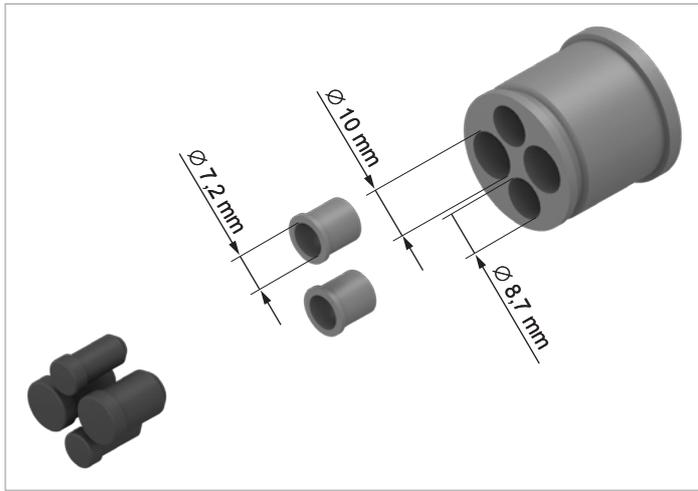


1. Unscrew the cable gland of the communication connection and remove the cable gland and seal.

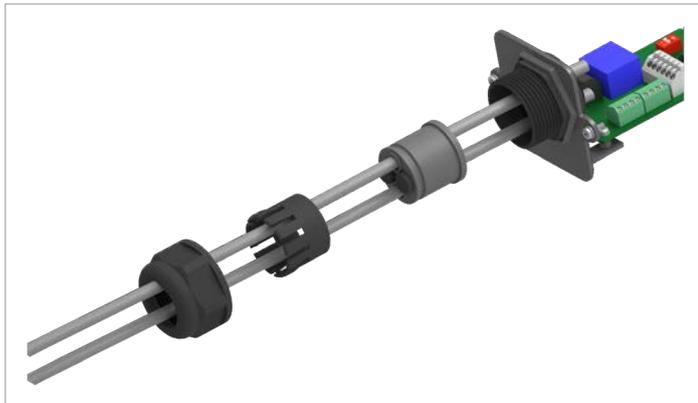
2. Unscrew and carefully pull out the cover. The communications card is screwed to the cover.

6 Installing the inverter

Connecting the communications card



3. Remove the rubber plugs from the seal corresponding to the number of cables and the cable diameter.
Do not remove the rubber plugs from the unused seal feed-throughs.



4. Pull the cable through the cable gland and seal.

6 Installing the inverter

Connecting the communications card

6.6.3 Connecting a data logger via RS485

6.6.3.1 Overview

- ▶ Lay the cable with a suitable clearance to the AC and DC cables to prevent interference in the data connection.

NOTICE

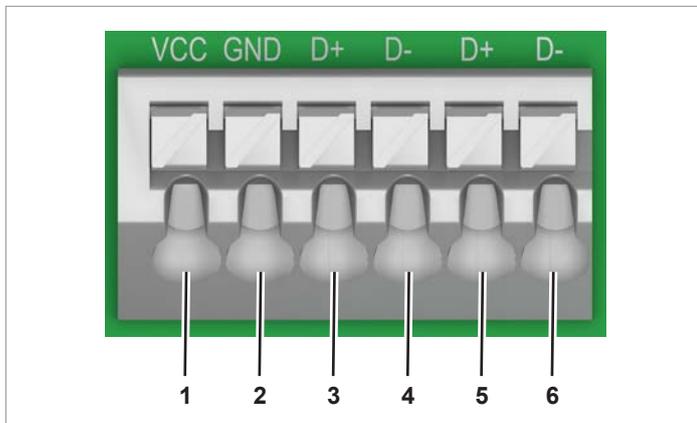


Unwanted currents.

Unwanted currents can flow when multiple inverters are connected via RS485.

- ▶ Do not use GND and VCC.
- ▶ If the cable shield is used for providing lightning protection then the housing of only one inverter in the RS485 chain should be grounded.

Terminal assignments of the RS485 terminal block



- 1 VCC (+12 V; 0.5 A)
- 2 GND
- 3 DATA+ (RS485)
- 4 DATA- (RS485)
- 5 DATA+ (RS485)
- 6 DATA- (RS485)

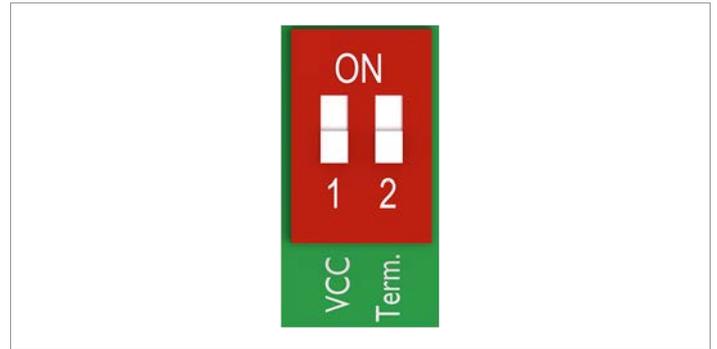
Terminal pairs 3/4 or 5/6 can be used. The second terminal pair is only required when connecting several inverters via RS485.

Data format

Baud rate	9600, 19200, 38400; standard: 19200
Data bits	8
Stop bit	1
Parity	Not applicable

The Baud rate can be set on the inverter display after commissioning, see "8.2.3 Baud rate", page 106.

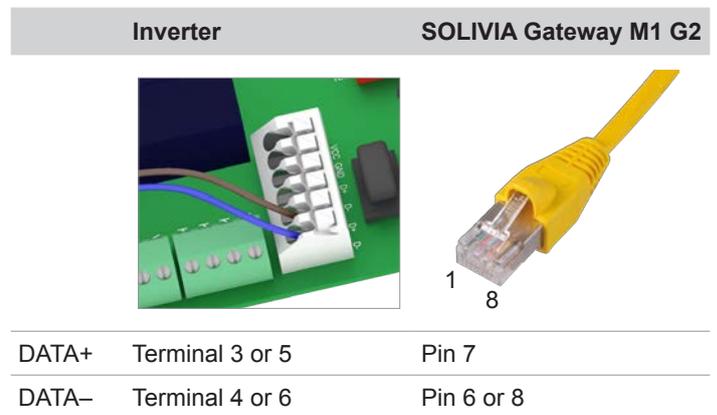
DIP switch for RS485 termination resistor and VCC



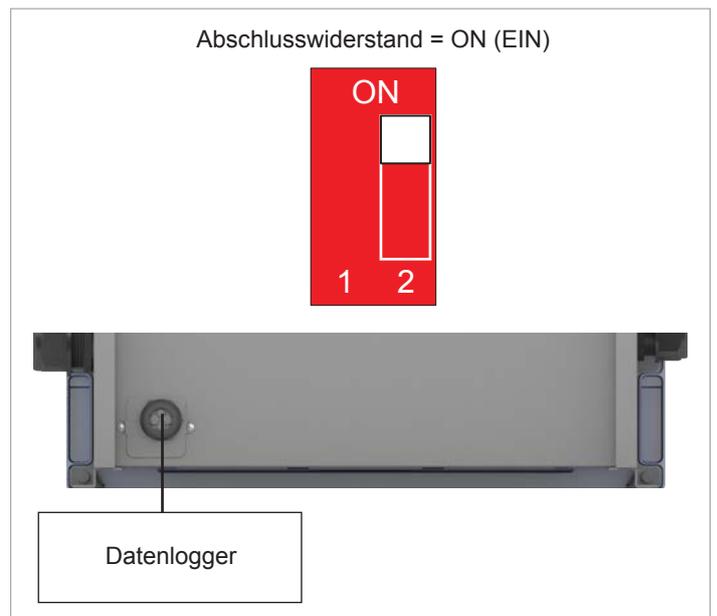
- 1 VCC (+12 V; 0.5 A)
- 2 RS485 termination resistor

Connection to a Delta SOLIVIA Gateway M1 G2

Individual wires are connected at the inverter and an RJ45 plug is used at the gateway.



Wiring diagram for a single inverter

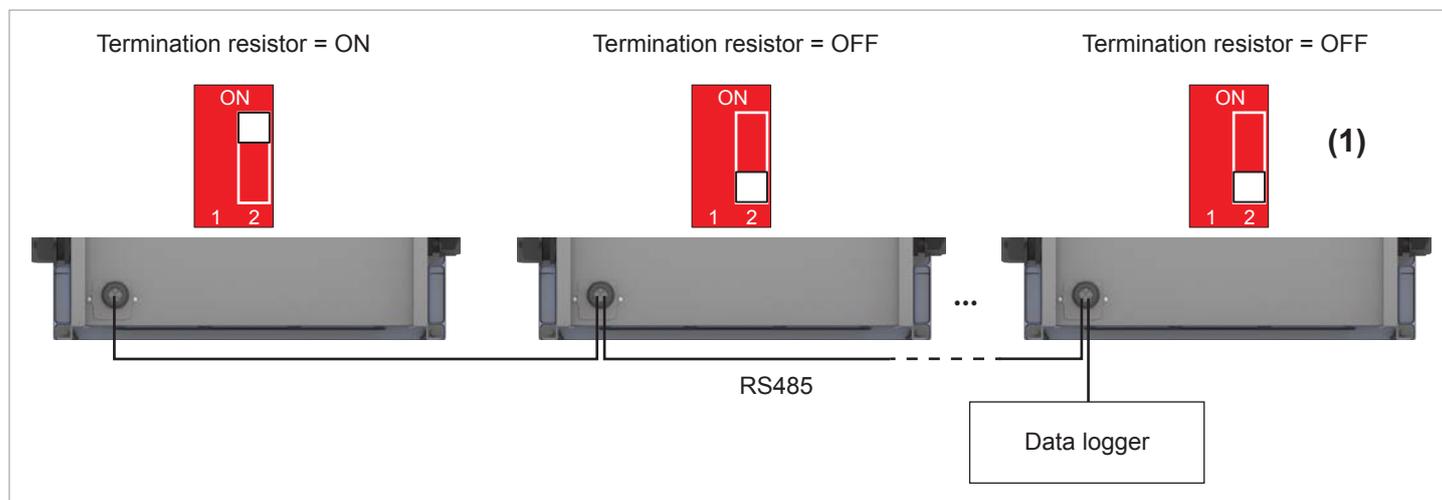


6 Installing the inverter

Connecting the communications card

Wiring diagram for multiple inverters

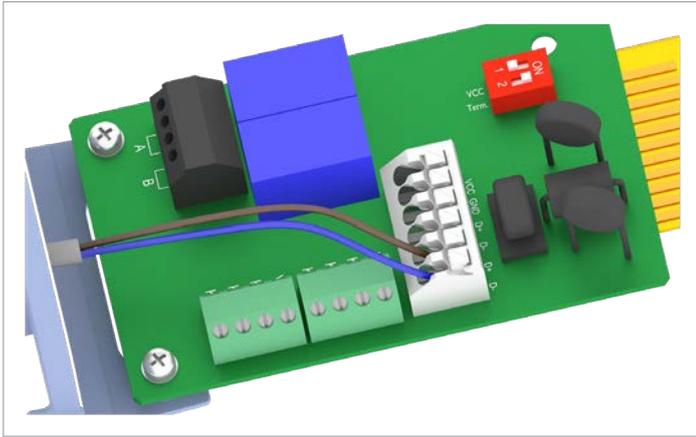
- ▶ If the data logger does not have an integrated RS485 termination resistor, switch on the RS485 termination resistor on the first inverter.
- ▶ Set a different inverter ID at each inverter during commissioning of the inverters.



6 Installing the inverter

Connecting the communications card

6.6.3.2 Wiring for a single inverter



1. Connect the DATA+ wire to terminal 5 and the DATA- wire to terminal 6.

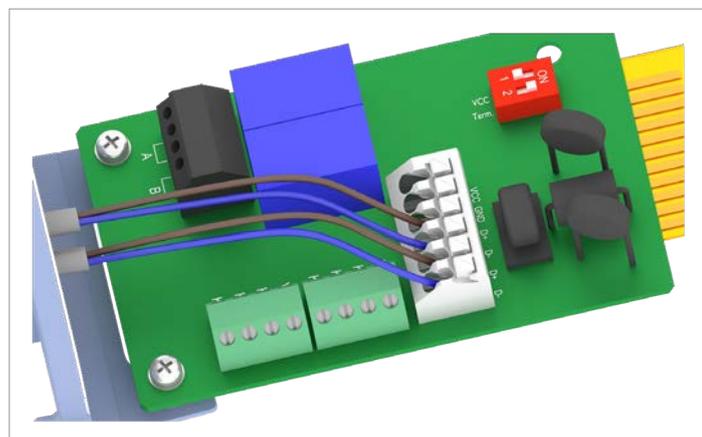
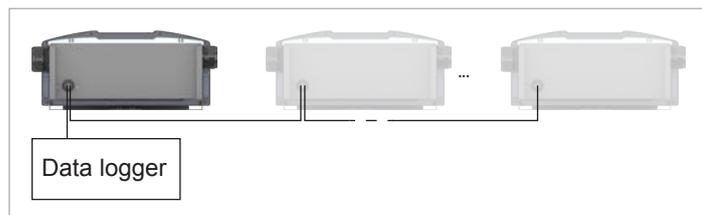


2. Set the DIP switch for the RS485 termination resistor (DIP 2) to the **ON** position.

6 Installing the inverter

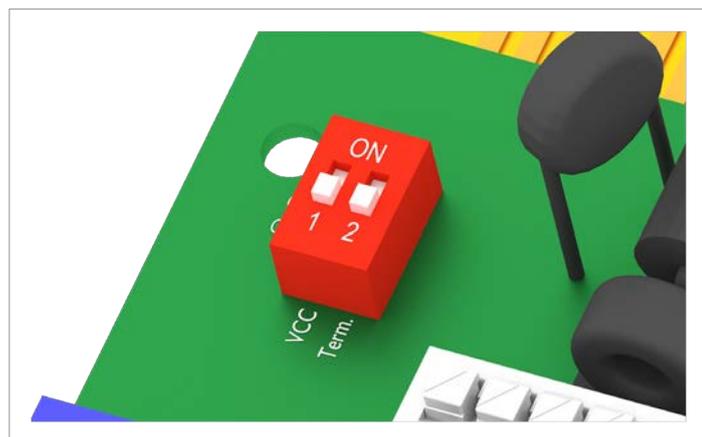
Connecting the communications card

6.6.3.3 Wiring for multiple inverters



1. On the cable coming from the data logger: Connect the DATA+ wire to terminal 5 and the DATA– wire to terminal 6.

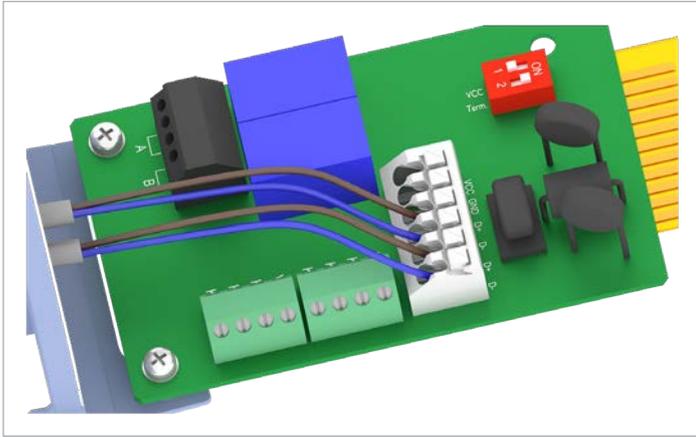
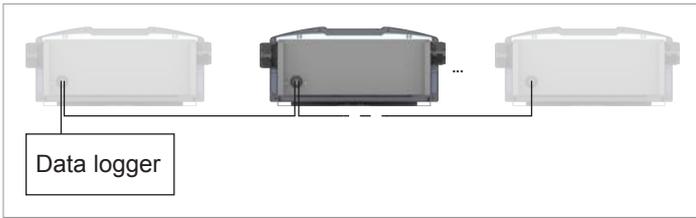
On the cable going to the second inverter: Connect the DATA+ wire to terminal 3 and the DATA– wire to terminal 4.



2. Set the DIP switch for the RS485 termination resistor (DIP 2) to the **OFF** position.

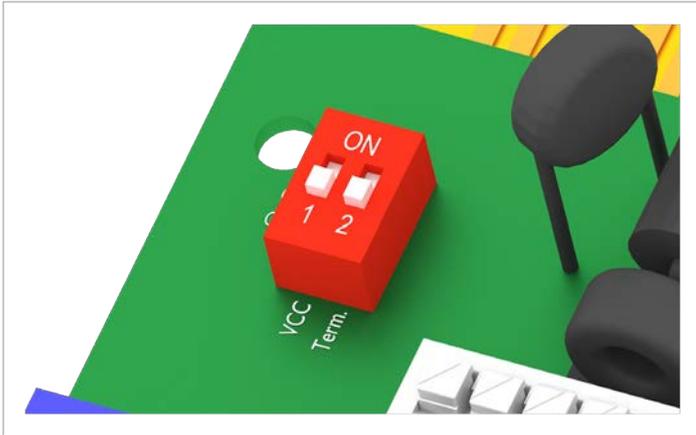
6 Installing the inverter

Connecting the communications card



3. On the cable coming from the previous inverter: Connect the DATA+ wire to terminal 5 and the DATA- wire to terminal 6.

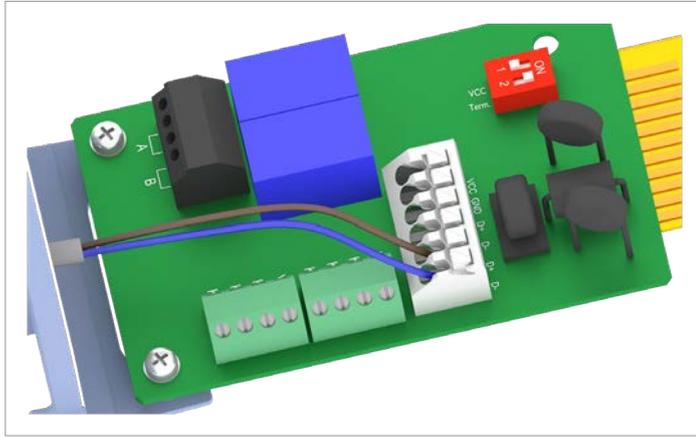
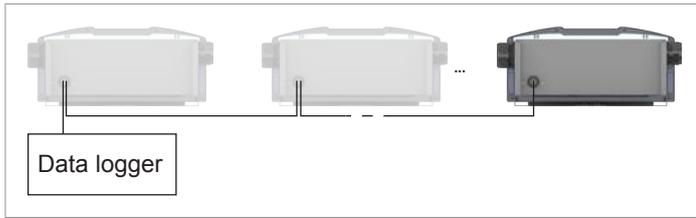
On the cable going to the next inverter: Connect the DATA+ wire to terminal 3 and the DATA- wire to terminal 4.



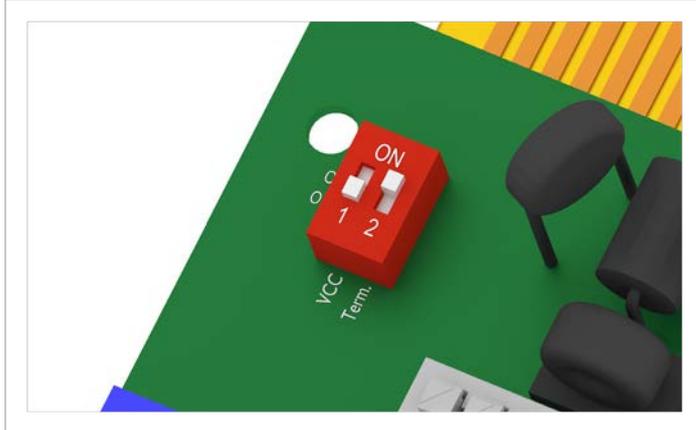
4. Set the DIP switch for the RS485 termination resistor (DIP 2) to the **OFF** position.

6 Installing the inverter

Connecting the communications card



5. Connect the DATA+ wire to terminal 5 and the DATA- wire to terminal 6.



6. Set the DIP switch for the RS485 termination resistor (DIP 2) to the **ON** position.

6.6.4 Connecting an external alarm unit

- Lay the cable with a suitable clearance to the AC and DC cables to prevent interference in the data connection.

6.6.4.1 Wiring for an external alarm unit with an external 12 V_{DC} power supply

The external alarm unit must be connected to an external power supply if the internal 12-V_{DC} power supply is not used.

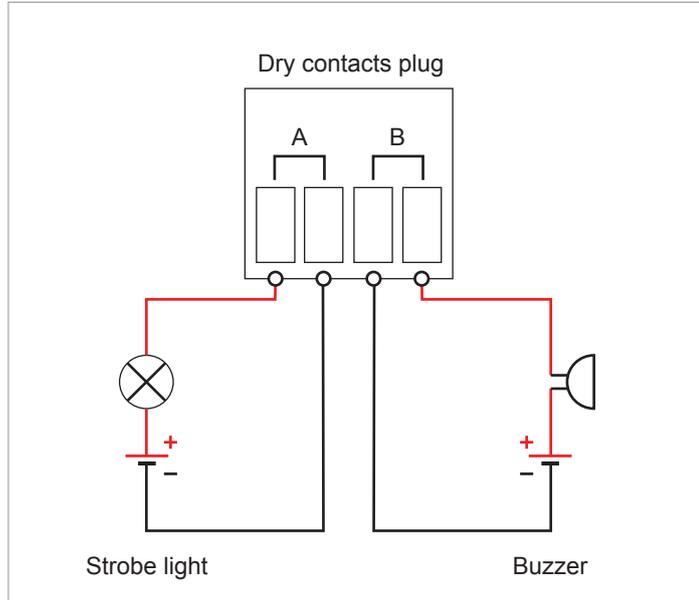
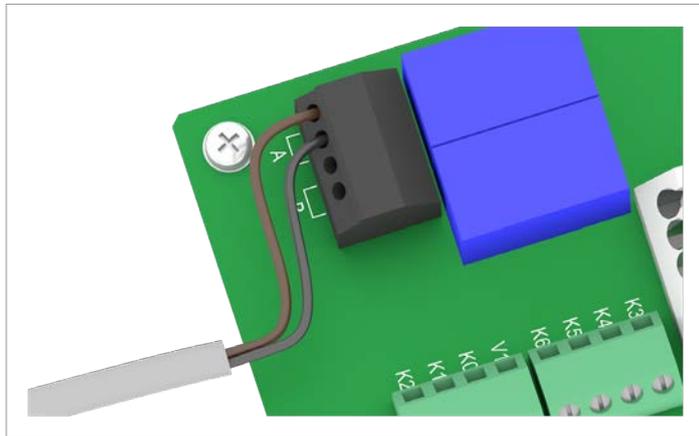


Fig. 6.2: Connection example: dry contacts with an external power supply



1. Connect two wires of the cable to one of the two dry contacts.
2. After commissioning, use the inverter display to assign an event for triggering the alarm unit (see [“8.3.6 Dry contacts”](#), page 125).

6 Installing the inverter

Connecting the communications card

6.6.4.2 Wiring for a single alarm unit with an internal 12 V_{DC} power supply

Connection examples

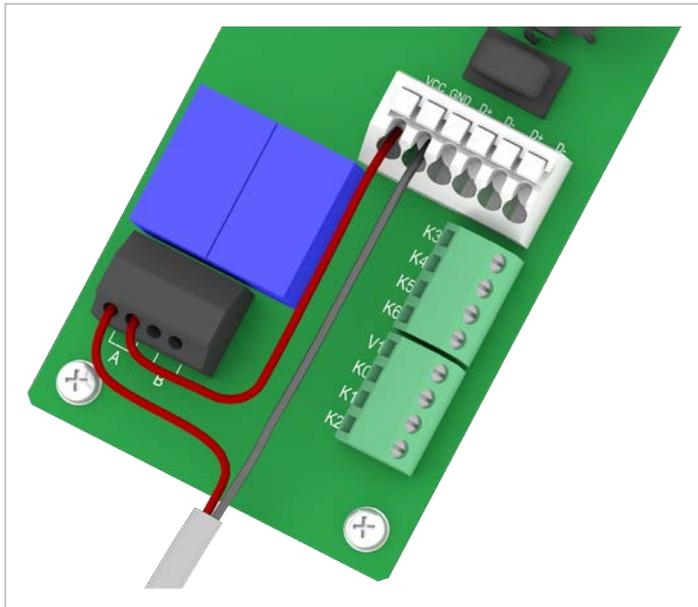
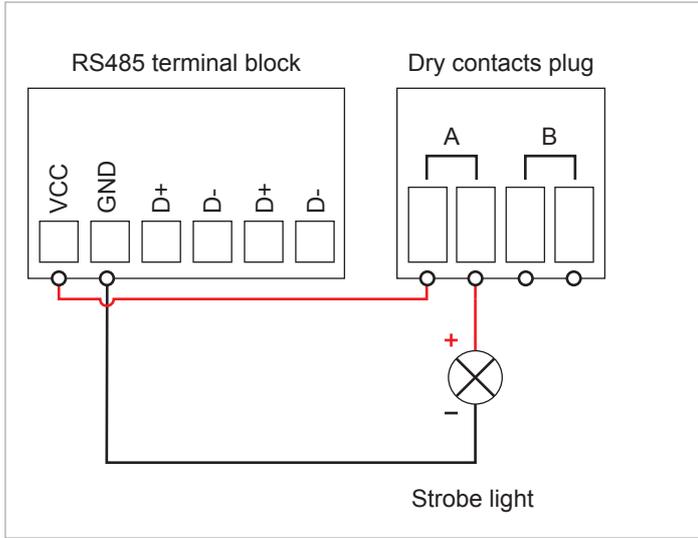


Fig. 6.3: Connection example 1: 1 dry contact with internal 12-V_{DC} power supply for one external alarm unit, variant 1

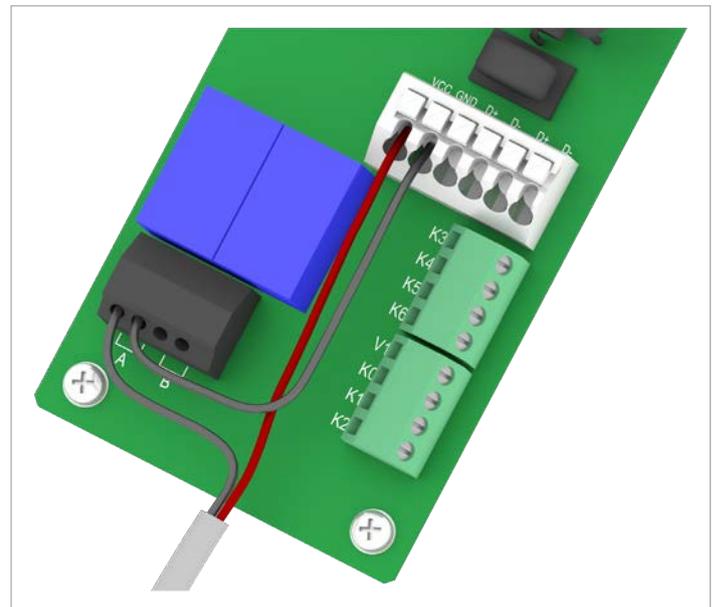
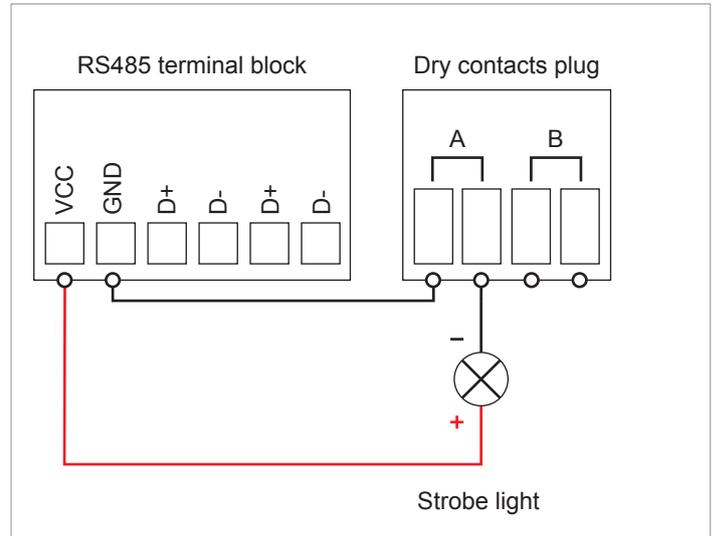


Fig. 6.4: Connection example 2: 1 dry contact with internal 12-V_{DC} power supply for one external alarm unit, variant 2

1. Connect the wires according to the desired connection diagram.
2. After commissioning, use the inverter display to assign an event for triggering the alarm unit (see “8.3.6 Dry contacts”, page 125).

6 Installing the inverter

Connecting the communications card

6.6.4.3 Wiring for two alarm units with an internal 12 V_{DC} power supply

Connection examples

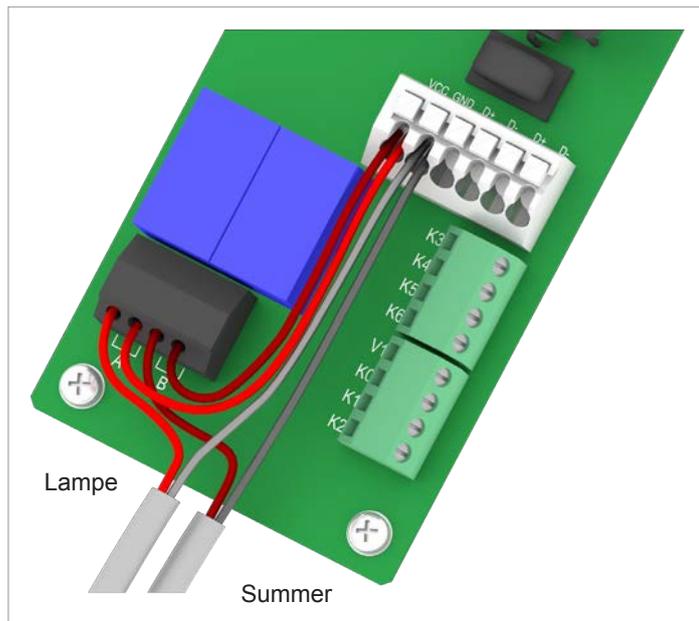
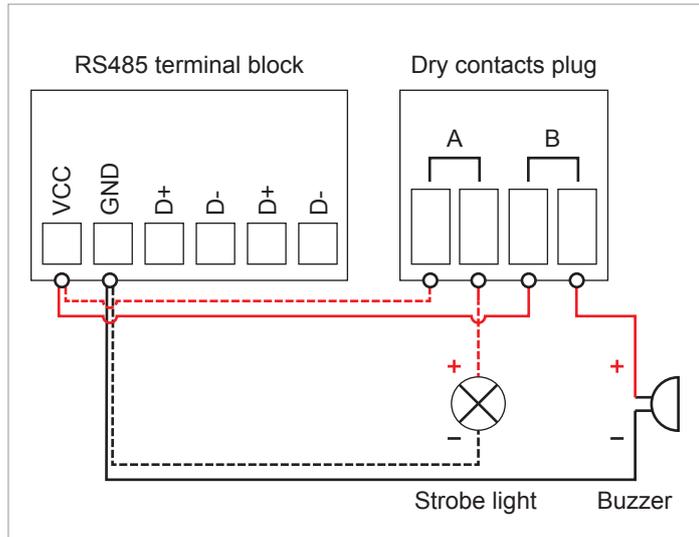


Fig. 6.5: Connection example 3: 2 dry contacts with an internal 12-V_{DC} power supply for 2 external alarm units, variant 1

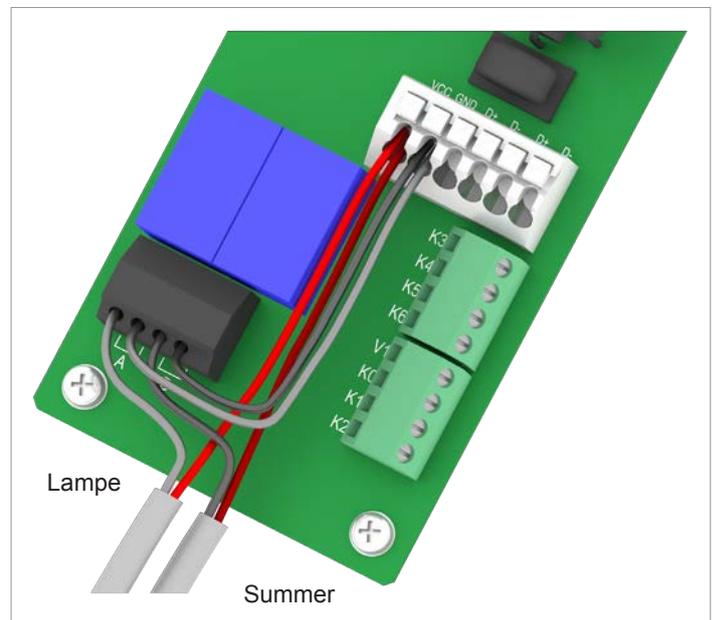
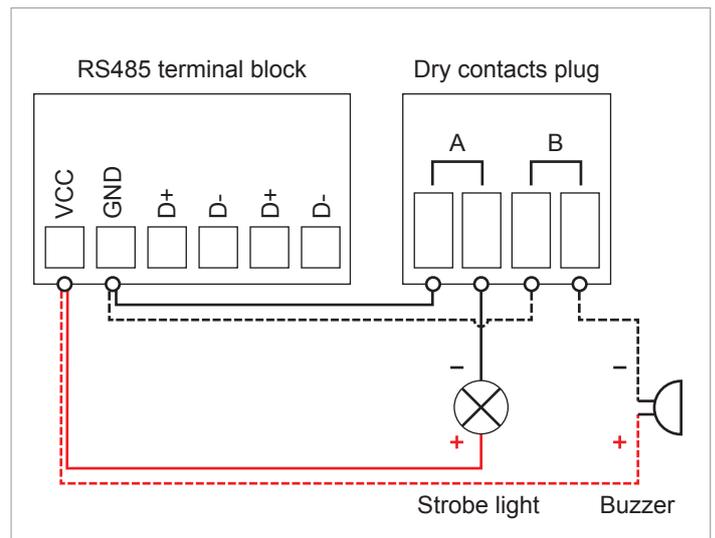


Fig. 6.6: Connection example 4: 2 dry contacts with an internal 12-V_{DC} power supply for 2 external alarm units, variant 2

1. Connect the wires according to the desired connection diagram.
2. After commissioning, use the inverter display to assign an event for triggering the alarm unit (see "8.3.6 Dry contacts", page 125).

6 Installing the inverter

Connecting the communications card

6.6.5 Connecting a ripple control receiver

- Lay the cable with a suitable clearance to the AC and DC cables to prevent interference in the data connection.

Power limiting to:	Short circuit
0%	Terminals V1 and K1
30%	Terminals V1 and K2
60%	Terminals V1 and K3
100%	Terminals V1 and K4

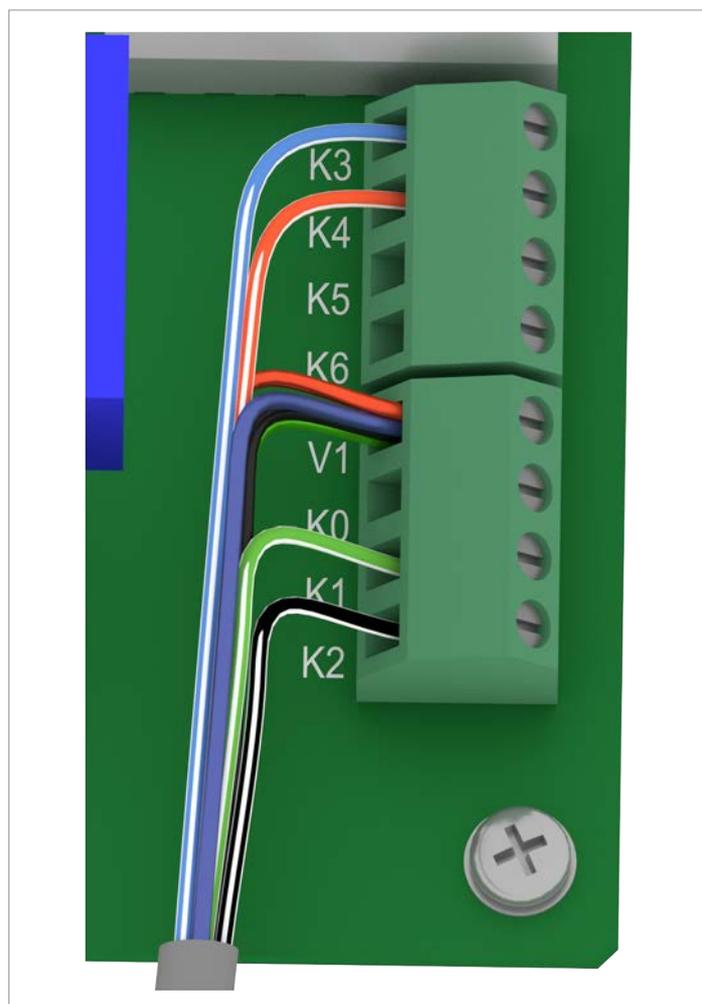
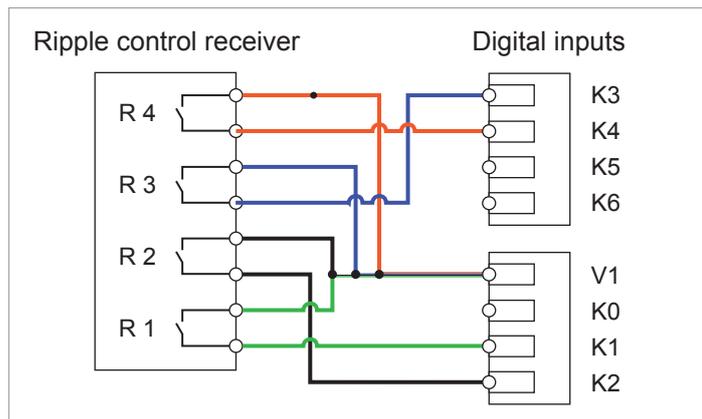


Fig. 6.7: Connecting a ripple control receiver



The colors of the wires in the connection example correspond to a standard CAT5 cable and may differ in other cables. The wire colors have no effect on the function of the wiring.

- Connect the wires according to the circuit diagram.

6.6.6 Connect the external power-off (EPO)

- ▶ Lay the cable with a suitable clearance to the AC and DC cables to prevent interference in the data connection.

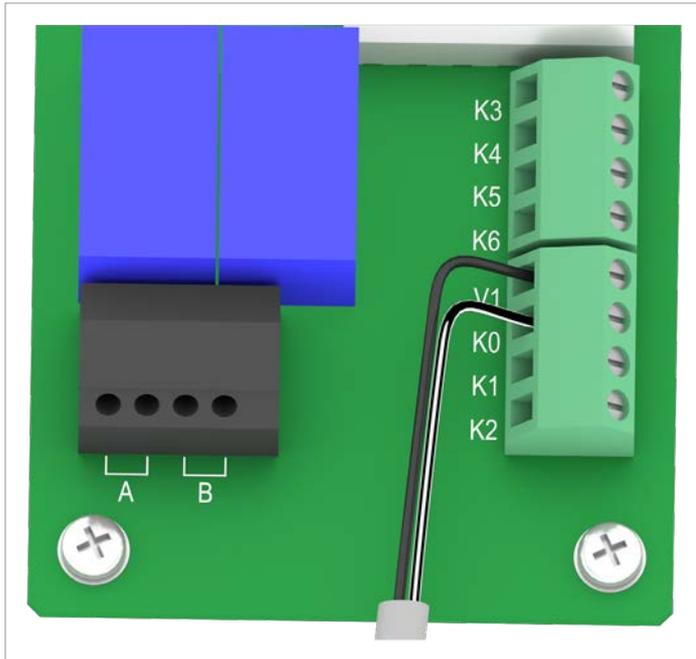


Fig. 6.8: Connecting an external power-off



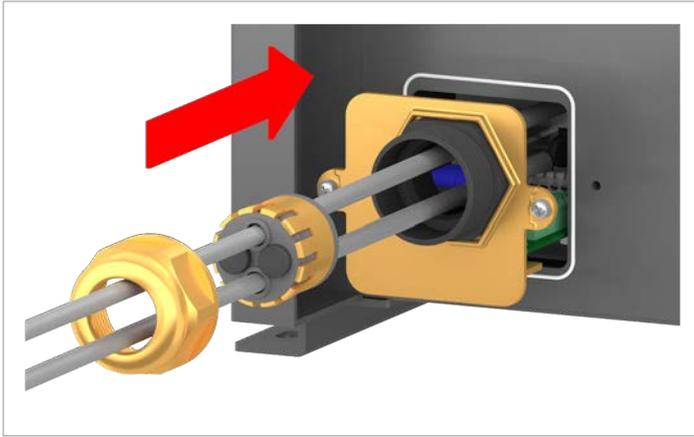
The colors of the wires in the connection example correspond to a standard CAT5 cable and may differ in other cables. The wire colors have no effect on the function of the wiring.

1. Connect the wires to the terminals V1 and K0.
2. After commissioning, the relays can be defined as make-contact or break-contact for the external shutdown on the display (see [“8.3.9 EPO Emergency power-off \(external shutdown\)”](#), page 129).

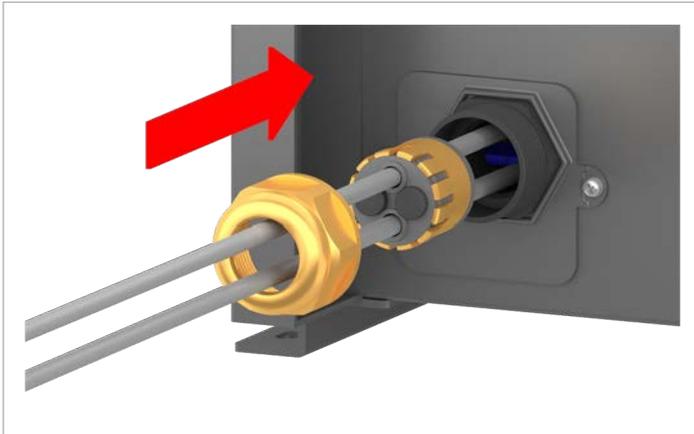
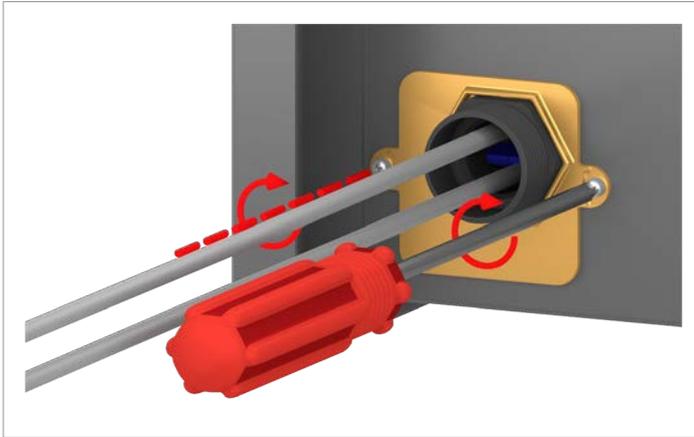
6 Installing the inverter

Connecting the communications card

6.6.7 Final work



1. Fit the communications card cover and screw in place.



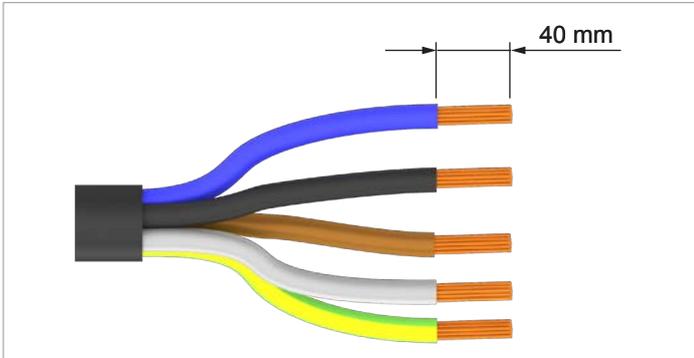
2. Fit the seal and cable gland and screw the cable gland tight.



6.7 Connecting the mains (AC)

6.7.1 Preparing the AC cables

Copper cables

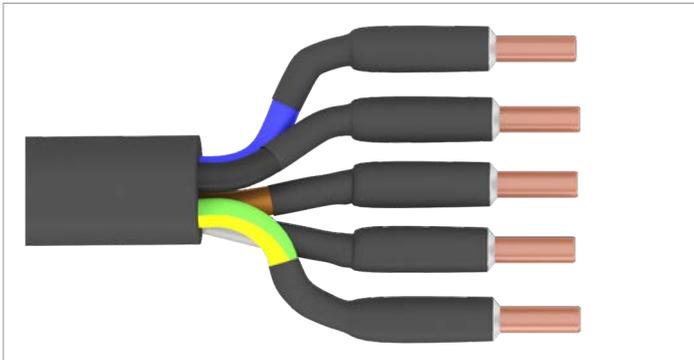


1. Remove the insulation from the cables and the conductors. Do not twist stranded conductors, because this reduces the contact surface area with the wire end sleeves.

Aluminum cables



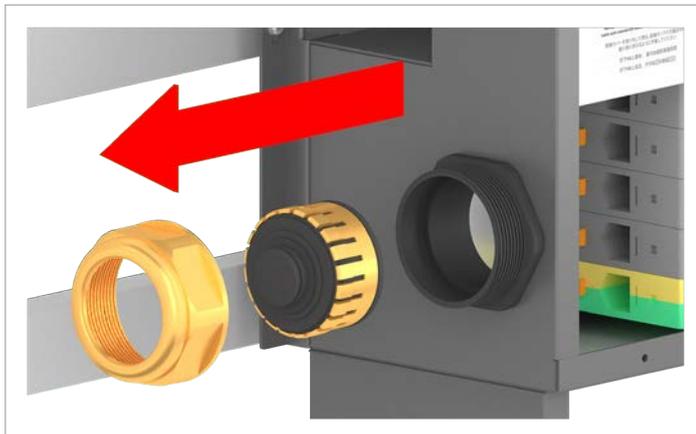
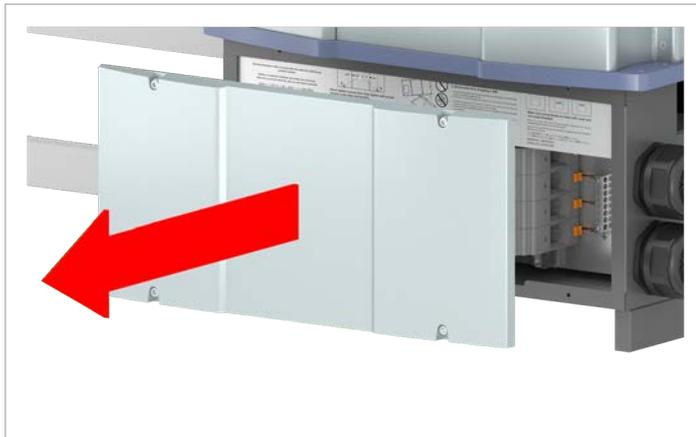
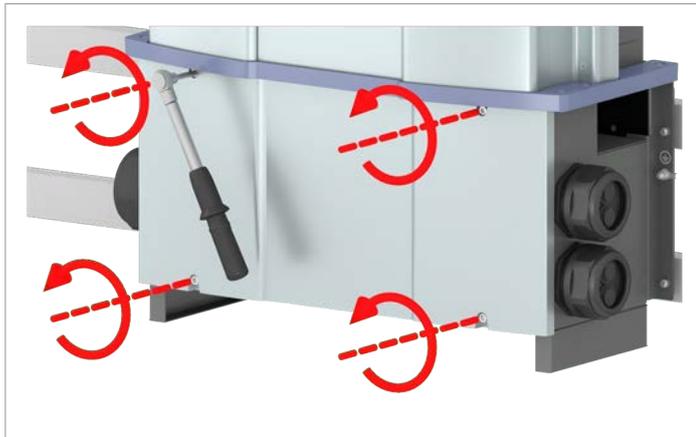
- Fit the crimp connectors according to the manufacturer's instructions, and secure them additionally with heat-shrink sleeving.



6 Installing the inverter

Connecting the AC cables

6.8 Connecting the AC cables



1. Unscrew and remove the junction box cover.

2. Unscrew the cable gland for the AC cable and remove the cable gland and seal.

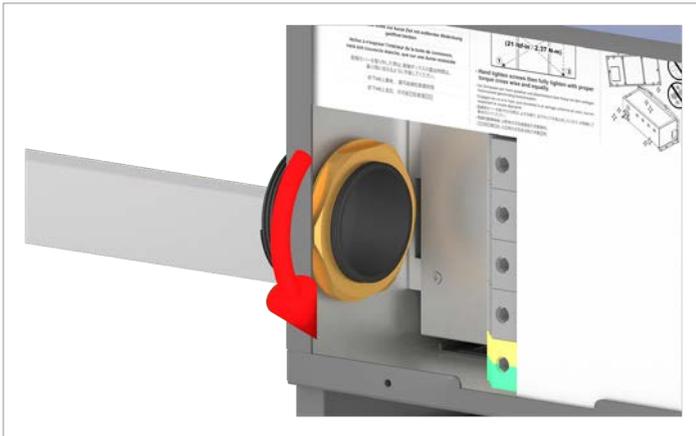
6 Installing the inverter

Connecting the AC cables



Removing all the parts of the cable gland makes it easier to pull the cable into the junction box.

3. Unscrew the inner and outer ring of the cable gland.



The M88H_121 is shipped with two different AC cable glands. These are designed for different cable diameters.

The two variants are described on the next three pages.

4. In accordance with the overview on the following three pages, select all the parts for the cable glands that are required for the respective cable diameters..

6 Installing the inverter

Connecting the AC cables

AC cable gland

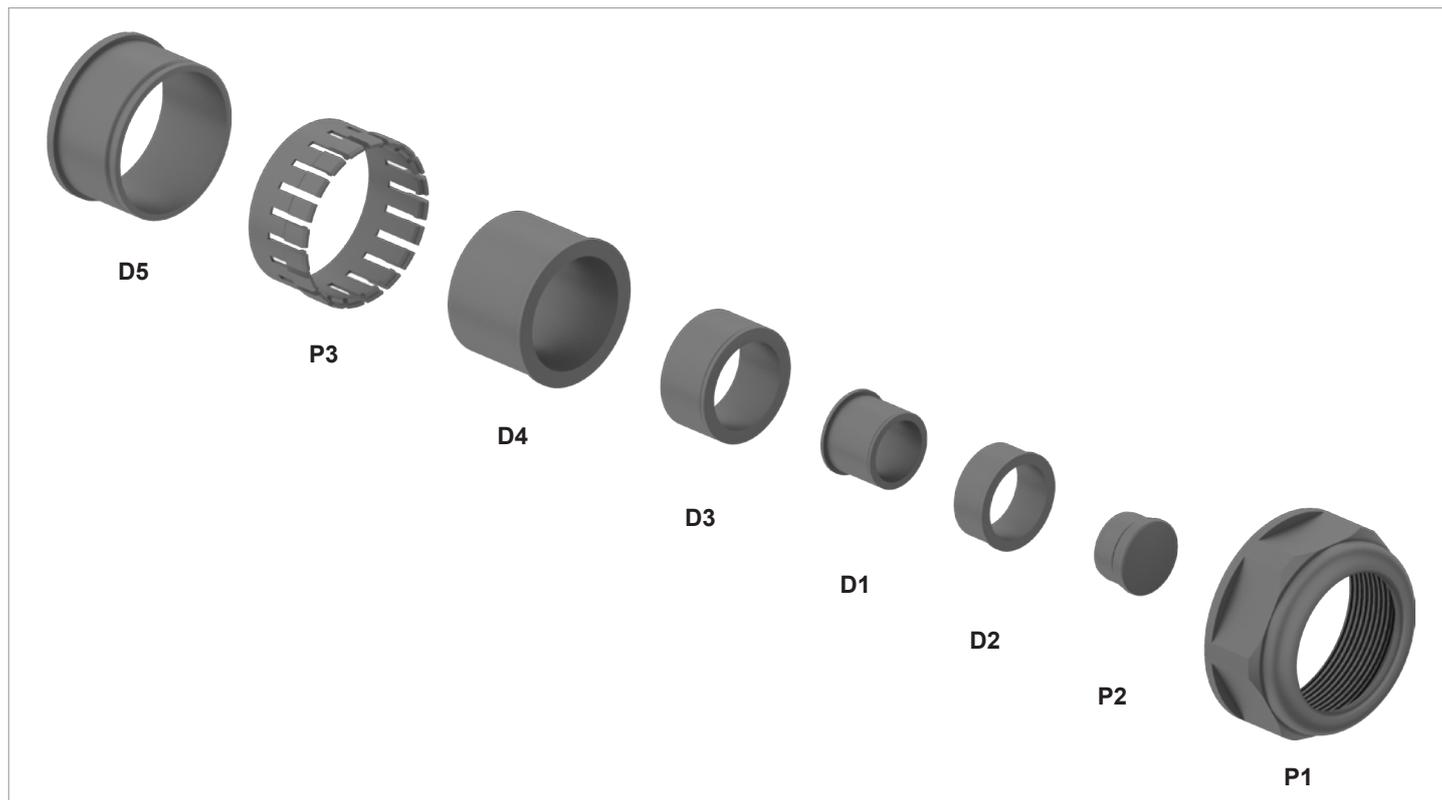


Fig. 6.9: AC cable gland, overview of the parts

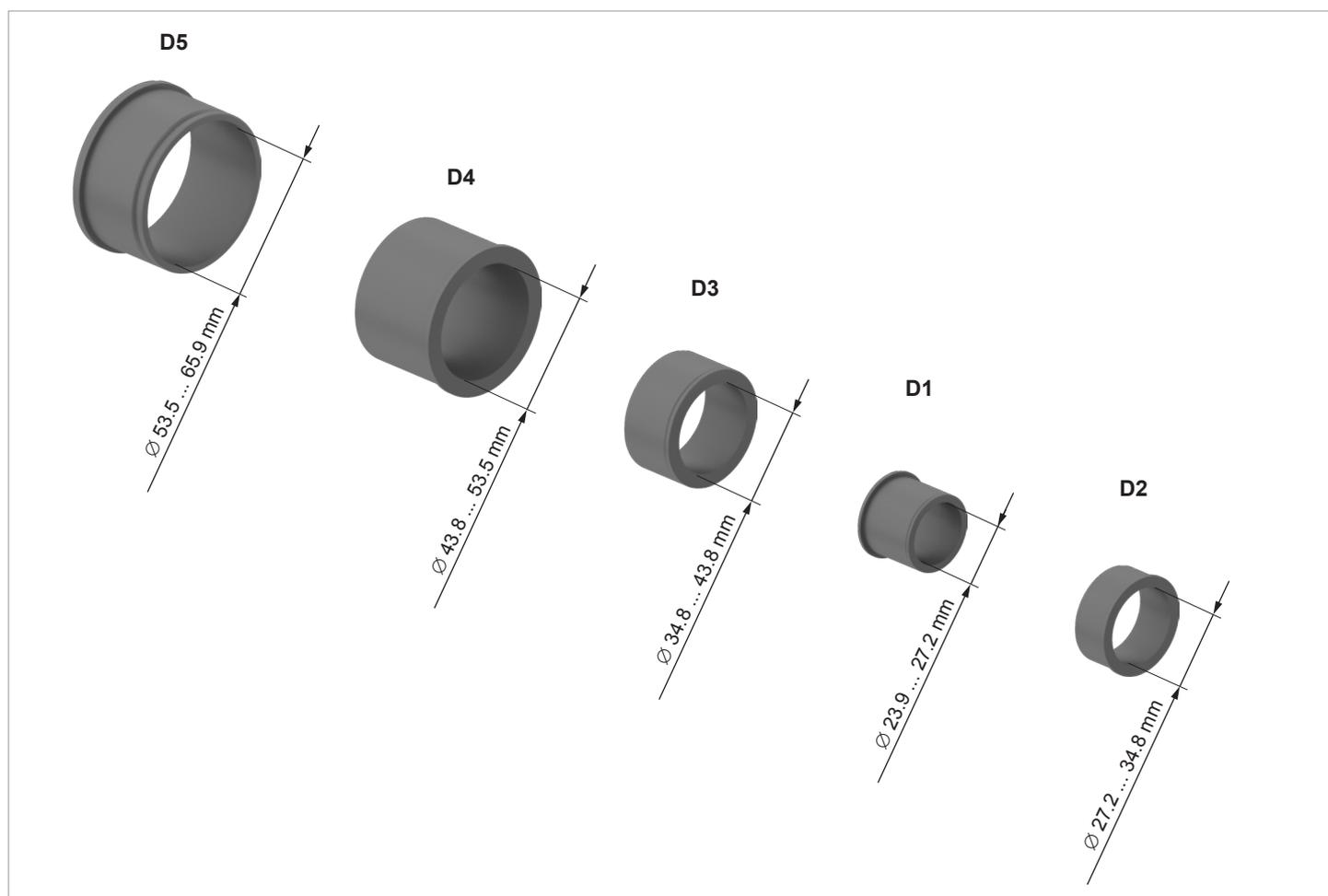


Fig. 6.10: AC cable gland, dimensions of the sealing rings

6 Installing the inverter

Connecting the AC cables

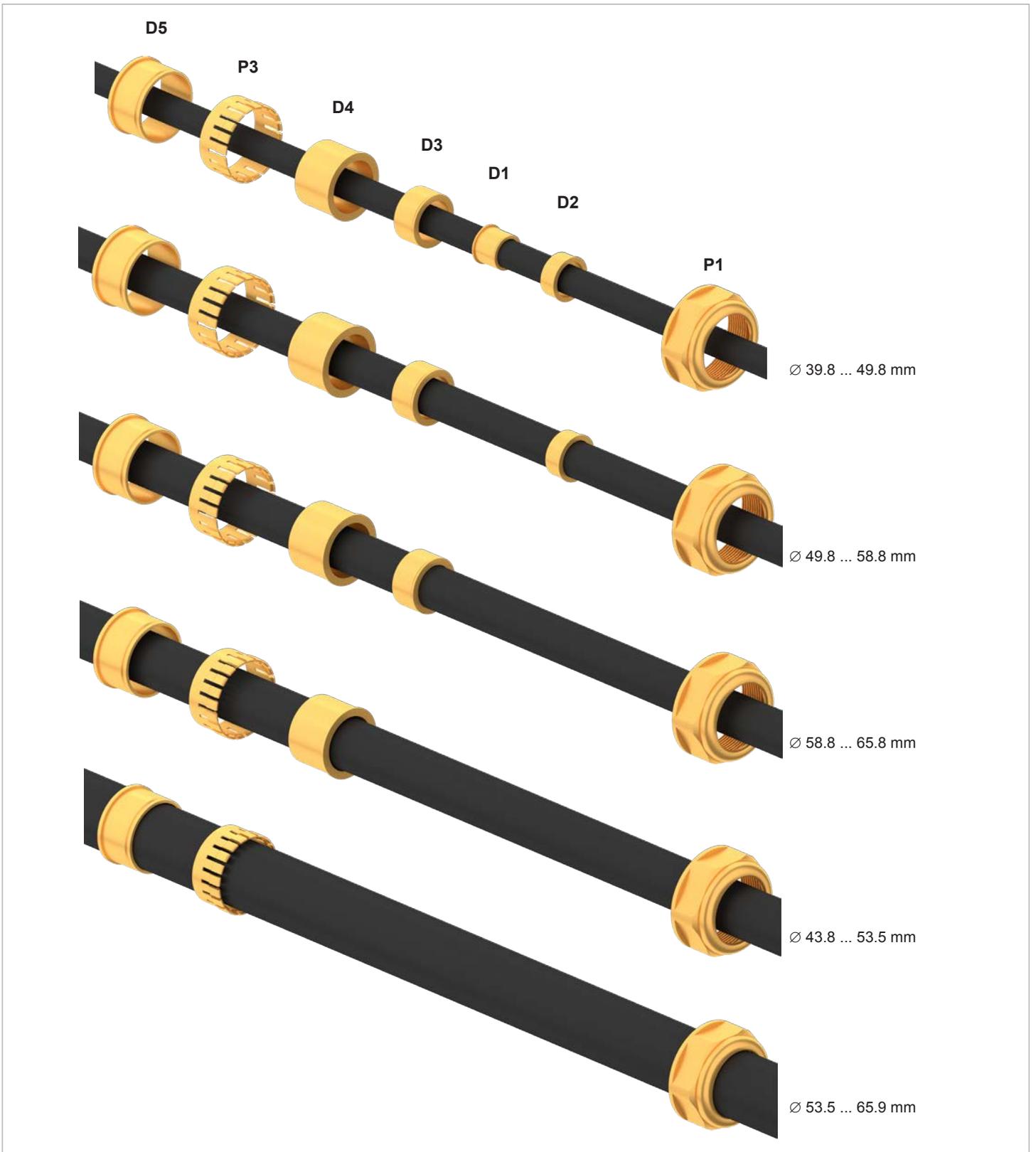


Fig. 6.11: AC cable gland, assignment of the sealing rings to the cable diameters

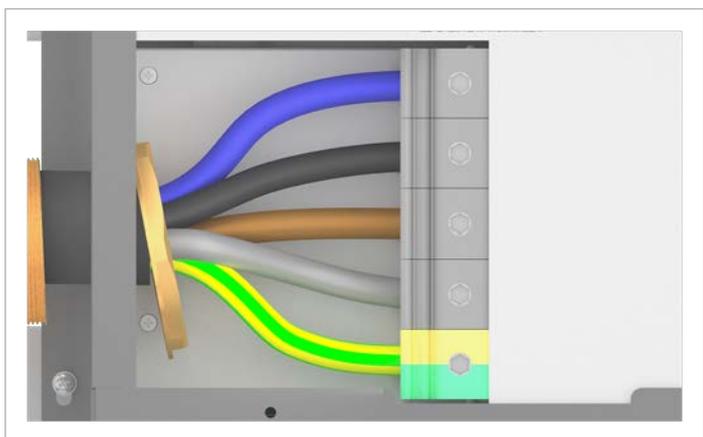
6 Installing the inverter

Connecting the AC cables



When bending and twisting cables or conductors, always comply with the manufacturer's instructions, so as to avoid damage to the conductors or the insulation.

5. The conductors should be pre-bent to suit their eventual position, but only insofar as they will still pass through the cable feed-throughs.

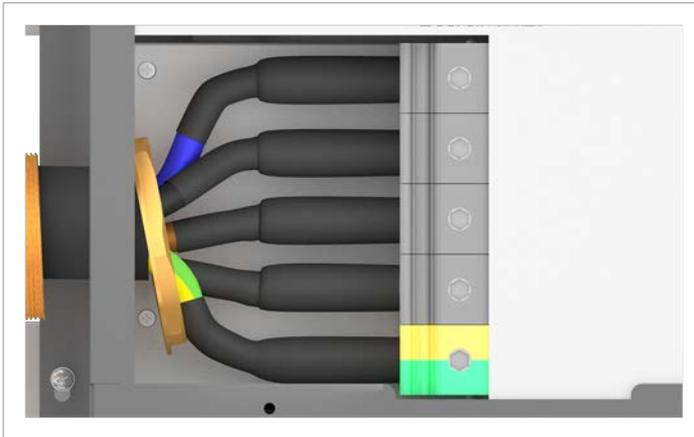
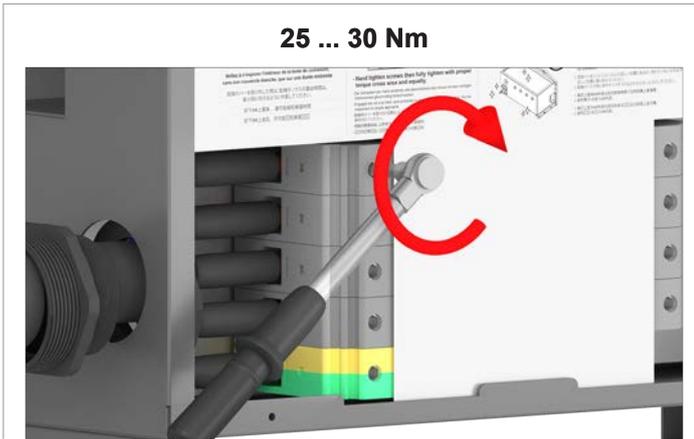


6. Pull the prepared AC cables through all the necessary parts of the cable glands and the AC cable feed-throughs.

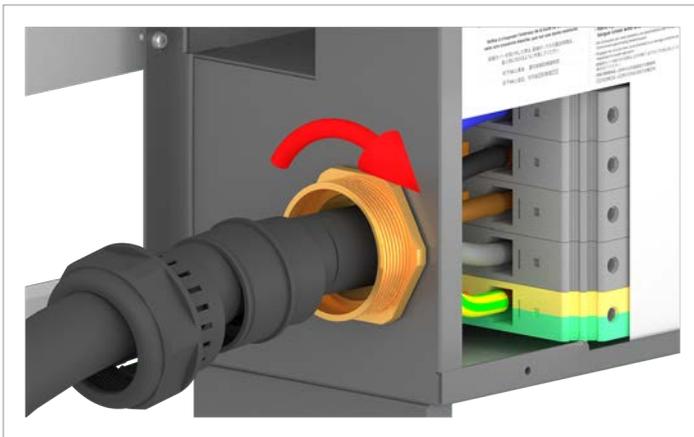
7. Insert the conductors of the AC cable into the terminals of the AC terminal block in accordance with the phase assignment, and tighten the terminals (torque 25 ... 30 Nm).

6 Installing the inverter

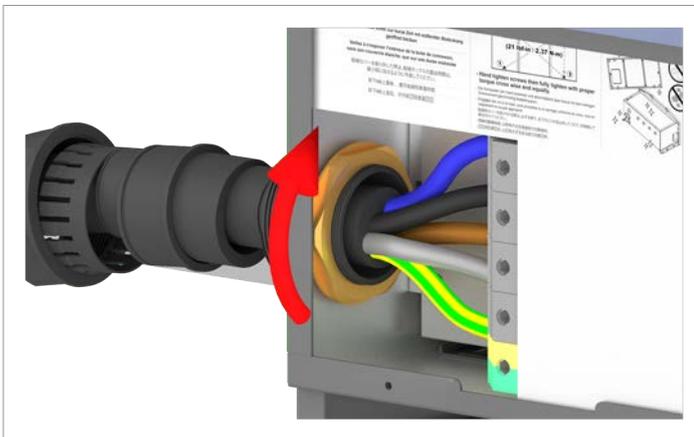
Connecting the AC cables



If aluminum cables with crimped connectors are being used, the installation should appear as shown in this illustration.

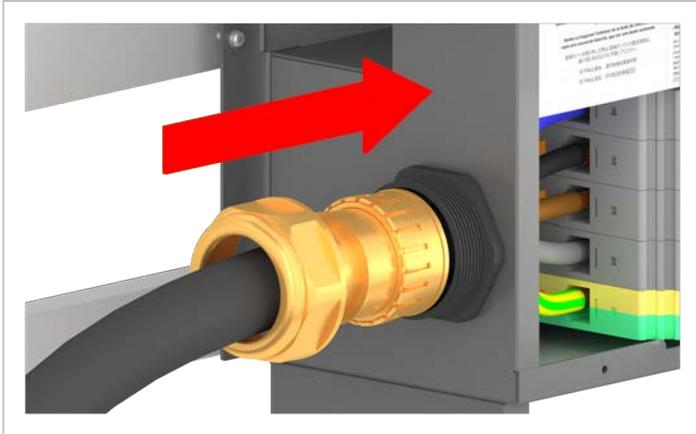


8. Tighten the inner and outer ring of the cable gland.



6 Installing the inverter

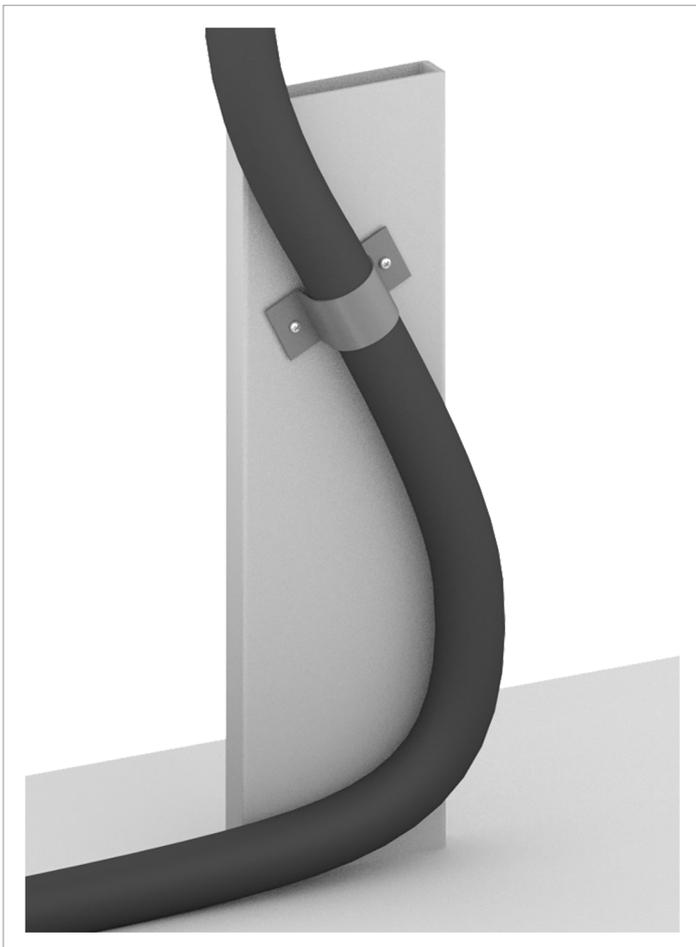
Connecting the AC cables



9. Fit the seal and cable gland and screw the cable gland tight.

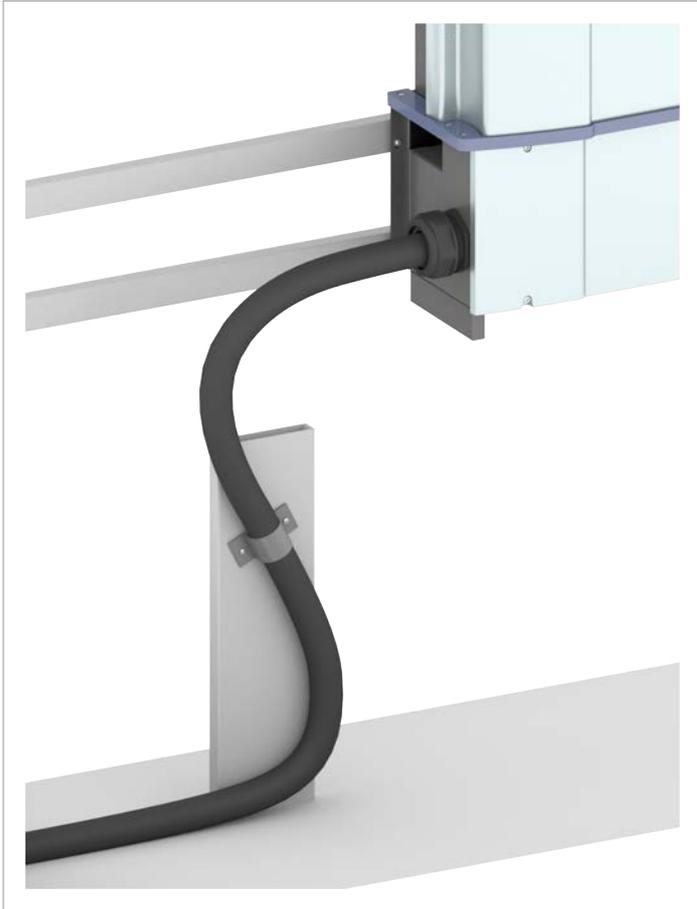


10. Secure the AC cable with a strain relief element.



6 Installing the inverter

Connecting the AC cables



- Work on the AC connection is now complete.

6 Installing the inverter

Connecting the solar modules (DC)

6.9 Connecting the solar modules (DC)

DANGER



Electric shock

Potentially fatal voltages are present at the inverter DC connections. When light falls on the solar modules, they immediately start to generate electricity. This also happens when light does not fall directly on the solar modules.

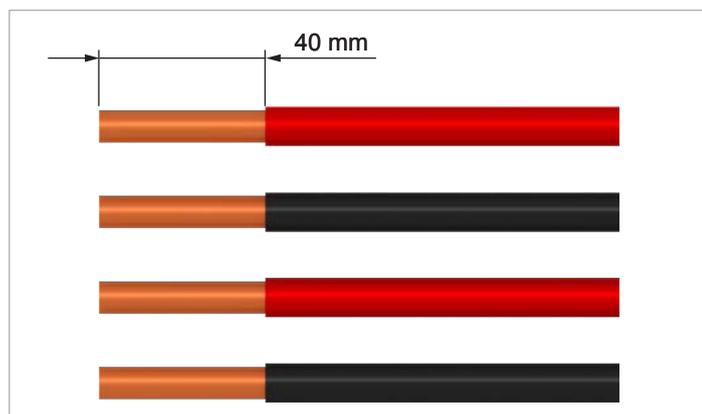
- ▶ Never disconnect the inverter from the solar modules when it is under load.
- ▶ Disconnect the connection to the mains so that the inverter cannot supply energy to the mains.
- ▶ Disconnect the inverter from all AC and DC voltage sources. Ensure that none of the connections can be restored accidentally.
- ▶ Ensure that the DC cables cannot be touched accidentally.

6.9.1 Preparing the DC cables



- ▶ Use a red cable for DC+ and a black cable for DC-. Use a voltmeter to check the polarity.

Copper cables



- ▶ Remove the insulation from the cables and the conductors. Do not twist stranded conductors, because this reduces the contact surface area with the wire end sleeves.

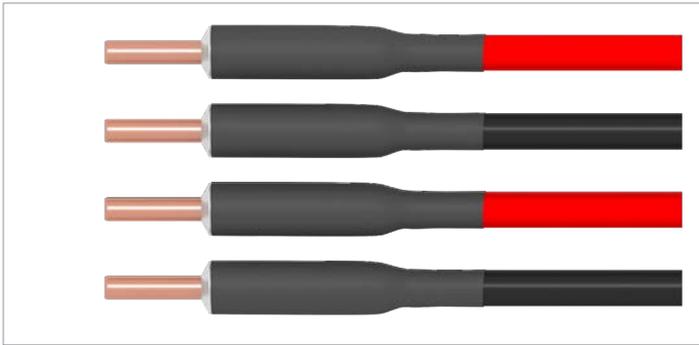
6 Installing the inverter

Connecting the solar modules (DC)

Aluminum cables



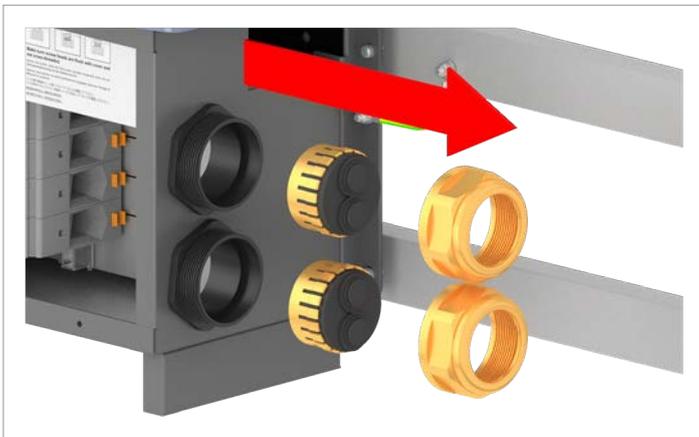
- ▶ Fit the crimp connectors according to the manufacturer's instructions, and secure them additionally with heat-shrink sleeving.



6.9.2 Connecting the DC cables



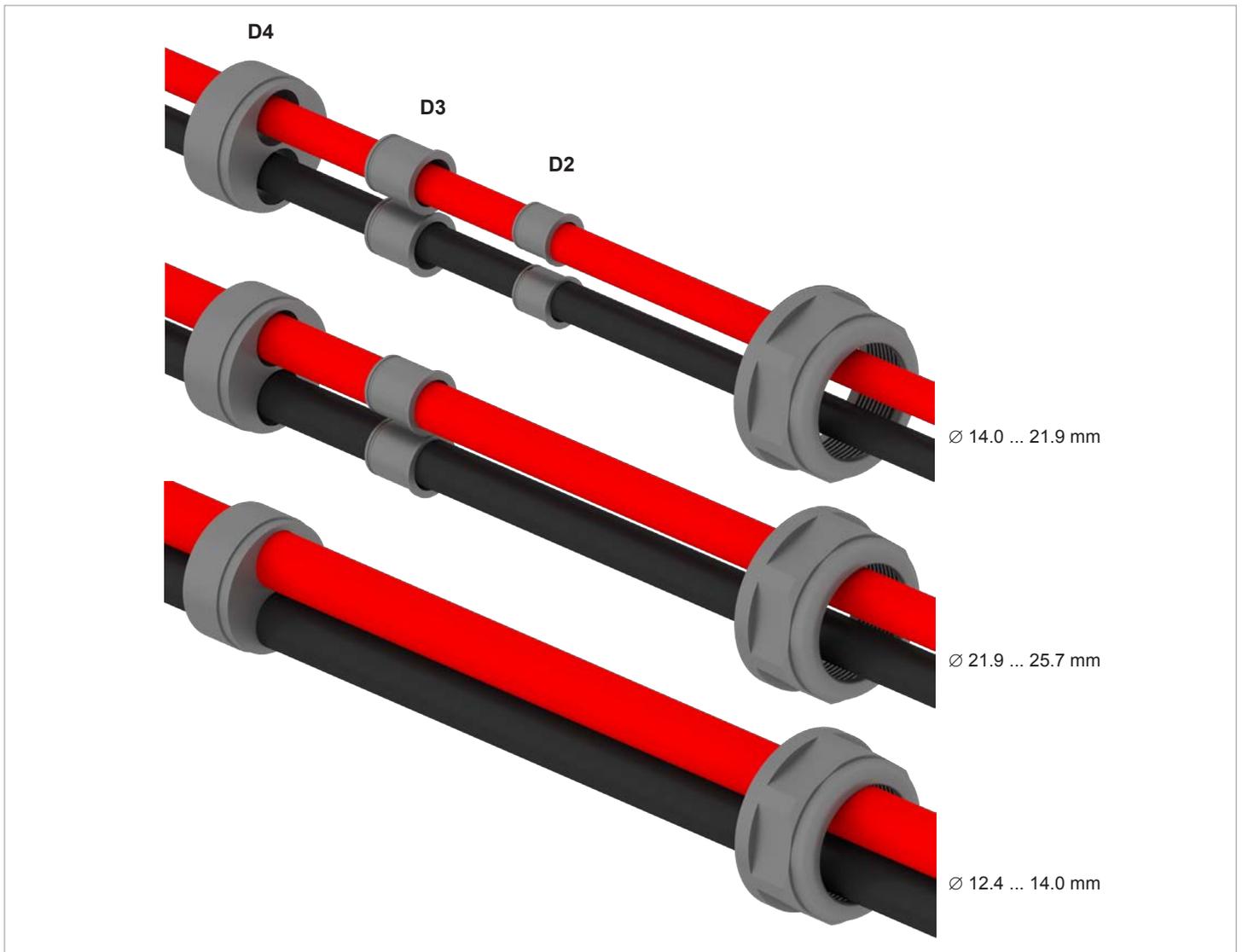
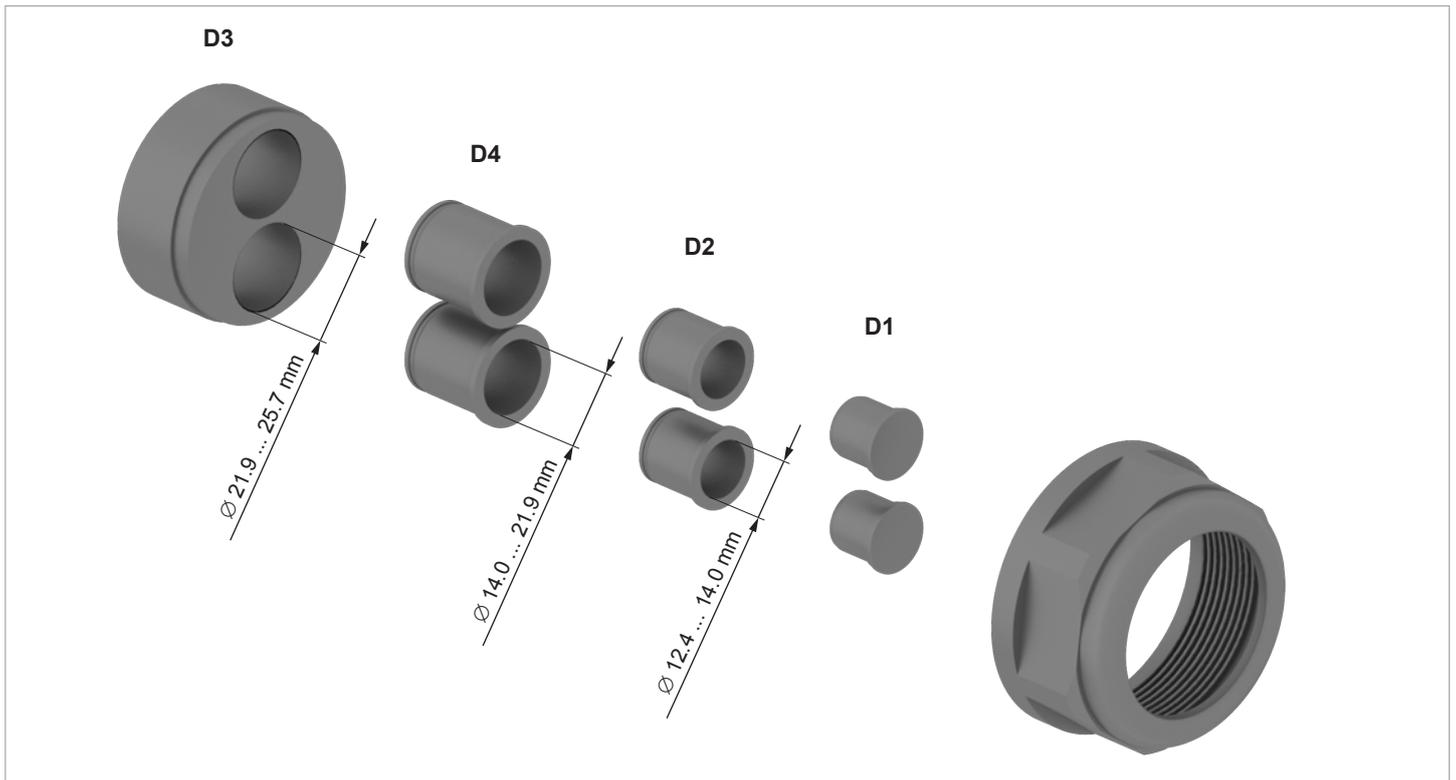
1. Unscrew the cable glands for the DC cables and remove the cable glands and seals.



2. In accordance with the following overview, select all the parts for the cable glands that are required for the respective cable diameters.

6 Installing the inverter

Connecting the solar modules (DC)



6 Installing the inverter

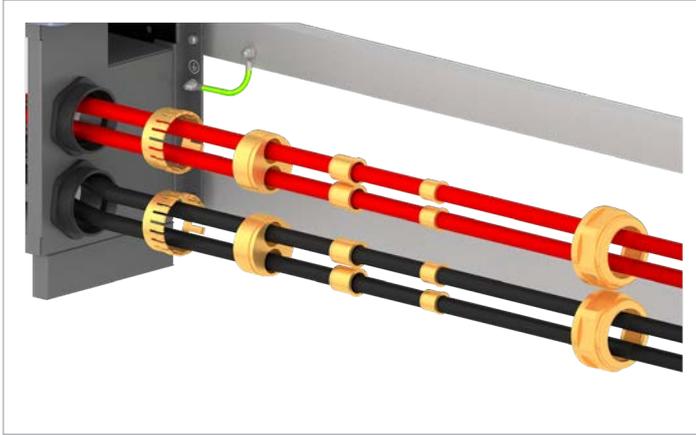
Connecting the solar modules (DC)



When bending and twisting cables or conductors, always comply with the manufacturer's instructions, so as to avoid damage to the conductors or the insulation.

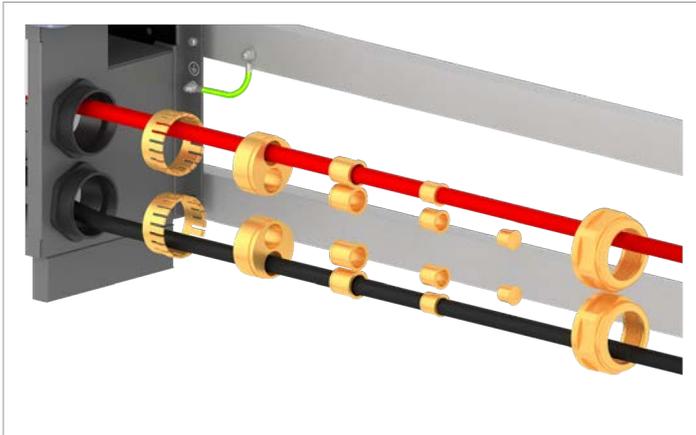
3. Pull the stripped DC cables through all the required parts of the DC cable glands and the DC cables feed-through.

When connecting two DC strings, lay the cables as shown in the illustration on the left.

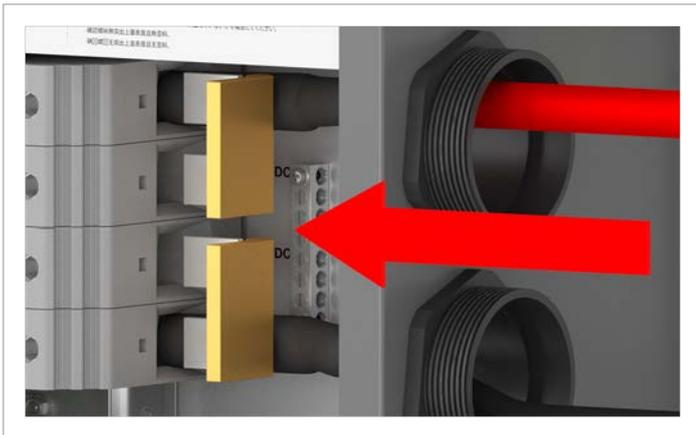


When connecting a single DC string, lay the cables as shown in the illustration on the left.

Seal the non-used openings of the DC cable glands with the seals.



4. Use the jumpers when connecting a single DC string.



5. Insert the DC cables into the respective terminals of the DC terminal block and tighten the terminals (torque 25 ... 30 Nm).

6 Installing the inverter

Connecting the solar modules (DC)



6. Fit the seals and cable glands and screw the cable glands tight.



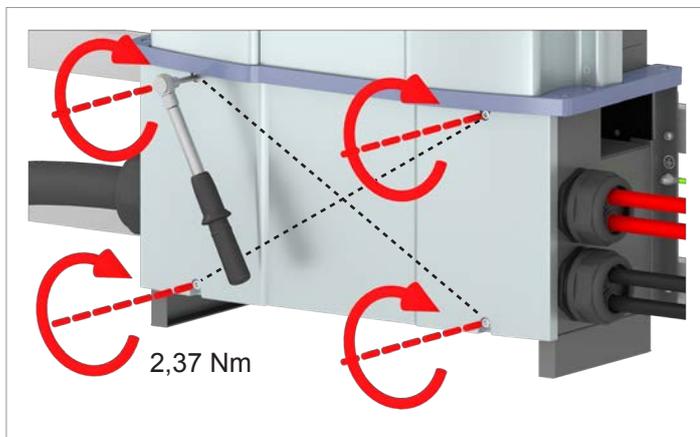
7. Secure the DC cables with a strain relief element.
8. In accordance with local regulations attach warning labels to the inside of the junction box as necessary, see [“6.10 Connecting a PC via RS485”](#), page 97

France: As required by UTE 15-712-1, this warning label must be attached in the inside of the junction box:



6 Installing the inverter

Connecting the solar modules (DC)



NOTICE



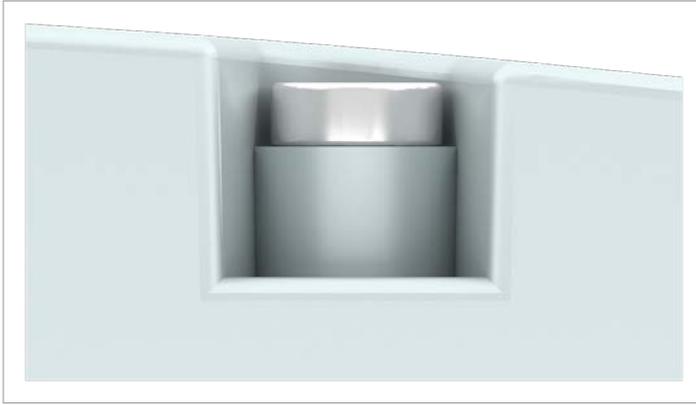
Impairment of operating response caused by moisture and dirt.

In order to restore degree of protection IP65 after the completion of installation work, attach the cover of the wiring box in accordance with the following instructions.

9. Before screwing on the cover, check all seals and surfaces for correct positioning and cleanliness.
10. Attach the cover in such a way that it is evenly mounted and not skewed.
11. Tighten the screws by hand at first and then use a torque wrench to tighten them crosswise with a torque of 2.37 Nm.

6 Installing the inverter

Connecting the solar modules (DC)



12. Do not skew the screws. The screw heads must be flush with the surface.

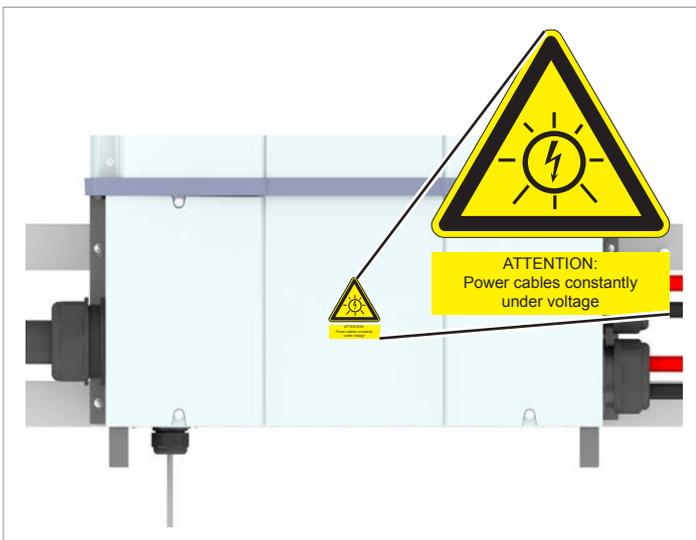


13. In accordance with local regulations attach warning labels to the outside of the inverter as necessary.



Warning
There are two voltage sources present
- Distribution network
- PV modules

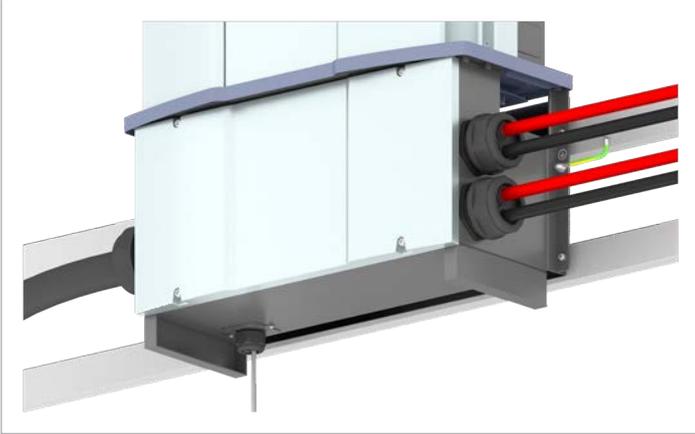
Prior to any work, disconnect both sources



France: As required by UTE 15-712-1, this warning label must be attached to the cover of the junction box.

6 Installing the inverter

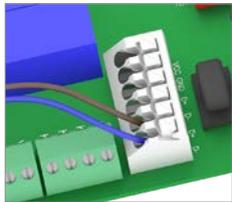
Connecting the solar modules (DC)



The installation work is now complete.

6.10 Connecting a PC via RS485

Inverter



USB/RS485 adapter



DATA+ Terminal 3 or 5

D+

DATA- Terminal 4 or 6

D-

7 Commissioning

7. Commissioning



To make the settings as described in this chapter, the inverter must be powered with alternating current (mains grid).

The inverter also needs a DC voltage in order to operate fully from the energy provider.

```
Select language
▶English
Deutsch
Français
```

```
▶UK G59-3 230
FRA-Is 50HZ
FRA-Is 60HZ
FRANCE MV
```

```
Are you sure to
set country:
UK G59-3 230
▶Yes / No
```

```
▶Delta prot.
SUNSPEC prot.
```

```
Are you sure to
set protocoll:
SUNSPEC prot.
▶Yes / No
```

```
Setting ID:
ID=001
```

```
Are you sure to set
ID: 1
▶Yes / No
```

1. Use the and buttons to select the **English** language and then press the button.

2. Use the and buttons to select your country or mains type and then press the button.

3. Check that the correct country or mains type is selected.

If the correct country is selected, use the and buttons to select the **Yes** entry and then press the button.

To change the selection, press the button.

NOTICE

The Delta protocol is the Delta Modbus protocol and is intended for utilization with the Delta Service Software.

4. Use the and buttons to select SUNSPEC as RS485 protocol option and then press the button.

5. Check that the correct protocol is selected.

If the protocol is selected, use the and buttons to select the **Yes** entry and then press the button.

Press the button to change the selection

NOTICE

If multiple inverters are connected to the PV system then a different inverter ID must be set for each inverter. For example, the inverter ID is used by monitoring systems to uniquely identify each inverter.

6. Use the and buttons to set the individual digits and then press the button.

7. Check that the correct inverter ID is set.

If the correct inverter ID is selected, use the and buttons to select the **Yes** entry and then press the button.

Press the button to change the selection

10.Feb	2017	15:32
Status:	On	Grid
Power:		0W
E-Today:		0kWh

The basic settings are now complete. The standard menu is displayed.

→ The inverter starts a self-test lasting approx. 2 minutes. The remaining time is shown on the display.

8 Settings

8. Settings



This section describes only the settings that can be changed directly on the inverter display. The Delta Service Software offers a wider range of setting facilities.

8.1 "Inverter info." menu area (current settings)	.101
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8.1 "Inverter info." menu area (current settings)

Overview

This function allows you to display the current inverter settings.

Setting options

None.

Menu item path

Main menu > Inverter Info.

Displaying the inverter information

```

 10.Feb 2017 15:32
Status:      On Grid
Power:      0W
E-Today:    0kWh

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.

```

Meter
Energy Log
Event Log
▶Inverter Info.

```

2. Use the **▼** and **▲** buttons to select the **Inverter Info.** entry and then press the **ENT** button.

3. Use the **▼** and **▲** buttons to page through the list.

Note: Some list items contain sub-items with additional information.

4. Press the **EXIT** button to exit the menu.

Overview of the information displayed at this menu item.

Displayed information	Description	How can I change this setting
Page 1		
<pre> S/N:xxxxxxxxxxxxxx Install: INV ID: 1 </pre>	<p>S/N: xxxxxxxxxxxxxx</p> <p>The 13-character serial number of the inverter. The serial number is also located on the type plate of the inverter.</p> <p>Install:</p> <p>The installation date of the inverter.</p> <p>ID: 1</p> <p>The inverter ID. This is required in order to uniquely identify an inverter when several inverters are installed in a system.</p>	<p>This setting cannot be changed.</p> <p>This setting cannot be changed.</p> <p>See "8.3.1 Inverter ID", page 109 for a detailed description and how to change the settings</p>
Page 2		
<pre> FW Version DSP: 1.31 Red: 1.03 COM: 1.15 ARC: 0 SCM: 1.02 </pre>	<p>The version numbers of the installed firmware. This manual relates to the firmware versions listed here.</p>	<p>This setting cannot be changed.</p>

8 Settings

"Inverter info." menu area (current settings)

Displayed information	Description	How can I change this setting
Page 3		
Country: UK G59-3 230	Country: GERMANY LV The configured country or mains type.	See "8.3.3 Country", page 112 for a detailed description and how to change the settings
Insulation: 250kΩ	Insulation: 250 kΩ The insulation resistance.	See "8.3.2 Insulation", page 110 for a detailed description and how to change the settings
Baudrate: 19200bps	Baudrate: 19200 bps The RS485 Baud rate.	See "8.2.3 Baud rate", page 106 for a detailed description and how to change the settings
Page 4		
AC connection: 3P4W	AC connection: 3P4W The mains type (with or without a neutral conductor).	See "8.3.10 AC connection", page 130 for a detailed description and how to change the settings
Max. Power: 88000W	Max. power: 88000W The maximum injection power (active power) to which the inverter is limited.	See "8.3.12 Max. power (maximum active power)", page 132 for a detailed description and how to change the settings
Dry Cont. A: Disable	Dry Cont. A: Disable Dry Cont. B: Disable The event at which the relays trigger the dry contacts.	See "8.3.6 Dry contacts", page 125 for a detailed description and how to change the settings
Dry Cont. B: Disable		
Page 5		
EPO: Normal open	E-Power off: Normal Open The setting for the external power off relay.	See "8.3.9 EPO Emergency power-off (external shutdown)", page 129 for a detailed description and how to change the settings
►Grid Settings	Grid Settings Sub-item with the settings for mains voltage, mains frequency and reconnection time after a mains fault and increase in the active power until reconnection.	See "8.3.4 Grid settings", page 113 for a detailed description and how to change the settings
Active Pwr Settings	Setting for active power Sub-item with the settings for the functions controlling active power.	See below for a description.
React Pwr Settings	Setting for reactive power Sub-item with the settings for the functions controlling reactive power.	See below for a description.

Displayed information	Description	How can I change this setting
-----------------------	-------------	-------------------------------

Sub-item "Setting for active power"

▶ Power Limit	Power limit	See "8.4.1 Power limit (active power)" , page 135 for a detailed description and how to change the settings
Power vs. Frequency	Function for power limitation	
P(V)	Power vs. Frequency	See "8.4.2 Regulating the active power via the mains frequency" , page 137 for a detailed description and how to change the settings
	Function for regulating the active power depending on the mains frequency.	
	P(V)	See "8.4.3 P (V) (regulating the active power via the mains voltage)" , page 140 for a detailed description and how to change the settings
	Function for regulating the active power depending on the mains voltage.	

Sub-item "Setting for reactive power"

▶ Constant cos phi	Constant cos phi	See "8.4.3 P (V) (regulating the active power via the mains voltage)" , page 140 for a detailed description and how to change the settings
Cos phi (P)	Function for setting a constant cos phi (power factor).	
Constant Q	Cos phi (P)	See "8.4.5 Cos phi (P) (regulate cos phi via active power)" , page 144 for a detailed description and how to change the settings
Q(V)	Function for regulating the cos phi (power factor) depending on the active power.	
	Constant Q	See "8.4.6 Constant Q (constant reactive power)" , page 146 for a detailed description and how to change the settings
	Function for setting a constant reactive power.	
	Q(V)	See "8.4.7 Q (V) – Regulating reactive power via voltage" , page 148 for a detailed description and how to change the settings
	Function for regulating the reactive power depending on the mains voltage.	

Page 6

▶ FRT Settings	FRT Settings	See "8.5 FRT (Fault Ride Through)" , page 151 for a detailed description and how to change the settings
	Function for setting the operating behavior in the event of a mains voltage failure.	

8 Settings

"General settings" menu area

8.2 "General settings" menu area

8.2.1 Language

Overview

This function allows you to set the display language.

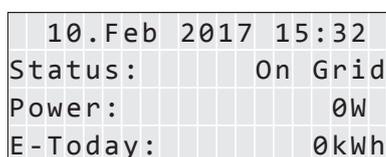
Setting options

Parameter	Description	Setting range
Language	The display language.	German English Spanish French Italian Dutch

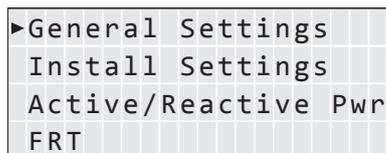
Menu item path

Main menu > General settings > Language

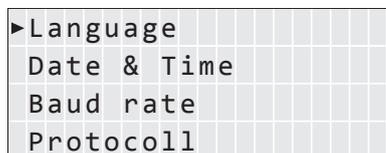
Set the display language



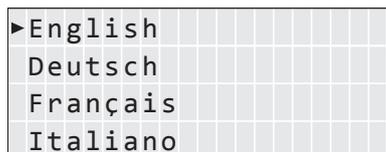
10.Feb 2017 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh



►General Settings
Install Settings
Active/Reactive Pwr
FRT



►Language
Date & Time
Baud rate
Protocoll



►English
Deutsch
Français
Italiano

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the  button repeatedly until the main menu is displayed.
2. Use the  and  buttons to select the **General Settings** entry and then press the  button.
3. Use the  and  buttons to select the **Language** entry and then press the  button.
4. Use the  and  buttons to select a language and then press the  button.

8.2.2 Date and Time

Overview

This function allows you to set the date and time.



The date and time must be set correctly for exact calculations of the statistics in the inverter or in a monitoring system.

Setting options

Parameter	Description	Setting range
-	Date and Time	-

Menu item path

Main menu > General settings > Date and time

Setting the date and time

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

▶General Settings
Install Settings
Active/Reactive Pwr
FRT

```

```

Language
▶Date & Time
Baud rate
Protocol

```

```

10.Sep 2014 14:55

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **General Settings** entry and then press the **ENT** button.
3. Press the **▼** and **▲** buttons to select the entry **Date and time** and press the **ENT** button.
4. Use the **▼** and **▲** buttons to change the selected (underlined) value and then press the **ENT** button.
→ The selection jumps to the next value.

8 Settings

"General settings" menu area

8.2.3 Baud rate

Overview

This function allows you to set the RS485 Baud rate.



If multiple inverters are connected via RS485 then the same Baud rate must be set at every inverter.

Setting options

Parameter	Description	Setting range
Baud rate	Baud rate for RS485	9600 19200 38400

Menu item path

Main menu > General settings > Baud rate

Setting the Baud rate for RS485

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
```

```
►General Settings
Install Settings
Active/Reactive Pwr
FRT
```

```
Language
Date & Time
►Baud rate
Protocol
```

```
►9600
19200
38400
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **General Settings** entry and then press the **ENT** button.
3. Use the buttons **▼** and **▲** to select the entry **Baud Rate** and press the **ENT** button.
4. Use the **▼** and **▲** buttons to select the value and then press the **ENT** button.

8.2.4 Protocol

Overview

This function allows you to select the RS485 protocol.

Setting options

Parameter	Description	Setting range
Prot. Delta	Delta Modbus protocol, for use with Delta Service Software only	-
Prot. SUNSPEC	Standard RS485 protocol	-

Menu item path

Main menu > General settings > Baud rate

Setting the Baud rate for RS485

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

▶General Settings
  Install Settings
  Active/Reactive Pwr
  FRT

```

```

Language
Date & Time
Baud rate
▶Protocol

```

```

▶9600
 19200
 38400

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **General Settings** entry and then press the **ENT** button.
3. Use the **▼** and **▲** buttons to select the **Protocol** entry and then press the **ENT** button.
4. Use the **▼** and **▲** buttons to select the entry and then press the **ENT** button.

8 Settings

"General settings" menu area

8.2.5 Test menu

See "[11.2 Checking the fans](#)", page 163 for a description

8.3 "Installation settings" menu area



This menu area is password-protected because the settings in this menu area affect the energy production of the inverter.

- ▶ Exercise extra care with all settings in this menu area.

8.3.1 Inverter ID

Overview

This function allows you to set the inverter ID.



If multiple inverters are connected to the PV system then a different inverter ID must set for each inverter. For example, the inverter ID is used by monitoring systems to uniquely identify each inverter.

Setting options

Parameter	Description	Setting range
Setting ID	Inverter ID	001 .. 254

Menu item path

Main Menu > Install Settings > Inverter ID

Setting the inverter ID

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

General Settings
▶Install Settings
Active/Reactive Pwr
FRT

```

```

Warning:
Adj. would affect
energy production.
Password  0 * * *

```

```

▶Inverter ID:  001
Insulation
Country
Grid Settings

```

```

Setting ID:
ID=001

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the buttons **▼** and **▲** to select the entry **Inverter ID** and press the **ENT** button. The currently set value is displayed after the entry.
5. Use the **▼** and **▲** buttons to set the inverter ID and then press the **ENT** button.

8 Settings

"Installation settings" menu area

8.3.2 Insulation



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview

This function allows you to set the insulation mode and insulation resistance.

Setting options

Parameter	Description	Setting range
Mode	The insulation mode.	ON Plus grounding Minus grounding OFF
Resistance	Insulation resistance	150 kΩ 250 kΩ 1200 kΩ

Menu item path

Main Menu > Install Settings > Insulation

Calling up the menu

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
```

```
General Settings
▶Install Settings
Active/Reactive Pwr
FRT
```

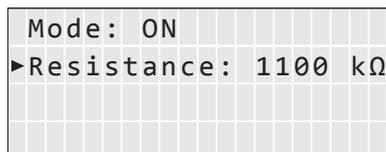
```
Warning:
Adj. would affect
energy production.
Password  0 * * *
```

```
Inverter ID:  001
▶Insulation
Country
Grid Settings
```

```
▶Mode: ON
Resistance: 1100 kΩ
```

```
▶ON
Plus grounded
Minus grounded
OFF
```

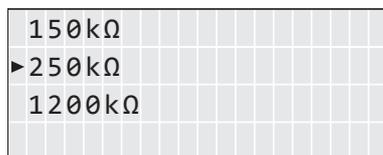
1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Insulation** entry then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **Mode** entry and then press the **ENT** button. The currently set value is displayed after the entry.
6. Use the **▼** and **▲** buttons to select a mode and then press the **ENT** button.



Mode: ON
▶Resistance: 1100 kΩ

7. Use the  and  buttons to select the **Resistance** entry and then press the  button.

The currently set value is displayed after the entry.



150kΩ
▶250kΩ
1200kΩ

8. Use the  and  buttons to select a value and then press the  button.

8 Settings

"Installation settings" menu area

8.3.3 Country



Change this setting only after consultation with Delta customer service.

Overview



To change this setting, you need a special password provided by Delta customer service. You can find the contact information on the back of this document.

This function allows you to set the country.

Menu item path

Main Menu > Install Settings > Country

Loading the factory settings

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:     0kWh
```

```
General Settings
▶Install Settings
Active/Reactive Pwr
FRT
```

```
Warning:
Adj. would affect
energy production.
Password 0 * * *
```

```
Inverter ID: 001
Insulation
▶Country
Grid Settings
```

```
▶UK G59-3 230
FRA-Is 50HZ
FRA-Is 60HZ
FRANCE MV
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the  and  buttons to select the **Install Settings** entry and then press the **ENT** button.
3. Enter the password provided by Delta customer service. Use the  and  buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the  and  buttons to select the **Country** entry and then press the **ENT** button.
5. Use the  and  buttons to select a country or mains type and then press the **EXIT** button.

8.3.4 Grid settings



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

8.3.4.1 Overview



To change this setting, you need a special password provided by Delta customer service. You can find the contact information on the back of this document.

This menu area is used to define the behavior of the inverter in the event of faults in the public mains.

The **Grid Settings** menu area has the following sub-areas:

Voltage protection	The behavior of the inverter in the event of mains overvoltage or undervoltage.
Frequency protection	The behavior of the inverter in the event of mains overfrequency or underfrequency.
Reconnection time	The time that the inverter will wait before reconnecting to the mains after a mains fault.
P Ramp Up	The increase in active power per minute when the inverter is reconnecting to the mains after a mains fault.

8 Settings

"Installation settings" menu area

8.3.4.2 Voltage protection



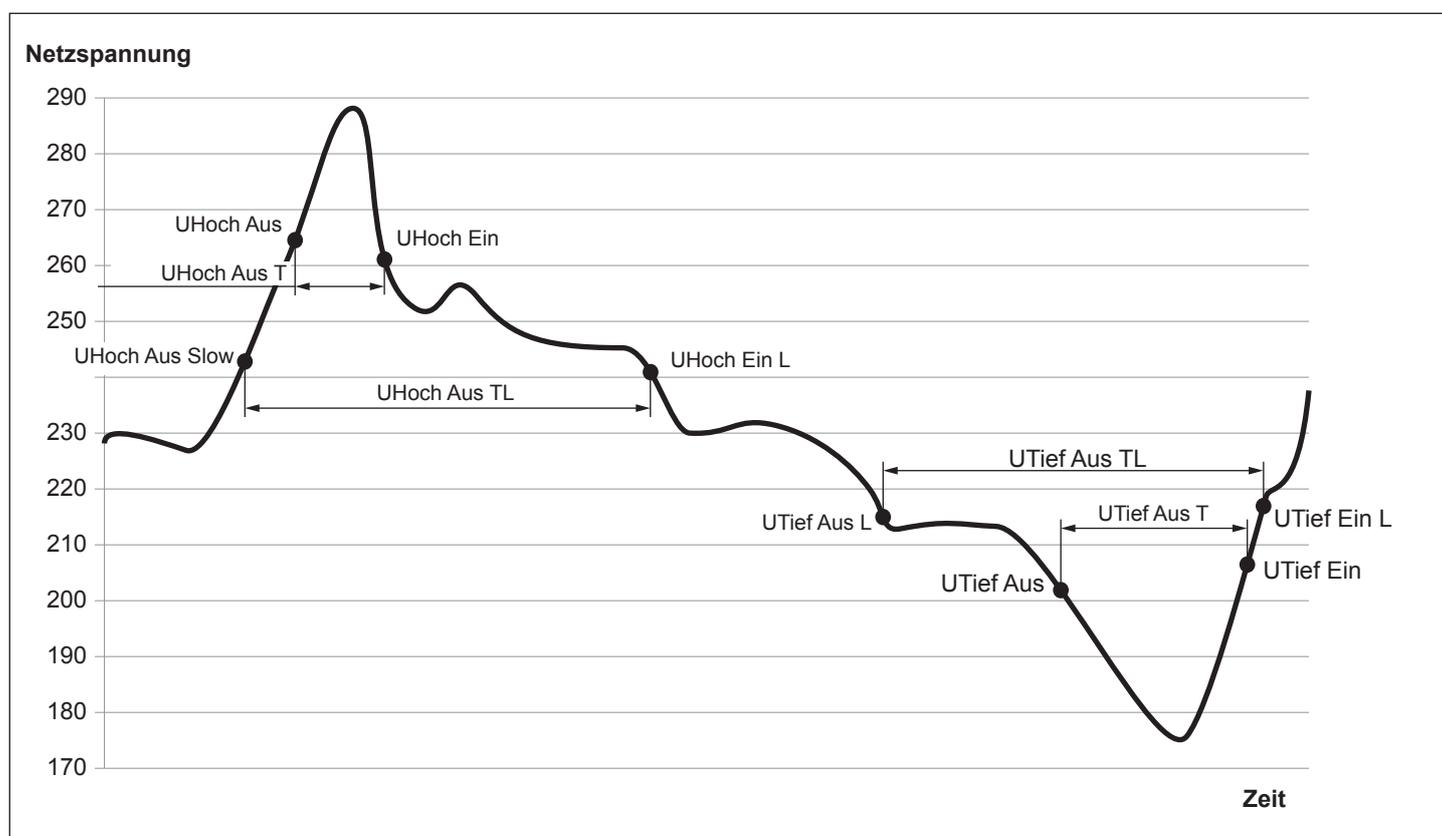
These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview



To change this setting, you need a special password provided by Delta customer service. You can find the contact information on the back of this document.

This function allows you to defined the behavior of the inverter in the event of mains overvoltage or undervoltage.



Setting options

Parameter	Description	Setting range
High Off	Voltage high off	104.0 .. 374.0 V
High On	Voltage high on	104.0 .. 374.0 V
High Off T	Disconnection time for voltage high off	0.0 .. 5.0 s
Low Off	Voltage low off	104.0 .. 374.0 V
Low On	Voltage low on	104.0 .. 374.0 V
Low Off T	Disconnection time for voltage high off	0.0 .. 5.0 s
Hi Off Slow	Voltage high off slowly	104.0 .. 374.0 V
Lo On Slow	Voltage low on slowly	104.0 .. 374.0 V
Hi Off Sl T	Disconnection time for voltage high off slowly	0.0 .. 600.0 s
Lo Off Slow	Voltage low off slowly	104.0 .. 374.0 V
Lo On Slow	Voltage low on slowly	104.0 .. 374.0 V
Lo Off Sl T	Disconnection time for voltage low off slowly	0.0 .. 600.0 s

Menu item path

Main Menu > Install Settings > Grid Settings > Voltage Protection

Changing the settings



This procedure is the same for all parameters.

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

General Settings
►Install Settings
Active/Reactive Pwr
FRT

```

```

Warning:
Adj. would affect
energy production.
Password  0 * * *

```

```

Inverter ID:  001
Insulation
Country
►Grid Settings

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. Enter the password provided by Delta customer service. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Grid Settings** entry and then press the **ENT** button.

8 Settings

"Installation settings" menu area

▶Voltage Protection	
Freq. Protection	
Reconnect T:	600s
P Ramp up:	6000%/m

▶High Off:	276.0V
High On:	259.0V
High Off T:	0.3s
Low Off:	104.0V

5. Use the  and  buttons to select the **Voltage Protection** entry and then press the  button.

6. Use the  and  buttons to select a parameter and then press the  button.
→ If the shape of the arrow changes , the value can be changed.
The currently set value is displayed after the entry.

7. Use the  and  buttons to configure the value and then press the  button.

8.3.4.3 Frequency protection



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview



To change this setting, you need a special password provided by Delta customer service. You can find the contact information on the back of this document.

This function allows you to defined the behavior of the inverter in the event of mains overfrequency or underfrequency.

Setting options

Parameter	Description	Setting range
High Off	Frequency high off	45.00 .. 65.00 Hz
High On	Frequency high on	45.00 .. 65.00 Hz
High Off T	Disconnection time for frequency high off	0.0 .. 5.0 s
Low Off	Frequency low off	45.00 .. 65.00 Hz
Low On	Frequency low on	45.00 .. 65.00 Hz
Low Off T	Disconnection time for frequency high off	0.0 .. 5.0 s
Hi Off Slow	Frequency high off slowly	45.00 .. 65.00 Hz
Lo On Slow	Frequency low on slowly	45.00 .. 65.00 Hz
Hi Off S1 T	Disconnection time for frequency high off slowly	0 .. 600 s
Lo Off Slow	Frequency low off slowly	45.00 .. 65.00 Hz
Lo On Slow	Frequency low on slowly	45.00 .. 65.00 Hz
Low Off S1 T	Disconnection time for voltage low off slowly	0.0 .. 600.0 s

Menu item path

Main Menu > Install Settings > Grid Settings > Freq. Protection

8 Settings

"Installation settings" menu area

Changing the settings



This procedure is the same for all parameters.

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:     0kWh
```

```
General Settings
▶Install Settings
Active/Reactive Pwr
FRT
```

```
Warning:
Adj. would affect
energy production.
Password 0 * * *
```

```
Inverter ID: 001
Insulation
Country
▶Grid Settings
```

```
Voltage Protection
▶Freq. Protection
Reconnect T: 600s
P Ramp up: 6000%/m
```

```
▶High Off: 51.50Hz
High On: 50.05Hz
High Off T: 0.1s
Low Off: 47.50Hz
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. Enter the password provided by Delta customer service. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Grid Settings** entry and then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **Freq. Protection** entry and then press the **ENT** button.
6. Use the **▼** and **▲** buttons to select a parameter and then press the **ENT** button.
→ If the shape of the arrow changes \rightarrow , the value can be changed.
The currently set value is displayed after the entry.
7. Use the **▼** and **▲** buttons to configure the value and then press the **ENT** button.

8.3.4.4 Reconnection time



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview



To change this setting, you need a special password provided by Delta customer service. You can find the contact information on the back of this document.

This function allows you to specify a reconnection time for cases where the inverter disconnects from the mains due to a voltage failure or frequency fault.

Once the fault has disappeared, the inverter waits for the specified reconnection time before reconnecting to the mains.

Setting options

Parameter	Description	Setting range
Reconnection T	Reconnection time	0 .. 600 s

Menu item path

Main Menu > Install Settings > Grid Settings > Reconnection T

Setting the reconnection time

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

General Settings
▶Install Settings
Active/Reactive Pwr
FRT

```

```

Warning:
Adj. would affect
energy production.
Password  0 * * *

```

```

Inverter ID:  001
Insulation
Country
▶Grid Settings

```

```

Voltage Protection
Freq. Protection
▶Reconnect T:  600s
P Ramp up:    6000%/m

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. Enter the password provided by Delta customer service. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Grid Settings** entry and then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **Reconnection T** entry and then press the **ENT** button.

→ If the shape of the arrow changes , the value can be changed. The currently set value is displayed after the entry.

8 Settings

"Installation settings" menu area

6. Use the  and  buttons to configure the value and then press the  button.

8.3.4.5 P Ramp Up



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview

This function allows you to specify the active power increase ramp for cases where the inverter disconnects from the mains due to a voltage failure or frequency fault.

Once the fault has disappeared, the inverter continuously increases the active power according to the specified ramp.

Setting options

Parameter	Description	Setting range
P Ramp Up	Increase of the fed active power in percent per minute.	0 .. 6000 %/min

Menu item path

Main Menu > Install Settings > Grid Settings > P Ramp Up

Setting the active power increase ramp

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

General Settings
▶Install Settings
Active/Reactive Pwr
FRT

```

```

Warning:
Adj. would affect
energy production.
Password  0 * * *

```

```

Inverter ID:  001
Insulation
Country
▶Grid Settings

```

```

Voltage Protection
Freq. Protection
Reconnect T:  600s
▶P Ramp up:  6000%/m

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. Enter the password provided by Delta customer service. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Grid Settings** entry and then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **P Ramp Up** entry and then press the **ENT** button.
→ If the shape of the arrow changes **→|**, the value can be changed.
The currently set value is displayed after the entry.

8 Settings

"Installation settings" menu area

Voltage Protection	
Freq. Protection	
Reconnect T:	600s
→P Ramp up:	6000%/m

6. Use the  and  buttons to configure the value and then press the  button.

8.3.5 DC Injection



Change this setting only after consultation with Delta customer service.

Overview



To change this setting, you need a special password provided by Delta customer service. You can find the contact information on the back of this document.

This function allows you to specify the behavior of the inverter when a DC component occurs in the infeed to the mains.

Setting options

Parameter	Description	Setting range
Mode	Switch the function on and off.	ON OFF
Trip Value	The amount of DC current at which the inverter stops feeding into the mains.	0.01 .. 1.00 A
Trip Time	When the switch-off value is exceeded, the inverter waits for the specified time to see if the DC current drops below the switch-off value again. When this time has expired, the inverter switches off.	0.0 .. 5.0 s

Menu item path

Main Menu > Install Settings > DC Injection

Calling up the menu item

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

General Settings
▶Install Settings
Active/Reactive Pwr
FRT

```

```

Warning:
Adj. would affect
energy production.
Password  0 * * *

```

```

▶DC Injection
Dry Contact
PID Function
RCMU:      ON

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. Enter the password provided by Delta customer service. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **DC injection** entry and then press the **ENT** button.

8 Settings

"Installation settings" menu area

Setting the mode

▶Mode:	ON
Trip Value:	1.00A
Trip Time:	0.2s

5. Use the  and  buttons to select the **Mode** entry and then press the  button.
→ If the shape of the arrow changes , the mode can be changed.
The currently set mode is displayed after the entry.

6. Use the  and  buttons to select a mode and then press the  button.

Changing the settings



This procedure is the same for all parameters.

Mode:	ON
▶Trip Value:	1.00A
Trip Time:	0.2s

7. Use the  and  buttons to select a parameter and then press the  button.
→ If the shape of the arrow changes , the mode can be changed.
The currently set value is displayed after the entry.

Mode:	ON
→Trip Value:	1.00A
Trip Time:	0.2s

8. Use the  and  buttons to configure the value and then press the  button.

8.3.6 Dry contacts

Overview

If you have connected an external alarm unit to the dry contacts you can use this function to specify the events that trigger the external alarm unit.

You can specify a different event for each dry contact.

Setting options

Parameter	Description	Setting range
Dry contact A	The event for dry contact A.	Disable On Grid Fan def. Insulation Alarm Error Fault Warning
Dry contact B	The event for dry contact B.	Disable On Grid Fan def. Insulation Alarm Error Fault Warning

Event	Description
Disable	The function of the dry contacts is disabled.
On Grid	The inverter is connected to the mains.
Fan Fail	The fans are defective.
Insulation	The insulation test has failed.
Alarm	An error event message, fault message or warning has been sent.
Error	An error event message has been sent.
Fault	A fault message has been sent.
Warning	A warning message has been sent.

Menu item path

Main Menu > Install Settings > Dry Cont.

Assigning events to the dry contacts

```

 10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

General Settings
►Install Settings
Active/Reactive Pwr
FRT

```

```

Warning:
Adj. would affect
energy production.
Password 0 * * *

```

```

DC Injection
►Dry Contact
PID Function
RCMU:      ON

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. Enter the password provided by Delta customer service. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the buttons **▼** and **▲** to select the **Dry Cont** button press the **ENT** button.

8 Settings

"Installation settings" menu area

►Dry Cont.A	Disable
Dry Cont.B	Disable

5. Use the buttons  and  to select a dry contact press the  button.

Disable
On Grid
Fan Fail
►Insulation

6. Use the  and  buttons to select an event and then press the  button.

8.3.7 PID Function



Change this setting only after consultation with Delta customer service.

Overview



To change this setting, you need a special password provided by Delta customer service. You can find the contact information on the back of this document.

Setting options

Parameter	Description	Setting range
		0 .. 10 hrs. Auto

Menu item path

Main Menu > Install Settings > PID Function

Setting the PID function

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.

```

General Settings
▶Install Settings
Active/Reactive Pwr
FRT

```

2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.

```

Warning:
Adj. would affect
energy production.
Password  0 * * *

```

3. Enter the password provided by Delta customer service. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.

```

DC Injection
Dry Contact
▶PID Function
RCMU:      ON

```

4. Use the **▼** and **▲** buttons to select the **PID function** entry and then press the **ENT** button.

```

▶Time:      0Hours

```

5. Use the **▼** and **▲** buttons to select a parameter and then press the **ENT** button. → If the shape of the arrow changes **→|**, the value can be changed. The currently set value is displayed after the entry.

6. Use the **▼** and **▲** buttons to configure a value and then press the **ENT** button.

8 Settings

"Installation settings" menu area

8.3.8 RCMU - Integrated residual current monitoring unit



Change this setting only after consultation with Delta customer service.

Overview



To change this setting, you need a special password provided by Delta customer service. You can find the contact information on the back of this document.

This function allows you to switch the integrated residual current monitoring unit on and off.

Setting options

Parameter	Description	Setting range
RCMU	Switch the function on and off.	ON OFF

Menu item path

Main Menu > Install Settings > RCMU

Setting the integrated residual current monitoring unit

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
```

```
General Settings
▶Install Settings
Active/Reactive Pwr
FRT
```

```
Warning:
Adj. would affect
energy production.
Password  0 * * *
```

```
DC Injection
Dry Contact
PID Function
▶RCMU:      ON
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. Enter the password provided by Delta customer service. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **RCMU** entry and then press the **ENT** button.
→ If the shape of the arrow changes **→|**, the mode can be changed.
5. Use the **▼** and **▲** buttons to select a mode and then press the **ENT** button.

8.3.9 EPO Emergency power-off (external shut-down)

Overview

This function allows you to define the external shutdown (EPO) relay contacts as being normally closed or normally open contacts.

Setting options

Parameter	Description	Setting range
EPO	Defines how the relay functions for the external shutdown (EPO).	Normally Open Normally Closed

Menu item path

Main Menu > Install Settings > EPO

Set EPO

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

General Settings
▶Install Settings
Active/Reactive Pwr
FRT

```

```

Warning:
Adj. would affect
energy production.
Password  0 * * *

```

```

▶EPO:      Normal Close
AC Connection: 3P4W
Anti-islanding: ON
Max. Power: 80000W

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the buttons **▼** and **▲** to select the entry **EPO** and press the **ENT** button. → If the shape of the arrow changes **→|**, the value can be changed. The currently set value is displayed after the entry.
5. Use the **▼** and **▲** buttons to configure the value and then press the **ENT** button.

8 Settings

"Installation settings" menu area

8.3.10 AC connection

Overview

The inverter is configured by default for a mains connection with 3 phases and a neutral conductor (3P4W). If you wish to connect the inverter without a neutral conductor then you must set the AC connection type to 3P3W after commissioning.

Setting options

Parameter	Description	Setting range
AC connection	Set the AC connection type. 3P3W: 3-phase system without a neutral conductor (L1, L2, L3, PE) 3P4W: 3-phase system with a neutral conductor (L1, L2, L3, N, PE)	3P3W 3P4W

Menu item path

Main Menu > Install Settings > AC connection

Setting the AC connection type

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
```

```
General Settings
▶Install Settings
Active/Reactive Pwr
FRT
```

```
Warning:
Adj. would affect
energy production.
Password 0 * * *
```

```
EPO: Normal Close
▶AC Connection: 3P4W
Anti-islanding: ON
Max. Power: 80000W
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the buttons **▼** and **▲** to select the entry **AC connection** and press the **ENT** button.
→ If the shape of the arrow changes **→|**, the value can be changed. The currently set value is displayed after the entry.
5. Use the **▼** and **▲** buttons to configure the value and then press the **ENT** button.

8.3.11 Anti-islanding



Change this setting only after consultation with Delta customer service.

Overview



To change this setting, you need a special password provided by Delta customer service. You can find the contact information on the back of this document.

This function allows you to switch the anti-islanding protection on and off.

Setting options

Parameter	Description	Setting range
Anti-islanding	Switch the anti-islanding protection on and off.	ON OFF

Menu item path

Main Menu > Install Settings > Anti-islanding

Set anti-islanding

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
  
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.

```

General Settings
▶Install Settings
Active/Reactive Pwr
FRT
  
```

2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.

```

Warning:
Adj. would affect
energy production.
Password  0 * * *
  
```

3. Enter the password provided by Delta customer service. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.

```

EPO:      Normal Close
AC Connection: 3P4W
▶Anti-islanding: ON
Max. Power: 80000W
  
```

4. Use the **▼** and **▲** buttons to select the **Anti-islanding** entry then press the **ENT** button.

5. Use the **▼** and **▲** buttons to select a mode and then press the **ENT** button.

8 Settings

"Installation settings" menu area

8.3.12 Max. power (maximum active power)



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview

This function allows you to set the maximum active power fed into the mains.

Setting options

Parameter	Description	Setting range
Max. Power	The maximum active power that can be fed into the mains.	0 .. 66000 W (for $U_{AC} = 400 V_{AC}$) 0 .. 88000 W (for $U_{AC} = 480 V_{AC}$)

Menu item path

Main Menu > Install Settings > Max. Power

Setting the maximum active power

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
```

```
General Settings
▶Install Settings
Active/Reactive Pwr
FRT
```

```
Warning:
Adj. would affect
energy production.
Password  0 * * *
```

```
EPO:      Normal Close
AC Connection: 3P4W
Anti-islanding: ON
▶Max. Power: 80000W
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Max. Power** entry and then press the **ENT** button.
→ If the shape of the arrow changes **→|**, the value can be changed. The currently set value is displayed after the entry.
5. Use the **▼** and **▲** buttons to configure the value and then press the **ENT** button.

8.3.13 AFCI

Overview

This function is not available at present.

8 Settings

"Installation settings" menu area

8.3.14 Loading the factory settings



Change this setting only after consultation with Delta customer service.

Overview



To change this setting, you need a special password provided by Delta customer service. You can find the contact information on the back of this document.

This function allows you to reset the inverter to the factory settings.

Setting options

Parameter	Description	Setting range
Return to Factory	Reset the inverter to the factory settings.	None

Menu item path

Main Menu > Install Settings > Return to Factory

Loading the factory settings

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
```

```
General Settings
▶Install Settings
Active/Reactive Pwr
FRT
```

```
Warning:
Adj. would affect
energy production.
Password  0 * * *
```

```
▶Return to Factory
```

```
Return to factory?
▶Yes / No
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Install Settings** entry and then press the **ENT** button.
3. Enter the password provided by Delta customer service. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Return to Factory** entry and then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **Yes** entry and then press the **EXIT** button.

8.4 "Active/reactive power" menu area



This menu area is password-protected because the settings in this menu area affect the energy production of the inverter.

- ▶ Exercise extra care with all settings in this menu area.

8.4.1 Power limit (active power)



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview

This function allows you to additionally limit the active power. The active power is specified as a percentage of the value set in the **Max. power** parameter (see "8.3.12 Max. power (maximum active power)", page 132).

Example

Maximum power = 75000 W (from the parameter **Max. power**)

Power limit = 90%

Maximum active power = max. power x power limit

Maximum active power = 75000 W x 90% = 67500 W

Setting options

Parameter	Description	Setting range
Mode	Switch the function on and off.	ON OFF
Set Point	Additional active power limitation	0 .. 100%

Menu item path

Main menu > Active/Reactive Pwr > Active Power Ctrl > Power Limit

Calling up the menu item

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

General Settings
Install Settings
▶Active/Reactive Pwr
FRT

```

```

Warning:
Adj. would affect
energy production.
Password  0 * * *

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Active/Reactive Pwr** entry and then press the button **ENT**.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.

8 Settings

"Active/reactive power" menu area

```
▶Active Power Ctrl
Reactive Power Ctrl
```

4. Use the  and  buttons to select the **Active Power Ctrl** entry and then press the  button.

```
▶Power Limit
Power vs. Frequency
P(V)
```

5. Use the  and  buttons to select the **Power Limit** entry and then press the  button.

Setting the mode

```
▶Mode: ON
Set Point: 100%
```

6. Use the  and  buttons to select the **Mode** entry and then press the  button.
→ If the shape of the arrow changes , the mode can be changed.
The currently set mode is displayed after the entry.

7. Use the  and  buttons to select a mode and then press the  button.

Changing the settings

```
Mode: ON
▶Set Point: 100%
```

8. Use the  and  buttons to select a parameter and then press the  button.
→ If the shape of the arrow changes , the parameter can be changed.
The currently set value is displayed after the entry.

9. Use the  and  buttons to configure the value and then press the  button.

8.4.2 Regulating the active power via the mains frequency

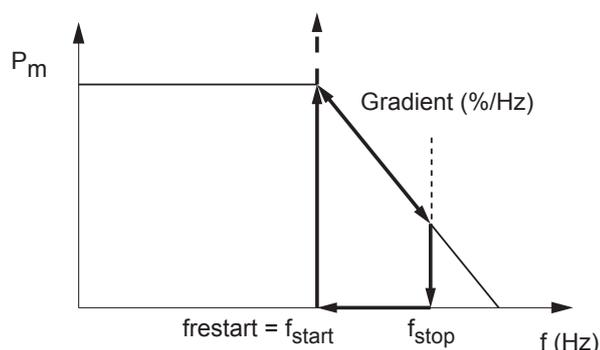


These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview

This function allows you to regulate the active power fed into the mains via the mains frequency.

Standard behavior of low-voltage power grids in Germany (VDE-AR-N 4105)



When the mains frequency exceeds f_{start} the instantaneous value of the active power is stored and the fed active power is reduced according to the gradient.

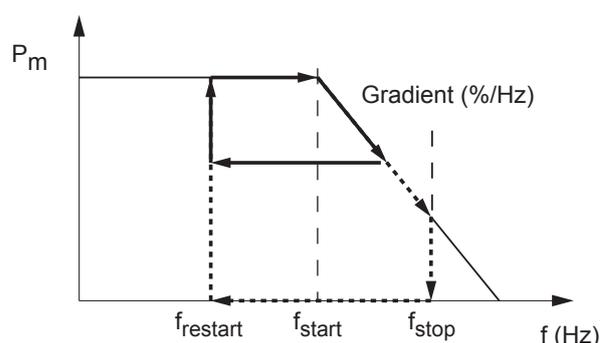
The active power is regulated according to the gradient as long as the mains frequency lies between f_{start} and f_{stop} .

The active power feed is stopped when the mains frequency exceeds f_{stop} .

Feeding remains stopped until the mains frequency falls below f_{start} again.

Feeding is resumed at the stored instantaneous value when the mains frequency falls below f_{start} again.

Standard behavior of medium-voltage power grids in Germany (BDEW)



When the mains frequency exceeds f_{start} the instantaneous value of the active power is stored and the fed active power is reduced according to the gradient.

The subsequent mains feed behavior depends on changes in the mains frequency.

a)

When the mains frequency falls again, the fed active power stored at this time is maintained before reaching f_{stop} .

Feeding is resumed at the stored instantaneous value when the mains frequency falls below f_{restart} .

b)

The active power feed is stopped when the mains frequency exceeds f_{stop} .

Feeding remains stopped until the mains frequency falls below f_{restart} .

Feeding resumes at the stored instantaneous value when the mains frequency falls below f_{restart} again.

f_{stop} is automatically calculated using the following formula:

$$f_{\text{stop}} = f_{\text{start}} + (1 / \text{gradient})$$

8 Settings

"Active/reactive power" menu area

Setting options

Parameter	Description	Setting range
Mode	Switch the function on and off.	ON OFF
F Start	The mains frequency above which the active power being fed is reduced.	50.00 .. 55.00 Hz
F recovery	The mains frequency below which the active power being fed is no longer reduced.	50.00 .. 55.00 Hz
Gradient	When the mains frequency exceeds F Start the active power being fed is continuously reduced by the value specified here.	0 .. 100%
T recovery	When the mains frequency falls below F recovery again, the inverter waits for the time specified here before removing the previously imposed reduction of fed active power.	0 .. 600 s

Menu item path

Main Menu > Active/Reactive Pwr > Active Power Ctrl > Power vs. Frequency

Calling up the menu item

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
```

```
General Settings
Install Settings
▶Active/Reactive Pwr
FRT
```

```
Warning:
Adj. would affect
energy production.
Password  0 * * *
```

```
▶Active Power Ctrl
Reactive Power Ctrl
```

```
Power Limit
▶Power vs. Frequency
P(V)
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Active/Reactive Pwr** entry and then press the **ENT** button.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Active Power Ctrl** entry and then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **Power vs. Frequency** entry and then press the **ENT** button.

Setting the mode

▶Mode:		ON
F Start:	50.20Hz	
F Recovery:	50.20Hz	
Gradient:	100%	

6. Use the  and  buttons to select the **Mode** entry and then press the  button.
→ If the shape of the arrow changes , the mode can be changed.
The currently set mode is displayed after the entry.

7. Use the  and  buttons to select a mode and then press the  button.

Changing the settings



This procedure is the same for all parameters.

Mode:		ON
▶F Start:	50.20Hz	
F Recovery:	50.20Hz	
Gradient:	100%	

8. Use the  and  buttons to select a parameter and then press the  button.
→ If the shape of the arrow changes , the parameter can be changed.
The currently set value is displayed after the entry.

9. Use the  and  buttons to configure the value and then press the  button.

8 Settings

"Active/reactive power" menu area

8.4.3 P (V) (regulating the active power via the mains voltage)



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview

This function allows you to regulate the active power fed into the mains via the mains voltage.

Setting options

Parameter	Description	Setting range
Mode	Switch the function on and off.	ON OFF
P lock-in		10 .. 100%
P lock-out		0 .. 50%
V lock-in		230.0 .. 276.1 V
V lock-out		207.0 .. 253.1 V
T recovery		10 .. 900 s

Menu item path

Main menu > Active/Reactive Pwr > Active Power Ctrl > P(V)

Calling up the menu item

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
```

```
General Settings
Install Settings
▶Active/Reactive Pwr
FRT
```

```
Warning:
Adj. would affect
energy production.
Password  0 * * *
```

```
▶Active Power Ctrl
Reactive Power Ctrl
```

```
Power Limit
Power vs. Frequency
▶P(V)
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Active/Reactive Pwr** entry and then press the button **ENT**.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Active Power Ctrl** entry and then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **P(V)** entry and then press the **ENT** button.

Setting the mode

► Modus:	EIN
P lock-in:	20%
P lock-out:	5%
V lock-in:	253.0V

6. Use the  and  buttons to select the **Mode** entry and then press the  button.

→ If the shape of the arrow changes , the mode can be changed.

The currently set mode is displayed after the entry.

7. Use the  and  buttons to select a mode.

Press the  button to confirm or the  button to cancel.

Changing the settings



This procedure is the same for all parameters.

► Modus:	EIN
P lock-in:	20%
P lock-out:	5%
V lock-in:	253.0V

8. Use the  and  buttons to select a parameter and then press the  button.

→ If the shape of the arrow changes , the parameter can be changed.

The currently set value is displayed after the entry.

9. Use the  and  buttons to configure the value and then press the  button.

8 Settings

"Active/reactive power" menu area

8.4.4 Constantt cos phi (cos φ)



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview

This function allows you to set a constant cos φ .

Setting options

Parameter	Description	Setting range
Mode	Switch the function on and off.	ON OFF
Cos Phi	Constant cos phi (cos φ), capacitive or inductive	0.800 .. 0.999 cap 1 0.800 .. 0.999 ind

Menu item path

Main Menu > Active/Reactive Pwr > Reactive Power Ctrl >
Constant cos phi

Calling up the menu item

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
```

```
General Settings
Install Settings
▶Active/Reactive Pwr
FRT
```

```
Warning:
Adj. would affect
energy production.
Password  0 * * *
```

```
Active Power Ctrl
▶Reactive Power Ctrl
```

```
▶Constant cos phi
Cos phi (P)
Constant Q
Q(V)
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Active/Reactive Pwr** entry and then press the **ENT** button.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Reactive Power Ctrl** entry and then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **Constant cos phi** entry and then press the **ENT** button.

Setting the mode

```

Mode:                ON
▶Cos phi:           Ind 1.00
  
```

6. Use the  and  buttons to select the **Mode** entry and then press the  button.

→ If the shape of the arrow changes , the mode can be changed.

The currently set mode is displayed after the entry.

7. Use the  and  buttons to select a mode and then press the  button.

Changing the settings

```

Mode:                ON
▶Cos phi:           Ind 1.00
  
```

8. Use the  and  buttons to select a parameter and then press the  button.

→ If the shape of the arrow changes , the parameter can be changed.

The currently set value is displayed after the entry.

9. Use the  and  buttons to configure the value and then press the  button.

8 Settings

"Active/reactive power" menu area

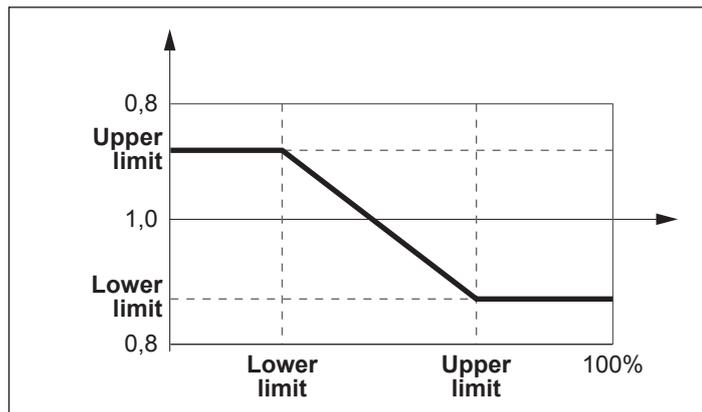
8.4.5 Cos phi (P) (regulate cos phi via active power)



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview

This function allows you to regulate cos phi ($\cos \phi$) via the active power.



Setting options

Parameter	Description	Setting range
Mode	Switch the function on and off.	ON OFF
Q upper	The upper limit of cos phi ($\cos \phi$).	0.800 .. 0.999 cap 1 0.800 .. 0.999 ind
P lower	The lower limit of the active power.	0 .. 100%
Q lower	The lower limit of cos phi ($\cos \phi$).	0.800 .. 0.999 cap 1 0.800 .. 0.999 ind
P upper	The upper limit of the active power.	0 .. 100%
V lock-in		230.0 .. 253.1 V
V lock-out		207.0 .. 230.0 V

Menu item path

Main Menu > Active/Reactive Pwr > Reactive Power Ctrl
> Cos phi (P)

Calling up the menu item

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

General Settings
Install Settings
▶Active/Reactive Pwr
FRT

```

```

Warning:
Adj. would affect
energy production.
Password 0 * * *

```

```

Active Power Ctrl
▶Reactive Power Ctrl

```

```

Constant cos phi
▶Cos phi (P)
Constant Q
Q(V)

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Active/Reactive Pwr** entry and then press the button **ENT**.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Reactive Power Ctrl** entry and then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **Cos phi (P)** entry and then press the **ENT** button.

Setting the mode

```

▶Mode:      ON
Q upper:   Ind 1.00
P lower:   45%
Q lower:   Ind 1.00

```

6. Use the **▼** and **▲** buttons to select the **Mode** entry and then press the **ENT** button. → If the shape of the arrow changes \rightarrow , the mode can be changed. The currently set mode is displayed after the entry.
7. Use the **▼** and **▲** buttons to select a mode and then press the **ENT** button.

Changing the settings



This procedure is the same for all parameters.

```

Mode:      ON
▶Q upper:   Ind 1.00
P lower:   45%
Q lower:   Ind 1.00

```

8. Use the **▼** and **▲** buttons to select a parameter and then press the **ENT** button. → If the shape of the arrow changes \rightarrow , the parameter can be changed. The currently set value is displayed after the entry.
9. Use the **▼** and **▲** buttons to configure the value and then press the **ENT** button.

8 Settings

"Active/reactive power" menu area

8.4.6 Constant Q (constant reactive power)



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview

This function allows you to set constant reactive power.

Setting options

Parameter	Description	Setting range
Mode	Switch the function on and off.	ON OFF
Fixed Q	The constant reactive power as a percentage of the nominal apparent power.	1 .. 100% cap 0% 1 .. 100% ind

Menu item path

Main Menu > Active/Reactive Pwr > Reactive Power Ctrl
> Constant Q

Calling up the menu item

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
```

```
General Settings
Install Settings
▶Active/Reactive Pwr
FRT
```

```
Warning:
Adj. would affect
energy production.
Password  0 * * *
```

```
Active Power Ctrl
▶Reactive Power Ctrl
```

```
Constant cos phi
Cos phi (P)
▶Constant Q
Q(V)
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Active/Reactive Pwr** entry and then press the **ENT** button.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Reactive Power Ctrl** entry and then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **Constant Q** entry and then press the **ENT** button.

Setting the mode

```

▶Mode:                ON
Fix Q:                Ind 90%
  
```

6. Use the  and  buttons to select the **Mode** entry and then press the  button.

→ If the shape of the arrow changes , the mode can be changed.

The currently set mode is displayed after the entry.

7. Use the  and  buttons to select a mode and then press the  button.

Changing the settings

```

Mode:                ON
▶Fix Q:                Ind 90%
  
```

8. Use the  and  buttons to select a parameter and then press the  button.

→ If the shape of the arrow changes , the parameter can be changed.

The currently set value is displayed after the entry.

9. Use the  and  buttons to configure the value and then press the  button.

8 Settings

"Active/reactive power" menu area

8.4.7 Q (V) – Regulating reactive power via voltage

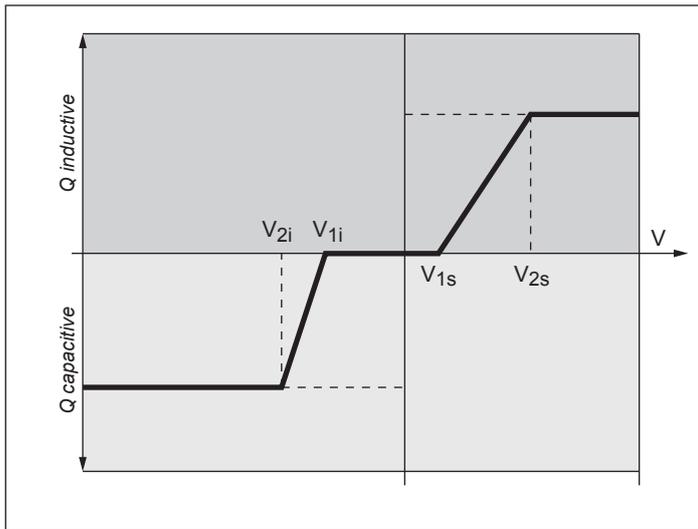


These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview

This function allows you to regulate the reactive power via the voltage.

This function is only available for medium-voltage grids.



Case 1: Mains voltage > nominal voltage

When the mains voltage drops below the lower voltage limit **V1s** the inverter begins feeding inductive reactive power.

If the **Delay time** is greater than 0 (zero), the inverter waits for the time specified here to see if the mains voltage falls below **V1s** again, before feeding capacitive reactive power.

When the mains voltage increases again, the inductive reactive power is increased according to the ramp specified by the characteristic curve.

When the mains voltage exceeds the upper voltage limit **V2s** the inductive reactive power remains at the level specified in **Qs Limit**.

Case 2: Mains voltage < nominal voltage

When the mains voltage drops below the upper voltage limit **V1i** the inverter begins feeding capacitive reactive power.

If the **Delay time** is greater than 0 (zero), the inverter waits for the time specified here to see if the mains voltage rises above **V1i** again, before feeding capacitive reactive power.

When the mains voltage increases again, the capacitive reactive power is increased according to the ramp specified by the characteristic curve.

When the mains voltage drops below the lower voltage limit **V2i** the capacitive reactive power remains at the level specified in **Qi limit**.

Setting options

Parameter	Description	Setting range
Mode	Switch the function on and off.	Curve A Curve B OFF
V1s	The lower voltage limit for feeding inductive reactive power.	230.0 .. 264.6 V
V2s	The upper voltage limit for feeding inductive reactive power.	230.0 .. 264.6 V
Qs limit	The limit value for inductive reactive power. The value is set as a percentage of the nominal apparent power S_n . This value is connected to the parameter V2s.	ind 63% .. 1% 0%
V1i	The upper voltage limit for feeding capacitive reactive power.	184.0 .. 230.0 V
V2i	The lower voltage limit for feeding capacitive reactive power.	184.0 .. 230.0 V
Qi limit	The limit value for capacitive reactive power. The value is set as a percentage of the nominal apparent power S_n . This value is connected to the parameter V2i.	cap 63% .. 1% 0%
T Delay	Delay time before feeding reactive power.	0.00 .. 120.00 s
Lock-in power	The upper limit of the active power range in which the function is active. The value is set as a percentage of the nominal active power.	Cannot be changed
Lock-out power	The lower limit of the active power range in which the function is active. The value is set as a percentage of the nominal active power.	Cannot be changed

Menu item path

Main Menu > Active/Reactive Pwr > Reactive Power Ctrl
> Q(V)

Calling up the menu item

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

General Settings
Install Settings
▶Active/Reactive Pwr
FRT

```

```

Warning:
Adj. would affect
energy production.
Password  0 * * *

```

```

Active Power Ctrl
▶Reactive Power Ctrl

```

```

Constant cos phi
Cos phi (P)
Constant Q
▶Q(V)

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Active/Reactive Pwr** entry and then press the button **ENT**.
3. This function is protected with password 5555. Use the **▼** and **▲** buttons to set the individual numerals. Press the **ENT** button to confirm a numeral.
4. Use the **▼** and **▲** buttons to select the **Reactive Power Ctrl** entry and then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **Q(V)** entry and then press the **ENT** button.

8 Settings

"Active/reactive power" menu area

Setting the mode

►Mode:				OFF
V1s:				248.4V
V2s:				253.0V
Qs limit:			Ind	44%

6. Use the  and  buttons to select the **Mode** entry and then press the  button.
→ If the shape of the arrow changes , the mode can be changed.
The currently set mode is displayed after the entry.

7. Use the  and  buttons to select a mode and then press the  button.

Changing the settings



This procedure is the same for all parameters.

Mode:				OFF
►V1s:				248.4V
V2s:				253.0V
Qs limit:			Ind	44%

8. Use the  and  buttons to select a parameter and then press the  button.
→ If the shape of the arrow changes , the parameter can be changed.
The currently set value is displayed after the entry.

9. Use the  and  buttons to configure the value and then press the  button.

8.5 FRT (Fault Ride Through)



These parameters are set according to the requirements of the selected country. Changing these parameter settings can invalidate the type approval of the unit. Change this setting only after consultation with Delta customer service.

Overview



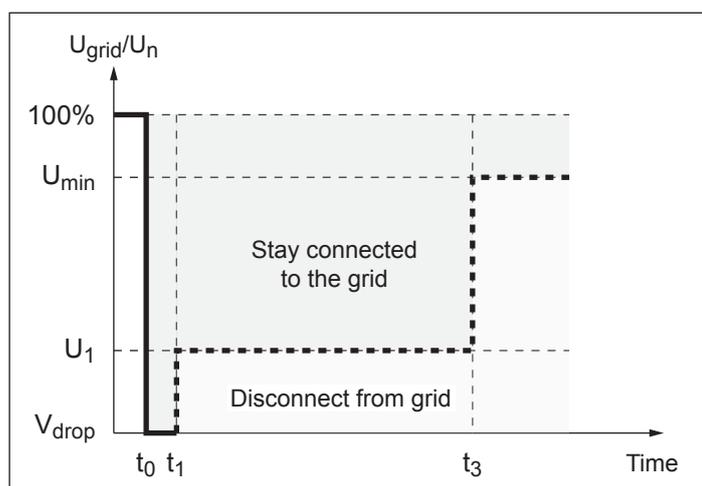
To change this setting, you need a special password provided by Delta customer service. You can find the contact information on the back of this document.

This function allows you to define the behavior of the inverter in the event of short-term mains voltage dropouts.

Menu item path

Main menu > Settings > FRT

Setting options



t_0 : The time at which a voltage collapse begins.

Parameter	Description	Setting range
Mode	Switch the function on and off.	ON OFF
Dead band	The upper voltage limit of the voltage range in which this function is not active. The percentage value relates to the nominal voltage.	-20 .. 0%
Vdrop	Voltage drop	0 .. 90%
t1	Time t1	0.00 .. 5.00 s
U1	Voltage U1	20 .. 90%
t3	Time t3	0.00 .. 5.00 s
K factor	Switching current factor	0.00 .. 10.00

8 Settings

FRT (Fault Ride Through)

Calling up the menu item

10.Feb 2017 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
Install Settings
Active/Reactive Pwr
►FRT

Warning:
Adj. would affect
energy production.
Password 0 * * *

1. If the default information is displayed, press any button to open the main menu.
Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Active/Reactive Pwr** entry and then press the button **ENT**.
3. This function is protected with password 5555.
Use the **▼** and **▲** buttons to set the individual numerals.
Press the **ENT** button to confirm a numeral.

Setting the mode

►Mode: ON
Dead band: -10%
Vdrop: 0%
t1: 0.30s

4. Use the **▼** and **▲** buttons to select the **Mode** entry and then press the **ENT** button.
→ If the shape of the arrow changes **→|**, the mode can be changed.
The currently set mode is displayed after the entry.
5. Use the **▼** and **▲** buttons to select a mode and then press the **ENT** button.

Changing the settings



This procedure is the same for all parameters.

Mode: ON
►Dead band: -10%
Vdrop: 0%
t1: 0.30s

6. Use the **▼** and **▲** buttons to select a parameter and then press the **ENT** button.
→ If the shape of the arrow changes **→|**, the parameter can be changed.
The currently set value is displayed after the entry.
7. Use the **▼** and **▲** buttons to configure the value and then press the **ENT** button.

9. Measurements and statistics

The following information is available:

Type of information	Description
Measurements	Current data for various parameters
Energy log	Information on the energy generated over the entire usage period of the inverter
Event log	A list of major events, e.g. warning messages, faults, parameter changes etc., with date and time.
Inverter information	Information on general settings, mains settings, active power and reactive power monitoring, firmware versions etc. (see "8.1 "Inverter info." menu area (current settings)", p. 101)

9.1 Measurements

Overview

This menu displays the current data for various parameters in real time.

Setting options

The displayed information cannot be edited.

Menu item path

Main menu > Meter

Displaying measurements

10.Feb 2017 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.

▶Meter
Energy Log
Event Log
Inverter Info.

2. Use the **▼** and **▲** buttons to select the **Meter** entry and then press the **ENT** button.

3. Use the **▼** and **▲** buttons to page through the menu. Press the **EXIT** button to cancel.

AC	L1	L2	L3
V	0	0	0 V
I	0	0	0 A
P	0	0	0 W

AC side

The instantaneous values for phases L1, L2 and L3 are shown.

V: AC voltage in V
I: AC current in A
P: AC active power in W

PF:	cap 0.95
Power:	0 W
Frequency:	0 Hz
E-Today:	0 kWh

AC side

Cos phi: Active power factor cos phi
Power: Instantaneous active power being fed in kW
Frequency: Current mains frequency in Hz
E-Today: Amount of energy generated today up to now

DC	DC1	DC2
V	0	0 V
I	0	0 A
P	0	0 W

DC side

The instantaneous values for DC inputs DC1 and DC2 are shown.

V: DC voltage in V
I: DC current in A
P: DC active power in W

9 Measurements and statistics

9.2 Energy log

Overview

This menu shows the energy yields for various time periods.

Setting options

The displayed information cannot be edited.

Menu item path

Main menu > Energy Log

Displaying the energy log

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:     0kWh
```

```
Meter
▶Energy Log
Event Log
Inverter Info.
```

```
▶Life Energy
Day Energy
Month Energy
```

1. If the default information is displayed, press any button to open the main menu.

Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.

2. Use the **▼** and **▲** buttons to select the **Energy Log** entry and then press the **ENT** button.

3. Use the **▼** and **▲** buttons to page through the menu.

Press the **ENT** button to open a sub-menu.

Press the **EXIT** button to cancel.

Life Energy

```
Life Energy
E-total:     0kWh
Runtime:     0hrs
```

Life Energy: The energy generated over the runtime period.

Runtime: Total running time of the inverter.

Day Energy

```
Day Energy
2016.05.19   0kWh
2016.05.18   0kWh
2016.05.17   0kWh
```

Amount of energy generated per day.

Month Energy

```
Day Energy
2016.05.19   0kWh
2016.05.18   0kWh
2016.05.17   0kWh
```

Amount of energy generated per month.

9.3 Event log

The event log contains error event messages and a mains report.

9.3.1 Error events

Overview

This menu shows a list with the last 30 error events.

Setting options

The list can be deleted.

Menu item path

Main Menu > Event Log > Error Events

Displaying error events

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
    
```

```

Meter
Energy Log
▶Event Log
Inverter Info.
    
```

```

▶Error Events
Grid Report
    
```

```

1. 23/02/2016 17:20
   AC Freq High
2. 22/02/2016 08:20
   AC Volt Low
    
```

1. If the default information is displayed, press any button to open the main menu.

Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.

2. Use the **▼** and **▲** buttons to select the **Event Log** entry and then press the **ENT** button.

3. Use the **▼** and **▲** buttons to select the **Error Events** entry and then press the **ENT** button.

4. Use the **▼** and **▲** buttons to page through the menu. Press the **EXIT** button to cancel.

Deleting error events



The mains report is also deleted together with the error events!

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
    
```

```

Meter
Energy Log
▶Event Log
Inverter Info.
    
```

```

▶Error Events
Grid Report
    
```

1. If the default information is displayed, press any button to open the main menu.

Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.

2. Use the **▼** and **▲** buttons to select the **Event Log** entry and then press the **ENT** button.

3. Use the **▼** and **▲** buttons to select the **Error Events** entry and then press the **ENT** button.

→ The list of error events is displayed.

9 Measurements and statistics

```
1. 23/02/2016 17:20
   AC Freq High
2. 22/02/2016 08:20
   AC Volt Low
```

```
Clear Event Logs?
  ▶Yes / No
```

4. Press and hold the ,  and  buttons simultaneously for at least 5 seconds.

→ A confirmation prompt is displayed.

5. Use the  and  buttons to select the **Yes** entry and then press the  button.

→ .

The event log has now been deleted.

9.3.2 Mains report

Overview

This menu shows a list with the last 5 error events.

Setting options

The list can be deleted.

Menu item path

Main Menu > Event Log > Grid Report

Displaying the mains report

```
10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
```

```
Meter
Energy Log
▶Event Log
Inverter Info.
```

```
Error Events
▶Grid Report
```

```
1. 23/02/2016 17:20
   AC Freq High
2. 22/02/2016 08:20
   AC Volt Low
```

1. If the default information is displayed, press any button to open the main menu.

Otherwise, press the  button repeatedly until the main menu is displayed.

2. Use the  and  buttons to select the **Event Log** entry and then press the  button.

3. Use the  and  buttons to select the **Grid Report** entry and then press the  button.

4. Use the  and  buttons to page through the menu.
Press the  button to cancel.

Deleting the mains report



The error events are also deleted together with the mains report!

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh
    
```

```

Meter
Energy Log
▶Event Log
Inverter Info.
    
```

```

Error Events
▶Grid Report
    
```

```

1. 23/02/2016 17:20
   AC Freq High
2. 22/02/2016 08:20
   AC Volt Low
    
```

```

Clear Event Logs?
▶Yes / No
    
```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **Event Log** entry and then press the **ENT** button.
3. Use the **▼** and **▲** buttons to select the **Grid Report** entry and then press the **ENT** button.
→ The list of error events is displayed.
4. Press and hold the **▼**, **▲** and **ENT** buttons simultaneously for at least 5 seconds.
→ A confirmation prompt is displayed.
5. Use the **▼** and **▲** buttons to select the **Yes** entry and then press the **ENT** button.
→ .

The event log has now been deleted.

10 Error events and troubleshooting

10. Error events and troubleshooting

DANGER



Electric shock

Potentially fatal voltages are present at the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 100 seconds.

Therefore, always carry out the following steps before working on the inverter

1. Disconnect the inverter from all AC and DC voltage sources and make sure that none of the connections can be accidentally restored.
2. Wait at least 100 seconds until the internal capacitors have discharged.

DANGER



Electric shock

Potentially fatal voltages are present at the inverter DC connections. When light falls on the solar modules, they immediately start to generate electricity. This also happens when light does not fall directly on the solar modules.

- ▶ Never disconnect the inverter from the solar modules when it is under load.
- ▶ Disconnect the inverter from all AC and DC voltage sources. Ensure that none of the connections can be restored accidentally.
- ▶ Ensure that the DC cables cannot be touched accidentally.

WARNING



Electric shock

When the cover is removed from the wiring box, this exposes voltage-carrying parts and protection conforming to IP65 is no longer guaranteed.

- ▶ Remove the cover only when absolutely necessary.
- ▶ Do not remove the cover if water might enter the inverter.
- ▶ After work is completed, ensure that the cover is properly replaced and screwed in. Check that the cover is properly sealed.



Only Delta Customer Service is permitted to perform repair work and replace inverter components.

Exceptions:

- ▶ Replacing the fans.
- ▶ Cleaning the air inlets/outlets.
- ▶ Replacing AC and DC surge protection devices.

Failure to adhere to this requirement will invalidate the warranty.

The Delta Customer Service contact information for your country is provided on the last page of this document.

10.1 Error

Number	Message	Possible causes	Correction suggestions
E01	AC Freq High (AC Freq. High)	Mains mains frequency lies above the OFR setting (overfrequency detection).	Check the mains frequency on the inverter display.
		Incorrect country setting.	Check the country setting on the inverter display.
E02	AC Freq Low (AC Freq Low)	Mains mains frequency lies below the UFR setting (underfrequency detection).	Check the mains frequency on the inverter display.
		Incorrect country or mains type setting.	Check the country and mains type settings.
E11, E13, E16, E18, E21, E23	AC Volt High (AC Volt High)	Mains mains voltage lies above the OVR setting (overvoltage detection).	Check the mains voltage on the inverter display.
		Supply voltage during operation is greater than the OVR Langs. setting.	Check the mains voltage on the inverter display.
		Incorrect country or mains type setting.	Check the country and mains type settings.
E10, E15, E20	AC Volt Low (AC Volt Low)	Mains mains voltage lies below the UVR setting (undervoltage detection).	Check the mains voltage connection at the inverter terminals.
		Incorrect country or mains type setting.	Check the country and mains type settings.
		Incorrectly wired AC plug.	Check the wiring of the AC plug.
E07	Grid Quality (Mains quality)	Non-linear load in the mains and in the vicinity of the inverter.	If necessary, the mains connection must be far away from a non-linear load.
E08	HW Connect Fail (HW connection failed)	Incorrectly wired AC plug.	Check the wiring of the AC plug.
E34	Insulation (Insulation)	Insulation fault in the PV system.	Check the insulation of the DC inputs.
		Large PV system capacitance between Plus and Ground or Minus and Ground or both.	Check the capacitance and dry the PV modules if necessary.
E09	No Grid (No Mains)	The AC/DC disconnecter is in the OFF position.	Turn the AC/DC disconnecter to the ON position.
		AC plug is not correctly connected.	Check the connection in the AC plug and its connection to the inverter.
		Incorrectly wired AC plug.	Check the wiring of the AC plug.
E30	Solar1 High (Solar1 High)	The DC input voltage at DC1 is greater than the maximum permissible DC input voltage.	Change the solar system setting so that the DC input voltage at DC1 lies below the maximum permissible DC input voltage.
E31	Solar2 High (Solar2 High)	The DC input voltage at DC2 is greater than the maximum permissible DC input voltage.	Change the solar system setting so that the DC input voltage at DC1 lies below the maximum permissible DC input voltage.

10 Error events and troubleshooting

Warnings

10.2 Warnings

Number	Message	Possible causes	Correction suggestions
W01	Solar1 Low (Solar1 Low)	The DC input voltage at DC1 is less than the minimum permissible DC input voltage.	Check the DC input voltage at DC1 on the inverter display. There may be insufficient solar radiation.
W02	Solar2 Low (Solar2 Low)	The DC input voltage at DC2 is less than the minimum permissible DC input voltage.	Check the DC input voltage at DC2 on the inverter display. There may be insufficient solar radiation.
W11	HW Fan (HW Fan)	One or more fans are blocked.	Remove all objects that might be blocking the fans.
		One or more fans are defective.	Replace the fans.
		One or more fans are disconnected.	Check the connections for all fans.
	SPD Fail (SPD failed)	The inverter has been hit by lightning.	Check the inverter status.
		One or more surge protection devices are defective.	Replace the defective surge protection devices.
		One or more surge protection devices are incorrectly fitted.	Check all surge protection devices.

10.3 Faults

Number	Message	Possible causes	Correction suggestions
F36, F37, F38, F39, F40, F41	AC Current High (AC Current High)	Overvoltage during operation.	Contact Delta Customer Service.
		Internal error.	Contact Delta Customer Service.
F30	Bus Imbalance (Bus not symmetrical)	Incomplete independent or parallel configuration between the inputs.	Check the input connections.
		Grounding of the PV system.	Check the insulation of the PV system.
		Internal error.	Contact Delta Customer Service.
F60, F61, F70, F71	DC Current High (DC Current High)	Internal error.	Contact Delta Customer Service.
F24	Ground Current (Ground Current)	Insulation fault in the PV system.	Check the insulation of the DC inputs.
		Large PV system capacitance between Plus and Ground or Minus and Ground.	Check the capacitance, it must be < 2.5 µF. Install an external transformer if necessary.
		Internal error.	Contact Delta Customer Service.
F45	HW AC OCR (HW AC OCR)	Large mains harmonics.	Check the mains waveform. The mains connection of the inverter must be kept away from non-linear loads; if necessary, move it further away..
		Internal error.	Contact Delta Customer Service.
F31, F33, F35	HW Bus OVR (HW Bus OVR)	The DC input voltage is greater than the maximum permissible DC input voltage.	Change the solar system setting so that the DC input voltage at DC1 lies below the maximum permissible DC input voltage.
		Overvoltage during operation.	Contact Delta Customer Service.
		Internal error.	Contact Delta Customer Service.
F23	HW COMM1 (HW COMM1)	Internal error.	Contact Delta Customer Service.
F22	HW COMM2 (HW COMM2)	Internal error.	Contact Delta Customer Service.

Number	Message	Possible causes	Correction suggestions
F26	HW Connect Fail (HW connection failed)	Internal error.	Contact Delta Customer Service.
F42	HW CT A Fail (HW CT A failed)	Internal error.	Contact Delta Customer Service.
F43	HW CT B Fail (HW CT B failed)	Internal error.	Contact Delta Customer Service.
F44	HW CT C Fail (HW CT C failed)	Internal error.	Contact Delta Customer Service.
F01, F02, F03	HW DC Injection (HW DC injection)	The mains waveform is abnormal. Internal error.	Check the mains waveform. The mains connection of the inverter must be kept away from non-linear loads; if necessary, move it further away.. Contact Delta Customer Service.
F15, F16, F17	HW DSP ADC1, HW DSP ADC2, HW DSP ADC3	The DC input voltage is less than the minimum required DC voltage. Internal error.	Check the DC input voltage on the inverter display. There may be insufficient solar radiation. Contact Delta Customer Service.
F20	HW Efficiency (HW Efficiency)	Incorrect calibration. Internal error.	Check the accuracy of the voltage and power. Contact Delta Customer Service.
F06, F08, F09, F10	HW NTC1 Fail, HW NTC2 Fail, HW NTC3 Fail, HW NTC4 Fail (HW NTCx failed)	Ambient temperature is > 90 °C or < -30 °C. Fault in the detection circuit.	Check the system environment. Check the detection circuit in the <i>Inverter</i> .
F18, F19	HW Red ADC1, HW Red ADC2	The DC input voltage is less than the minimum required DC voltage. Internal error.	Check the DC input voltage on the inverter display. There may be insufficient solar radiation. Contact Delta Customer Service.
F50	HW ZC Fail (HW ZC failed)	Internal error.	Contact Delta Customer Service.
F27	RCMU Fail (RCMU failed)	Internal error.	Contact Delta Customer Service.
F13, F29	Relay Open (Relay Open)	Internal error.	Contact Delta Customer Service.
F28	Relay Short (Relay short circuit)	Internal error. Fault in the relay driver circuit.	Contact Delta Customer Service. Check the driver circuit in the <i>Inverter</i> .
F05	Temperature High (Temperature High)	The ambient temperature is > 60 °C.	Check the system environment.
F07	Temperature Low (Temperature Low)	The ambient temperature is < -30 °C. Internal error.	Check the system environment. Contact Delta Customer Service.

11 Maintenance

Periodic maintenance

11. Maintenance

11.1 Periodic maintenance

Perform the following checks every 6 months.

- Check the fans for soiling and clean them if necessary.
- Checking the fans.
- Check air inlets and outlets for soiling and clean them if necessary.

DANGER



Electric shock

Potentially fatal voltages are present at the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 100 seconds.

Therefore, always carry out the following steps before working on the inverter

1. Disconnect the inverter from all AC and DC voltage sources and make sure that none of the connections can be accidentally restored.
2. Wait at least 100 seconds until the internal capacitors have discharged.

DANGER



Electric shock

Potentially fatal voltages are present at the inverter DC connections. When light falls on the solar modules, they immediately start to generate electricity. This also happens when light does not fall directly on the solar modules.

- ▶ Never disconnect the inverter from the solar modules when it is under load.
- ▶ Disconnect the connection to the mains so that the inverter cannot supply energy to the mains.
- ▶ Disconnect the inverter from all AC and DC voltage sources. Ensure that none of the connections can be restored accidentally.
- ▶ Ensure that the DC cables cannot be touched accidentally.

WARNING



Electric shock

When the cover is removed from the wiring box, this exposes voltage-carrying parts and protection conforming to IP65 is no longer guaranteed.

- ▶ Remove the cover only when absolutely necessary.
- ▶ Do not remove the cover if water might enter the inverter.
- ▶ After work is completed, ensure that the cover is properly replaced and screwed in. Check that the cover is properly sealed.

WARNING



Heavy weight

The inverter is very heavy.

- ▶ The inverter must be lifted and carried by at least 3 people or using appropriate lifting gear (e.g. block and tackle or crane).

11.2 Checking the fans

In order to be able to perform the fan test, the inverter must be supplied with DC voltage.

Menu item path

Main menu > General settings > Test Menu

Performing the fan test

```

10.Feb 2017 15:32
Status:      On Grid
Power:       0W
E-Today:    0kWh

```

```

▶General Settings
Install Settings
Active/Reactive Pwr
FRT

```

```

▶Test menu

```

```

▶Fan Test

```

```

▶Fan Test      OFF
Fan Test Result

```

```

▶Fan Test      ON
Fan Test Result

```

```

▶Fan Test      OFF
Fan Test Result

```

1. If the default information is displayed, press any button to open the main menu. Otherwise, press the **EXIT** button repeatedly until the main menu is displayed.
2. Use the **▼** and **▲** buttons to select the **General Settings** entry and then press the **ENT** button.
3. Use the **▼** and **▲** buttons to select the **Test Menu** entry and then press the **ENT** button.
4. Use the **▼** and **▲** buttons to select the **Fan Test** entry and then press the **ENT** button.
5. Use the **▼** and **▲** buttons to select the **Fan Test** entry again and then press the **ENT** button.
6. To start the fan test, use the **▼** and **▲** buttons to set the **Fan Test** entry to **ON** and then press the **ENT** button.
 - The fan test starts after approx. 5 seconds.
 - The fans audibly accelerate to maximum speed. The fans have reached maximum speed when the fan noise remains constant.
7. Allow the fans to run at a maximum speed for approximately 20 seconds.
 - If one of the fans is not functioning correctly, the **ALARM** LED starts flashing after around 10 seconds.
 - If all fans are functioning correctly the **ALARM** LED remains off.
8. To end the fan test, use the **▼** and **▲** buttons to set the **Fan Test** entry to **OFF** and then press the **ENT** button.
 - The fan speed drops and the fans come to a standstill.

11 Maintenance

Periodic maintenance

```
Fan Test      OFF
▶Fan Test Result
```

9. To see the results of the fan test, use the  and  buttons to select the **Result Fan Test** entry and then press the  button.

```
Failed Fan:
Empty
```

The list shows the fans that are defective.

Result if no fans are defective.

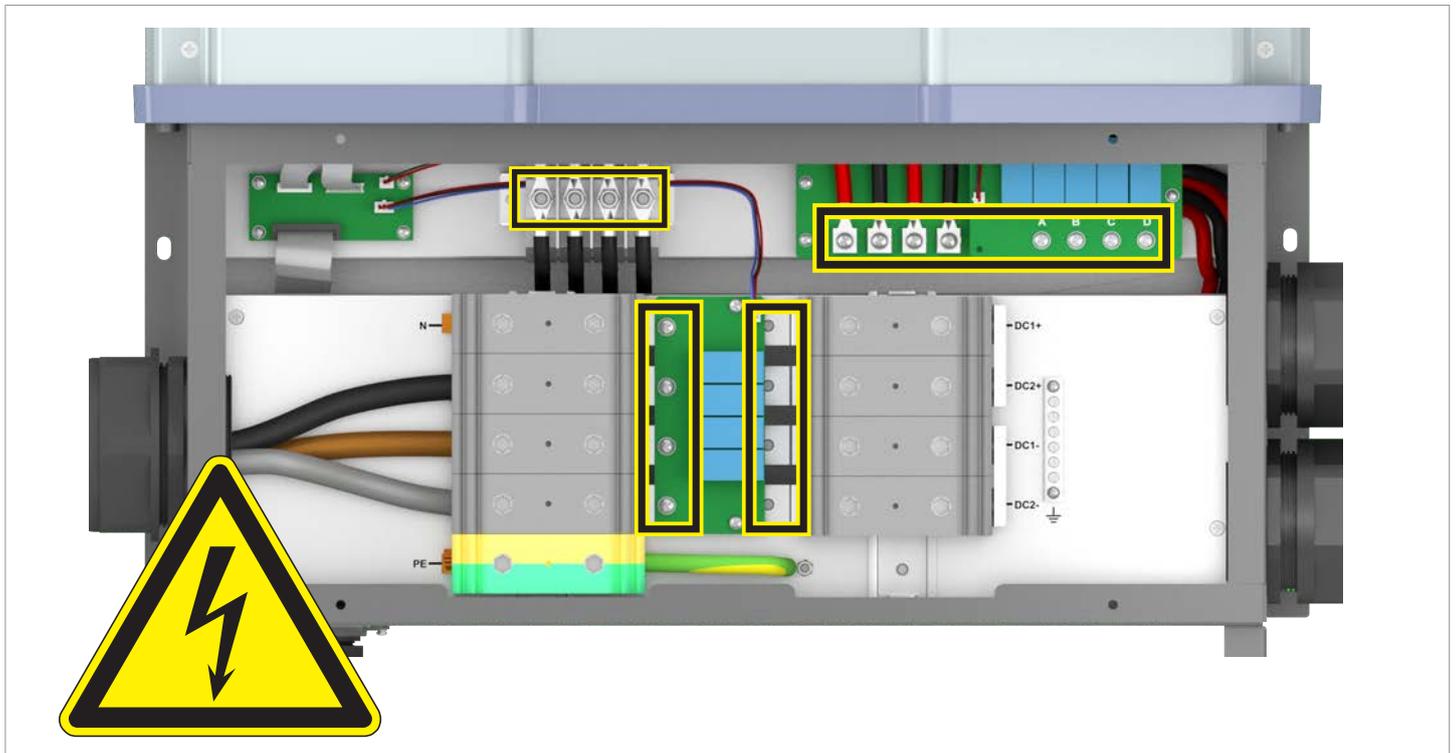
```
Failed Fan:
Ext Fan 1
```

Result if one fan is defective.

11.3 Make preparations for maintenance work - disconnect the inverter from the mains (AC) and solar modules (DC)



The work instructions in this segment apply for all maintenance work that the installer is permitted to perform on the inverter.



Hazard zones with potentially life-threatening currents and voltages

DANGER



Electric shock

Potentially fatal voltages are present at the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 100 seconds.

Therefore, always carry out the following steps before working on the inverter

1. Disconnect the inverter described in this section from all AC and DC voltage sources.
2. Wait at least 100 seconds until the internal capacitors have discharged.



There is normally an isolating switch (for example in an equipment terminal box) between the inverter and the mains and between the solar modules, to isolate the inverter from all AC and DC voltage sources and to render it de-energized.

11 Maintenance

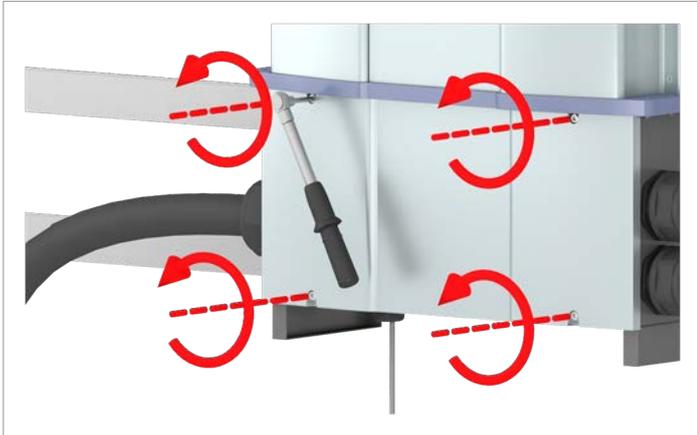
Periodic maintenance

Tools required

In addition to standard tools such as screwdrivers, open-ended wrenches and socket wrenches in various sizes, the following tools are required for working on the inverter:

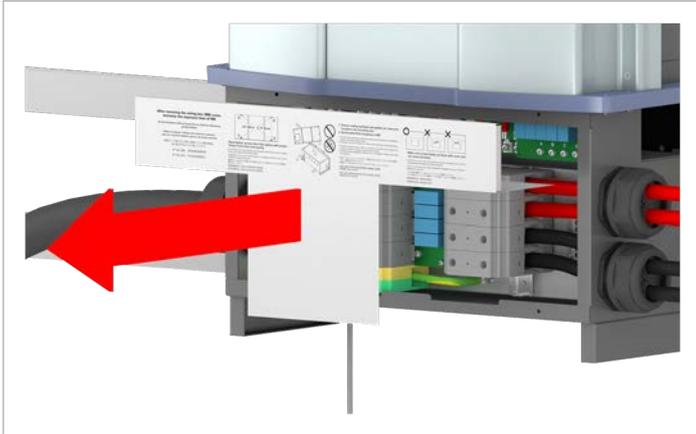
- Voltmeter to check that the junction box is de-energized.
- M6 Allen wrench (hexagon socket) for opening the cover of the junction box
- M10 Allen wrench (hexagon socket) for disconnecting the cables on the AC terminal block
- Mounting tool for disconnecting the MC4 plug connectors of the DC cables

1. To render the inverter de-energized, open the isolating switches between inverter and mains connection point and between the inverter and solar modules.
Secure all isolating switches against being accidentally switched back on.



2. Unscrew and remove the junction box cover.





3. Remove the cover in the interior of the junction box.

DANGER

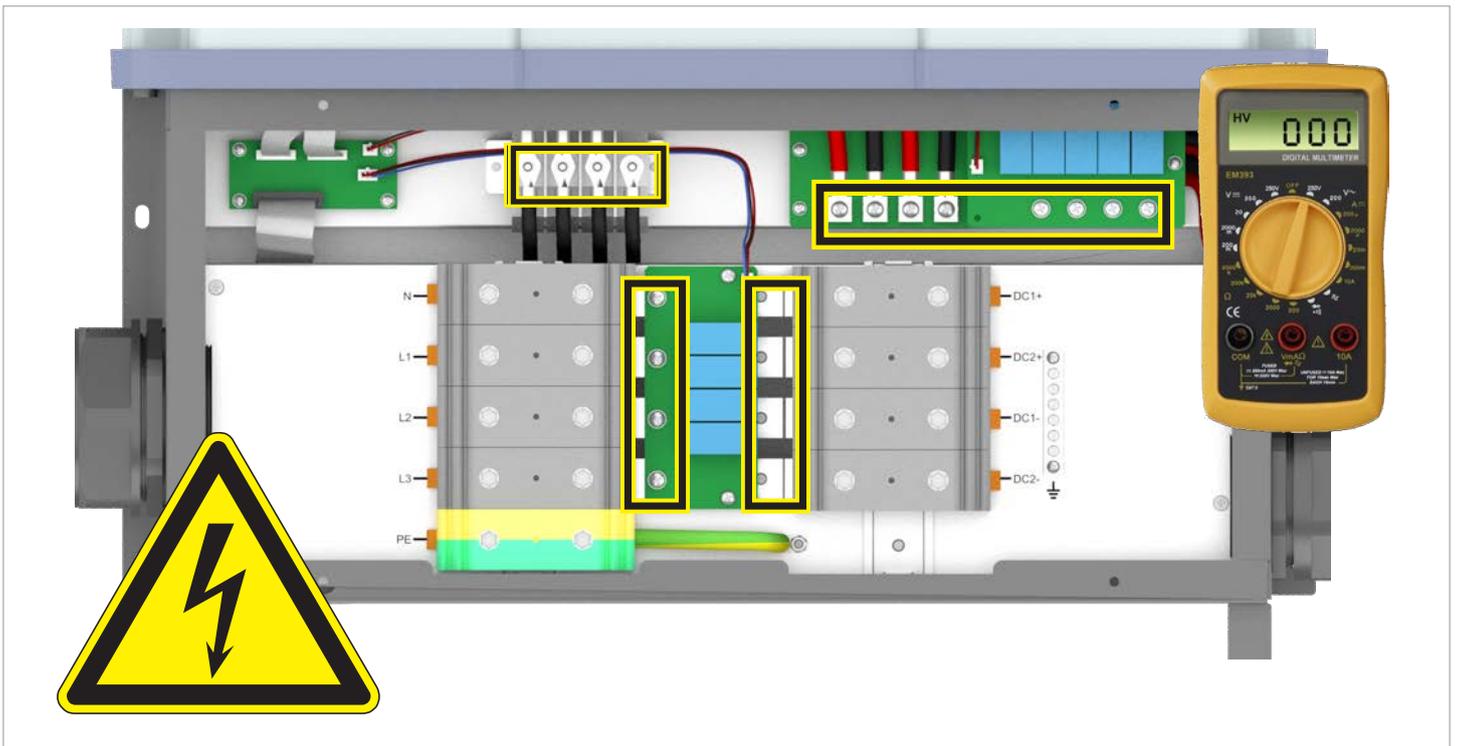


Electric shock

Voltage-carrying parts can still be live!

- ▶ Do not touch potentially voltage-carrying parts until these have been proven to be de-energized using a voltmeter!

4. Use a voltmeter to check that there is no more voltage in the danger zones.



11 Maintenance

Periodic maintenance

11.4 Cleaning the cooling system

DANGER



Electric shock

Potentially fatal voltages are present at the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 100 seconds.

- ▶ Perform the instructions listed in [“11.3 Make preparations for maintenance work - disconnect the inverter from the mains \(AC\) and solar modules \(DC\)”](#) on page 165 **before** you start work on the inverter!



Do not use any sharp, pointed or hard objects for cleaning.

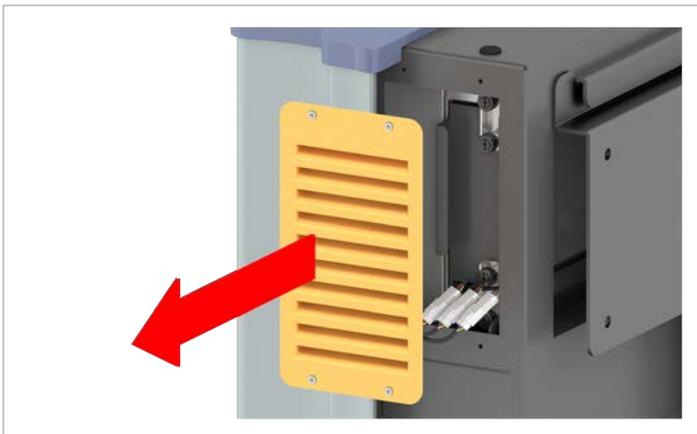
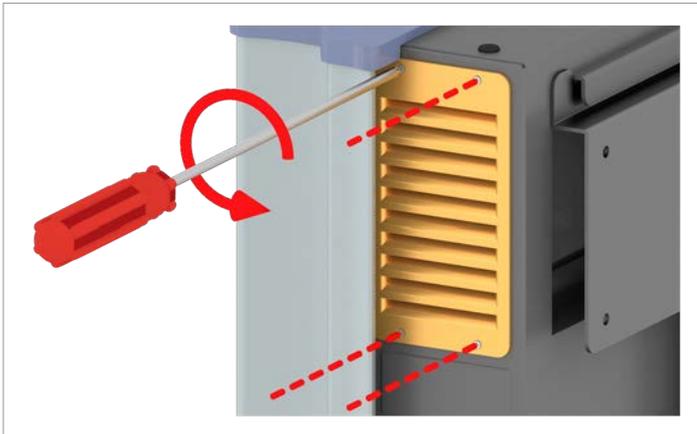
Do not use liquids for cleaning.

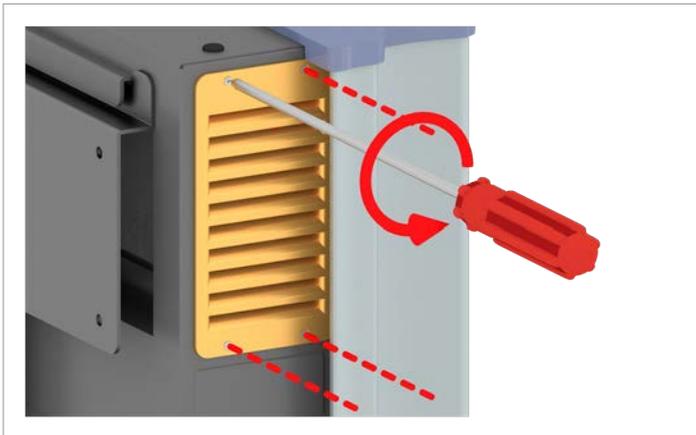


The screws on the air outlets are very small and can easily be dropped. You should therefore use a magnetic screwdriver.

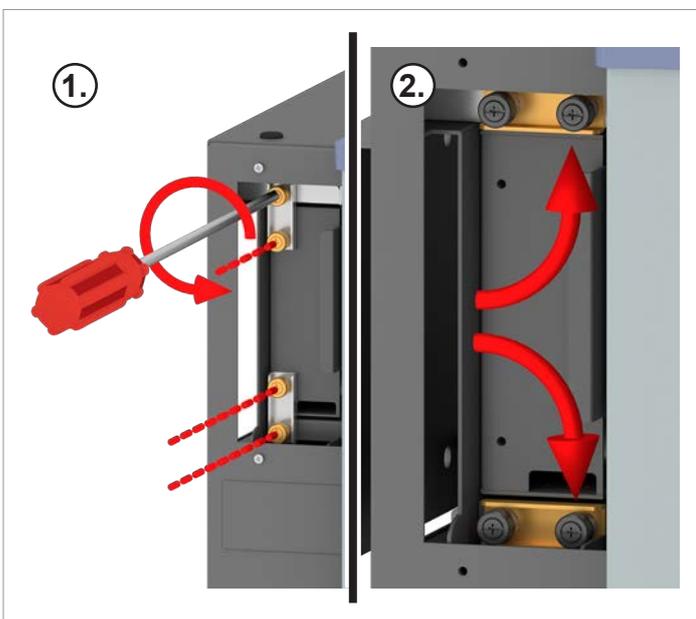
11.4.1 Cleaning the air outlets and fans

1. Perform the instructions listed in [“11.3 Make preparations for maintenance work - disconnect the inverter from the mains \(AC\) and solar modules \(DC\)”](#) on page 165 **before** you perform the following operations!
2. Unscrew and remove the cover on the right hand side of the air outlet.





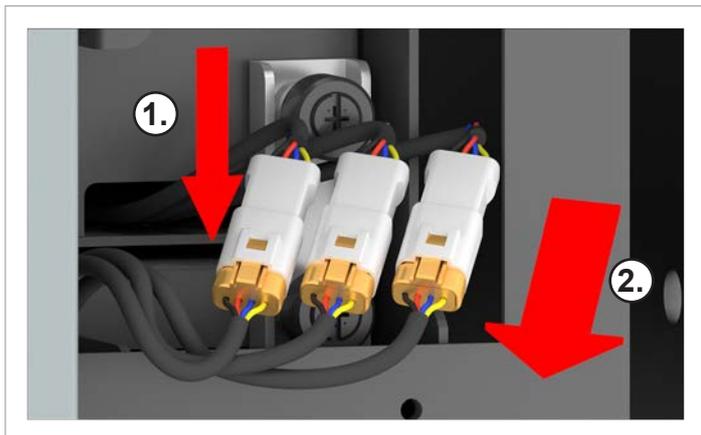
3. Unscrew and remove the cover on the left hand side of the air outlet.



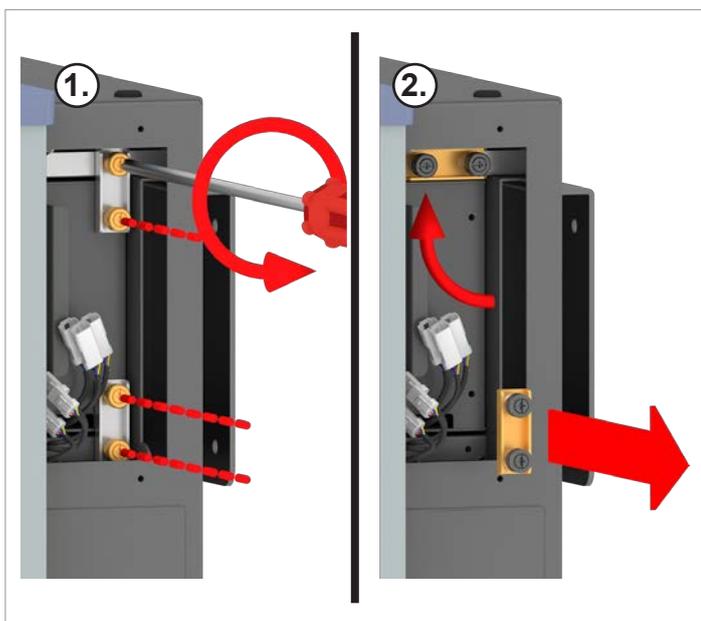
4. Undo the attachment screws on the left hand side of the fan module.

11 Maintenance

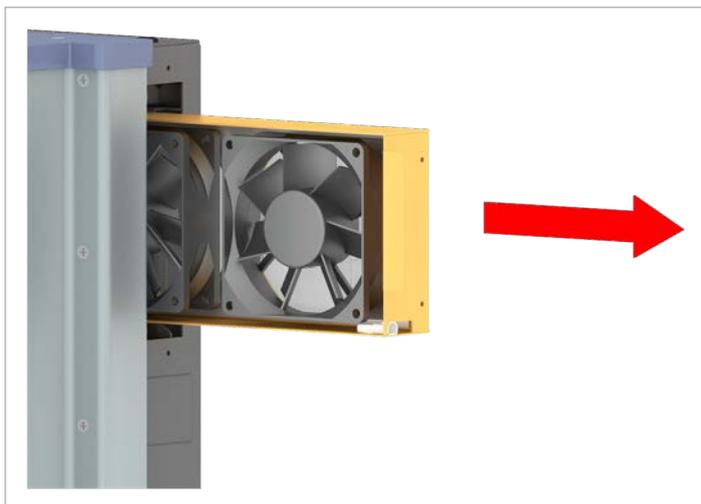
Periodic maintenance



5. On the right hand side, disconnect the plug connectors for the 3 power supply cables to the fan module.



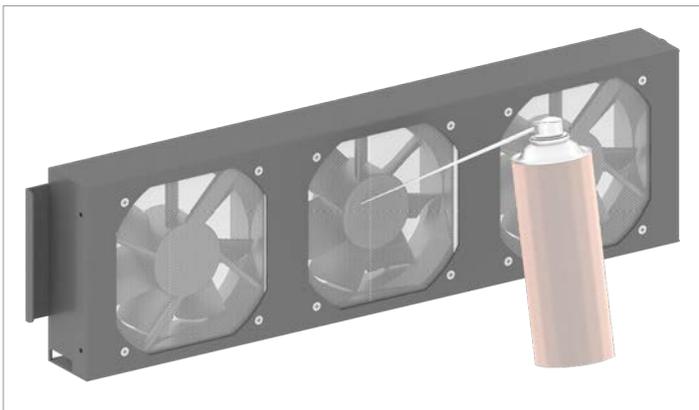
6. Undo the attachment screws on the right hand side of the fan module.
Remove the lower attachment screws.



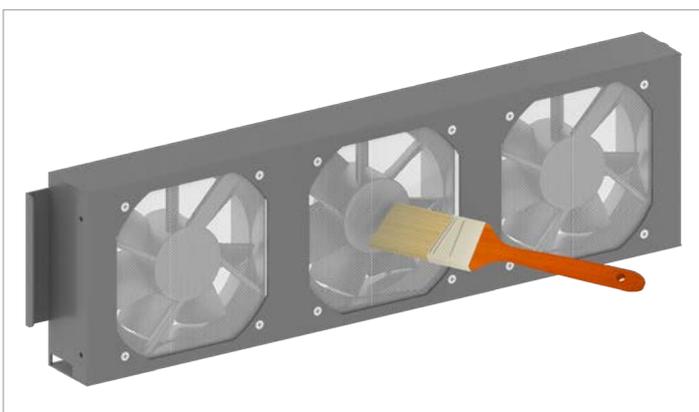
7. Pull out the fan module to the right.



8. Clean the air outlets with a compressed air cleaner or a stiff paintbrush.

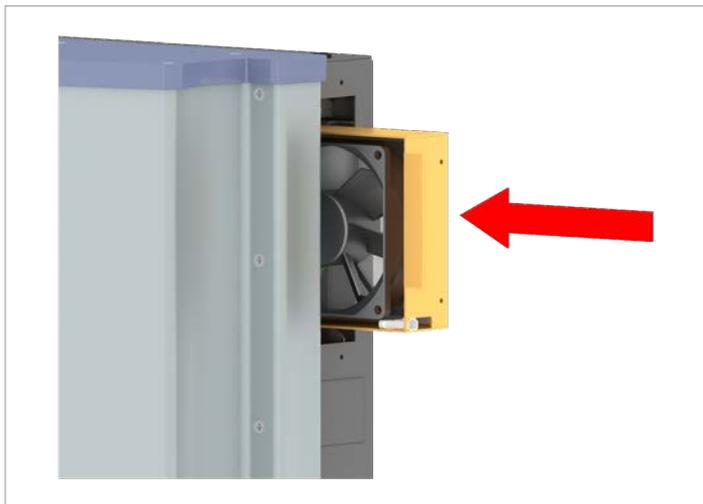


9. Clean the fan module with a compressed air cleaner or a stiff paintbrush.

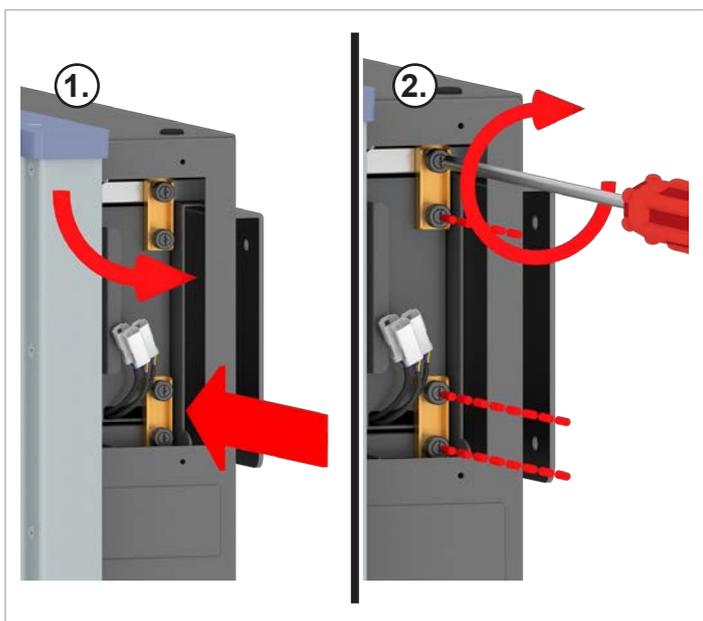


11 Maintenance

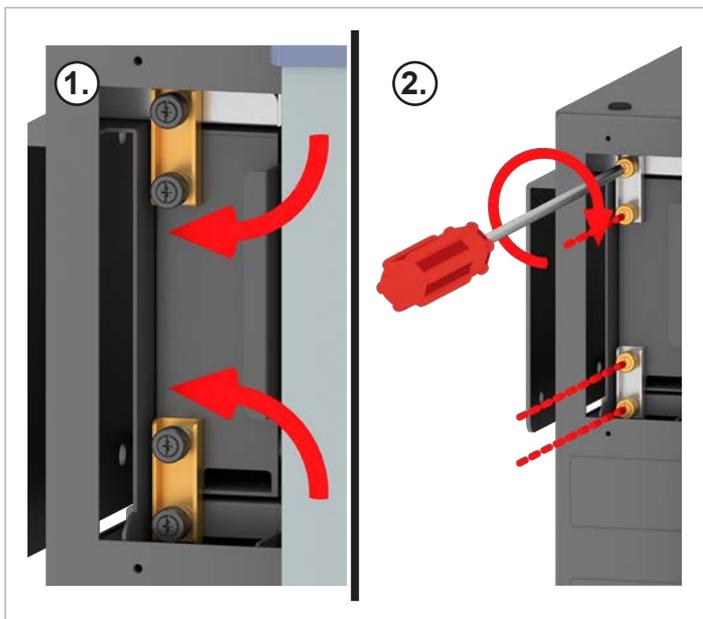
Periodic maintenance



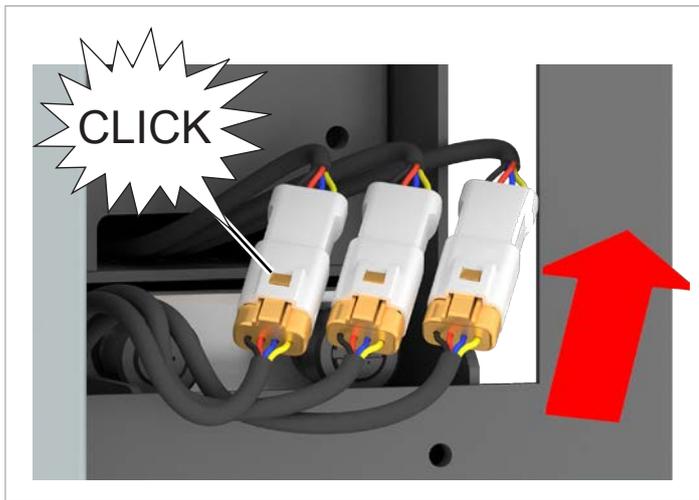
10. Slide the fan module into the inverter from the right hand side.



11. Screw in the attachment screws on the right hand side of the fan module.

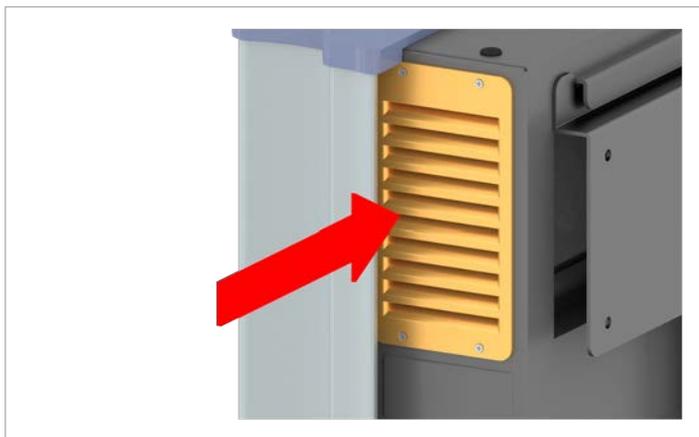


12. Screw in the attachment screws on the left hand side of the fan module.

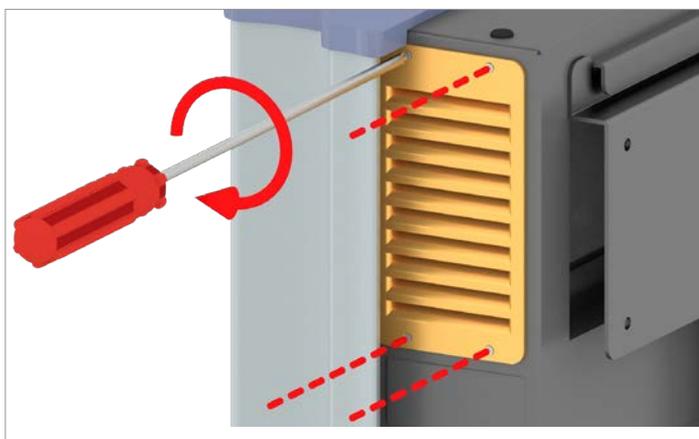


NOTE: The sequence of the plug connectors is unimportant.

13. On the right hand side, push together the plug connectors for the 3 power supply cables to the fan module, until they click home.

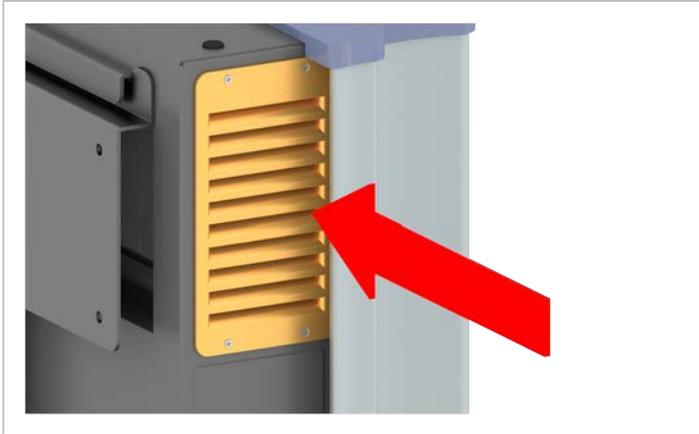


14. Insert and tighten the screws on the cover on the right hand side of the air outlet.

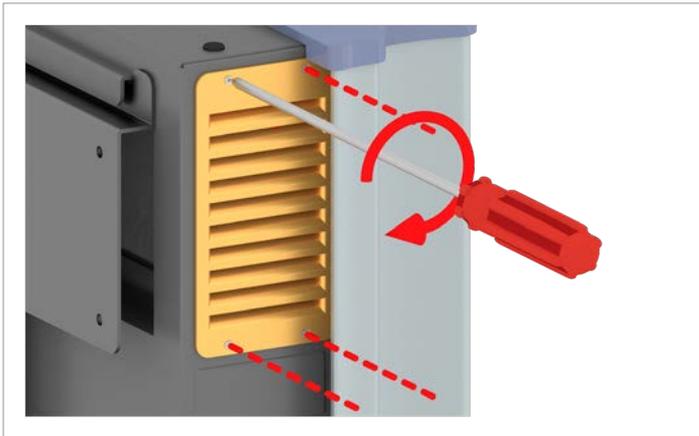


11 Maintenance

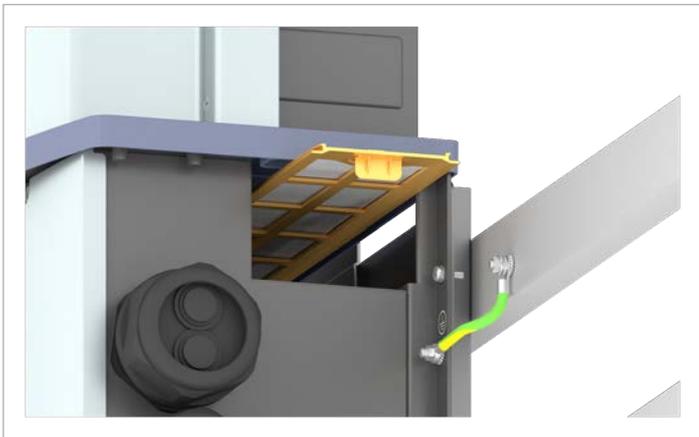
Periodic maintenance



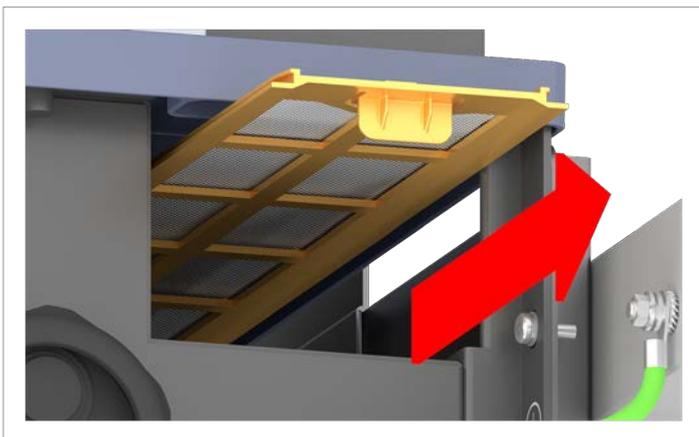
15. Insert and tighten the screws on the cover on the left hand side of the air outlet.

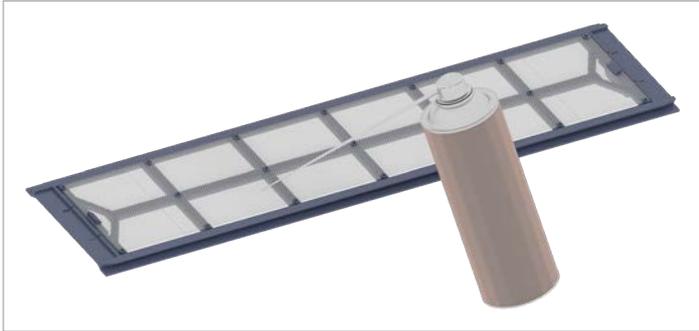


11.4.2 Cleaning the air inlet

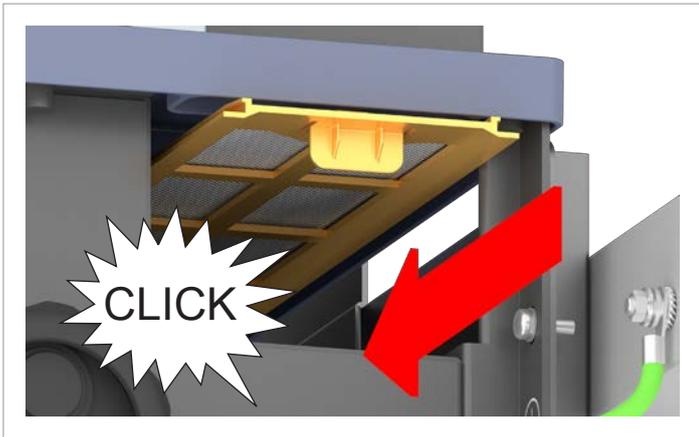
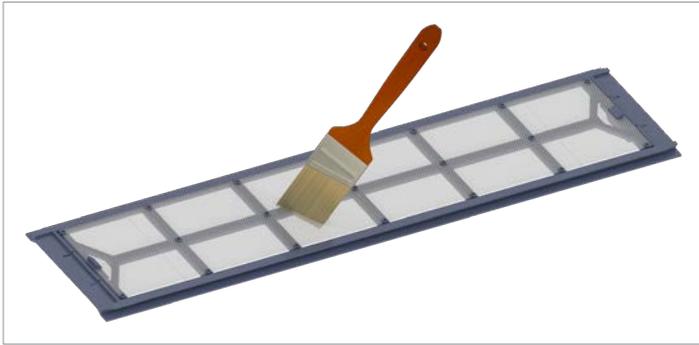


16. Pull out the air inlet filter to the left or the right.





17. Clean the air inlet filter with a compressed air cleaner or a stiff paintbrush.



18. Insert the air inlet filter into the guide rails from the left or right and push it in until it clicks home.

19. Perform the instructions listed in [“11.3 Make preparations for maintenance work - disconnect the inverter from the mains \(AC\) and solar modules \(DC\)”](#) on page 165 to end the work!

11 Maintenance

Periodic maintenance

11.5 Replacing the surge protection devices

DANGER



Electric shock

Potentially fatal voltages are present at the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 100 seconds.

- ▶ Perform the instructions listed in “11.3 Make preparations for maintenance work - disconnect the inverter from the mains (AC) and solar modules (DC)” on page 165 before you start work on the inverter!
- ▶ Use an insulated screwdriver!

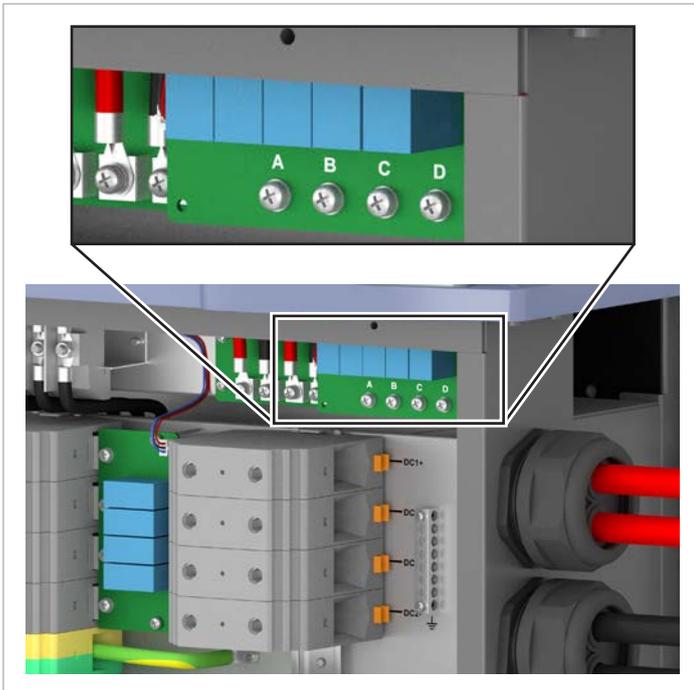


The surge protection devices are replaced as a block. You can obtain spare parts from Delta Customer Service. You can find the contact information on the back of this document.



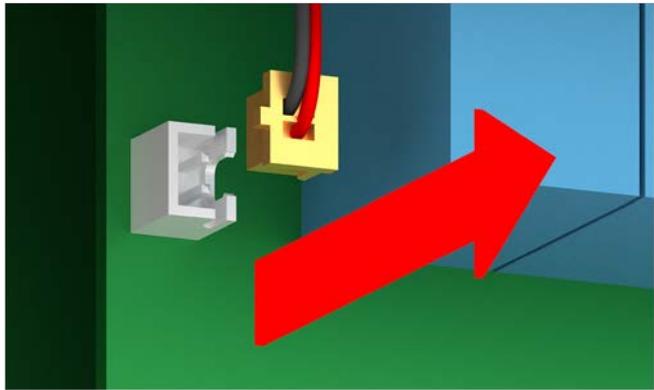
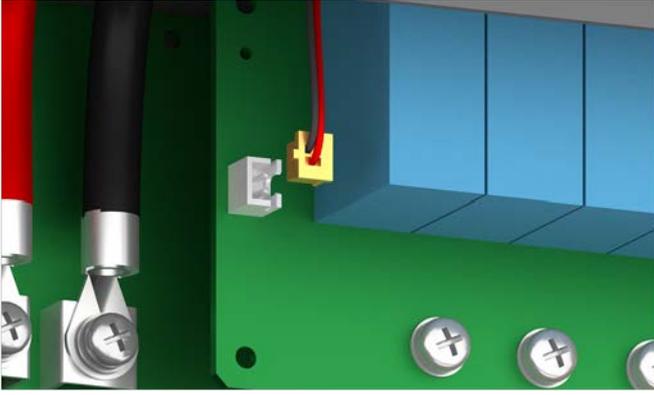
Some of the attachment screws for the surge protection devices are very small and can easily be dropped into the junction box. You should therefore use a magnetic screwdriver.

11.5.1 Replacing DC surge protection devices

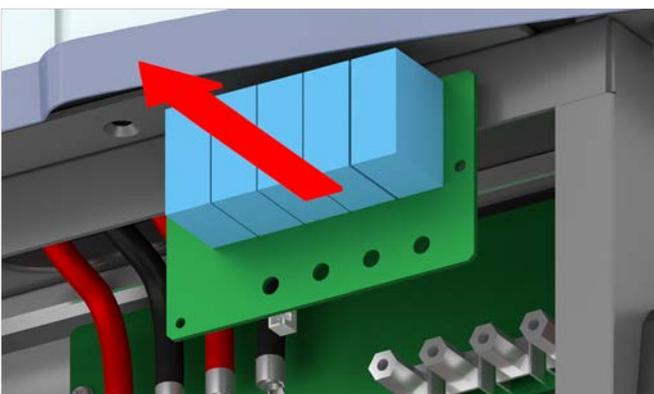
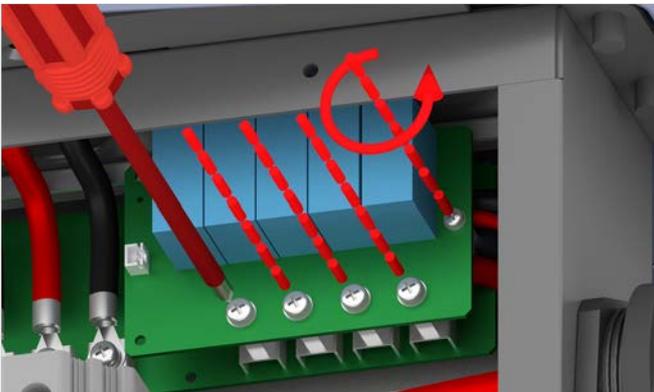


1. Perform the instructions listed in “11.3 Make preparations for maintenance work - disconnect the inverter from the mains (AC) and solar modules (DC)” on page 165 before you perform the following operations!

2. Pull out the communication cable plug.



3. Unscrew the 5 screws and lift out the block with the defective surge protection devices.



11 Maintenance

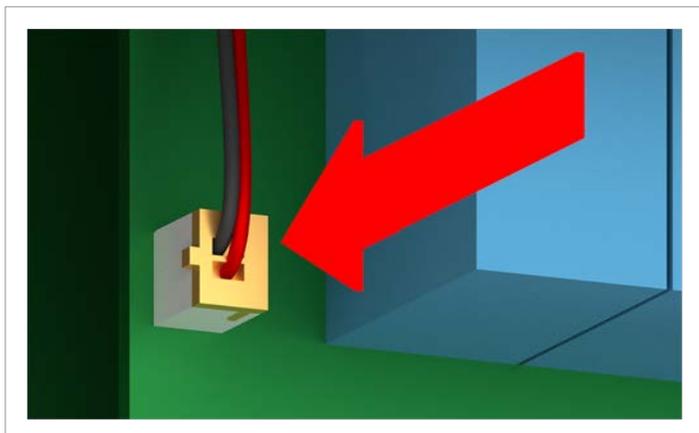
Periodic maintenance



4. Fit the new block with the surge protection devices and screw in place using the 5 screws.

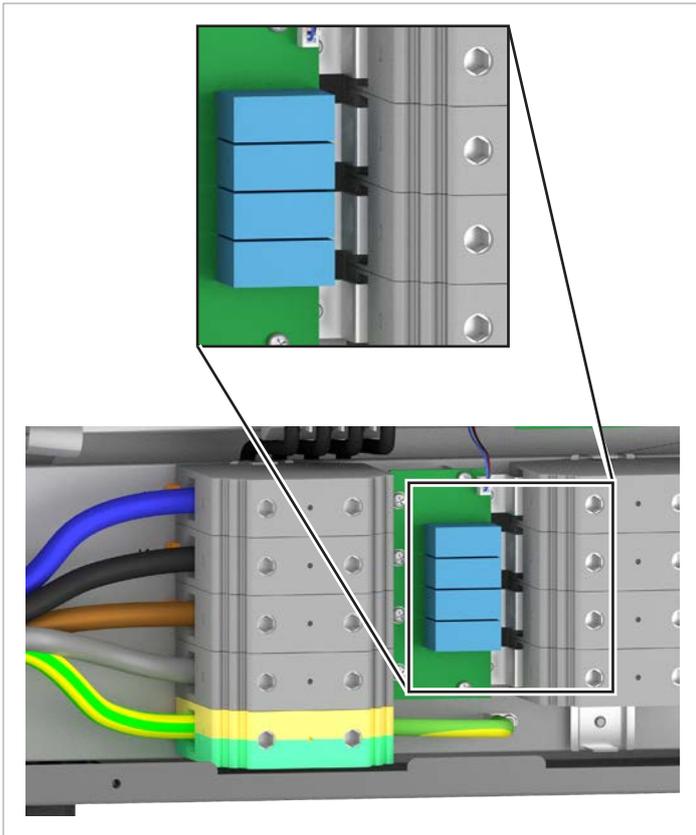


5. Plug in the communication cable plug.



6. Perform the instructions listed in [“11.3 Make preparations for maintenance work - disconnect the inverter from the mains \(AC\) and solar modules \(DC\)”](#) on page 165 to end the work!

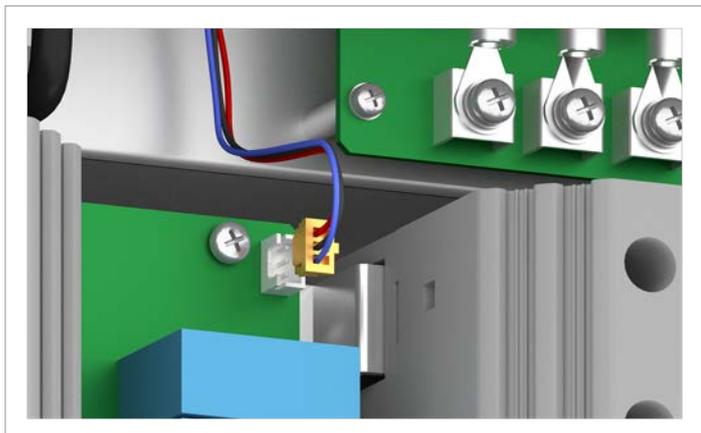
11.5.2 Replacing AC surge protection devices



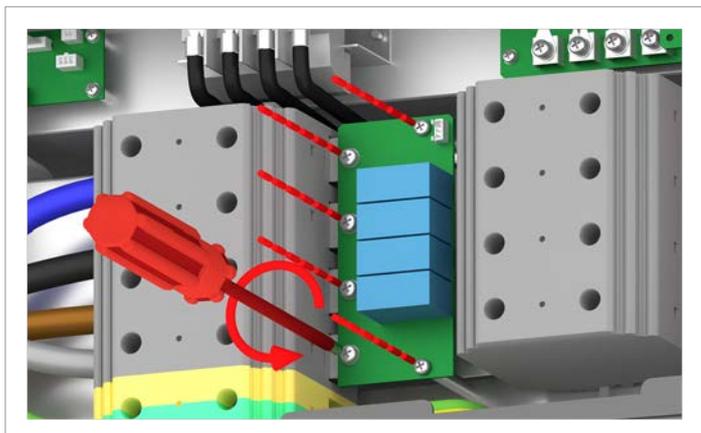
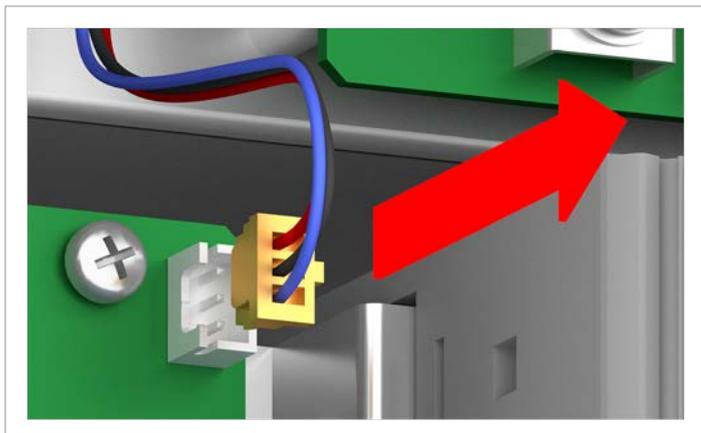
1. Perform the instructions listed in [“11.3 Make preparations for maintenance work - disconnect the inverter from the mains \(AC\) and solar modules \(DC\)”](#) on page 165 **before** you perform the following operations!

11 Maintenance

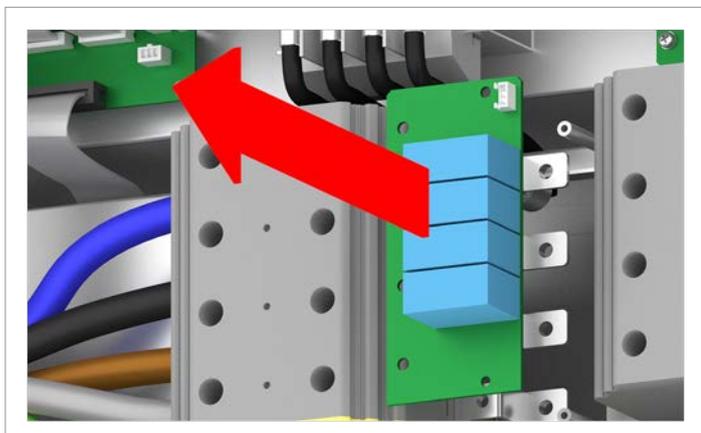
Periodic maintenance

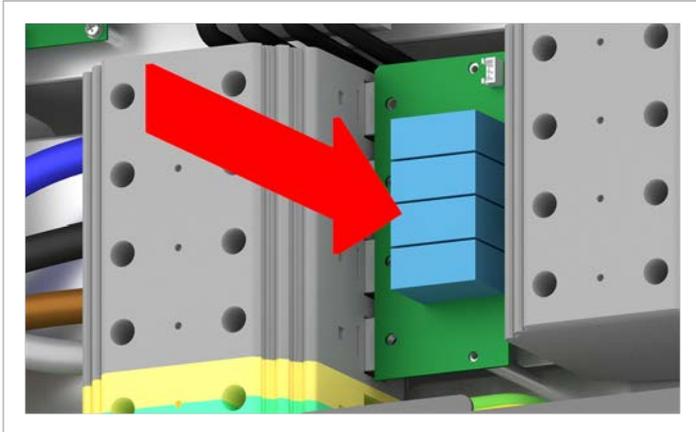


2. Pull out the communication cable plug.

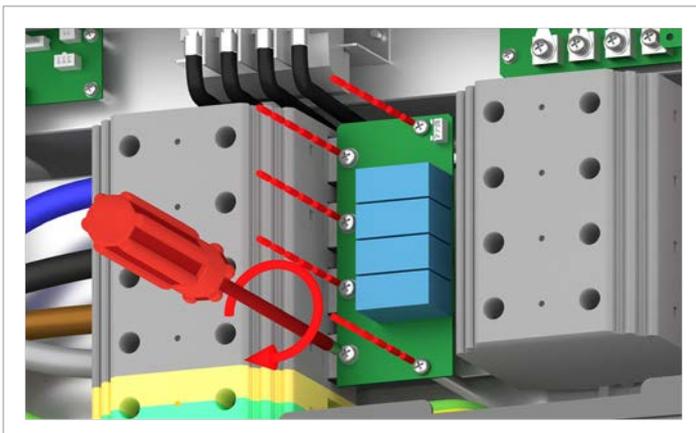


3. Unscrew the 6 screws and lift out the block with the defective surge protection devices.

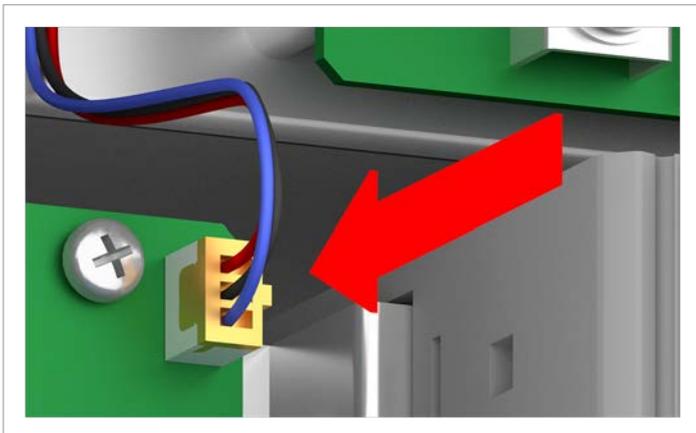




4. Fit the new block with the surge protection devices and screw in place using the 6 screws.



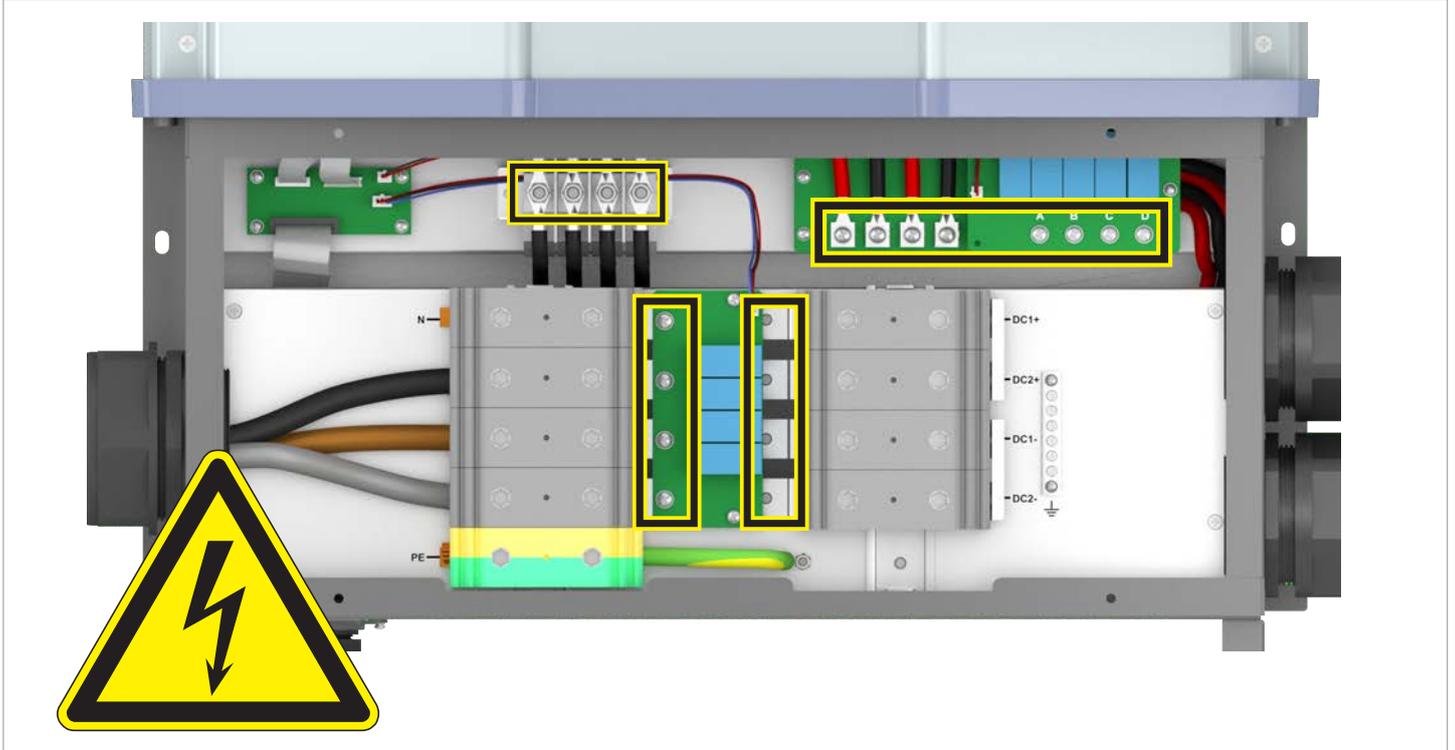
5. Plug in the communication cable plug.



11 Maintenance

Periodic maintenance

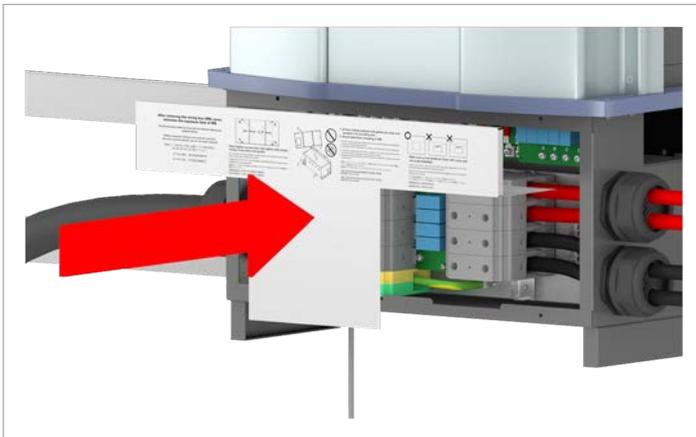
11.6 Finishing the maintenance work - connecting the inverter from the mains (AC) and solar modules (DC)



Hazard zones with potentially life-threatening currents and voltages



There is normally an isolating switch (for example in an equipment terminal box) between the inverter and the mains and between the solar modules, to isolate the inverter from all AC and DC voltage sources and to render it de-energized.



1. Tighten the screws by hand at first and then use a torque wrench to tighten them crosswise with a torque of 2.37 Nm.

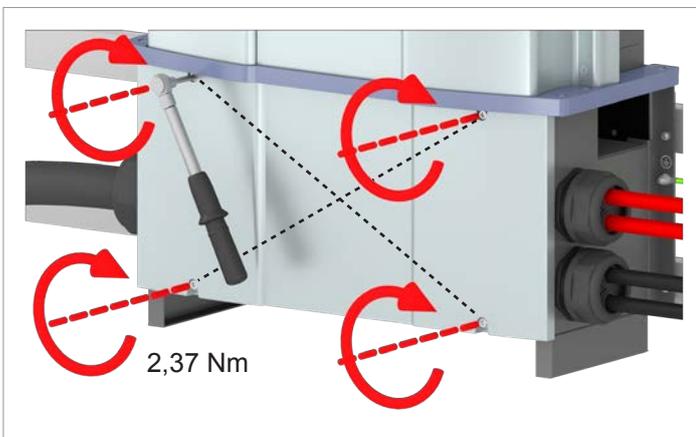


NOTICE



Impairment of operating response caused by moisture and dirt.

In order to restore degree of protection IP65 after the completion of installation work, attach the cover of the wiring box in accordance with the following instructions.



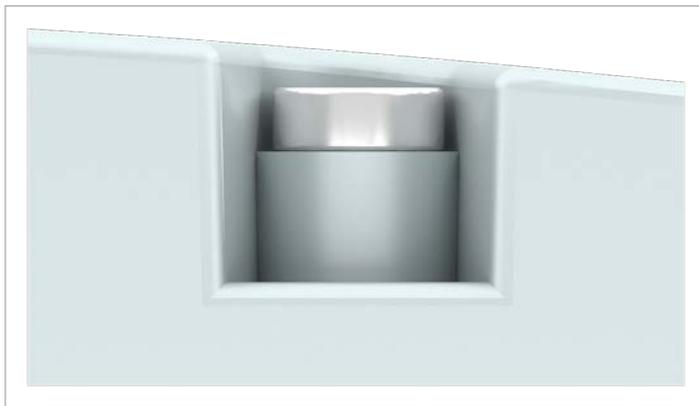
2. Before screwing on the cover, check all seals and surfaces for correct positioning and cleanliness.

3. Attach the cover in such a way that it is evenly mounted and not skewed.

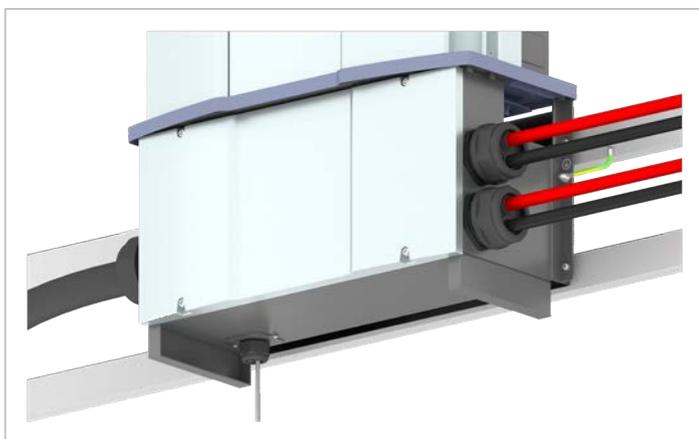
4. Tighten the screws by hand at first and then use a torque wrench to tighten them crosswise with a torque of 2.37 Nm.

11 Maintenance

Periodic maintenance



5. Do not skew the screws. The screw heads must be flush with the surface.



- The maintenance work is now complete.

6. To connect the inverter to the mains and to the solar modules, close the isolating switches between the inverter and mains connection point and between the inverter and solar modules.

Secure all isolating switches against being accidentally switched back on.

→ The inverter starts a self-test lasting approx. 2 minutes. The remaining time is shown on the display.

12. Replacing the inverter

12.1 Safety instructions

DANGER



Electric shock

Potentially fatal voltages are present at the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 100 seconds.

Therefore, always carry out the following steps before working on the inverter:

1. Disconnect the inverter from all AC and DC voltage sources and make sure that none of the connections can be accidentally restored.
2. Wait at least 100 seconds until the internal capacitors have discharged.

DANGER



Electric shock

Potentially fatal voltages are present at the inverter DC connections. When light falls on the solar modules, they immediately start to generate electricity. This also happens when light does not fall directly on the solar modules.

- ▶ Never disconnect the inverter from the solar modules when it is under load.
- ▶ Disconnect the connection to the mains so that the inverter cannot supply energy to the mains.
- ▶ Disconnect the inverter from all AC and DC voltage sources. Ensure that none of the connections can be restored accidentally.
- ▶ Ensure that the DC cables cannot be touched accidentally.

WARNING



Electric shock

When the cover is removed from the wiring box, this exposes voltage-carrying parts and protection conforming to IP65 is no longer guaranteed.

- ▶ Remove the cover only when absolutely necessary.
- ▶ Do not remove the cover if water might enter the inverter.
- ▶ After work is completed, ensure that the cover is properly replaced and screwed in. Check that the cover is properly sealed.

If the entire inverter, the power module or the junction box need to be sent to Delta for repair, then you will receive a suitable substitute from Delta.

Always contact Delta Customer Service before commencing the removal of the inverter for replacement.

The inverter can be either replaced in its entirety or only the power module or the junction box separately.



The work steps respectively required for this are described in the following segments.

It is best to wait before performing the removal until you have received the replacement device. You must then use the delivery box in which the replacement device was delivered to send back the defective part.

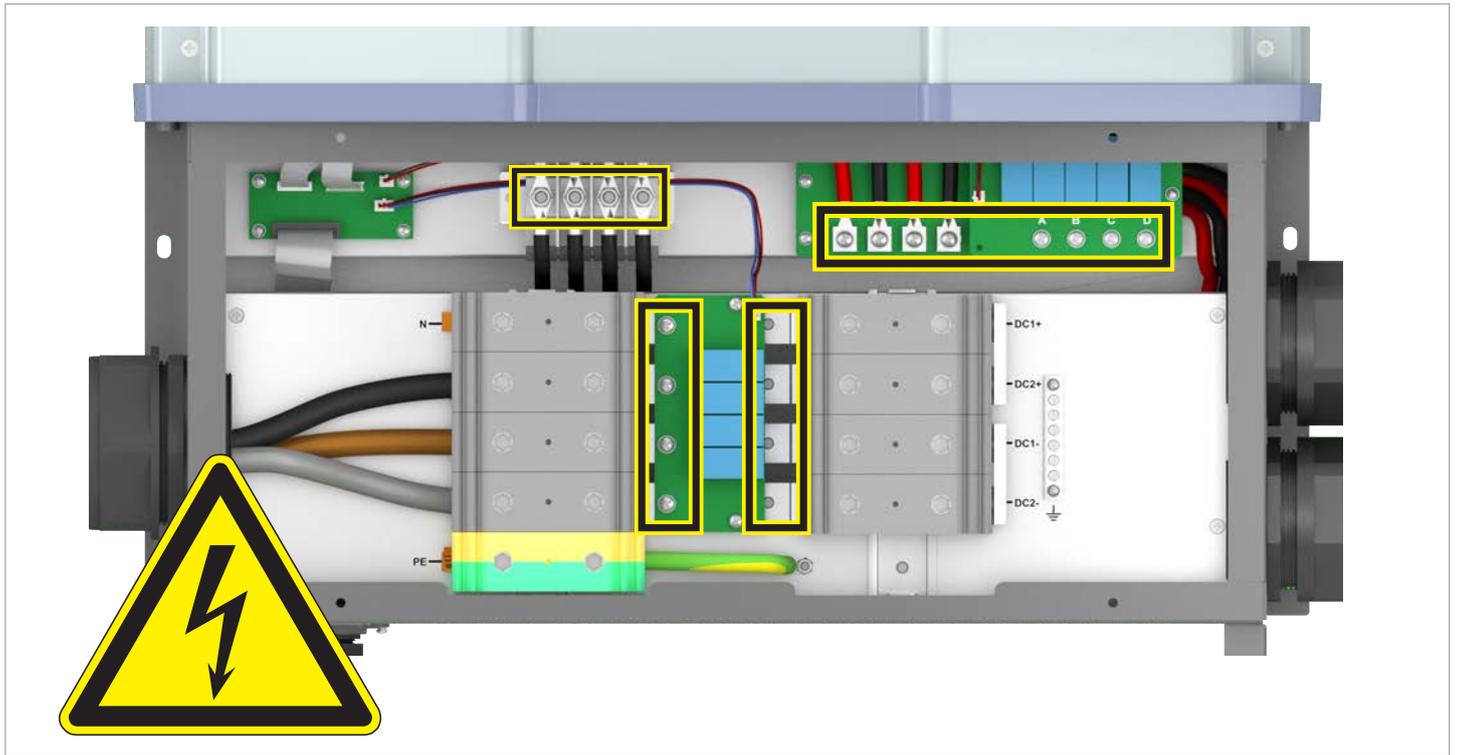
All of the attachments required, e.g. cable glands or communications card are supplied with the replacement device. You need not send back the cable glands and communications card of the old inverter, i.e. you can reuse them.



There is normally an isolating switch (for example in an equipment terminal box) between the inverter and the mains and between the solar modules, to isolate the inverter from all AC and DC voltage sources and to render it de-energized.

12 Replacing the inverter

Safety instructions



Hazard zones with potentially life-threatening currents and voltages

12.2 Replacing the entire inverter

12.2.1 Brief overview of the working steps

1. [“12.2.3 Preparatory work”, p. 188](#)
2. [“12.2.4 Disconnect the cables”, p. 190](#)
3. [“12.2.5 Removing the old inverter”, p. 194](#)
4. [“12.2.6 Installing the new inverter”, p. 196](#)

12.2.2 Tools required



You need not send back the cable glands of the old inverter.

All of the necessary cable glands are however supplied with the new inverter.

In addition to standard tools such as screwdrivers, open-ended wrenches and socket wrenches in various sizes, the following tools are required for working on the inverter:

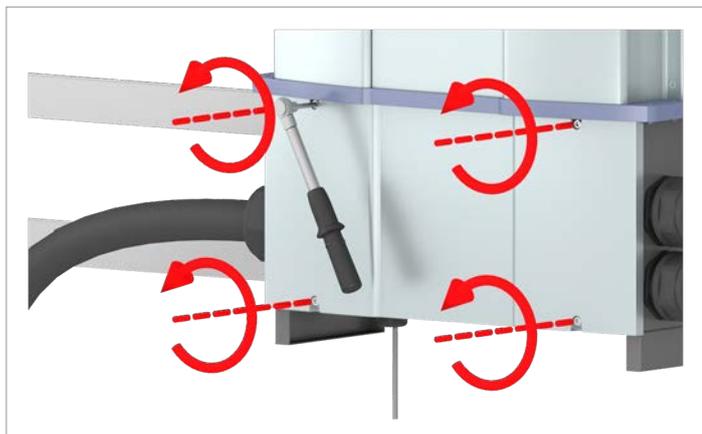
- Voltmeter to check that the junction box is de-energized.
- M6 Allen wrench (hexagon socket) for opening the cover of the junction box
- M10 Allen wrench (hexagon socket) for disconnecting the cables on the AC and DC terminal block
- M12 eyebolts for raising the inverter
- Block and tackle or small crane for lifting the inverter (take into account the weight of the inverter!)

12 Replacing the inverter

Replacing the entire inverter

12.2.3 Preparatory work

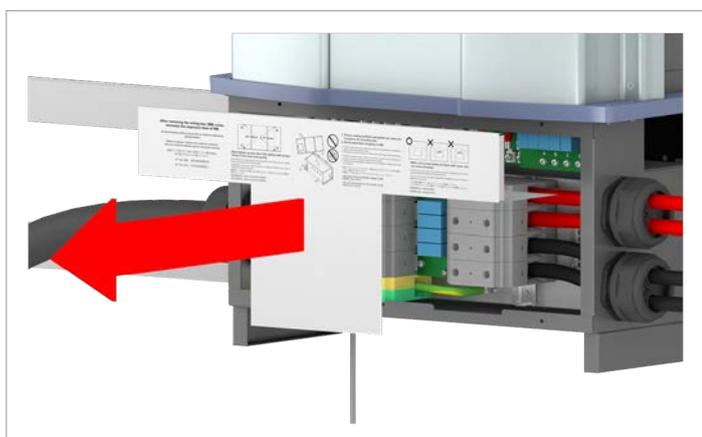
1. To render the inverter de-energized, open the isolating switches between inverter and mains connection point and between the inverter and solar modules.
Secure all isolating switches against being accidentally switched back on.



2. Unscrew and remove the junction box cover.



3. Remove the cover in the interior of the junction box.



12 Replacing the inverter

Replacing the entire inverter

DANGER

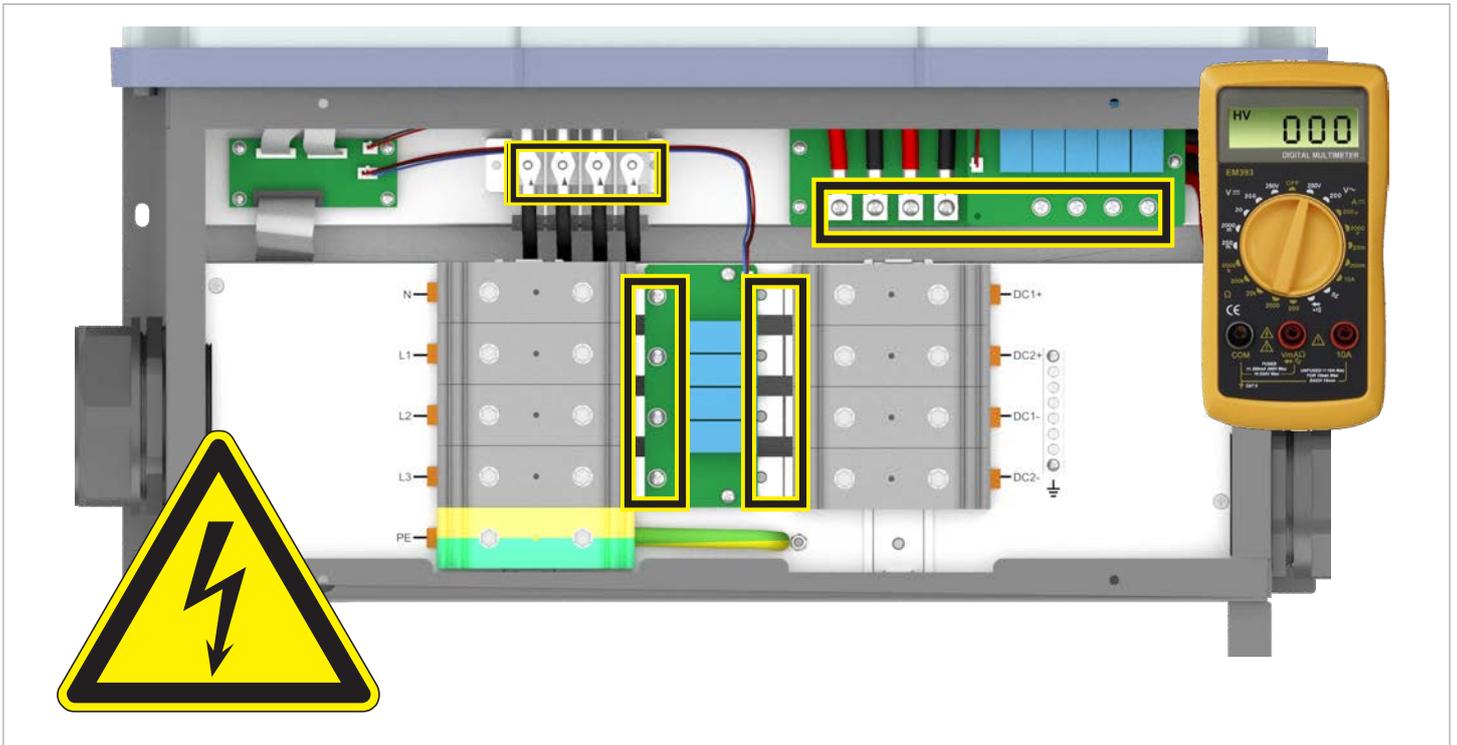


Electric shock

Voltage-carrying parts can still be live!

- ▶ Do not touch potentially voltage-carrying parts until these have been proven to be de-energized using a voltmeter!

4. Use a voltmeter to check that there is no more voltage in the danger zones.



12 Replacing the inverter

Replacing the entire inverter

12.2.4 Disconnect the cables

NOTICE



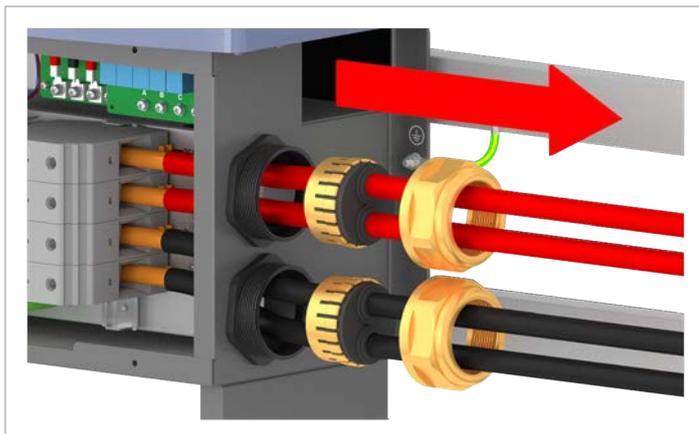
When pulling out the cables, take care to ensure that no parts are damaged in the junction box.



5. Unscrew the DC cables on the DC terminal block.

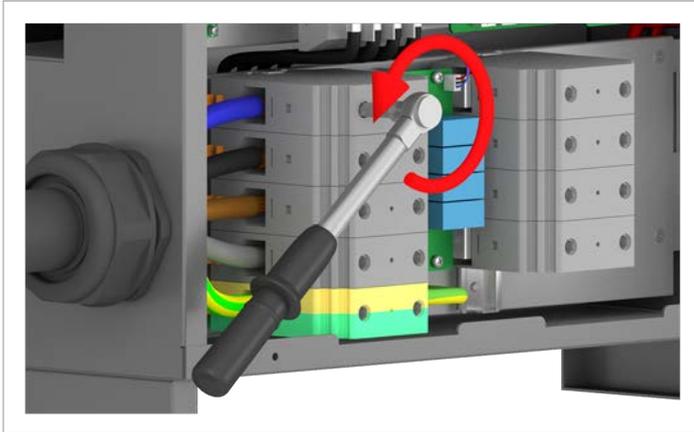


6. Unscrew the DC cable gland and carefully pull out the DC cables.

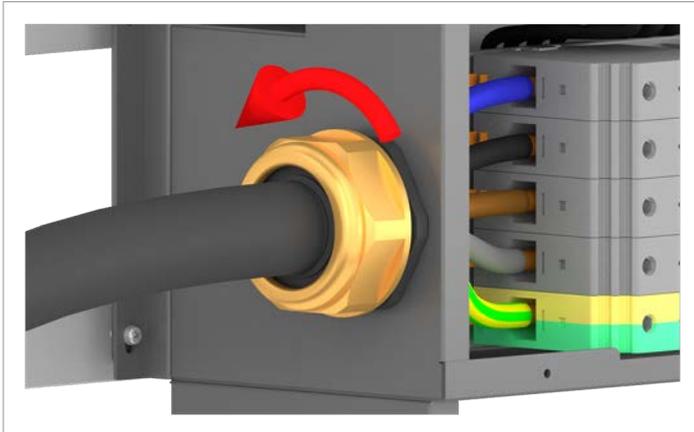


12 Replacing the inverter

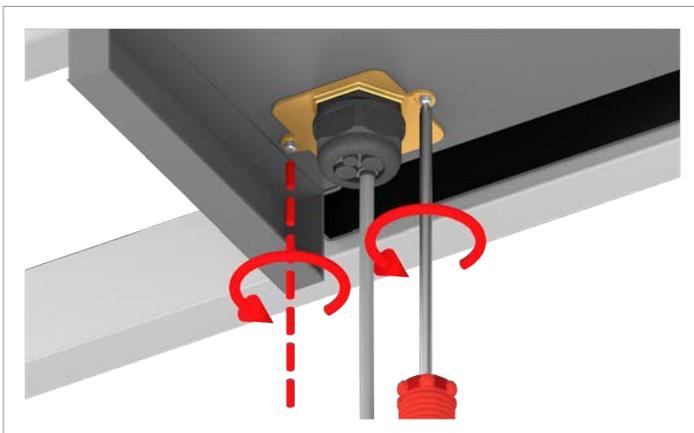
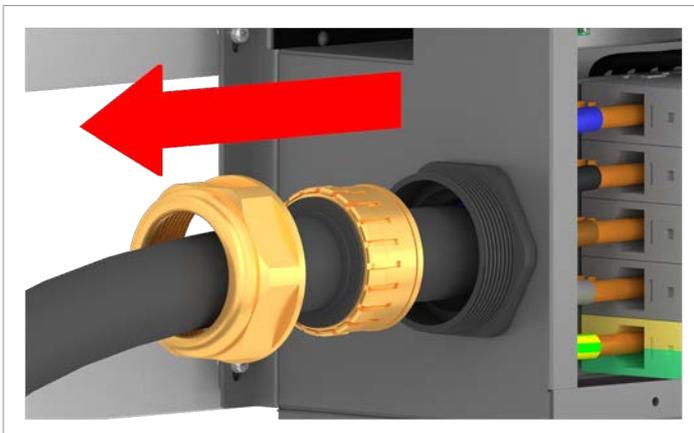
Replacing the entire inverter



7. Unscrew the AC cable on the AC terminal block.



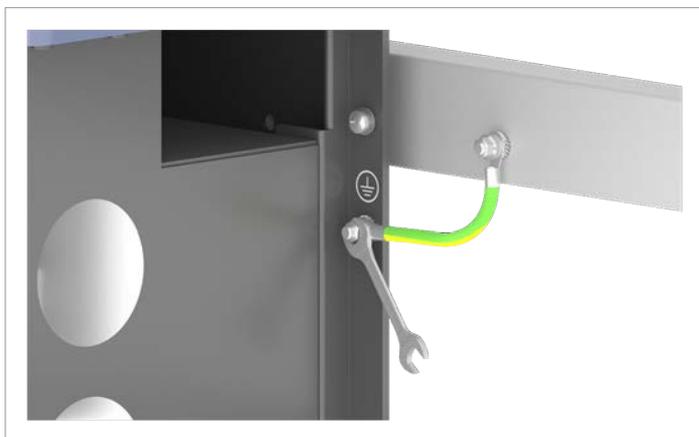
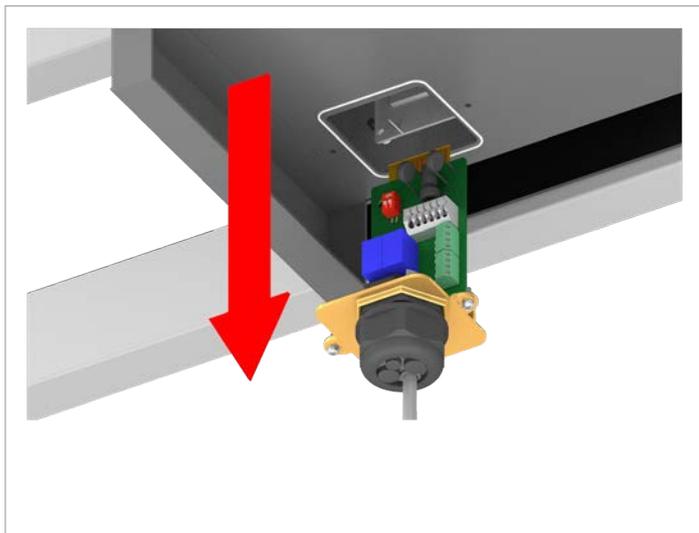
8. Unscrew the YC cable gland and carefully pull out the AC cable.



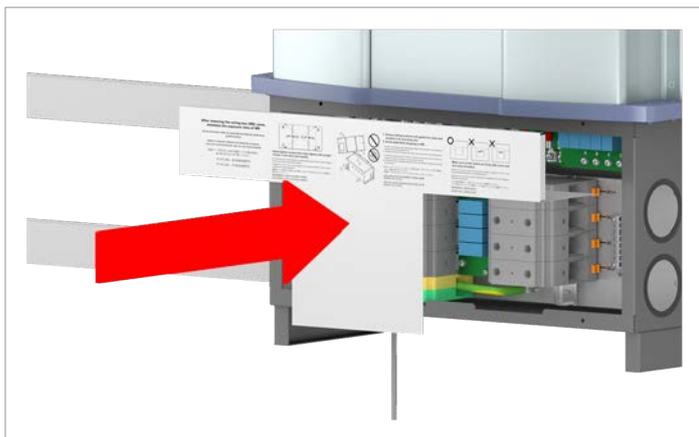
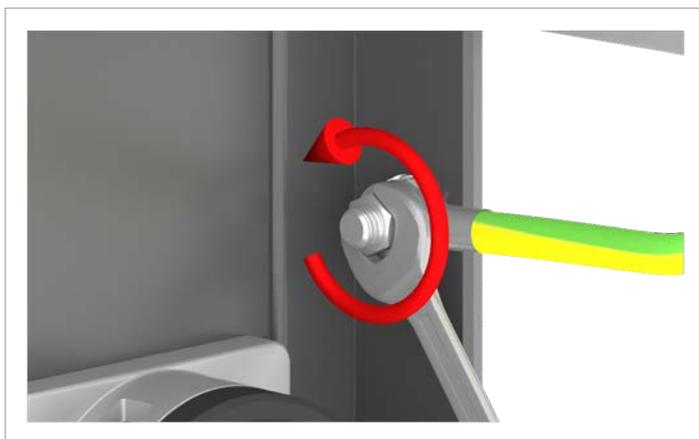
9. Unscrew and carefully pull out the cover. The communications card is screwed to the cover.

12 Replacing the inverter

Replacing the entire inverter



10. Unscrew the grounding cable.



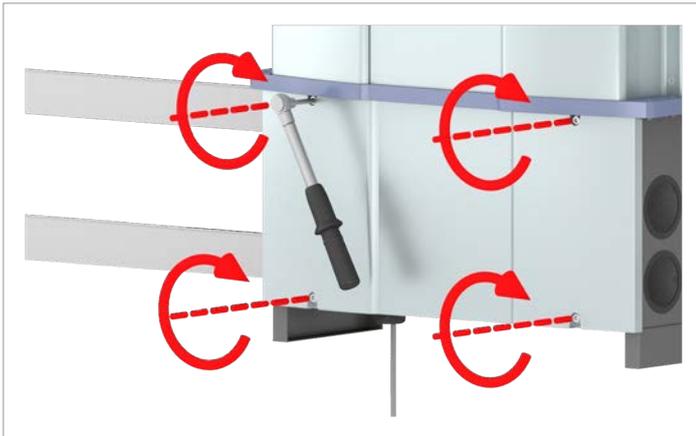
11. Fit the terminal box cover and screw it into place.

12 Replacing the inverter

Replacing the entire inverter



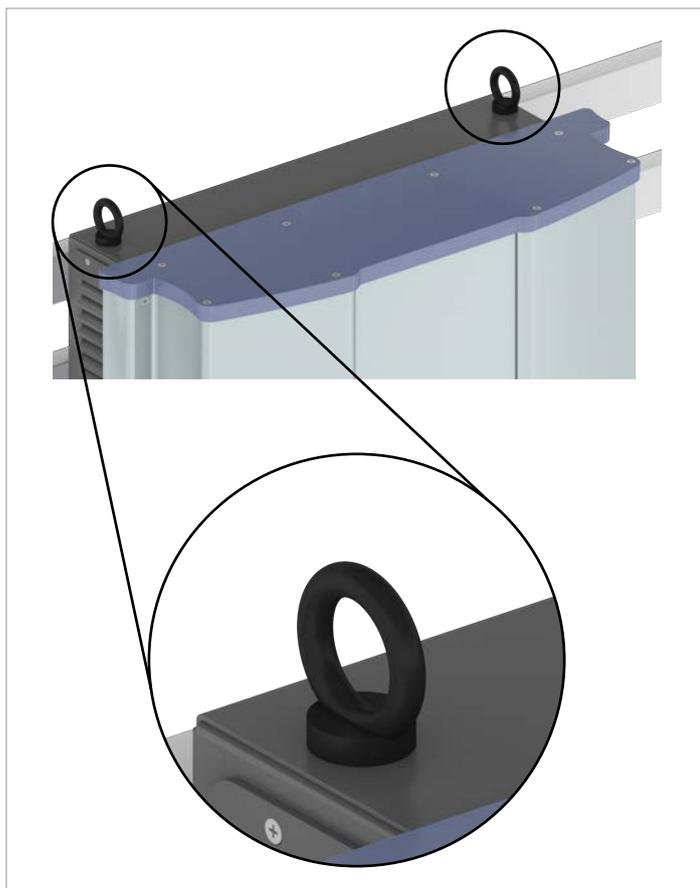
12. Fit the terminal box cover and screw it into place.



12 Replacing the inverter

Replacing the entire inverter

12.2.5 Removing the old inverter



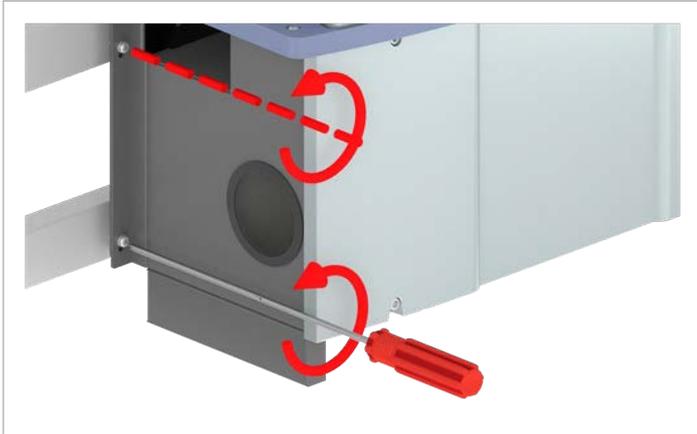
13. Attach M12 eyebolts to the upper side of the inverter. The screw eyebolts are not included in the scope of delivery.



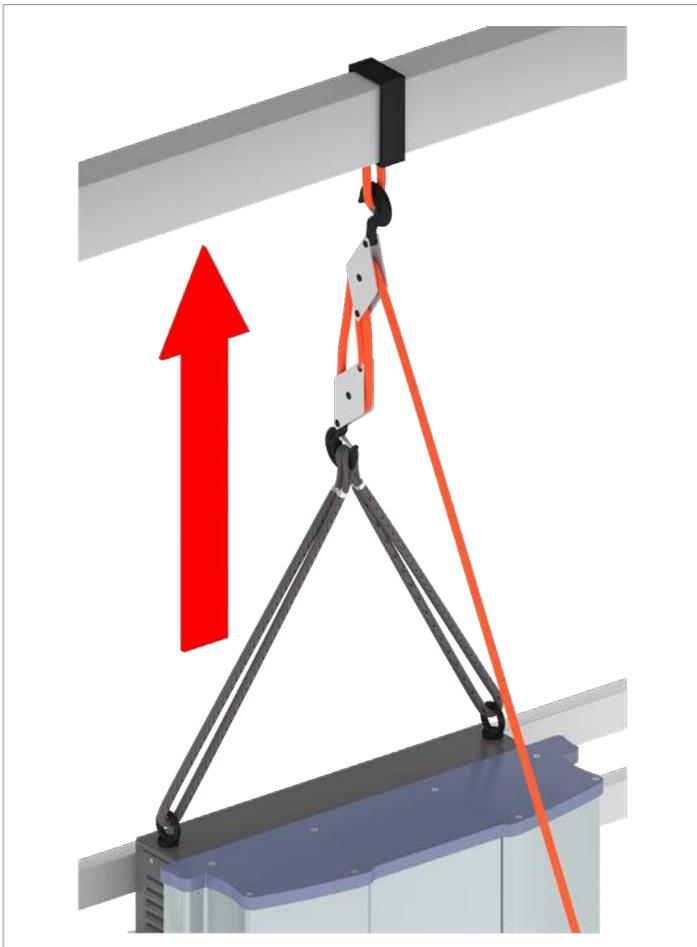
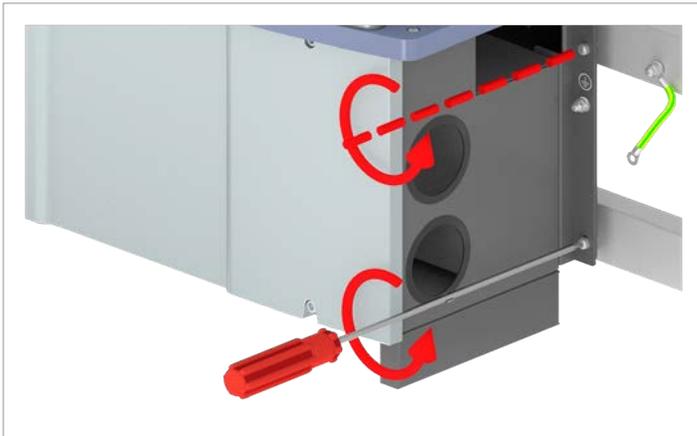
14. Secure the inverter with a block and tackle or with crane so that the weight will be suspended from the block and tackle after the mounting screws are loosened.

12 Replacing the inverter

Replacing the entire inverter



15. Unscrew the junction box from the mounting plate.



16. Lift the inverter with a block and tackle or crane and place it in the box of the replacement device.

If that is not possible, then place the inverter for the time being on a stable and dry surface that can support the great weight of the inverter.

12 Replacing the inverter

Replacing the entire inverter

12.2.6 Installing the new inverter

17. Install the new inverter in accordance with the instructions in the Quick Installation Guide that is supplied with the new inverter.

12.3 Replacing the power module

12.3.1 Brief overview of the working steps

1. [“12.3.3 Preparatory work”, p. 197](#)
2. [“12.3.4 Disconnecting the internal cables”, p. 199](#)
3. [“12.3.5 Removing the old power module”, p. 201](#)
4. [“12.3.6 Mounting the new power module”, p. 205](#)
5. [“12.3.7 Connecting the new power module”, p. 211](#)

12.3.2 Tools required

In addition to standard tools such as screwdrivers, open-ended wrenches and socket wrenches in various sizes, the following tools are required for working on the inverter:

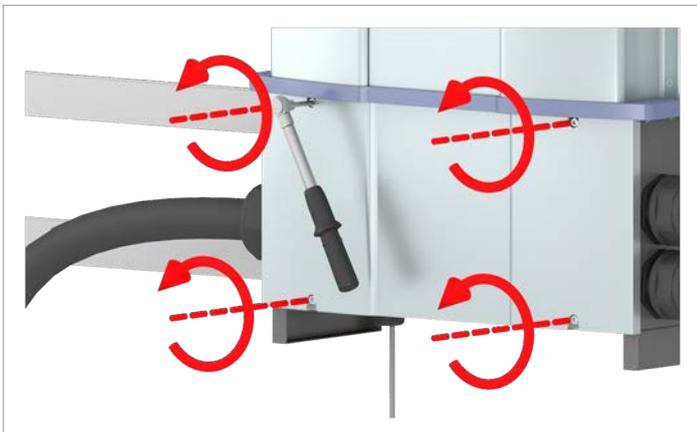
- Voltmeter to check that the junction box is de-energized.
- M6 Allen wrench (hexagon socket) for opening the cover of the junction box
- M12 eyebolts for raising the inverter
- Block and tackle or small crane for lifting the inverter (take into account the weight of the inverter!)

12.3.3 Preparatory work

1. To render the inverter de-energized, open the isolating switches between inverter and mains connection point and between the inverter and solar modules.

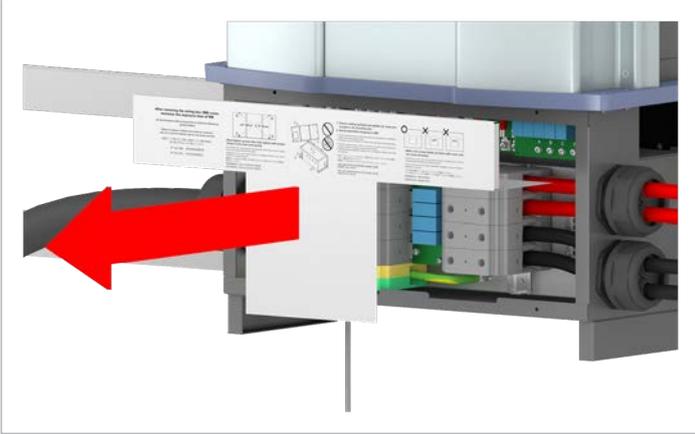
Secure all isolating switches against being accidentally switched back on.

2. Unscrew and remove the junction box cover.



12 Replacing the inverter

Replacing the power module



3. Remove the cover in the interior of the junction box.

DANGER

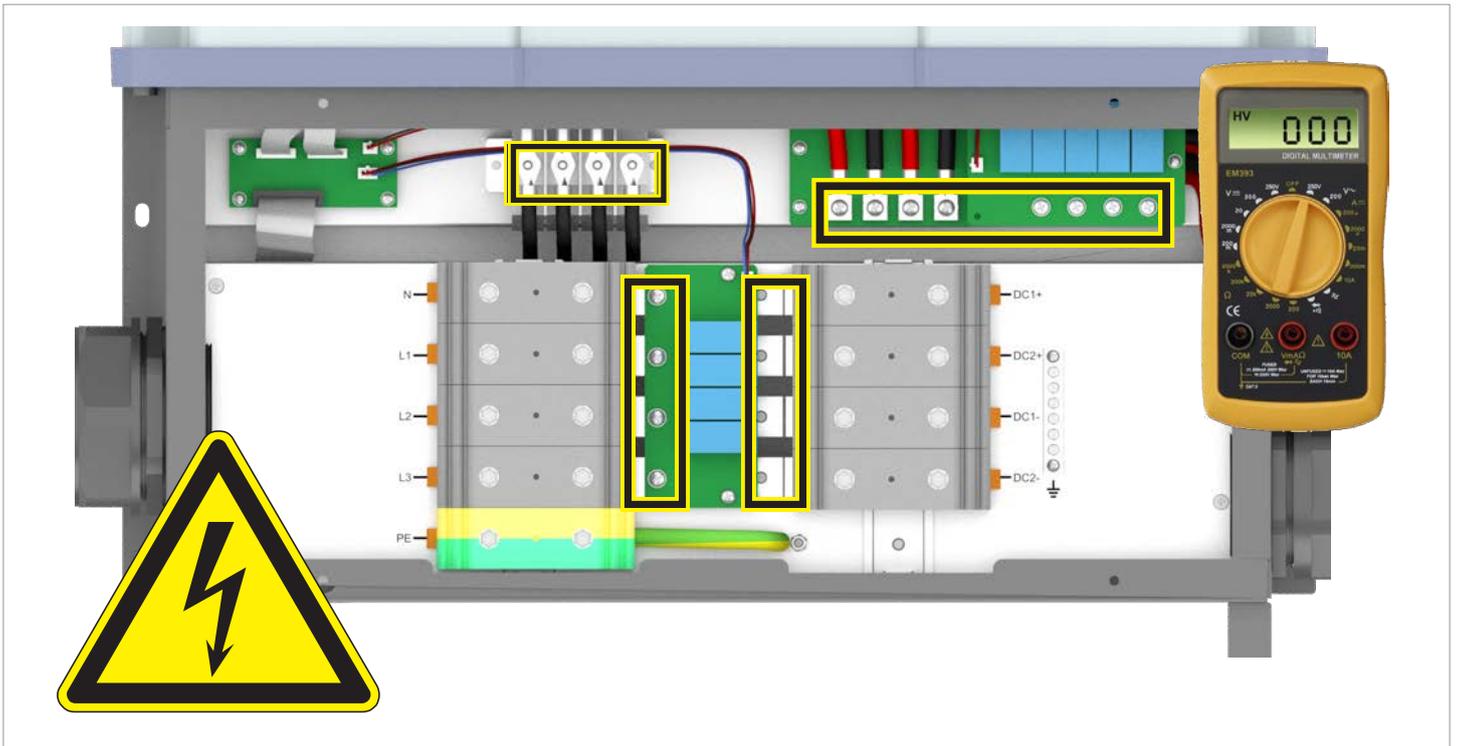


Electric shock

Voltage-carrying parts can still be live!

- ▶ Do not touch potentially voltage-carrying parts until these have been proven to be de-energized using a voltmeter!

4. Use a voltmeter to check that there is no more voltage in the danger zones.



12.3.4 Disconnecting the internal cables

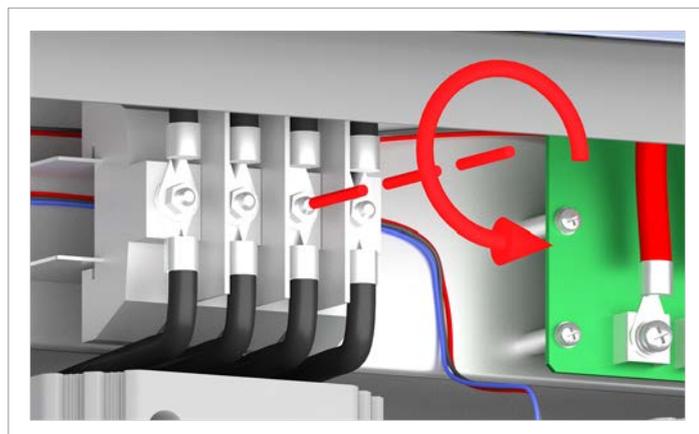
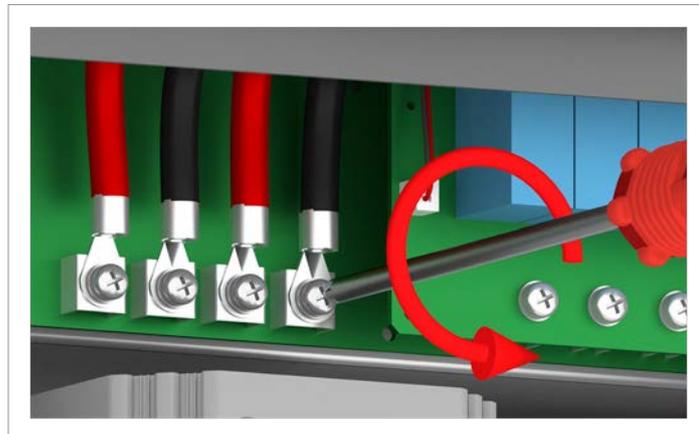
All the cables that lead from the junction box into the power module must be disconnected:



- Internal communications cable
- Internal AC cables
- Internal DC cables

Cables that lead outwards from the junction box need **not** be disconnected.

No other cables and wires are relevant.

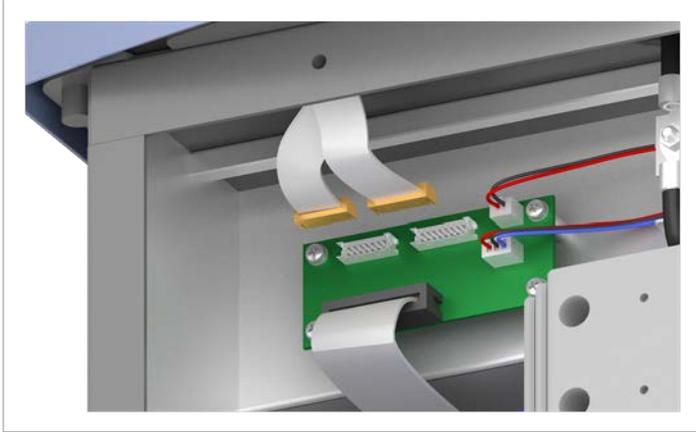


5. Disconnect the internal DC cables (4 cables).

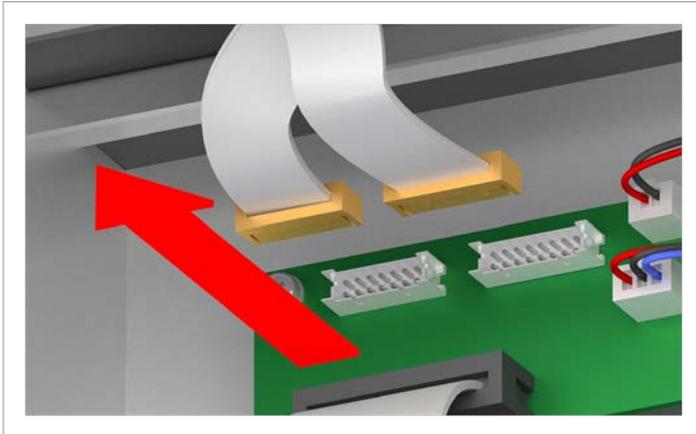
6. Pull off the internal AC cables (4 cables) and the cables that come out of the power module.

12 Replacing the inverter

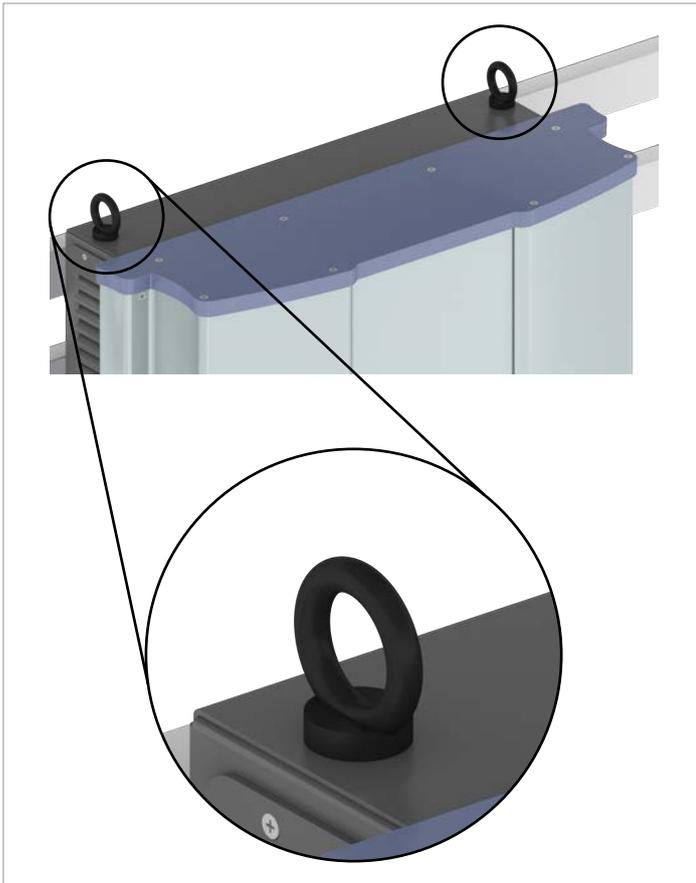
Replacing the power module



7. At the top left circuit board, pull out the two upper plugs with the internal communications cables.



12.3.5 Removing the old power module



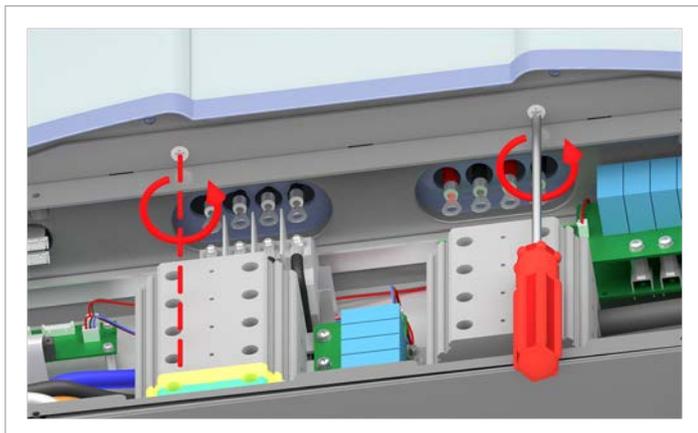
8. Attach M12 eyebolts to the upper side of the inverter. The screw eyebolts are not included in the scope of delivery.



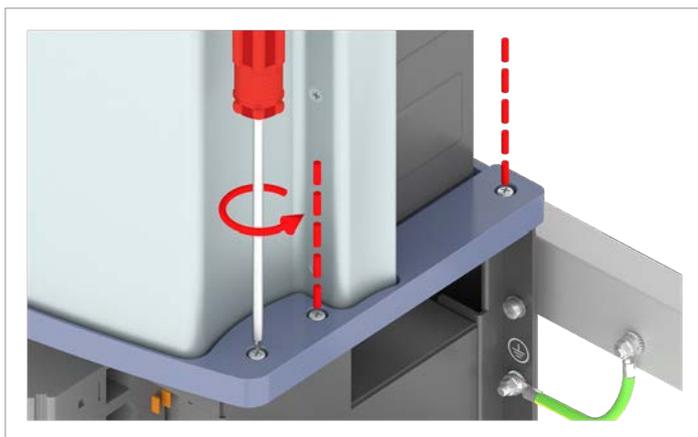
9. Secure the inverter with a block and tackle or with crane so that the weight will be suspended from the block and tackle after the connection screws to the junction box have been loosened.

12 Replacing the inverter

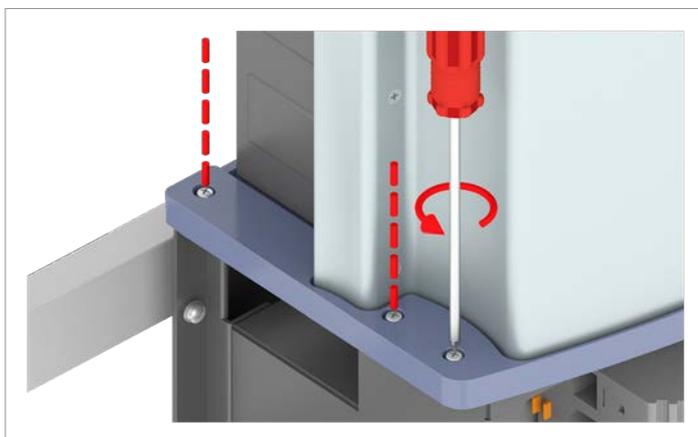
Replacing the power module



10. Unscrew the connection screws between power module and junction box in the interior of the junction box (2 screws).

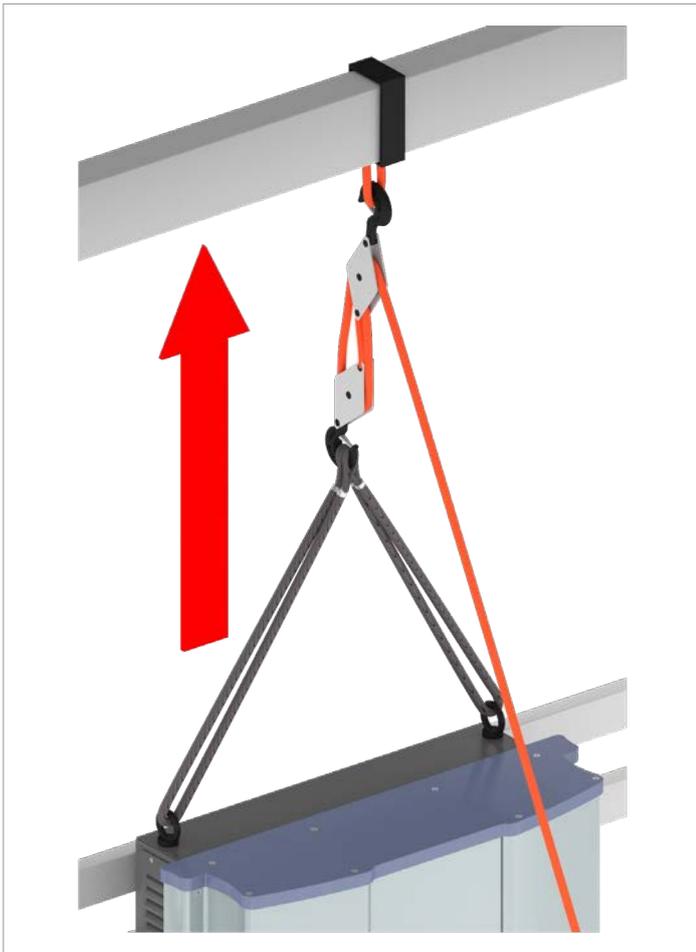


11. Unscrew the connection screws between power module and junction box on the right-hand and left-hand exterior sides (3 screws on each side).



12 Replacing the inverter

Replacing the power module



NOTICE



Damage to internal components of the power module

When raising the power module, take care to ensure that the internal cables which were disconnected in the preceding work steps, do not remain hanging from parts of the junction box.

12. Lift the power module with a block and tackle or crane and place it in the box of the replacement device.

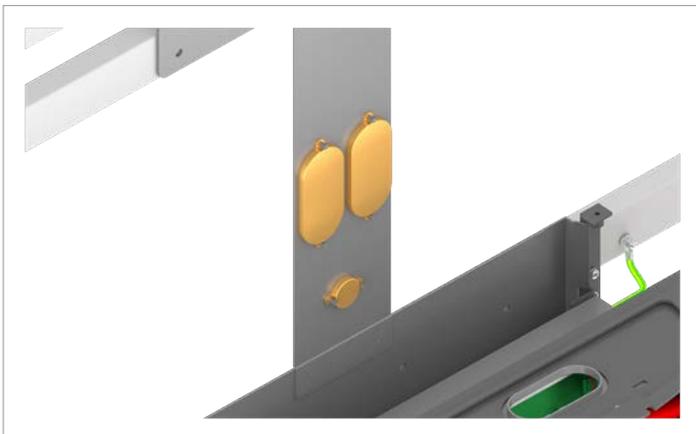
If that is not possible, then place the power module for the time being on a stable and dry surface that can support the great weight of the power module.

13. Attach the eyebolts to the upper side of the power module.

14. If you have not yet received the replacement device, continue with the following work steps.

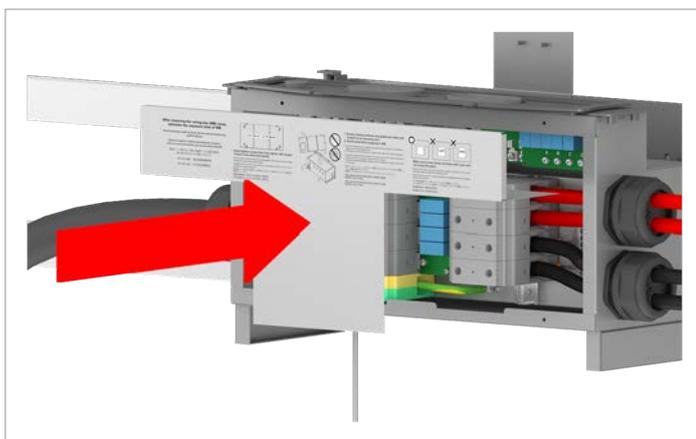
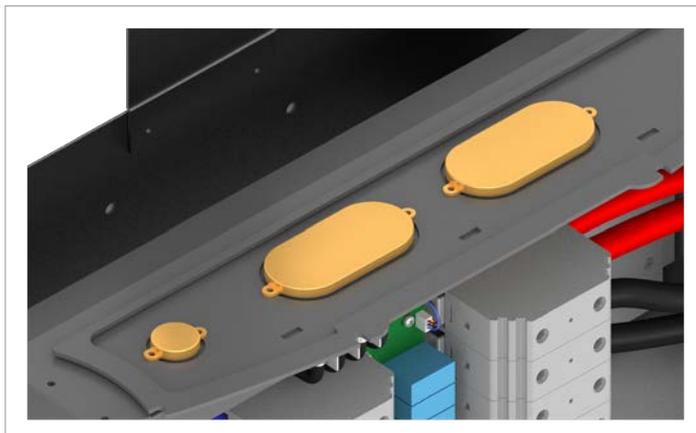
Otherwise, install the new power module in accordance with the enclosed installation instructions.

15. Seal the three cable feed-throughs on the upper side of the junction box with the closure caps supplied. The cover caps are fitted to the mounting plate.

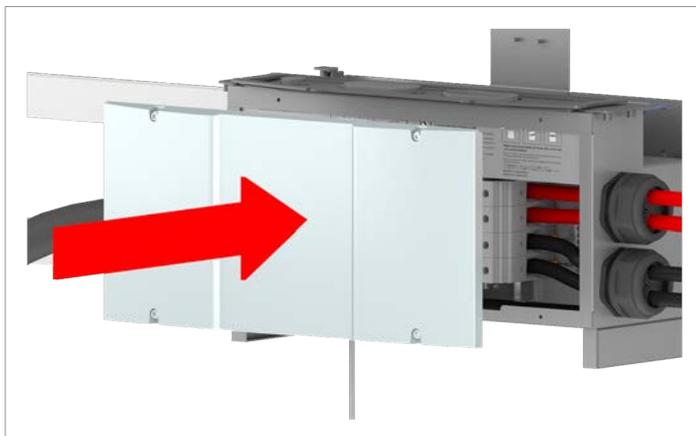


12 Replacing the inverter

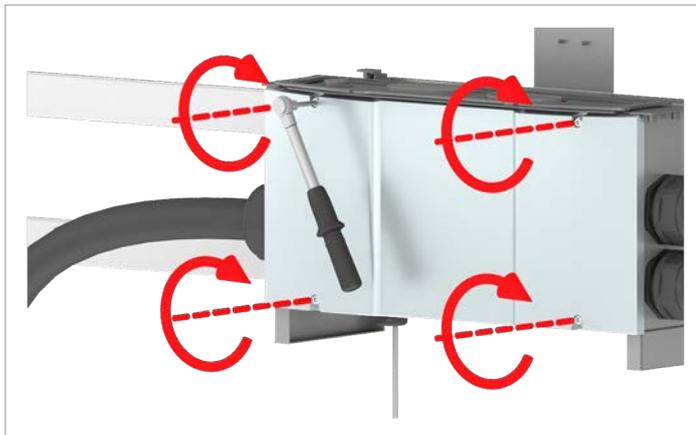
Replacing the power module



16. Insert the cover in the interior of the junction box.



17. Fit the junction box cover and screw it securely into place.



12.3.6 Mounting the new power module

DANGER



Electric shock

Potentially fatal voltages are present at the inverter DC connections. When light falls on the solar modules, they immediately start to generate electricity. This also happens when light does not fall directly on the solar modules.

- ▶ Never disconnect the inverter from the solar modules when it is under load.
- ▶ Disconnect the connection to the mains so that the inverter cannot supply energy to the mains.
- ▶ Disconnect the inverter from all AC and DC voltage sources. Ensure that none of the connections can be restored accidentally.
- ▶ Ensure that the DC cables cannot be touched accidentally.

WARNING



Electric shock

When the cover is removed from the wiring box, this exposes voltage-carrying parts and protection conforming to IP65 is no longer guaranteed.

- ▶ Remove the cover only when absolutely necessary.
- ▶ Do not remove the cover if water might enter the inverter.
- ▶ After work is completed, ensure that the cover is properly replaced and screwed in. Check that the cover is properly sealed.



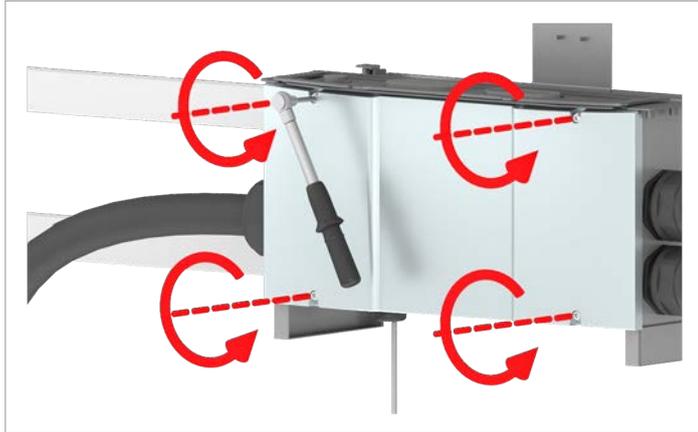
There is normally an isolating switch (for example in an equipment terminal box) between the inverter and the mains and between the solar modules, to isolate the inverter from all AC and DC voltage sources and to render it de-energized.

1. To render the inverter de-energized, open the isolating switches between inverter and mains connection point and between the inverter and solar modules.

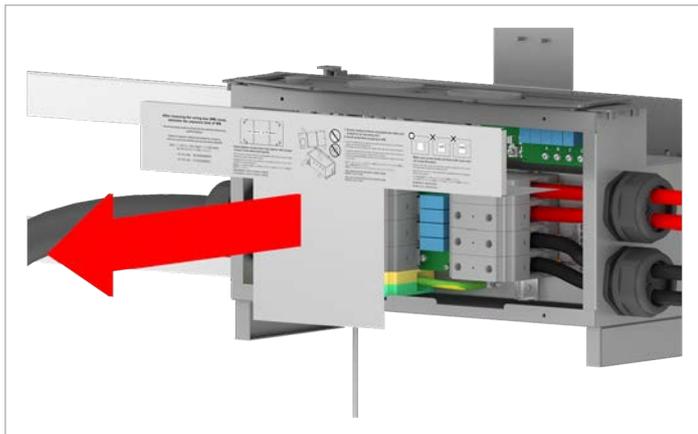
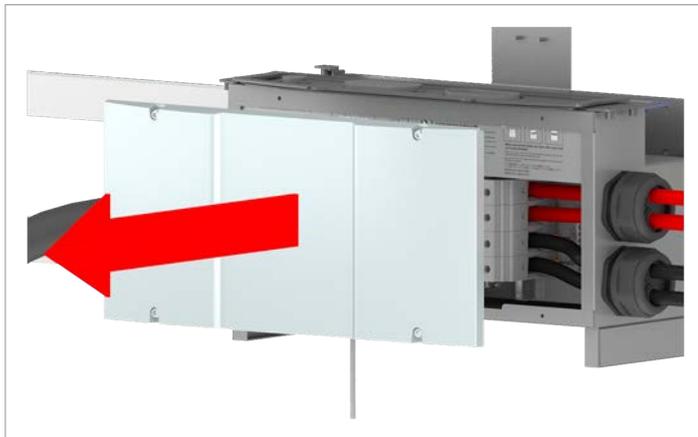
Secure all isolating switches against being accidentally switched back on.

12 Replacing the inverter

Replacing the power module



2. Unscrew and remove the junction box cover.



3. Remove the cover in the interior of the junction box.

12 Replacing the inverter

Replacing the power module

DANGER

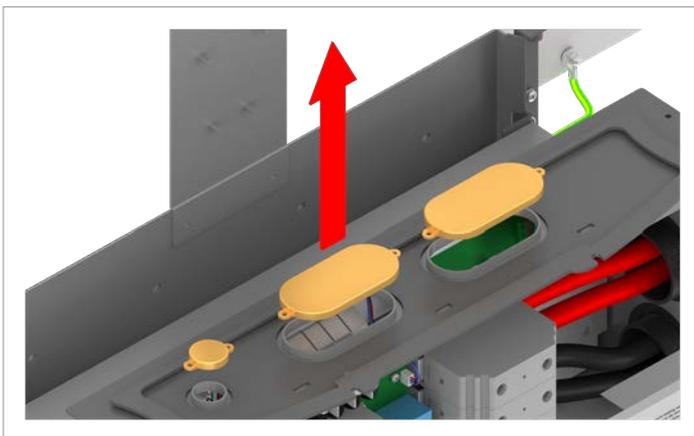
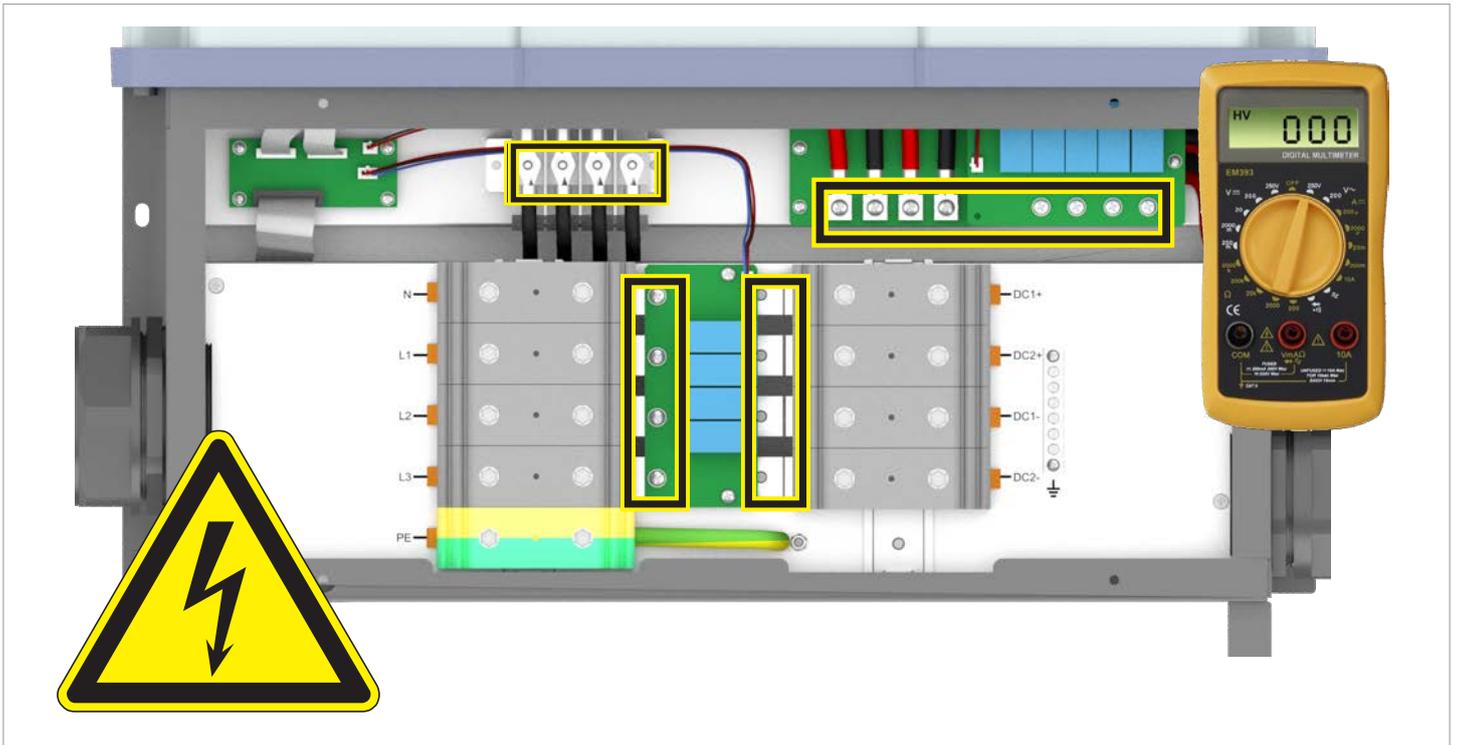


Electric shock

Voltage-carrying parts can still be live!

- ▶ Do not touch potentially voltage-carrying parts until these have been proven to be de-energized using a voltmeter!

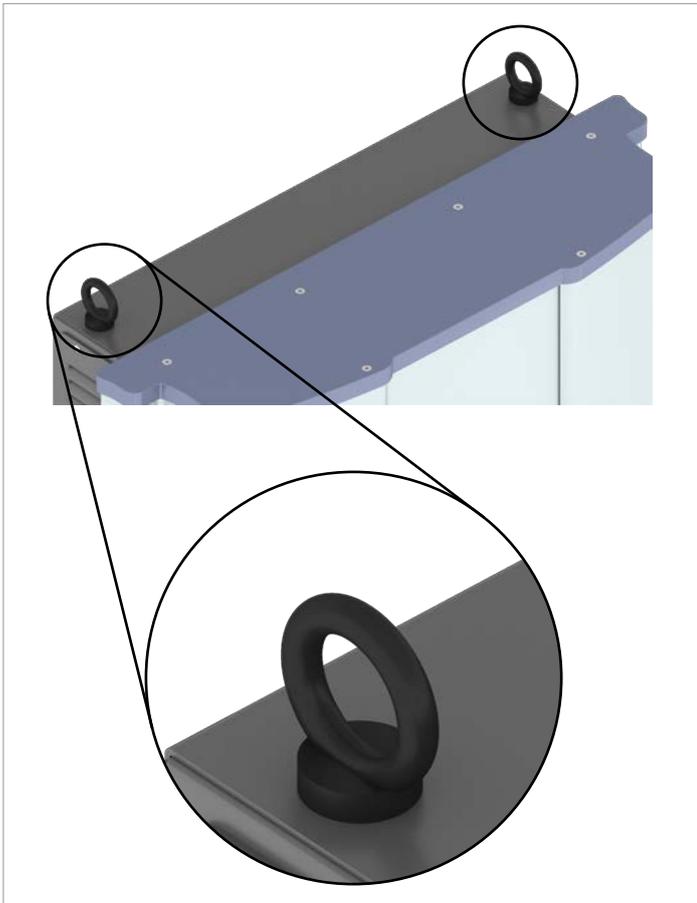
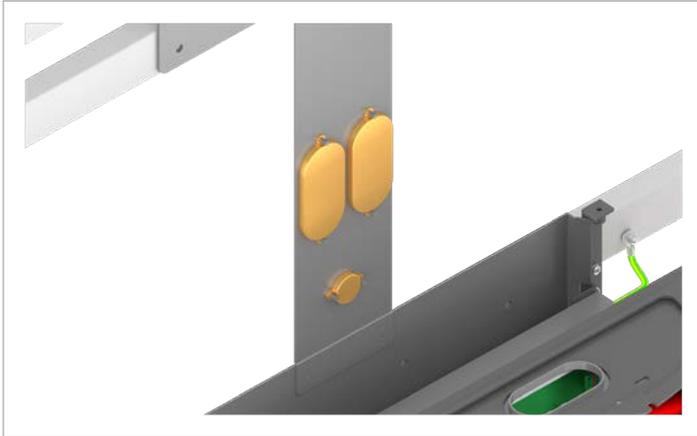
4. Use a voltmeter to check that there is no more voltage in the danger zones.



5. Remove the closure caps from the upper side of the junction box and attach at the mounting plate.

12 Replacing the inverter

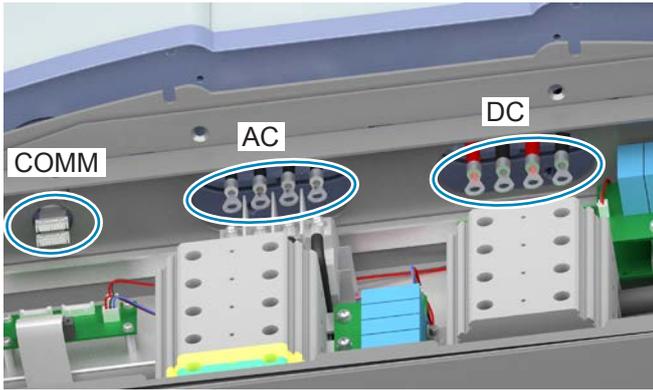
Replacing the power module



6. Attach M12 eyebolts to the upper side of the new power module. The screw eyebolts are not included in the scope of delivery.

12 Replacing the inverter

Replacing the power module



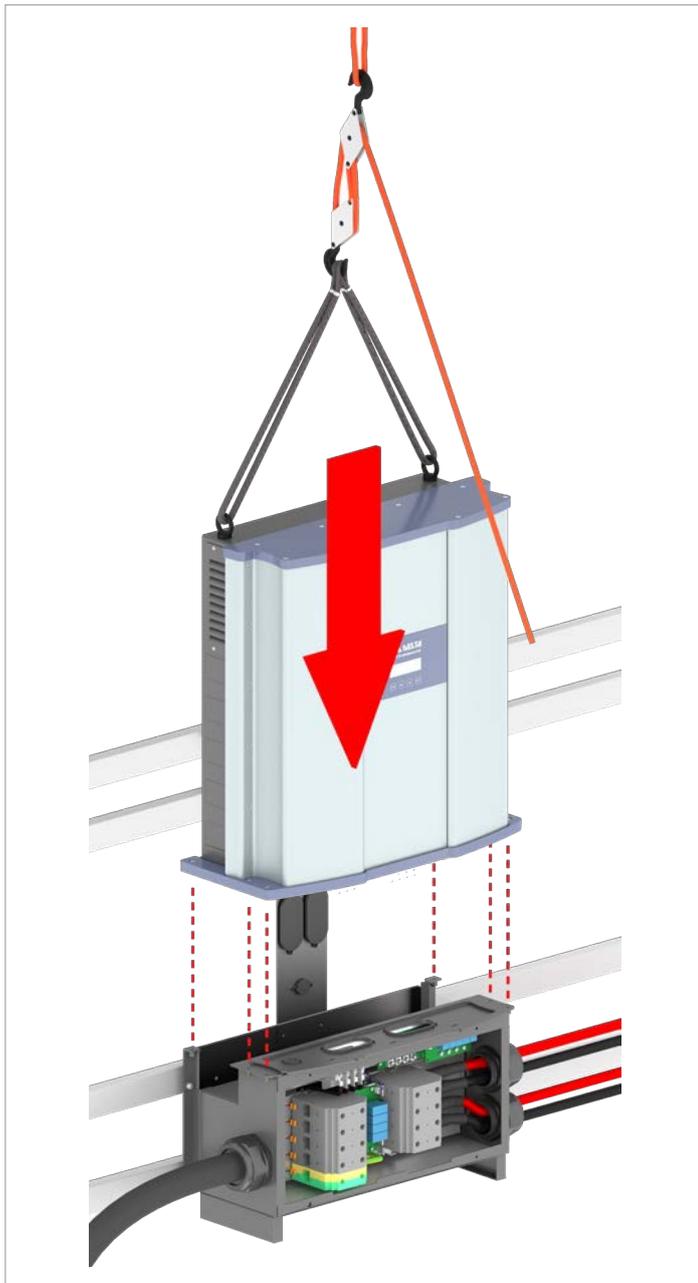
NOTICE



Damage to the cables or internal components

Cables are hanging out of the underside of the power module.

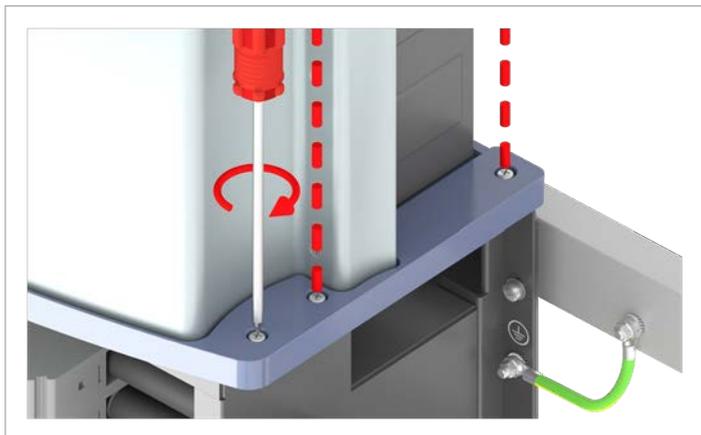
- ▶ When moving the power module, take care to ensure that the cables are not left hanging at other parts of the installation.
- ▶ When attaching the power module on the junction box, take care to ensure that the cables do not become jammed between power module and junction box.
- ▶ Guide the cables through the correct opening in the junction box.



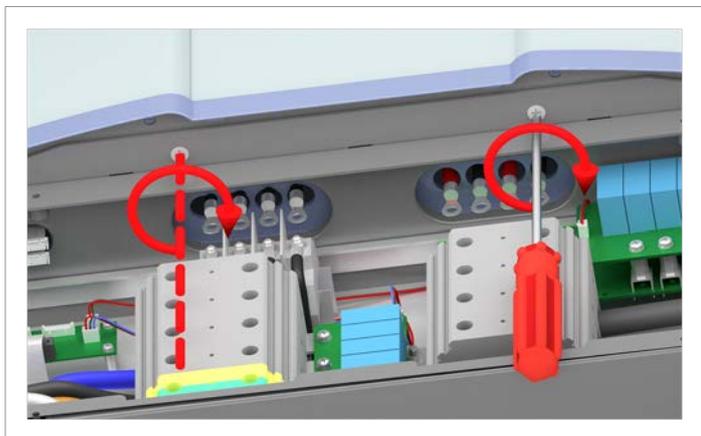
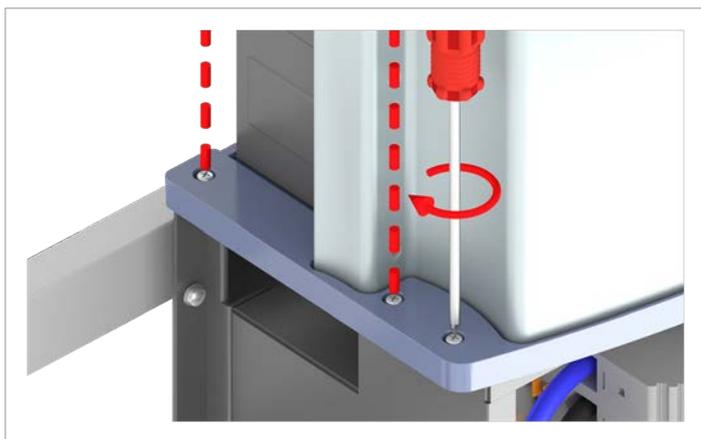
7. Lift the power module with a block and tackle or a crane and set it down on the junction box in such a way that the mounting holes of the power module and the junction box are lined up correctly above one another.

12 Replacing the inverter

Replacing the power module



8. Screw the connection screws on between power module and junction box on the right-hand and left-hand exterior sides (3 screws on each side).

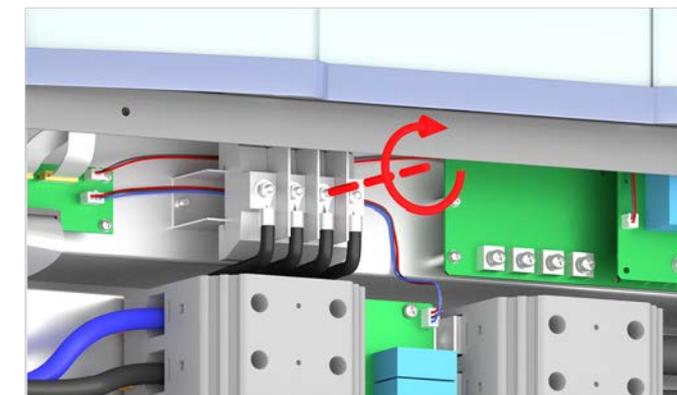
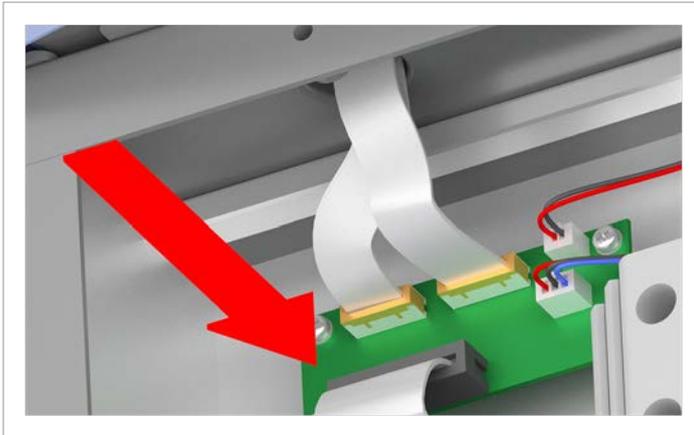


9. Screw the connection screws between power module and junction box on in the interior of the junction box (2 screws).

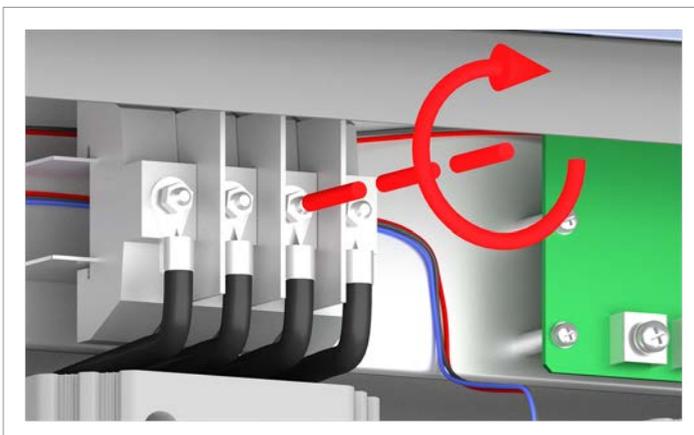
12.3.7 Connecting the new power module



10. At the top left circuit board, plug in the two upper plugs with the internal communications cables.

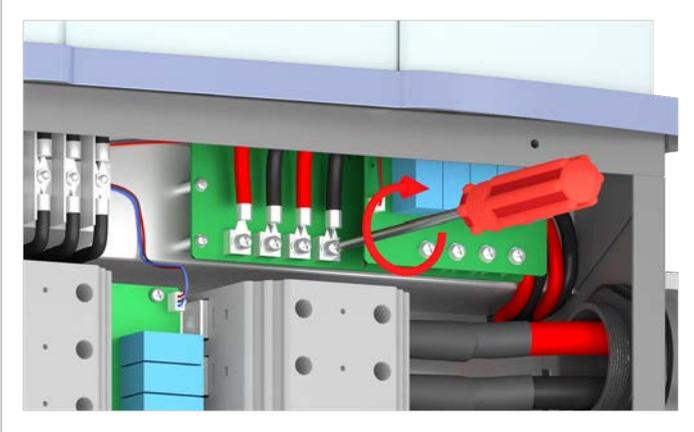


11. Screw on the internal AC cables (4 screws).

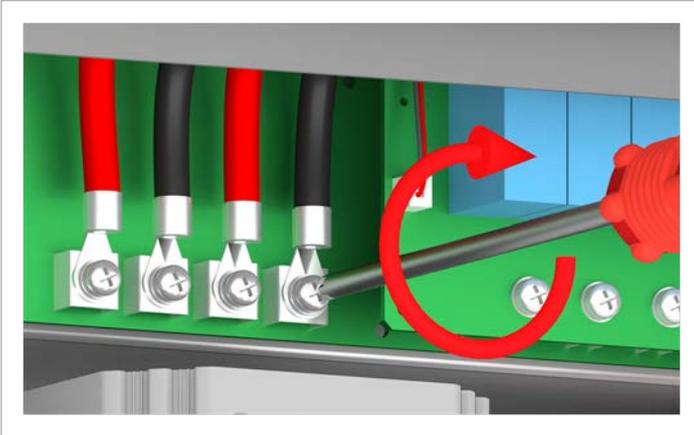


12 Replacing the inverter

Replacing the power module



12. Screw on the internal DC cables (4 screws).



13. In accordance with local regulations attach warning labels to the inside of the junction box as necessary, see [“6.10 Connecting a PC via RS485”](#), p. 97

France: As required by UTE 15-712-1, this warning label must be attached in the inside of the junction box:



NOTICE



Impairment of operating response caused by moisture and dirt.

In order to restore degree of protection IP65 after the completion of installation work, attach the cover of the wiring box in accordance with the following instructions.

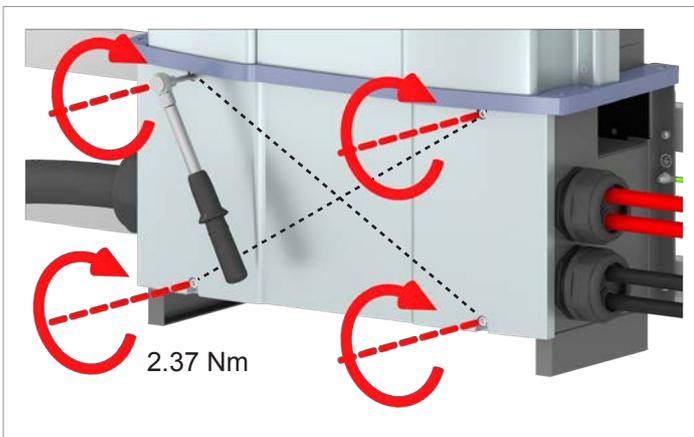
14. Before screwing on the cover, check all seals and surfaces for correct positioning and cleanliness.

12 Replacing the inverter

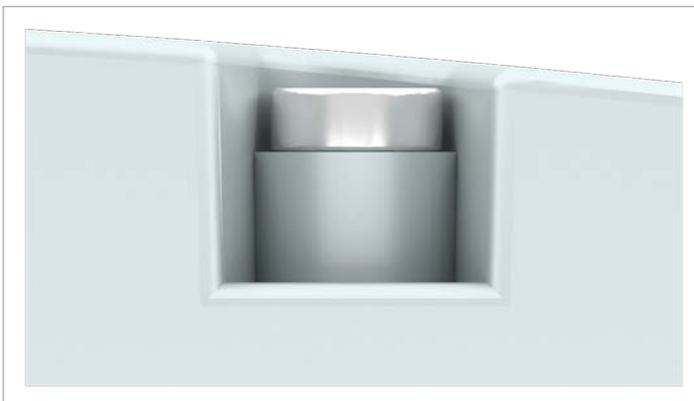
Replacing the power module



15. Attach the cover in such a way that it is evenly mounted and not skewed.



16. Tighten the screws by hand at first and then use a torque wrench to tighten them crosswise with a torque of 2.37 Nm.

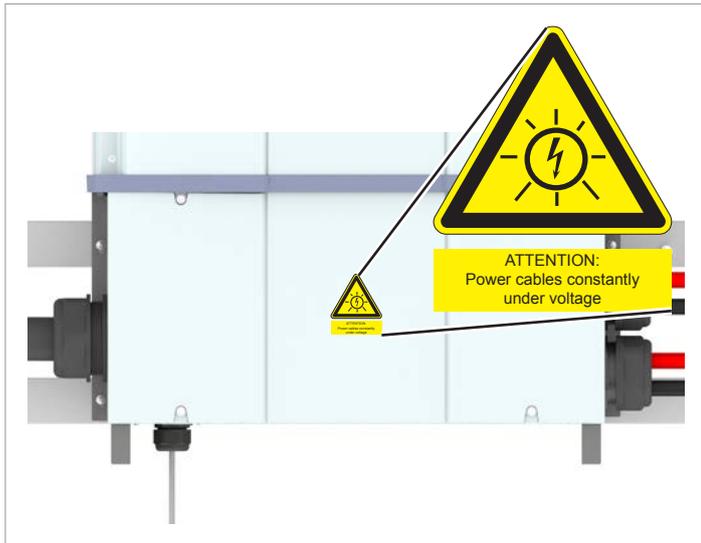


17. Do not skew the screws. The screw heads must be flush with the surface.

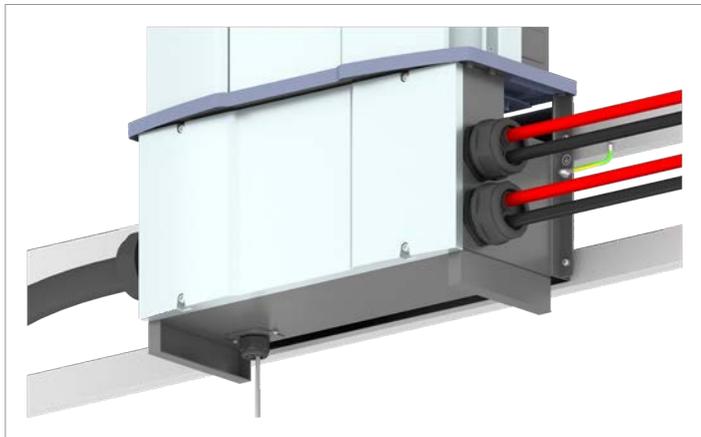
18. In accordance with local regulations attach warning labels to the outside of the inverter as necessary, see ["6.10 Connecting a PC via RS485"](#), p. 97.

12 Replacing the inverter

Replacing the power module



France: As required by UTE 15-712-1, this warning label must be attached to the cover of the junction box.



The installation work is now complete.

13 Decommissioning

Safety instructions

13. Decommissioning

13.1 Safety instructions

DANGER



Electric shock

Potentially fatal voltages are present at the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 100 seconds.

Therefore, always carry out the following steps before working on the inverter:

1. Disconnect the inverter from all AC and DC voltage sources and make sure that none of the connections can be accidentally restored.
2. Wait at least 100 seconds until the internal capacitors have discharged.

DANGER



Electric shock

Potentially fatal voltages are present at the inverter DC connections. When light falls on the solar modules, they immediately start to generate electricity. This also happens when light does not fall directly on the solar modules.

- ▶ Never disconnect the inverter from the solar modules when it is under load.
- ▶ Disconnect the connection to the mains so that the inverter cannot supply energy to the mains.
- ▶ Disconnect the inverter from all AC and DC voltage sources. Ensure that none of the connections can be restored accidentally.
- ▶ Ensure that the DC cables cannot be touched accidentally.

WARNING



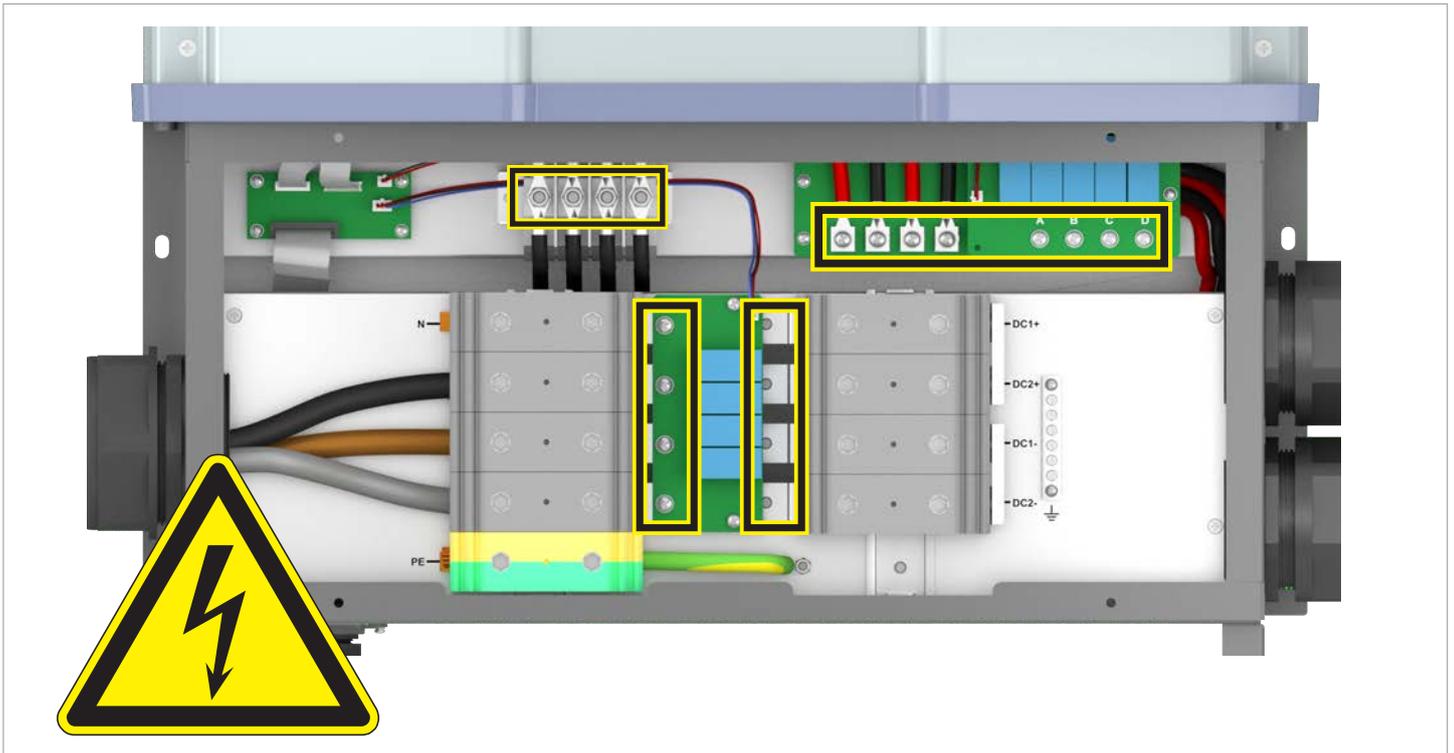
Electric shock

When the cover is removed from the wiring box, this exposes voltage-carrying parts and protection conforming to IP65 is no longer guaranteed.

- ▶ Remove the cover only when absolutely necessary.
- ▶ Do not remove the cover if water might enter the inverter.
- ▶ After work is completed, ensure that the cover is properly replaced and screwed in. Check that the cover is properly sealed.



There is normally an isolating switch (for example in an equipment terminal box) between the inverter and the mains and between the solar modules, to isolate the inverter from all AC and DC voltage sources and to render it de-energized.



Hazard zones with potentially life-threatening currents and volt-ages

13.2 Tools required

In addition to standard tools such as screwdrivers, open-ended wrenches and socket wrenches in various sizes, the following tools are required for working on the inverter:

- Voltmeter to check that the junction box is de-energized.
- M6 Allen wrench (hexagon socket) for opening the cover of the junction box
- M10 Allen wrench (hexagon socket) for disconnecting the cables on the AC and DC terminal block
- M12 eyebolts for raising the inverter
- Block and tackle or small crane for lifting the inverter (take into account the weight of the inverter!)

13 Decommissioning

Preparatory work

13.3 Preparatory work

WARNING



Electric shock

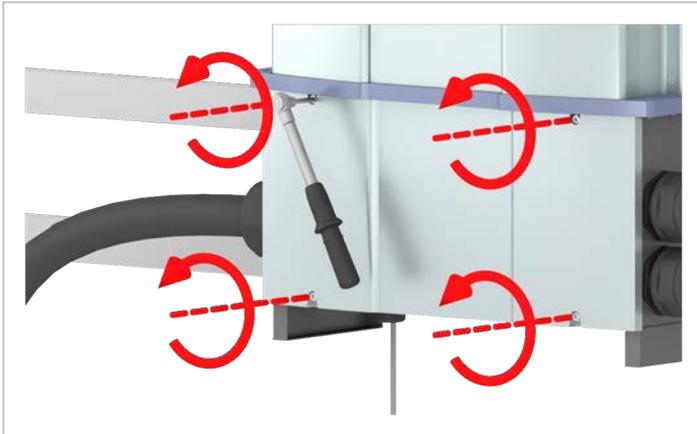
When the cover is removed from the wiring box, this exposes voltage-carrying parts and protection conforming to IP65 is no longer guaranteed.

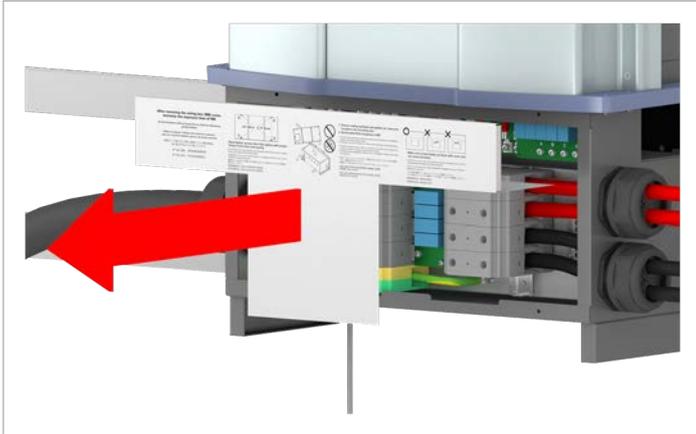
- ▶ Remove the cover only when absolutely necessary.
- ▶ Do not remove the cover if water might enter the inverter.
- ▶ After work is completed, ensure that the cover is properly replaced and screwed in. Check that the cover is properly sealed.

1. To render the inverter de-energized, open the isolating switches between inverter and mains connection point and between the inverter and solar modules.

Secure all isolating switches against being accidentally switched back on.

2. Unscrew and remove the junction box cover.





3. Remove the cover in the interior of the junction box.

DANGER

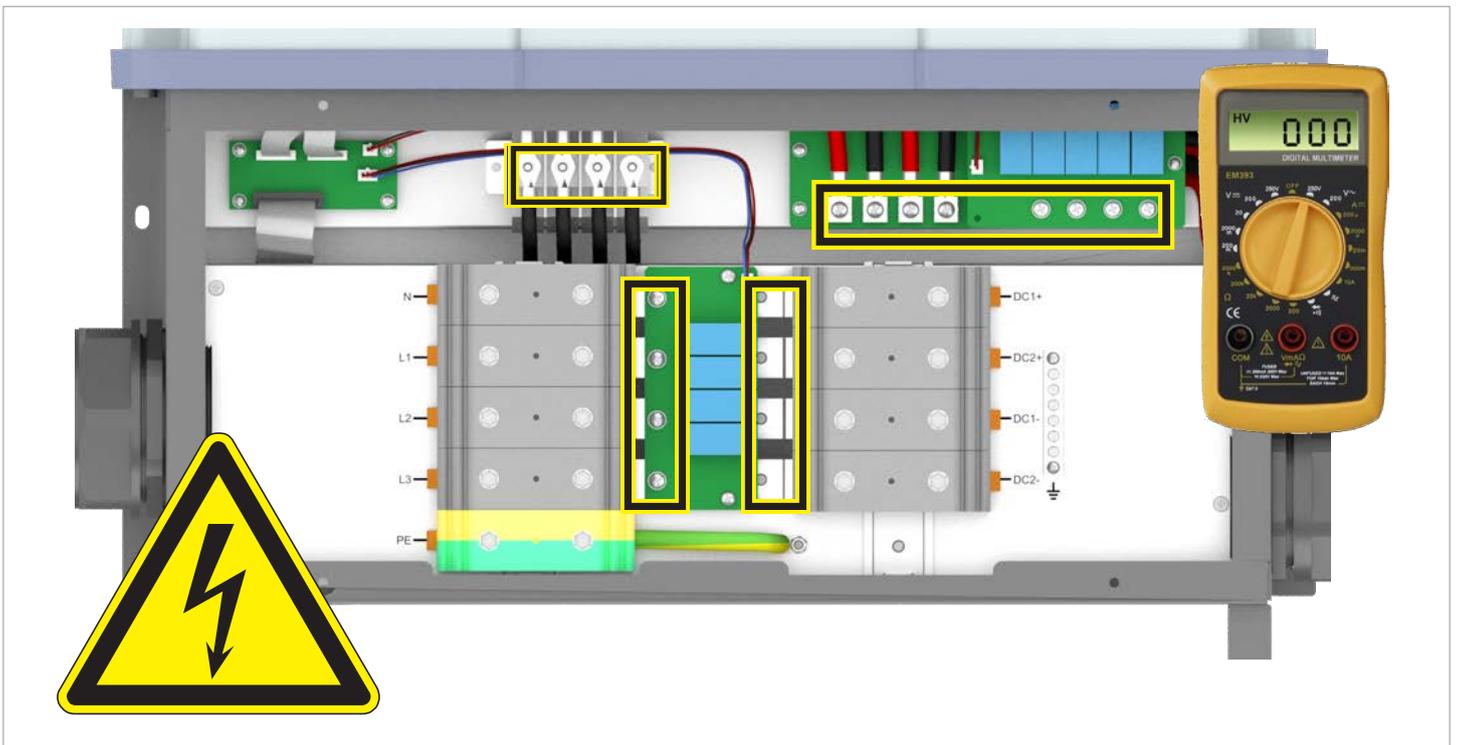


Electric shock

Voltage-carrying parts can still be live!

- ▶ Do not touch potentially voltage-carrying parts until these have been proven to be de-energized using a voltmeter!

4. Use a voltmeter to check that there is no more voltage in the danger zones.



13 Decommissioning

Disconnect the cables

13.4 Disconnect the cables

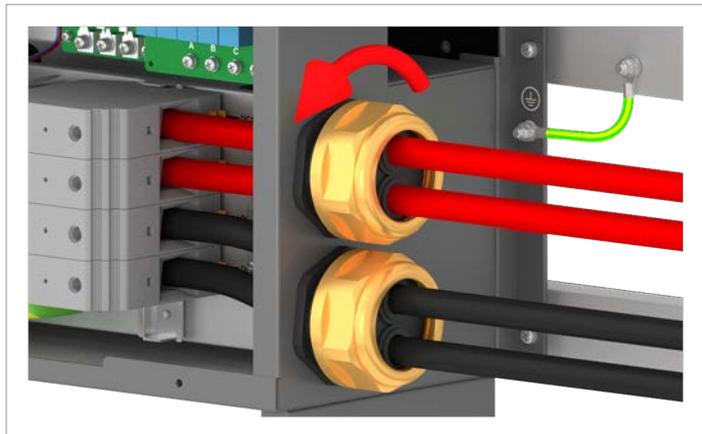
NOTICE



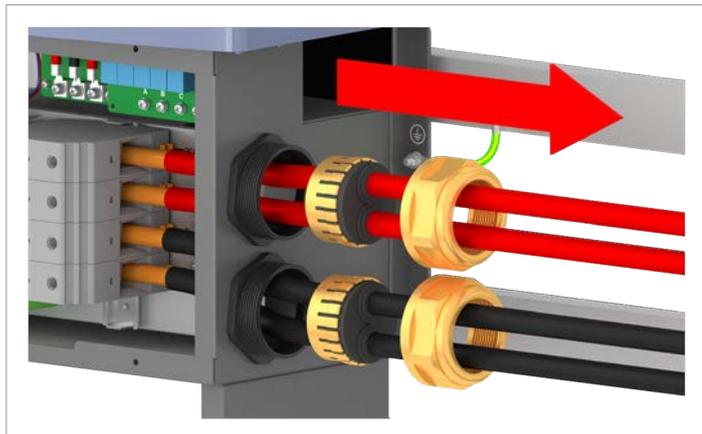
When pulling out the cables, take care to ensure that no parts are damaged in the junction box.



5. Unscrew the DC cables on the DC terminal block.



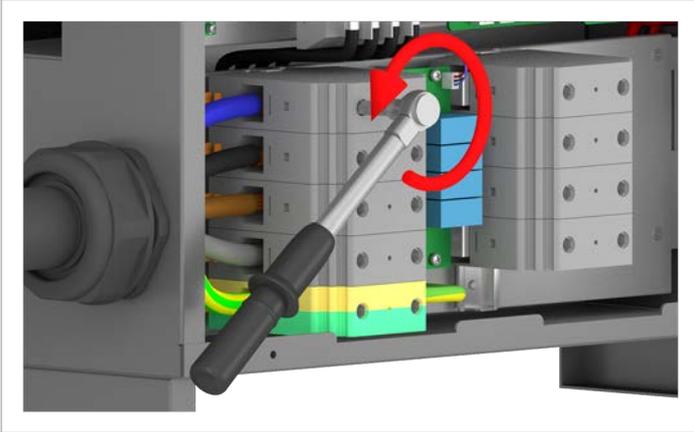
6. Unscrew the DC cable gland and carefully pull out the DC cables.



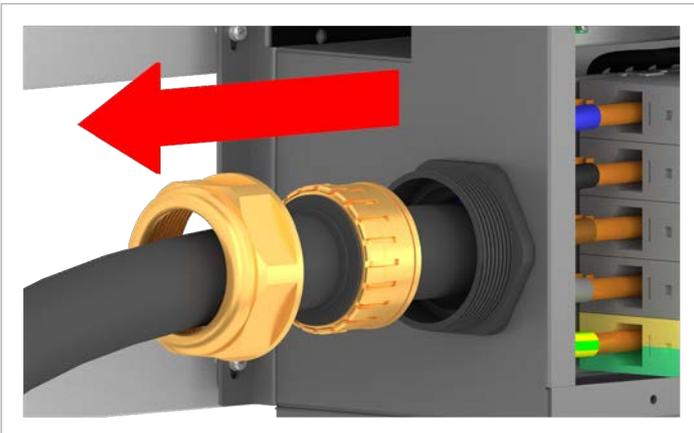
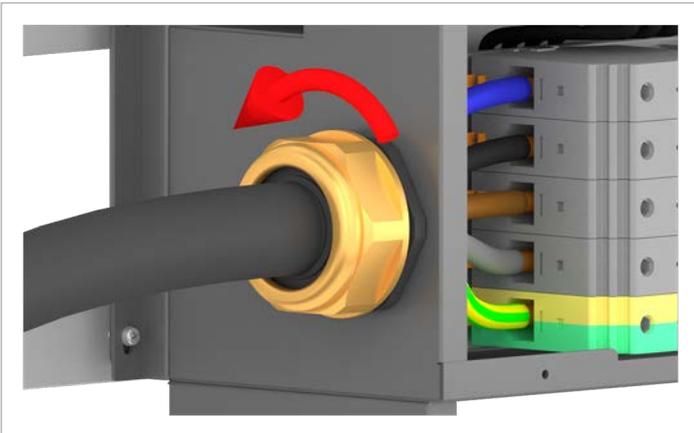
13 Decommissioning

Disconnect the cables

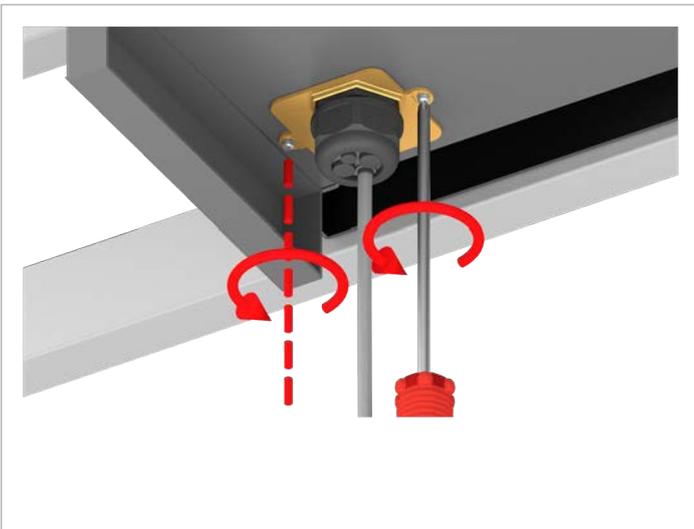
7. Unscrew the AC cable on the AC terminal block.



8. Unscrew the AC cable gland and carefully pull out the AC cable.

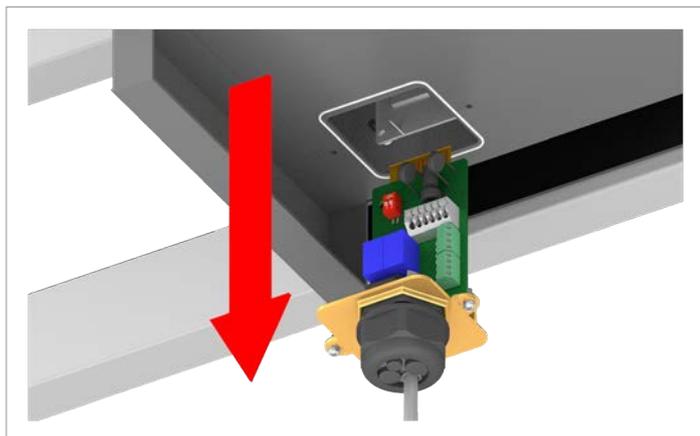


9. Unscrew and carefully pull out the cover. The communications card is screwed to the cover.

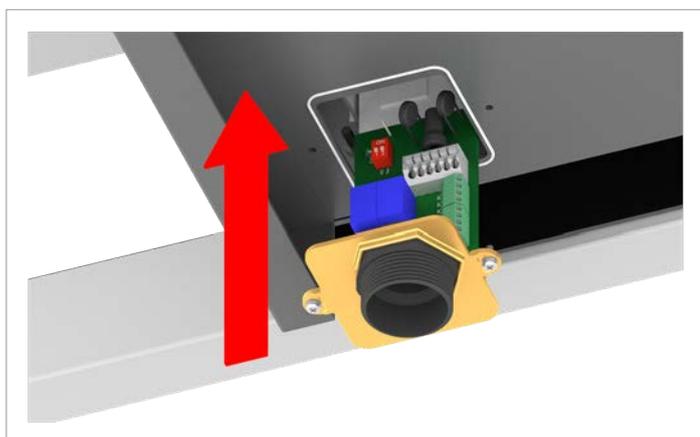


13 Decommissioning

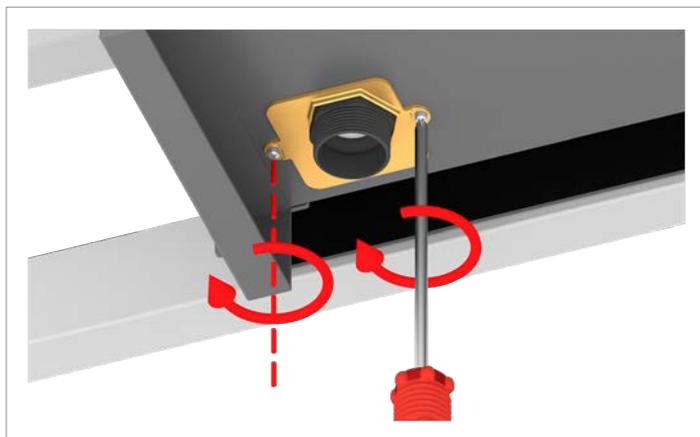
Disconnect the cables



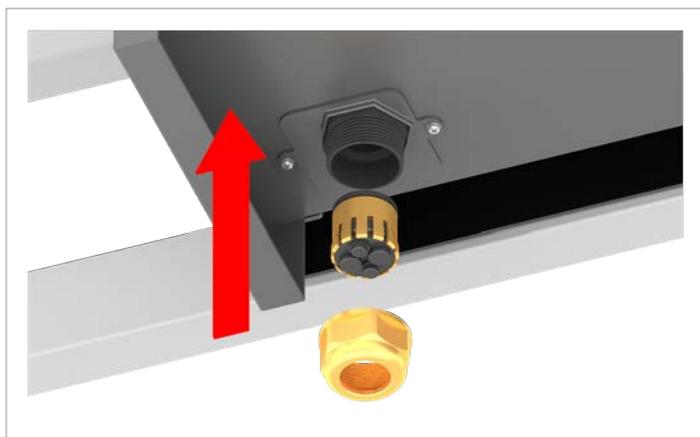
10. Remove all cables from the communications card and pull them out of the cable gland.



11. Fit the communications card cover and screw in place.



12. Fit the seal and cable gland of the communication connection and screw the cable gland tight.

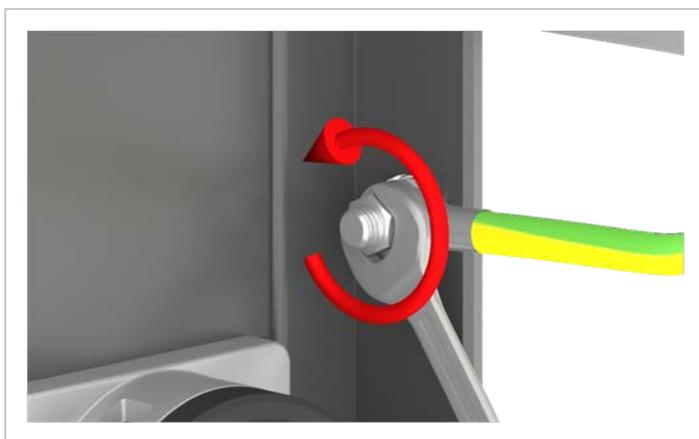


13 Decommissioning

Disconnect the cables



13. Unscrew the grounding cable.

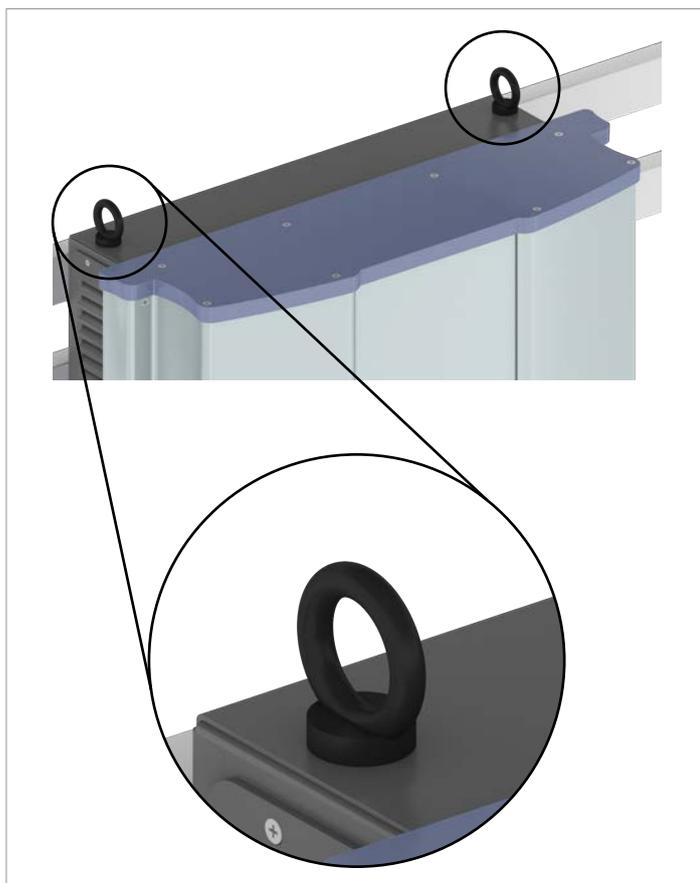


14. Screw the ground screw back on.

13 Decommissioning

Removing and packing the inverter

13.5 Removing and packing the inverter



15. Attach M12 eyebolts to the upper side of the inverter. The screw eyebolts are not included in the scope of delivery.



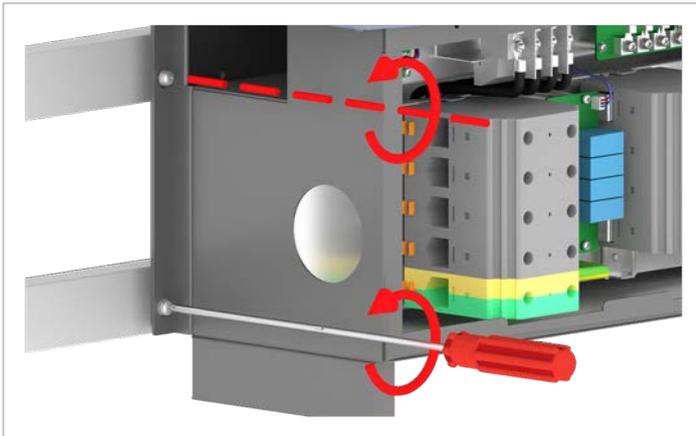
16. Secure the inverter with a block and tackle or with crane so that the weight will be suspended from the block and tackle after the mounting screws are loosened.

13 Decommissioning

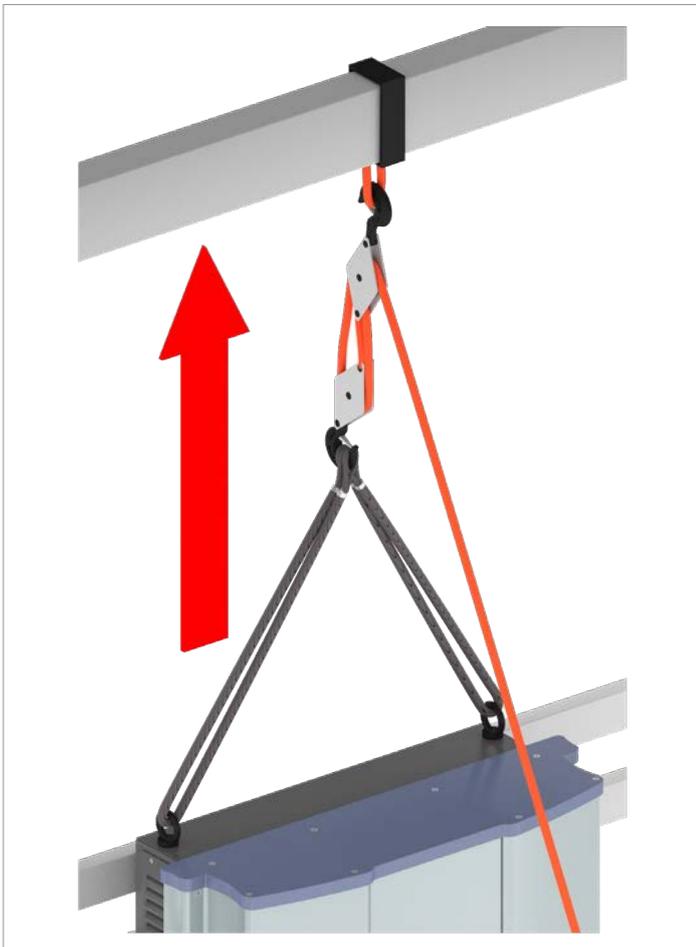
Removing and packing the inverter



17. Unscrew the junction box from the mounting plate.
Keep the four mounting screws and pack them later in the box with the inverter.

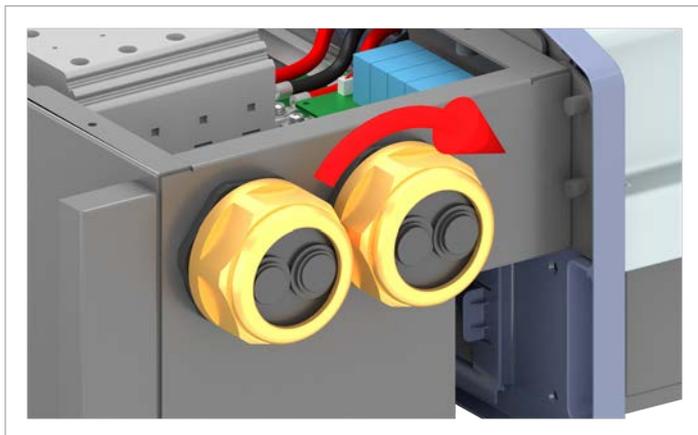


18. Lift the inverter with a block and tackle or crane and place it in the box of the replacement device.
If that is not possible, then place the inverter for the time being on a stable and dry surface that can support the great weight of the inverter.

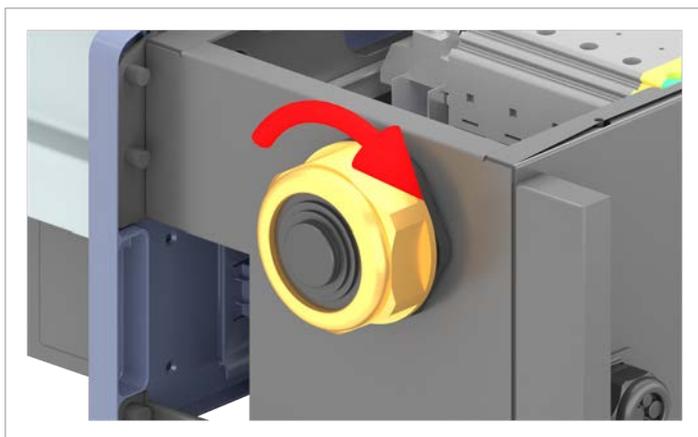


13 Decommissioning

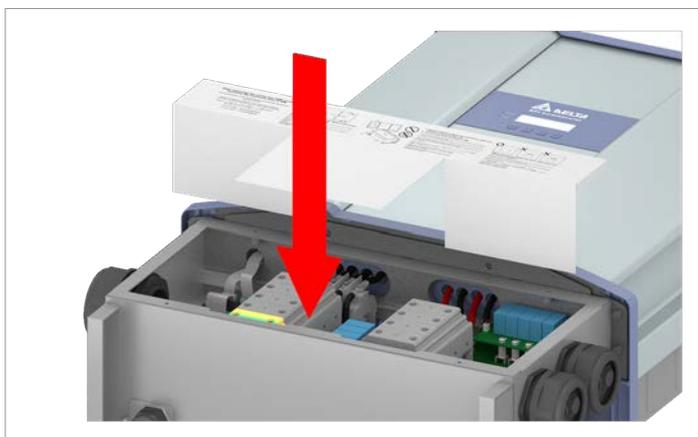
Removing and packing the inverter



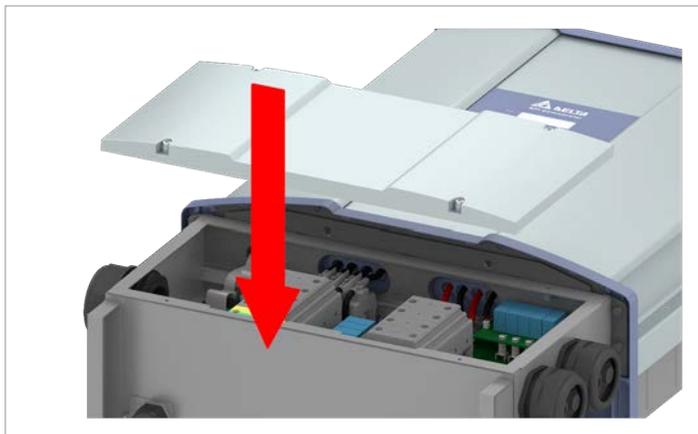
19. Fit the DC cable gland with all of the sealing rings and screw the DC cable gland tight.



20. Fit the AC cable gland with all of the sealing rings and screw the AC cable gland tight.



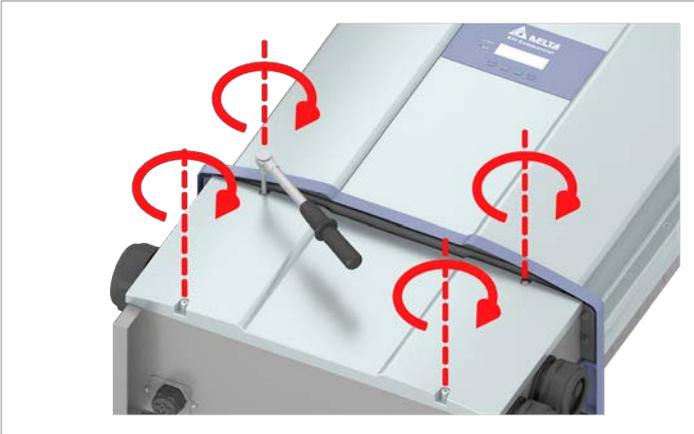
21. Insert the cover in the interior of the junction box.



22. Fit the junction box cover and screw it into place.

13 Decommissioning

Removing and packing the inverter



23. Place the inverter in the original box along with all of the accessory parts.

24. Store the inverter under the necessary environmental conditions (e.g. Storage temperature, see [“14. Technical data”](#), page 228).

14 Technical data

14. Technical data

Input (DC)	M88H_121 (ST)	
AC nominal voltage	400 V_{AC}	480 V_{AC}
Recommended maximum PV power	90 kW _P	110 kW _P
Maximum input power (total / per input)		
Symmetrical design	76 kW / 38 kW	91 kW / 45.5 kW
Asymmetrical design	45.6 kW / 30.4 kW	54.6 kW / 36.4 kW
Rated power	70 kW	84 kW
Maximum input voltage	1100 V _{DC}	
Operating input voltage range	200 ... 1000 V _{DC}	
Nominal voltage	600 V _{DC}	710 V _{DC}
Cut-in voltage	250 V _{DC}	
Cut-in power	150 W	
MPP input voltage range	200 ... 1000 V _{DC}	
MPP input voltage range with full power		
Symmetrical design	540 ... 800 V _{DC}	650 ... 800 V _{DC}
Asymmetrical design (60% / 40%)	650 / 440 V _{DC}	780 / 520 V _{DC}
MPP input voltage range at rated power		
Symmetrical design	500 ... 800 V _{DC}	600 ... 800 V _{DC}
Asymmetrical design (60% / 40%)	580 / 390 V _{DC}	710 / 475 V _{DC}
Asymmetrical design	60/40%; 40/60%	
Maximum total input current (DC1 / DC2)	140 A (70 A / 70 A)	
Maximum DC short-circuit current I _{sc}	180 A (90 A per DC input)	
Maximum breaking current	120 A	
Open-circuit voltage VOC	1000 V	
Number of MPP trackers	Parallel inputs: 1 MPP tracker; separate inputs: 2 MPP tracker	
Number of DC inputs, total (DC1/DC2)	2 (1 / 1)	
Electrical isolation	No	
Overtoltage category ¹⁾	II	
String fuses	15 A ²⁾	
Surge protection devices ³⁾	Type 2, replaceable	
Output (AC)	M88H_121 (ST)	
AC nominal voltage	400 V_{AC}	480 V_{AC}
Maximum apparent power ⁴⁾	73 kVA ⁵⁾	88 kVA ⁶⁾
Rated apparent power ⁵⁾	66 kVA	80 kVA
Nominal voltage ⁷⁾	400 ± 30% Δ and Y / 480 V _{AC} ± 20% Δ and Y 3 phases + PE or 3 phases + N + PE	
Nominal current	96 A	
Maximum current	106 A	
Maximum current under fault conditions	115.4 A _{rms}	
Switch-on current	40 A / 100 μs	
Nominal frequency	50 / 60 Hz	
Frequency range ⁷⁾	45 ... 65 Hz	
Configurable power factor	0.8 cap ... 0.8 ind	
Total harmonic distortion	<3% at rated apparent power	
DC injection	<0.5% at nominal current	
Power loss in night mode	<3 W	
Overtoltage category ¹⁾	III	
Surge protection devices ⁸⁾	Type 2, replaceable	

Mechanical details	M88H_121 (ST)
Dimensions (W x H x D)	960 × 615 × 275 mm
Weight	84 kg (power module: 68 kg)
Cooling	3 fans
AC connection type	Phoenix Contact UKH 150
DC connection type	Phoenix Contact UKH 150
Communication interfaces	2 x RS485, 2 x dry contacts, 1 x external power-off, 6 x digital inputs

General specifications	M88H_121 (ST)
Delta model name	RPI M88H_121
Delta part number	RPI883M121200
Maximum efficiency	98.8%
EU efficiency	98.5%
Operating temperature range	-25 ... +60 °C
Operating temperature range without derating	-25 ... +40 °C
Storage temperature range	-25 ... +60 °C
Relative humidity	0 ... 100%, non-condensing
Max. operating height	3000 m above sea level
Noise level (at a distance of 1 m)	75.8 dB(A)

Standards and guidelines	M88H_121 (ST)
Protection degree	IP65
Safety class	I
Pollution degree	II
Overload behavior	Current limit, power limit
Safety	IEC 62109-1 / -2, CE-compliance
EMC	EN 61000-6-2, EN 61000-6-3
Fault-free operation	IEC 61000-4-2 / -3 / -4 / -5 / -6 / -8
Harmonic distortion	EN 61000-3-2
Fluctuations and fibrillations	EN 61000-3-3
Mains connection guidelines	You will find the current list at www.solar-inverter.com .

¹⁾ IEC 60664-1, IEC 62109-1

²⁾ The specified value applies for a temperature of 25 °C in the interior of the inverter. At higher temperatures, the value can drop down to 10 A.

³⁾ EN 50539-11

⁴⁾ For $\cos \phi = 1$ (VA = W)

⁵⁾ Can occur under the following conditions: DC input voltage > 540 V; symmetrical design; ambient temperature < 35 °C.

⁶⁾ Can occur under the following conditions: DC input voltage > 650 V; symmetrical design; ambient temperature < 35 °C.

⁷⁾ AC voltage and frequency range are programmed using the corresponding country specifications.

⁸⁾ EN 61463-11

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Belgium	support.belgium@solar-inverter.com	0800 711 35 (toll free)
Bulgaria	support.bulgaria@solar-inverter.com	+421 42 4661 333
Czech Republic	podpora.czechia@solar-inverter.com	800 143 047 (toll free)
Denmark	support.danmark@solar-inverter.com	8025 0986 (toll free)
France	support.france@solar-inverter.com	0800 919 816 (toll free)
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Spain	soporto.espana@solar-inverter.com	900 958 300 (toll free)
Switzerland	support.switzerland@solar-inverter.com	0800 838 173 (toll free)
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Other European countries	support.europe@solar-inverter.com	+49 7641 455 549

