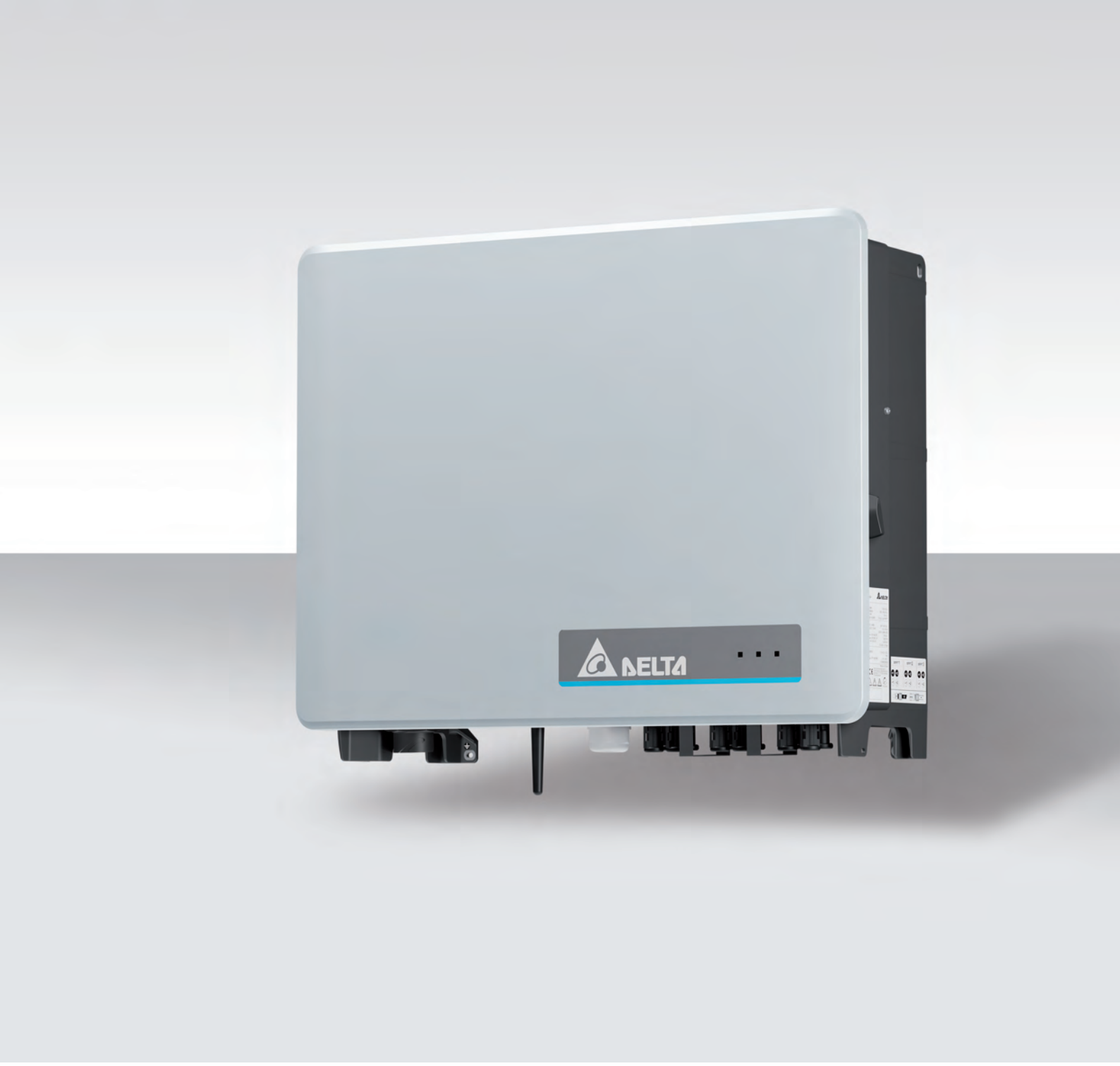


Installation and Operation Manual

Solar inverter
M30A_230
Product version 0

Europe

This manual applies to the inverter models:

- M30A_230 (Delta part number RPI303M230100, product version 0)

and DSS software version 6.0 or higher

The Delta part number and the product version can be found on the type plate of the inverter (see section “ Identification of the product and the product version”, page 2.

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 Therefore, before starting installation work, **always** consult solarsolutions.delta-emea.com to check whether a newer version of the Quick Installation Guide or the Installation and Operation Manual is available.

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This manual is intended for use by electrical installers who are trained and approved for installation and commissioning of grid-connected solar inverters.

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Information about the versions of this manual

Version	Date	Changes
1.0	2021-08-19	First edition for the product version
1.1	2021-11-02	Minor errors fixed.

Identification of the product and the product version



Product version	Identification of the product and the product version
0	❶ Delta part number ❷ The last letter of the serial number indicates the product version.

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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 grid-connected solar systems.

1.3 Use of warning notices and warning symbols

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

Always follow the instructions in the warning notices.

Warning levels

DANGER

Indicates a hazardous situation that, if not avoided, **will result** in death or serious injury.

WARNING

Indicates a hazardous situation that, if not avoided, **could result** in death or serious injury.

CAUTION

Indicates a hazardous situation that, if not avoided, **could result** in minor or moderate injury.

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

In addition, there are symbols for the use of protective equipment.



Wear safety gloves

1.4 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 work instructions 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 complete.

If the work instructions consist of just one 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

LEDs	***ALARM*** LED

2. Basic safety instructions

DANGER



Electric shock

Potentially fatal voltages are present in the inverter during operation.

► If the inverter is installed in a location to which children or other persons in need of protection have access, do not store the Allen key to open the front door on or near the inverter.

DANGER



Electric shock

Potentially fatal voltages are present in the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 60 seconds.
You should therefore always carry out the following steps before working on the inverter:

► Never disconnect the inverter from the solar modules when it is under load.

1. Disconnect the connection to the grid so that the inverter cannot feed energy into the grid.
2. Turn the DC isolating switch to the ***OFF*** position.
3. Disconnect the inverter from all AC and DC voltage sources. Make sure that none of the connections can be restored accidentally.
4. Wait at least 60 seconds for the internal capacitors to discharge.
5. Ensure that the DC cables cannot be touched accidentally.

DANGER



Electric shock

Potentially fatal voltages are present at the DC connections of the inverter. 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.

1. Disconnect the connection to the grid so that the inverter cannot feed energy into the grid.
2. Turn the DC isolating switch to the ***OFF*** position.
3. Disconnect the inverter from all AC and DC voltage sources. Make sure that none of the connections can be restored accidentally.
4. Wait at least 60 seconds for the internal capacitors to discharge.
5. Ensure that the DC cables cannot be touched accidentally.

DANGER



Electric shock

The inverter has a high leakage current value.

► **Always** connect the ground cable first, then the AC and DC cables.

WARNING



Electric shock

The IP66 protection degree is no longer guaranteed when the door is open.

► Only open the door when absolutely necessary.

► Do not open the door if water or dirt might enter the inverter.

► After work is completed, ensure that the door is properly shut and tightened again. Check that the door is properly sealed.

WARNING



Heavy weight

The inverter is heavy.

► Lift and carry the inverter with at least 2 people.

WARNING



Hot surfaces
The surface of the inverter can get very hot during operation.



- Always wear safety gloves when touching the inverter.

NOTICE



Use of aluminum cables
► Always observe the applicable regulations and rules for the use of aluminum cables. For detailed information, refer to the complete Installation and Operation Manual.

NOTICE



Working in freezing conditions
In frosty conditions, the rubber seal of the front door can freeze to the enclosure, tear when opened and thus become leaky.

► Before opening the front door, defrost the rubber seal with some warm air.

► Open the front door slowly.

- To comply with 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 only be installed and commissioned by installers who have been trained and approved for the installation and operation of grid-connected solar inverters.
- All repair work on the inverter must be carried out by Delta Electronics. Otherwise the warranty will be void.
- Warning notices, warning symbols and other markings attached to the inverter by Delta Electronics must not be removed.
- To avoid the risk of arcing, do not disconnect cables when the inverter is under load.
- To prevent damage due to lightning strikes, follow the applicable regulations in your country.
- All external connections must be sufficiently sealed in order to ensure an IP66 protection degree. Seal any unused connections with the cover caps supplied.
- The front door does **not** need to be removed for standard installation. All connections required for the standard installation are also accessible from outside.
- Only equipment in accordance with SELV (EN 60950) may be connected to the RS485 interfaces.

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 grid. 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 grid.
- 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:

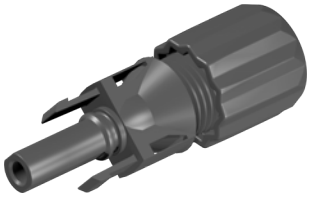
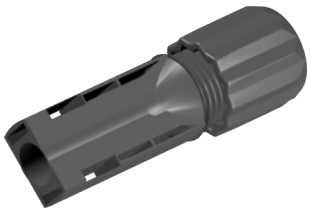
- Use in stand-alone mode, i.e. without a connection to the public grid. The inverter has functions that prevent isolated operation.
- Use in mobile solar systems.

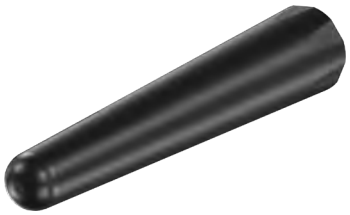
4. Product overview

4.1 Scope of delivery

- ► Check the delivery for completeness and all components for damage before starting installation work.
- ► Do not use any damaged components.
- ► Contact Delta Customer Service if the scope of delivery does not match the description in this manual.

- ► Keep the packaging.

Part	Q'ty	Description
Inverter	1	
Mounting plate	1	For mounting the inverter on the wall 
DC plug for DC+	6	Amphenol H4 DC plug for 4/6 mm² (H4C**F** C4D●MS) 
DC plug for DC–	6	Amphenol H4 DC plug for 4/6 mm² (H4C**M** C4D●MS) 
Mounting tool for DC plug	2	For unscrewing the Amphenol H4 DC plugs from the DC connections of the inverter 

Part	Q'ty	Description
AC plug	1	To connect the inverter to the grid 
Wi-Fi antenna	1	The inverter can be connected to a PC or smartphone via the Wi-Fi antenna. 
Allen key	1	For opening the front door and securing the open door from slamming shut. The Allen key is attached to the upper door seal. 
Quick Installation Guide	1	
Safety instructions	1	

4.2 Overview of components and connections

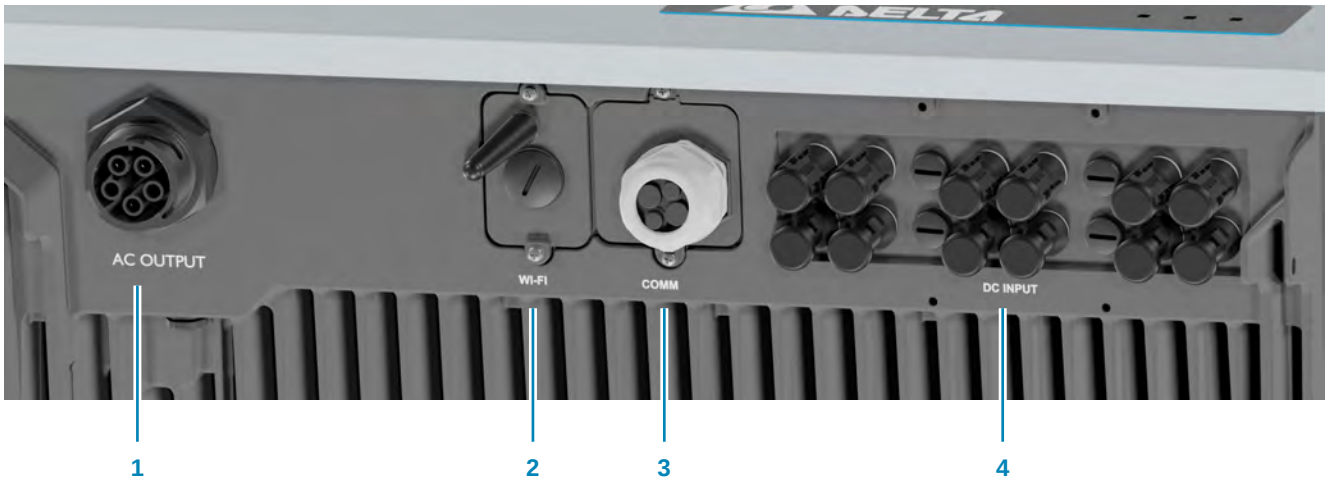


Fig. 4.1: Overview of the external electrical connections

1 AC socket
2 Wi-Fi module
3 Communication connection
4 DC connection panel

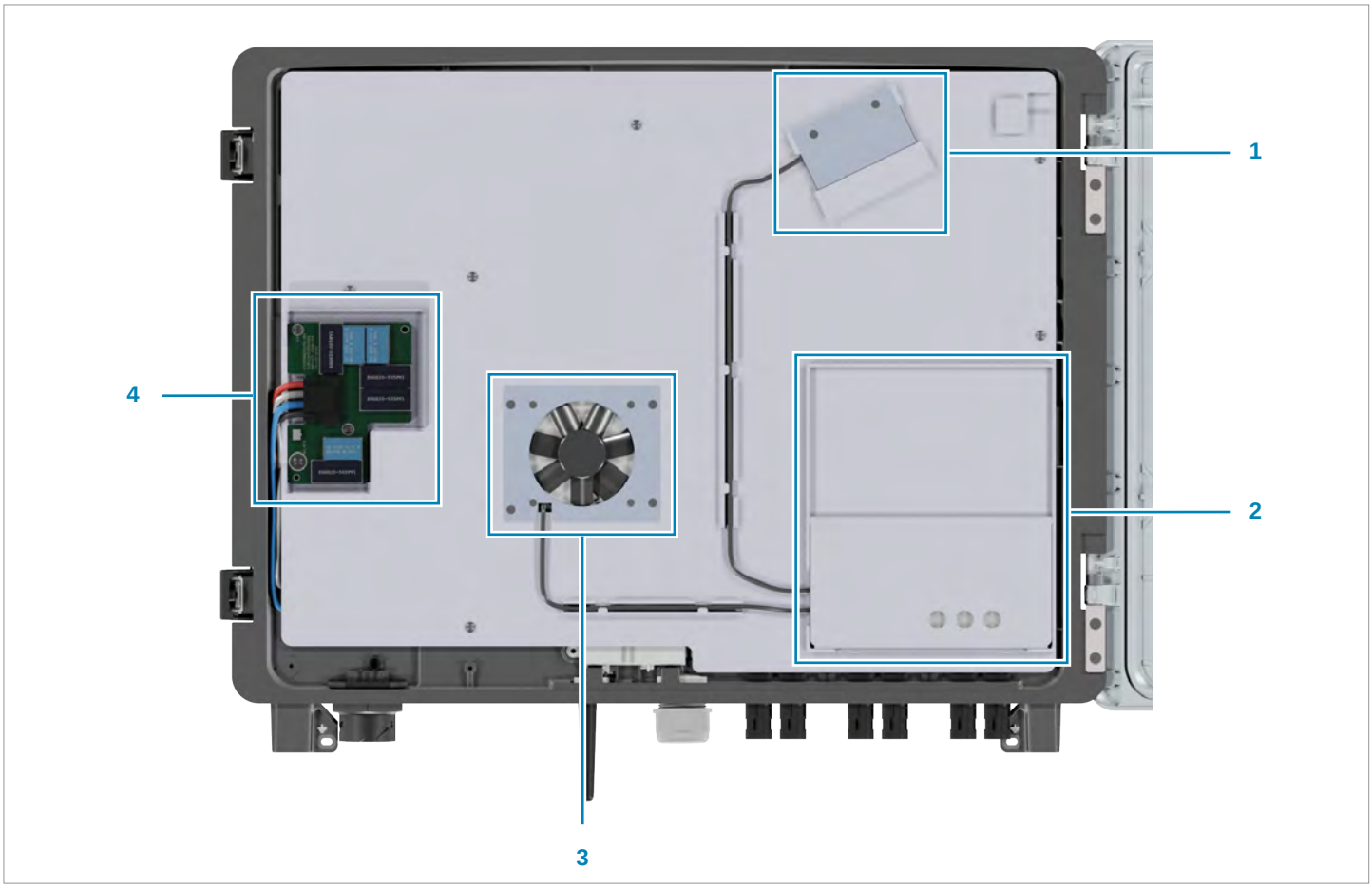


Fig. 4.2: Overview of internal components

1 Internal fan 1
2 DC surge protection devices
3 Internal fan 2
4 AC surge protection devices

4.3 LEDs



GRID	Grid	LED: green
ALARM	Alarm	LED: red / yellow
COMM.	Communication	LED: green

	LED is off.
1s	LED flashes normally (1s ON, 1s OFF).
0,25s	LED flashes quickly (0.25s ON, 0.25s OFF).
5s	LED flashes slowly (5s ON, 10s OFF).
	LED lights up constantly.

Status display operation

GRID	***ALARM***		Description
Green	**Red**	**Yellow**	
1s			Countdown (inverter starts).
			Inverter is connected to the grid and operates normally.
			Error. Shutdown by external signal.
	1s		Warning. Inverter still feeding into the grid.

GRID	***ALARM***		Description
Green	**Red**	**Yellow**	
	1s		Warning. Inverter is no longer feeding.
			Solar system error. Inverter no longer feeding.
		1s	Warning Solar system. Inverter still feeding in.
		5s	No DC. Also appears when both DC disconnectors are open.
1s	1s		Firmware is being updated.
1s		1s	Standby mode.
0,25s		0,25s	Check PV power.
	1s	1s	System lockout.

4.4 Grid connection (AC)

Related topics

“5.4 Planning the grid connection (AC)”, page 32
“7.6 Connecting the grid (AC)”, page 63
“11.4 Replacing the AC surge protection devices”, page 93

4.4.1 AC socket



Fig. 4.3: AC socket

The AC connection is suitable for grids with and without a neutral conductor.

The AC plug is included in the scope of delivery.

4.4.2 AC surge protection devices



Fig. 4.4: AC surge protection devices

The inverter has replaceable type 2 AC surge protection devices (EN 61463-11). The card is replaced as a whole.

4.5 DC-side components

Related topics

“5.5 Planning the connection of the solar modules (DC)”, page 36
“7.7 Connecting the solar modules (DC)”, page 66
“11.3 Replacing DC surge protection devices”, page 90

4.5.1 DC connection panel

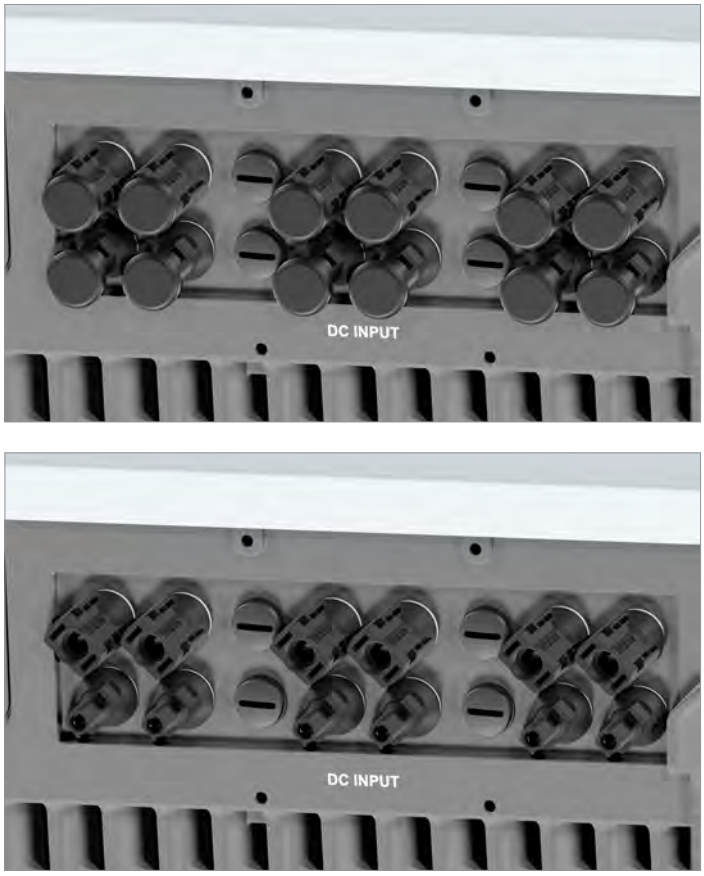


Fig. 4.5: DC connection panel

The DC connector panel has 6 pairs of DC connectors (3 MPP trackers with 2 pairs of DC connectors each).

Plug type:

- DC+: Amphenol H4 for 4/6 mm² (Amphenol part number H4C**F**C4D●MS)
- DC–: Amphenol H4 for 4/6 mm² (Amphenol part number H4C**M**C4D●MS)

6 pairs of DC plugs are supplied in the scope of delivery.

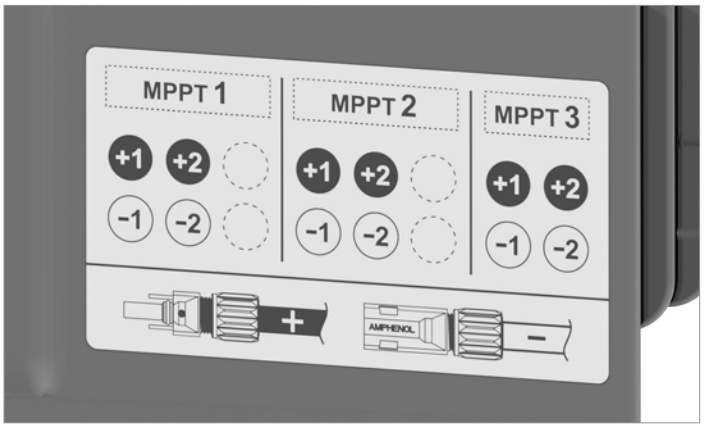


Fig. 4.6: Assignment of the DC connectors to the MPP trackers

The assignment of the individual DC connectors to the module strings is shown in a picture on the inverter.

4.5.2 DC disconnectors

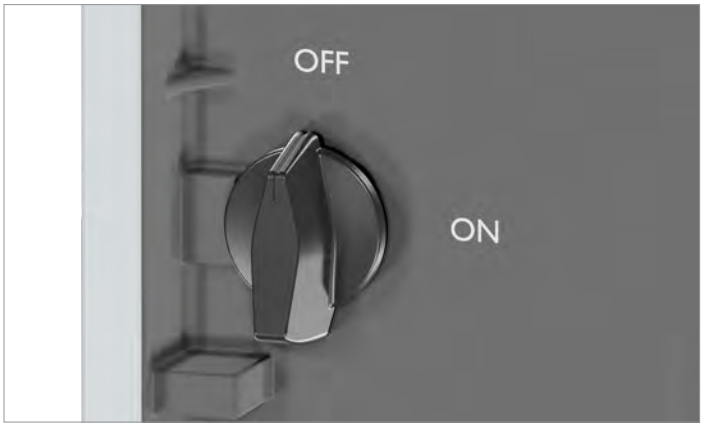


Fig. 4.7: DC disconnector

The DC disconnector is a mechanical disconnector that disconnects all DC strings.

Germany: The DC disconnector meets the requirements of VDE 0100-712.

France: The DC disconnector meets the requirements of UTE 15-712-1.

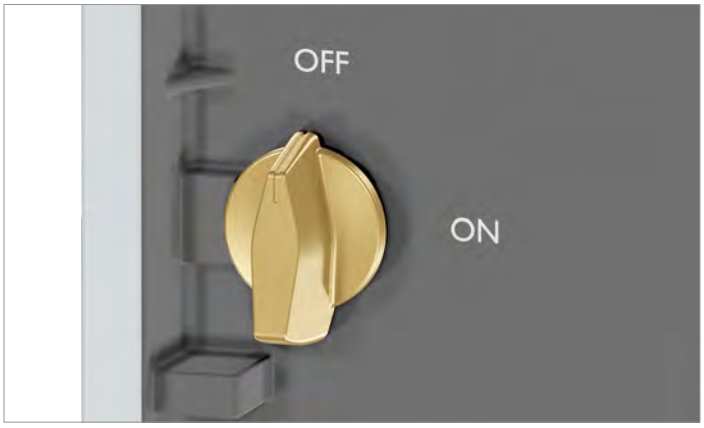


*Fig. 4.8: The DC disconnector in the **OFF** position = the connection to the solar modules is disconnected*

The connection between the inverter and the solar modules is **disconnected** when the DC disconnector is in the ***OFF*** position.

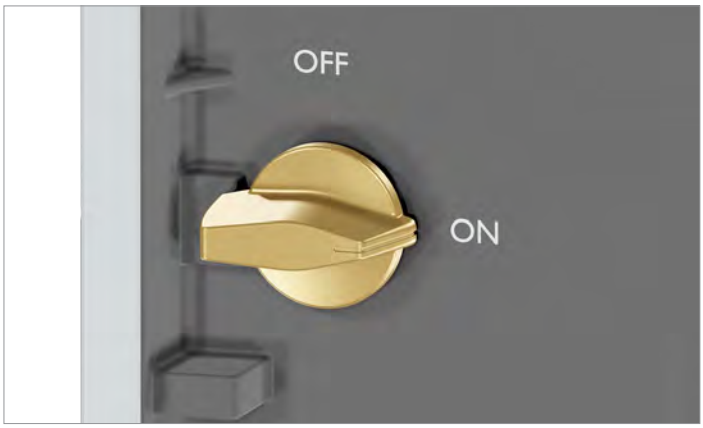


*Fig. 4.9: The DC disconnector in the **ON** position = the connection to the solar modules is closed*

The connection between the inverter and the solar modules is **closed** when the disconnector is in the ***ON*** position.

4.5.3 DC surge protection devices



Fig. 4.10: DC surge protection devices

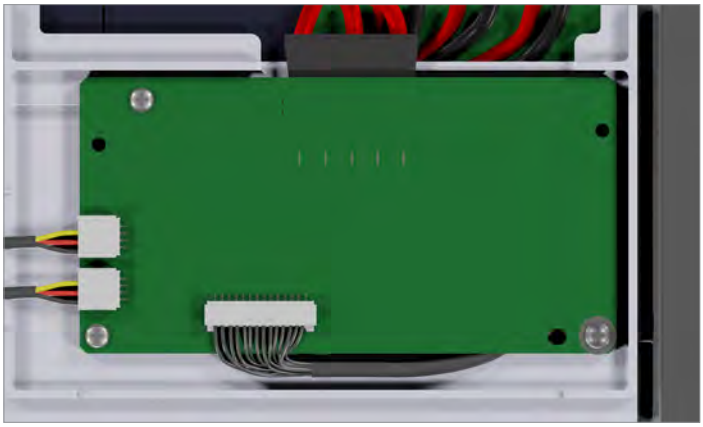


Fig. 4.11: View of the DC surge protection devices with the cover removed

The inverter has replaceable type 2 DC surge protection devices (EN 50539-11). The DC surge protection devices are replaced as a block.

4.6 Wi-Fi card and communication connection

Related topics

“5.6 Planning the device communication and plant monitoring”, page 39
“5.7 Grid and system protection”, page 45
“6. Planning the Commissioning”, page 46
“7.5 Connecting the communication card”, page 54



Fig. 4.12: Wi-Fi card and communication connection

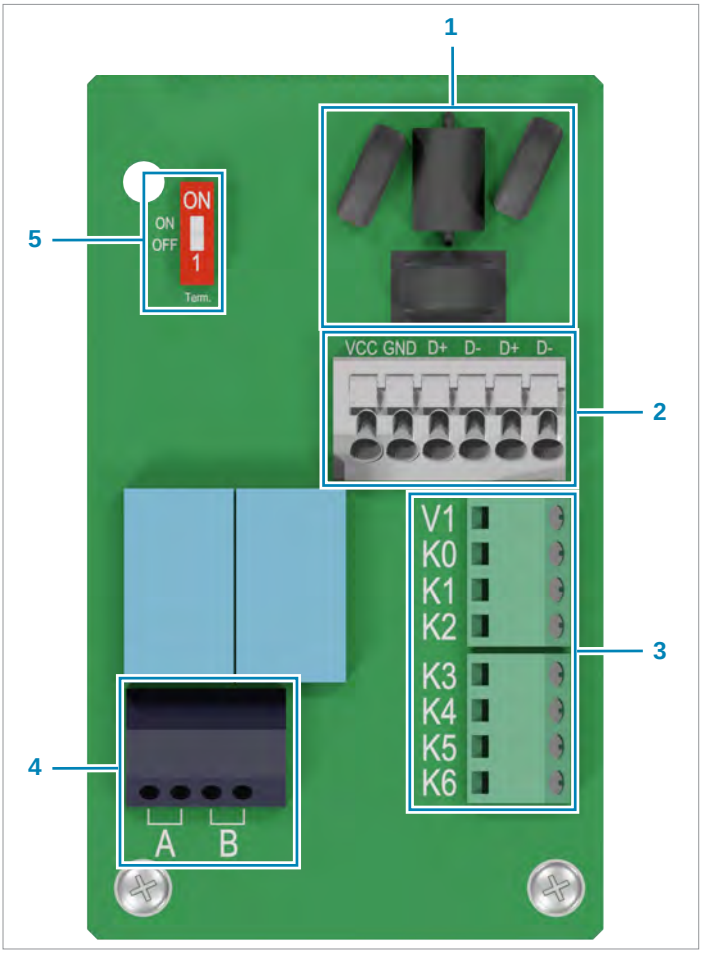


Fig. 4.13: Components of the communication card

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

Connection	Connector type
2 x RS485 (DATA+ and DATA–)	Terminal block
1 x VCC (12 V, 0.5 A)	Terminal block
6 x digital inputs	Terminal block
2 x dry contacts	Terminal block
1 x external power-off (EPO)	Terminal block

Table 4.1.: Connections on the communication card

Cable type	Shielded and twisted pair cable (CAT5 or CAT6)
Cable diameter	7.2 to 10 mm
Wire cross section	0.25 ... 1.5 mm^2

Table 4.2.: Specification of the communication cable

4.7 Grounding connections

Related topics

“5.4.6 Planning grounding of the inverter”, page 33
“7.4 Grounding the inverter housing”, page 52





Fig. 4.14: Grounding connections at the left foot of the inverter





Fig. 4.15: Grounding connections on the right foot of the inverter

Variant A: A cable lug, **M5**screw with an M5 nut, spring washer and washer are required for connecting the grounding cable. A toothed washer is not required. Attention: The mounting hole has no thread!

Variant B: A cable lug, M6 screw, spring washer and washer are required for connecting the grounding cable. A toothed washer is not required. The ground connection has an M6 thread.

4.8 Cooling system

Related topics

“5.1 Installation location”, page 26
“11.1 Clean/replace internal fan 1”, page 80
“11.2 Clean/replace internal fan 2”, page 85

The inverter is cooled by means of natural convection.



Fig. 4.16: Cooling fins on the back of the inverter

To prevent heat buildup, the inverter has 2 interchangeable internal fans that circulate the air inside.

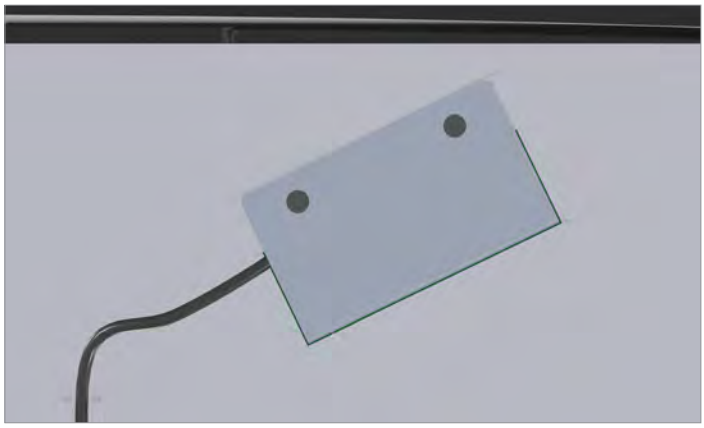


Fig. 4.17: Internal fan 1

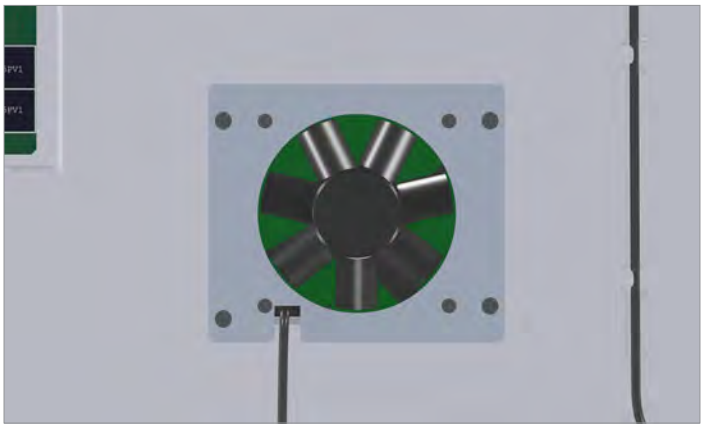


Fig. 4.18: Internal fan 2

4.9 Mounting plate

The inverter is mounted in a suspended position. The mounting plate is supplied in the scope of delivery.



Fig. 4.19: Mounting plate

There is a mounting hole on the both left and right foot to attach the inverter to the wall or to the mounting system.

With the mounting screws it is also possible to implement anti-theft protection.



Fig. 4.20: Mounting holes

4.10 Type plate and markings



Fig. 4.21: Type plate and markings

Identification of the product and the product version



Product version	Identification of the product and the product version
0	❶ Delta part number ❷ The last letter of the serial number indicates the product version.

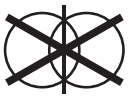
4 Product overview

Type plate and markings

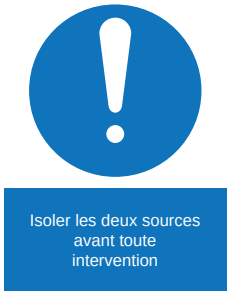
Information on the type plate

Information on the type plate	Meaning
M30A_230	Delta model name
P/N: RPI303M230100	Delta part number
DC INPUT	DC input
Max. Input voltage: 1000 VDC	Max. input voltage
MPP voltage range: 480-900 VDC	MPP input voltage range
Max. Input current: 72 A DC	Total maximum DC input current
Max. Short circuit current: 50 A DC per MPPT	Maximum DC short-circuit current per MPP tracker
AC OUTPUT	AC output
Nominal output voltage: 400/380 V AC	Rated output voltage
Nominal output frequency: 50/60 Hz	Rated frequency
Connection type: 3Ø3W/3Ø4W, PE	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).
Max. Continuous output current: 50 A AC	Maximum output current
Rated continuous output power: 30,000 W.	Rated output power
Max. Apparent output power: 33,000 VA	Maximum apparent power
Power factor: 0.8 lead ~ 0.8 lag	Setting range of the power factor cos φ
Protection class: I	Safety class as per EN 61140
Overvoltage category: III (AC), II (DC)	Overvoltage category for AC and DC as per EN 50539-11
Ingress protection: IP66	Protection degree according to EN 60529
Operating temperature range: -25 ~ +60°C.	Operating temperature range
Non-isolated inverter	The inverter has no galvanic isolation.
Made in China	The device was made in China.
VDE-AR-N 4105	The inverter fulfills the requirements of VDE-AR-N 4105.
IEC 61439-2	The inverter meets the requirements of IEC61439-2.
IEC 62109-1/-2	The inverter meets the requirements of IEC 62109-1/-2.
CNS 15382	The inverter meets the requirements of CNS 15382.
CNS 15426-1/-2	The inverter meets the requirements of CNS 15426-1/-2.
CE	CE mark. By applying this mark, Delta declares that the inverter satisfies the provisions of the applicable EU directives.

For a complete list of standards that the inverter meets, please contact Delta Customer Service.

Symbols on the type plate	Meaning
	This inverter is not separated from the grid by a transformer.
	Before working on the inverter, read the supplied manual and follow the instructions provided.
	The inverter housing can become very hot during operation.
	The inverter housing must be grounded if this is required by local regulations.
 60 seconds	**Risk of death due to electric shock** Potentially fatal voltage is present inside the inverter during operation and this voltage remains present for up to 60 seconds after disconnection from the power supply.
	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.

For France

Warning notice	Description
	**For France: Warning notice according to UTE 15712-1** Attention Présence de deux sources de tension - Réseau de distribution - Panneaux photovoltaics
	**For France: Warning notice according to UTE 15712-1** Isoler les deux sources avant toute intervention

5. Planning the installation

This chapter describes only the **planning** of the installation work. The **execution**of the installation work and the associated dangers are described in “7. Installation”, page 47.

This chapter describes the default installation conditions. If you wish to implement conditions that deviate from these, please refer to

5.1 Installation location

Related topics

“7. Installation”, page 47

5.1.1 Requirements for the wall, ground and mounting system

- ► The inverter is mounted in a suspended position.
- ► The inverter is heavy. The wall, ground 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 disruptions.
- ► When using the inverter in residential areas or in buildings with animals, possible noise emissions can be disturbing. Therefore, choose the installation location carefully.
- ► Mount the inverter on a fireproof wall.

5.1.2 Installation height

- ► Mount the inverter so that the LEDs are always visible.

5.1.3 Installation position

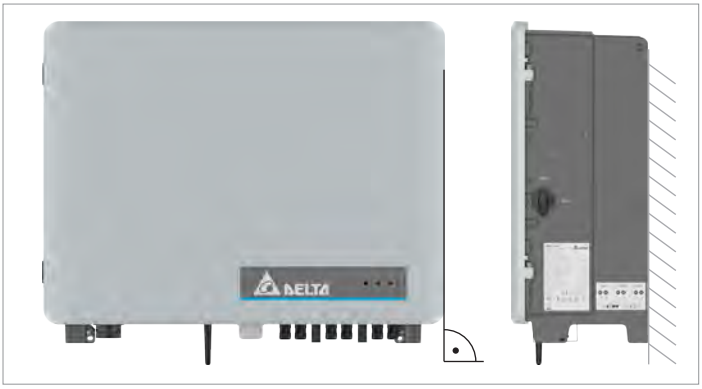


Fig. 5.1: Installation position

- ► Mount the inverter vertically.

5.1.4 Outdoor installations

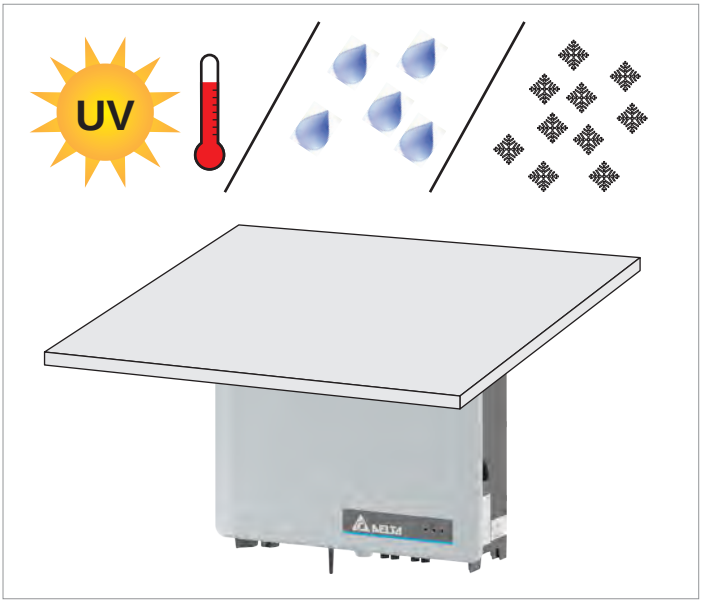


Fig. 5.2: For outdoor installations, protect the inverter from direct sun, UV radiation, rain and snow

The inverter has a protection degree of IP66 and can be installed indoors and outdoors. Despite this, the inverter should be protected by a roof against direct sun, UV 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.

5.1.5 Lifting and transporting the inverter

- ► Lift and move the inverter with at least 2 people or a suitable lifting device.

5.1.6 Installation clearances and air circulation

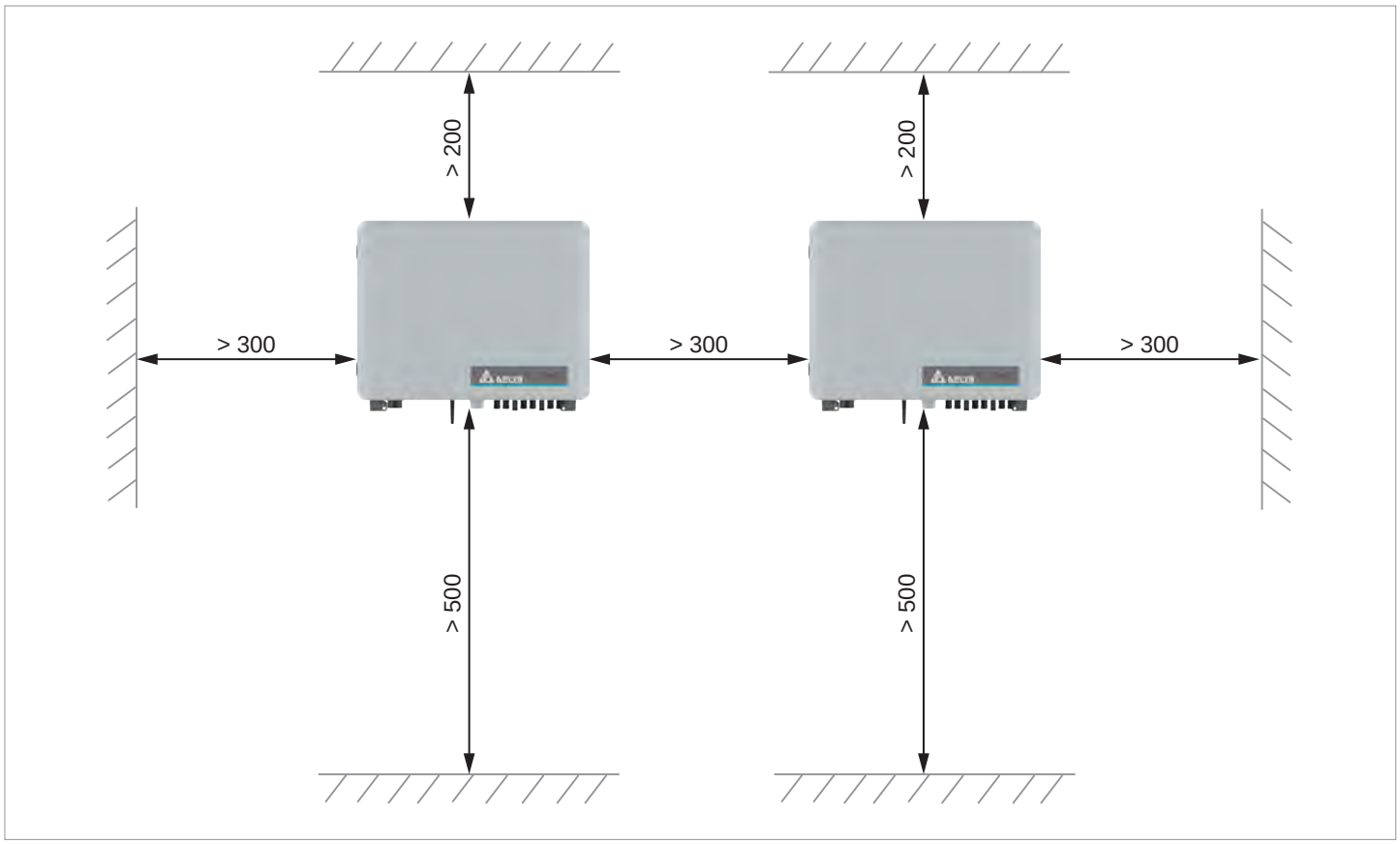


Fig. 5.3: Mounting distances (in mm)

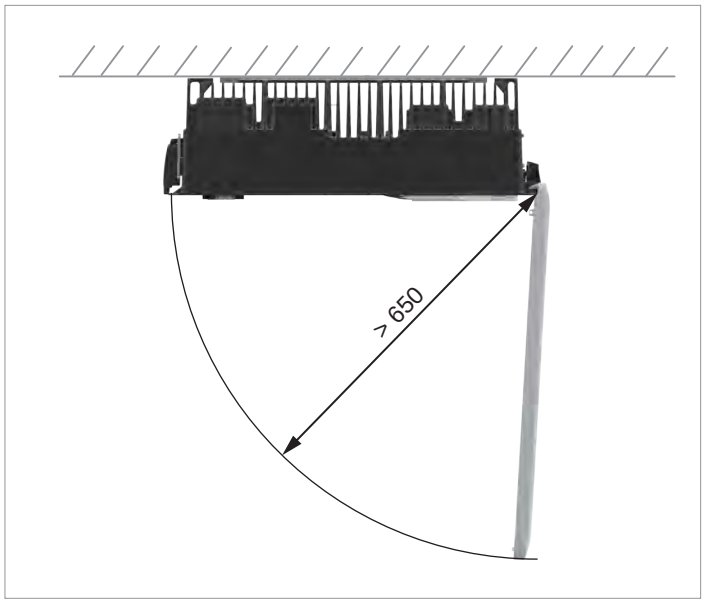


Fig. 5.4: Mounting distances (in mm)

- ► Ensure sufficient air circulation. There must not be heat buildup around the inverter.
- ► Observe *Operating temperature range without derating* the *Total operating temperature range* (see “16. Technical Data”, page 118).

  When the *operating temperature range without derating* is exceeded, the inverter reduces the AC power fed into the grid.

  When the *Total operating temperature range* is exceeded, the inverter stops feeding AC power into the grid.

  This is normal operating behavior for the inverter and is necessary to protect the internal electronics.
- ► Position multiple inverters so that they do not heat each other up.
- ► Observe the minimum bend radius of the cables used (especially the AC cable)!
- ► Allow space to the front to open the door.

  If there is a loss of performance during operation, this may be due to overheating of the inverter.

5.2 Characteristic curves

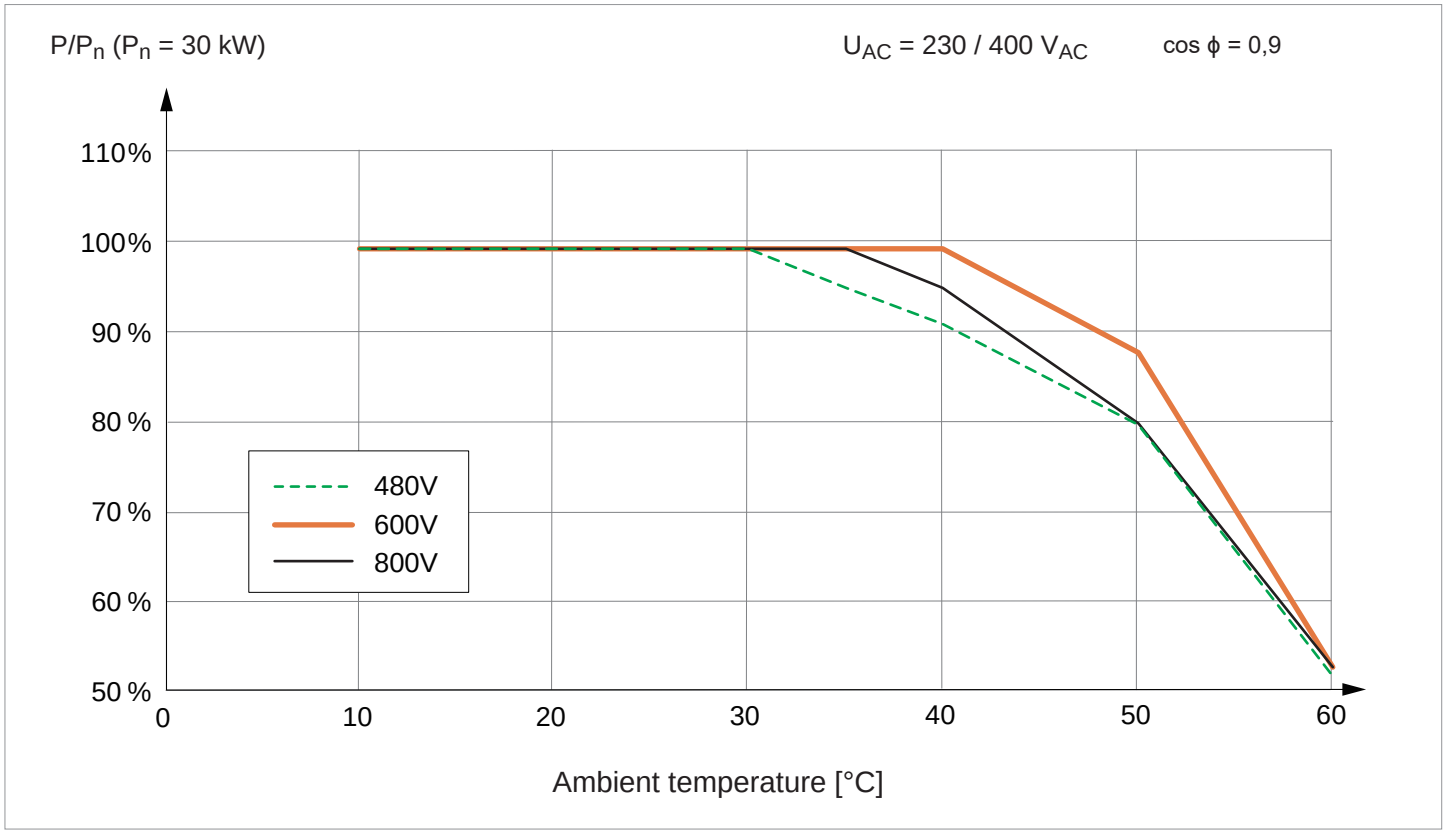


Fig. 5.5: Characteristic curve “Active power control depending on the ambient temperature, cos φ = 0.90, AC voltage =230/400 V”

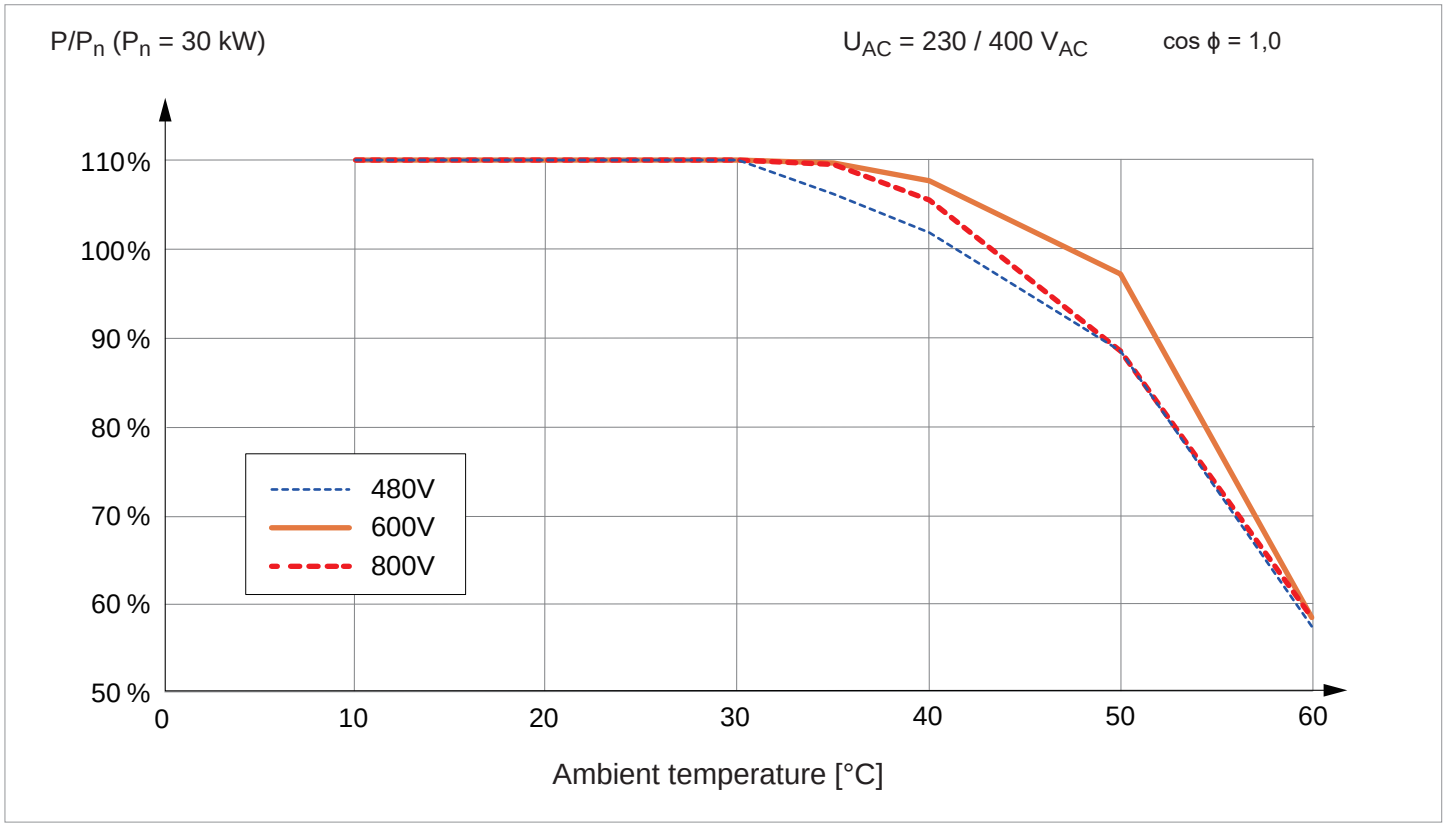


Fig. 5.6: Characteristic curve “Active power control depending on the ambient temperature, cos φ = 1.0, AC voltage =230/400 V”

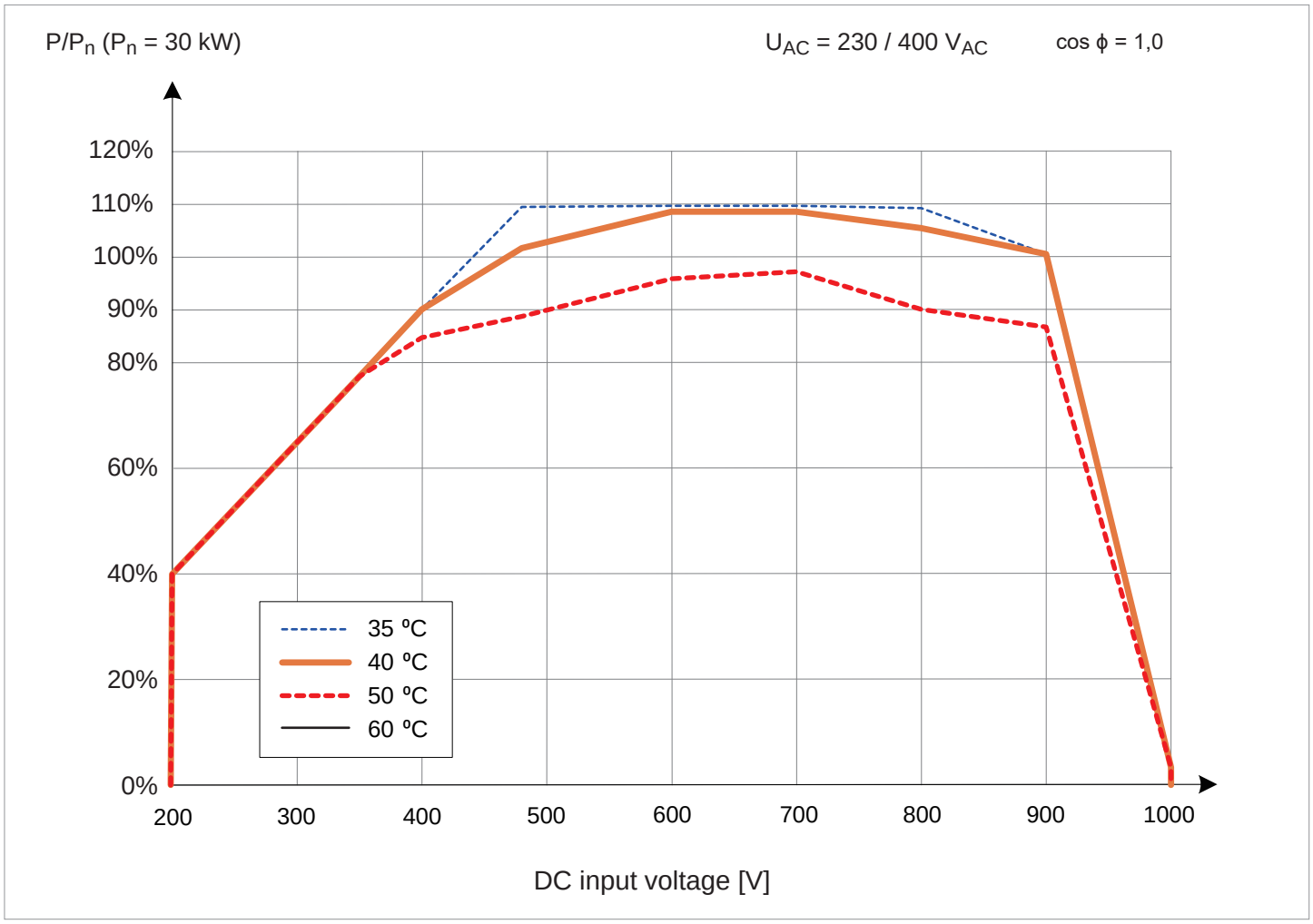


Fig. 5.7: Characteristic curve “Active power control depending on the DC input voltage, cos φ = 1.0, AC voltage =230/400 V”

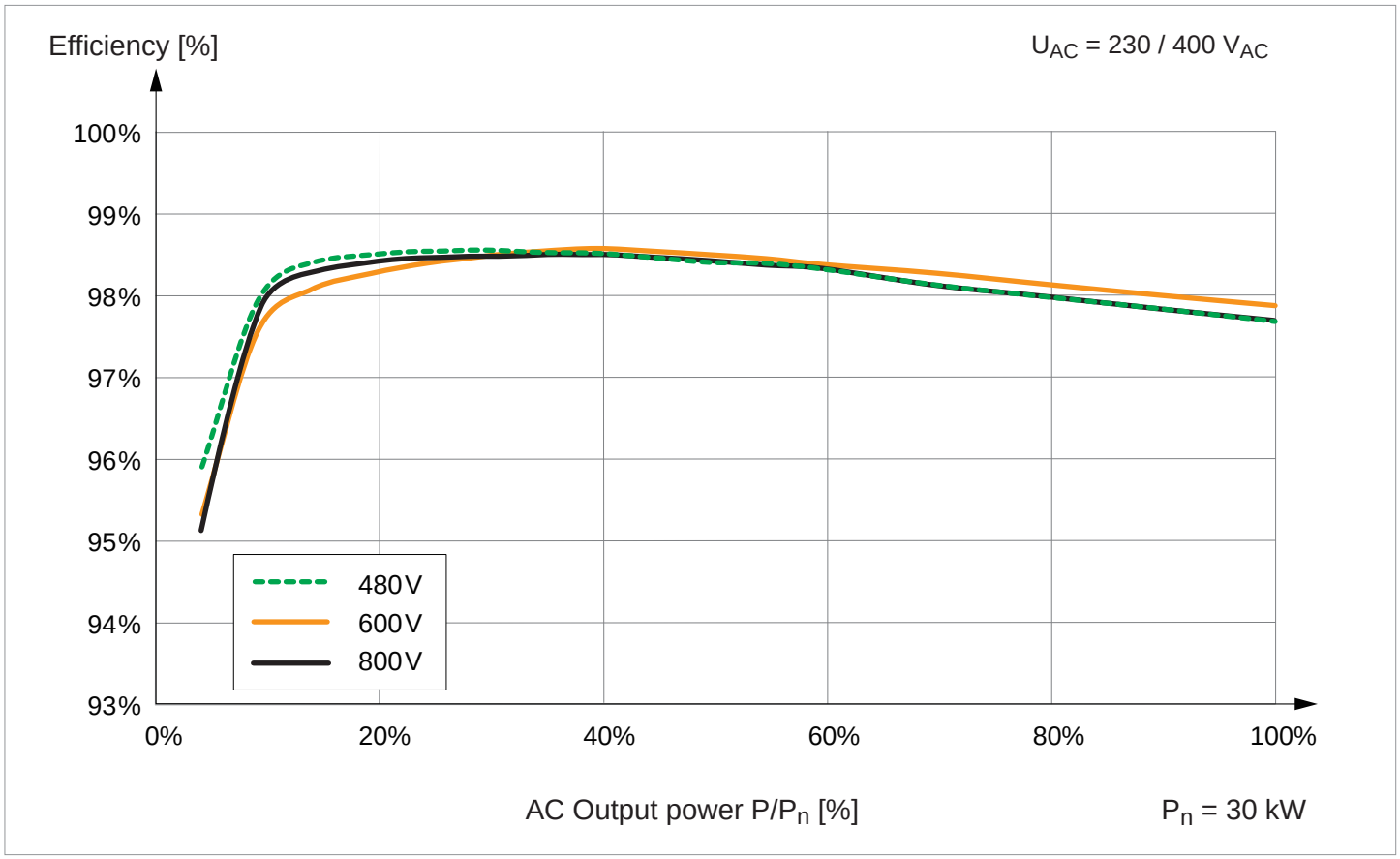


Fig. 5.8: Efficiency characteristic curve; AC voltage = 230/400 V_{AC}

5.3 Dimensions

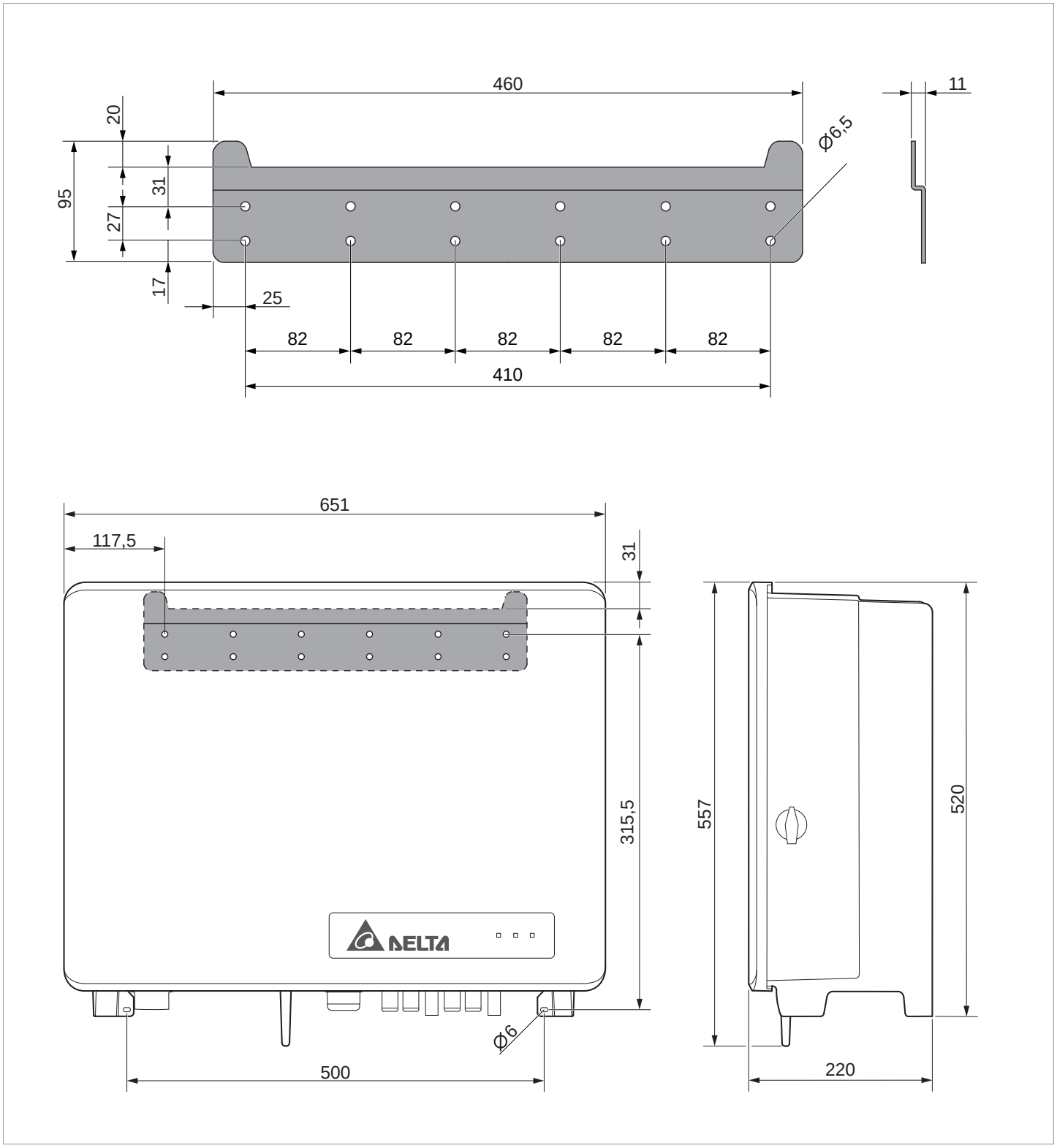


Fig. 5.9: Inverter with mounting plate, dimensions without antennae (in mm)

5.4 Planning the grid connection (AC)

Related topics

“7.6 Connecting the grid (AC)”, page 63

5.4.1 Important safety instructions

- ► Always follow the specific regulations of your country or region.
- ► Always follow the specific regulations of your energy provider.
- ► Install all the 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 circuit breaker	80 A recommended

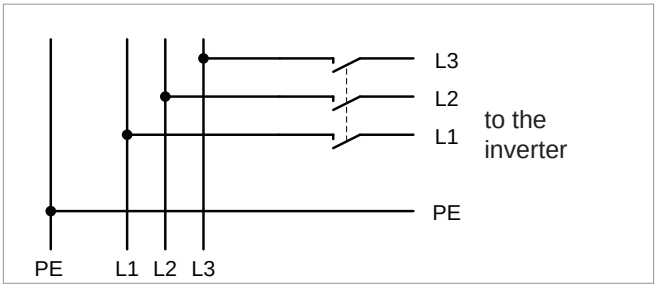


Fig. 5.10.: Position of the upstream circuit breaker

- ► Selection of the protective devices for the grid cables to the transformer of the grid 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 IT networks.

5.4.2 Residual current circuit breaker

Due to its design, the inverter cannot supply the grid 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 (for example, humidity). The tripping current must not, however, be less than the specified minimum tripping current.

5.4.3 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.

5.4.4 AC surge protection devices

The inverter is equipped with type-2 AC surge protection devices. Replacements can be ordered from Delta Electronics.

5.4.5 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

Table 5.1.: Permissible grounding systems

5.4.6 Planning grounding of the inverter

WARNING

High current

- ► Always observe the local regulations relating to grounding cable requirements.
- ► To increase the safety of the system, always use the grounding screw to 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 grid and solar modules.
- ► The grounding cable cross-section must be at least 6 mm².





Fig. 5.11: Grounding connections at the left foot of the inverter





Fig. 5.12: Grounding connections on the right foot of the inverter

Variant A: A cable lug, **M5**screw with an M5 nut, spring washer and washer are required for connecting the grounding cable. A toothed washer is not required. Attention: The mounting hole has no thread!

Variant B: A cable lug, M6 screw, spring washer and washer are required for connecting the grounding cable. A toothed washer is not required. The ground connection has an M6 thread.

5.4.7 Permissible grid voltages

The inverter is suitable for grid systems with 3 phases + PE (delta connection) or 3 phases + N * PE (star connection).

3P3W	Voltage range	3P4W	Voltage range
L1-L2	400 V_{AC} -20%/+30%	L1-N	230 V_{AC} -20%/+30%
L1-L3	400 V_{AC} -20%/+30%	L2-N	230 V_{AC} -20%/+30%
L2-L3	400 V_{AC} -20%/+30%	L3-N	230 V_{AC} -20%/+30%

Table 5.2.: Permissible grid voltages

5.4.8 AC plug and AC cable

5.4.8.1 Technical specification for the AC plug

An AC plug is included in the scope of delivery

Connection type	5-pin AC plug
Rated currents I_N	
• 4 mm²	30 A
• 6 mm²	40 A
• 10 mm²	50 A
• 16 mm²	65 A
• 25 mm²	75 A
Rated voltage U_N	600 V
Operating temperature range	-40 to +85°C
Cable type	Please refer to section “5.4.8.3 AC cable specifications”, page 34

Table 5.3.: Technical specification for the AC plug

5.4.8.2 Notes on calculating the cable cross-section

► Consider the following factors when calculating the cable cross-section:
  – Cable material
  – Temperature conditions
  – Cable length
  – Installation type
  – Voltage drop
  – Loss of power in the cable
  – Bundling factor (for example, if several cables are routed together in a single cable duct.)

► Always follow the IEC 60364-5-52 requirements and your country-specific installation instructions.

► 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 VDE 0100-712. This standard contains the requirements for minimum cable diameters and for avoiding overheating due to high currents.

5.4.8.3 AC cable specifications

NOTICE



The AC plug is only approved for copper cables. Aluminum cables must not be used.

Cable diameter	20 to 26 mm
Min./max. Wire cross section	
Without wire end sleeve	
• Rigid cable	4 to 25 mm²
• Multi-wire cable	4 to 25 mm²
With wire end sleeve	
• Fine-wire cable	2.5 to 16 mm²
Cables	Copper (rigid, multi-wire, fine-wire)

Table 5.4.: AC cable specifications

5.4.8.4 Stripping length

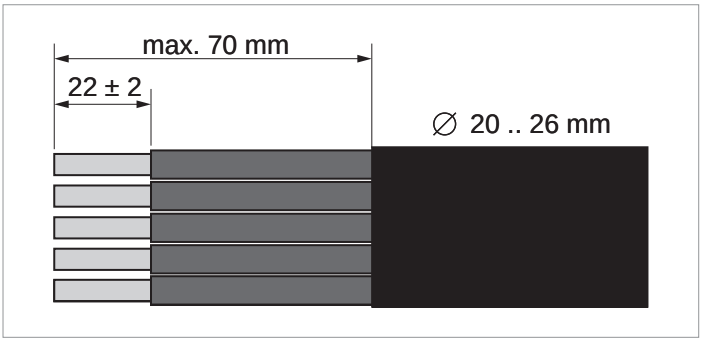
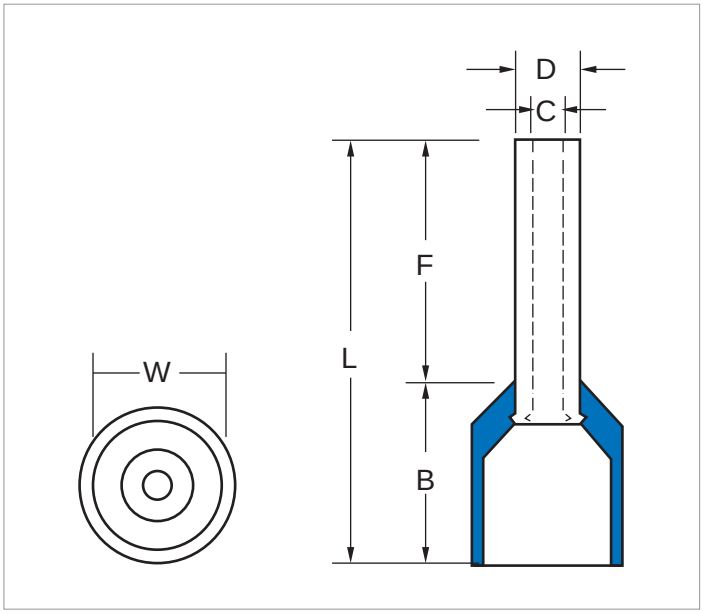


Fig. 5.13: Stripping length for AC cables

5.4.8.5 Wire end-sleeves



Wire cross section	16 mm²
L	28 mm
F	18 mm
B	10 mm
ØC	5.8 mm
ØD	6.2 mm
ØW	8.7 mm

Table 5.5.: Specifications for wire end ferrules for the AC cable

5.5 Planning the connection of the solar modules (DC)

Related topics

“7.7 Connecting the solar modules (DC)”, page 66

5.5.1 Safety instructions

DANGER

Electric shock
Potentially fatal voltages are present at the DC connections of the inverter. 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.
- ► Turn the DC isolating switch to the ***OFF*** position.
- ► Disconnect the connection to the grid so that the inverter cannot feed energy into the grid.
- ► Disconnect the inverter from all AC and DC voltage sources. Make sure that none of the connections can be restored accidentally.
- ► Ensure that the DC cables cannot be touched accidentally.

NOTICE

Incorrectly dimensioned solar system
If the solar system is dimensioned incorrectly, this may damage the inverter.

- ► When calculating the module string, always pay attention to technical specifications of the inverter (*input voltage range*, *maximum input current* and *maximum input power*, see “16. Technical Data”, page 118).

NOTICE

Overheating of the DC connections
Exceeding the *maximum input current* can cause the DC connections to overheat and result in a fire.

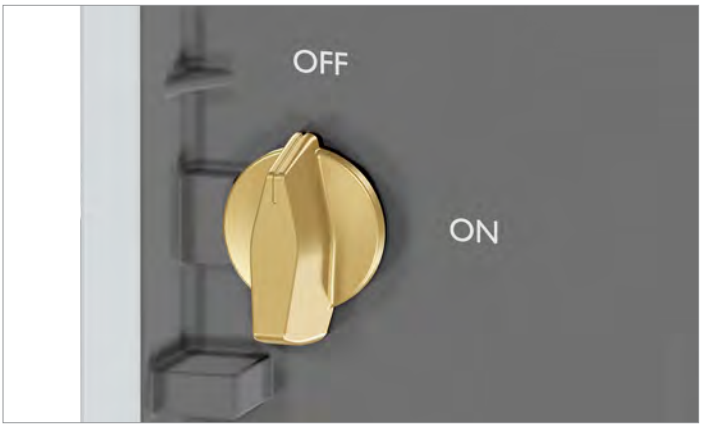
- ► When dimensioning the module strings, always take into account the *maximum input current* of the DC connections (see “16. Technical Data”, page 118).

NOTICE

Ingress of moisture
Moisture can enter via open DC connectors.

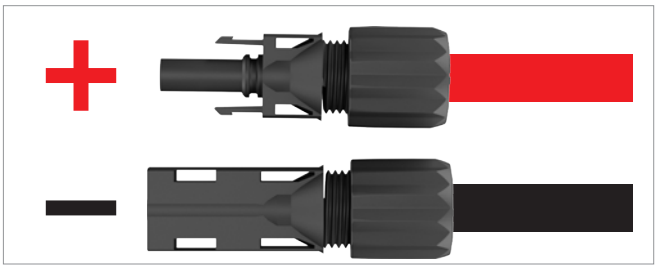
- ► To ensure protection degree IP66, close unused DC connectors with the rubber plugs that are attached to the DC connectors.

Before connecting the solar modules, turn the DC disconnector to the ***OFF*** position.



5.5.2 Polarity of the DC voltage

- ► Check the polarity of the module strings before connecting the solar modules.



The inverter has an integrated function for detecting reverse polarity on the DC connections. If such reverse polarity is detected, the inverter triggers an error message. This error message is indicated by the ***ALARM*** LED as soon as the inverter is switched on.

5.5.3 Arrangement of the DC inputs on the DC connection panel

The inverter has 3 MPP trackers (MPPT1 to MPPT3) with 2 pairs of DC connectors each. Up to 18 module strings can be directly connected to the inverter.

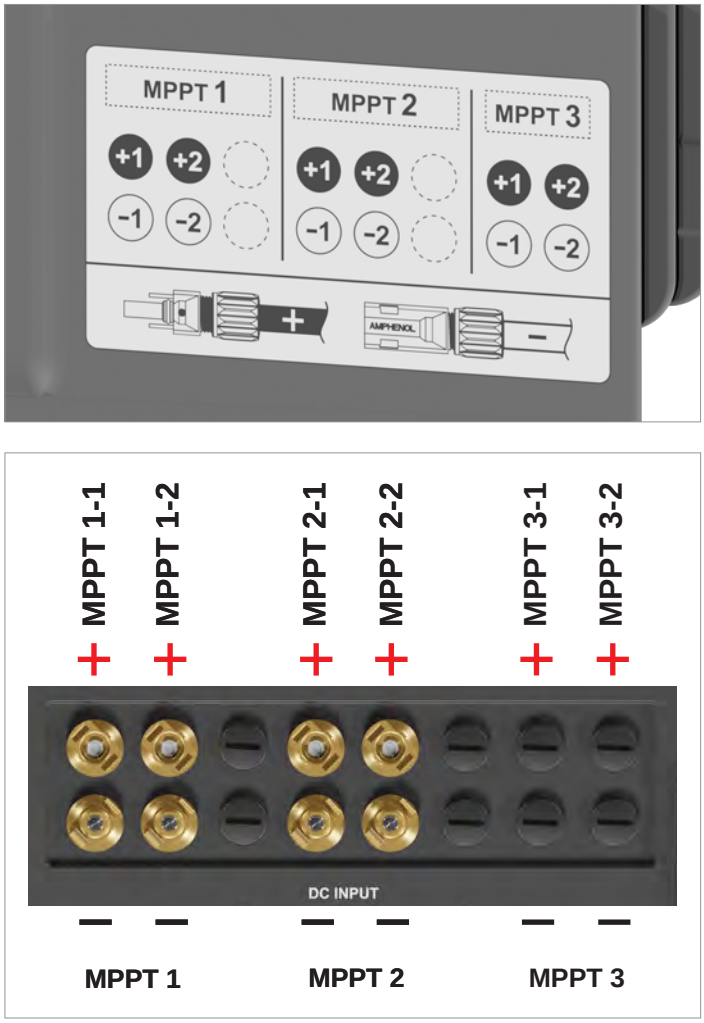


Fig. 5.14: Assignment of the DC connectors to the MPP trackers

5.5.4 Functioning of integrated string monitoring

The string is monitored via current sensors. Fig. 5.15 shows the distribution of the current sensors to the module strings of a DC input.

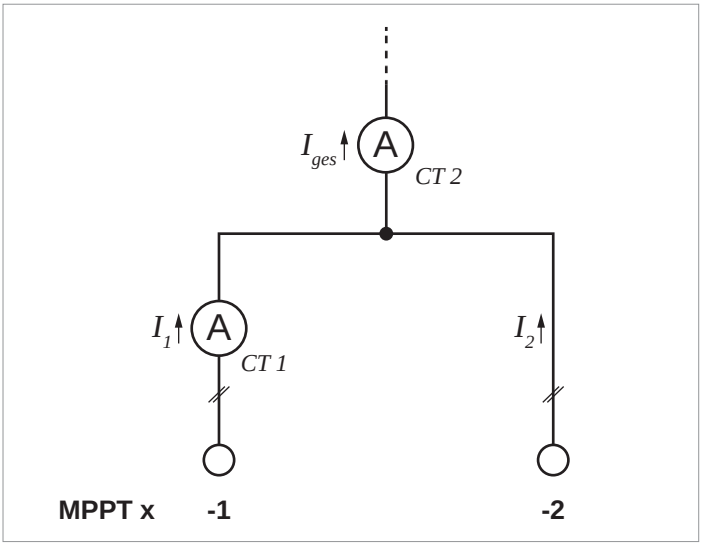


Fig. 5.15: Arrangement of the current sensors of a DC input

2 DC strings can be connected to each MPP tracker. The first DC connection of each string has a current sensor (*CT 1*). Current sensor *CT 2* measures the total current of the two module strings. The current in module string 2 is calculated by the difference: $I_2 = I_{total} - I_1$.

5.5.5 Use of string fuses

When connecting one or two module strings per DC input, no string fuses are required.

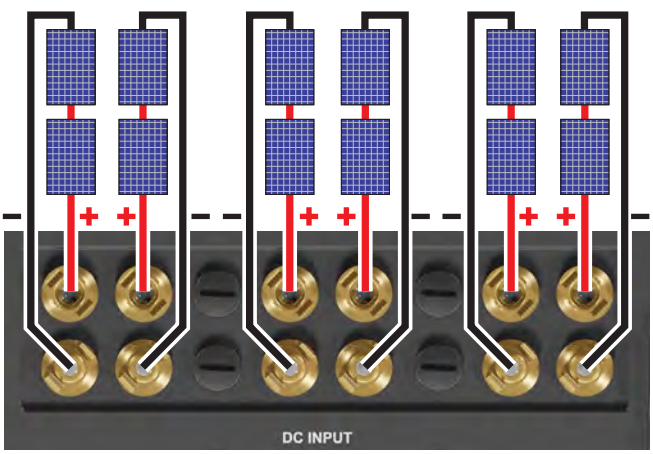


Fig. 5.16: Connection of one or two module strings per DC input (= MPP tracker): no string fuses necessary

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

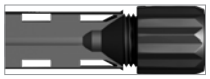
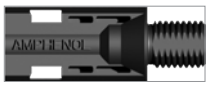
5.5.6 Specification for the DC cables

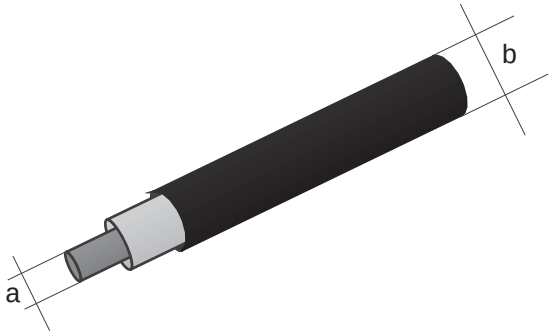
The DC plugs for all DC connectors are supplied with the inverter.

The DC plugs are only suitable for copper wire.

You can download the assembly instructions for the DC plugs from Amphenol at: www.amphenol-solar.com.

If you want to order more or need a different size, see the information in the following table.

	DC plugs for DC cables	DC connections on the inverter
DC–		
DC+		



	a	b	Amphenol DC plug [1]
	mm²	mm	
DC+	4/6	5.3 ... 7.65	H4C**F**C4D●MS
DC–	4/6	5.3 ... 7.65	H4C**M**C4D●MS

[1] Included in scope of delivery

Fig. 5.17: Specification for the DC cables

5.6 Planning the device communication and plant monitoring

Related topics

"6. Planning the Commissioning", page 46
"7.5 Connecting the communication card", page 54

5.6.1 Introduction

The inverter offers the following options for communication with other devices (e.g. PC, smartphone, data logger):

- RS485 (communication card with RS485 connections, digital inputs, dry contacts, external power-off and 12 V_{DC} power supply)
- Sub-1G antenna (included in scope of delivery)
- Wi-Fi module (optional accessory)

5.6.2 Components of the communication card

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

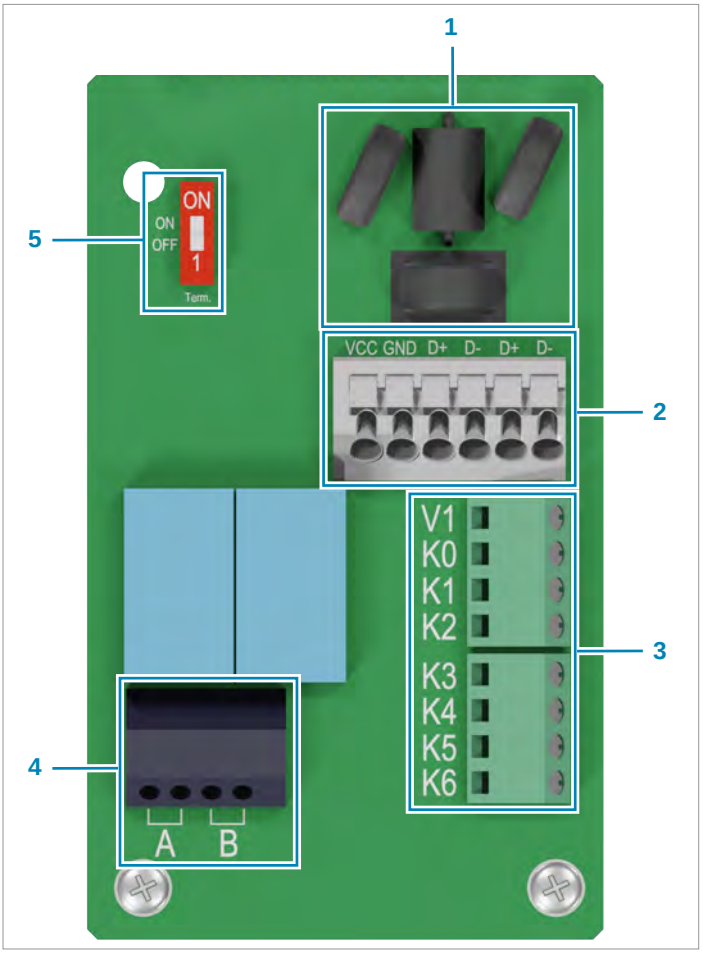


Fig. 5.18: Components of the communication card

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

Connection	Connector type
2 x RS485 (DATA+ and DATA–)	Terminal block
1 x VCC (12 V, 0.5 A)	Terminal block
6 x digital inputs	Terminal block
2 x dry contacts	Terminal block
1 x external power-off (EPO)	Terminal block

Table 5.6.: Connections on the communication card

Cable type	Shielded and twisted pair cable (CAT5 or CAT6)
Cable diameter	7.2 to 10 mm
Wire cross section	0.25 ... 1.5 mm^2

Table 5.7.: Specification of the communication cable

5.6.3 Cable gland for the communication connection



The inverter has one cable gland for up to four communication cables.

5.6.4 Connection of a data logger via RS485

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.

Take into account the notes for ensuring a stable data connection.

Connecting a single inverter to a data logger

- ► Switch on the RS485 termination resistor.
- ► Lay the communication 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

Consideration of the position of the data logger in the RS485 bus:

- ► The data logger is located at one of the two ends of the RS485 bus:
  - – Switch the RS485 termination resistor of the data logger *on*.
  - – Switch the RS485 termination resistor of the inverter at the other end of the RS485 bus *on*.
- ► The data logger is *not* at either end of the RS485 bus:
  - – Switch the RS485 termination resistor of the data logger *off*.
  - – Switch the RS485 termination resistor of the two inverters at the ends of the RS485 bus *on*.
- ► Switch the RS485 termination resistor on all other inverters *off* (default setting from the factory).

Further notes:

- ► Set a different inverter ID for each inverter. Otherwise the data logger cannot identify the individual inverters.
- ► Set the same RS485 baud rate at each inverter (factory setting: 19200).
- ► Lay the RS485 cable with a suitable clearance to the AC and DC cables to prevent interference in the data connection.
- ► Do not connect VCC and GND when using RS485.

5.6.5 Connection of a DC1 data collector from Delta

You can use the DC1 data collector for, among other things:

- Commissioning the inverter (see “6. Planning the Commissioning”, page 46 and “8. Commissioning”, page 68)
- Updating the firmware
- Connecting to the MyDeltaSolar Cloud

The inverter can be connected to the DC1 via RS485.

Connection via RS485

Observe the general instructions in section “5.6.4 Connection of a data logger via RS485”, page 40.

The DC1 does not have an integrated RS485 termination resistor. For this reason, refer to the information in Fig. 5.19.

Required software

In order to access the DC1 and the inverter through it, you also need:

- A mobile device (smartphone, tablet) with the MyDeltaSolar app

or

- A Windows PC running the Delta Service Software (DSS)

The MyDeltaSolar app is available for iOS and Android.

The DSS be downloaded from https://solarsolutions.delta-emea.com/en/Solar-Inverter-Support-171.htm.

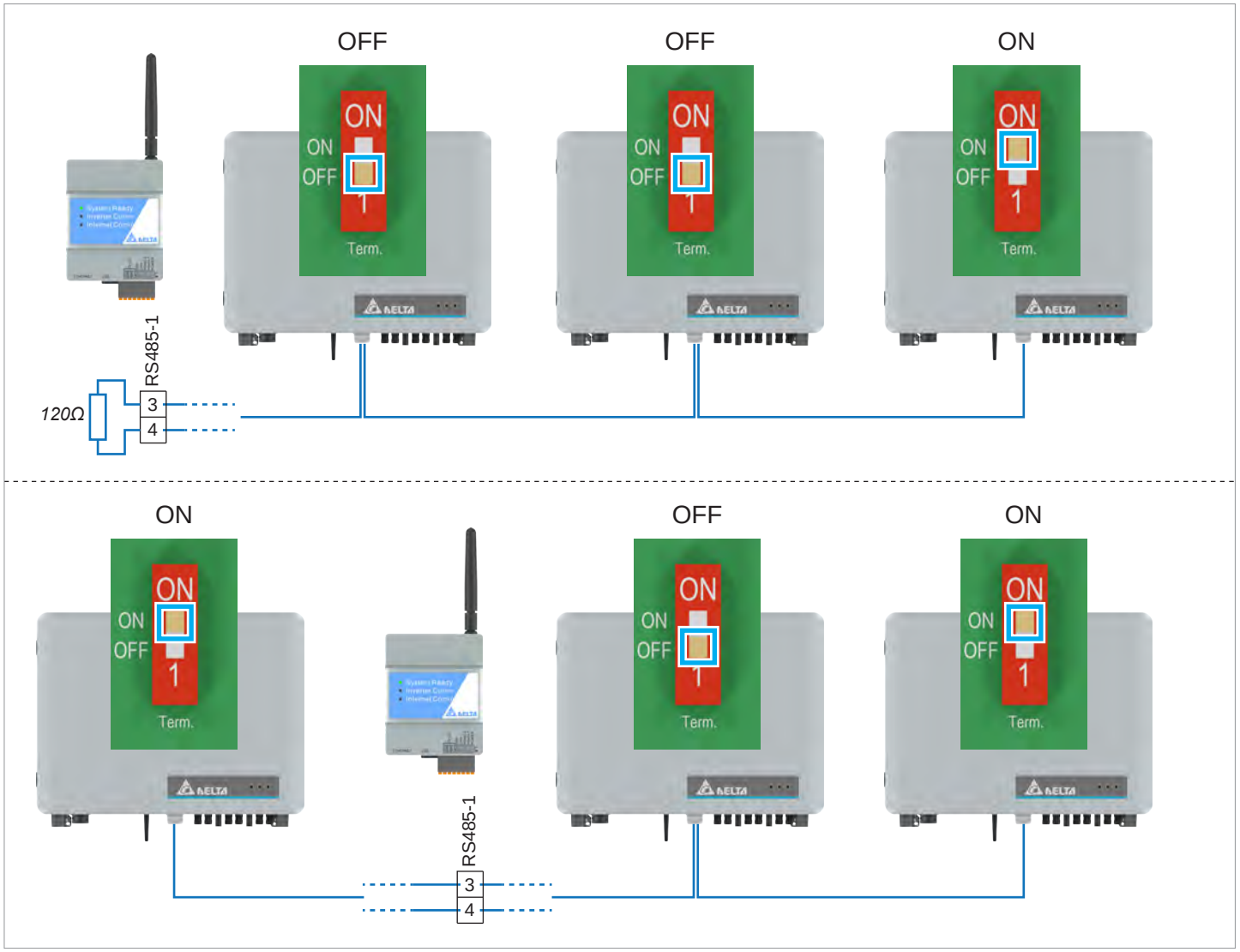


Fig. 5.19: RS485 connection diagram for a DC1 data collector with multiple inverters

5.6.6 Connecting an external alarm unit

The inverter has two relays for triggering external alarm devices. The communication card contains 2 pairs of dry contacts, each of which can be connected to an external acoustic or optical alarm device.

The communication card also has a 12 V_{DC} power supply.

Both relays are designed as normally open contacts.

After commissioning, each relay can be assigned an event at which the relay switches. By default, the relays are disabled.

To set an event for the relays, you need:

- A mobile device (smartphone, tablet) with the DeltaSolar app

or

- A Windows PC running the Delta Service Software (DSS)

The MyDeltaSolar app is available for iOS and Android.

The DSS be downloaded from https://solarsolutions.delta-emea.com/en/Solar-Inverter-Support-171.htm.

Event	Description
`Disabled`	The function is disabled.
`On Grid`	The inverter is connected to the grid.
`Fan defective`	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.

Table 5.8.: Events for which the relay can trigger

The default setting for both relays is **`Disabled`**.

5.6.7 Connecting a ripple control receiver

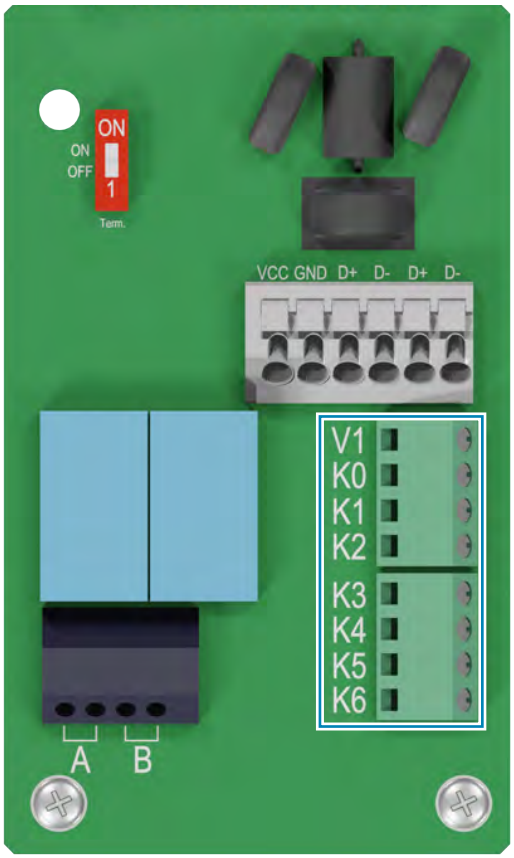


Fig. 5.20: Terminal block with digital inputs

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

The digital inputs are located on the communication card.

Pin	Naming	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

Table 5.9.: Pin assignment of the terminal block with digital inputs for connecting a ripple control receiver

5.6.8 External power-off

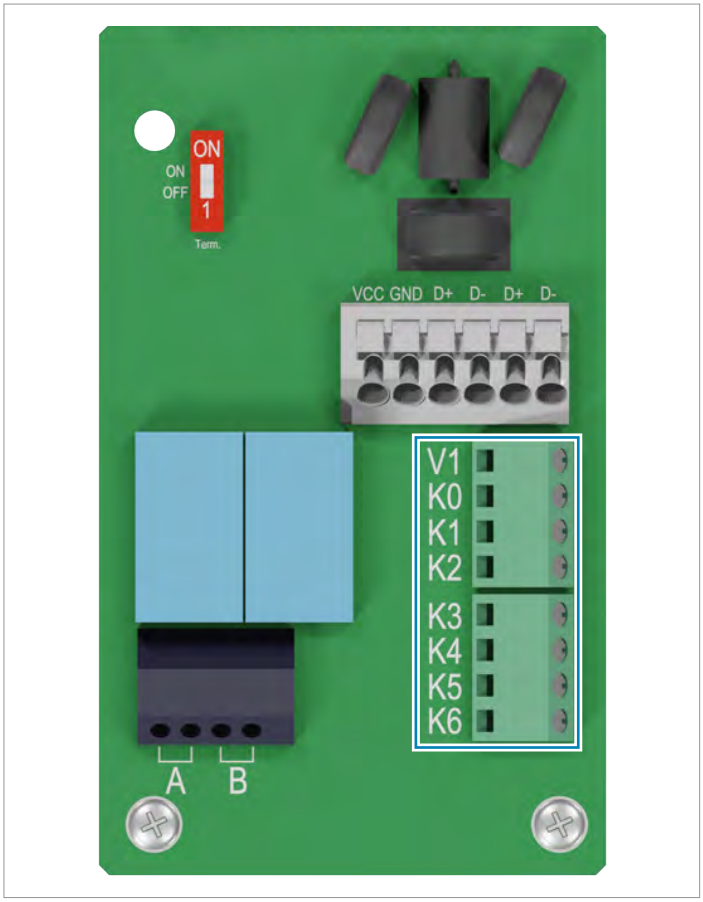


Fig. 5.21: Terminal block with digital inputs

To disconnect the inverter AC-side from the grid connection point, a switching signal can be sent via an external monitoring unit using the digital input K0.

The relay is designed at the factory as a normally open contact. The relay can also be set as an normally closed contact in the inverter settings.

The connection for external disconnection is located on the terminal block with the digital inputs of the communication card.

Pin	Naming	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

Table 5.10.: Pin assignment of the terminal block for the external power-off

5.6.9 Connecting a PC

You can use the PC to commission the inverter and change all settings and parameters.

The Delta Service Software (DSS) is available for this purpose.

Download link: https://solarsolutions.delta-emea.com/en/Solar-Inverter-Support-171.htm

Options for connecting the PC to the inverter:

- Via the RS485 terminal block on the communication card of the inverter
- Via Wi-Fi

To connect the PC via RS485, you will need: A **USB/RS485 adapter**.

5.7 Grid and system protection

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

This inverter meets the requirement in (2). An external coupling switch is not required.

6. Planning the Commissioning

6.1 Introduction

Once the inverter has been installed and all electrical connections (to the grid, to the solar modules, communication) have been set up, the inverter can be commissioned.

In order to allow you to plan commissioning on site, the various commissioning methods are briefly described in this chapter.

6.2 Commissioning options

6.2.1 Delta Service Software (DSS)

The Delta Service Software is available for Windows PCs.

Options for connecting a PC to the inverter:

- Via the RS485 terminal block on the communication card of the inverter

You can set all inverters on the RS485 bus at the same time.

The DSS enables you to:

- Set all parameters of the inverter.
- Update the firmware

Download link: https://solarsolutions.delta-emea.com/en/Solar-Inverter-Support-171.htm

6.2.2 Smartphone with MyDeltaSolar app with direct connection to the inverter via Wi-Fi

The MyDeltaSolar app is available for smartphones with iOS or Android.

The mobile device is connected directly to the inverter via Wi-Fi (point-to-point connection).

Since this creates a point-to-point connection between the mobile device and the inverter, you must commission each inverter individually.

Features of the app:

- Commissioning the inverter.
- Setting all parameters.
- Updating the firmware.
- Registering the system in the MyDeltaSolar Cloud.

6.2.3 MyDeltaSolar app with DC1 data collector from Delta

The DC1 can connect to this inverter via RS485.

When RS485 is used, the DC1 is connected to the RS485 terminal block of one of the inverters in the RS485 series.

You can access the DC1 via the MyDeltaSolar app.

You can perform the following tasks on the inverters connected to the DC1:

- Commission all inverters at the same time.
- Set all parameters of the inverters.
- Update the inverter firmware.
- Registering the system in the MyDeltaSolar Cloud.

7. Installation

► Read chapter “5. Planning the installation”, page 26 and this chapter in full before you start installation.

7.1 Safety instructions

DANGER



Electric shock

Potentially fatal voltages are present in the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 60 seconds.
You should therefore always carry out the following steps before working on the inverter:

► Never disconnect the inverter from the solar modules when it is under load.

1. Disconnect the connection to the grid so that the inverter cannot feed energy into the grid.
2. Turn the DC isolating switch to the ***OFF*** position.
3. Disconnect the inverter from all AC and DC voltage sources. Make sure that none of the connections can be restored accidentally.
4. Wait at least 60 seconds for the internal capacitors to discharge.
5. Ensure that the DC cables cannot be touched accidentally.

DANGER



Electric shock

Potentially fatal voltages are present at the DC connections of the inverter. 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.

1. Disconnect the connection to the grid so that the inverter cannot feed energy into the grid.
2. Turn the DC isolating switch to the ***OFF*** position.
3. Disconnect the inverter from all AC and DC voltage sources. Make sure that none of the connections can be restored accidentally.
4. Wait at least 60 seconds for the internal capacitors to discharge.
5. Ensure that the DC cables cannot be touched accidentally.

DANGER



Electric shock

The inverter has a high leakage current value.

► **Always** connect the ground cable first, then the AC and DC cables.

WARNING



Electric shock

If the doors of the inverter are open, the IP66 degree of protection is no longer guaranteed.

► Only open the door when absolutely necessary.
► Do not open the door if water or dirt might enter the inverter.
► After work is completed, ensure that the door is properly shut and tightened again. Check that the door is properly sealed.
► The inverter does **not** need to be opened for standard installation.

WARNING



Heavy weight

The inverter is heavy.

► Lift and carry the inverter with at least 2 people.

NOTICE



Water ingress.

► All sealing caps removed during installation should be stored for later use (for example, transportation or storage).

NOTICE



Working in freezing conditions

In frosty conditions, the rubber seal of the front door can freeze to the enclosure, tear when opened and thus become leaky.

► Before opening the front door, defrost the rubber seal with some warm air.

► Open the front door slowly.



Use insulated tools.

7.2 Sequence of installation and commissioning steps

7.2.1 General information

Ideally, install optional internal accessories in a dry environment. If the inverter is installed outdoors, this is done on the



Install optional internal accessories such as type 1+2 AC and DC combined surge protection devices ideally before mounting the inverter.

Step	Notice	Description in chapter
Mounting the inverter		“7.3 Mounting the inverter”, page 50
Grounding the inverter housing		“7.4 Grounding the inverter housing”, page 52
Connecting the communication card	Optional	“7.5 Connecting the communication card”, page 54
Connecting the PC to the inverter	This step is only necessary if commissioning is carried out via PC.	“7.5.8 Connecting a PC via RS485 (optional)”, page 61
Connecting the grid (AC)		“7.6 Connecting the grid (AC)”, page 63
Connecting the solar modules (DC)		“7.7 Connecting the solar modules (DC)”, page 66
Commissioning the inverter		“8. Commissioning”, page 68

7.3 Mounting the inverter

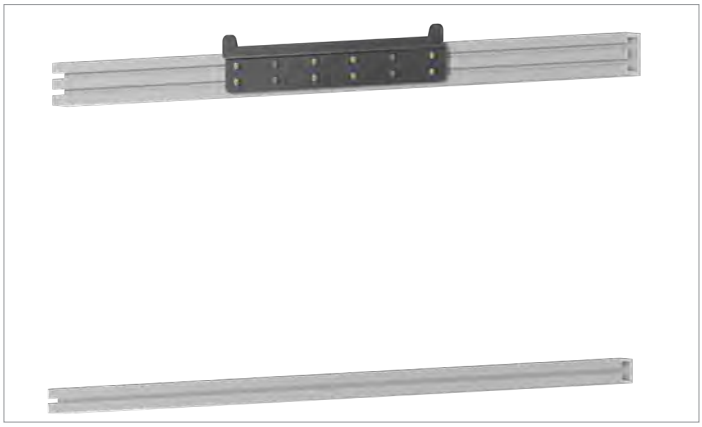
WARNING



Heavy weight
The inverter is heavy.
► Lift and carry the inverter with at least 2 people.



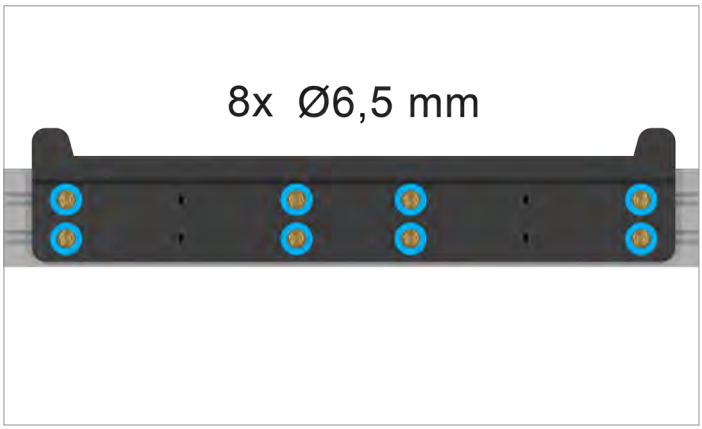
Always check with Delta Customer Service **first** if you want to deviate from the work instructions given in this section.



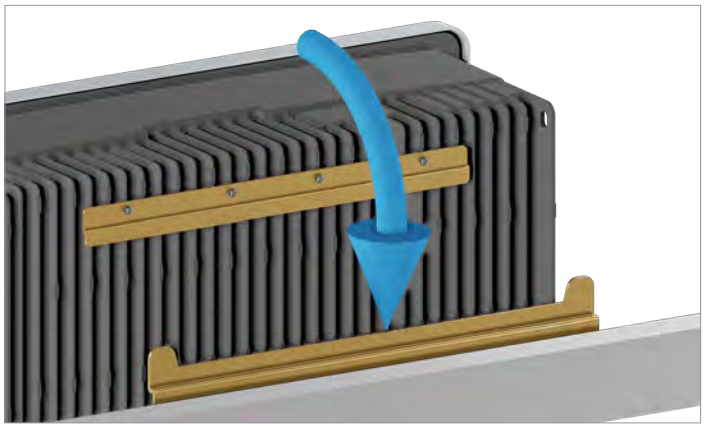
1. Attach the mounting plate to the wall/mounting system using one of the options shown below.



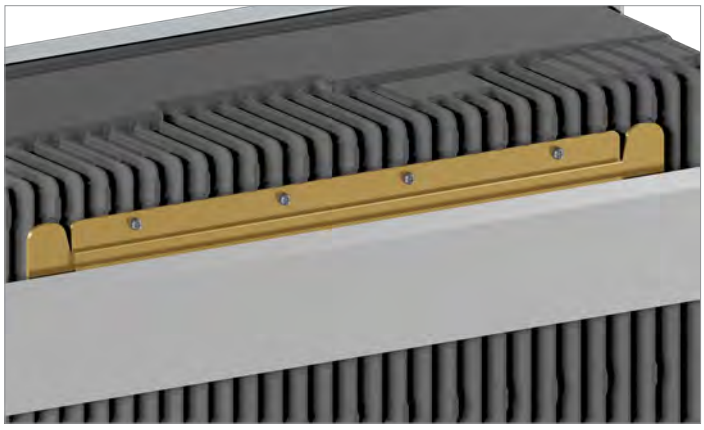
Option 1: Attach with at least **6** screws



Option 2: Attach with at least **8** screws

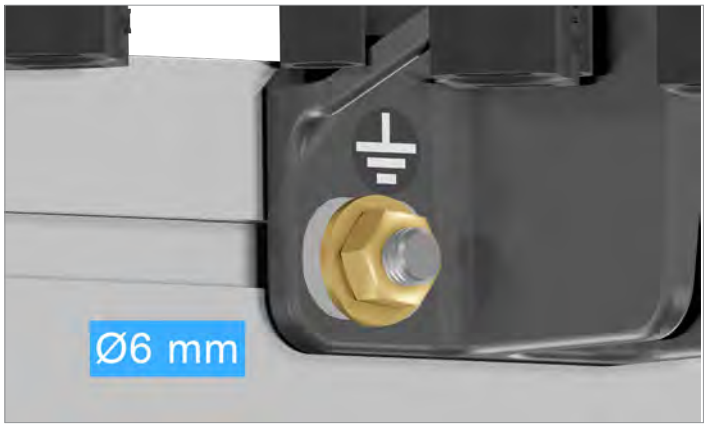


2. Mount the inverter on the mounting plate.



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





4. Screw the lower left and right sides of the inverter onto the wall or mounting system using one screw, spring washer and washer on each side.

7.4 Grounding the inverter housing

WARNING

High current

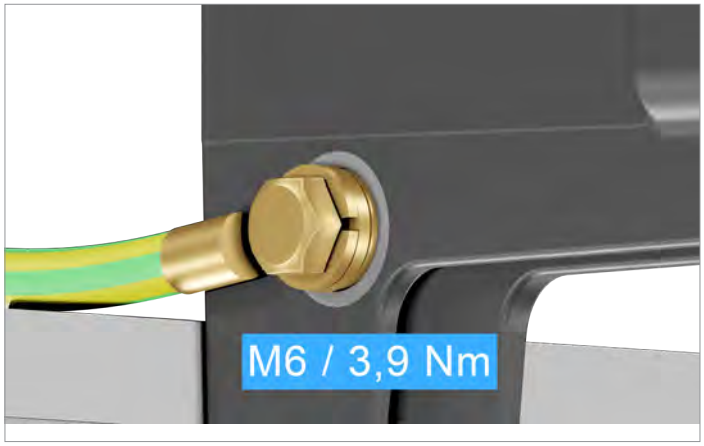
- ► Always observe the local regulations relating to grounding cable requirements.
- ► To increase the safety of the system, always ground the inverter housing even when this is not required by the local regulations.
- ► Always ground the inverter housing **before** connecting the inverter to the grid and the solar modules.
- ► The grounding cable cross-section must be at least 6 mm².

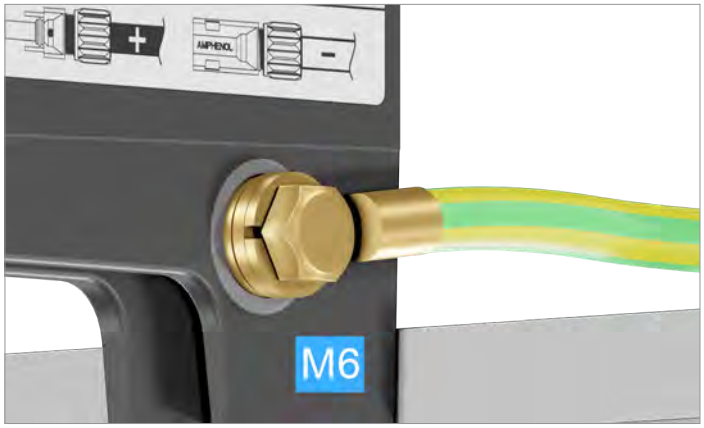
DANGER

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**!





1. Screw the ground cable to the lower left side or lower right side of the ground connection (torque: 3.9 Nm). This requires an M6 screw, spring washer and washer. A toothed washer is **not** required.

2. Perform a continuity check of the grounding connection.
   → If there is not a sufficiently conductive connection, clean the contact surface on the grounding screw or use a toothed washer if necessary.

7.5 Connecting the communication card

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

NOTICE

Water ingress.
► All sealing caps removed during installation should be stored for later use (for example, transportation or storage).

7.5.1 Connections on the communication card

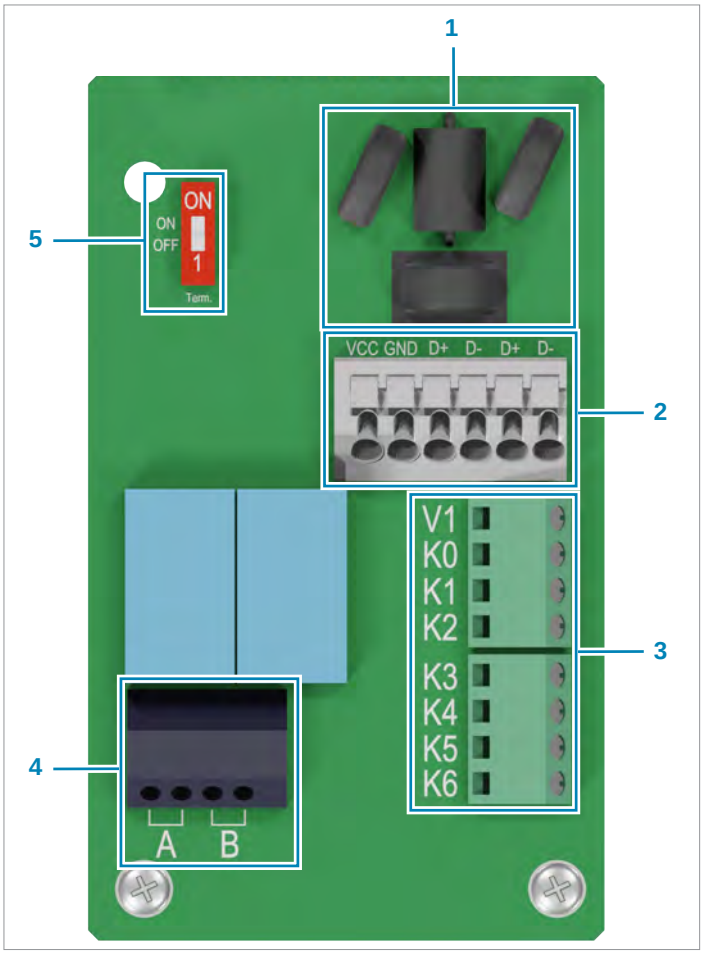


Fig. 7.1: Components of the communication card

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

Connection	Connector type
2 x RS485 (DATA+ and DATA–)	Terminal block
1 x VCC (12 V, 0.5 A)	Terminal block
6 x digital inputs	Terminal block
2 x dry contacts	Terminal block
1 x external power-off (EPO)	Terminal block

Table 7.1.: Connections on the communication card

Cable type	Shielded and twisted pair cable (CAT5 or CAT6)
Cable diameter	7.2 to 10 mm
Wire cross section	0.25 ... 1.5 mm²

Table 7.2.: Specification of the communication cable

Cable type	Shielded and twisted pair cable (CAT5 or CAT6)
Cable diameter	2 x 7.2 / 8 / 10 mm
Wire cross section	0.25 ... 1.5 mm²

Table 7.3.: Specification of the communication cable

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

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

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

7.5.2 Threading the communication cable



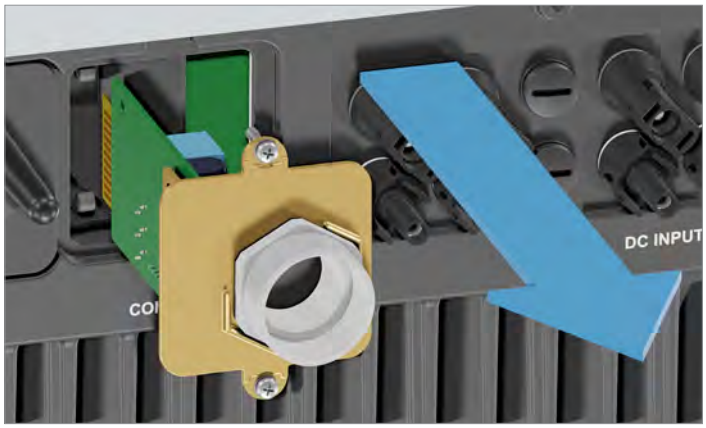
1. Unscrew the cable gland of the communication connection and remove the cable gland and seal.





The communication card is screwed on to the cover!

2. Unscrew the communication card cover and carefully pull out the communication card.



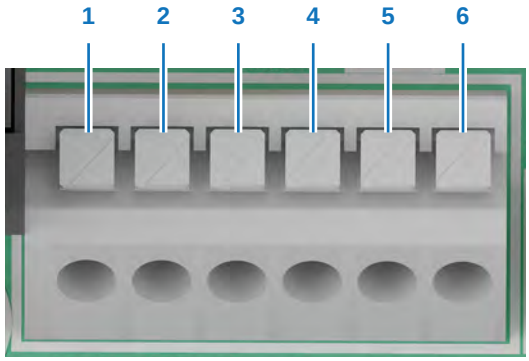
7.5.3 Connecting a data logger via RS485

7.5.3.1 Introduction

NOTICE

Unwanted currents.
In some installation variants, unwanted currents can flow when multiple inverters are connected via RS485.
► Do not use GND and VCC.

Terminal assignment 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)

Fig. 7.2: Terminal assignment of the RS485 terminal block

Terminal pair 3/4 or 5/6 can be used to connect a data logger. The second terminal pair is only required when connecting several inverters via RS485. The second terminal pair can also be used to connect a PC.

Data format

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

DIP switch for the RS485 termination resistor



Fig. 7.3: DIP switch for the RS485 termination resistor

RS485 connection diagram for a single inverter

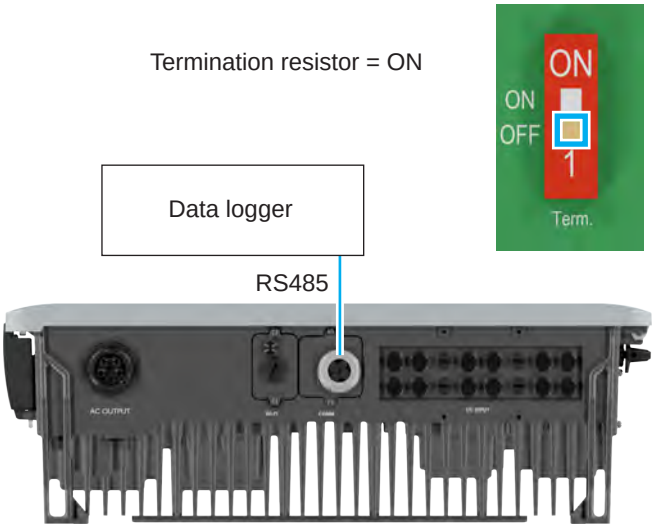


Fig. 7.4: RS485 connection diagram for a single inverter

RS485 connection diagram for multiple inverters

If you are using a DC1 data collector from Delta, also refer to the notes in the next section.

- ► On the last inverter in the RS485 bus, set the DIP switch of the RS485 termination resistor to ***ON***.
- ► If the data logger is located at one end of the RS485 chain, then also switch on the RS485 termination resistor of the data logger. If the data logger does not have an integrated RS485 termination resistor, then also switch on the DIP switch of the first inverter in the RS485 series, i.e. the one that is directly connected to the data logger.
- ► Set a different inverter ID at each inverter during commissioning of the inverters.

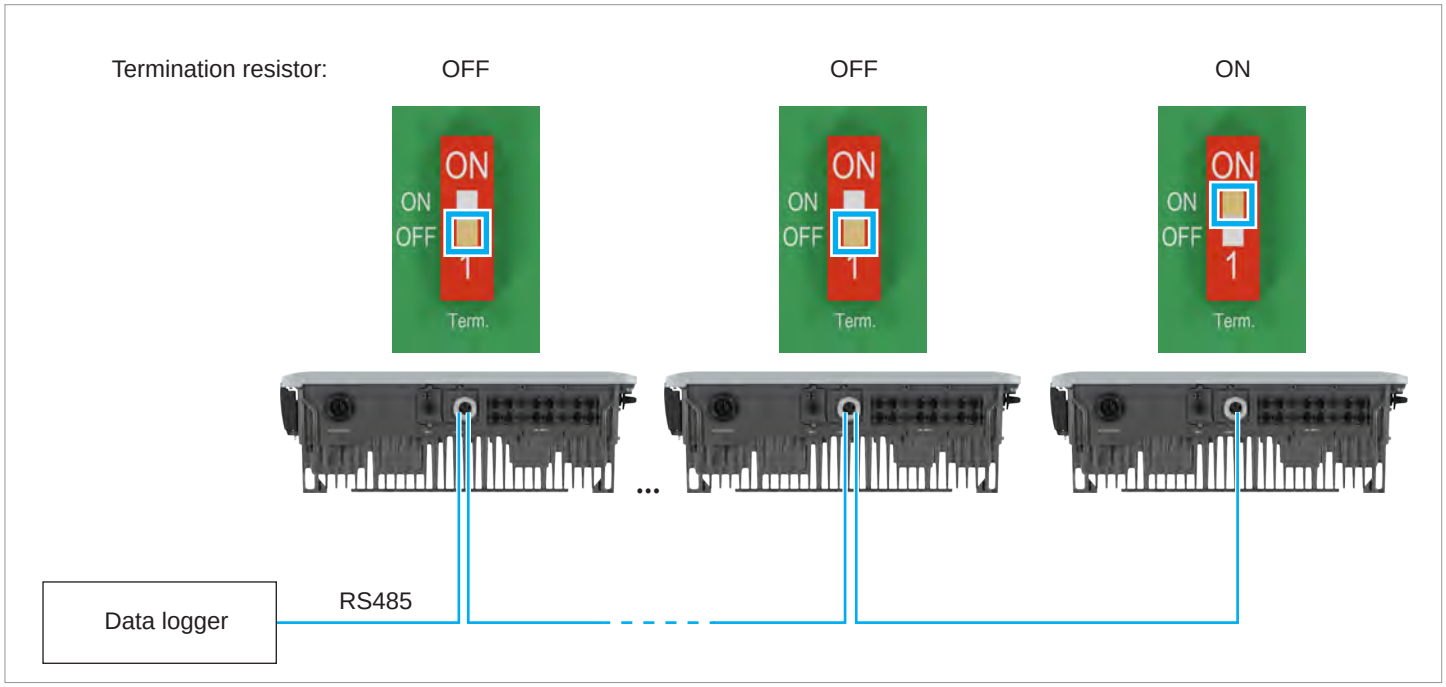


Fig. 7.5: RS485 connection diagram for several inverters

7.5.4 Connection of a DC1 data collector via RS485

7.5.4.1 Connecting multiple inverters

The DC1 data collector from Delta does not have an integrated RS485 termination resistor. Depending on where the DC1 is located in the RS485 bus, an external RS485 termination resistor may need to be connected, see Fig. 7.6, p. 58.

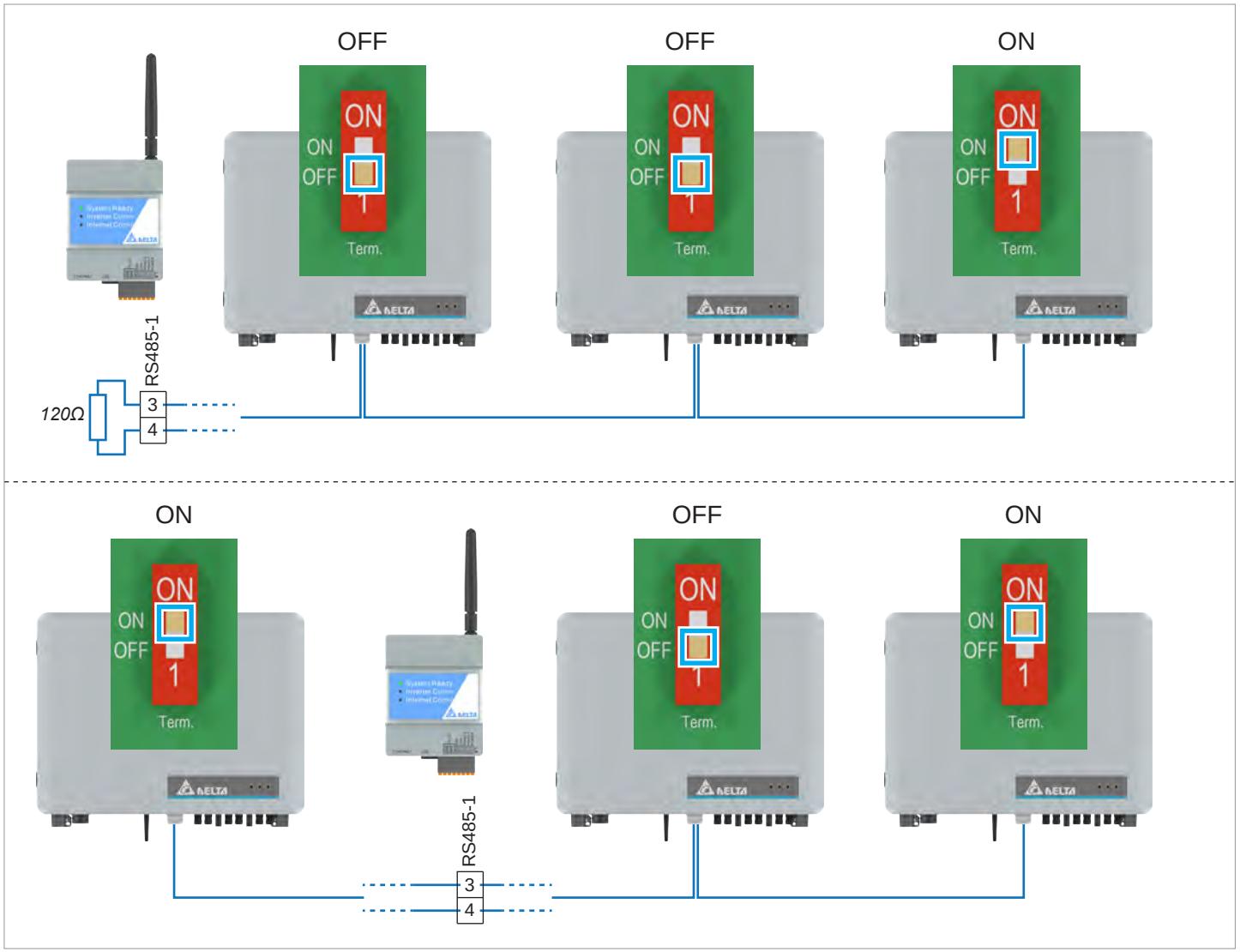


Fig. 7.6: RS485 connection diagram for a DC1 data collector with multiple inverters

7.5.5 Connecting an external alarm unit

The external alarm unit is connected to the dry contacts.

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

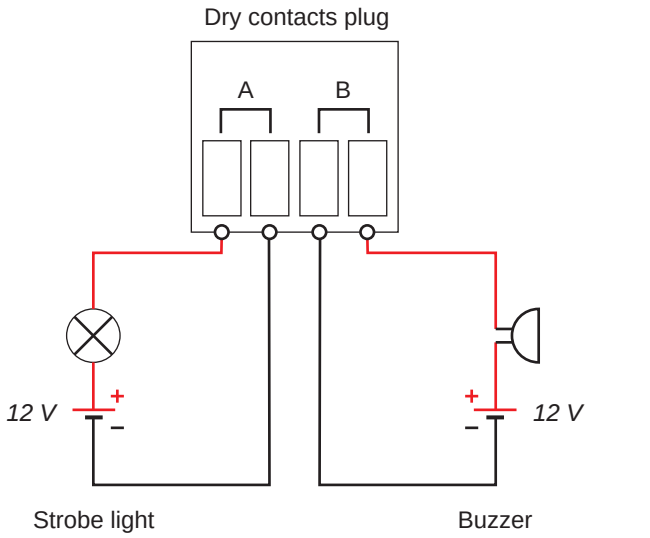


Fig. 7.7: Connection for an external alarm unit with an external 12 V_{DC} power supply

► An event can be assigned to the dry contacts with Delta Service Software or the MyDeltaSolar app after commissioning.

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

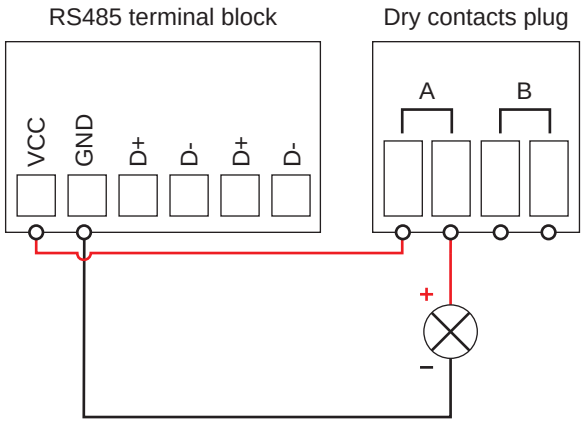


Fig. 7.8: Connection for an external alarm unit with an internal 12 V_{DC} power supply

► An event can be assigned to the dry contacts with Delta Service Software or the MyDeltaSolar app after commissioning.

7.5.6 Connecting a ripple control receiver

Pin	Naming	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

Table 7.4.: Pin assignment of the terminal block with digital inputs for connecting a ripple control receiver

Connection schema

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

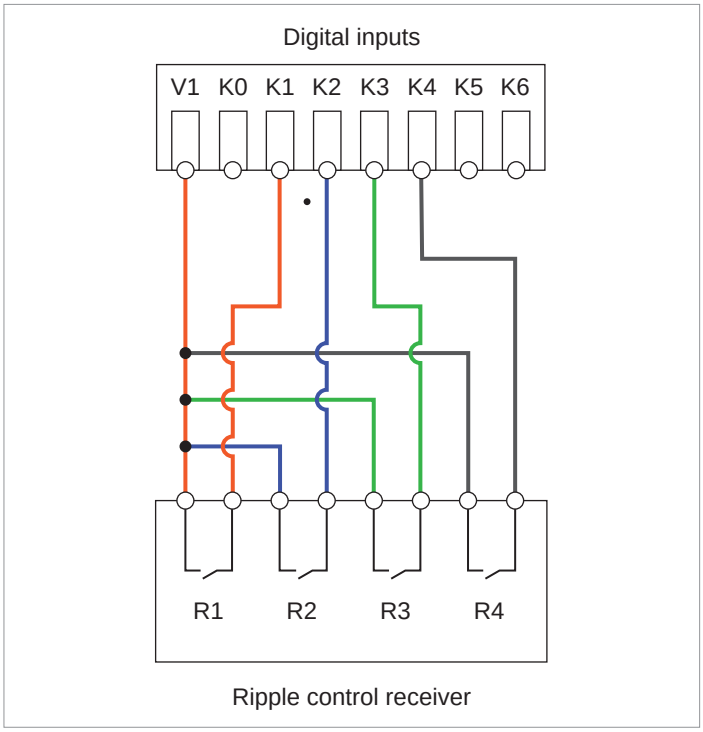


Fig. 7.9: Connection diagram for a ripple control receiver

7.5.7 Connecting the external power-off (EPO)

Pin assignments

Pin	Naming	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

Table 7.5.: Pin assignment of the terminal block for the external power-off

1. Connect the wires to the terminals V1 and K0.
2. After commissioning, the relay for the external power-off can be defined with Delta Service Software as a normally closed or normally open contact.

7.5.8 Connecting a PC via RS485 (optional)

Please note that after commissioning, you must reset the protocol to SUNSPEC and disconnect the PC from the inverter again!

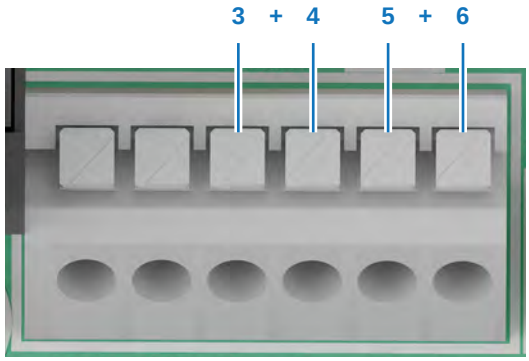
Alternatively, you can connect the PC to the inverter via Wi-Fi:

“6. Planning the Commissioning”, page 46

“8. Commissioning”, page 68

Accessories	Description
Standard USB/RS485 adapter	For connecting the PC to the inverter.
Delta Service Software (DSS)	For changing the inverter settings.

You can download the DSS at https://solarsolutions.delta-emea.com.



You can use terminal pairs 3+4 or 5+6 to connect the PC.

DATA+	Terminal 3 or 5
DATA–	Terminal 4 or 6

Cable requirements

Bell wire. Both ends open.

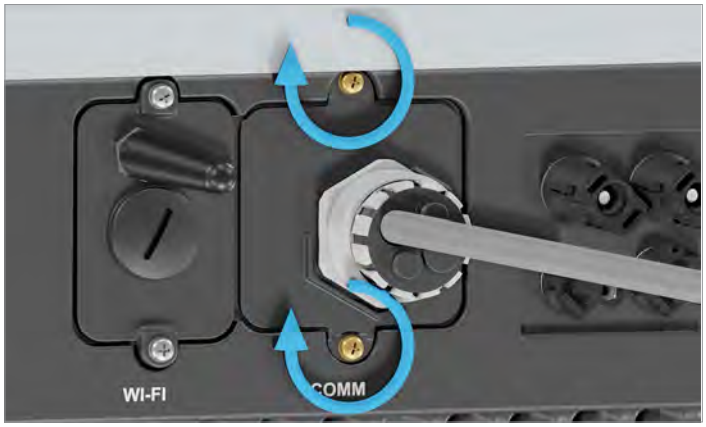
7.5.9 Reinstalling the communication card



1. Thread the communication cable through the cable gland and seal.



2. Thread all communication cables through the cable gland and seal.



3. Insert the communication card and screw it in place.



4. Tighten the cable gland.

7.6 Connecting the grid (AC)

► Always observe the information in section “5.4 Planning the grid connection (AC)”, page 32!



Fig. 7.10: AC connection

7.6.1 AC cable specifications

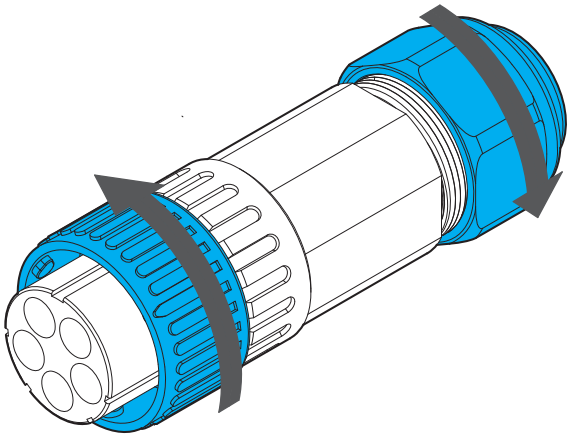
NOTICE

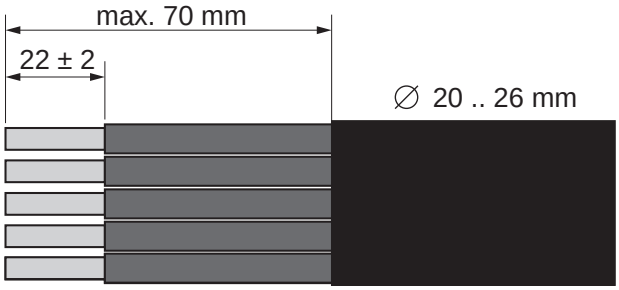
The AC plug is only approved for copper cables. Aluminum cables must not be used.

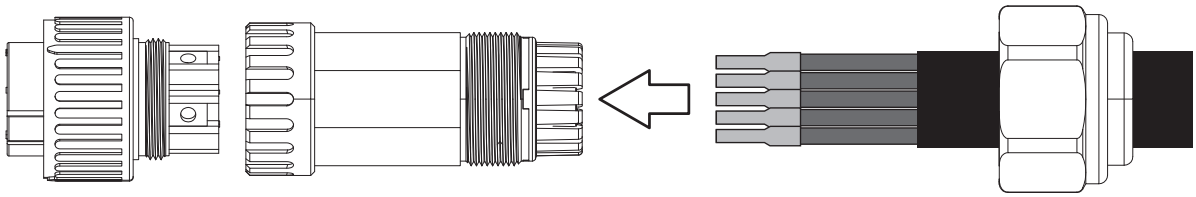
Cable diameter	20 to 26 mm
Min./max. Wire cross section	
Without wire end sleeve	
• Rigid cable	4 to 25 mm²
• Multi-wire cable	4 to 25 mm²
With wire end sleeve	
• Fine-wire cable	2.5 to 16 mm²
Cables	Copper (rigid, multi-wire, fine-wire)

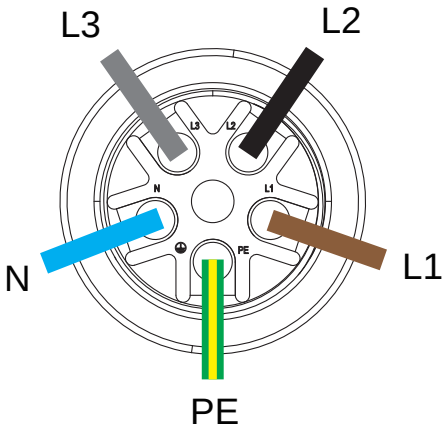
Table 7.6.: AC cable specifications

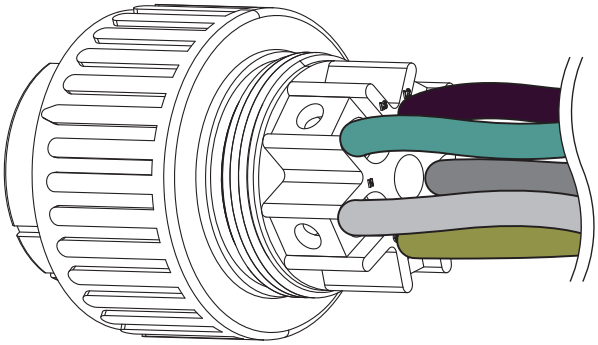
7.6.2 Wire the AC plug

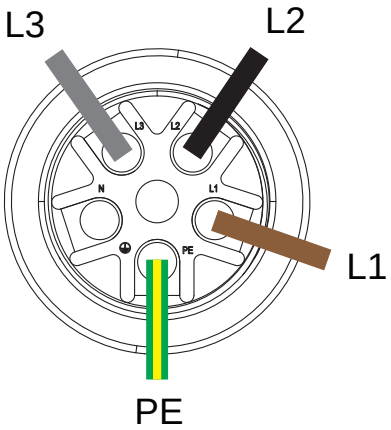


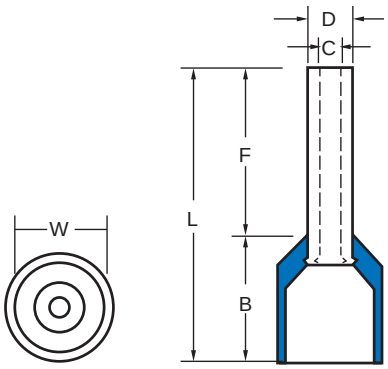












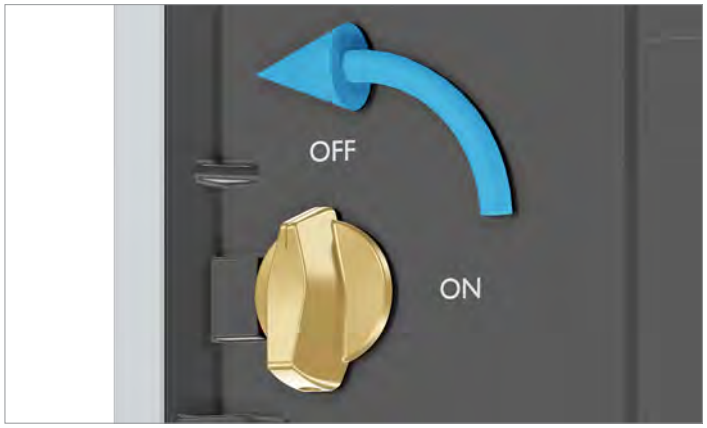
Cu 16 mm²	
L	28 mm
F	18 mm
B	10 mm
ØC	5,8 mm
ØD	6,2 mm
ØW	8,7 mm

7.6.3 Connecting the AC cables

There is normally an isolating switch (for example in an equipment wiring box) between the inverter and the grid connection box and between the inverter and the solar modules. This isolates the inverter from all the AC and DC voltage sources and renders it de-energized.

1. To ensure that no voltage can be applied to the inverter during installation work, open the isolating switches between the inverter and the grid connection point and between the inverter and the solar modules.

   Secure all the isolating switches to prevent them from being switched back on accidentally.



2. Turn the DC isolating switch to the ***OFF*** position.



3. Screw on the AC plug.

7.7 Connecting the solar modules (DC)

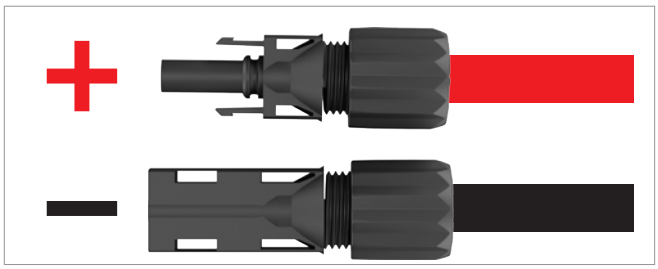
Always use the supplied mounting tools to open the DC connectors.

When disconnecting the DC cables, take care not to damage the connectors.

Do not use force.

Pull out at the DC connector, **not** at the DC cable.

► Check the polarity of the DC voltage of the DC strings before connecting the solar modules.



The inverter has an integrated function for detecting reverse polarity on the DC side. If such reverse polarity is detected, the inverter triggers an error message. This error message is indicated by the ***ALARM*** LED as soon as the inverter is switched on.

Special tools required

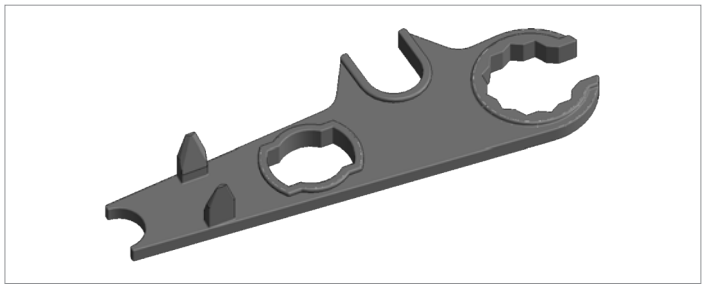


Fig. 7.11: Mounting tools for DC connectors (included in delivery)



1. Pull out the cover caps of the DC connections.



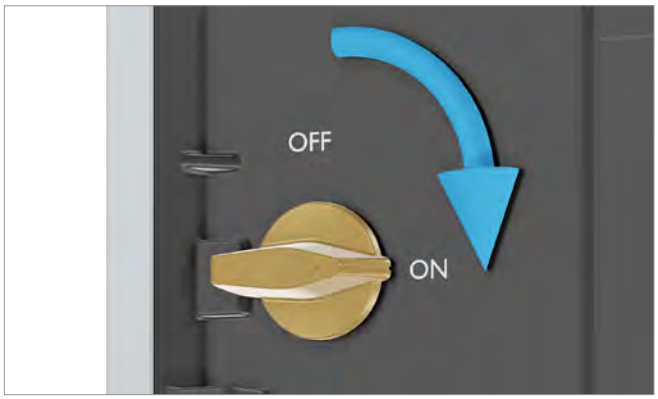
2. Plug in the DC cables.

8. Commissioning

8.1 General prerequisites for commissioning

All inverters are supplied with AC or DC voltage.

► Turn the DC isolating switch to the ***ON*** position.



8.2 Commissioning with a Windows PC and the Delta Service Software (DSS)

Prerequisites

- The PC is connected to one of the inverters in the RS485 bus via a USB/RS485 adaptor.

  or:

- The PC is connected to a single inverter via Wi-Fi. If several inverters are installed in your system, you must commission each inverter individually.

  and

- The Delta Service Software (DSS) is installed on the PC. Download from: https://solarsolutions.delta-emea.com/en/Solar-Inverter-Support-171.htm

Prerequisites

► Start the DSS and follow the instructions.

8.3 Commissioning with the DeltaSolar app

8.3.1 Direct connection between smartphone and inverter

Prerequisites

The DeltaSolar app is installed on your smartphone.

Procedure

1. Launch the DeltaSolar app.
2. Follow the instructions in the app to connect your smartphone device to the inverter.
3. Once the connection is established, follow the instructions in the commissioning procedure.

8.3.2 Mobile device connected to inverter via DC1 data collector

Prerequisites

All inverters are connected to the DC1.

The DeltaSolar app is installed on your smartphone.

1. Launch the DeltaSolar app.
2. Follow the instructions in the DeltaSolar app to connect your smartphone to the DC1.
3. Once the connection is established, follow the instructions in the commissioning procedure.

8.4 Completing the commissioning process

DANGER



Electric shock

Potentially fatal voltages are present in the inverter during operation.

► If the inverter is installed in a location to which children or other persons in need of protection have access, do not store the Allen key to open the front door on or near the inverter.

9. Error events and troubleshooting

9.1 Safety instructions

DANGER



Electric shock

Potentially fatal voltages are present in the inverter during operation.

- ► **Before carrying out any** work on the inverter, carry out the work steps described in the chapter “10. Disconnecting the inverter from the power supply before working on it”, page 74!
- ► **To complete all** work on the inverter, carry out the work steps described in the chapter “12. Recommissioning the inverter after work”, page 97.

9.2 Error

Error number	Description	Suggestions for resolution
E01	Mains frequency lies above the ***OFR*** setting (overfrequency detection).	Check the grid frequency.
	Incorrect country or grid type setting.	Check the country and grid type settings.
E02	Mains frequency lies below the ***UFR*** setting (underfrequency detection).	Check the grid frequency.
	Incorrect country or grid type setting.	Check the country and grid type settings.
E07	Non-linear load in the grid and in the vicinity of the inverter.	The grid connection of the inverter must be kept away from non-linear loads; if necessary, move it further away.
		If this error occurs repeatedly, contact Delta Customer Service.
E08	AC cable is not connected correctly.	Check the AC cable connection.
E09	There is normally an external load isolating switch between the inverter and the mains (e.g. in an equipment terminal box). This is used to isolate the inverter from the mains and to shut off its AC voltage supply.	Check that the external load-break switch is closed.
	AC cable is not connected correctly.	Check the AC cable connection.
E10, E15, E20	Grid voltage lies below the ***UVR*** setting (undervoltage detection).	Check the grid voltage connection at the inverter terminals.
	Incorrect country or grid type setting.	Check the country and grid type settings.
	AC cable is not connected correctly.	Check that the AC cable is connected correctly.
E11, E13, E16, E18, E21, E23	Mains voltage lies above the ***OVR*** setting (overvoltage detection).	Check the grid voltage.
	Supply voltage during operation is greater than the ***OVR Langs.*** setting.	Check the grid voltage.
	Incorrect country or grid type setting.	Check the country and grid type settings.
E30	The DC input voltage is too high.	Design the module strings so that the DC input voltage is below the maximum permissible DC input voltage.
E34	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 capacity. Check the grounding of the frame with the solar modules.

9.3 Warnings

Warning number	Description	Suggestions for resolution
W01	DC input voltage is too low.	Check the DC input voltage on the inverter display. There may be insufficient solar radiation.
W07	The inverter is not delivering the expected power. This can have several causes:	
	The temperature is too high.	Check the ambient conditions (for example, air circulation).
	A power limit has been set.	Change the power limit settings.
	The "Active power control via grid frequency" function is active and has regulated the active power.	Check the grid frequency.
	The "Active power control via grid voltage" function is active and has regulated the active power.	Check the grid voltage.
	The grid voltage is too low.	Check the grid voltage.
	The solar voltage is too low or too high.	Check the solar voltage.
W08	The polarity of the DC string is reversed.	Connect the DC strings correctly.
	The string monitoring circuit is defective.	Contact Delta Customer Service.
W11	One or more fans are blocked.	Clean or replace the fans if necessary.
	One or more fans are defective.	Replace the defective fans.
	One or more fans are disconnected from the power supply.	Check the power supply connections of the fans.
W17	A lightning bolt has struck in the vicinity of the inverter and the DC surge protection devices have tripped.	Check on the inverter whether the DC surge protection devices have tripped. If yes, replace the card with the DC surge protection devices.
	One or more DC surge protection devices are defective.	Replace the card with the DC surge protection devices.
	The card containing the DC surge protection devices is not inserted correctly, fastening screws are missing or the fastening screws are not tightened correctly.	Check that the card is seated correctly. Check that there are no missing screws. Tighten all screws.
	The signal cable is not inserted correctly.	Check that the signal cable is inserted correctly.
W18	A lightning bolt has struck in the vicinity of the inverter and the AC surge protection devices have tripped.	Check on the inverter whether the DC surge protection devices have tripped. If yes, replace the card with the DC surge protection devices.
	One or more AC surge protection devices are defective.	Replace the card with the DC surge protection devices.
	The card containing the DC surge protection devices is not inserted correctly, fastening screws are missing or the fastening screws are not tightened correctly.	Check that the card is seated correctly. Check that there are no missing screws. Tighten all screws.
	The signal cable is not inserted correctly.	Check that the signal cable is inserted correctly.

9.4 Faults

Fault number	Possible causes	Suggestions for resolution
F01, F02, F03	The grid waveform is abnormal.	Contact Delta Customer Service.
	Internal error.	Contact Delta Customer Service.
F05	The ambient temperature is > 60°C.	Check the system environment.
F06, F08, F09, F10	The ambient temperature is > 90°C or < -30°C.	Check the system environment.
	Detection circuit malfunction.	Contact Delta Customer Service.
F07	The ambient temperature is < -30°C.	Check the system environment.
	Internal error.	Contact Delta Customer Service.
F13, F29	Internal error.	Contact Delta Customer Service.
F15, F16, F17	The DC input voltage is less than the minimum required DC input voltage.	Check the DC input voltage on the inverter display. There may be insufficient solar radiation.
	Internal error.	Contact Delta Customer Service.
F18, F19	The DC input voltage is less than the minimum required DC input voltage.	Check the DC input voltage on the inverter display. There may be insufficient solar radiation.
	Internal error.	Contact Delta Customer Service.
F20	Incorrect calibration.	Check the accuracy of the voltage and power.
	Internal error.	Contact Delta Customer Service.
F22	Internal error.	Contact Delta Customer Service.
F23	Internal error.	Contact Delta Customer Service.
F24	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 < 12 µF. Install an external transformer if necessary.
	Internal error.	Contact Delta Customer Service.
F26	Internal error.	Contact Delta Customer Service.
F27	Internal error.	Contact Delta Customer Service.
F28	Internal error.	Contact Delta Customer Service.
	Fault in the relay driver circuit.	Contact Delta Customer Service.
F30	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.
F31, F33, F35	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 is below the maximum permissible DC input voltage.
	Overvoltage during operation.	Contact Delta Customer Service.
	Internal error.	Contact Delta Customer Service.
F36, F37, F38, F39, F40, F41	Overvoltage during operation.	Contact Delta Customer Service.
	Internal error.	Contact Delta Customer Service.
F42	Internal error.	Contact Delta Customer Service.
F43	Internal error.	Contact Delta Customer Service.
F44	Internal error.	Contact Delta Customer Service.

Fault number	Possible causes	Suggestions for resolution
F45	Line harmonics.	Check the grid waveform. The grid connection of the inverter must be kept away from non-linear loads; if necessary, move it further away.
	Internal error.	Contact Delta Customer Service.
F50	Internal error.	Contact Delta Customer Service.
F60, F61, F70, F71	Internal error.	Contact Delta Customer Service.

10. Disconnecting the inverter from the power supply before working on it

10.1 Safety instructions

DANGER



Electric shock

Potentially fatal voltages are present in the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 60 seconds.
You should therefore always carry out the following steps before working on the inverter:

► Never disconnect the inverter from the solar modules when it is under load.

1. Disconnect the connection to the grid so that the inverter cannot feed energy into the grid.
2. Turn the DC isolating switch to the ***OFF*** position.
3. Disconnect the inverter from all AC and DC voltage sources. Make sure that none of the connections can be restored accidentally.
4. Wait at least 60 seconds for the internal capacitors to discharge.
5. Ensure that the DC cables cannot be touched accidentally.

DANGER



Electric shock

Potentially fatal voltages are present at the DC connections of the inverter. 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.

1. Disconnect the connection to the grid so that the inverter cannot feed energy into the grid.
2. Turn the DC isolating switch to the ***OFF*** position.
3. Disconnect the inverter from all AC and DC voltage sources. Make sure that none of the connections can be restored accidentally.
4. Wait at least 60 seconds for the internal capacitors to discharge.
5. Ensure that the DC cables cannot be touched accidentally.

DANGER



Electric shock

The inverter has a high leakage current value.

► **Always** connect the ground cable first, then the AC and DC cables.

WARNING



Electric shock

The IP66 protection degree is no longer guaranteed when the door is open.

► Only open the door when absolutely necessary.

► Do not open the door if water or dirt might enter the inverter.

► After work is completed, ensure that the door is properly shut and tightened again. Check that the door is properly sealed.

WARNING



Heavy weight

The inverter is heavy.

► Lift and carry the inverter with at least 2 people.

WARNING



Hot surfaces

The surface of the inverter can get very hot during operation.



- Always wear safety gloves when touching the inverter.



All work described in this section must only be carried out by electrical installers who are trained and approved for work on grid-connected solar inverters.

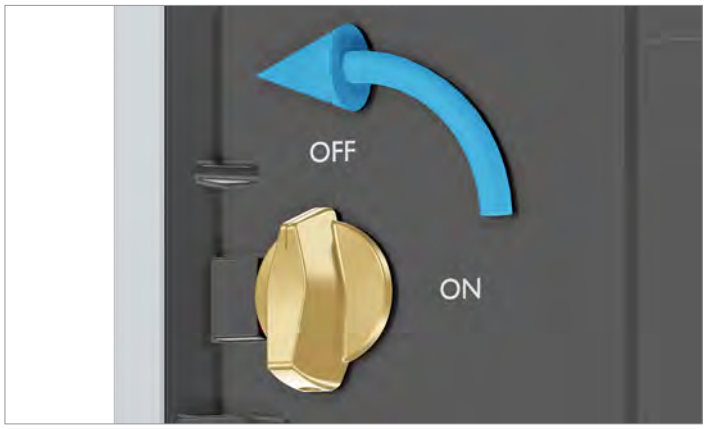


Use insulated tools.

10.2 Procedure

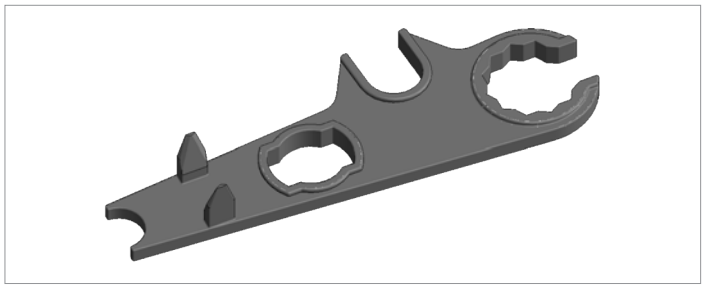
1. To shut off the inverter at the grid, open the load-break switch between the inverter and the grid connection point.

   Secure the load-break switch to prevent it from being switched back on.



2. Turn the DC isolating switch to the ***OFF*** position.

3. Wait at least 60 seconds until the internal capacitors have discharged.

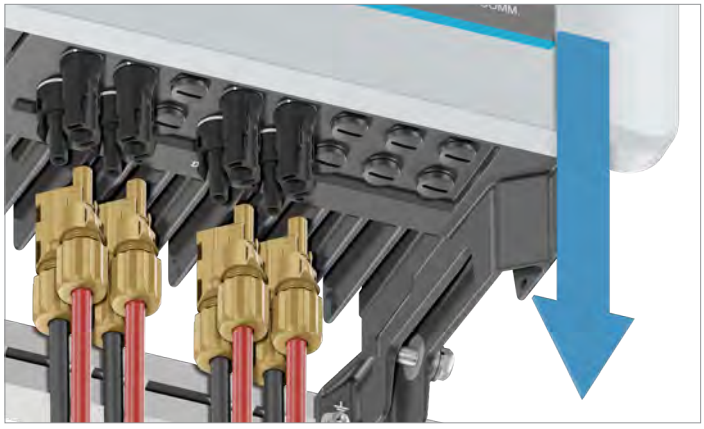


Always use the supplied mounting tools to open the DC connectors.

When disconnecting the DC cables, take care not to damage the connectors.

Do not use force.

Pull out at the DC connector, **not** at the DC cable.



4. Use the mounting tool to release the DC cables and then pull them out.

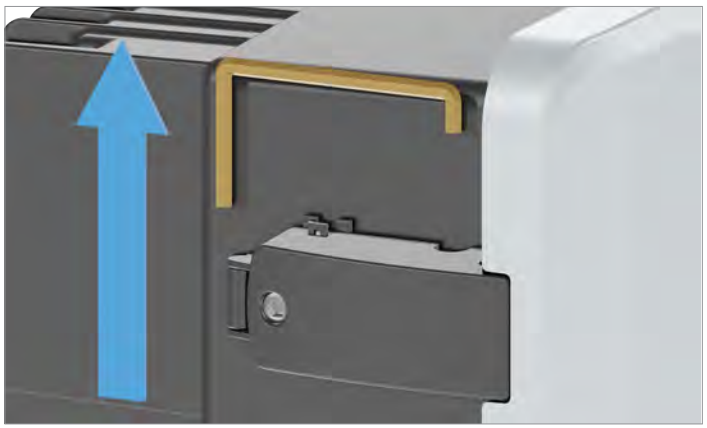
10 Disconnecting the inverter from the power supply before working on it

Procedure

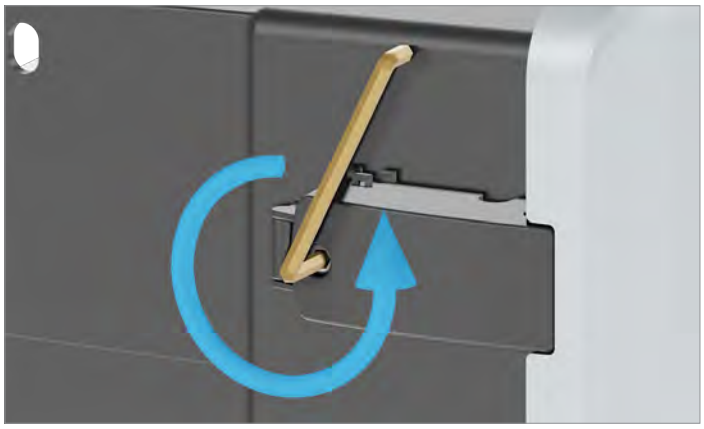




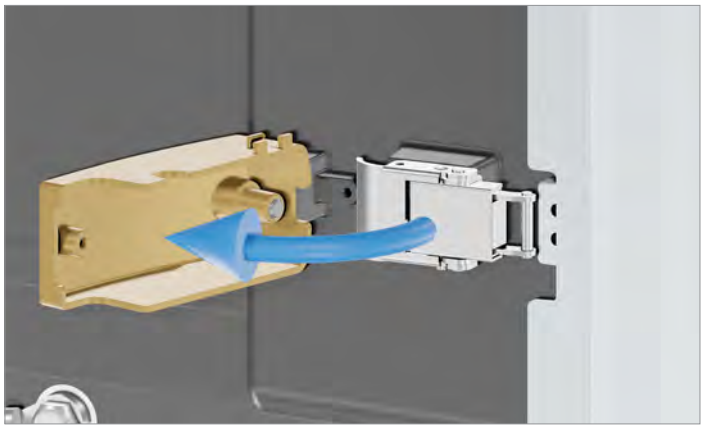
5. Unscrew and unplug the AC plug.

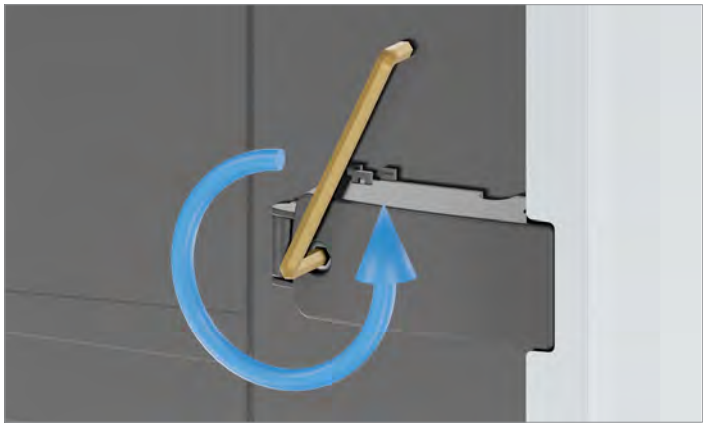


6. Remove the Allen key from the upper door lock.

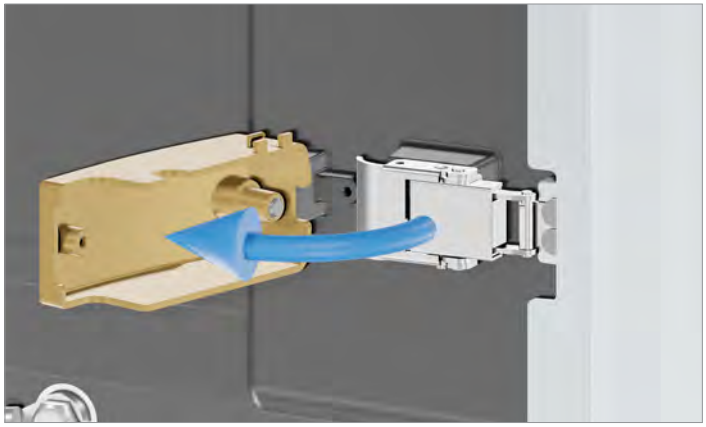


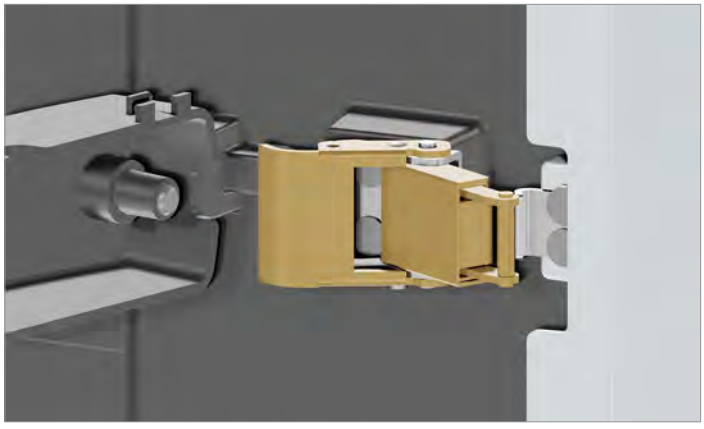
7. Unscrew and open the upper door lock cover.





8. Unscrew and open the lower door lock cover.

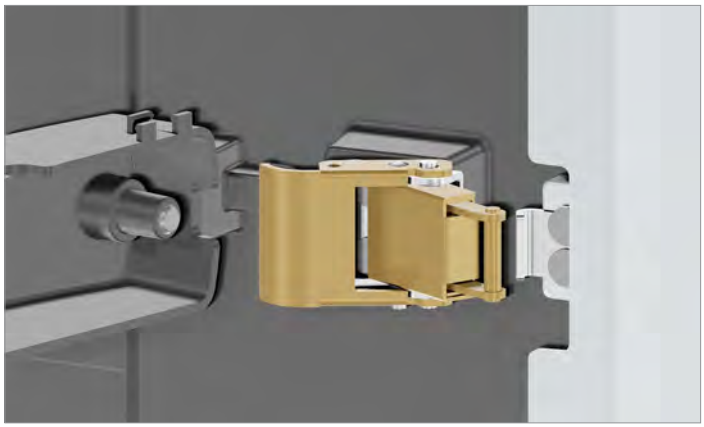




9. Open the upper and lower door lock.

10 Disconnecting the inverter from the power supply before working on it

Procedure





10. Open the door and secure it on top with the Allen key.

11. Maintenance

DANGER



Electric shock

Potentially fatal voltages are present in the inverter during operation.

- ► **Before carrying out any** work on the inverter, carry out the work steps described in the chapter “10. Disconnecting the inverter from the power supply before working on it”, page 74!
- ► **To complete all** work on the inverter, carry out the work steps described in the chapter “12. Recommissioning the inverter after work”, page 97.

Summary

11.1 Clean/replace internal fan 1 81

11.2 Clean/replace internal fan 2 86

11.3 Replacing DC surge protection devices 91

11.4 Replacing the AC surge protection devices 94

11.1 Clean/replace internal fan 1

DANGER

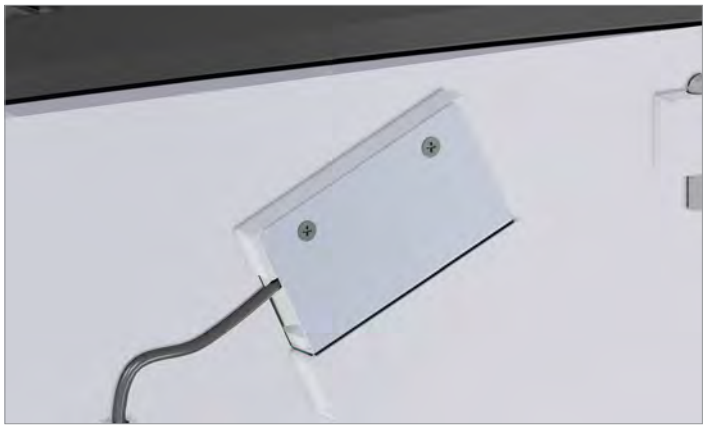
Electric shock
Potentially fatal voltages are present in the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 60 seconds.

► Perform the instructions listed in chapter “10. Disconnecting the inverter from the power supply before working on it”, page 74**before** you start work on the inverter!

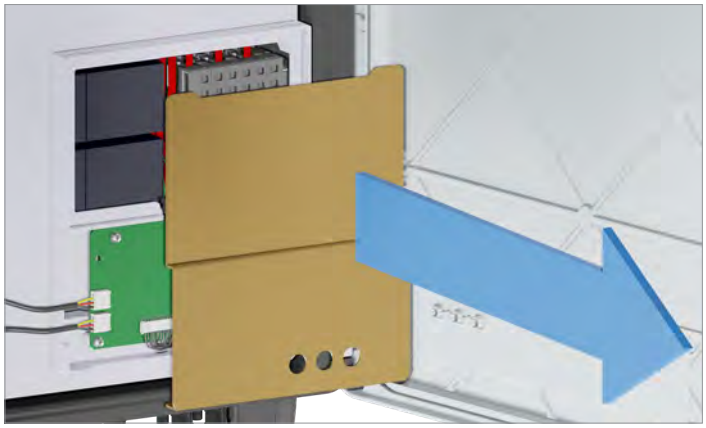
Do not use any sharp, pointed or hard objects for cleaning.

Do not use liquids for cleaning.

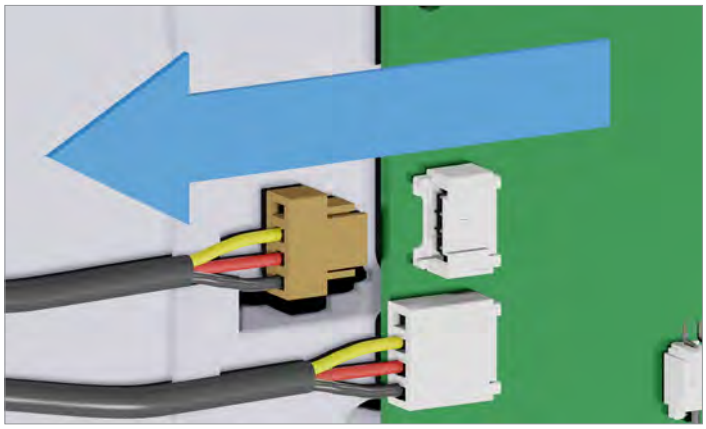
The screws are very small and can easily fall down. You should therefore use a magnetic screwdriver.



Position of internal fan 1



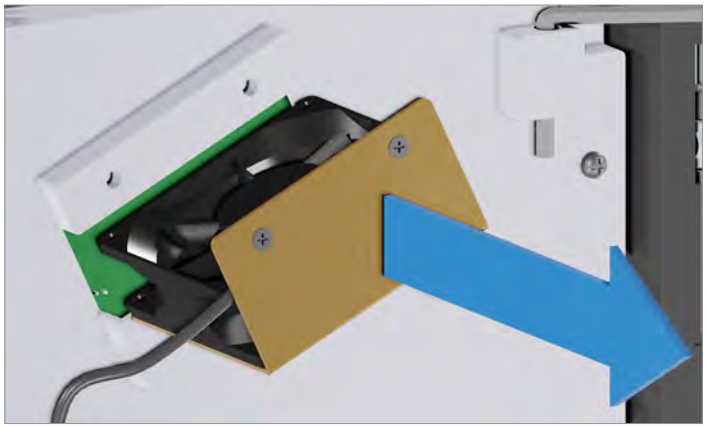
1. Remove the cover from the DC surge protection devices. The power supply connections for the internal fans are behind this cover.

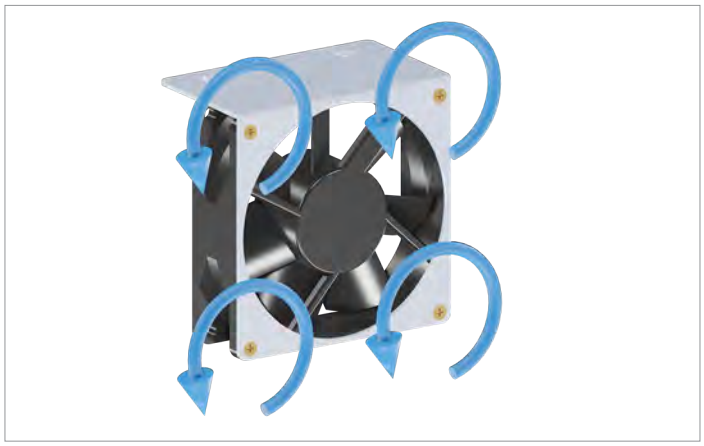


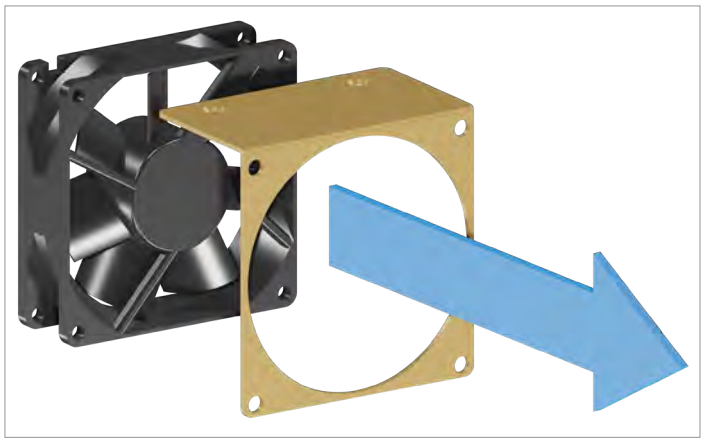
2. Pull out the power supply cable plug.

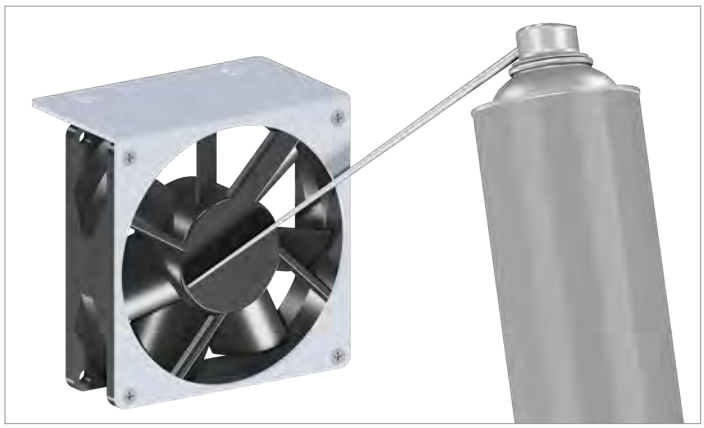


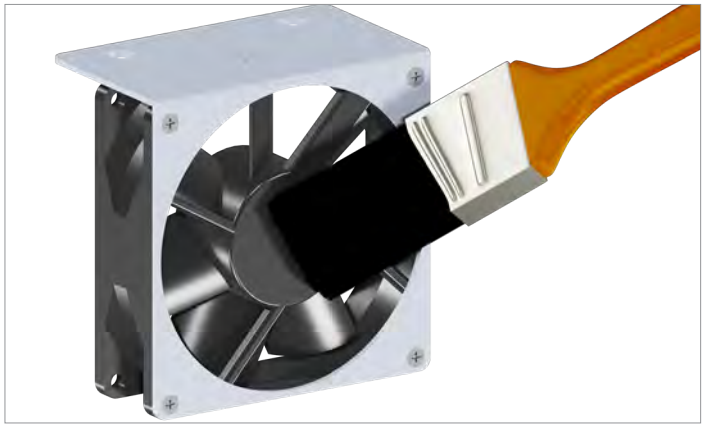
3. Unscrew and pull out the cover. The fan is screwed onto the cover.







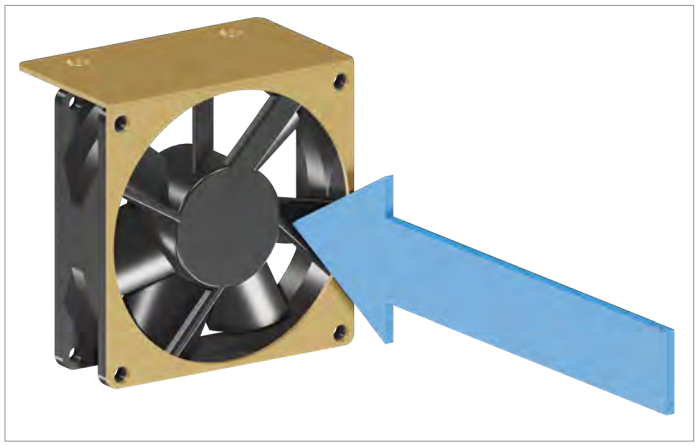




This work step must only be carried out if the fan is to be replaced. The work step is not necessary for cleaning the fan.

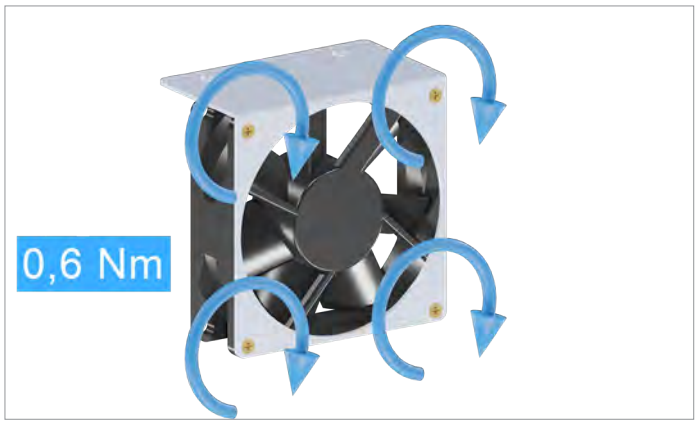
4. Unscrew the fan from the cover.

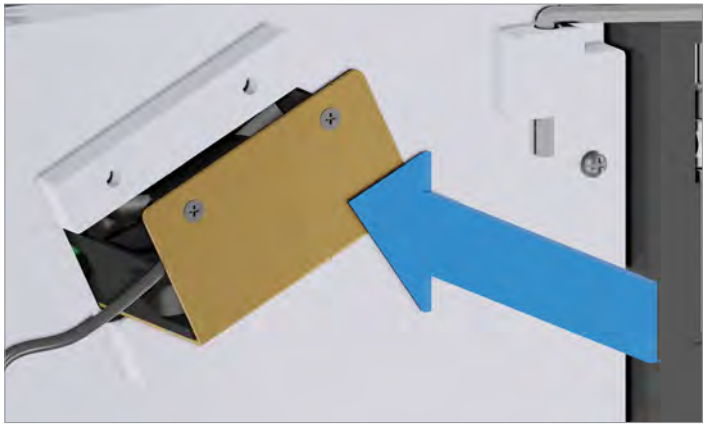
5. Clean the fan and cover with compressed air or a firm brush.



This work step must only be carried out if the fan is to be replaced. The work step is not necessary for cleaning the fan.

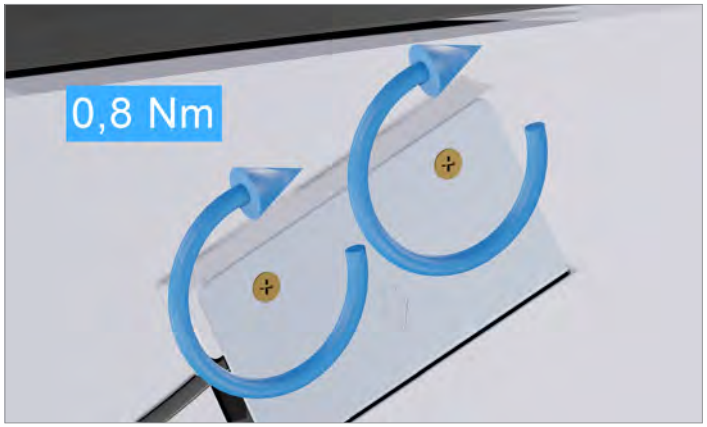
6. Screw the fan onto the cover.

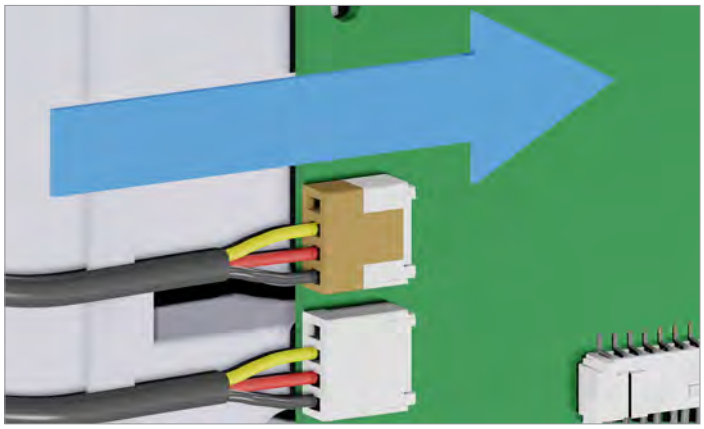




- Do not pinch the power supply cable wires during installation!

7. Insert and tighten the cover with the fan attached.







8. Plug in the power supply cable plug.

9. Insert the cover for the DC surge protection devices.

10. To complete the work, follow the instructions in the chapter “12. Recommissioning the inverter after work”, page 97.

11.2 Clean/replace internal fan 2

DANGER

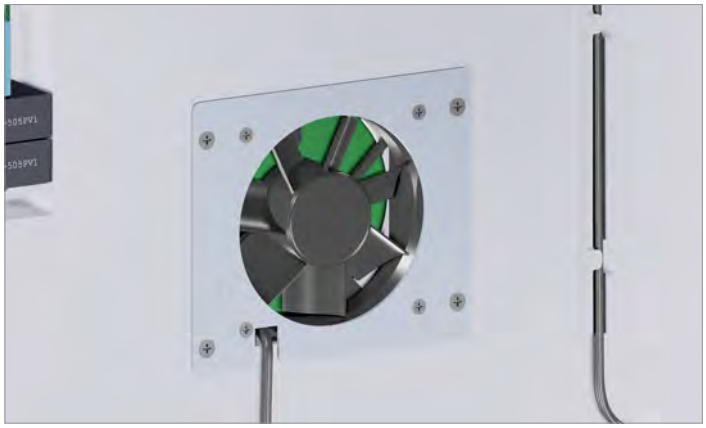
Electric shock
Potentially fatal voltages are present in the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 60 seconds.

► Perform the instructions listed in chapter “10. Disconnecting the inverter from the power supply before working on it”, page 74**before** you start work on the inverter!

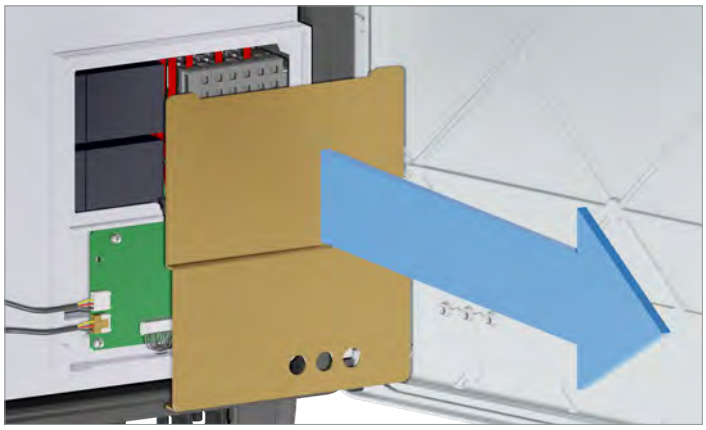
Do not use any sharp, pointed or hard objects for cleaning.

Do not use liquids for cleaning.

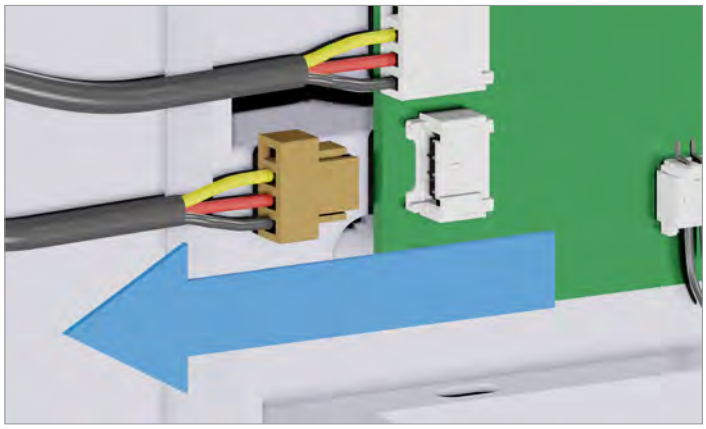
The screws are very small and can easily fall down. You should therefore use a magnetic screwdriver.



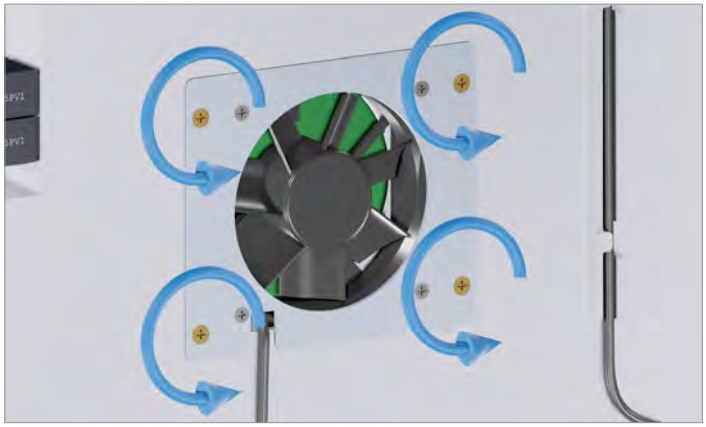
Position of internal fan 2



1. Remove the cover from the DC surge protection devices. The power supply connections for the internal fans are behind this cover.

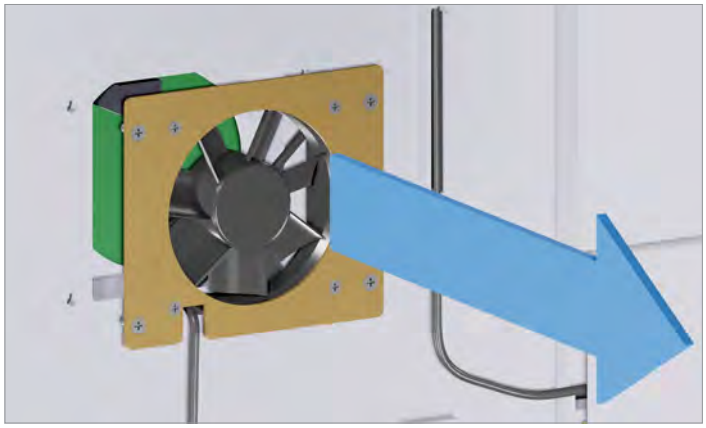


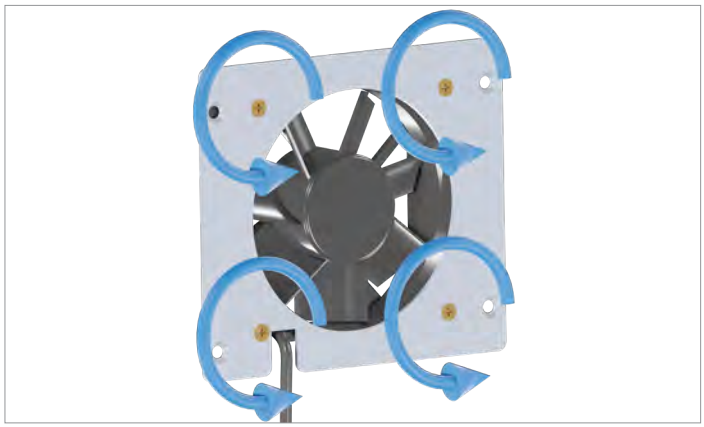
2. Pull out the power supply cable plug.

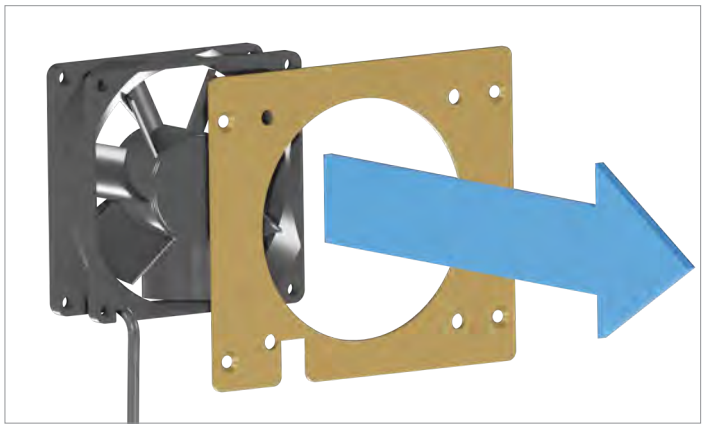


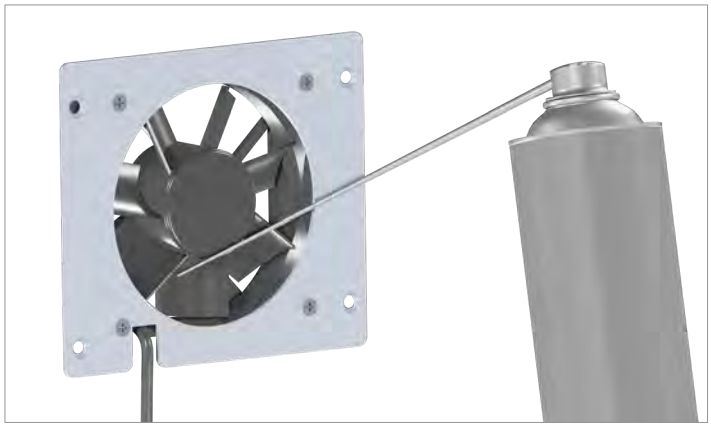
Once all the screws have been loosened, the fan no longer has a hold and can easily fall!

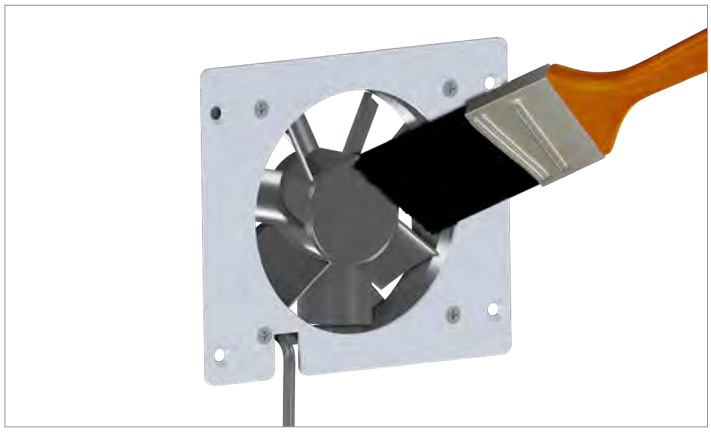
3. Unscrew and pull out the cover. The fan is screwed onto the cover.







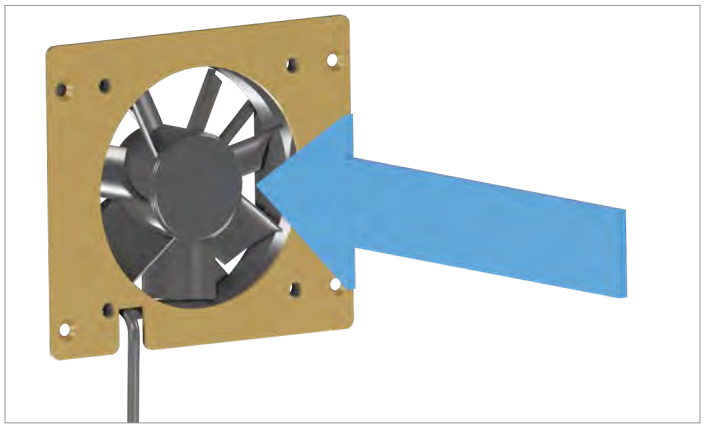


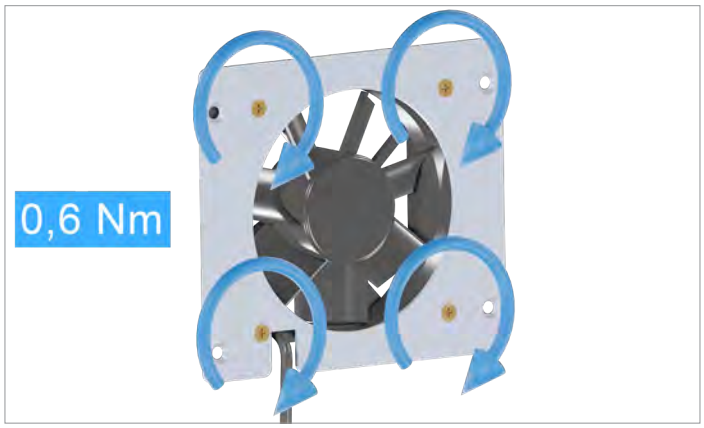


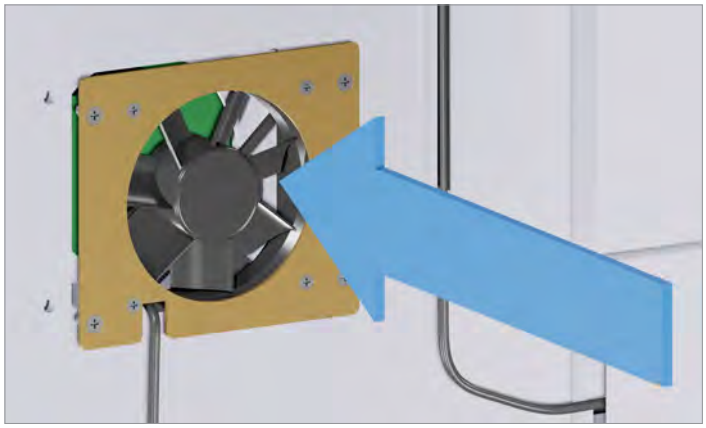
This work step must only be carried out if the fan is to be replaced. The work step is not necessary for cleaning the fan.

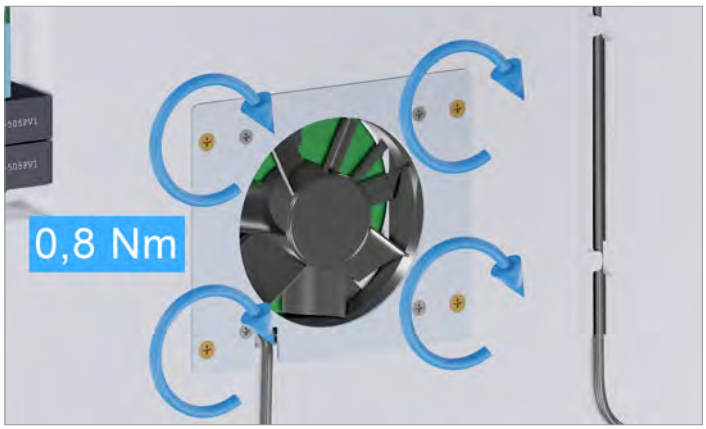
4. Unscrew the fan from the cover.

5. Clean the fan and cover with compressed air or a firm brush.







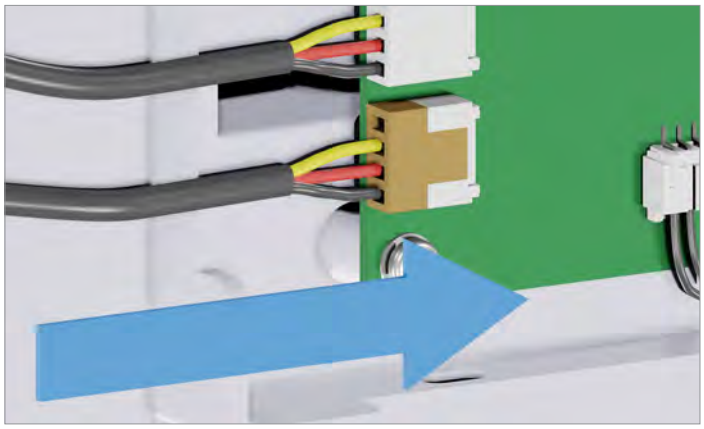


This work step must only be carried out if the fan is to be replaced. The work step is not necessary for cleaning the fan.

6. Screw the fan onto the cover.

- Do not pinch the power supply cable wires during installation!
- The arrow on the cover must be pointing downward!

7. Insert and tighten the cover with the fan attached.



8. Plug in the power supply cable plug.



9. Insert the cover for the DC surge protection devices.

10. To complete the work, follow the instructions in the chapter “12. Recommissioning the inverter after work”, page 97.

11.3 Replacing DC surge protection devices

DANGER

Electric shock
Potentially fatal voltages are present in the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 60 seconds.

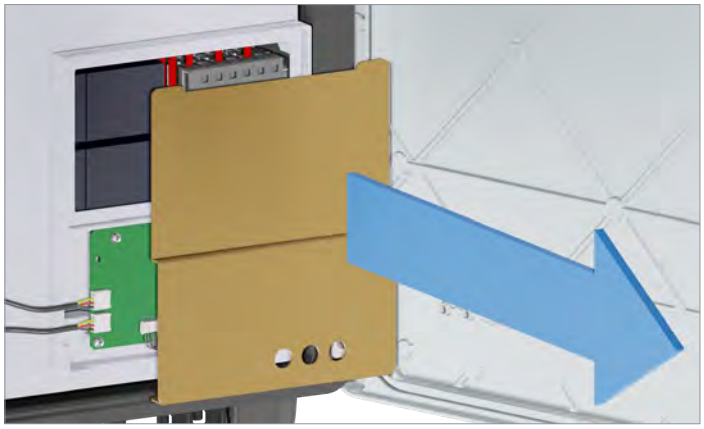
► Perform the instructions listed in chapter “10. Disconnecting the inverter from the power supply before working on it”, page 74**before** you start work on the inverter!

DC surge protection devices are supplied without screws.

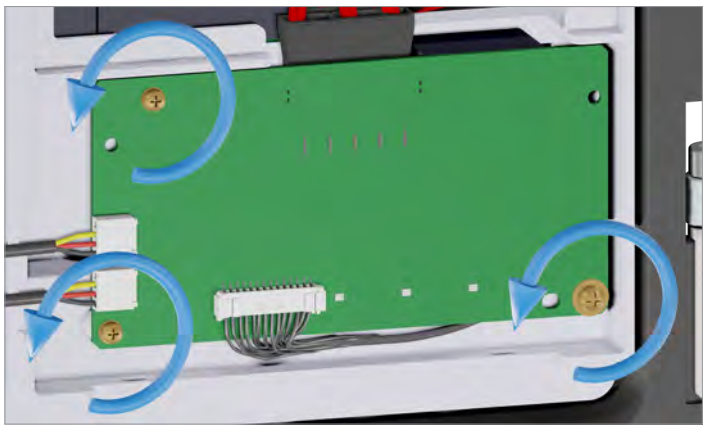
All screws including spring washers and washers of the old DC surge protection devices must be reused for the new DC surge protection devices.

Use an insulated, strongly magnetic screwdriver.

Make sure that no screws fall down in the process.



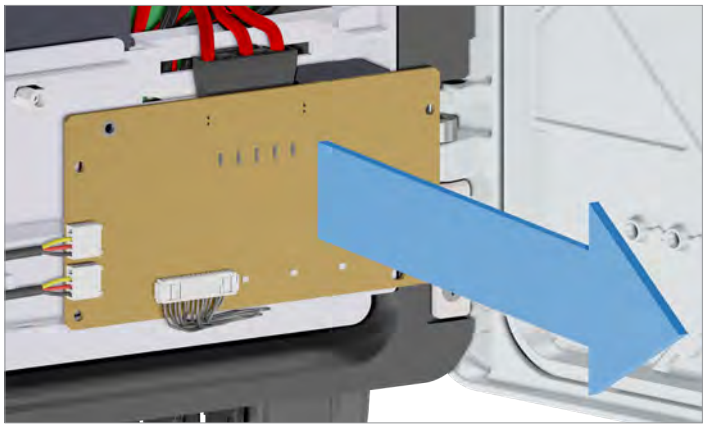
1. Remove the cover from the DC surge protection devices.

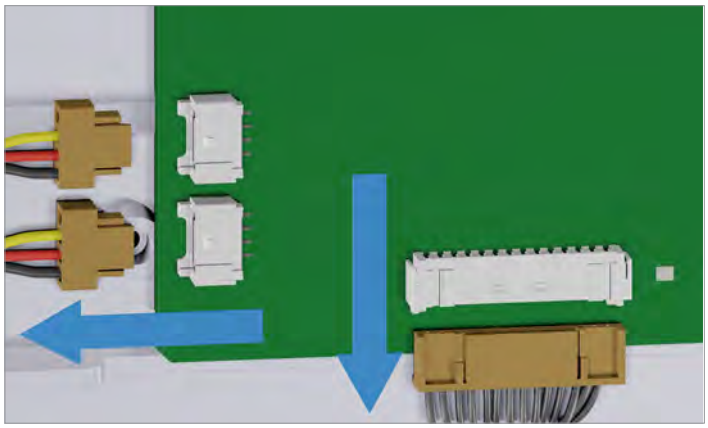


The connectors of the four cables can be pulled out more easily if the card is first unscrewed and pulled partway out.

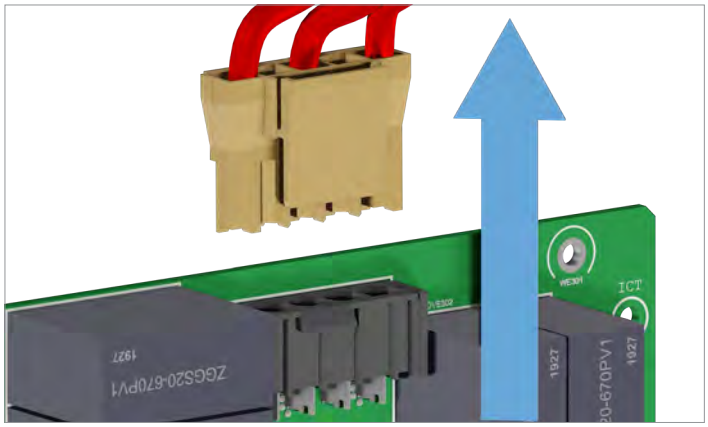
Reuse the mounting screws for the new card!

2. Loosen the 3 mounting screws and pull the card partway out.

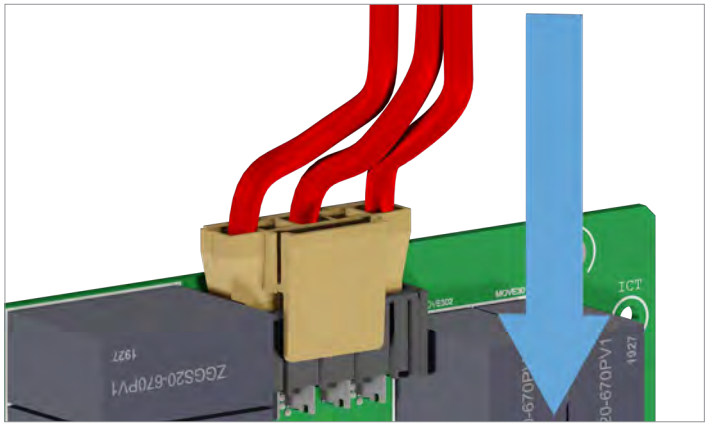




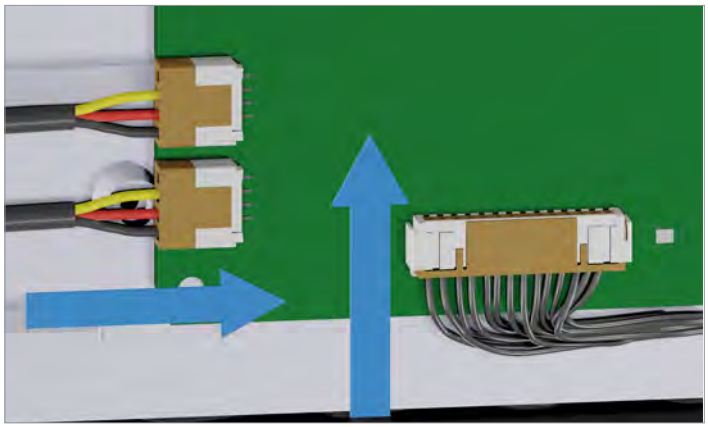
3. Pull out the signal cable and the cables of the two fans.



4. Pull out the DC cable.

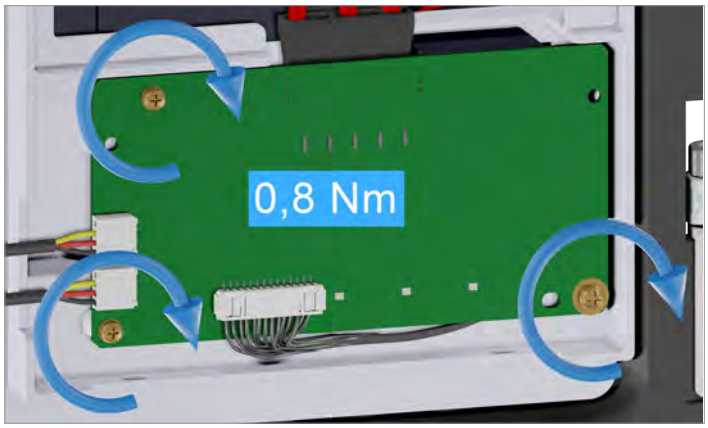


5. Insert the DC cable into the new card.



Route the signal cable along the back of the card!

6. Insert the signal cable and the cables of the two fans.



When installing, make sure that the cables are not pinched.

7. Insert the new card and screw on with the 3 mounting screws of the old card.



8. Insert the cover for the DC surge protection devices.

9. To complete the work, follow the instructions in the chapter “12. Recommissioning the inverter after work”, page 97.

11.4 Replacing the AC surge protection devices

DANGER

Electric shock
Potentially fatal voltages are present in the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 60 seconds.

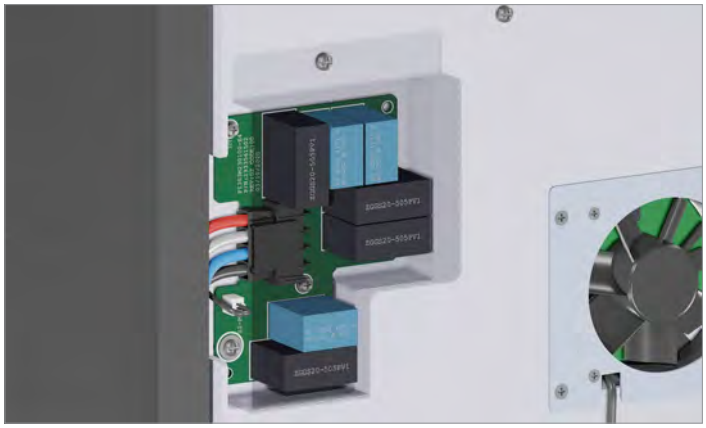
► Perform the instructions listed in chapter “10. Disconnecting the inverter from the power supply before working on it”, page 74**before** you start work on the inverter!

AC surge protection devices are supplied without screws.

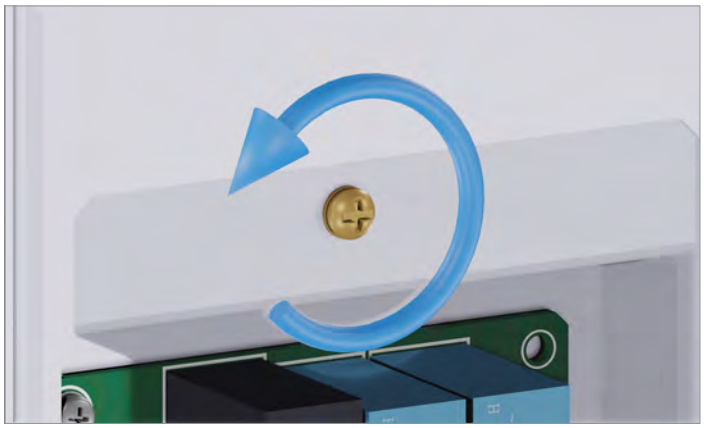
All screws including spring washers and washers of the old AC surge protection devices must be reused for the new AC surge protection devices.

Use an insulated, strongly magnetic screwdriver.

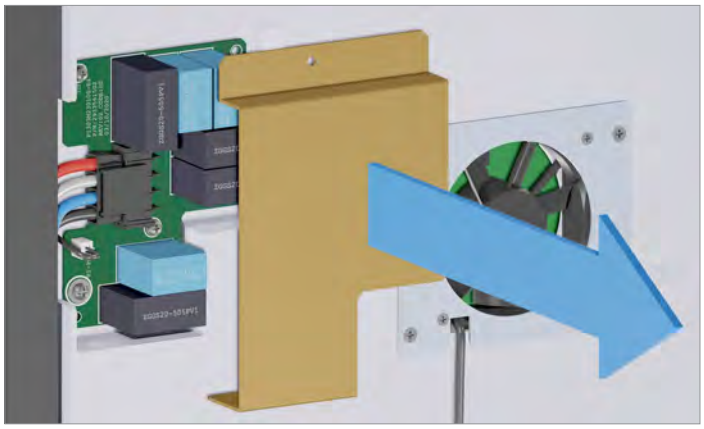
Make sure that no screws fall down in the process.

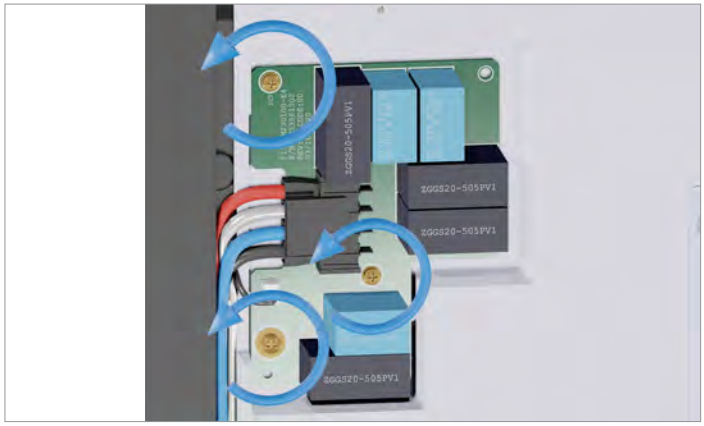


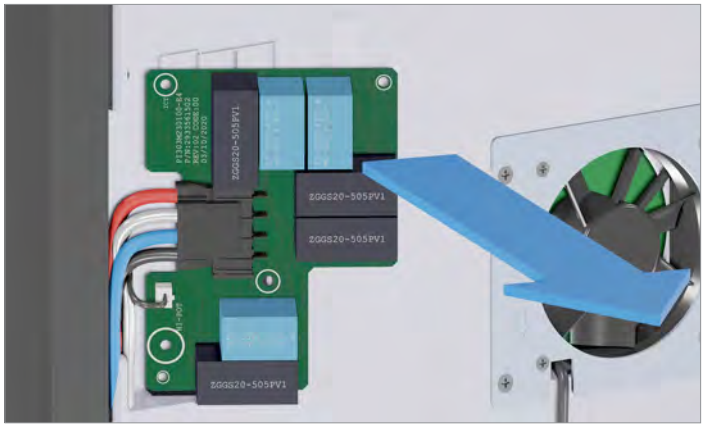
Position of the AC surge protection devices

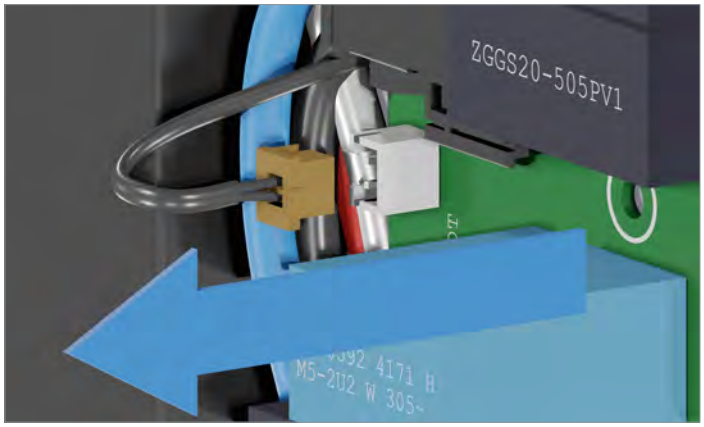


1. Unscrew and remove the cover.









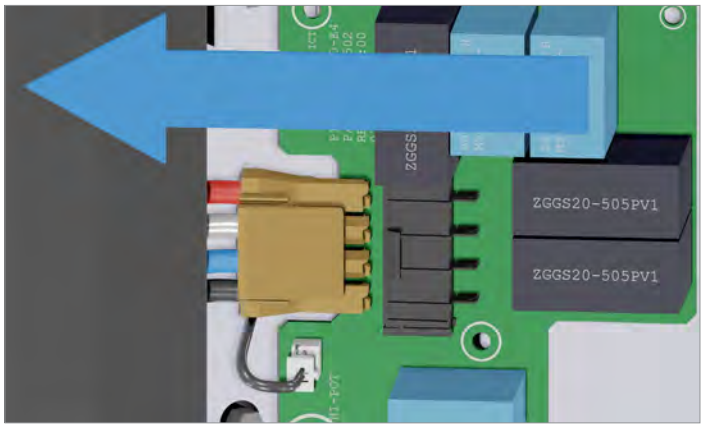
The connectors of the two cables can be pulled out more easily if the card is first unscrewed and pulled partway out.

Reuse the mounting screws for the new card!

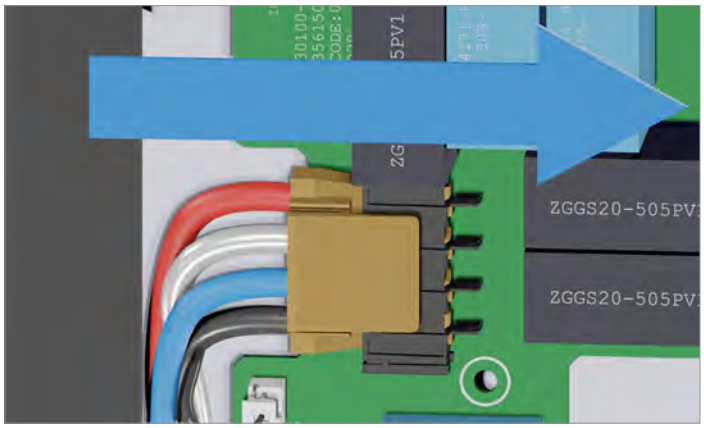
2. Loosen the 3 mounting screws and pull the card partway out.

First pull out the signal cable so that the weight of the card is being borne by the stronger AC cable.

3. Pull out the signal cable.



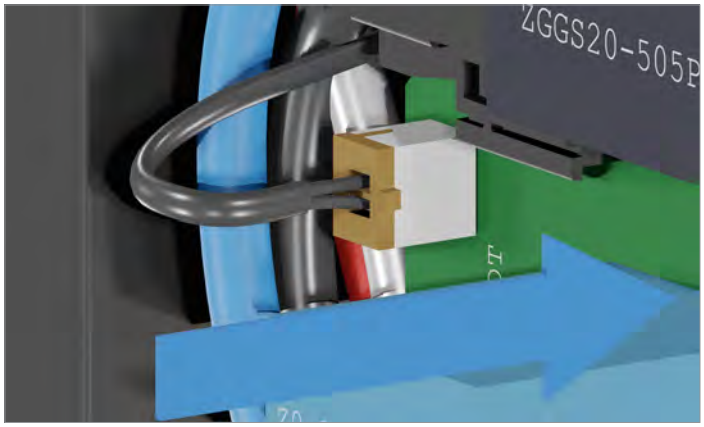
4. Pull out the AC cable.



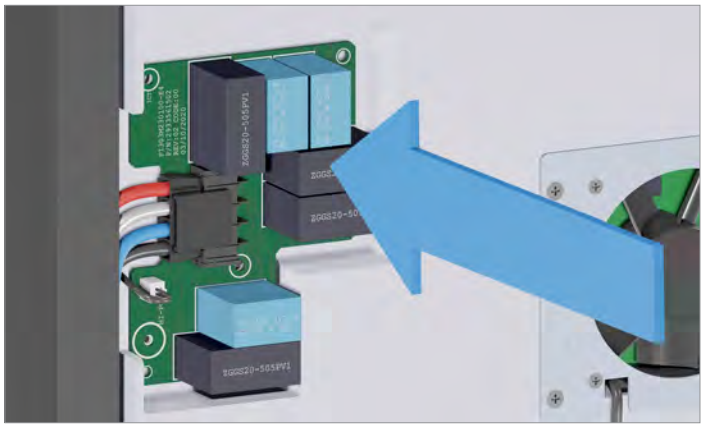
Insert the two cables before screwing on the card.

First insert the AC cable so that the weight of the card is being borne by the stronger AC cable.

5. Insert the AC cable.

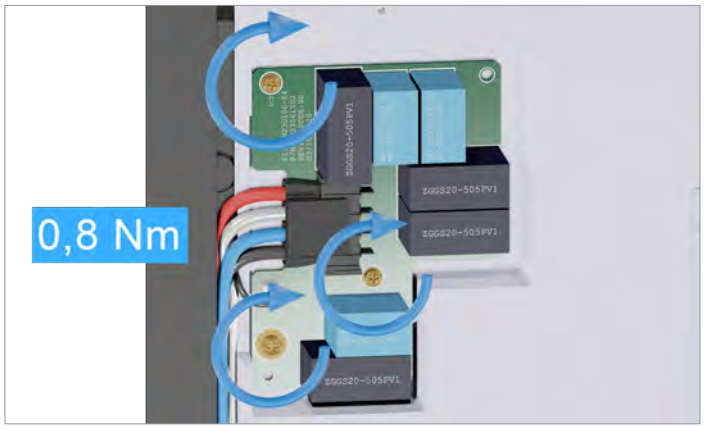


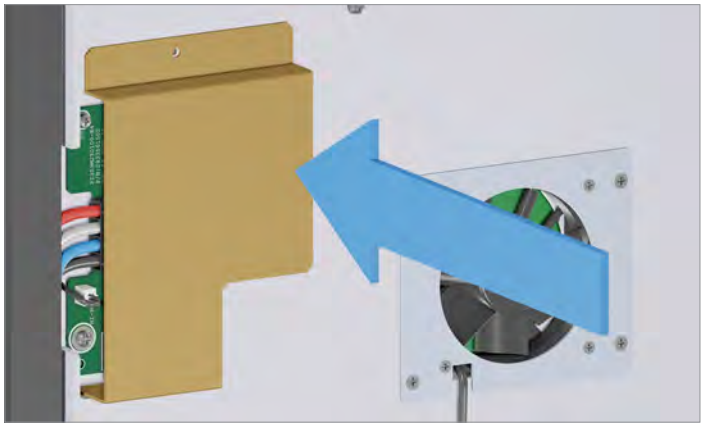
6. Plug in the signal cable.

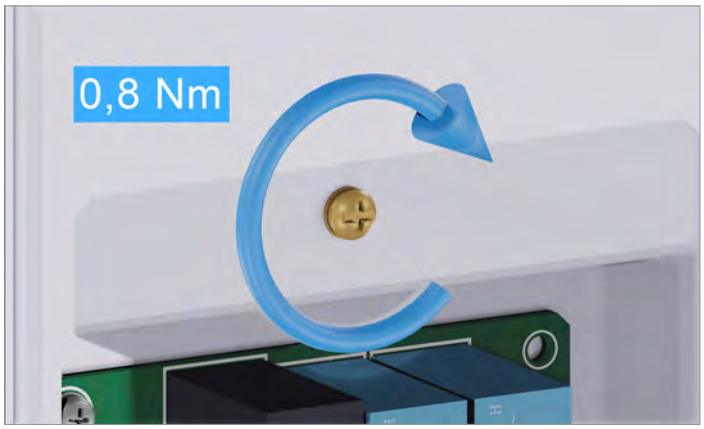


When installing, make sure that the cables are not pinched.

7. Insert the new card and screw on with the 3 mounting screws of the old card.







8. Install and screw on the cover.

9. To complete the work, follow the instructions in the chapter “12. Recommissioning the inverter after work”, page 97.

12. Recommissioning the inverter after work

12.1 Safety instructions

DANGER



Electric shock

Potentially fatal voltages are present in the inverter during operation.

- ► **Before carrying out any** work on the inverter, carry out the work steps described in the chapter “10. Disconnecting the inverter from the power supply before working on it”, page 74!
- ► **To complete all** work on the inverter, carry out the work steps described in this chapter!

DANGER

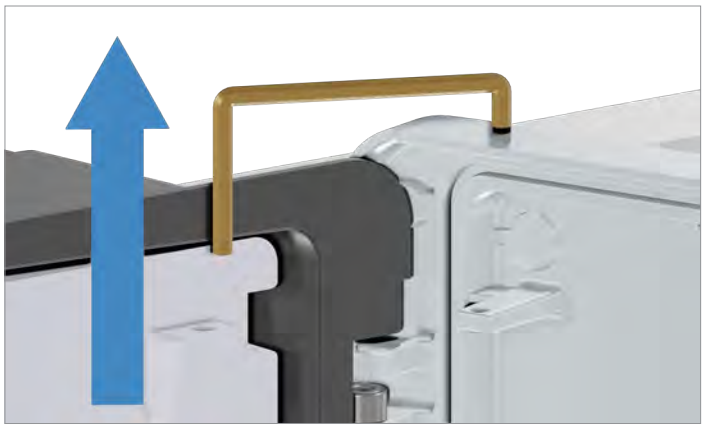


Electric shock

Potentially fatal voltages are present in the inverter during operation.

- ► If the inverter is installed in a location to which children or other persons in need of protection have access, do not store the Allen key to open the front door on or near the inverter.

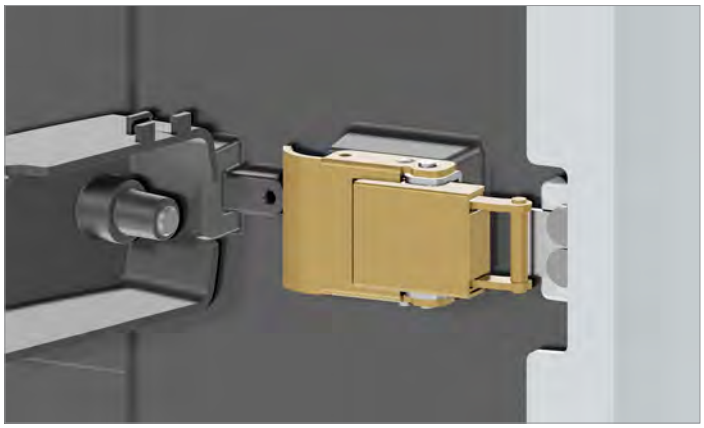
12.1.1 Procedure



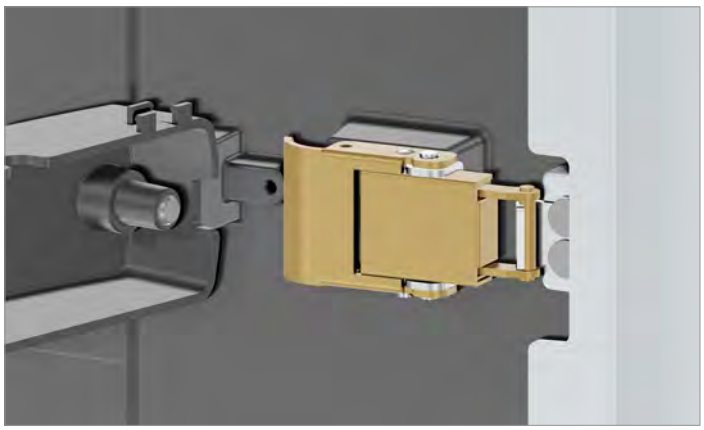
1. Remove the Allen key from the top of the door.



2. Close the door.

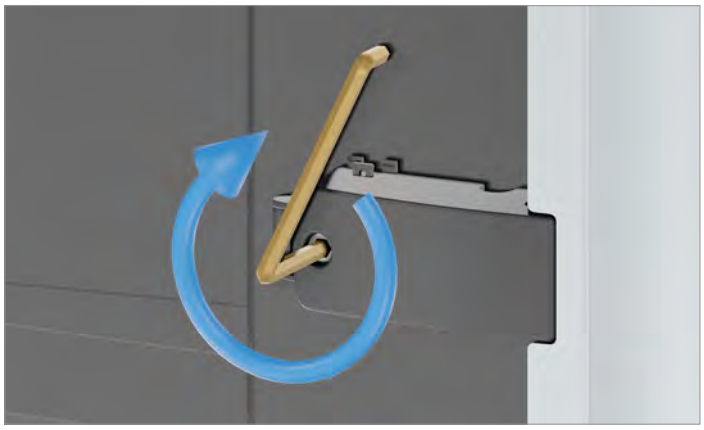


3. Close the upper and lower door locks.





4. Close and screw on the cover of the upper door lock.



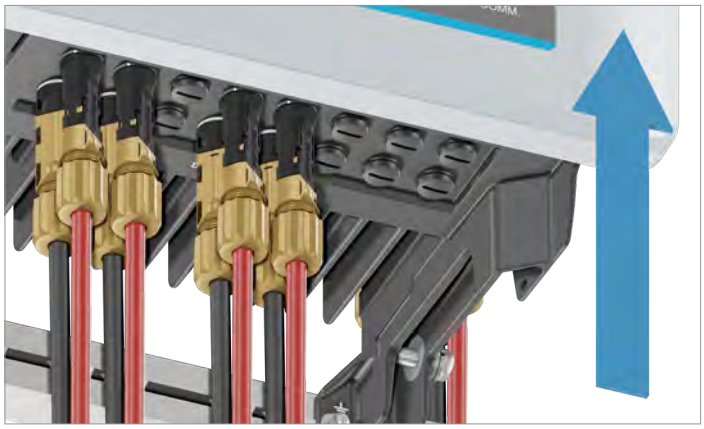
5. Close and screw on the cover of the lower door lock.



6. Insert the Allen key into the upper door lock.

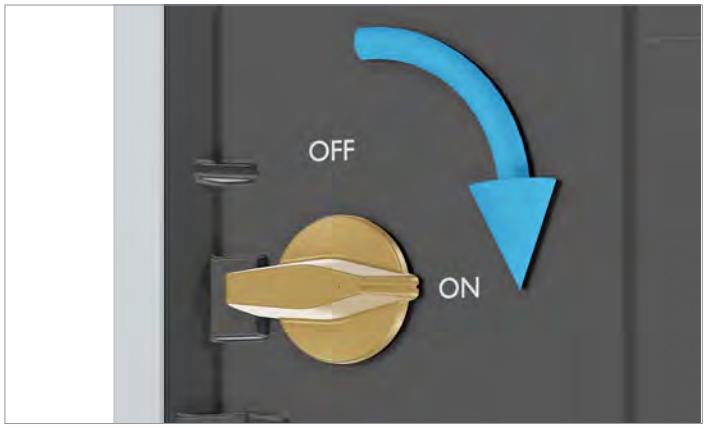


7. Tighten the AC plug.



8. Plug in the DC cables.

9. Close the isolating switch between the inverter and the grid connection point or inverter and the solar modules.



10. Turn the DC isolating switch to the ***ON*** position.

☑ Recommissioning is complete.

13. Replacing the inverter

13.1 Safety instructions

DANGER



Electric shock
Potentially fatal voltages are present in the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 60 seconds.
You should therefore always carry out the following steps before working on the inverter:

► Never disconnect the inverter from the solar modules when it is under load.

1. Disconnect the connection to the grid so that the inverter cannot feed energy into the grid.
2. Turn the DC isolating switch to the ***OFF*** position.
3. Disconnect the inverter from all AC and DC voltage sources. Make sure that none of the connections can be restored accidentally.
4. Wait at least 60 seconds for the internal capacitors to discharge.
5. Ensure that the DC cables cannot be touched accidentally.

DANGER



Electric shock
Potentially fatal voltages are present at the DC connections of the inverter. 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.

1. Disconnect the connection to the grid so that the inverter cannot feed energy into the grid.
2. Turn the DC isolating switch to the ***OFF*** position.
3. Disconnect the inverter from all AC and DC voltage sources. Make sure that none of the connections can be restored accidentally.
4. Wait at least 60 seconds for the internal capacitors to discharge.
5. Ensure that the DC cables cannot be touched accidentally.

DANGER



Electric shock
The inverter has a high leakage current value.

► **Always** connect the ground cable first, then the AC and DC cables.

WARNING



Electric shock
The IP66 protection degree is no longer guaranteed when the door is open.

► Only open the door when absolutely necessary.
► Do not open the door if water or dirt might enter the inverter.
► After work is completed, ensure that the door is properly shut and tightened again. Check that the door is properly sealed.

WARNING



Heavy weight
The inverter is heavy.

► Lift and carry the inverter with at least 2 people.

WARNING



Hot surfaces
The surface of the inverter can get very hot during operation.



- Always wear safety gloves when touching the inverter.



All work described in this section must only be carried out by electrical installers who are trained and approved for work on grid-connected solar inverters.



It is best to wait before removing the old inverter until you have received the replacement device from Delta Electronics.



Use insulated tools.

13.2 Special notes on replacement

Delta Electronics will provide you with a fully equipped replacement device and detailed information about the replacement process.

If you are continuing to use the components of the old inverter, attach the appropriate parts of the replacement device to the old inverter before returning it to Delta Electronics. This is also necessary to ensure that all openings of the inverter are properly closed and that no moisture can enter during transportation.

Pack the old inverter into the box of the replacement device and return everything to Delta Customer Service.

All necessary work steps are described in this chapter.

13.3 Sequence of work steps

Step	Notice	Description in chapter
Disconnect the inverter from AC and DC		“13.5 Disconnecting the inverter from the power supply”, page 105
Remove the communication cable		“13.6 Removing the communication card”, page 107
Removing the inverter		“13.7 Removing and packing the inverter”, page 108
Pack the inverter		“13.7 Removing and packing the inverter”, page 108

13.4 Tools required

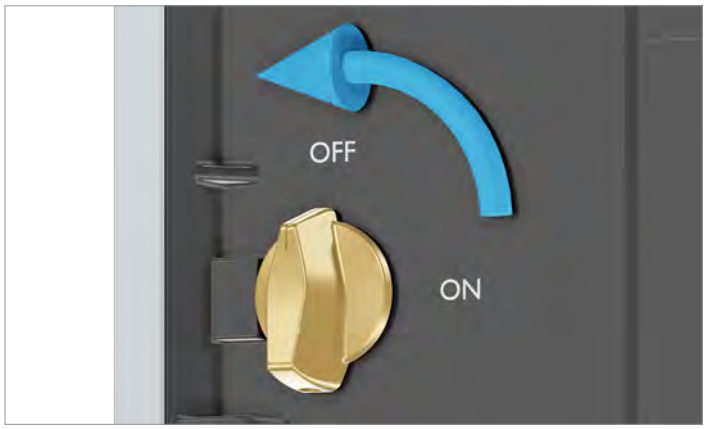
In addition to standard tools such as screwdrivers, open-ended wrenches, Allen keys and socket wrenches in various sizes, the following tools are required for working on the inverter:

- Mounting tool for disconnecting the Amphenol plug connectors from the DC cables (included in the scope of delivery)

13.5 Disconnecting the inverter from the power supply

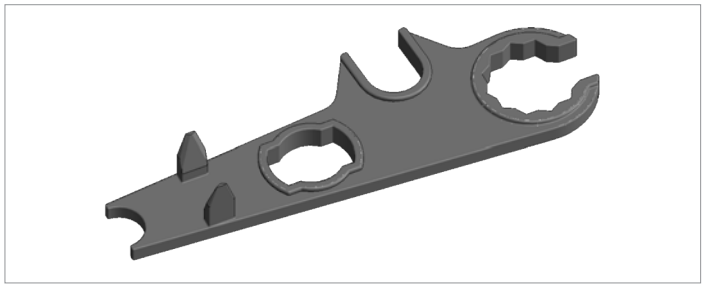
1. To shut off the inverter at the grid, open the load-break switch between the inverter and the grid connection point.

   Secure the load-break switch to prevent it from being switched back on.



2. Turn the DC isolating switch to the ***OFF*** position.

3. Wait at least 60 seconds until the internal capacitors have discharged.

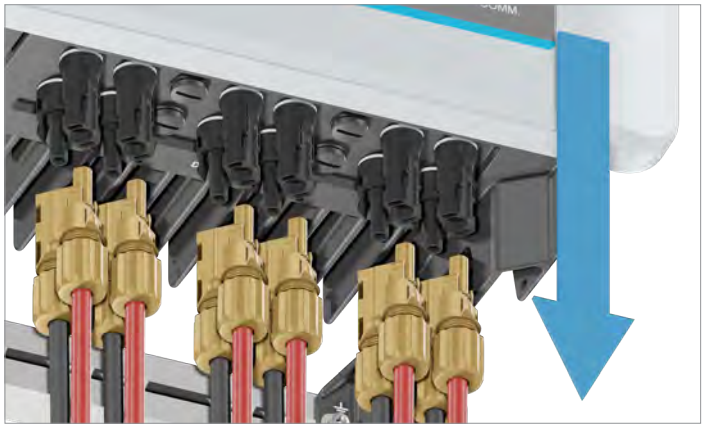


Always use the supplied mounting tools to open the DC connectors.

When disconnecting the DC cables, take care not to damage the connectors.

Do not use force.

Pull out at the DC connector, **not** at the DC cable.



4. Use the mounting tool to release the DC cables and then pull them out.

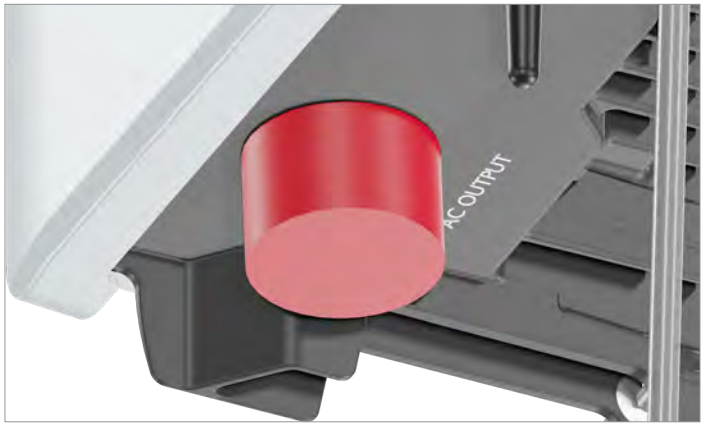


5. Place the cover caps on the DC connections.



6. Unscrew and unplug the AC plug.





7. Fit the cover cap.

13.6 Removing the communication card

You can reuse the wired communication card for the replacement device.





The communication card is screwed on to the cover!

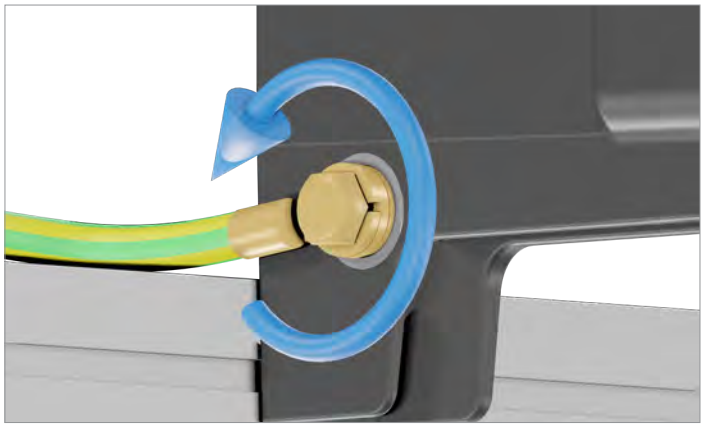
8. Unscrew the communication card cover and carefully pull out the communication card.

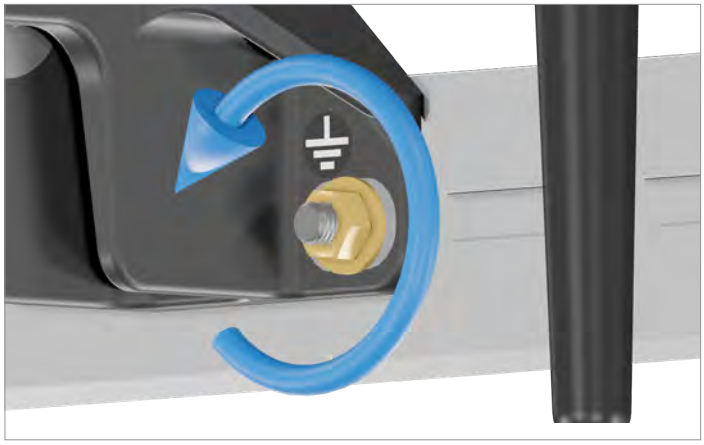
13.7 Removing and packing the inverter

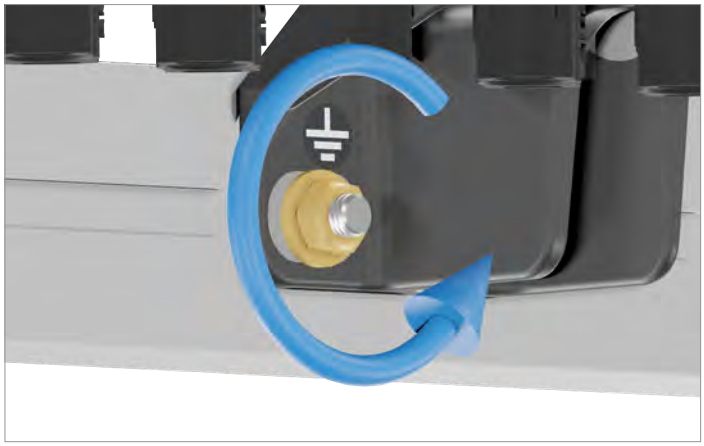
WARNING



Heavy weight
The inverter is heavy.
► Lift and carry the inverter with at least 2 people.



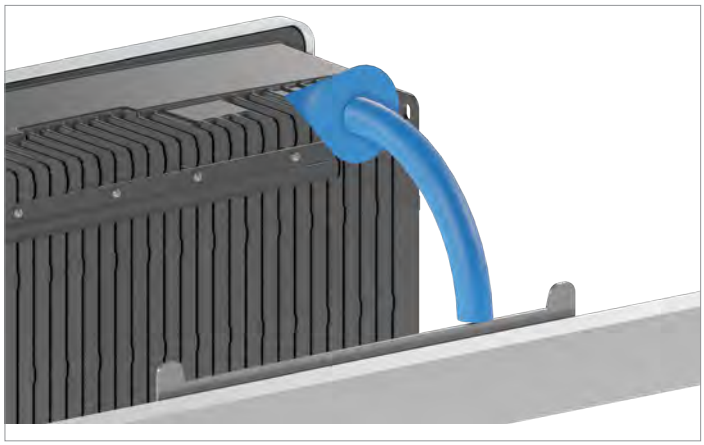




The grounding cable can be connected to the left or right foot.

1. Unscrew the grounding cable.

2. Unscrew the inverter from the bottom left and right of the wall or the mounting system.



3. Lift the inverter out of the mounting plate and place it in the box of the replacement device.

4. Place all components of the replacement device that will not be needed back into the box.

5. Package and ship the old inverter in accordance with the description received from Delta Customer Service.

6. Install and commission the new inverter in accordance with the installation instructions supplied.

14. Decommissioning

14.1 Safety instructions

DANGER



Electric shock
Potentially fatal voltages are present in the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 60 seconds.
You should therefore always carry out the following steps before working on the inverter:

► Never disconnect the inverter from the solar modules when it is under load.

1. Disconnect the connection to the grid so that the inverter cannot feed energy into the grid.
2. Turn the DC isolating switch to the ***OFF*** position.
3. Disconnect the inverter from all AC and DC voltage sources. Make sure that none of the connections can be restored accidentally.
4. Wait at least 60 seconds for the internal capacitors to discharge.
5. Ensure that the DC cables cannot be touched accidentally.

DANGER



Electric shock
Potentially fatal voltages are present at the DC connections of the inverter. 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.

1. Disconnect the connection to the grid so that the inverter cannot feed energy into the grid.
2. Turn the DC isolating switch to the ***OFF*** position.
3. Disconnect the inverter from all AC and DC voltage sources. Make sure that none of the connections can be restored accidentally.
4. Wait at least 60 seconds for the internal capacitors to discharge.
5. Ensure that the DC cables cannot be touched accidentally.

DANGER



Electric shock
The inverter has a high leakage current value.

► **Always** connect the ground cable first, then the AC and DC cables.

WARNING



Electric shock
The IP66 protection degree is no longer guaranteed when the door is open.

► Only open the door when absolutely necessary.
► Do not open the door if water or dirt might enter the inverter.
► After work is completed, ensure that the door is properly shut and tightened again. Check that the door is properly sealed.

WARNING



Heavy weight
The inverter is heavy.

► Lift and carry the inverter with at least 2 people.

WARNING



Hot surfaces
The surface of the inverter can get very hot during operation.



- Always wear safety gloves when touching the inverter.



All work described in this section must only be carried out by electrical installers who are trained and approved for work on grid-connected solar inverters.



Use insulated tools.

14.2 Tools required

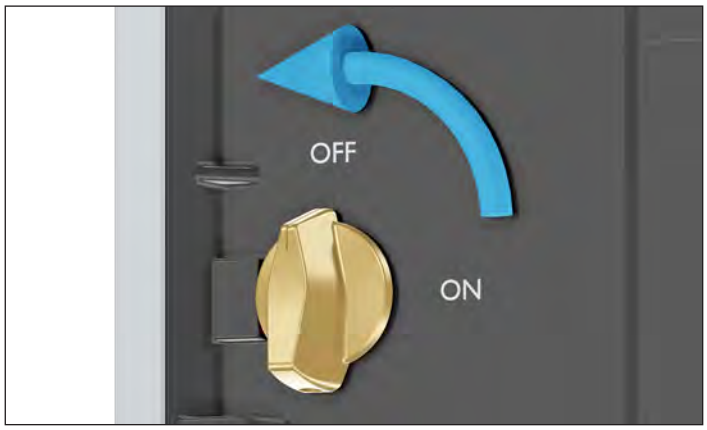
In addition to standard tools such as screwdrivers, open-ended wrenches, Allen keys and socket wrenches in various sizes, the following tools are required for working on the inverter:

- Mounting tool for disconnecting the Amphenol plug connectors from the DC cables (included in the scope of delivery)
- Use insulated tools.

14.3 Disconnecting the inverter from the power supply

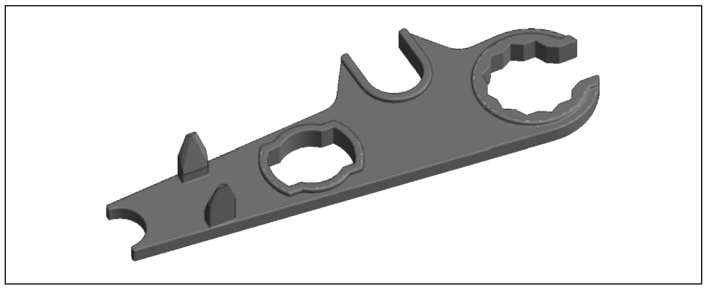
1. To shut off the inverter at the grid, open the load-break switch between the inverter and the grid connection point.

   Secure the load-break switch to prevent it from being switched back on.



2. Turn the DC isolating switch to the ***OFF*** position.

3. Wait at least 60 seconds until the internal capacitors have discharged.

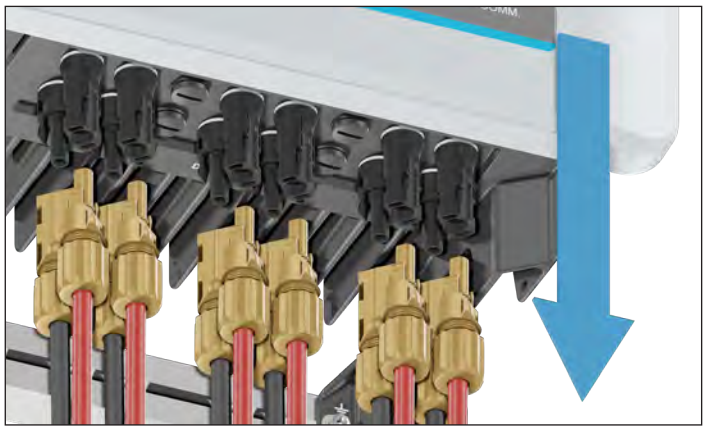


Always use the supplied mounting tools to open the DC connectors.

When disconnecting the DC cables, take care not to damage the connectors.

Do not use force.

Pull out at the DC connector, **not** at the DC cable.



4. Use the mounting tool to release the DC cables and then pull them out.

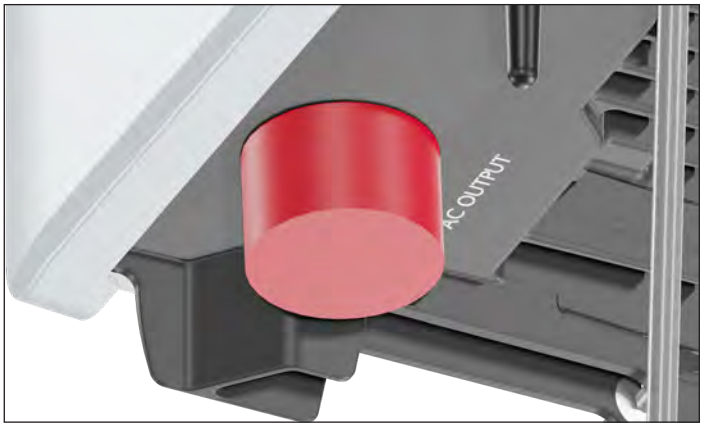


5. Place the cover caps on the DC connections.



6. Unscrew and unplug the AC plug.

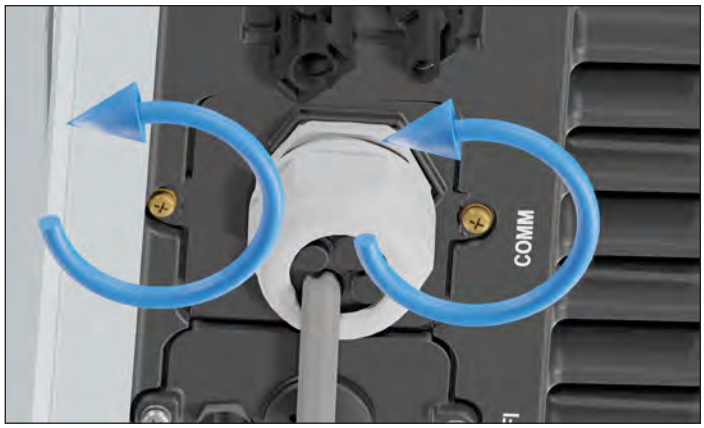




7. Fit the cover cap.

14.4 Removing the communication card

You can reuse the wired communication card for the replacement device.







The communication card is screwed on to the cover!

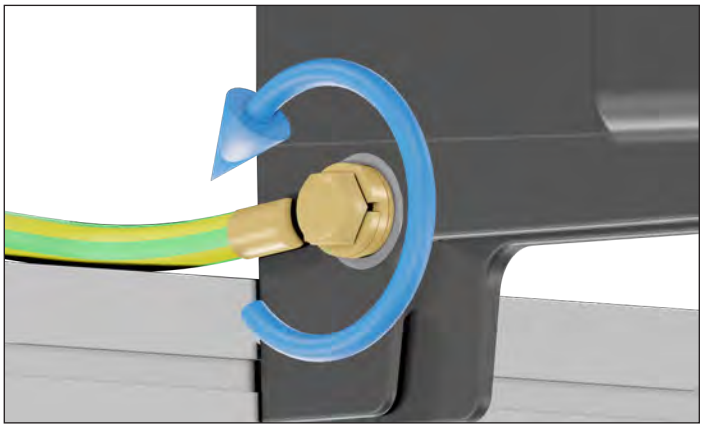
8. Unscrew the communication card cover and carefully pull out the communication card.

9. Remove all cables, insert the rubber seals and reinstall the communication card.

14.5 Removing the inverter

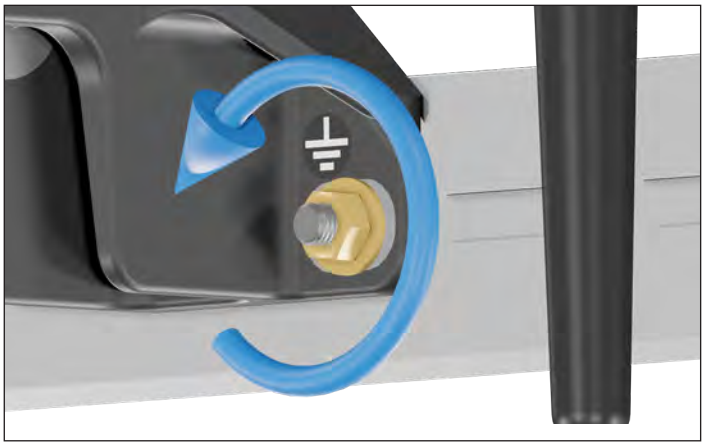
WARNING

Heavy weight
The inverter is heavy.
► Lift and carry the inverter with at least 2 people.

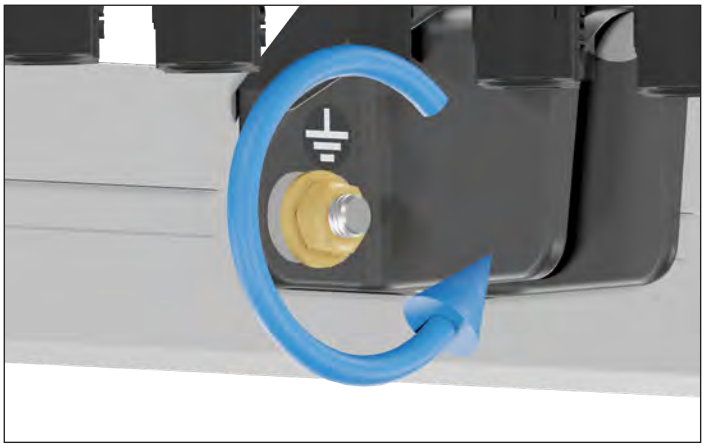


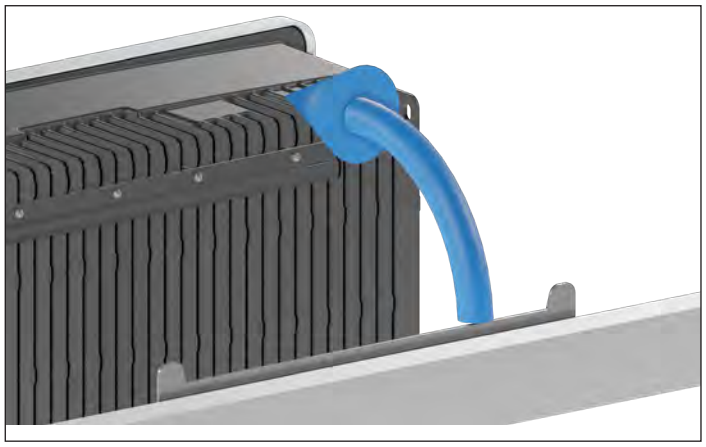
The grounding cable can be connected to the left or right foot.

1. Unscrew the grounding cable.



2. Unscrew the inverter from the bottom left and right of the wall or the mounting system.





3. Lift the inverter out of the mounting plate and place it in the box of the replacement device.

15. Disposal

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.

16. Technical Data

Input (DC)	M30A
Maximum input power (per MPP Tracker/total)	20.4 kW/33.5 kW
Rated power	30 kW
Input voltage range for operation	200 to 1000 V_{DC}
Max. input voltage	1100 V_{DC} [1]
Rated voltage	600 V_{DC}
Number of MPP trackers	3
MPP input voltage range total	200 to 1000 V_{DC}
MPP input voltage range with full power	480 to 900 V_{DC}
Maximum input current (per MPP Tracker/total)	30 A/72 A.
DC short-circuit current I_{SC}	50 A per MPP tracker
Open-circuit voltage V_{OC}	1000 V_{DC}/1100 V_{DC} without damage
DC connection panel	
Connector type	Amphenol H4 connector
Number of DC connections	6 pairs
DC cable specifications	4/6 mm^2
Use of external string fuses	1 or 2 strings per MPPT: no external string fuses required
Overvoltage category [2]	II
Surge protection devices	Type 2 (EN 50539-11), replaceable
Galvanic isolation	No

Output (AC)	M30A
Maximum apparent power [3]	33 kVA at 40°C.
Maximum active power	30 kW at 40°C; 33 kW at 35°C.
Nominal active power	30 kW
Nominal apparent power	30 kVA
Rated voltage [4]	230/400 V -20%/+30%, 3 phases + PE, 3 phases + N + PE (Y)
Nominal current	48 A
Maximum output current	50 A
Switch-on current	110 A/50 µs
Frequency range [4]	50/60 Hz ± 5 Hz
Power factor adjustment range	0.8 cap to 0.8 ind
Total harmonic distortion	<3% at rated apparent power
Power consumption in night mode	<2 W [5]
AC connection	
Connector type	AC connector (included with delivery)
Copper cable specifications	
Cable diameter	20 to 26 mm
Conductor type	Single-wire; multi-wire; fine-wire with end sleeve
Wire cross section	2.5 to 16 mm^2 with end sleeve; 4 to 25 mm^2 without end sleeve
Aluminum cable specifications	The use of aluminum cable is not permitted.
Overvoltage category [2]	III
Surge protection devices	Type 2 (EN 61463-11), replaceable

Mechanical details	M30A
Dimensions (W x H x D)	650 × 520 × 220 mm
Weight	42 kg
Cooling	Natural convection
Installation options	suspended (mounting plate included in the scope of delivery)
Disconnectors	1x mechanical DC disconnector

Communication and data visualization	M30A
Communication interfaces	2x RS485, 2x dry contacts, 1x EPO, 1x 12 V_{DC} power supply, 6x digital inputs
Communication	RS485, Wi-Fi, Sub-1G (optional)
Communication protocols	Modbus RTU

General specifications	M30A
Delta model name	M30A_230
Delta part number	RPI303M230100
Overall operating temperature range	-25 to +60°C
Relative humidity	0 to 100%, non-condensing
Max. operating height	4000 m above sea level
Noise level	≤46 dB(A)

Standards and guidelines	M30A
Protection class	IP66
Safety class	I
Pollution degree	II
Configurable trip parameters	Yes
Insulation monitoring	Yes
Overload behavior	Current limit, power limit
Safety	IEC 62109-1/-2, CE compliance
EMC	EN 61000-6-2/-6-3/-3-11/-3-12
Noise immunity	IEC 61000-4-2/-3/-4/-5/-6/-8
Distortion factor	EN 61000-3-2
Voltage fluctuations and flicker	EN 61000-3-3
Islanding protection/grid connection guidelines	You will find the current list at solarsolutions.delta-emea.com

1) The maximum withstand voltage is 1100 V_{DC}. The inverter starts to work if the input voltage falls below 1000 V_{DC}.
2) IEC 60664-1, IEC 62109-1
3) For cos phi = 1 (VA = W)
4) AC voltage and frequency range will be programmed according to the individual country requirements.
5) Power consumption with standby communication

Delta customer service

Austria	service.oesterreich@solar-inverter.com	0800 291 512 (toll free)
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)
Germany	service.deutschland@solar-inverter.com	0800 800 9323 (toll free)
Greece	support.greece@solar-inverter.com	+49 7641 455 549
Great Britain	support.uk@solar-inverter.com	0800 051 4281 (toll free)
Israel	supporto.israel@solar-inverter.com	800 787 920 (toll free)
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Slovenia	podpora.slovenija@solar-inverter.com	+421 42 4661 333
Spain	soporto.espana@solar-inverter.com	900 958 300 (toll free)
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