Installation and Operation Manual

RPI M6A
RPI M8A
RPI M10A

Europe Australia New Zealand

This manual applies for solar inverter models:

- **RPI M6A**
- **RPI M8A**
- **RPI M10A**

with firmware version: DSP: 1.32 / RED: 1.13 / COMM: 1.12

If you experience deviations between the descriptions in this quick installation guide and the information on the inverter display, please check www.solar-inverter.com for a quick installation guide that matches the firmware version on the inverter. The standard manual can also be downloaded from www.solar-inverter.com.

Delta Energy Systems (Germany) GmbH

Tscheulinstrasse 21

79331 Teningen

Germany

This manual is included with our solar inverter and is intended for use by the installer and end user.

The technical instructions and illustrations in this manual are to be treated as confidential and no part of this manual may be reproduced without prior written permission from Delta Energy Systems. Maintenance technicians and end users may not release the information contained in this manual, and may not use it for purposes not directly associated with the proper use of the solar power inverter.

All information and specifications can be modified without prior notice.

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Table of Contents

1. About this manual

1.1 Purpose of this manual

This manual is part of the inverter and will help you become familiar with the inverter.

Always follow the safety instructions given in this manual. You can help keep the product durable and reliable during its use by handling it carefully.

Read the manual carefully and thoroughly and follow the instructions contained therein. This manual contains important information on the installation, commissioning and operation of the inverter.

Always follow the general safety instructions (see “2 General safety instructions”, p. 7).

Store the manual in a safe place near the inverter, so that installer and operator have easy access to this manual.

The inverter can be safely and normally operated if installed and used in accordance with this manual. Delta Energy Systems is not responsible for damage incurred by failure to comply with the installation and operating instructions in this manual.

1.2 Target audience of this manual

This manual is aimed at qualified electricians who have received a sufficient training to apply safe methods of work to install a micro-generator in compliance with the requirements of the applying standard.

Only chapter “9 Measurements and statistics”, p. 101 is relevant to the operator. All other activities may only be performed by qualified electricians.

1.3 Warnings and symbols

Where hazards may arise when working with the *inverter*, the following hazard levels and symbols are used to indicate these hazards:

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will** result in death or serious injury.

WARNING

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

CAUTION

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

NOTICE

NOTICE is used to address practices not related to physical injury.

A note provides general information on using the inverter. A note does **not** indicate hazardous situations.

Where required, further, supplementary warning symbols are used. Type and source of the hazard is explained in the safety instructions or warnings.

This symbol is a warning of a risk of electric shock due to high voltage.

This symbol is a warning of a hot surface.

This symbol is a warning of general hazards.

1.4 Conventions used in this manual

Order of instructions

Numbered instructions must be performed in the specified order.

1. First instruction step

→ When the *inverter* reacts to a step, this reaction is marked with an arrow.

2. Second instruction step

3. Third instruction step

Instructions consisting of only one step or when the order of the instruction steps is not important, are shown as follows:

► Instruction step
► Instruction step

Marking of inverter parts

Parts of the inverter are marked as follows:

Buttons: ESC button

LEDs on the inverter: ***ALARM*** LED

All other parts: *RS485 terminal*.

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

Information on Display

Information shown on the inverter display includes menus, settings and messages.

This information is shown in this manual as follows:

Menu names: **User settings** menu

Parameter names: ***Cos phi*** parameter

2. General safety instructions

DANGER

Risk of death by electrocution
Potentially fatal voltage is applied to the solar inverter during operation. This potentially fatal voltage is still present for 60 seconds after all power sources have been disconnected.

► Never open the solar inverter.
► Always disconnect the solar inverter from power before installation, open the AC/DC isolating switch and make sure neither can be accidentally reconnected.
► Wait at least 60 seconds until the capacitors have discharged.

DANGER

Risk of death or serious injury from electrocution
Potentially fatal voltage may be applied to the DC connections of the solar inverter. When light is falling on solar modules, they immediately start producing energy. They do so, even when the sun is not shining.

► Never disconnect the solar modules when the solar inverter is powered.
► First switch off the grid connection so that the solar inverter cannot feed energy into the grid.
► Turn the AC/DC isolating switch to position **OFF**.
► Make sure the DC connections cannot be accidentally touched.

- The solar inverter can be safely and normally operated if installed and used in accordance with this manual (see IEC 62109-5.3.3). Delta Energy Systems is not responsible for damage incurred by failure to observe the installation and commissioning instructions in this manual. For this reason, be sure to observe and follow all instructions!
- Installation and commissioning may only be performed by qualified electricians using the installation and commissioning instructions found in this manual.
- The solar inverter must be disconnected from power and the solar modules before any work on it can be performed.
- The solar inverter has a high leakage current value. The ground wire **must** be connected before commissioning.
- Do not remove any warning signs that the manufacturer has installed on the solar inverter.
- Improper handling of the solar inverter may result in physical injury and damage to property. For this reason, observe and follow all general safety instructions and warnings.
- The solar inverter contains no components that must be maintained or repaired by the operator or installer. All repairs must be performed by Delta Energy Systems. Opening the cover will void the warranty.
- Do not disconnect any cables when the solar inverter is powered due to risk of a fault arc.
- To prevent lightning strikes, follow the relevant regulations applicable in your country.
- The surface of the solar inverter can become very hot during operation. Use safety gloves when working on the solar inverter.
- The solar inverter is very heavy. The solar inverter must be lifted and carried by at least two people.
- Only devices in compliance with SELV (EN 60950) may be connected to the RS485 and USB interfaces.
- All connections must be sufficiently insulated in order to comply with the IP65 protection rating. Unused connections must be closed by placing cover caps on the solar inverter.

3. Intended use

The inverter may only be used as intended.

Proper use of the inverter meets the following criteria:

- Use in stationary PV systems connected to the local power grid for converting the direct current in the PV system to alternating current and feeding it into the grid.
- Use within the specified power range (see “13 Technical data”, p. 113) and under the specified ambient conditions (see “5 Planning the installation”, p. 19).

Any of the following uses of the inverter is considered improper:

- Isolated operation. The inverter has anti-islanding and other monitoring features.
- Use in mobile PV systems.

EC Declaration of Conformity

Producer:	Delta Energy Systems (Germany) GmbH
Address:	Tscheulinstr. 21, 79331 Teningen, Germany
Product Description:	**Solar Inverter for Grid operation**
Model:	**RPI M6A, RPI M8A, RPI M10A**

The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2004/108/EC Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility

EN 61000-6-3:2007 / EN 61000-6-4:2007
EN 61000-3-11:2001 / EN 61000-3-12:2005
EN 61000-6-2:2005 / EN 61000-6-1:2007
IEC 61000-4-2:2008 / IEC 61000-4-3:2010
IEC 61000-4-4:2011 / IEC 61000-4-5:2005
IEC 61000-4-6:2008
IEC 61000-4-8:2009
IEC 61000-4-11:2004

2006/95/EC Council Directive on the approximation of the laws of the Member States related to electrical equipment designed for use within certain voltage limits

IEC 62109-1:2010, IEC 62109-2:2011

Teningen, Oct 2nd 2014

Patrick Schahl		Andreas Hoischen	
Product Management LOB SPE		Head of LOB SPE	
Name, Function	Signature	Name, Function	Signature

This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail.

4. Product overview

4.1 Scope of delivery

Part	Qty	Image/Description	Part	Qty	Image/Description
Inverter	1		AC plug	1	Amphenol C16-3 
Mounting plate	1		Mounting screws	2	M4 mounting screws with washer, spring washers and toothed lock ring to fasten the inverter to the mounting plate and to ground the inverter housing. 
DC plugs	M6A: 2 M8A: 2 M10A: 3	Multi-Contact MC4 plug for DC+ (32.0017P0001-UR for 4/6 mm²) 	Quick Installation Guide and General Safety Instructions	1	
	M6A: 2 M8A: 2 M10A: 3	Multi-Contact MC4 plug for DC– (32.0016P0001-UR for 4/6 mm²) 			

4.2 Components and connectors

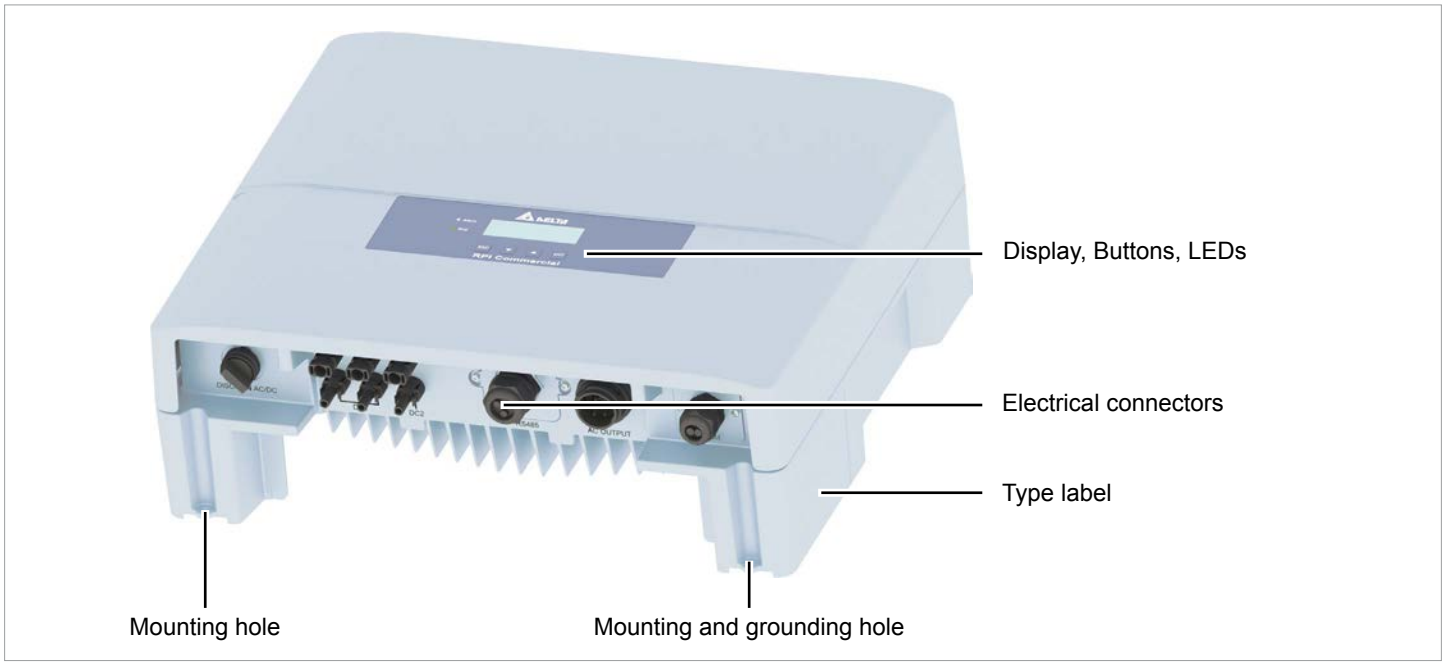


Fig. 4.1: Components and connectors

Component / connector	Description
Display, buttons, status LEDs	See “4.3 Display, buttons, status LEDs”, p. 12
Electrical connectors	See “4.4 Electrical connectors”, p. 13
Type label	See “4.6 Information on the type label”, p. 17
Mounting and grounding holes	See “4.5 Mounting and grounding holes”, p. 16

4 Product overview

4.3 Display, buttons, status LEDs

Label	Designation	Usage
LEDs		
GRID	Grid	Green; lights up when the inverter feeds into the grid
ALARM	Alarm	Red; indicates an error, fault, or warning
Buttons		
ESC	Exit	Exit current menu. Cancel value setting.
▼	Move down	Move downwards in menu. Set value (decrease).
▲	Move up	Move upwards in menu. Set value (increase).
ENT	Enter	Select menu item. Open configurable value for editing. Finish editing (adopt set value).

4.4 Electrical connectors

4.4.1 Overview

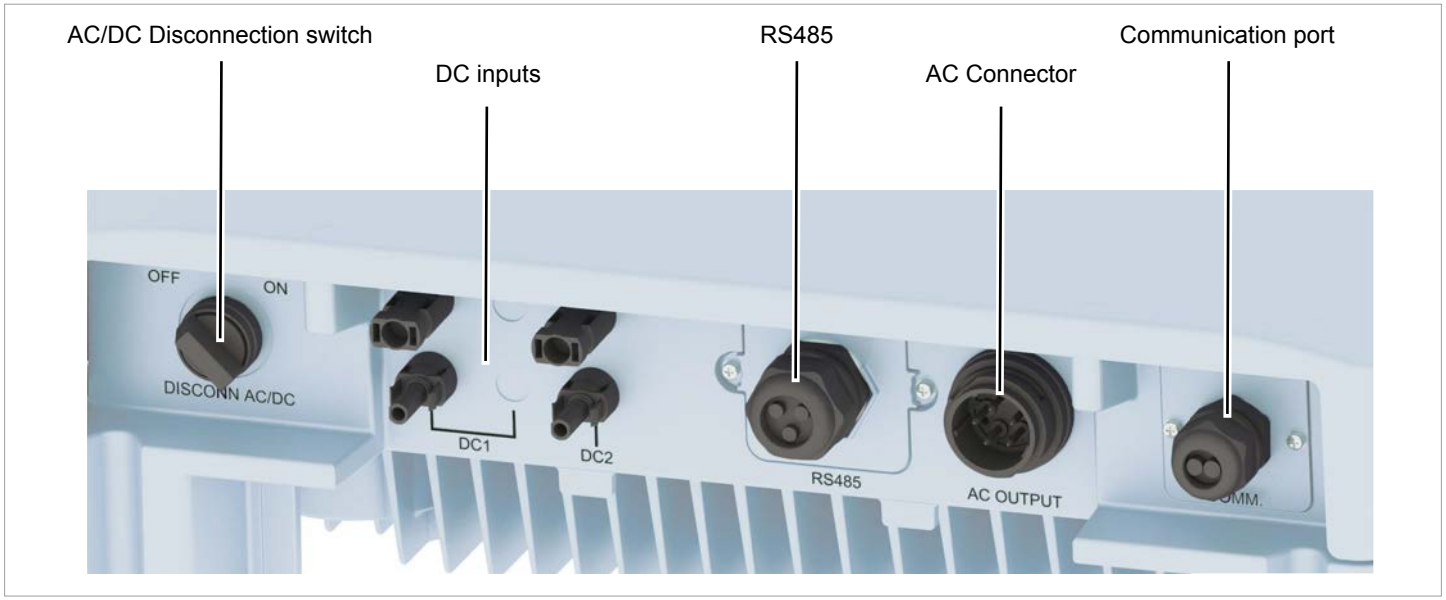


Fig. 4.2: Overview electrical connectors RPI M6A and M8A

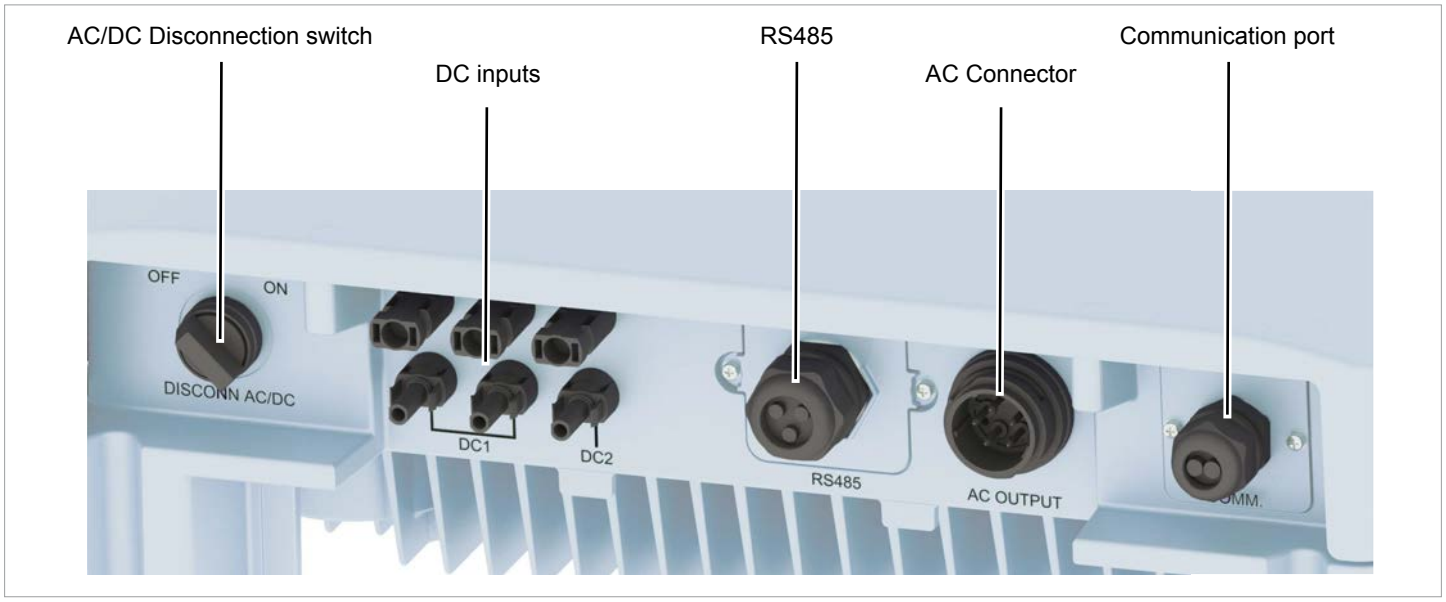


Fig. 4.3: Overview electrical connectors RPI M10A

Component / connector	Description
AC/DC Disconnection switch	See “4.4.2 AC/DC disconnection switch”, p. 14
DC connectors (DC inputs)	See “4.4.4 DC connectors (DC inputs)”, p. 15
RS485 port	See “4.4.5 RS485 port”, p. 15
AC connector	See “4.4.3 AC connector (AC output)”, p. 14
Communication port	See “4.4.6 Communication port 2”, p. 15

4.4.2 AC/DC disconnection switch

The inverter is **disconnected** from the grid (AC) and the solar modules (DC) when the *AC/DC Disconnection switch* is in position **OFF**.

The inverter is **connected** to the grid (AC) and the solar modules (DC) when the *AC/DC Disconnection switch* is in position **ON**.

4.4.3 AC connector (AC output)

The *AC connector* is used for connecting the inverter to the grid.

Usage of the AC connection:

- Feeding AC current into the grid.
- Powering up the display when no DC voltage is available via the *DC connectors* (*DC inputs*).

The inverter can be connected to:

- 5-wire grid systems 3P4W (L1, L2, L3, N, PE)
- 4-wire grid systems 3P3W (L1, L2, L3, PE).

AC plug type:

China Aviation Optical-Electrical Technology Co. PVE5T50KP73

The AC plug is delivered with the inverter.

4.4.4 DC connectors (DC inputs)

The *DC connectors* (*DC inputs*) are used for connecting the inverter to the solar module string(s).

Connector type:

- Multi-contact MC4
- with female socket for DC+ and male socket for DC–
- M6A/M8A: 2 pairs (M10A: 3 pairs) of DC plugs are delivered with the inverter

For technical specifications, see “13. Technical data”, p. 113.

4.4.5 RS485 port

Functions of the *RS485 port*:

- 2 x RS485 in/out (e.g. for connecting to a datalogger)
- 1 x VCC contacts (e.g. for connecting to an external relais)

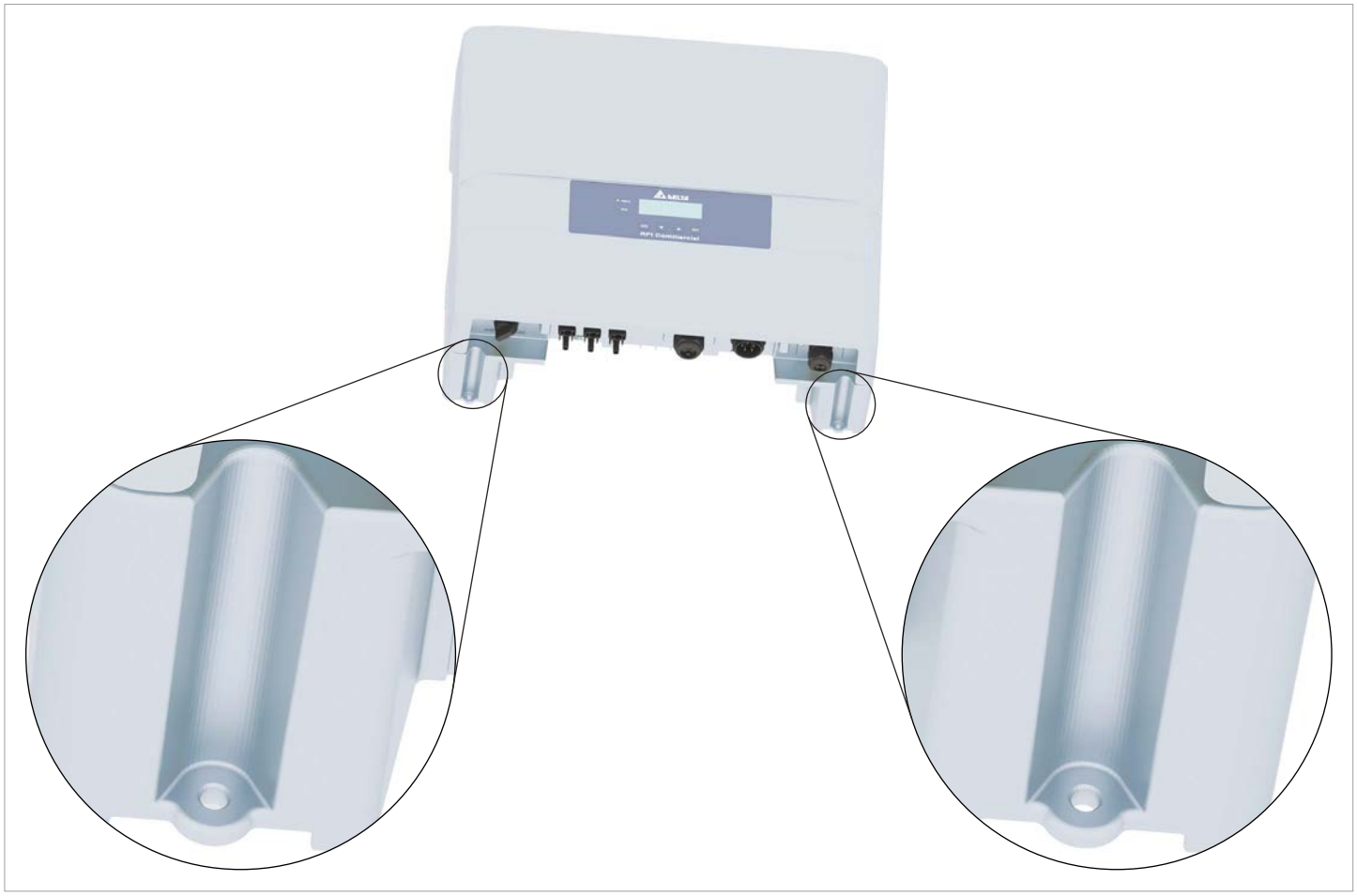
4.4.6 Communication port 2

Functions of the *Communication port*:

- 6 x Digital inputs (e.g. for connecting to a ripple control receiver)
- 1 x Dry contacts (e.g. for connecting to an external relais)
- 1 x External Power Off (EPO)

4 Product overview

4.5 Mounting and grounding holes



The grounding connection is used for grounding the inverter housing.

Grounding screw, spring washer, washer and toothed lock ring are delivered with the inverter.

4.6 Information on the type label

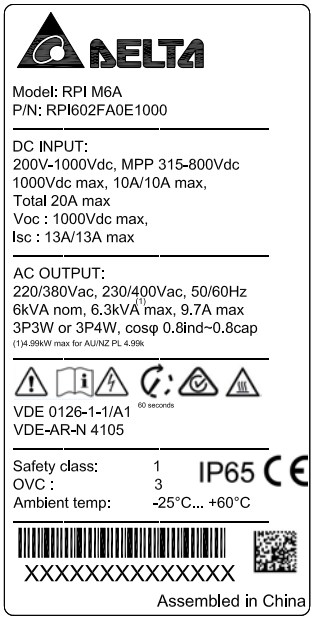


Fig. 4.4: Type label M6A

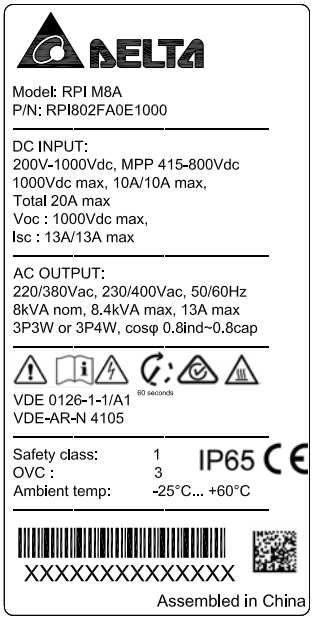


Fig. 4.5: Type label M8A

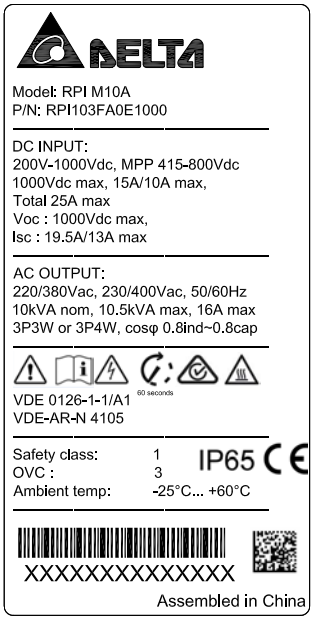


Fig. 4.6: Type label M10A

Symbols on the type label

Symbol	Description
 60 seconds	**Risk of death by electrocution** Potentially fatal voltage is present when the solar inverter is in operation that remains for 60 seconds after being disconnected from power. Never open the solar inverter. The solar inverter contains no components that must be maintained or repaired by the operator or installer. Opening the cover will void the warranty.
	Read the manual delivered with the inverter before working with the solar inverter and follow the instructions contained in the manual.
	Risk of injury from hot surfaces. When in operation, the housing of the solar inverter can become very hot.
	The housing of the inverter must be grounded if this is required by local regulations.
	Regulatory Compliance Mark (RCM mark): The inverter is compliant with the Australian Electrical Safety and EMC standards. Applies only to Australia and New Zealand.

4 Product overview

Technical data and other information on the type label

Technical data / information			Description
M6A	**M8A**	**M10A**	
Model: RPI M6A	Model: RPI M8A	Model: RPI M10A	Delta Model name
P/N: RPI602FA0E1000	P/N: RPI802FA0E1000	P/N: RPI103FA0E1000	Delta Part number
DC Input			
200-1000Vdc			DC input voltage range
MPPT 315-800Vdc	MPPT 415-800Vdc	MPPT 415-800Vdc	MPP input voltage range with full power (with symmetrical load)
1000Vdc	1000Vdc	1000Vdc	Maximum DC input voltage
10A/10A max	10A/10A max	15A/10A max	Maximum DC input current DC input DC1 / DC2
Total 20A max	Total 20A max	Total 25A max	Total maximum DC current
Voc: 1000VDC max	Voc: 1000VDC max	Voc: 1000VDC max	Maximum **Open circuit voltage**
Isc: 13A/13A max	Isc: 13A/13A max	Isc: 19.5A/13A max	Maximum **DC short circuit current** x number of strings
AC Output			
220/380, 230/400 Vac	220/380, 230/400 Vac	220/380, 230/400 Vac	AC Nominal voltage
50/60 Hz	50/60 Hz	50/60 Hz	AC Nominal frequency
6kVA nom	8kVA nom	10kVA nom	Nominal reactive power
6.3kVA max (1) 4.99 kW max for **AU/NZ PL 4.99k**	8.4kVA max	10.5kVA max	Maximum reactive power; The RPI M6A will be limited to 4.99 kW if grid type **AU/NZ PL 4.99k** is selected (applies to Australia and New Zealand only)
9.7A max	13A max	16A max	Maximum AC current
3P3W or 3P4W	3P3W or 3P4W	3P3W or 3P4W	The inverter can be connected to a 3-phase-grid with a 3-wire system (3 phases + PE) or with a 4-wire system (3 phases + N + PE)
cosφ 0.8ind~0.8cap	cosφ 0.8ind~0.8cap	cosφ 0.8ind~0.8cap	Range of cos φ
Standards and directives			
VDE 0126-1-1/A1	VDE 0126-1-1/A1	VDE 0126-1-1/A1	The inverter fulfils the requirements of standard VDE 0126-1-1/A1.
VDE-AR-N 4105	VDE-AR-N 4105	VDE-AR-N 4105	The inverter fulfils the requirements of standard VDE-AR-N 4105.
CE	CE	CE	CE marking. With the marking Delta declares that the inverter meets the requirements of the applicable EC directives.
Environmental information			
Safety Class: 1	Safety Class: 1	Safety Class: 1	Safety class according to EN 61140
OVC: III	OVC: III	OVC: III	Overvoltage category according to IEC 62109-1
Ambient temp: -25°C...+60°C	Ambient temp: -25°C...+60°C	Ambient temp: -25°C...+60°C	Operating temperature range
IP65	IP65	IP65	Protection degree according to EN 60529

5. Planning the installation

NOTE

This chapter is for illustration purposes **only** and is not related to do any real actions.

Some of the actions can be dangerous. Chapter “6. Installation”, p. 39 describes all actions and the potential risks in detail.

5.1 Where to mount the inverter

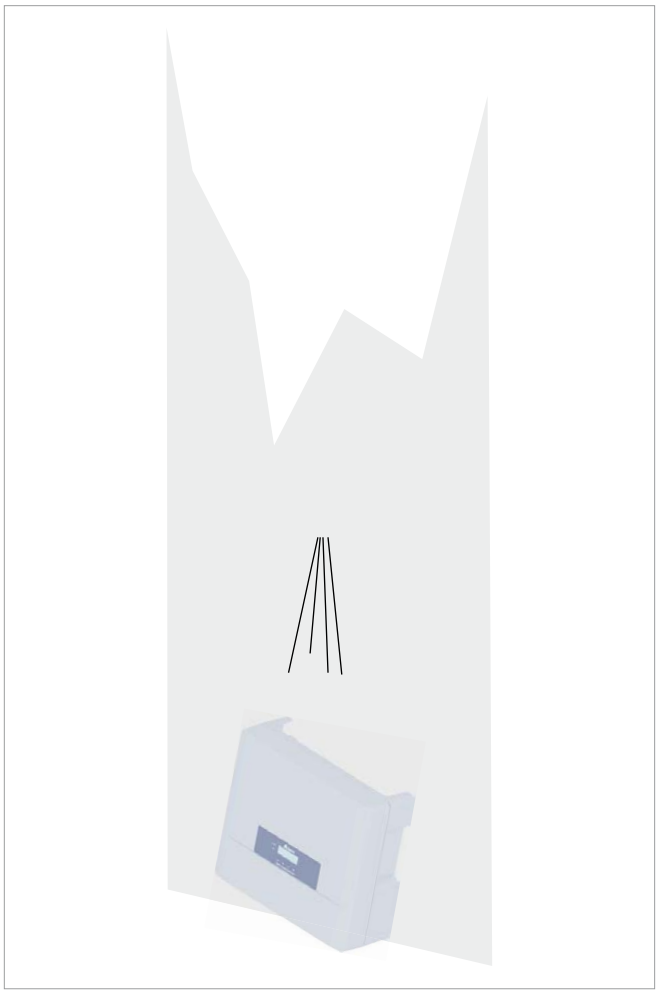


Fig. 5.1.: Where to mount the inverter 1

- ► The inverter is very heavy. The inverter must be lifted and carried by at least two people.
- ► Always use the mounting plate supplied with the inverter.
- ► Check that the wall is capable of bearing the heavy load of the device.
- ► Mount the inverter on a fireproof wall.
- ► Use dowels and screws that are suitable for the wall material and the heavy weight.
- ► Mount the inverter on a vibration-free wall to avoid disruptive vibrations.
- ► Possible noise emissions can be disruptive when the device is used in living areas or in buildings with animals. Therefore, choose your installation location carefully.

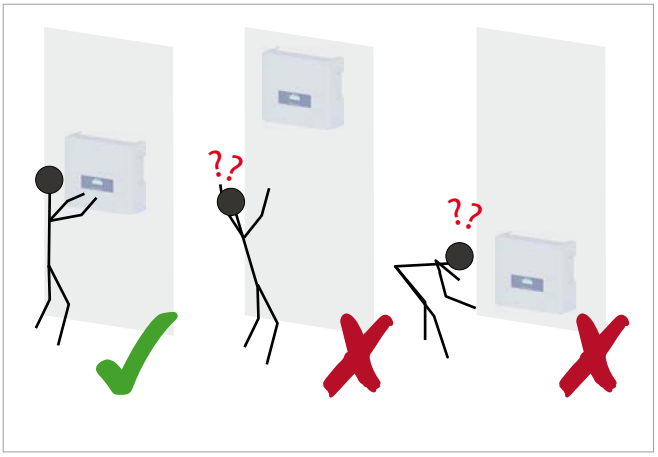


Fig. 5.2.: Where to mount the inverter 2

- ► Mount the inverter so that the LEDs and display can be easily seen and that the buttons can be operated. Make sure the reading angle and installation height are sufficient.

5.2 Mounting orientation

Fig. 5.3.: Mounting orientation

- ► Mount the inverter vertically.

5 Planning the installation

5.3 Outdoor installations

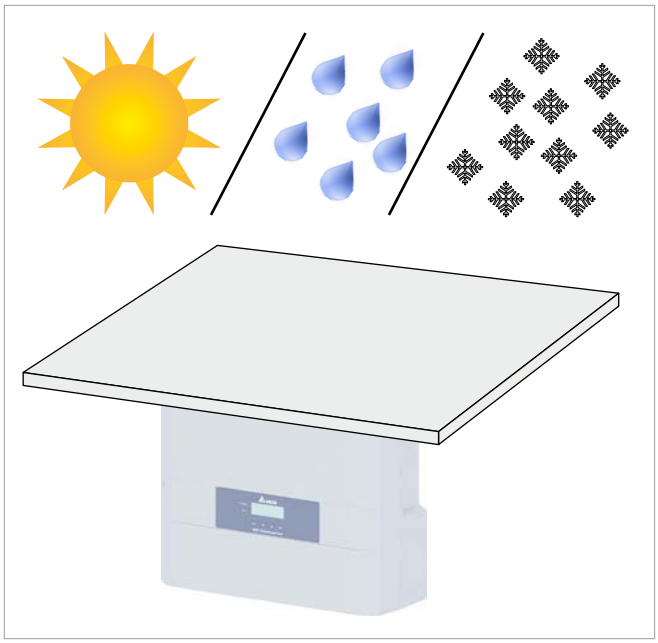


Fig. 5.4.: Outdoor installations

- ► The inverter has protection degree IP65 and can be installed indoors or in protected outdoor areas (that means outdoor but protected by a roof against direct sun, rain or snow).
- ► In areas with many nearby trees or meadows, pollen could clog the air inlets or fans. In this case you can try to cover the air inlets but be careful not to hinder the air flow. Alternatively, you can regularly clean air inlets and fans.

5.4 Ambient conditions and air circulation

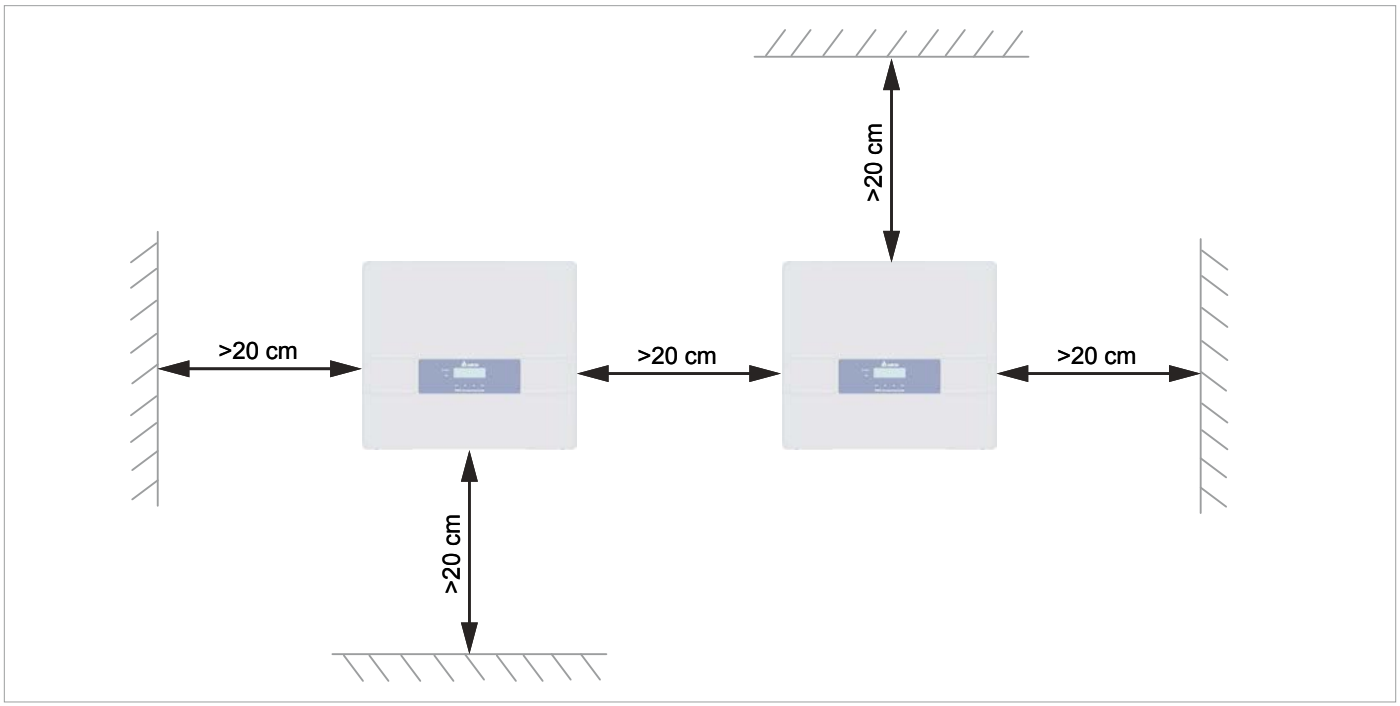


Fig. 5.5.: Mounting distances and air circulation

- ► Ensure adequate air circulation. Hot air must be able to dissipate downward. Keep enough space around each inverter.
- ► Do not install inverters directly above one another. Otherwise, the lower inverter is warmed up by the upper one.
- ► Consider the **operating temperature range** (see ”13. Technical data”, p. 113).

  When the operating temperature range is exceeded, the inverter reduces the amount of power generated.

5.5 Efficiency curves

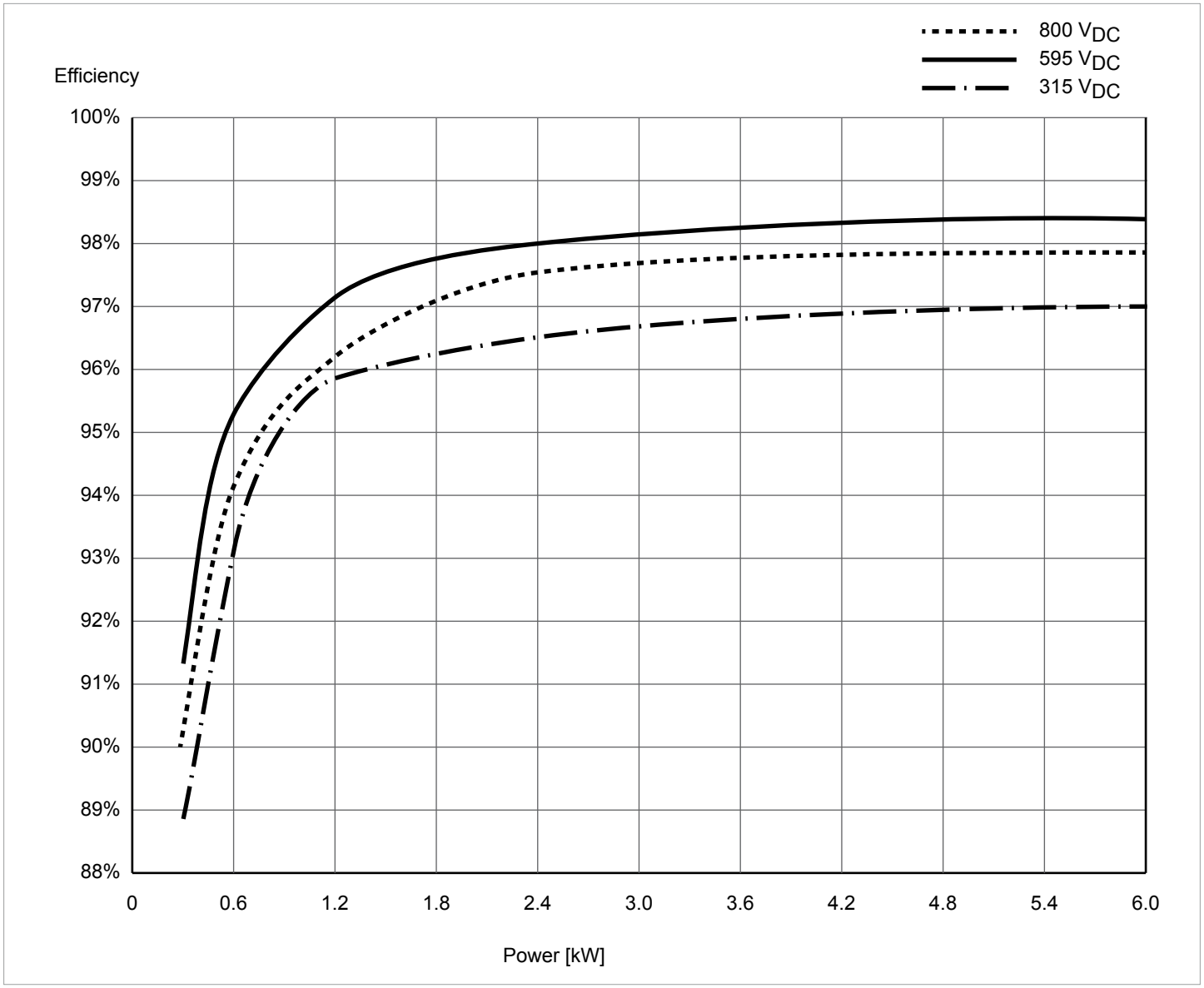


Fig. 5.6: M6A efficiency curve

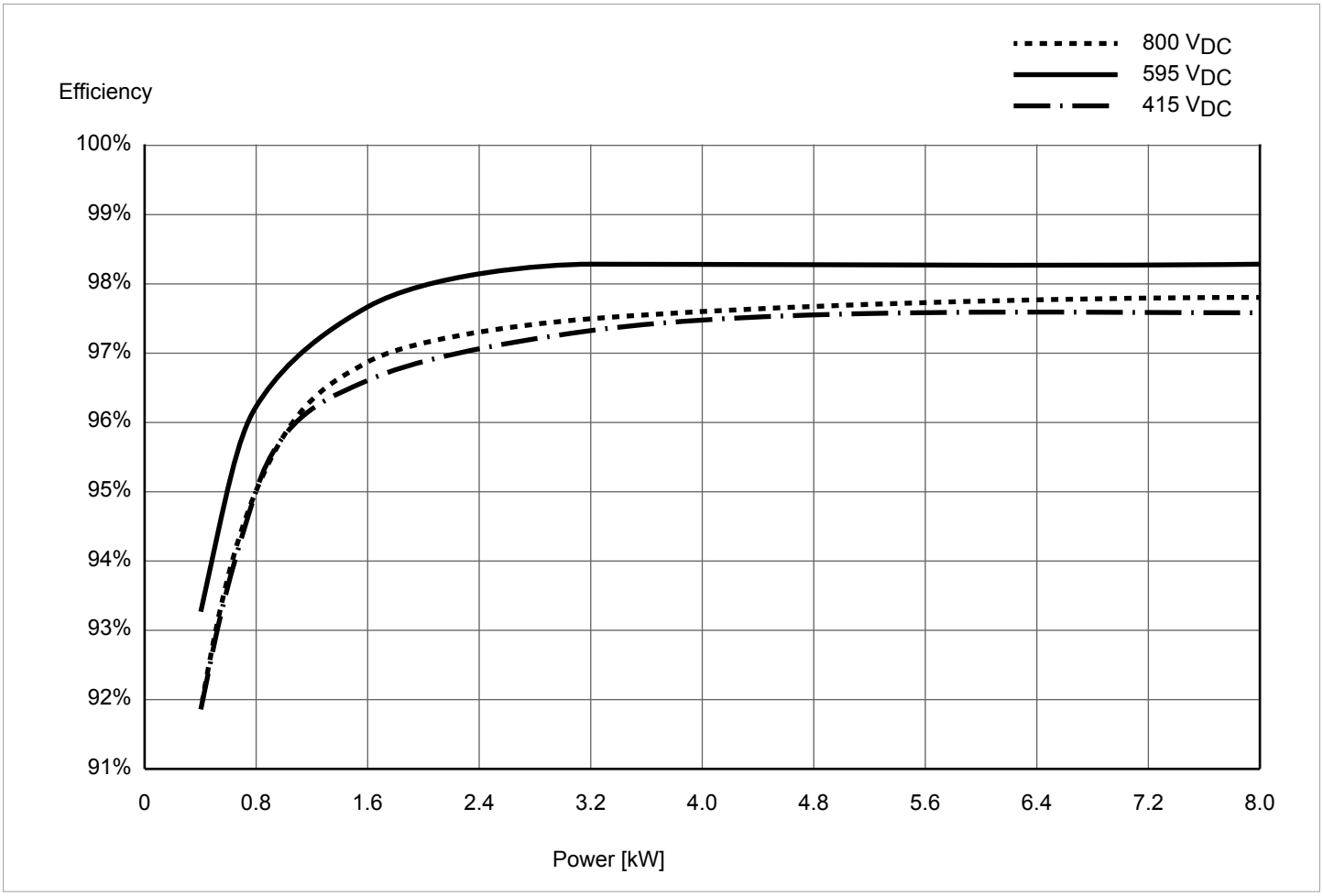


Fig. 5.7: M8A efficiency curve

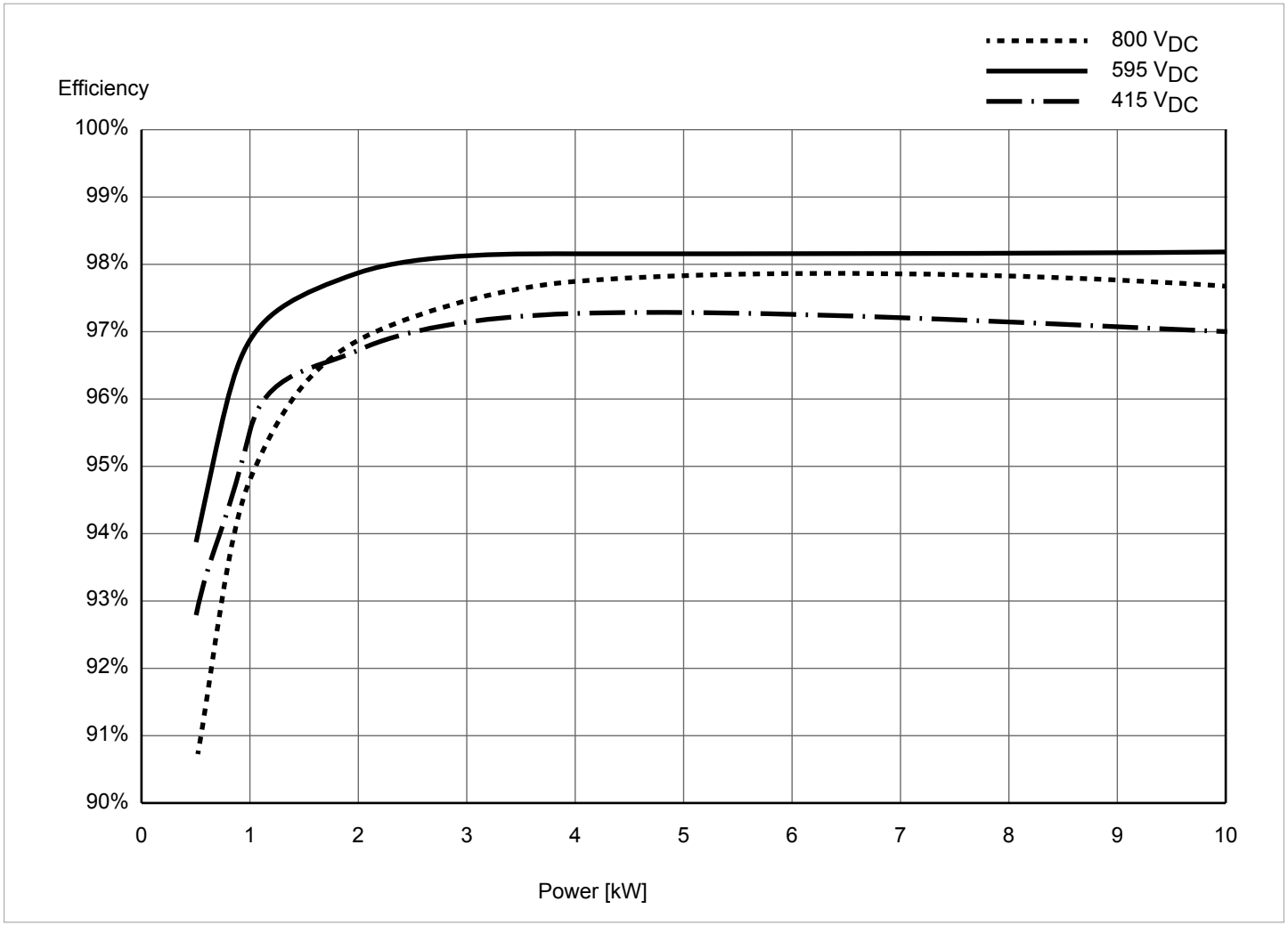


Fig. 5.8: M10A efficiency curve

5.6 Dimensions

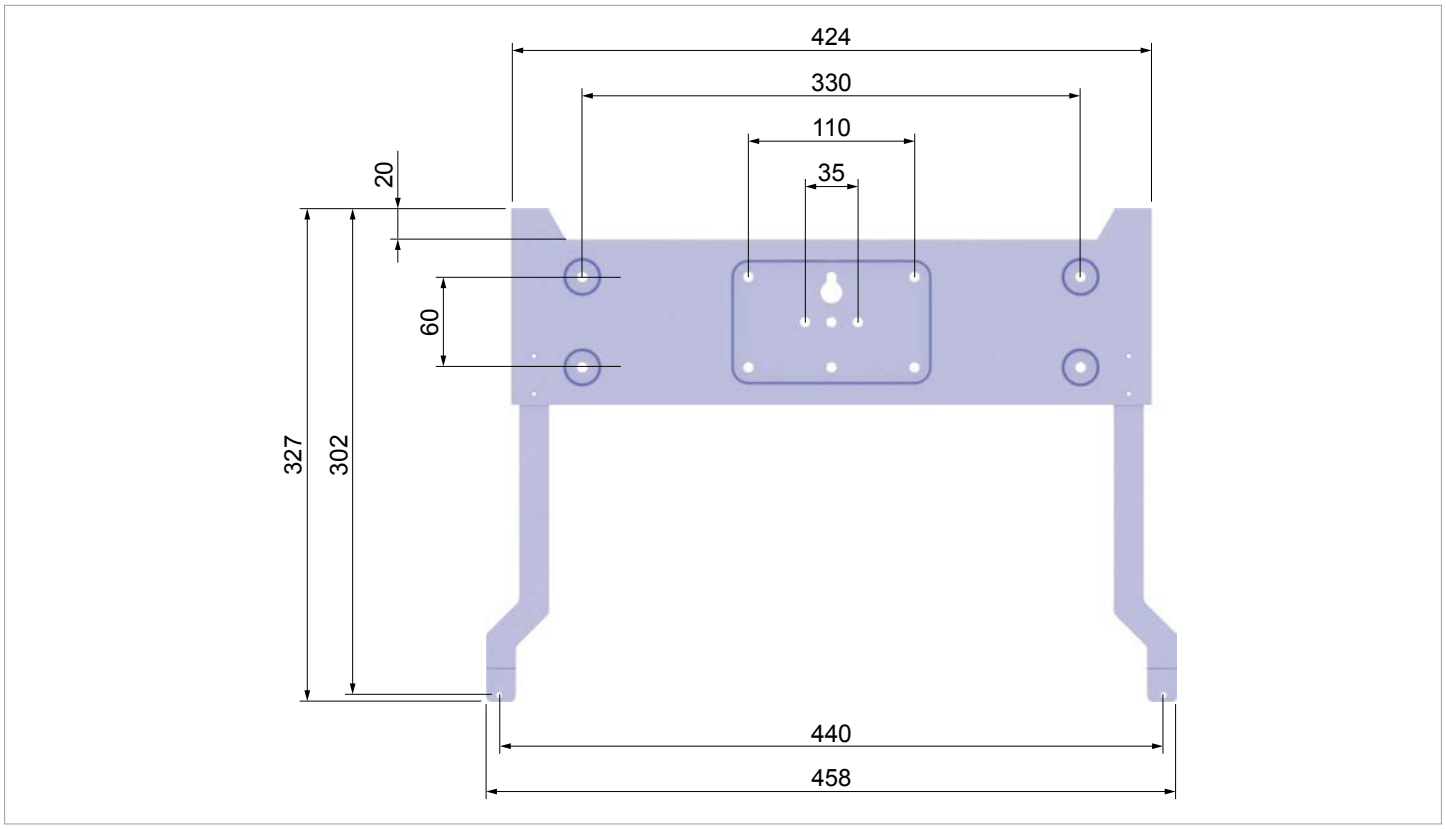


Fig. 5.9: Dimensions of mounting plate

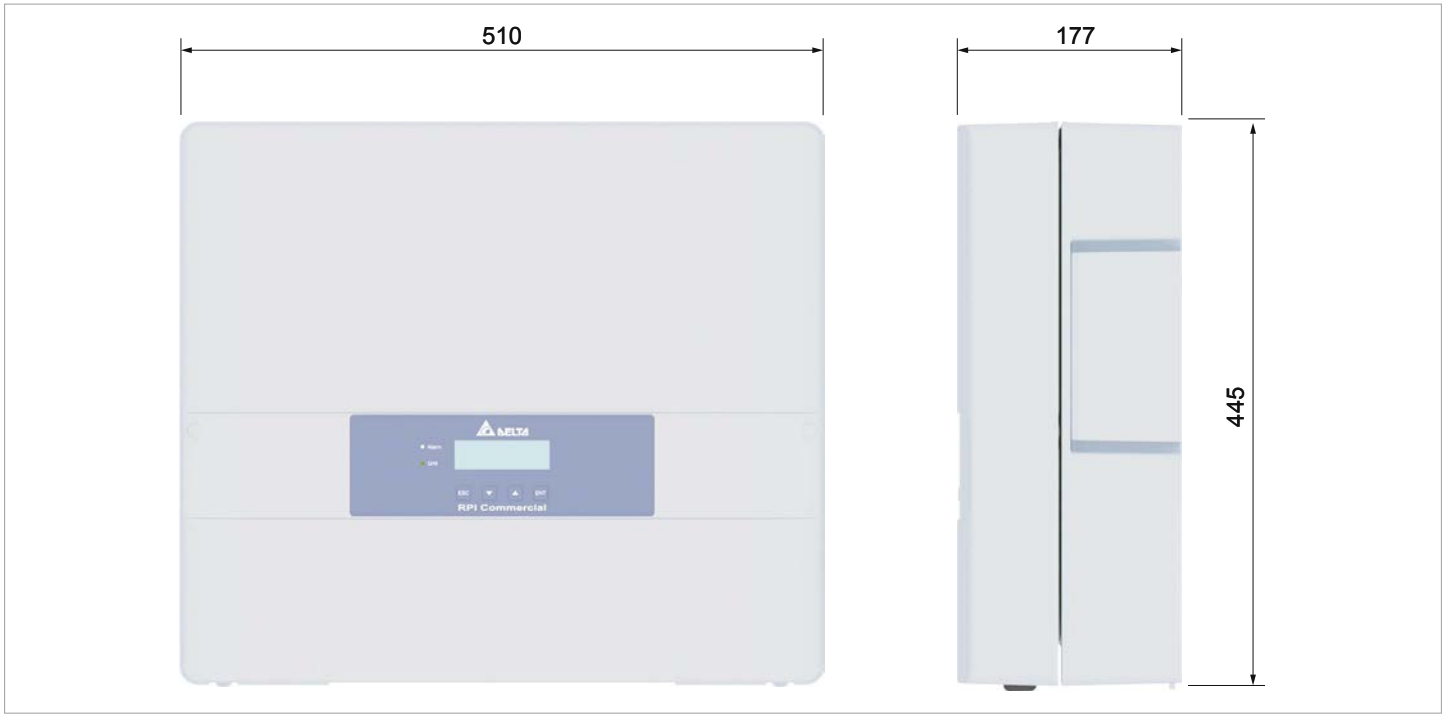


Fig. 5.10: Dimensions of inverter (in mm)

5.7 AC connection

Always adhere to the specific regulations applicable in your country or region.

Always adhere to the specific regulations defined by your grid operator.

For the safety of the user and for the security of your installation, install required safety and protection devices that are applicable for your installation environment (example: automatic circuit breaker and/or overcurrent protection equipment).

Use the proper upstream circuit breaker to protect the inverter:

Model	Upstream Circuit Breaker
RPI M6A	16 A
RPI M8A	16 A
RPI M10A	20 A

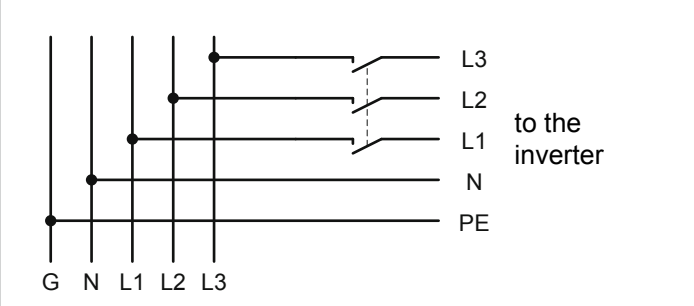


Fig. 5.11: Position of upstream circuit breaker

Due to its design, the inverter is not capable of feeding DC residual current back into the grid. It fulfils this requirement in accordance with DIN VDE 0100-712.

When examining these possible fault situations in terms of the currently valid installation standards, Delta has come to the conclusion that there is no danger when operating the inverter in combination with a type A upstream residual-current device (RCD).

Therefore faults that would otherwise require the use of a type B residual-current device due to the inverter can be excluded.

The integrated all-pole sensitive RCMU is certified according to VDE 0126 1-1/A1:2012-02 §6.6.2 for a tripping current of 300 mA. RCD Type A can be used for this inverter, according to the following table.

Minimum tripping current of the RCD	≥100 mA

NOTE

The value of the tripping current mainly depends on the quality of the solar modules, the size of the PV array and environmental conditions (e.g. humidity). The tripping current of the residual current device must not be less than the specified minimum tripping current.

Permitted earthing systems

Earthing System	TN-S	TN-C	TN-C-S	TT	IT
Permitted	Yes	Yes	Yes	Yes	No

AC grid voltage requirements

3P3W	Voltage	3P4W	Voltage
L1-L2	400 V_{AC} ± 20%	L1-N	230 V_{AC} ± 20%
L1-L3	400 V_{AC} ± 20%	L2-N	230 V_{AC} ± 20%
L2-L3	400 V_{AC} ± 20%	L3-N	230 V_{AC} ± 20%

5.8 DC connection

NOTICE

Machine and equipment damage may occur.
Exceeding the maximum current per DC input can cause an overheating of the DC inputs.
► Always consider the maximum current of the DC inputs when planning the installation.

5.8.1 Symmetrical and asymmetrical power input

The inverter operates using two separate MPP trackers that can handle both symmetrical and asymmetrical power input. This allows you to set up complex PV system designs. For example: east/west-facing roof (asymmetric load) or a south facing roof (symmetrical load).

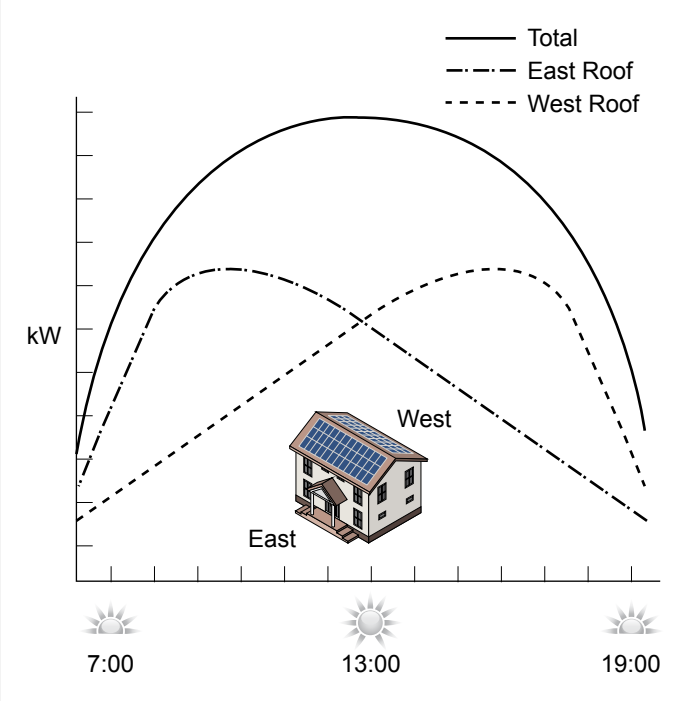
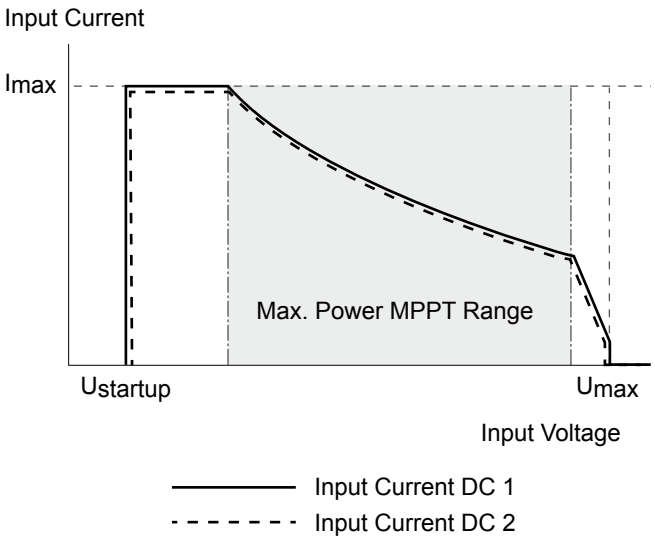


Fig. 5.12: Concept of 2-MPP-tracker system for asymmetrical power input

The following figures explain how symmetrical and asymmetrical power input is handled:

Symmetrical power input



Asymmetrical power input

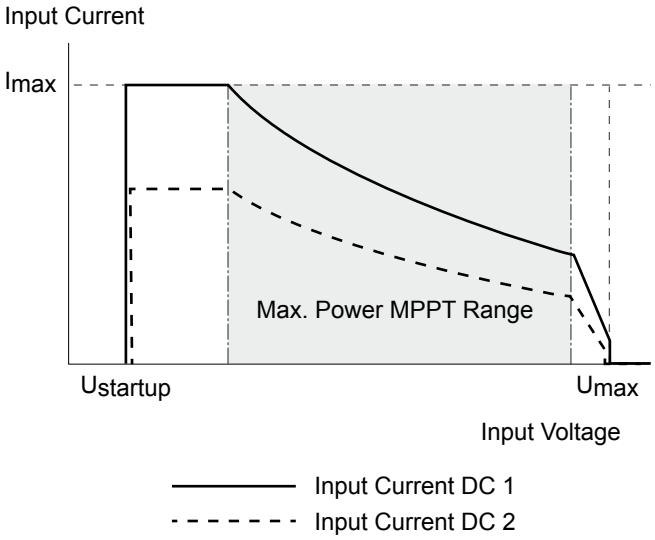


Fig. 5.13: I-U curve for symmetrical and asymmetrical power input (schematic diagrams)

For currents and voltages see “13. Technical data”, p. 113.

5.8.2 Use with solar modules that do not need to be grounded

When you use PV modules that do not need to be grounded, you can connect the DC inputs separately or in parallel.

“Separate DC inputs” means each DC input is connected to a separate MPP tracker. “Parallel DC inputs” means both DC inputs are connected to one MPP tracker. With parallel DC inputs you cannot realize asymmetrical power inputs.

PV array can be connected to the inverter directly or via an external DC distribution box.

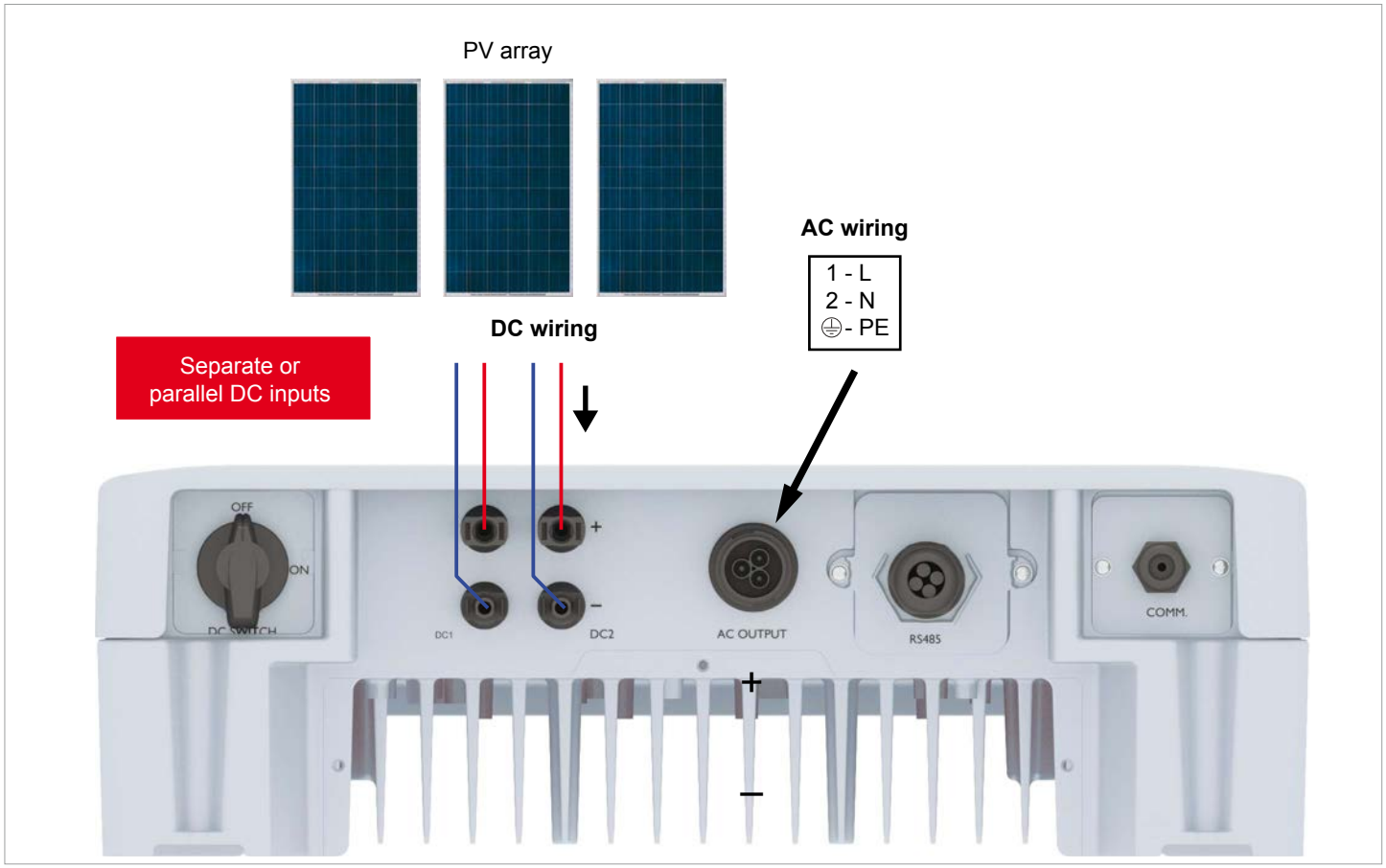


Fig. 5.14: System design with floating DC inputs

5.8.3 Use with solar modules that have to be grounded

NOTICE

Machine and equipment damage may occur.

- ► When the DC inputs are grounded, all strings must be connected in parallel and then connected to the inverters.
- ► Additionally, an external isolation transformer must be installed to the AC side of the PV system. Otherwise, damage will result and the inverter will not work properly.

Depending on the DC connection type, different settings for insulation problems detection have to be used, see “8.7 Insulation mode and insulation resistance”.

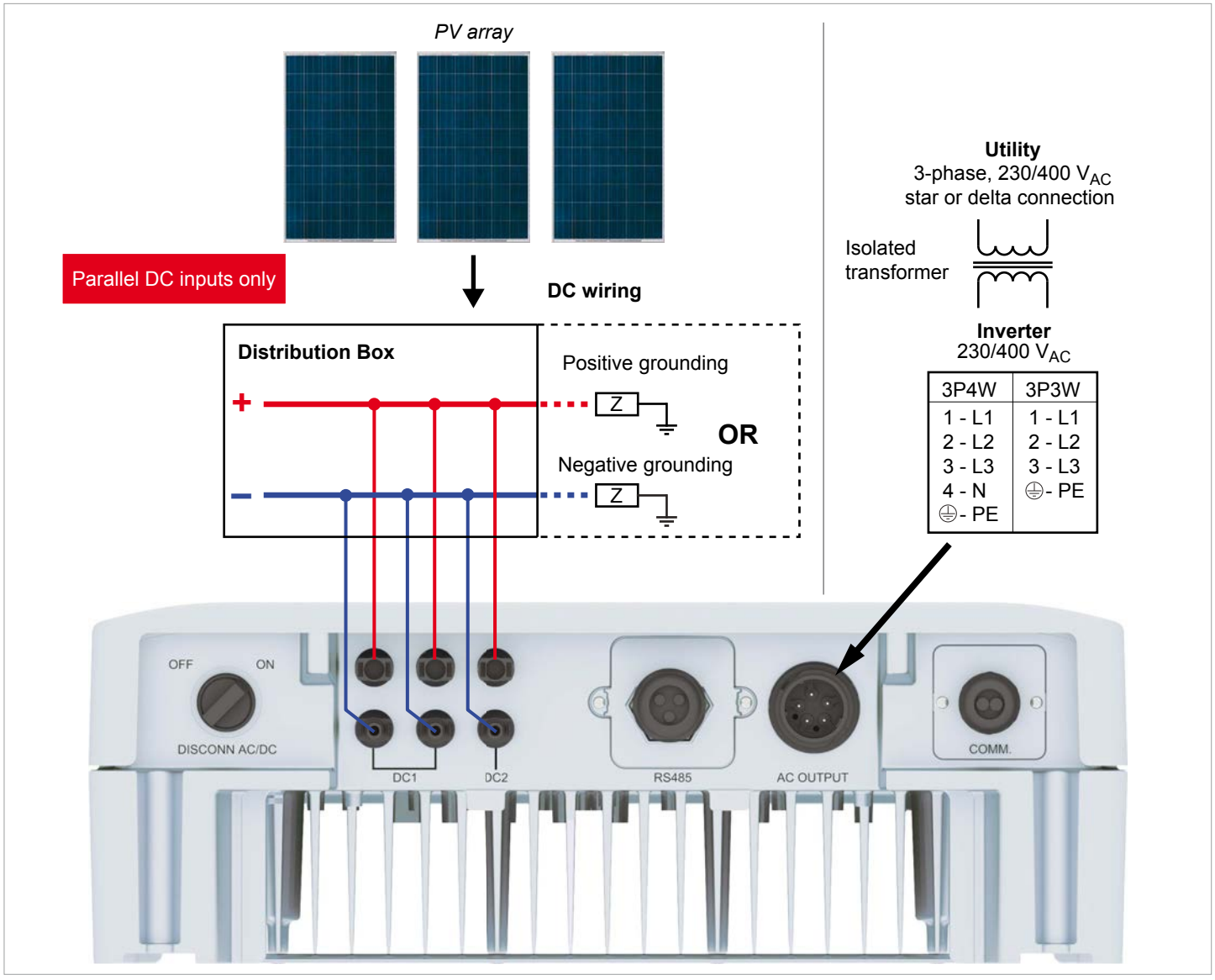


Fig. 5.15: System design with floating DC inputs

5.8.4 Connecting DC strings to the DC terminals

Check the polarity of the DC voltage before you connect the solar modules. The negative DC pole of the string is connected to the DC– connector; the positive DC pole to the DC+ connector.

Check **Maximum Reverse Current Capability** of your modules for required safety equipment like fuses.

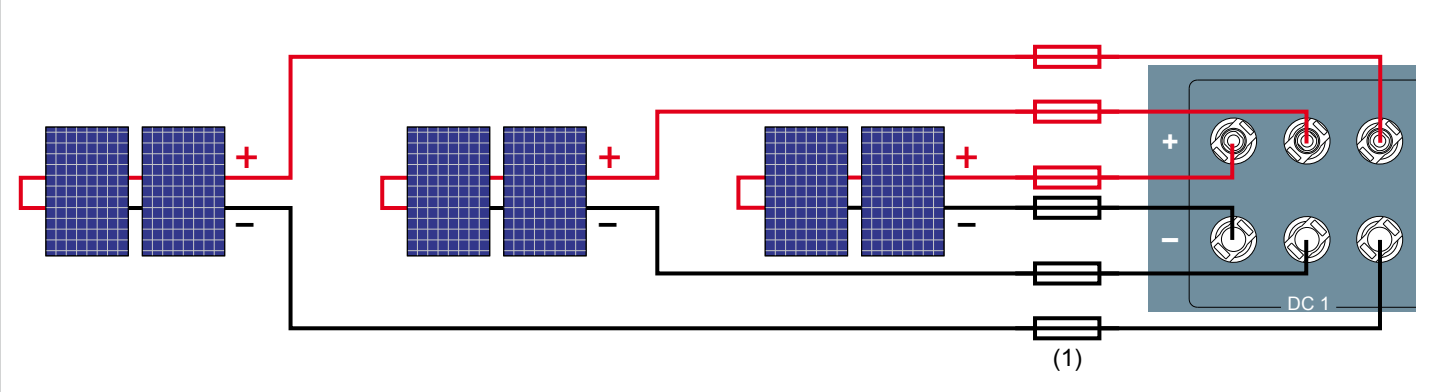


Fig. 5.16: Connecting a single string to each DC terminal

5.9 Connecting to a datalogger via RS485

The inverter can be connected to a datalogger via RS485, e.g. for monitoring, changing settings or software updates.

To ensure the proper work of the data connection, consider the following recommendation and instructions.

When you connect a single inverter

- The termination resistor has to be switched on.

When you connect multiple inverters within the same PV system

- On the **last** inverter in the chain, the termination resistor has to be switched on.
- If your datalogger has no internal termination resistor, the termination resistor on the **first** inverter in the chain has to be switched on too.
- To each inverter a different inverter ID has to be applied. This is necessary, so that the datalogger or the maintenance software can identify each inverter in the chain.
- The baud rate has to be the same on each inverter.

Cable and wire requirements

- Twisted and shielded cables with 2 solid wires.
- Cable diameter: 5 mm
- Wire cross-section: 1 mm^2
- The RS485 cables should be kept separate from the AC cable and the DC cables to avoid interferences.

5.10 Dry contacts

The inverter supports one multi-function relay which can be used for external alarm devices like buzzers or strobe lights.

On the display (see “8.9 Dry contacts”, p. 80), the dry contacts can be connected to one of the following events:

Event	Description
Disabled	The functionality for dry contacts is switched off.
On Grid	The inverter has connected to the grid.
Fan Fail	The fans are defective.
Insulation	Insulation test failed.
Alarm	An error, fault, or warning message occurred.
Error	An error message occurred.
Fault	A fault message occurred.
Warning	A warning message occurred.

Default setting for both dry contacts is “Disabled”.

Cable and wire requirements

- Twisted and shielded cable (CAT5 or CAT6) with 2 wires
- Cable diameter: 5 mm
- Wire cross section: 1 mm^2
- The RS485 cables should be kept separate from the AC cable and the DC cables to avoid interferences

Providing 12 V_{DC} supply power for an external alarm device

Depending on the type of communication card, the inverter provides one or two sources of on-board 12 V_{DC} power supplies.

	Source of supply power	Supply voltage	Communication card	
			Type 1	Type 2
a)	Communication card	12 V_{DC}	not possible	x
b)	RS485 card	12 V_{DC}	x	x [1)]

1) not recommend as it is more complicated than variant a)

Check the type of communication card installed in your inverter before you plan how to connect dry contacts and digital inputs.

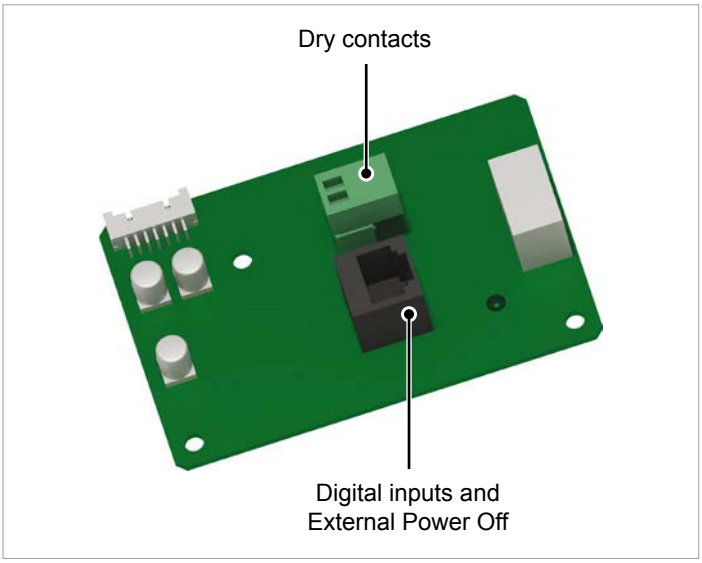


Fig. 5.17: Communication card type 1

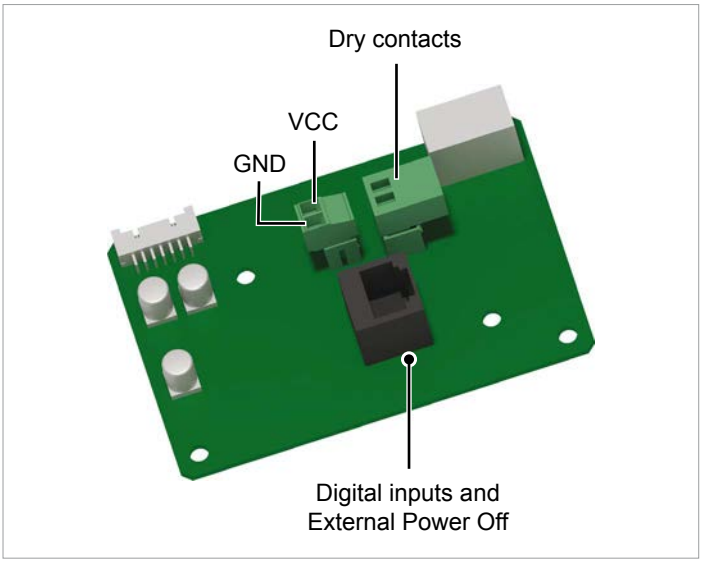


Fig. 5.18: Communication card type 2

a) 12 V_{DC} supply power from communication card type 2

Use a voltmeter to check which terminal on the plug is VCC.

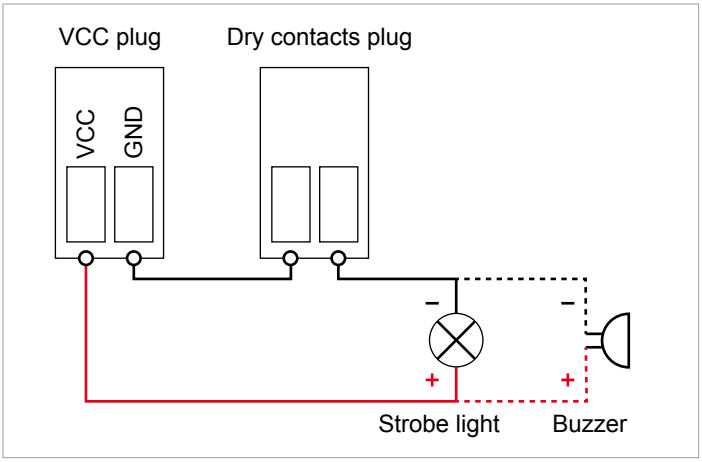


Fig. 5.19: Providing a 12 V_{DC} supply power for an external alarm device from the communication card, variant 1

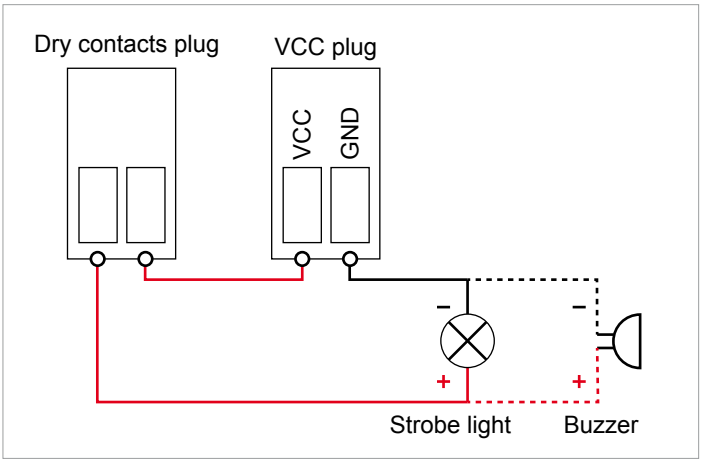


Fig. 5.20: Providing a 12 V_{DC} supply power for an external alarm device from the communication card, variant 2

b) 12 V_{DC} supply power from RS485 card

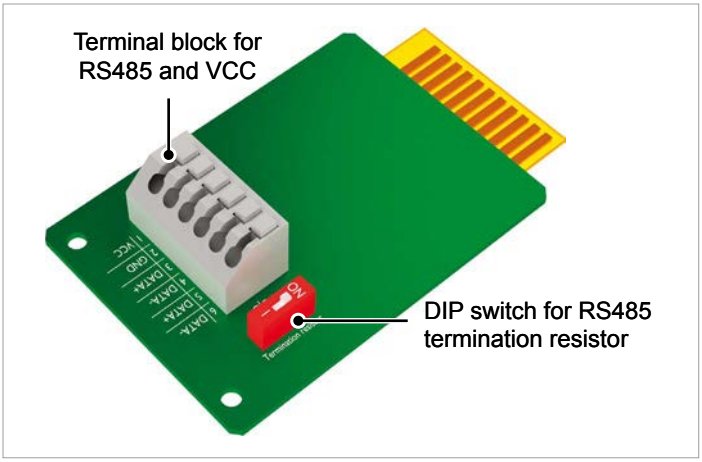


Fig. 5.21: RS485 card

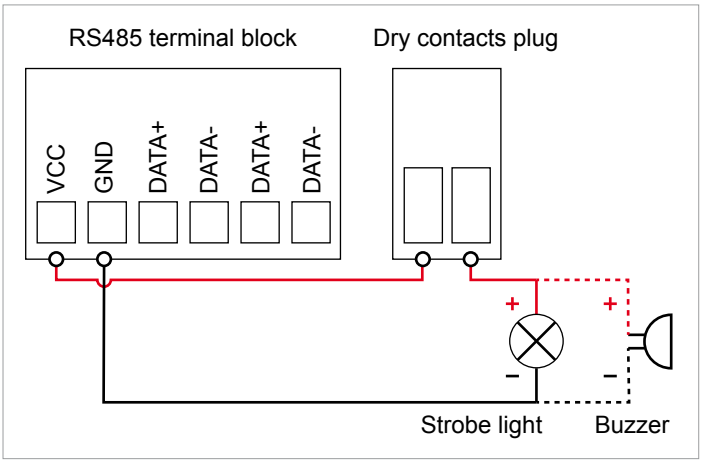


Fig. 5.22: Providing a 12 V_{DC} supply power for an external alarm device from the RS485 card, variant 1

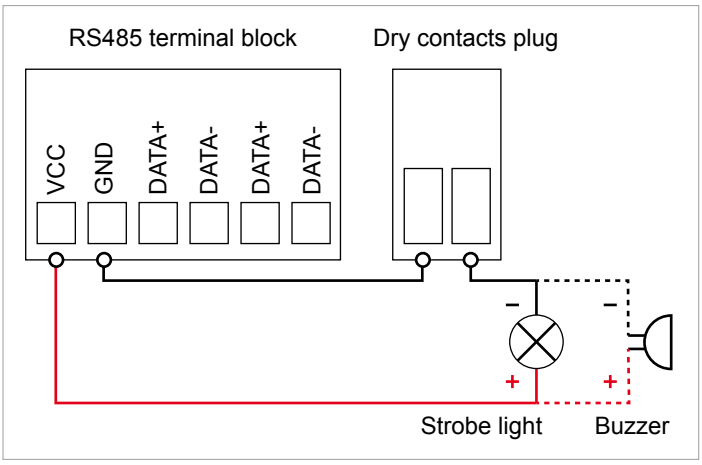


Fig. 5.23: Providing a 12 V_{DC} supply power for an external alarm device from the RS485 card, variant 2

5.11 Connecting a PC to the inverter

You can use a PC to set up the parameters of the inverter. To connect a PC to the inverter, you need the following parts:

Part name	Description
USB-RS485 adapter with RS485 cable	To connect a PC to the inverter.
Delta Service Software	To set the parameters on the inverter.

USB-RS485 adapter and Delta Service Software are available at Delta. Please contact Delta Support in your country, see contact data on the last page of this document. The RS485 cable can be a standard cable.

5.12 Connecting a ripple control receiver

A ripple control receiver can be connected to the digital inputs, see “6.5 Digital inputs and EPO”, p. 53.

5.13 Use of external power disconnection devices

(1) The German standard VDE-AR-N 4105, section 6.1 requires for PV plants larger than 30 kVA the use of an external power disconnection device (Netz- und Anlagenschutz) with clutch switch.

(2) Alternatively, VDE-AR-N 4105, section 6.4.1 allows the use of an inverter with an internal clutch switch if the internal clutch switch disconnects the inverter from the AC grid within less than 100 ms.

This inverter fulfils (2) when the following firmware versions are installed: DSP ≥ 1.30 / RED ≥ 1.20 / COMM ≥ 1.10. For inverters with these firmware versions, an external power disconnection device is not needed.

Beside the parts delivered with the inverter (see “4.1 Scope of delivery”, p. 10), you may need the following additional parts and tools.

5.14 What you need

5.14.1 For mounting the inverter

Part name	Quantity	Description
M5 mounting screws	8	The mounting plate has to be mounted with 8 M5 screws. Depending on where you mount the inverter (e.g. on a brick wall, concrete wall, metal frame, etc.), you may need additional mounting equipment: wall plugs (dowels), washers, spring washers, nuts, etc. When choosing additional mounting material, take into consideration the installation location as well as the galvanic corrosion effect of dissimilar metals.

5.14.2 For connecting the inverter to the grid

Part name	Quantity	Description
AC cable	-	Use properly sized wire to connect to the correct poles. AC connector: Amphenol C16-3 Current rating: ≤ 25 A Min. / Max. cable diameter: 11 ... 20 mm Min. / Max. wire diameter: 5 ... 8 mm² Recommended torque for terminal screws: ≥ 0.7 Nm The AC plug delivered with the inverter can only be used with flexible copper cable. When calculating the cross section of the cable, consider: ● material used ● thermal conditions ● cable length ● type of installation ● AC voltage drop ● power losses in cable Always follow the system installation requirements defined for your country! France: Follow the system installation requirements defined by UTE 15-712-1 regarding minimum cable sections and protections against overheating due to high currents! Germany: Follow the system installation requirements defined by VDE 0100 712 regarding minimum cable sections and protections against overheating due to high currents! Australia/New Zealand: Always follow the system installation requirements defined by AS/NZS 5033:2005 regarding minimum cable sections and protections against overheating due to high currents!
Wire end sleeves (bootlace pins)	5	Wire end sleeves are needed to tightly mount the wires of the AC cables to the AC plug. Use a crimping tool to fasten the wire end sleeves to the wire. 

5 Planning the installation

5.14.3 For connecting the inverter to the solar modules

Part name	Quantity	Description
DC plugs	M6A/M8A: 2 x female 2 x male M10A: 3 x female 3 x male	The MC4 plugs are delivered with the inverter. In case you need to choose different MC4 plugs, follow the description below to select the correct size.

DC connectors on the inverter		Plugs for DC cable			
			a	b	MultiContact
			mm²	mm	
DC–			1,5 / 2,5	3-6	32.0010P0001-UR [1]
				5,5-9	32.0012P0001-UR
			4 / 6	3–6	32.0014P0001-UR
				5,5-9	32.0016P0001-UR [2]
DC+			1,5 / 2,5	3-6	32.0011P0001-UR [1]
				5,5-9	32.0013P0001-UR
			4 / 6	3-6	32.0015P0001-UR
				5,5-9	32.0017P0001-UR [2]

[1] Delivered with M6A/M8A [2] Delivered with M10A

Part name	Quantity	Description
Safety caps	M6A/M8A: up to 4 M10A: up to 6	Safety caps secure the DC cables to the DC inputs so that they cannot be removed without a special tool, an open end spanner. Safety caps must be used in France. Please check local regulations whether you have to use safety caps. 

Part name	Quantity	Description
Open end spanner	1	Used to disconnect the DC plugs or safety caps from the DC inputs. Available at Multi-Contact. 

5.14.4 For grounding the inverter housing

Part name	Quantity	Description
Grounding cable	-	Typically a yellow/green copper cable with minimum wire size of 6 mm^2 has to be used. M4 screw, washer, spring washer and toothed lock ring are delivered with the inverter. You need a cable lug. Always consider local regulations regarding the cable requirements.

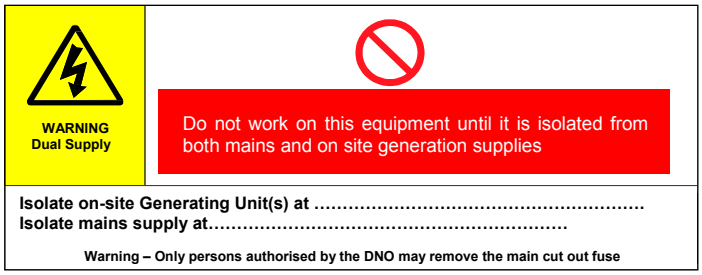
5.14.5 For wiring RS485, digital inputs and dry contacts

Part name	Quantity	Description
Cable	-	Twisted and shielded cable with a wire cross-section of 1 mm^2 and a cable diameter of 5 mm.

5.14.6 For setting up a power limitation

Part name	Quantity	Description
USB-RS485 adapter with RS485 cable	1	To set up a power limitation during the installation, e.g. to fulfil the 70% regulation in Germany. The USB-RS485 adapter can be ordered at Delta. The RS485 cable can be standard cable.
Delta Service Software	1	To change the parameters for power limitation. Can be ordered at Delta.

5.14.7 Other parts

Part name	Quantity	Description
Safety labels	-	Check local regulations whether you have to attach special safety labels to the inverter.   Warning Two sources of voltage present - distribution network - photovoltaic panels  Isolate both sources before carrying out any work

6. Installation

6.1 Safety instructions

DANGER

Risk of death by electrocution
Potentially fatal voltage is applied to the inverter during operation. This potentially fatal voltage is still present for some time after all power sources have been disconnected.

- ► Never open the inverter.
- ► Always disconnect the inverter from power before installation, open the AC/DC Disconnection switch and make sure neither can be accidentally reconnected.
- ► Wait 30 seconds until the capacitors have discharged.

DANGER

Risk of death or serious injury from electrocution
Potentially fatal voltage may be applied to the DC connections of the inverter. When light is falling on solar modules, they immediately start producing energy. They do so, even when the sun is not shining directly onto the solar modules.

- ► Never disconnect the solar modules when the inverter is powered.
- ► First switch off the grid connection so that the inverter cannot feed energy into the grid.
- ► Turn the AC/DC Disconnection switch to position **OFF**.
- ► Make sure the DC connections cannot be accidentally touched.

WARNING

Heavy weight
The inverter weighs about 49 kg.

- ► The inverter must be lifted and carried by at least two people or with an appropriate lifting equipment.

Read chapter “5. Planning the installation”, p. 19 and this chapter **before** you start installation.

Never open the housing of the inverter. Opening the inverter will void the warranty.

6.2 Overview

If you need to wire dry contacts, digital inputs or RS485, it is recommended to do this in a dry environment and before you hang the inverter onto the wall.
Reasons for this are:

- ► You will have to remove the covers from the connection ports. Water could leak into the inverter.
- ► The terminal blocks inside are not easily accessible.

It is recommended to do the installation steps in the following order:

1. Wire RS485
2. Wire dry contacts, digital inputs and EPO (all optional)
3. Mount the inverter to the wall
4. Ground the inverter housing
5. Connect AC plug
6. Connect DC plugs

The terminals for dry contacts, digital inputs and EPO are all on the communication card.

If you want to use the 12 V_{DC} supply power of the RS485 card and the dry contacts to connect an external alarm device, you have to combine step 1 and 2.

6.3 RS485

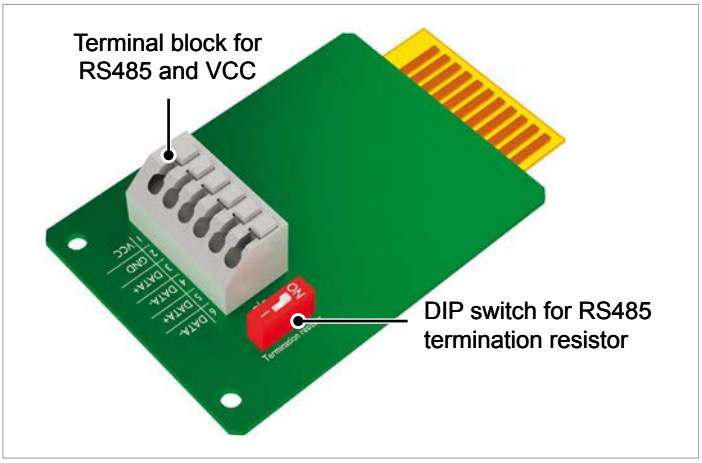


Fig. 6.24: Components on the RS485 card

RS485 is used to connect the inverters of the PV plant via a data-logger to a monitoring system.

For connecting RS485, terminals 3/4 or 5/6 are used. It does not matter which pair of terminals you use. The second pair you only need when you connect multiple inverters via RS485.

If you want to use SOLIVIA Monitor, the Internet based monitoring from Delta, you will also need a SOLIVIA M1 G2 Gateway.

Default baud rate is 19200 which can be changed on the inverter (see chapter “8.5 Baud rate for RS485”, p. 69).

Pin assignment

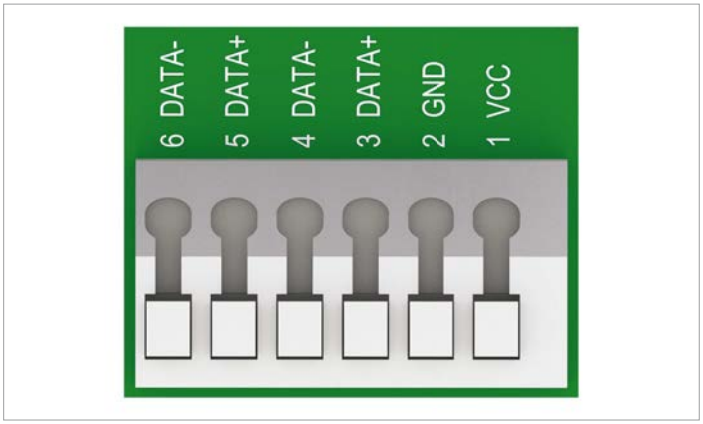


Fig. 6.25: Pin assignment of RS485 terminal block

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

Data format

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

Dip switch for RS485 termination resistor

Fig. 6.26: DIP switch for RS485 termination resistor

Connecting to a Delta SOLIVIA Gateway M1 G2

On the inverter you connect individual wires, on the gateway you have to use a RJ45 plug.

Connect the pins according to the following table:

	Inverter	SOLIVIA Gateway M1 G2
		 1 8
DATA+	Terminal 3 or 5	Pin 7
DATA–	Terminal 4 or 6	Pin 6 or 8

Connecting a single inverter to a datalogger

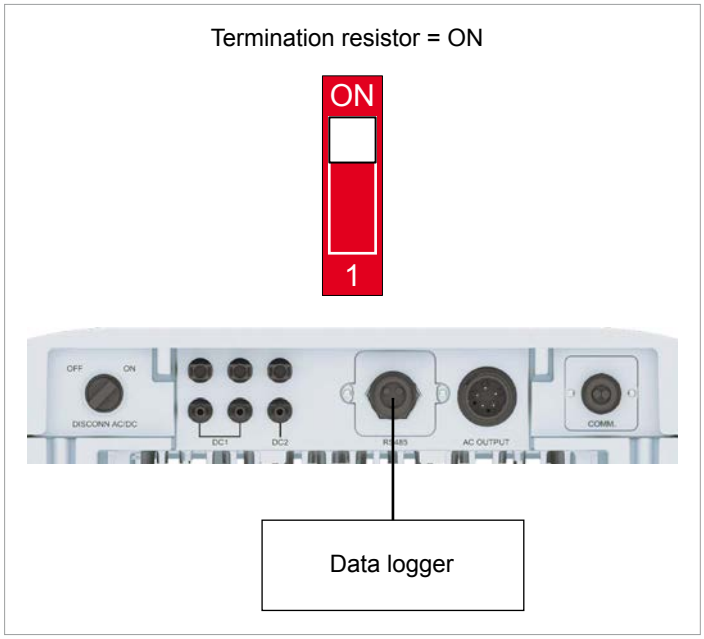


Fig. 6.27: Connecting a single inverter to a datalogger

Connecting multiple inverters to a datalogger

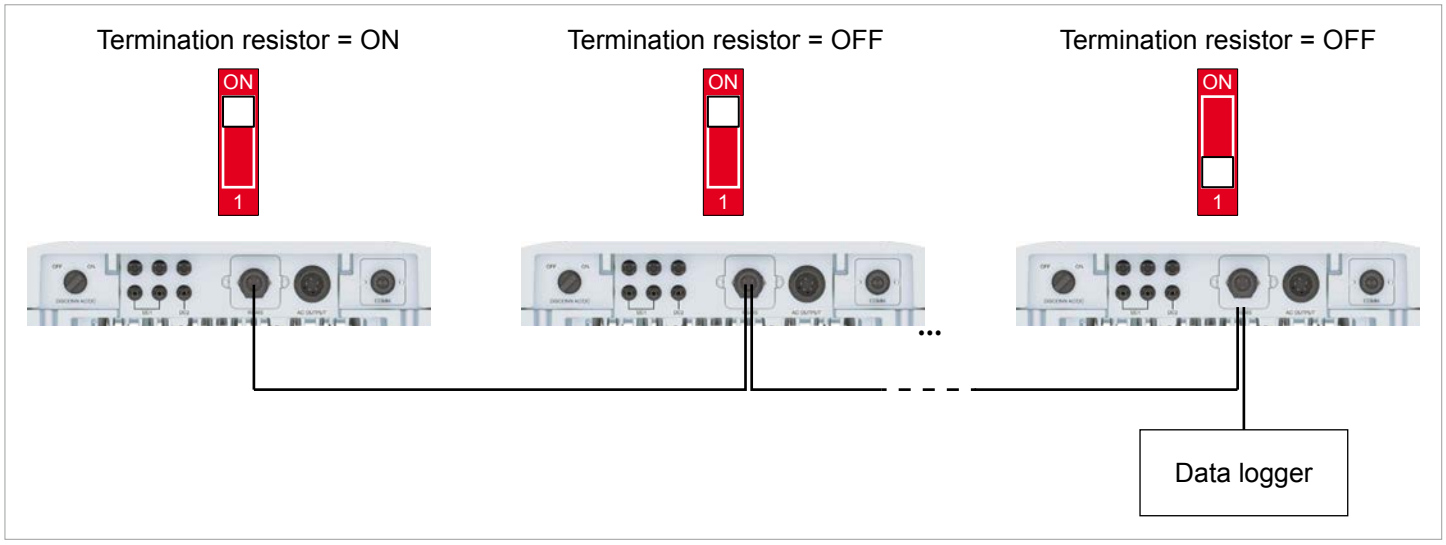
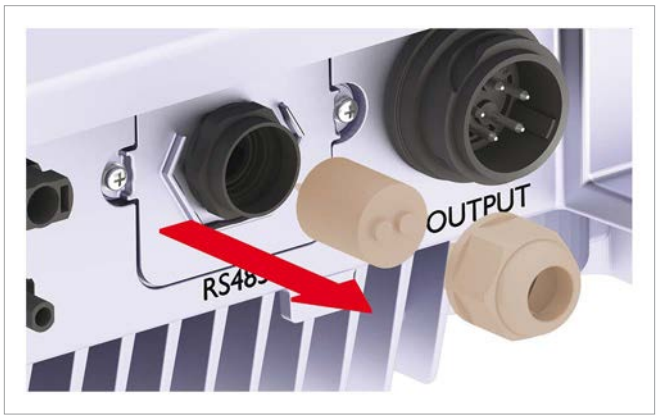


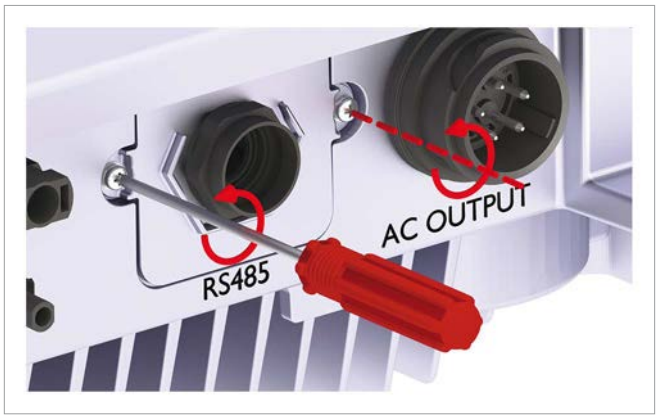
Fig. 6.28: Connecting multiple inverters to a datalogger

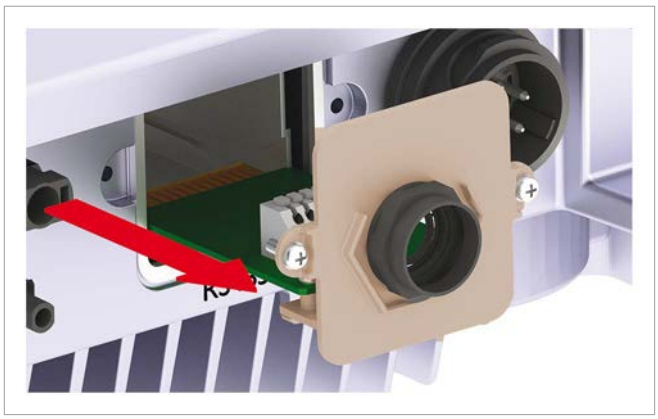
6 Installation

1. Unscrew the cable gland and remove cable gland and sealing.

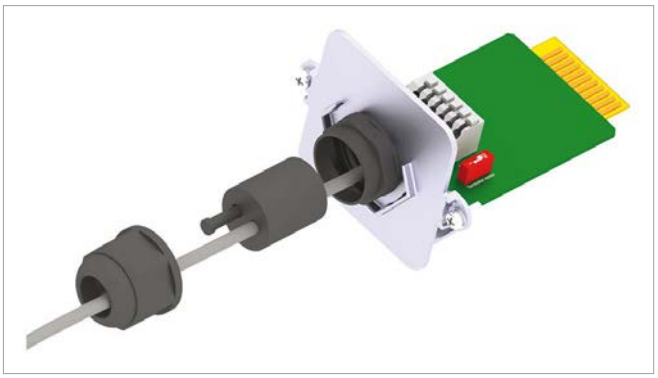


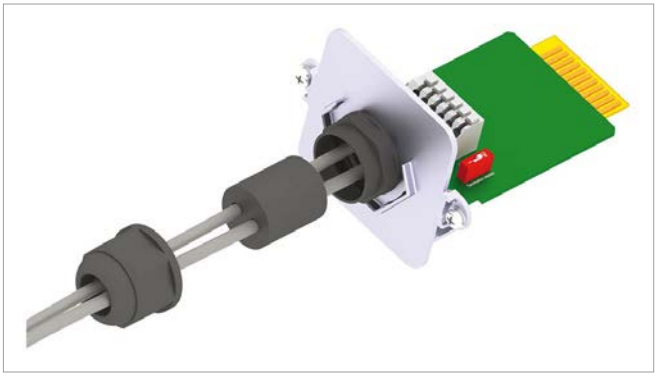
2. Unscrew and pull out the cover.





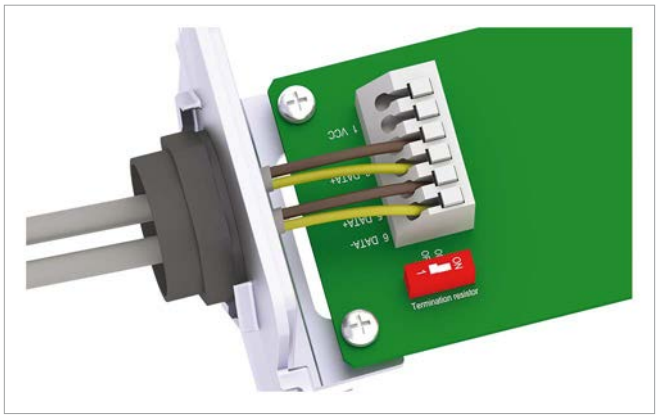
3. Pull the cable through cable gland and sealing. Do not remove the second grommet, unless you use a second cable.



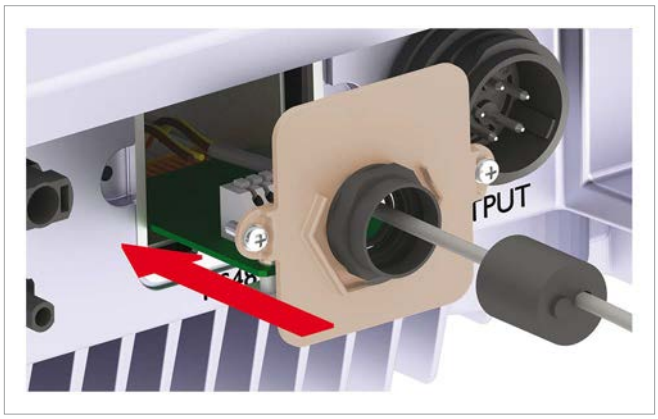


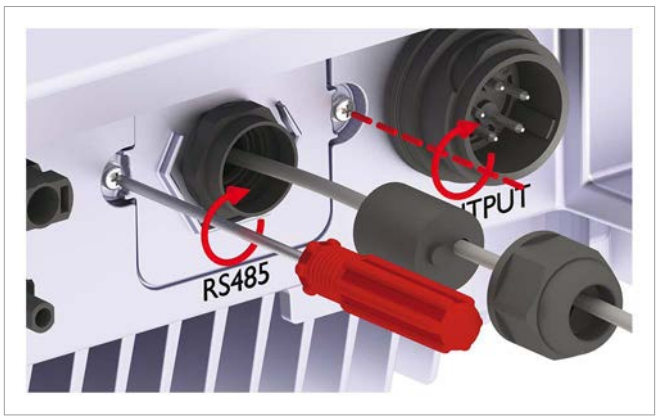
4. On a single inverter or on the last inverter in a chain of multiple inverters, wire RS485 as follows and switch the RS485 termination resistor ON.

When you connect multiple inverters, than wire RS485 on all inverters except the last one as follows and switch the RS485 termination resistor OFF.



5. Place and screw on the cover.





6. Place the sealing and screw on the cable gland.

When you have connected two cables, the final situation should look like this.

6.4 Dry contacts

There are two different communication cards available. Check before installation which one is built into your inverter.

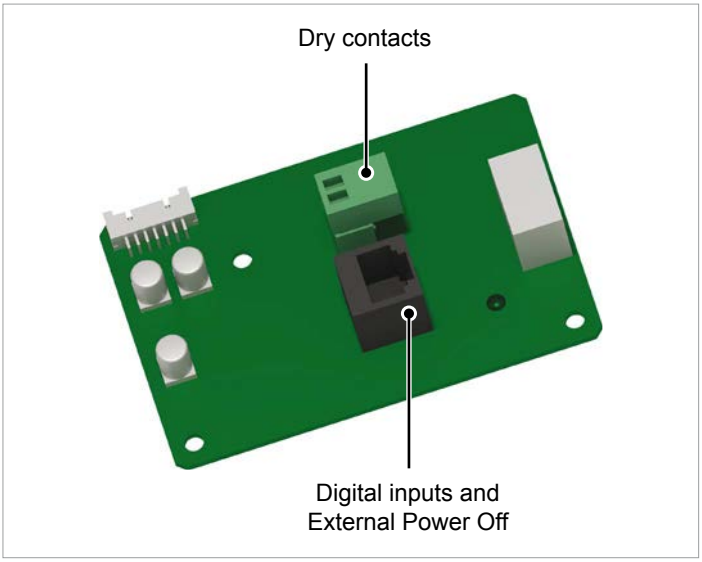


Fig. 6.29: Communication card type 1

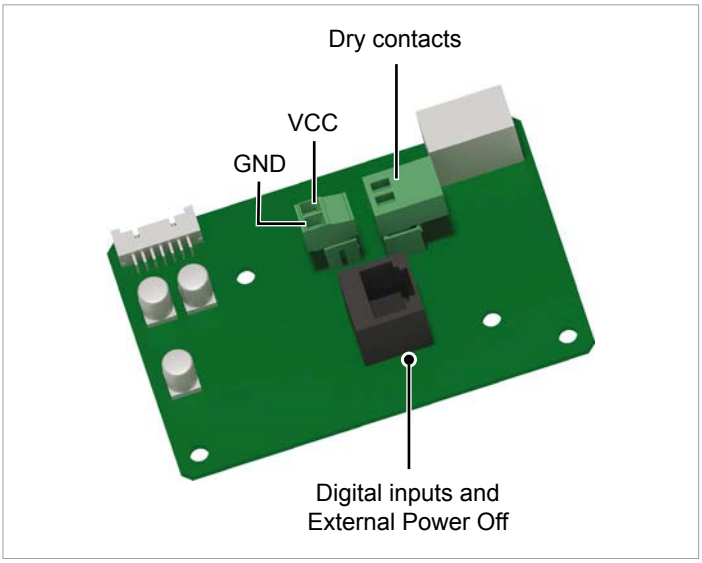


Fig. 6.30: Communication card type 2

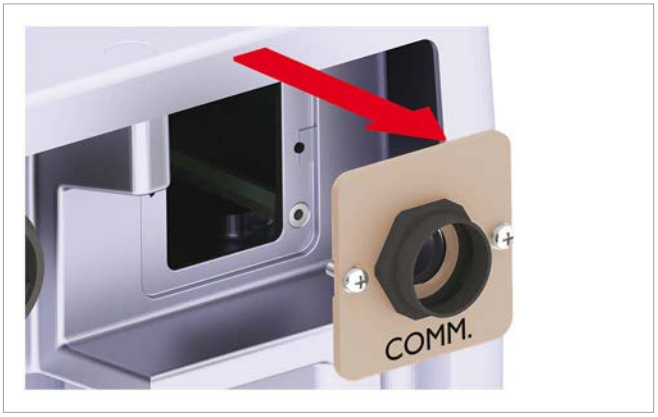
After the installation you can connect the dry contacts to an event, see “8.9 Dry contacts”, p. 80).

6.4.1 Wiring dry contacts without 12 V_{DC} power supply

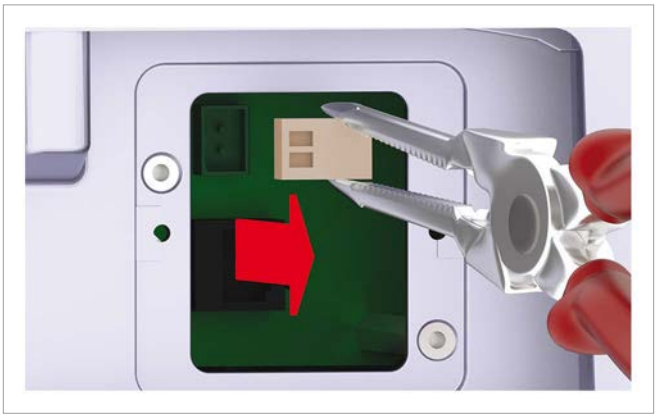
This procedure is possible for communication card type 1 and 2.

1. Unscrew the cable gland and remove cable gland and sealing.

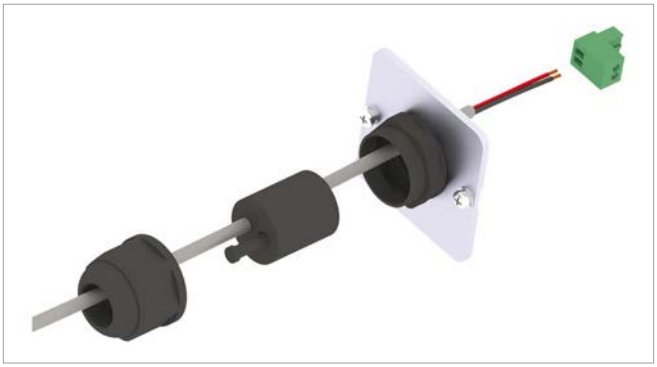
2. Unscrew and pull out the cover.



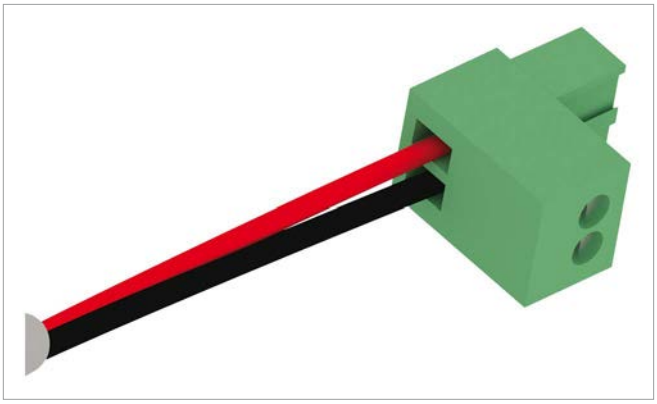
3. Carefully pull out the plug with the dry contacts by using long nose pliers.



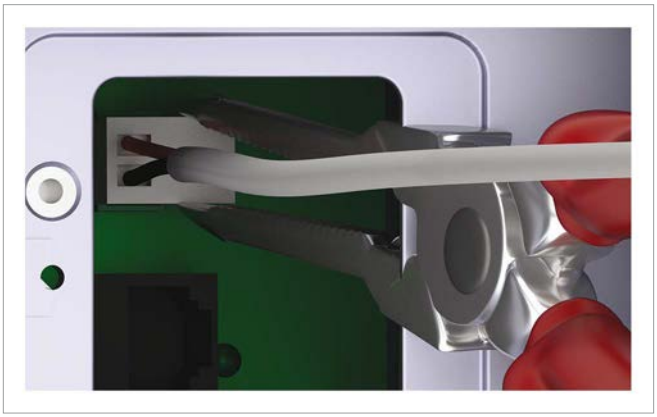
4. Pull the cable through cable gland and sealing. Do not remove the second grommet, unless you use a second cable for the digital inputs.



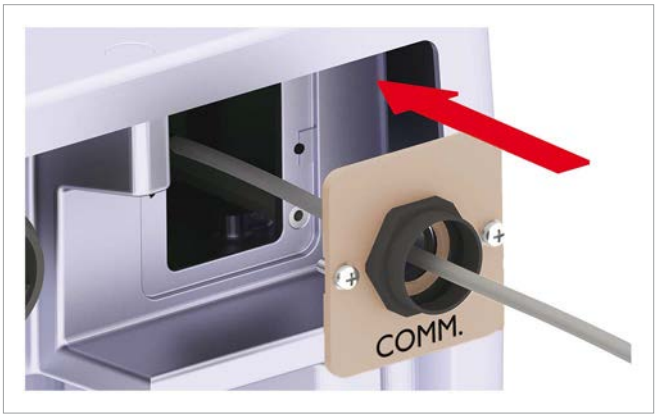
5. Connect the wires to the plug.



6. Carefully put in the wired plug by using long nose pliers.



7. Place and screw on the cover.



8. Place the sealing and screw on the cable gland.

6.4.2 Wiring dry contacts with 12 V_{DC} power supply from communication card

This procedure is possible for communication card type 2 only.

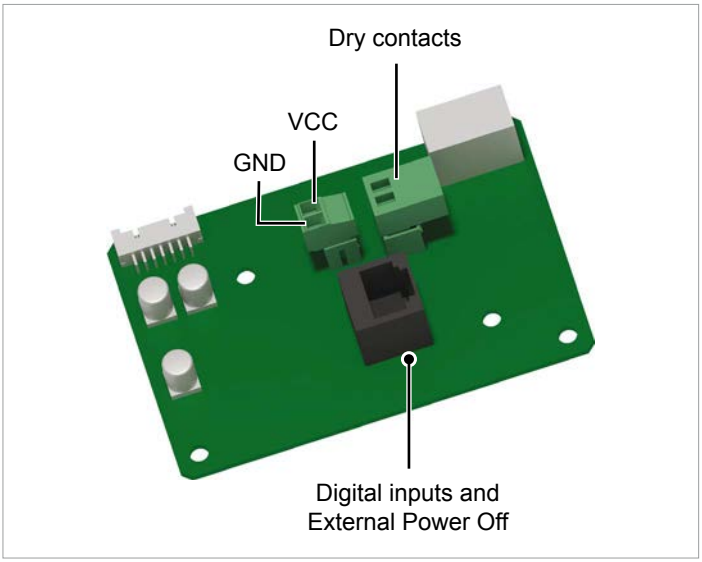
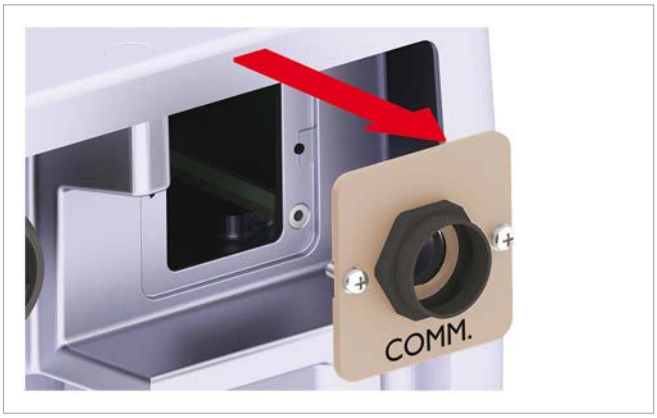


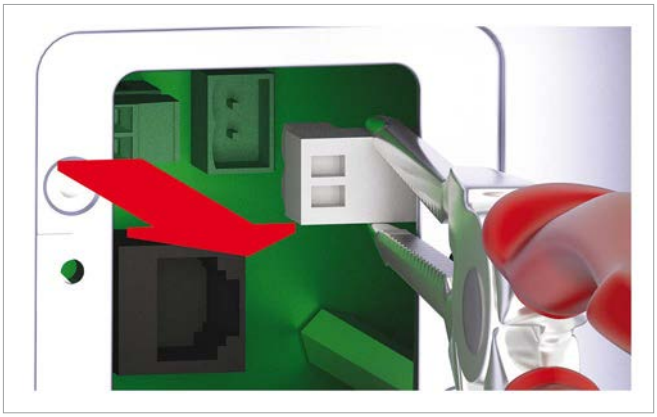
Fig. 6.31: Communication card type 2

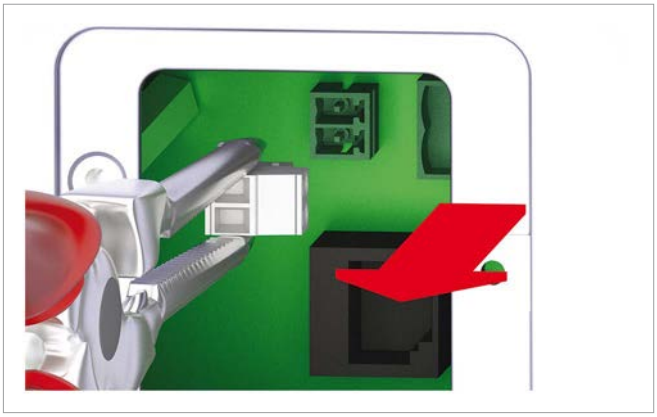
1. Unscrew the cable gland and remove cable gland and sealing.

2. Unscrew and pull out the cover.

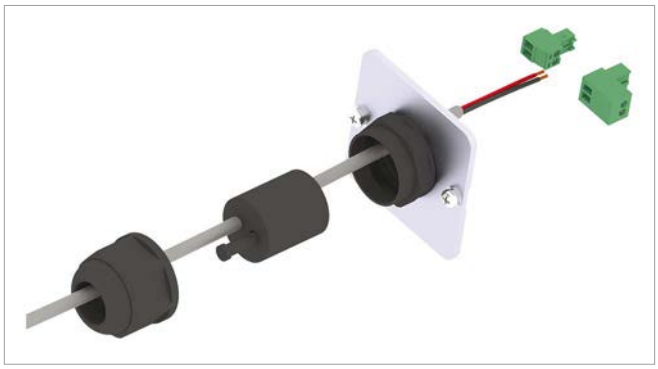


3. Carefully pull out the plug with the dry contacts and the plug with VCC by using long nose pliers.

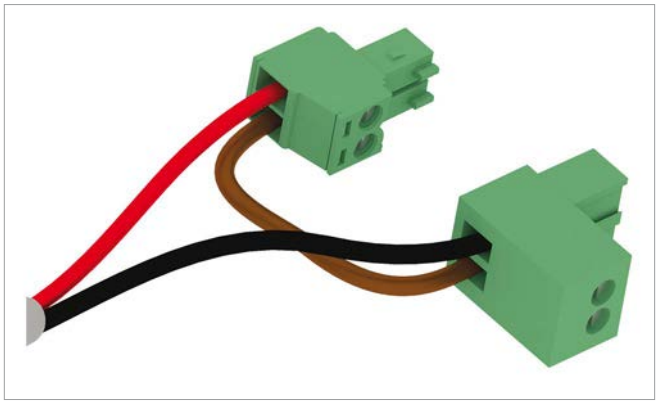




4. Pull the cable through cable gland and sealing. Do not remove the second grommet, unless you use a second cable for the digital inputs.

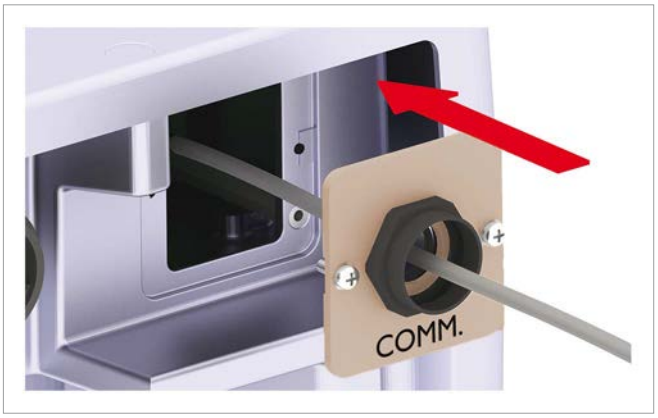


5. Connect the wires to the plugs.



6. Carefully put in the wired plugs by using long nose pliers.

7. Place and screw on the cover.



8. Place the sealing and screw on the cable gland.

6.4.3 Wiring dry contacts with 12 V_{DC} power supply from RS485 card

This procedure is possible for *communication card type 1* and *2*. But it is not recommended for *communication card type 2* as this card has a 12 V_{DC} power supply on-board.

The concept of wiring described in this section uses both holes of the bolting on the *communication port*. Therefore, it does not work when you want to use the digital inputs and/or EPO.
The concept of wiring described in this section uses two holes of the bolting on the *RS485 port*. Therefore, it does not work when you want to connect multiple inverter via RS485.

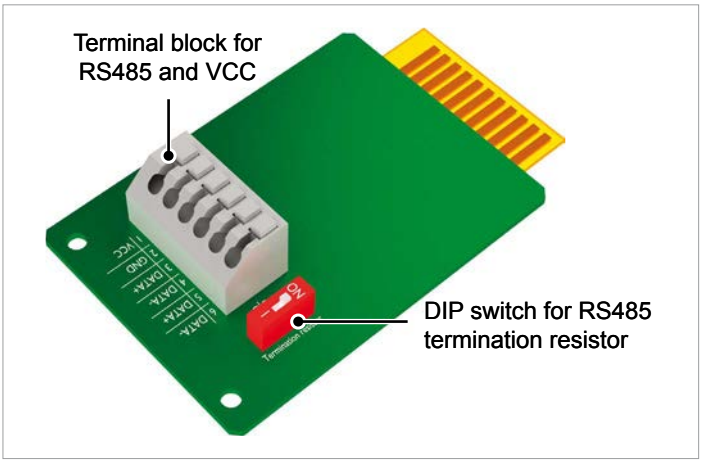


Fig. 6.32: Components on the RS485 card

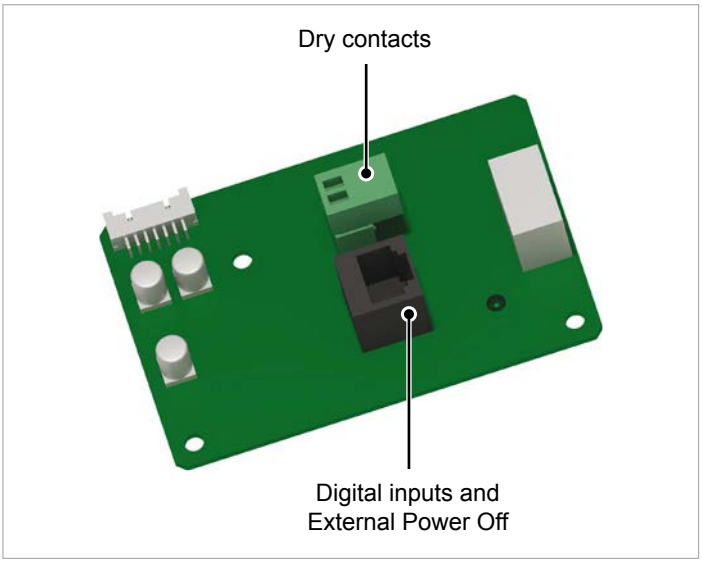


Fig. 6.33: Communication card type 1

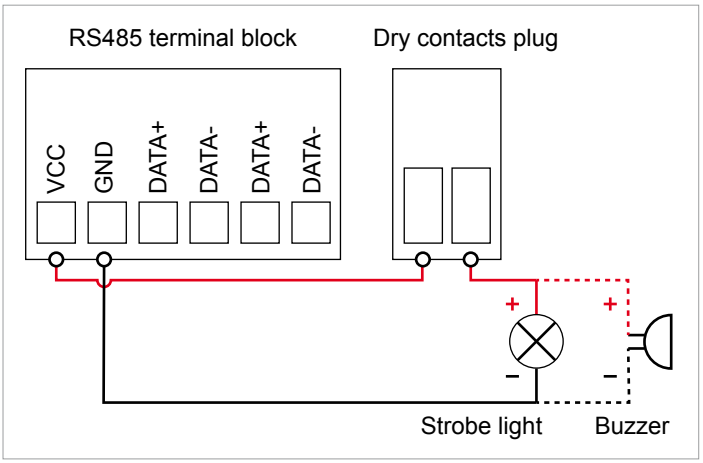


Fig. 6.34: Providing a 12 V_{DC} supply power for an external alarm device from the RS485 card, variant 1

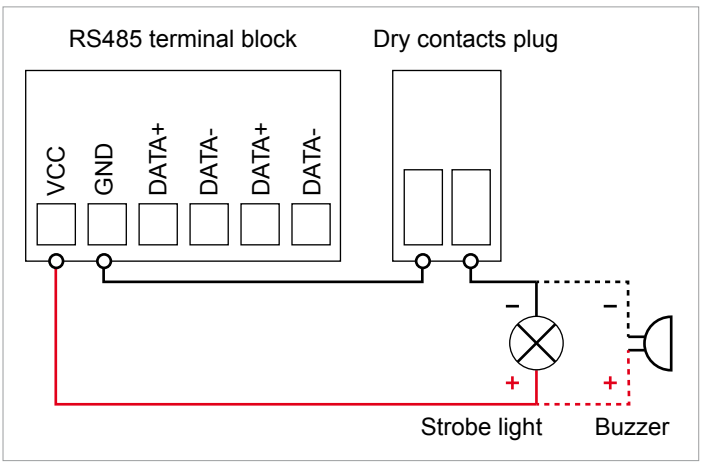
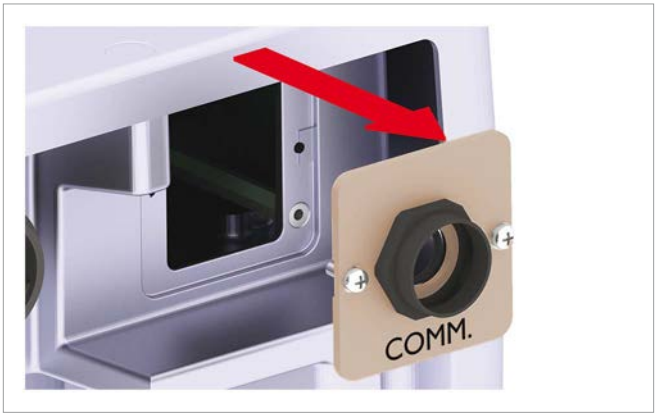


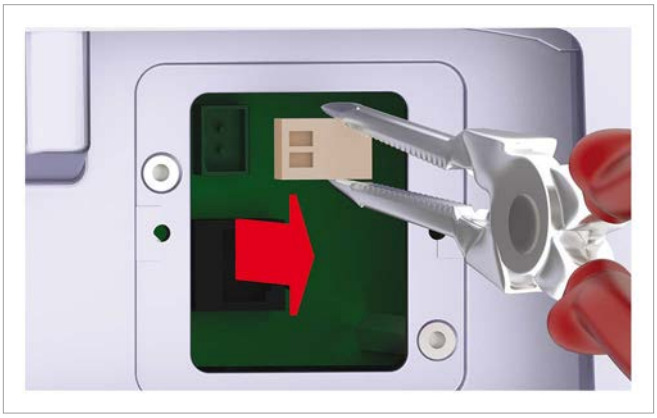
Fig. 6.35: Providing a 12 V_{DC} supply power for an external alarm device from the RS485 card, variant 2

1. On the *communication port*, unscrew the cable gland and remove cable gland and sealing.

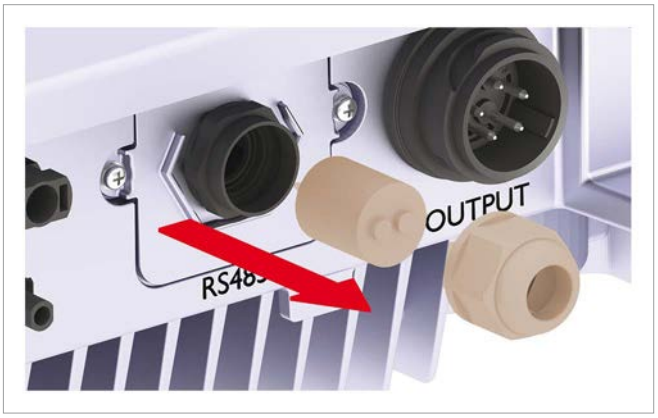
2. Unscrew and pull out the cover.



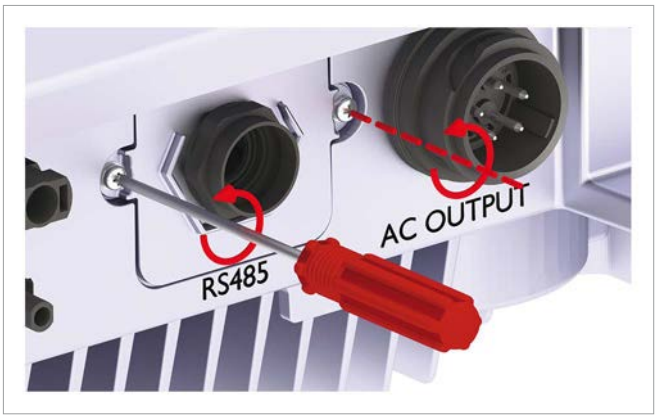
3. Carefully pull out the *dry contacts plug*.

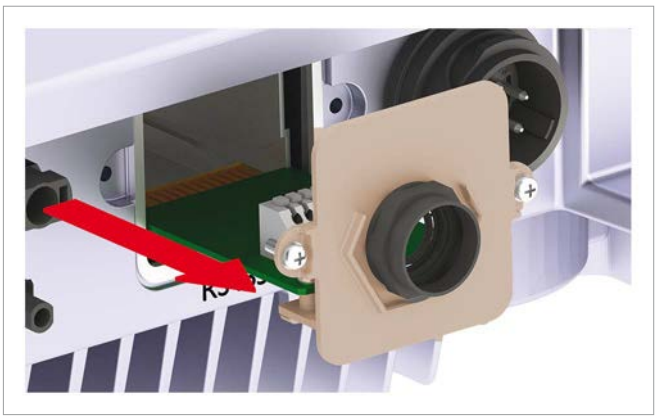


4. On the *RS485 port*, unscrew the cable gland and remove cable gland and sealing.

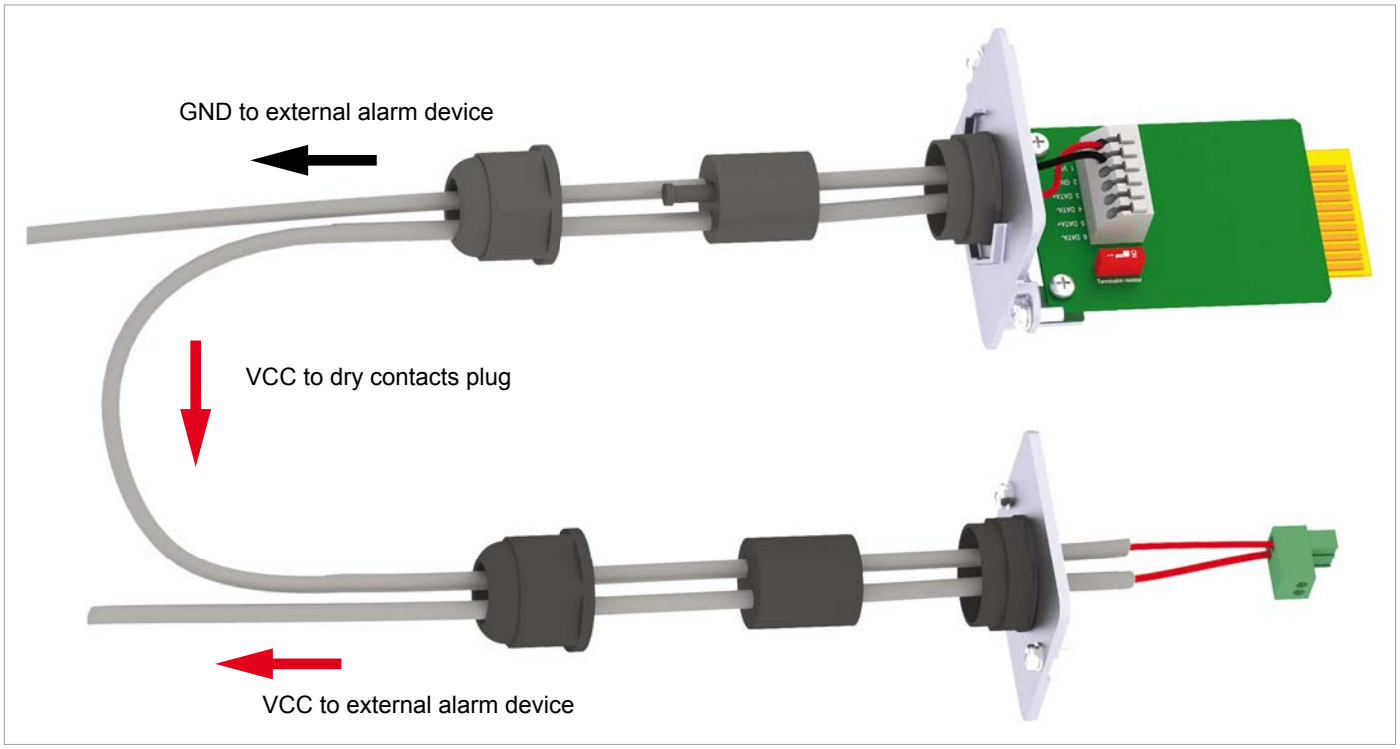


5. Unscrew and pull out the cover.

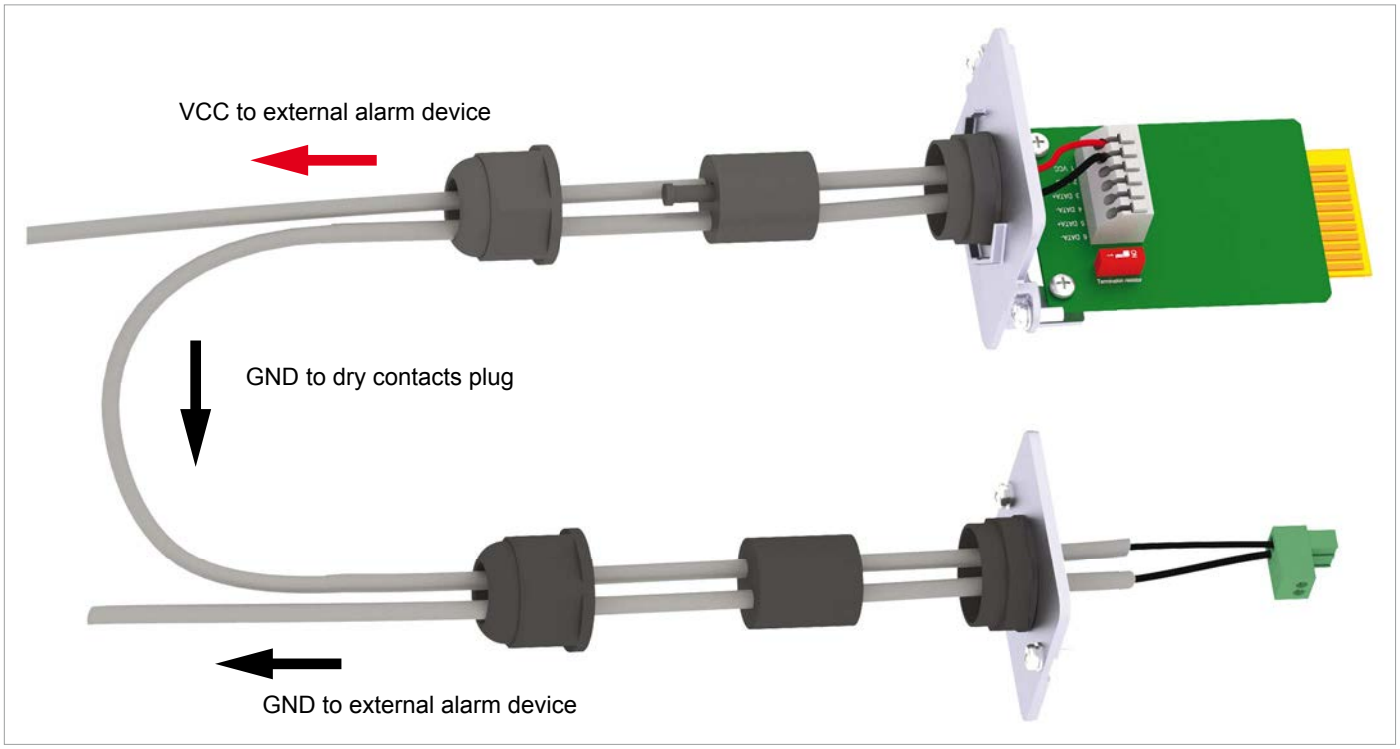




6. Pull the cables through the cable glands and sealings and wire the terminals according to the variant 1 or 2.



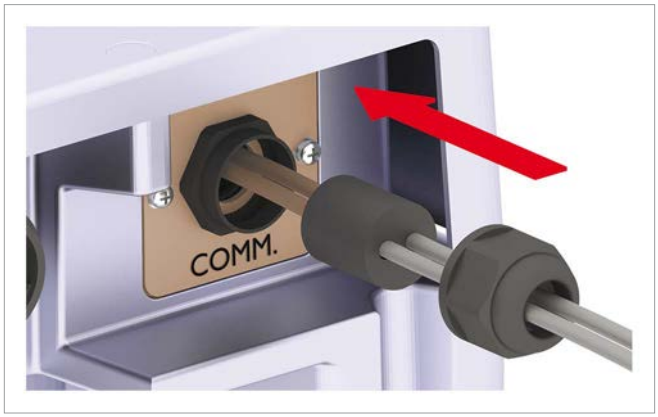
Wiring according to variant 1, see Fig. 6.34, p. 48



Wiring according to variant 2, see Fig. 6.35, p. 48

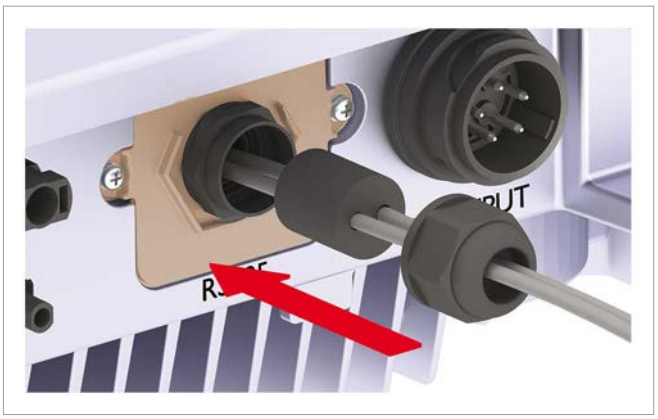
7. On the *communication port*, carefully put in the wired *dry contacts plug* by using long nose pliers.

8. Place and screw on the cover.

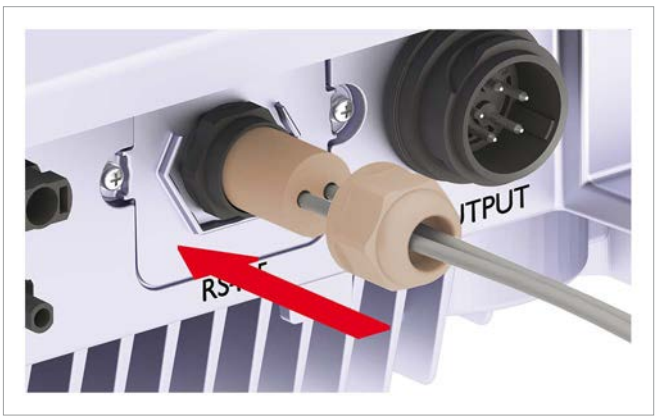


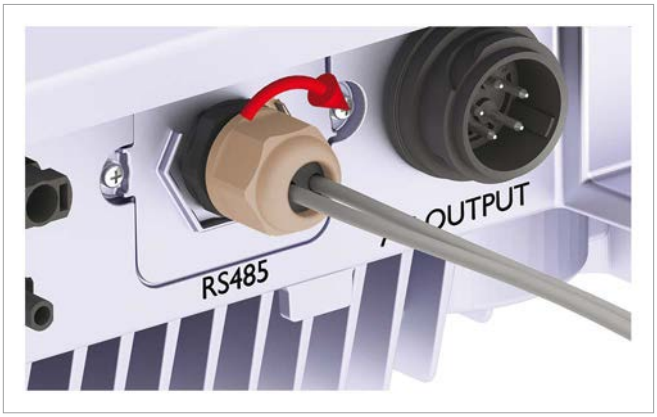
9. Place the sealing and screw on the cable gland.

10. On the *RS485 port*, Place and screw on the cover.



11. Place the sealing and screw on the cable gland.





☑ The final situation should look like in the following image.

6.5 Digital inputs and EPO

The digital inputs can be used to connect an external ripple control receiver for controlling the active power.

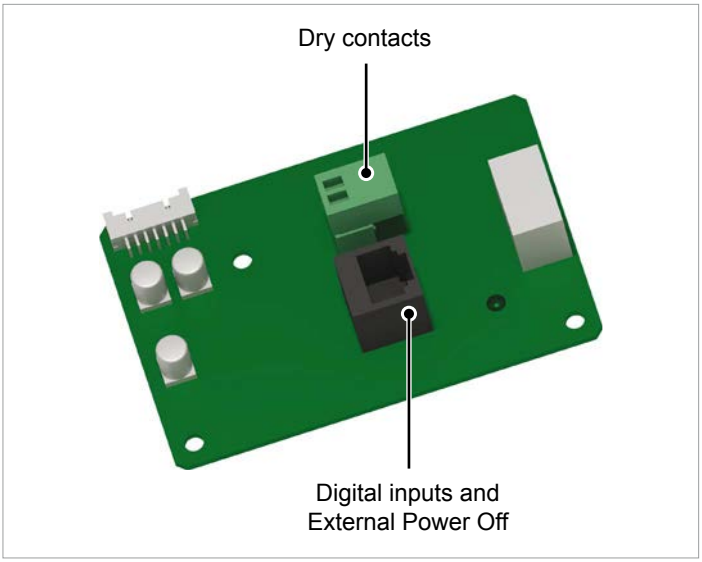


Fig. 6.36: Communication card type 1

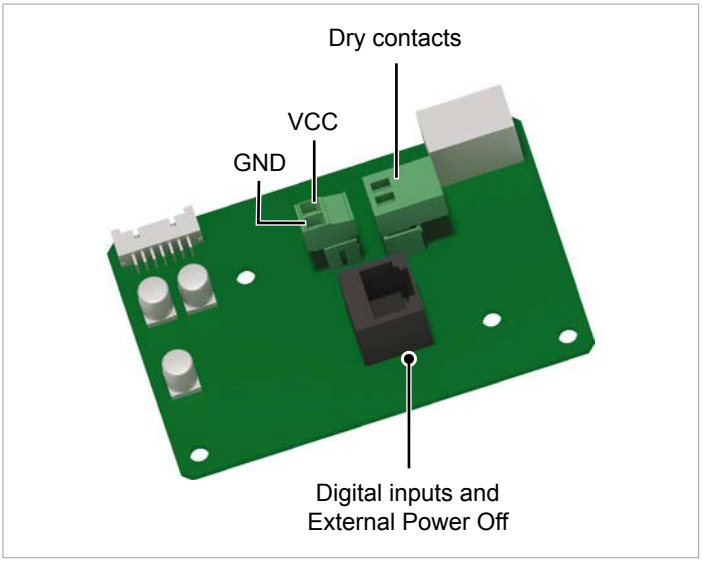


Fig. 6.37: Communication card type 2

Pin assignment

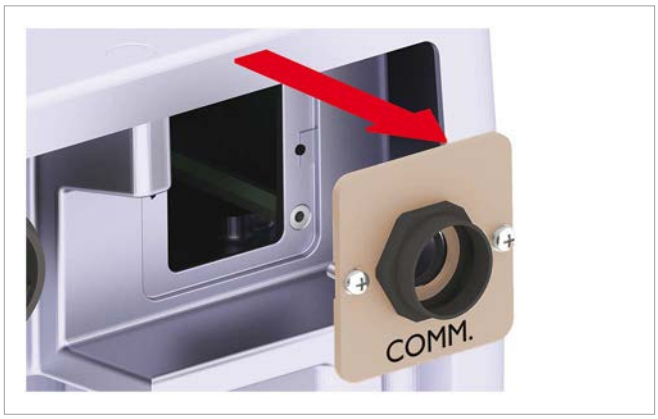
Pin	Design.	Short	Assigned action
1	V1	-	-
2	K0	V1 + K0	EPO (Emergency Power Off)
3	K1	V1 + K1	Set maximum active power to 0%
4	K2	V1 + K2	Set maximum active power to 30%
5	K3	V1 + K3	Set maximum active power to 60%
6	K4	V1 + K4	Set maximum active power to 100%
7	K5	V1 + K5	Reserved
8	K6	V1 + K6	Reserved

The relay for EPO can be set on the display to “normally open” or “normally closed”, see “8.10 EPO (External Power Off)”, p. 81.

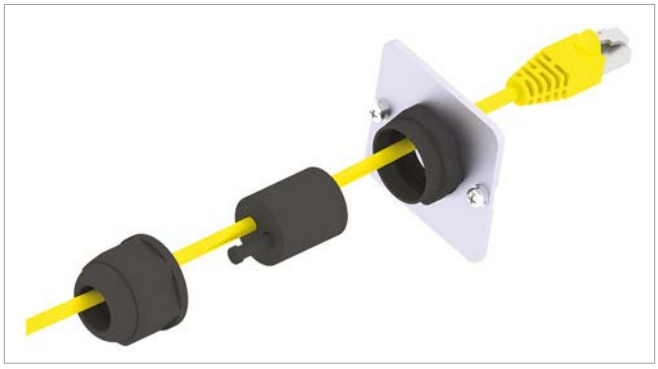
This procedure is possible for communication card type 1 and 2.

1. Unscrew the cable gland and remove cable gland and sealing.

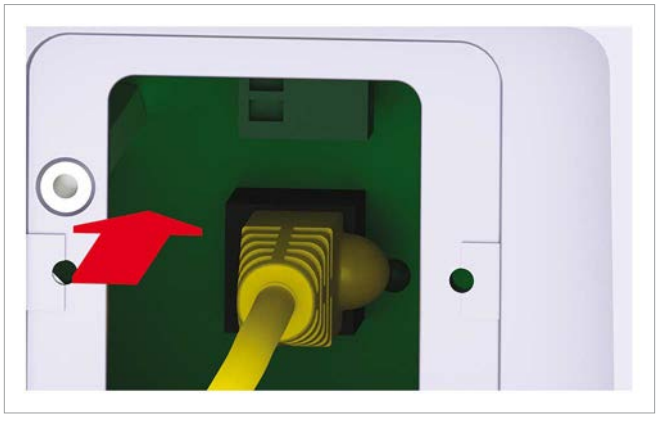
2. Unscrew and pull out the cover.



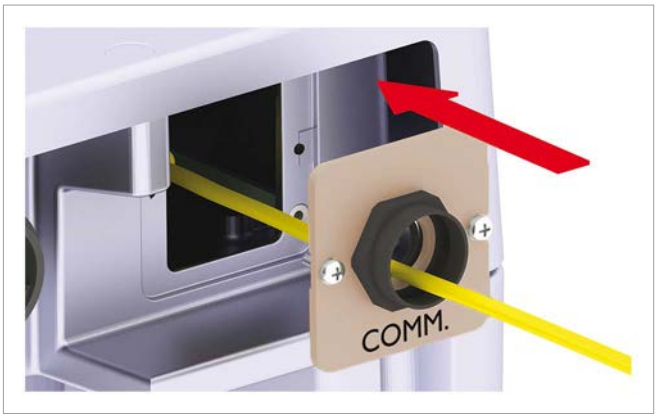
3. Pull the cable through cable gland and sealing. Do not remove the second grommet, unless you use a second cable.



4. Put in the RJ45 plug.



5. Place and screw on the cover.



6. Place the sealing and screw on the cable gland.

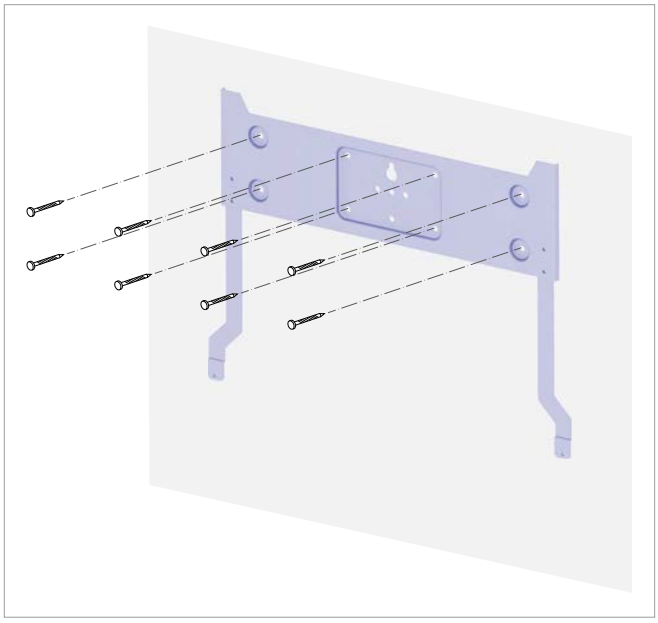
6.6 Mounting the inverter

WARNING

Heavy weight
The inverter is heavy, see “13. Technical data”, p. 113.
- ► The inverter must be lifted and carried by at least two people or with an appropriate lifting equipment.
- ► Always use the mounting plate delivered with the inverter.

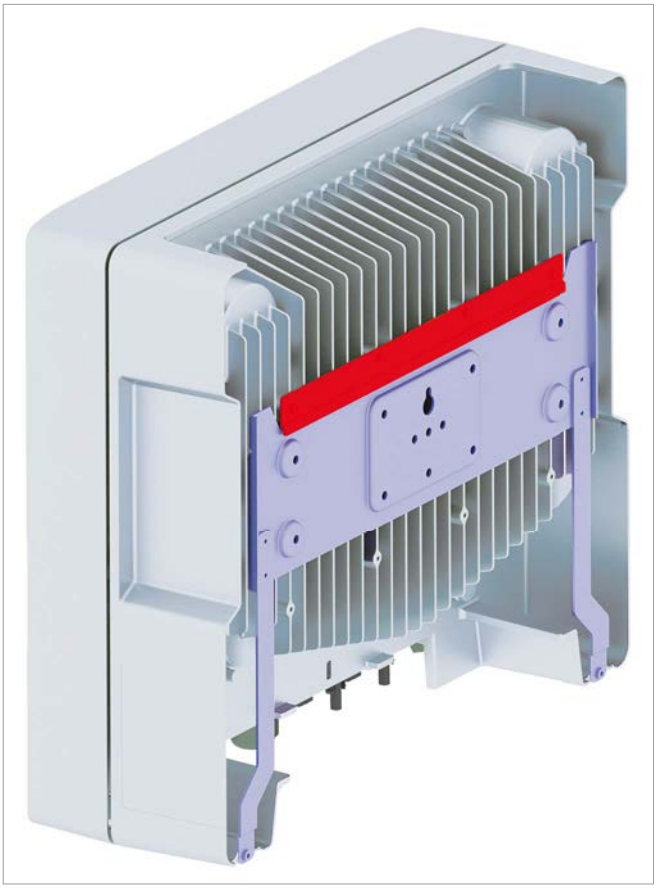
Read chapter “5. Planning the installation”, p. 19 **before** you start installation.

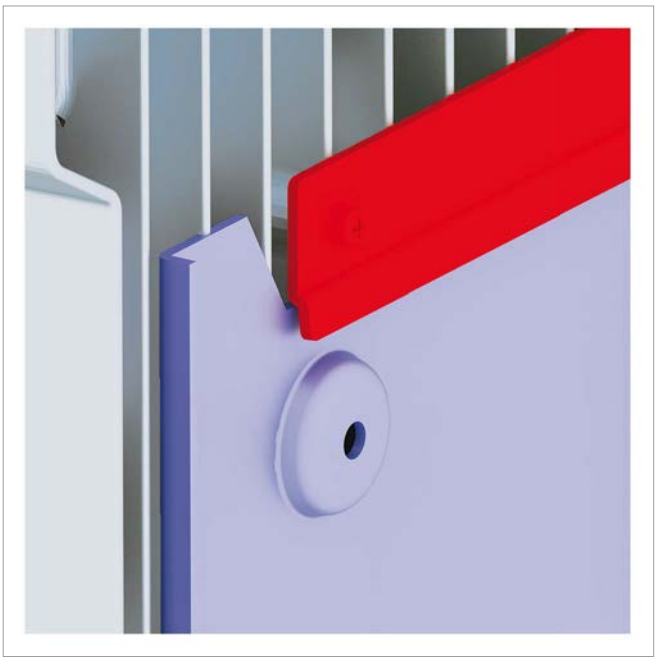
1. Attach the mounting plate with 8 M6 screws to the wall or to your mounting system.



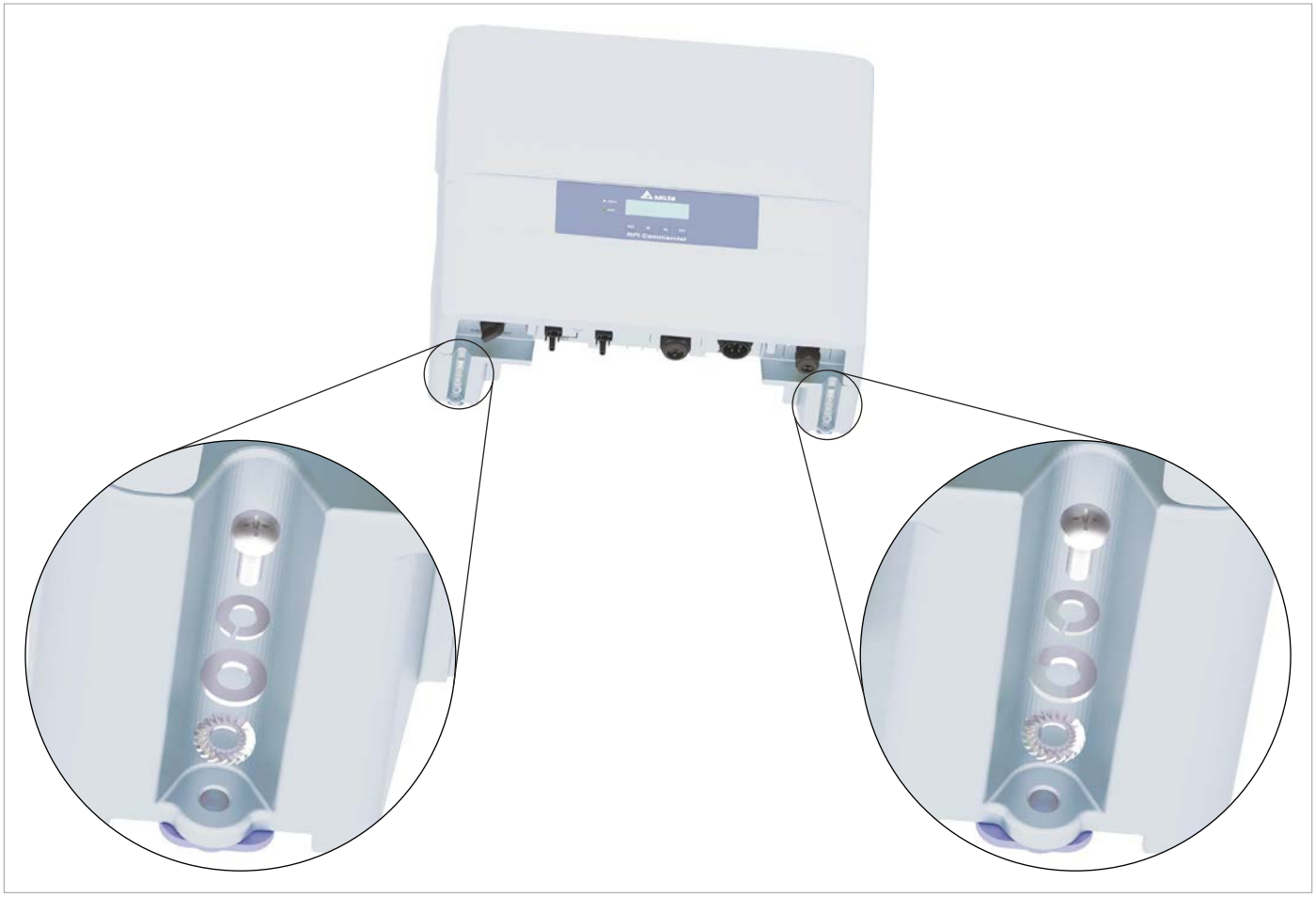
2. Hang the inverter onto the mounting plate.

3. Check that the rail of the inverter hangs correctly in the mounting plate.





4. Screw the inverter with the two mounting screws delivered with the inverter to the mounting plate.



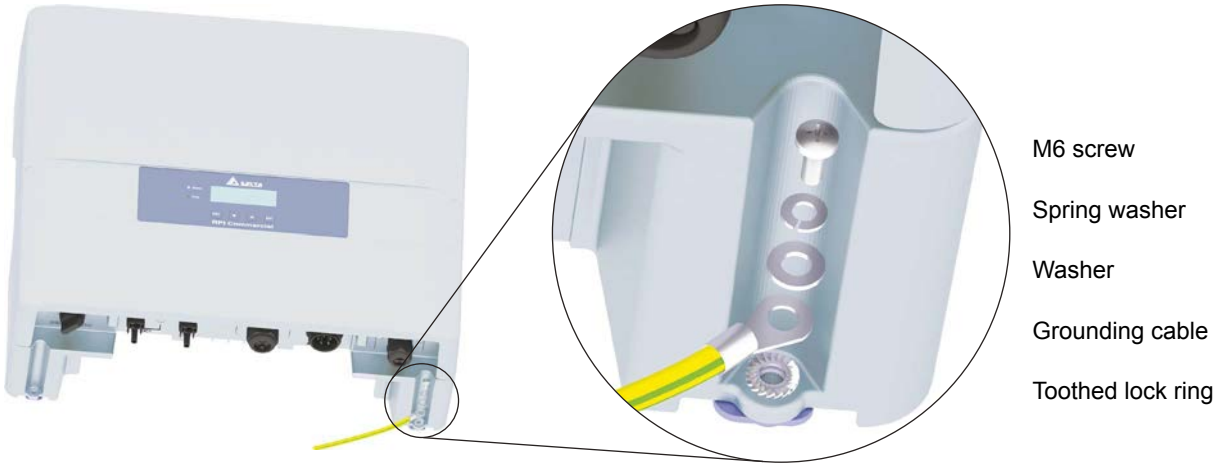
6.7 Grounding the inverter housing

Typically yellow/green copper cable with minimum wire size 6 mm^2 has to be used.

Always consider local regulation regarding the cable requirements.

In the absence of such regulations, it is nonetheless recommended to ground the inverter housing for safety reasons before setting up the electrical connections. External grounding is recommended in addition to PE connection within the AC connection.

1. On the left side, ground the inverter housing. The grounding screw is delivered with the inverter and mounted to the inverter.



Perform a continuity check for the grounding connection. If the test fails, scratch the paint off the inverter housing below the tooth lock washer to get a better electrical connection.

6 Installation

6.8 Connecting to the grid (AC)

Read chapter “5. Planning the installation”, p. 19 **before** you start installation.

What you need

- AC plug (delivered with the inverter)
- AC cable
- Wire end sleeves (bootlace pins)
- Crimping tool for the wire ferrules

Important information regarding safety

DANGER

Risk of death or serious injury from electrocution

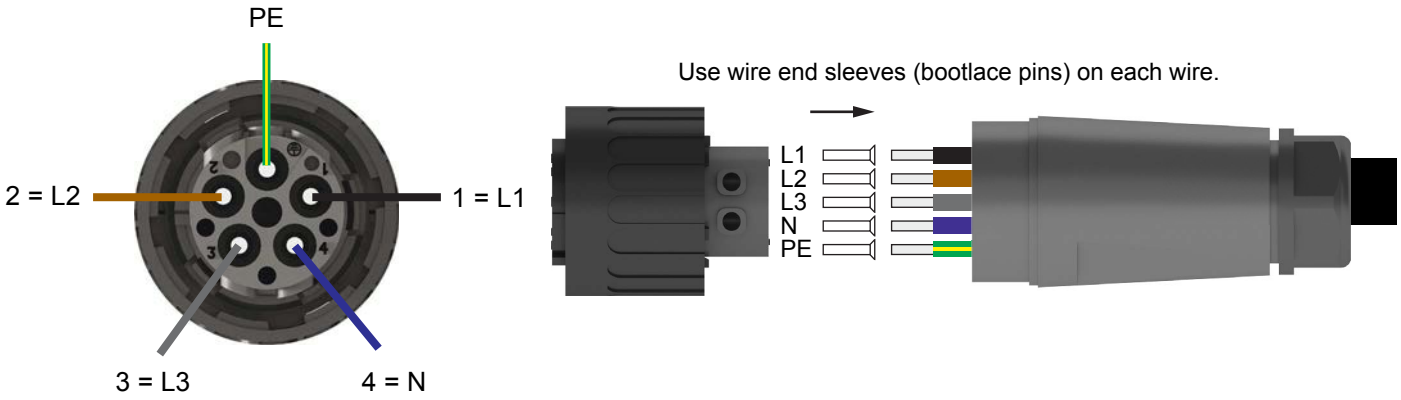
► Set the *AC/DC disconnection switch* to position **OFF** before connecting or disconnecting the AC plug to the inverter.

ATTENTION

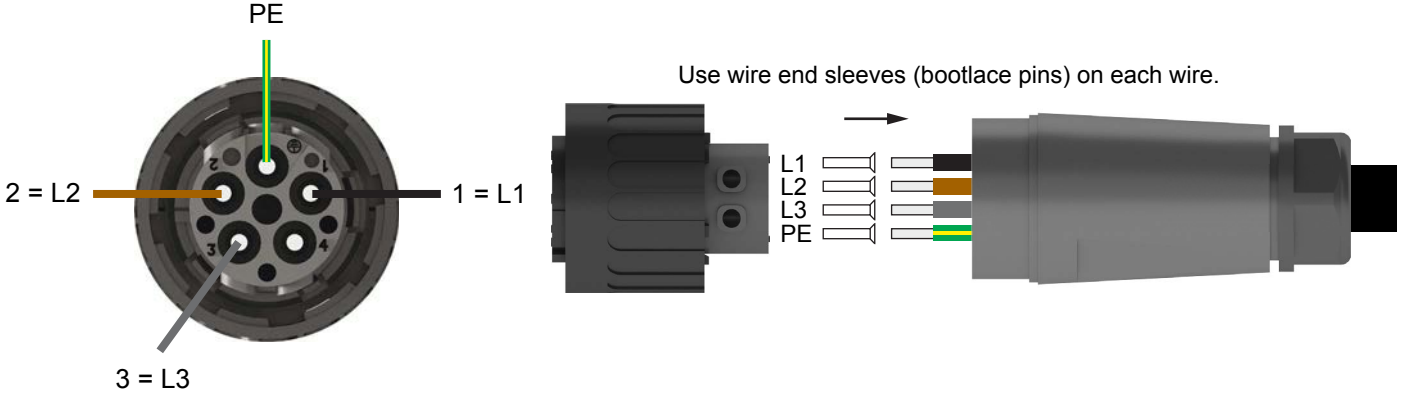
Observe the correct polarity of the AC plug. An incorrect configuration can destroy the inverter.

► For a description how to set the AC connection type on the display, see “8.11 AC Connection type”, p. 82.

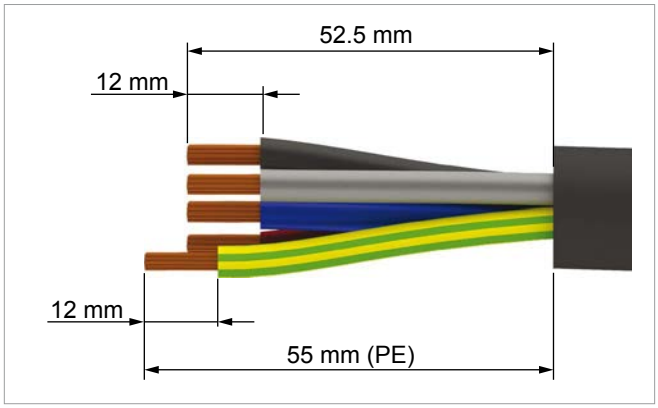
Wiring for 3P4W grid systems: 3 phases with 4 wires (L1, L2, L3, N) + PE



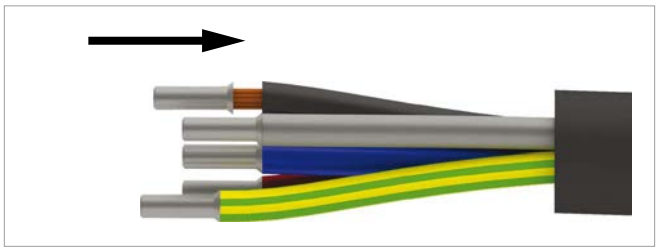
Wiring for 3P3W grid systems: 3 phases with 3 wires (L1, L2, L3) + PE



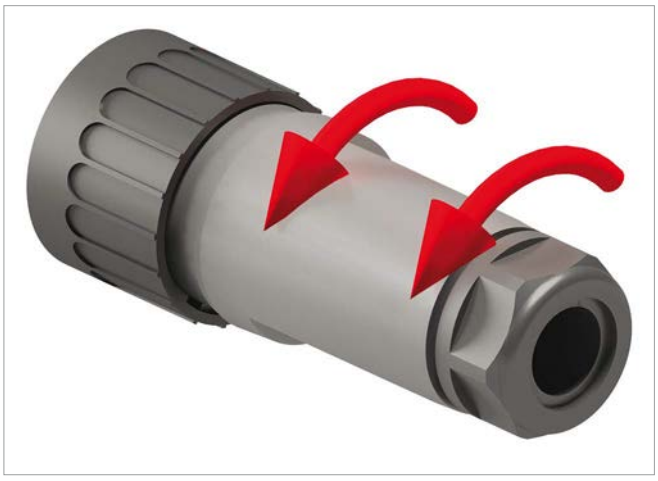
1. Remove the cable sheath as shown and remove 12 mm of insulation from each wire end. Do not twist wire ends as this reduces the surface contact area with the wire end sleeve (bootlace pin).



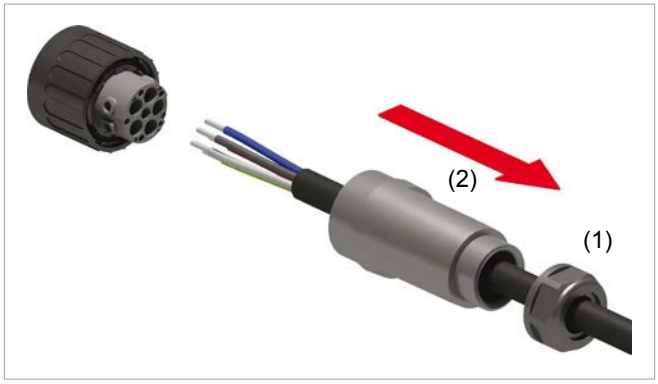
2. Place a wire end sleeve on each wire end and crimp them on tightly.



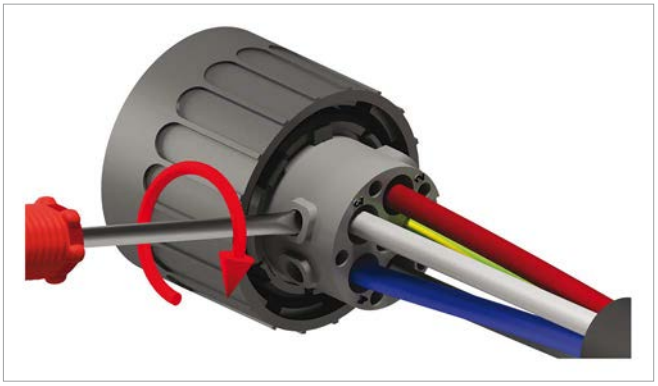
3. Unscrew the nut and cable housing from the socket insert.

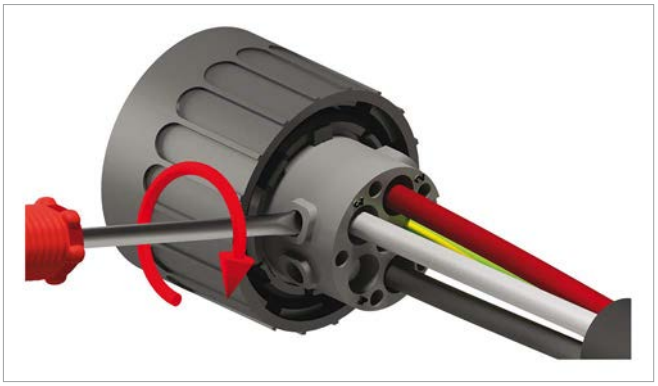


4. Slide nut (1) and housing (2) over the cable.

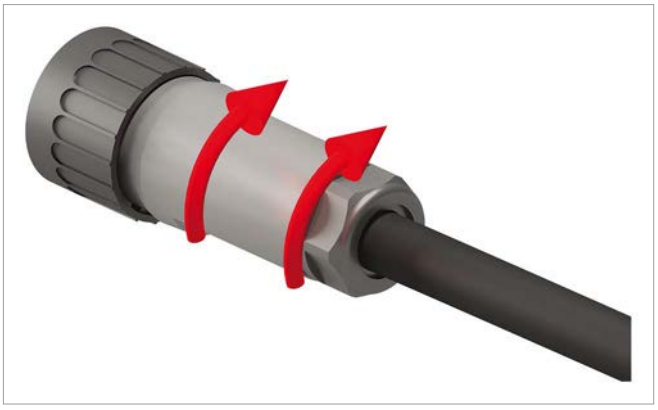


5. Slide the wires of the AC cable into the terminals of the pin insert and screw them tight with the hex-wrench (recommended torque 2.5 Nm). Observe the correct phase sequence when doing this.
The first image shows wiring for a 4-wire system (3P4W), the second one for a 3-wire system (3P3W).





6. Slide all parts into the pin insert and fasten the cable housing and the nut. Tighten the nut and the cable housing.



7. Insert the AC plug into the AC socket on the inverter and tighten the locking ring.

8. We recommend to secure the cable with a strain-relief clamp.
9. After commissioning check that the correct AC connection type (3P3W or 3P4W) is set correctly, see see “8.11 AC Connection type”, p. 82.

6.9 Connecting to the solar modules (DC)

Read chapter "5. Planning the installation", p. 19 **before** you start installation.

DANGER

Risk of death or serious injury from electrocution
Potentially fatal voltage may be applied to the DC connections of the *inverter*. When light is falling on solar modules, they immediately start producing energy. They do so, even when the sun is not shining directly onto the solar modules.

- ► Never disconnect the solar modules when the *inverter* is powered.
- ► First switch off the grid connection so that the *inverter* cannot feed energy into the grid.
- ► Turn the *AC/DC Disconnection switch* to position **OFF**.
- ► Make sure the DC connections cannot be accidentally touched.

NOTICE

Improperly sized PV array.
An improperly sized PV array can cause damage to the inverter.

- ► Consider the technical specifications of the inverter (input voltage range, maximum currents and maximum input power, see "13. Technical data", p. 113) when planning the size of the PV array.

NOTICE

Penetrating humidity.
Humidity can penetrate through unused DC connectors into the inverter.

- ► To ensure protection degree IP65, protect all unused DC connectors with the caps delivered with the inverter.

NOTICE

Machine and equipment damage may occur.
Exceeding the maximum current per DC input can cause an overheating of the DC inputs.

- ► Always consider the maximum current of the DC inputs when planning the installation.

Cable colors

Use a red cable for DC+ and a black cable for DC–.

Connector types

The DC plugs are delivered with the inverter. The plugs can also be ordered from Multi-Contact at www.multi-contact.de. The required size depends on the wire cross-section and thickness of the cable used.

DC connector type on the inverter	Counterpiece required for the cable
The DC-MINUS connector is a male socket.	A female plug is required for the black DC cable.
	
The DC-PLUS connector is a male socket.	A male plug is required for the red DC cable.
	

You can download the manual from the Multi-Contact website. This manual will also tell you which tools are required.

France: Safety caps are needed for each DC input that is connected to a string of solar modules.

It is recommended to use a special open-end spanner for the MC4 DC connectors if you need to disconnect MC4 DC connectors from the inverter. Otherwise you might destroy the DC Connectors.

Polarity of solar modules

Check the polarity of the DC voltage before you connect the solar modules. The negative DC pole of the string is connected to the DC-MINUS connector; the positive DC pole to the DC-PLUS connector.

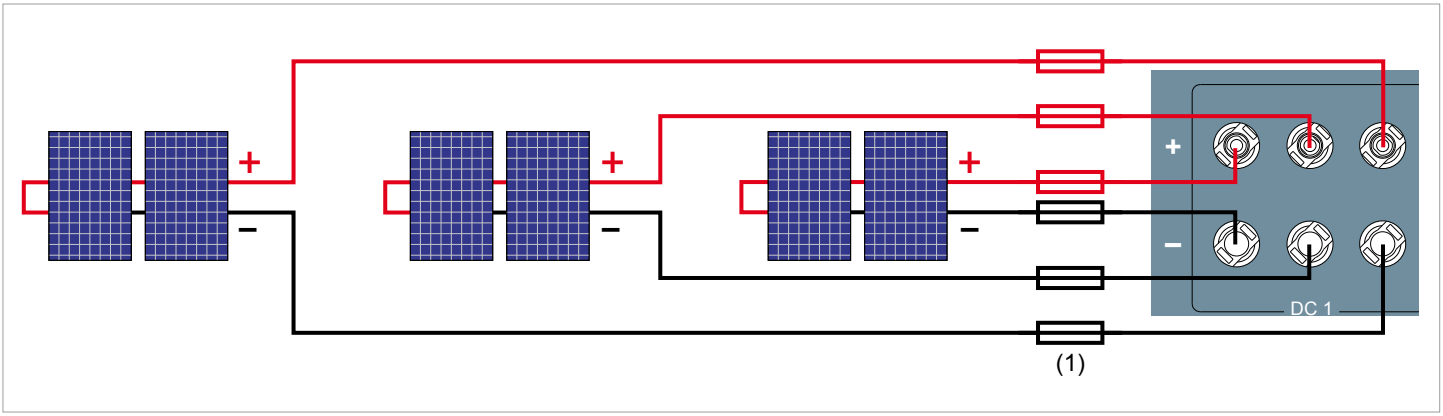


Fig. 6.38: Polarity of solar modules and use of string fuses

Final cabeling

After finishing the DC cabeling, the installation should look like shown in the following images.

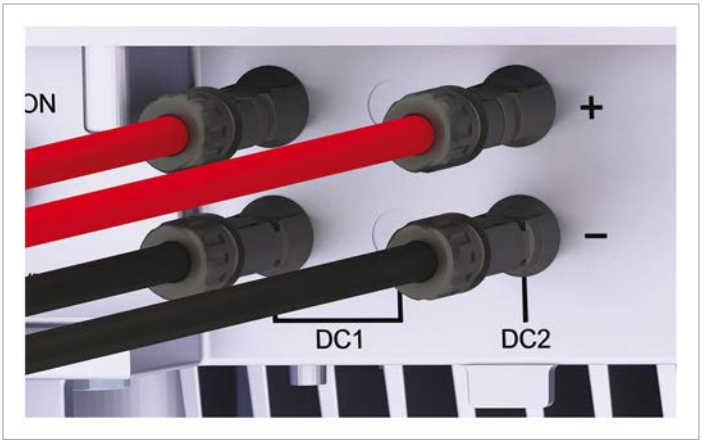


Fig. 6.39: Final DC cabeling for RPI M6A and M8A

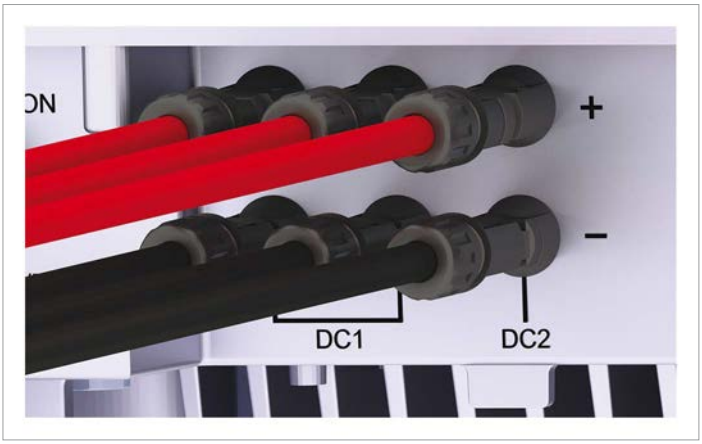
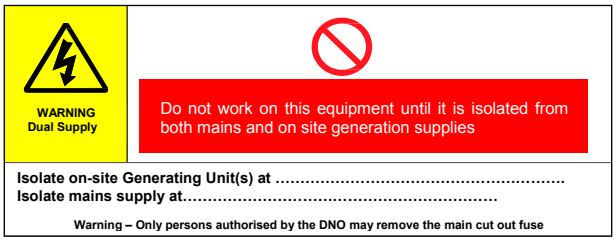


Fig. 6.40: Final DC cabeling for RPI M10A

6.10 Putting labels on the inverter

After finishing the installation, you have to put all necessary labels onto the inverter. Check local regulations about which labels are needed. See some samples below.



Warning
Two sources of voltage present
- distribution network
- photovoltaic panels

Isolate both sources before carrying out any work

6.11 Connecting a PC to RS485

If you want to use a PC with the Delta Service Software to set up the inverter, you need a USB/RS485 adapter to connect the PC to the RS485 terminal block of the inverter.

The USB/RS485 adapter is available from Delta.

Connect the pins according to the following table:

	Inverter	USB/RS485 adapter
		
DATA+	Pin 3 or 5	Pin 4
DATA–	Pin 4 or 6	Pin 5

7. Commissioning

The inverter must be correctly installed, see “6. Installation”, p. 39.

For information on how the display is operated, see “4.3 Display, buttons, status LEDs”, p. 12.

To commission the inverter, it needs to be powered either by AC (the grid) and by DC (the solar modules) on both DC inputs.

After powering up the inverter for the first time, the *Select language* dialog is shown.

```
 Select language
→English
 Deutsch
 Français
```

1. Use the buttons ▼ and ▲ to select language ***English***.

To confirm your selection, press the button ENT.

```
 CHINA MV
►UK G59-3 230
 FRA-Is 50HZ
 FRA-Is 60HZ
```

2. Use the buttons ▼ and ▲ to select your country or grid type.

To confirm your selection, press the button ENT.

```
Are you sure to
set country:
    UK G59-3 230
     ►YES / NO
```

3. If the selected country is correct, use the buttons ▼ and ▲ to select the entry ***YES***.

To confirm your selection, press the button ENT.

If you want to change your selection, press the button ESC.

→ The inverter starts a self-test which takes approximately 2 minutes. A countdown shows the remaining time on the display.

```
  10.Sep 2014 15:32
Status:      On Grid
Power:           0W
E-Today:         0kWh
```

☑ The basic setup is finished. The standard menu is shown.

► Check chapter “8. Settings”, p. 65 whether you need to adjust additional settings.

8. Settings

8.1 Overview

8 Settings

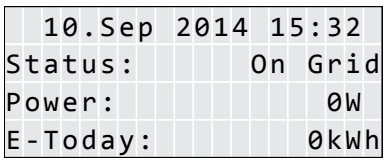
8.2 Current grid settings (inverter information)

Overview

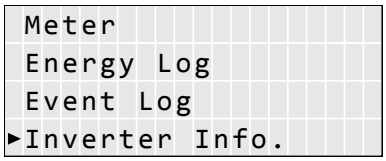
With this function you can see the current settings of the inverter.

Accessing the menu

Main menu > Inverter info.



1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



2. Use the buttons ▼ and ▲ to select **Inverter info**.

   To confirm your selection, press the button ENT.

3. Use the buttons ▼ and ▲ to scroll through the list.

4. To leave the menu, press the button ESC.

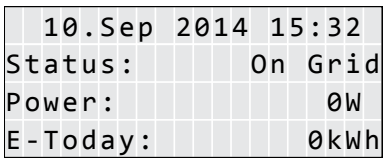
8.3 Display language

Overview

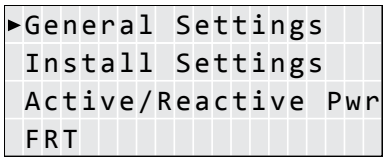
With this function you can set the language used in the display.

Accessing the menu

Main menu > General settings > Language

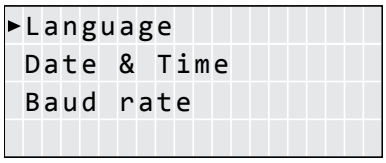


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



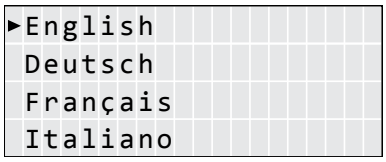
2. Use the buttons ▼ and ▲ to select **General Settings**.

   To confirm your selection, press the button ENT.



3. Use the buttons ▼ and ▲ to select **Language**.

   To confirm your selection, press the button ENT.



4. Use the buttons ▼ and ▲ to select a language.

   To confirm your selection, press the button ENT.

Configurable Parameters

Parameter	Description	Value range
Language	The language used in the display.	**English** | **Dutch** | **French** | **German** | **Italian** | **Spanish**

8 Settings

8.4 Date and Time

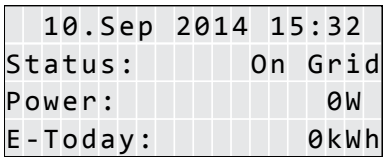
Overview

With this function you can set date and time.

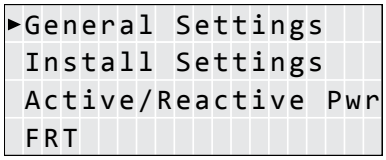
► For a precise calculation of the statistics in the inverter itself and in a monitoring system, date and time have to be correct.

Accessing the menu

Main menu > General settings > Date & Time

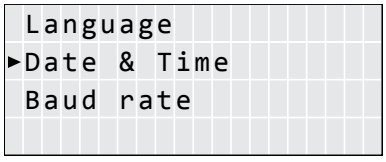


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



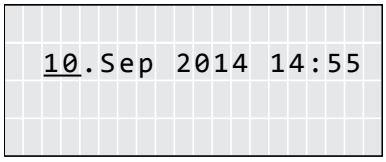
2. Use the buttons ▼ and ▲ to select **`General Settings`**.

To confirm your selection, press the button ENT.



3. Use the buttons ▼ and ▲ to select **`Date & time`**.

To confirm your selection, press the button ENT.



4. Use the buttons ▼ and ▲ to change the currently marked (underlined) value.

When finished, press the button ENT.

→ The marking moves to the next value.

Configurable Parameters

Parameter	Description	Value range
-	Date and Time	–

8.5 Baud rate for RS485

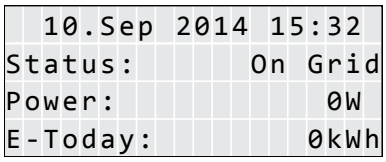
Overview

With this function you can set the baud rate for the RS485 connection.

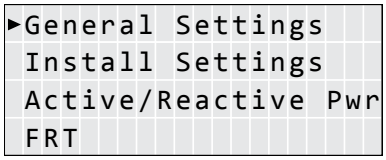
► If you connect multiple inverters via RS485, set the same baud rate on each inverter.

Accessing the menu

Main menu > General settings > Baud rate

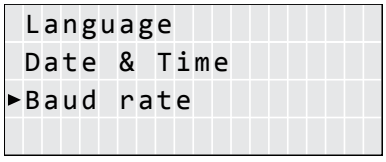


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



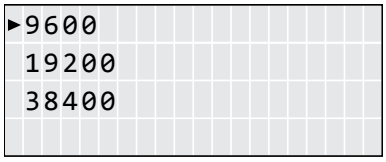
2. Use the buttons ▼ and ▲ to select **General Settings**.

   To confirm your selection, press the button ENT.



3. Use the buttons ▼ and ▲ to select **Baud rate**.

   To confirm your selection, press the button ENT.



4. Use the buttons ▼ and ▲ to select a baud rate.

   To confirm your selection, press the button ENT.

Configurable Parameters

Parameter	Description	Value range
Baud rate	Sets the baud rate for the RS485 connection.	**9600** | **19200** | **38400**

8 Settings

8.6 Inverter ID

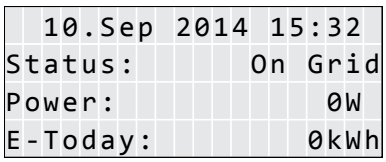
Overview

With this function you can set an ID for the inverter. The inverter ID is used to identify the inverter in a RS485 connection. The inverter ID is also used in monitoring systems.

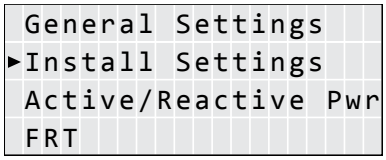
- ► Set a different inverter ID for each inverter in the PV plant. Otherwise, the inverters cannot be correctly identified.
- ► On the last inverter in the RS485 connection, switch on the RS485 termination resistor. For a description, see "6.6 Connecting communication port I", p. 58.

Accessing the menu

Main menu > Install Settings > Inverter ID

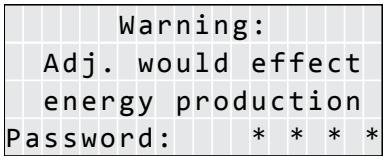


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



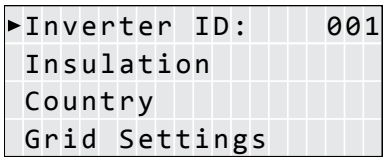
2. Use the buttons ▼ and ▲ to select **Install Settings**.

   To confirm your selection, press the button ENT.



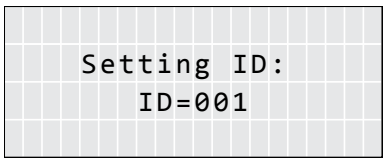
3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

   To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select **Inverter ID**. The currently set inverter ID is displayed behind the menu entry.

   To confirm your selection, press the button ENT.



5. Use the buttons ▼ and ▲ to set the inverter ID.

   To confirm your setting, press the button ENT.

Configurable Parameters

Parameter	Description	Value range
Setting ID	Sets the inverter ID that is needed to identify the inverter when a PV plant contains multiple inverters.	**001 ... 254**

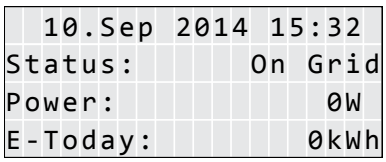
8.7 Insulation mode and insulation resistance

Description

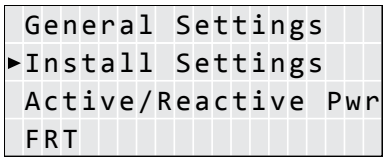
With this function you can set up the mode of insulation and the insulation resistance.

Accessing the menu

Main menu > Install Settings > Insulation

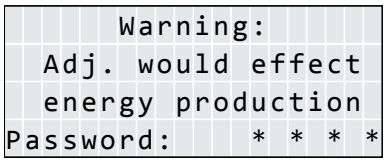


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



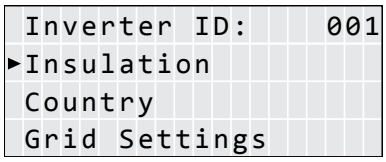
2. Use the buttons ▼ and ▲ to select **Install Settings**.

   To confirm your selection, press the button ENT.



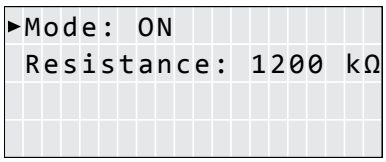
3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

   To confirm a digit, press the button ENT.



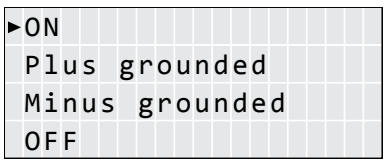
4. Use the buttons ▼ and ▲ to select **Insulation**.

   To confirm your selection, press the button ENT.



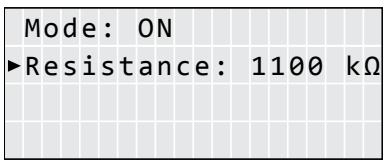
5. Use the buttons ▼ and ▲ to select **Mode**. The currently set mode of insulation is displayed behind the menu entry.

   To confirm your selection, press the button ENT.



6. Use the buttons ▼ and ▲ to select a type of insulation.

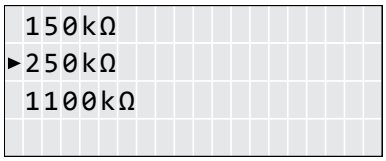
   To confirm your selection, press the button ENT.



7. Use the buttons ▼ and ▲ to select **Resistance**. The currently set value for the insulation resistance is displayed behind the menu entry.

   To confirm your selection, press the button ENT.

Do not change this setting without prior consultation with Delta Solar Support.



8. Use the buttons ▼ and ▲ to select a value for the insulation resistance.

To confirm your selection, press the button ENT.

Configurable Parameters

Parameter	Description	Value range
Mode	Mode of insulation	**ON | DC1 only | DC2 only | Plus grounded | Minus grounded | OFF** Default: **ON**
Resistance	Insulation resistance	**6000 kΩ | 1100 kΩ | 1200 kΩ** Default: **1100 kΩ**

8.8 Grid settings

8.8.1 Overview

This function is factory-set according to the regulation of each country. The inverter is certified with these settings. The settings should not be changed, unless it is really necessary. Please contact Delta Support when you want to change these settings.

This function is protected by a special password. To get the password, please call the Delta Support hotline in your country. You can find the telephone number on the last page of this document.

To adjust several parameters for the currently selected country/grid settings.

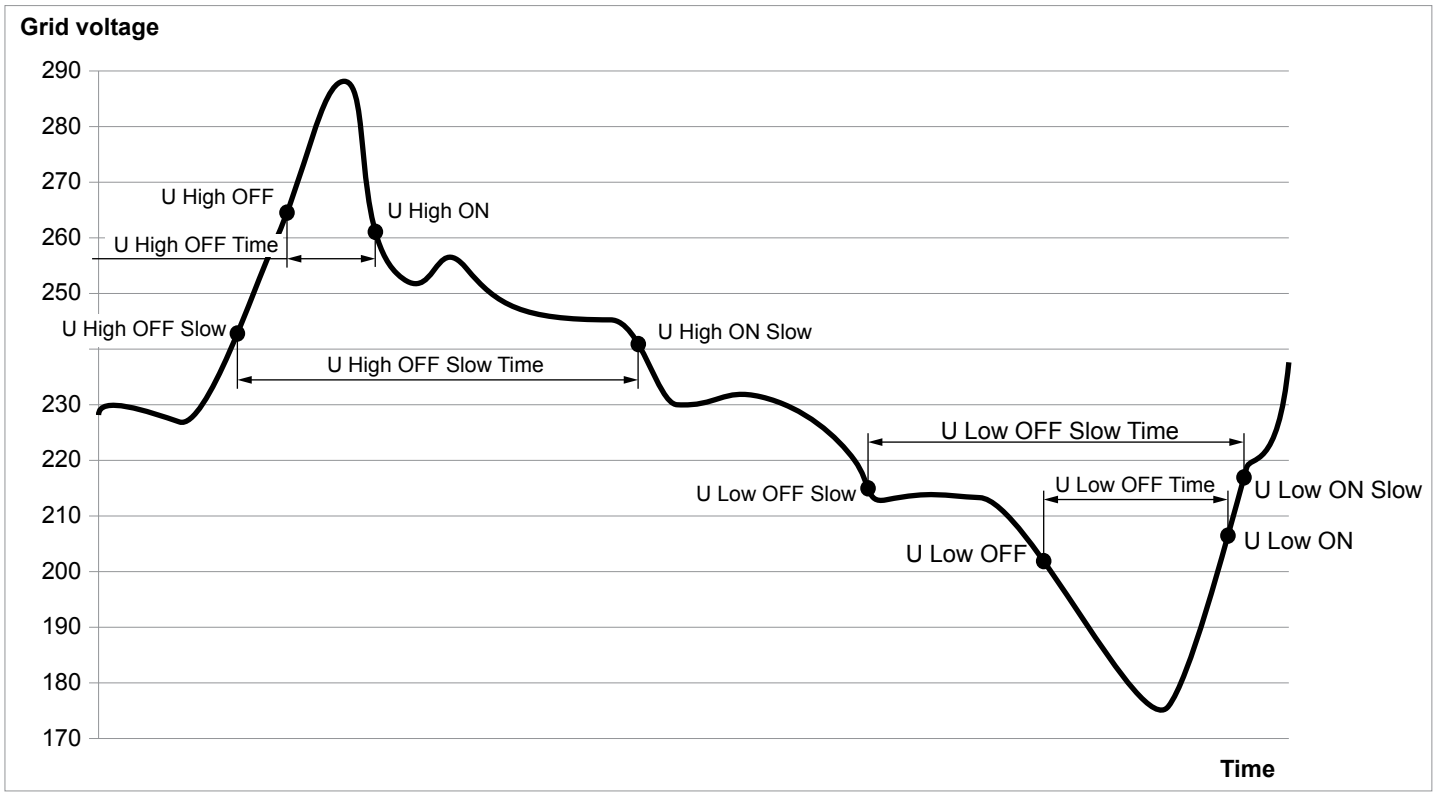
The grid settings section consists of the following subsections:

- Voltage protection (How does the inverter behave in case of overvoltages or undervoltages.)
- Frequency protection (How does the inverter behave in case of overfrequencies or underfrequencies.)
- Reconnection time (The delay time the inverter will wait before it reconnects to the grid after a fault.)
- P Ramp up (Feed-in behavior of the inverter when it reconnects to the grid after a fault.)

8.8.2 Voltage protection

Overview

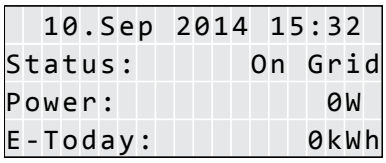
With this function you can define how the inverter behaves in case of a grid overvoltage and a grid undervoltage.



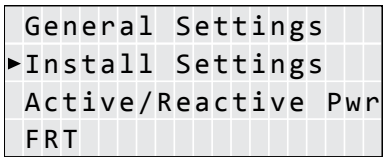
Do not change this setting without prior consultation with Delta Solar Support.

Accessing the menu

Main menu > Install Settings > Grid settings > Voltage Protection

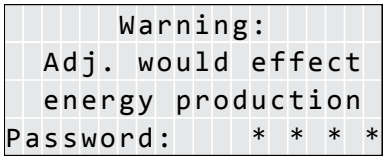


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



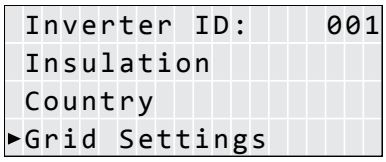
2. Use the buttons ▼ and ▲ to select **Install Settings**.

   To confirm your selection, press the button ENT.



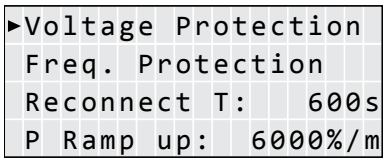
3. Type in the password you received from Delta Support. Use the buttons ▼ and ▲ to set each digit.

   To confirm a digit, press the button ENT.



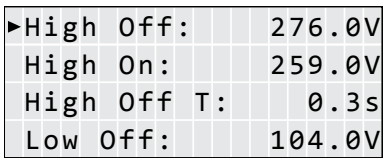
4. Use the buttons ▼ and ▲ to select **Grid settings**.

   To confirm your selection, press the button ENT.



5. Use the buttons ▼ and ▲ to select **Voltage protection**.

   To confirm your selection, press the button ENT.



6. If you need to change a parameter, use the buttons ▼ and ▲ to select the parameter.

7. Press the button ENT to start editing the parameter value.

8. Use the buttons ▼ and ▲ to change the parameter value.

   To confirm your setting, press the button ENT or press the button ESC to cancel the action.

9. Repeat steps 6 to 8 for the other parameters if you need to change them.

Configurable Parameters

Parameter	Description	Value range
`High Off`	Voltage High Off	`184.0 ... 276.0 V`
`High On`	Voltage High On	`184.0 ... 276.0 V`
`High Off T`	Disconnection time for Voltage High Off	`0.0 ... 5.0 s`
`Low Off`	Voltage Low Off	`184.0 ... 276.0 V`
`Low On`	Voltage Low On	`184.0 ... 276.0 V`
`Low Off T`	Disconnection time for Voltage Low Off	`0.0 ... 5.0 s`
`Hi Off Slow`	Voltage High Off Slow	`184.0 ... 276.0 V`
`Hi On Slow`	Voltage High On Slow	`184.0 ... 276.0 V`
`Hi Off Slow T`	Disconnection time for Voltage High Off Slow	`0.0 ... 600.0 s`
`Lo Off Slow`	Voltage Low Off Slow	`184.0 ... 276.0 V`
`Lo On Slow`	Voltage Low On Slow	`184.0 ... 276.0 V`
`Lo Off Slow T`	Disconnection time for Voltage Low Off Slow	`0.0 ... 600.0 s`

Do not change this setting without prior consultation with Delta Solar Support.

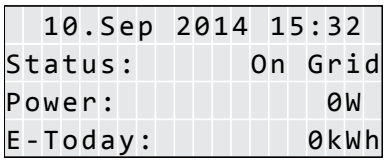
8.8.3 Frequency protection

Overview

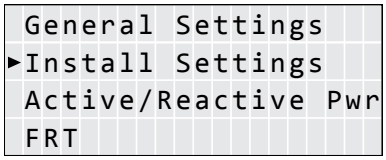
With this function you can define how the inverter behaves in case of a grid overfrequency and a grid underfrequency.

Accessing the menu

Main menu > Install Settings > Grid settings > Freq. Protection

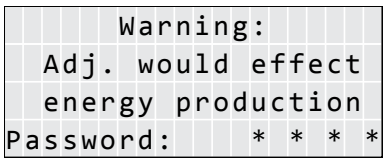


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



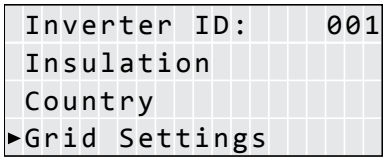
2. Use the buttons ▼ and ▲ to select **Install Settings**.

   To confirm your selection, press the button ENT.



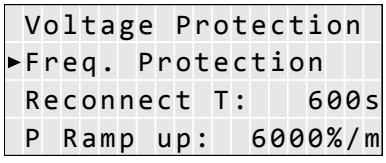
3. Type in the password you received from Delta Support. Use the buttons ▼ and ▲ to set each digit.

   To confirm a digit, press the button ENT.



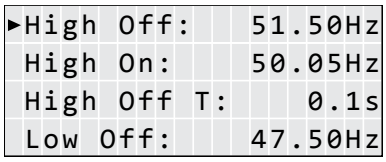
4. Use the buttons ▼ and ▲ to select **Grid settings**.

   To confirm your selection, press the button ENT.



5. Use the buttons ▼ and ▲ to select **Freq. Protection**.

   To confirm your selection, press the button ENT.



6. Use the buttons ▼ and ▲ to select a parameter.

7. To start editing the parameter value, press the button ENT.

8. To change the parameter value, use the buttons ▼ and ▲.

   To confirm your setting, press the button ENT or press the button ESC to cancel the action.

9. Repeat steps 6 to 8 for all parameters you want to change.

Configurable Parameters

Parameter	Description	Value range
High Off	Frequency High Off	45.00 ... 65.00 Hz
High On	Frequency High On	45.00 ... 65.00 Hz
High Off T	Disconnection time for Frequency High Off	0.0 ... 5.0 s
Low Off	Frequency Low Off	45.00 ... 65.00 Hz
Low On	Frequency Low On	45.00 ... 65.00 Hz
Low Off T	Disconnection time for Frequency Low Off	0.0 ... 5.0 s
Hi Off Slow	Frequency High Off Slow	45.00 ... 65.00 Hz
Hi On Slow	Frequency High On Slow	45.00 ... 65.00 Hz
Hi Off Sl T	Disconnection time for Frequency High Off Slow	0.0 ... 600.0 s
Lo Off Slow	Frequency Low Off Slow	45.00 ... 65.00 Hz
Lo On Slow	Frequency Low On Slow	45.00 ... 65.00 Hz
Lo Off Sl T	Disconnection time for Frequency Low Off Slow	0.0 ... 600.0 s

Do not change this setting without prior consultation with Delta Solar Support.

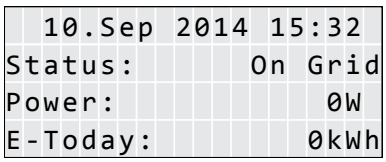
8.8.4 Reconnection time

Overview

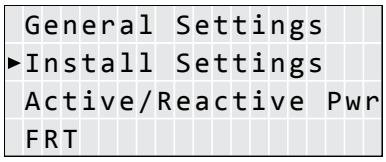
With this function you can define a reconnection time in case the inverter has disconnected from the grid because of a grid voltage or grid frequency failure (see “8.8.2 Voltage protection”, p. 73 and “8.8.3 Frequency protection”, p. 76). When the failure disappears, the inverter will wait for the set reconnection time before it reconnects to the grid.

Accessing the menu

Main menu > Install Settings > Grid settings > Reconnect T

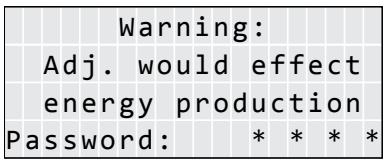


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



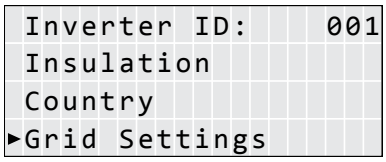
2. Use the buttons ▼ and ▲ to select **`Install Settings`**.

   To confirm your selection, press the button ENT.



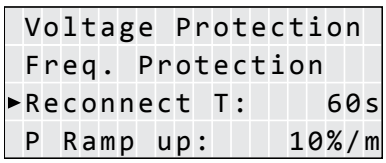
3. Type in the password you received from Delta Support. Use the buttons ▼ and ▲ to set each digit.

   To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select **`Grid settings`**.

   To confirm your selection, press the button ENT.



5. Use the buttons ▼ and ▲ to select **`Reconnect T`**.

   This subsection consists of only one parameter which can be directly edited.

6. To start editing the parameter value, press the button ENT.
7. To change the parameter value, use the buttons ▼ and ▲.

   To confirm your setting, press the button ENT.

   To cancel the action, press the button ESC.

Configurable Parameters

Parameter	Description	Value range
`Reconnect T`	Reconnection time	**`0 ... 900 s`**

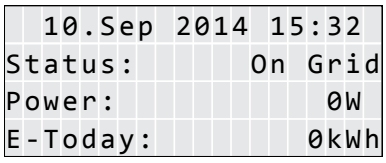
8.8.5 P Ramp Up

Overview

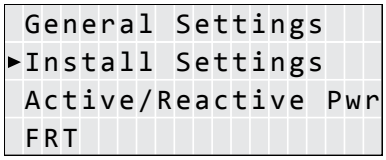
With this function you can define a ramp for the active power in case the inverter has disconnected from the grid because of a grid voltage or grid frequency failure (see “8.8.2 Voltage protection”, p. 73 and “8.8.3 Frequency protection”, p. 76). After the failure has disappeared, the inverter will continuously increase the active power fed into the grid according to the set ramp.

Accessing the menu

Main menu > Install Settings > Grid settings > P Ramp Up

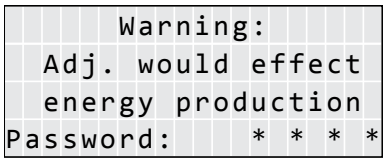


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



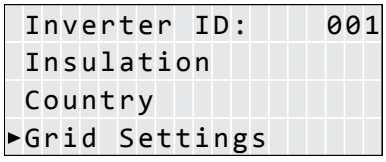
2. Use the buttons ▼ and ▲ to select **`Install Settings`**.

   To confirm your selection, press the button ENT.



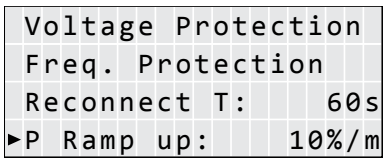
3. Type in the password you received from Delta Support. Use the buttons ▼ and ▲ to set each digit.

   To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select **`Grid settings`**.

   To confirm your selection, press the button ENT.



5. Use the buttons ▼ and ▲ to select **`P Ramp Up`**.

   This subsection consists of only one parameter which can be directly edited.

6. To start editing the parameter value, press the button ENT.

7. To change the parameter value, use the buttons ▼ and ▲.

   To confirm your setting, press the button ENT.

   To cancel the action, press the button ESC.

Configurable Parameters

Parameter	Description	Value range
`P Ramp up`	After the failure has disappeared, the inverter will continuously increase the active power fed into the grid according to the set ramp	`0 ... 6000 %/min`

8 Settings

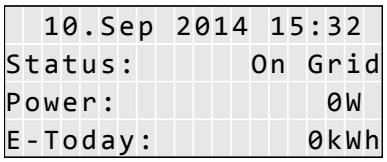
8.9 Dry contacts

Overview

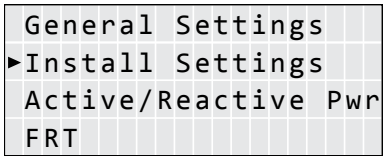
With this function you can apply an event to the dry contacts.

Accessing the menu

Main menu > Install Settings > Grid settings > P Ramp Up

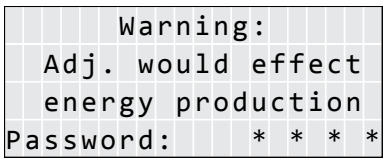


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



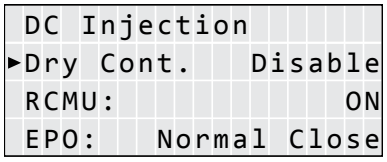
2. Use the buttons ▼ and ▲ to select ***Install Settings***.

To confirm your selection, press the button ENT.



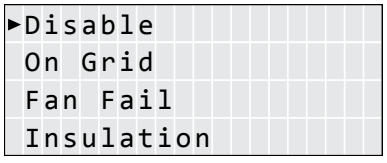
3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select ***Dry Contact***.

To confirm your selection, press the button ENT.



5. Use the buttons ▼ and ▲ to select an option.

To confirm your selection, press the button ENT.

Configurable Parameters

Parameter	Description	Value range
Dry cont.	Applies an event to the selected dry contact.	**Disabled** | **On Grid** | **Fan Fail** | **Insulation** | **Alarm** | **Error** | **Fault** | **Warning**

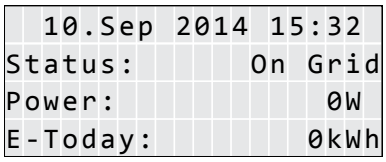
8.10 EPO (External Power Off)

Overview

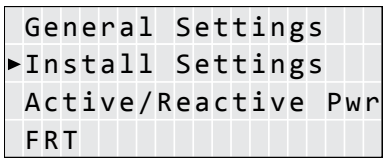
With this function you can set the type of contact for the EPO function (normally open or normally closed).

Accessing the menu

Main menu > Install Settings > EPO

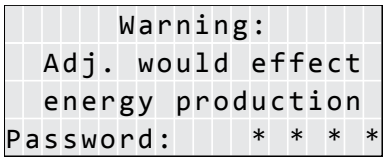


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



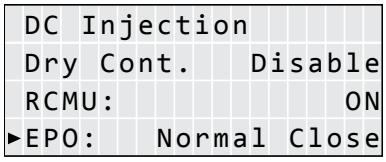
2. Use the buttons ▼ and ▲ to select **Install Settings**.

   To confirm your selection, press the button ENT.



3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

   To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select **EPO**. The current setting is displayed behind the menu entry.

5. To start editing the parameter value, press the button ENT.

6. To change the parameter value, use the buttons ▼ and ▲.

   To confirm your selection, press the button ENT.

   To cancel the action, press the button ESC.

Configurable Parameters

Parameter	Description	Value range
EPO	Sets the type of contact for the relay (normally closed or normally open).	**Normal Open** | **Normal Close** Default setting: **Normal Close**

8 Settings

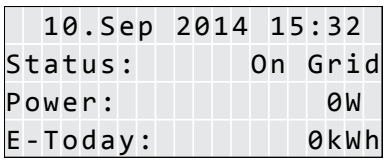
8.11 AC Connection type

Overview

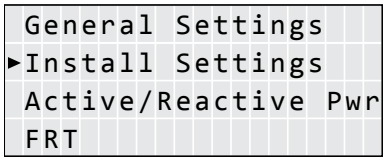
With this function you can set the type of AC connection you use to connect the inverter to the grid. The inverter can be connected to a 3-wire system (3P3W: L1, L2, L3, PE) or a 4-wire system (3P4W: L1, L2, L3, N, PE). The default setting is 3P4W.

Accessing the menu

Main menu > Install Settings > AC Connection

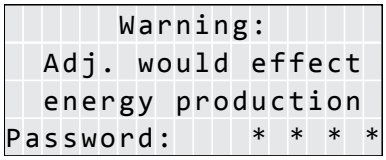


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



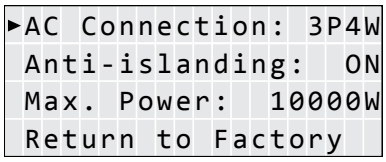
2. Use the buttons ▼ and ▲ to select **`Install Settings`**.

   To confirm your selection, press the button ENT.



3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

   To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select **`AC Connection`**. The current setting is displayed behind the menu entry.

5. To start editing the parameter value, press the button ENT.

6. To change the parameter value, use the buttons ▼ and ▲.

   To confirm your selection, press the button ENT.

   To cancel the action, press the button ESC.

Configurable Parameters

Parameter	Description	Value range
`AC Connection`	Sets the type of AC connection used to connect the inverter to the grid. **`3P3W`**: 3-wire system (L1, L2, L3, PE) **`3P4W`**: 4-wire system (L1, L2, L3, N, PE)	**`3P3W`** | **`3P4W`**

8.12 Max. Power (Maximum feed-in power)

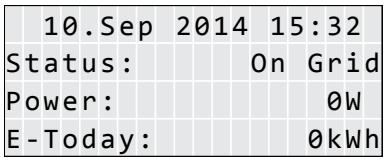
Overview

This function should be set only when requested by country regulations, authorities or your grid operator.

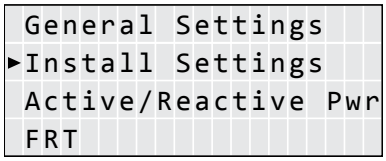
With this function you can limit the maximum active power to be fed into the grid.

Accessing the menu

Main menu > Install Settings > Max. Power

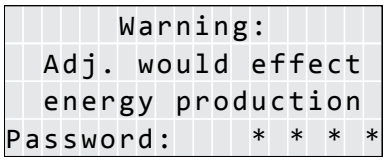


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



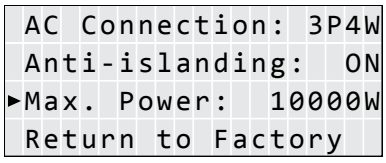
2. Use the buttons ▼ and ▲ to select **`Install Settings`**.

   To confirm your selection, press the button ENT.



3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

   To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select **`Max. Power`**. The current setting is displayed behind the menu entry.

5. To start editing the parameter value, press the button ENT.

6. To change the parameter value, use the buttons ▼ and ▲.

   To confirm your selection, press the button ENT.

   To cancel the action, press the button ESC.

Configurable Parameters

Parameter	Description	Value range
`Max. Power`	Limits the maximum power to be fed into the grid.	**`0 ... 33000 W`** Default: according to the country regulations

Do not change this setting without prior consultation with Delta Solar Support.

8.13 Power limitation

Overview

Values have been set based upon country standards. If you modify these values, you will lose certification. Therefore you should set this function only when requested by country regulations, authorities or your grid operator.

With this function you can limit the active power fed into the grid.

The power limitation set with this function relates to the value set for the **Max. Power** parameter in the installation settings. For a description of the **Max. Power** parameter, see “8.12 Max. Power (Maximum feed-in power)”, p. 83.

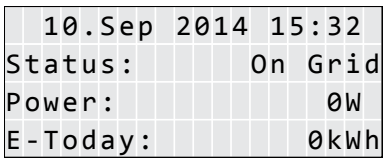
Example

You have set the maximum power to 80%.

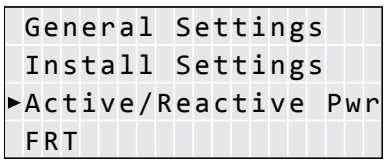
If you additionally set a power limitation of 70%, the total maximum active power is calculated as 50 kW x 80% x 70% = 28 kW.

Accessing the menu

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

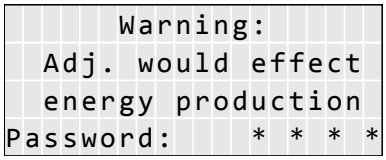


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



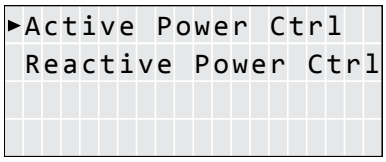
2. Use the buttons ▼ and ▲ to select **Active/Reactive Pwr**.

   To confirm your selection, press the button ENT.



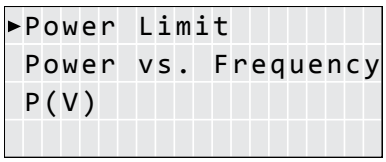
3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

   To confirm a digit, press the button ENT.



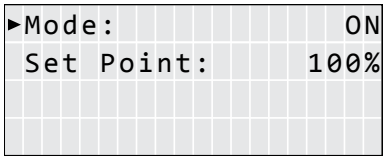
4. Use the buttons ▼ and ▲ to select **Active Power Ctrl**.

   To confirm your selection, press the button ENT.



5. Use the buttons ▼ and ▲ to select **Power Limit**.

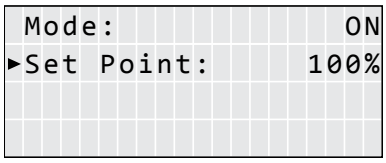
   To confirm your selection, press the button ENT.



6. To change the mode, use the buttons ▼ and ▲ and press the button ENT.

To switch the function **on**, select **ON** and press the button ENT.

To switch the function **off**, select **OFF** and press the button ENT. When you switch the function off, you can ignore the following steps.



7. To set the value for the power limitation, use the buttons ▼ and ▲ to select **Set Point** and press the button ENT.

8. Use the buttons ▼ and ▲ to change the parameter value.

To confirm your setting, press the button ENT.

To cancel the action, press the button ESC .

Configurable Parameters

Parameter	Description	Value range
Mode	Switches the function on and off.	**ON** | **OFF** Default value: **OFF**
Set Point	The value for the power limitation.	**0 ... 100%** Default value: **100%**

Do not change this setting without prior consultation with Delta Solar Support.

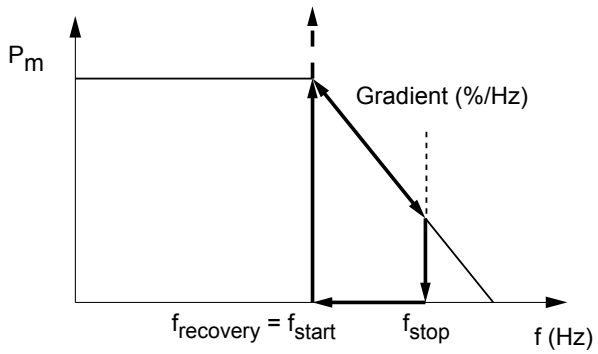
8.14 Power versus frequency

Overview

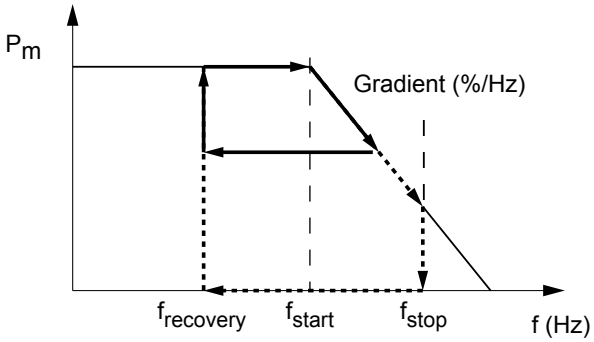
Values have been set based upon country standards. If you modify these values, you will lose certification. Therefore you should set this function only when requested by country regulations, authorities or your grid operator.

With this function you can control the active power as a function of the grid frequency.

Default behavior for Germany LV (VDE-AR-N 4105)



Default behavior for grid Germany MV (BDEW)

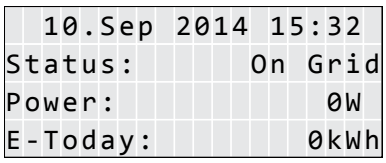


F_{stop} is automatically calculated according to the following formula:

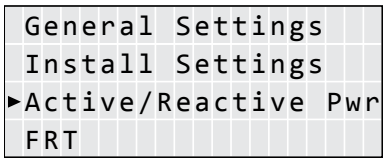
$F_{stop} = F_{start} + (1 / Gradient)$

Accessing the menu

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

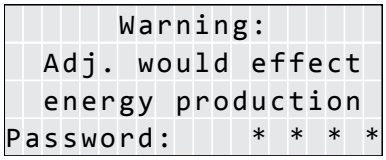


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



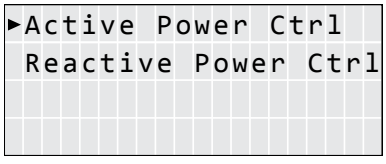
2. Use the buttons ▼ and ▲ to select **Active/Reactive Pwr**.

   To confirm your selection, press the button ENT.

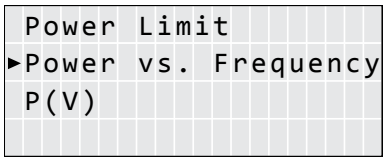


3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

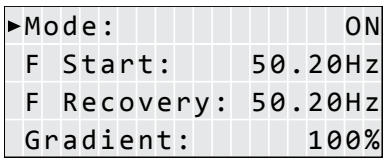
   To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select **Active Power Ctrl**. The current setting is displayed behind the menu entry.



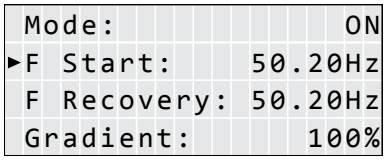
5. Use the buttons ▼ and ▲ to select **Power vs Frequency**. The current setting is displayed behind the menu entry.



6. To change the mode, use the buttons ▼ and ▲ and press the button ENT.

To switch the function **on**, select **ON** and press the button ENT.

To switch the function **off**, select **OFF** and press the button ENT. When you switch the function off, you can ignore the following steps.



7. Use the buttons ▼ and ▲ to select a parameter and press the button ENT.

8. To change the parameter value, use the buttons ▼ and ▲.

To confirm your setting, press the button ENT.

To cancel the action, press the button ESC.

9. Repeat steps 7 to 8 for all parameters you want to change.

Configurable Parameters

Parameter	Description	Value range
Mode	Switches the function on and off.	**ON** | **OFF** Default value: **OFF**
F Start	The grid frequency at which the inverter starts to limit the active power according to the **Gradient** parameter.	**50.00 .. 55.00 Hz** Default value: according to the country regulations
F Recovery	The grid frequency at which the inverter reconnects to the grid or at which the inverter feeds-in full power again. The behavior depends on the selected country and grid.	**50.00 .. 55.00 Hz** Default value: according to the country regulations
Gradient	Adjustment of the active power fed into the grid in percent per Hz when the grid frequency is between **F Start** and **F Stop**.	**0 .. 100 %/Hz**
T Recovery	When the grid frequency drops to **F Recovery**, the inverter will wait for the time defined in **T Recovery** before it returns to normal operating behavior.	**0 .. 600 s**

Do not change this setting without prior consultation with Delta Solar Support.

8.15 P(V)

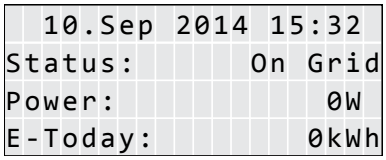
Overview

Values have been set based upon country standards. If you modify these values, you will lose certification. Therefore you should set this function only when requested by country regulations, authorities or your grid operator.

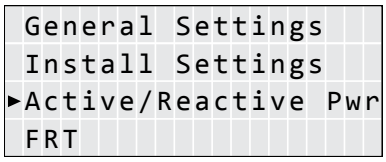
With this function you can adjust the active power as a function of the grid voltage.

Accessing the menu

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

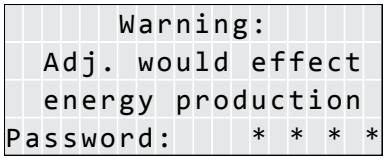


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



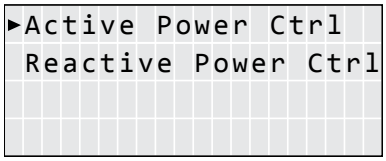
2. Use the buttons ▼ and ▲ to select **Active/Reactive Pwr**.

   To confirm your selection, press the button ENT.



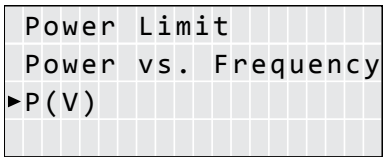
3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

   To confirm a digit, press the button ENT.



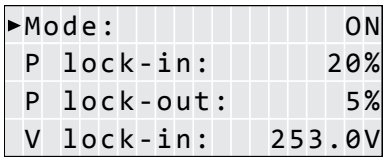
4. Use the buttons ▼ and ▲ to select **Active Power Ctrl**.

   To confirm your selection, press the button ENT.



5. Use the buttons ▼ and ▲ to select **Power Limit**.

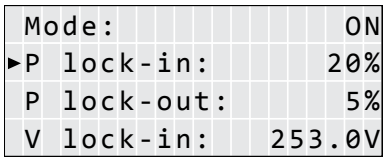
   To confirm your selection, press the button ENT.



6. To change the mode, use the buttons ▼ and ▲ and press the button ENT.

   To switch the function **on**, select **ON** and press the button ENT.

   To switch the function **off**, select **OFF** and press the button ENT. When you switch the function off, you can ignore the following steps.



7. If you need to change a parameter, use the buttons ▼ and ▲ to select the parameter and press the button ENT.

8. To change the parameter value, use the buttons ▼ and ▲.

To confirm your setting, press the button ENT.

To cancel the action, press the button ESC.

9. Repeat steps 7 to 8 for other parameters if you need to change them.

Configurable Parameters

Parameter	Description	Value range
Mode	Switches the function on and off.	**ON** | **OFF** Default value: **OFF**
P lock-in		**10 ... 100%**
P lock-out		**0 ... 50%**
V lock-in		**230.0 ... 264.0 V**
V lock-out		**207.0 ... 253.0 V**
T recovery		**10 ... 900 s**

Do not change this setting without prior consultation with Delta Solar Support.

8.16 Constant cos phi

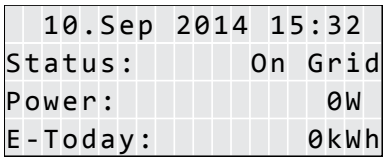
Overview

With this function you can set a constant cos phi (cos φ).

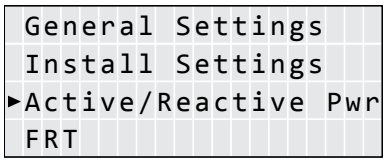
This function should be set only when requested by country regulations, authorities or your grid operator.

Accessing the menu

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

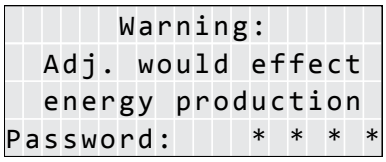


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



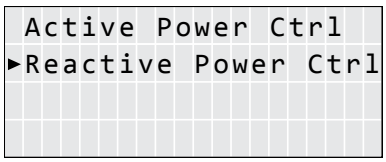
2. Use the buttons ▼ and ▲ to select **Active/Reactive Pwr**.

   To confirm your selection, press the button ENT.

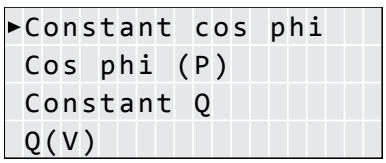


3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

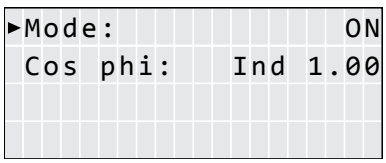
   To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select **Reactive Power Ctrl**. The current setting is displayed behind the menu entry.



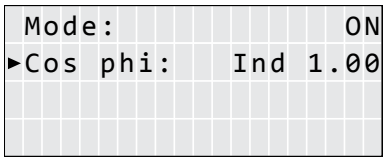
5. Use the buttons ▼ and ▲ to select **Constant cos phi**. The current setting is displayed behind the menu entry.



6. To change the mode, use the buttons ▼ and ▲ to select **Mode** and press the button ENT.

   To switch the function **on**, select **ON** and press the button ENT.

   To switch the function **off**, select **OFF** and press the button ENT. When you switch the function off, you can ignore the following steps.



7. If you need to change the cos phi (cos φ), use the buttons ▼ and ▲ to select **Cos phi** and press the button ENT.

8. To change the parameter value, use the buttons ▼ and ▲.

To confirm your setting, press the button ENT.

To cancel the action, press the button ESC.

Configurable Parameters

Parameter	Description	Value range
Mode	Switches the function on and off.	**ON** | **OFF** Default value: **OFF**
Cos phi	Sets up a cos phi so that the inverter can feed reactive power into the grid.	**ind 0.8 ... cap 0.8**

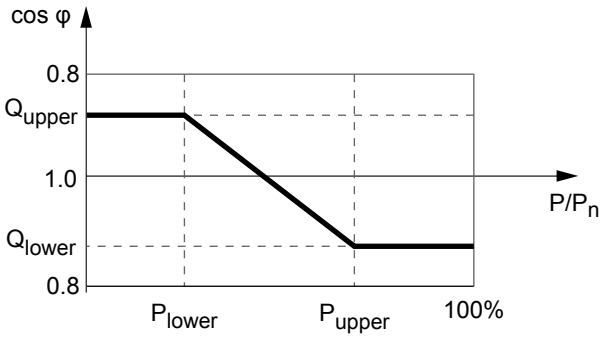
Do not change this setting without prior consultation with Delta Solar Support.

8.17 Cos phi (P)

Overview

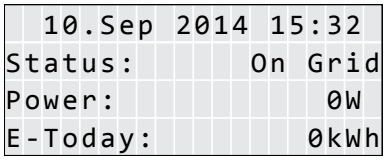
Values have been set based upon country standards. If you modify these values, you will lose certification. Therefore you should set this function only when requested by country regulations, authorities or your grid operator.

With this function you can set the cos phi (cos φ) as a function of the active power.

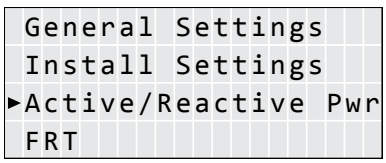


Accessing the menu

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

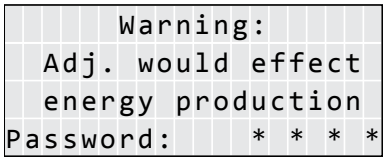


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



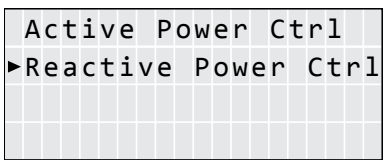
2. Use the buttons ▼ and ▲ to select **`Active/Reactive Pwr`**.

   To confirm your selection, press the button ENT.

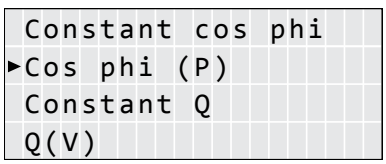


3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

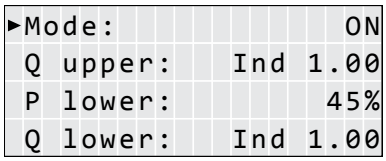
   To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select **`Reactive Power Ctrl`**. The current setting is displayed behind the menu entry.



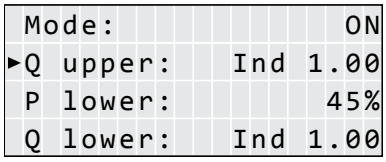
5. Use the buttons ▼ and ▲ to select **`Cos phi (P)`**. The current setting is displayed behind the menu entry.



6. To change the mode, use the buttons ▼ and ▲ to select **Mode** and press the button ENT.

To switch the function **on**, select **ON** and press the button ENT.

To switch the function **off**, select **OFF** and press the button ENT. When you switch the function off, you can ignore the following steps.



7. If you need to change a parameter, use the buttons ▼ and ▲ to select the parameter and press the button ENT.

8. To change the parameter value, use the buttons ▼ and ▲.

To confirm your setting, press the button ENT.

To cancel the action, press the button ESC.

9. Repeat steps 7 to 8 for other parameters if you need to change them.

Configurable Parameters

Parameter	Description	Value range
Mode	Switches the function on and off.	**ON** | **OFF** Default value: **OFF**
Q upper	Sets up the upper limit for the reactive power which is set as a cos phi (cos φ).	**ind 0.8 .. cap 0.8**
P upper	Sets up the upper limit for the active power which is set in per cent of the nominal power.	**0 .. 100%**
Q lower	Sets up the lower limit for the reactive power which is set as a cos phi (cos φ).	**ind 0.8 .. cap 0.8**
P lower	Sets up the lower limit for the active power which is set in per cent of the nominal power.	**0 .. 100%**
V lock-in	The lower limit of the grid voltage range in which the function is active. The parameter is used for Italy only.	**230.0 .. 253.0 V**
V lock-out	The upper limit of the grid voltage range in which the function is active. The parameter is used for Italy only.	**207.0 .. 230.0 V**

Do not change this setting without prior consultation with Delta Solar Support.

8.18 Constant Q

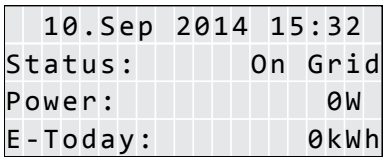
Overview

With this function you can set a constant reactive power.

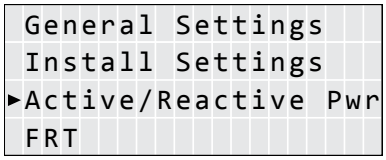
This function should be set only when requested by country regulations, authorities or your grid operator.

Accessing the menu

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

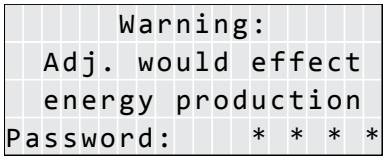


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



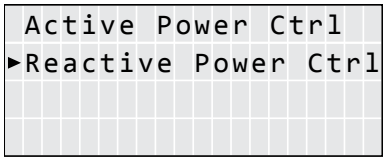
2. Use the buttons ▼ and ▲ to select **Active/Reactive Pwr**.

   To confirm your selection, press the button ENT.

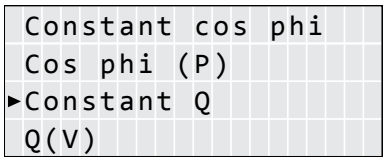


3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

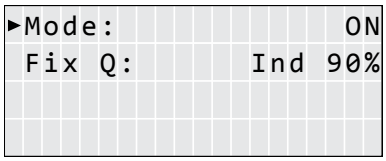
   To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select **Reactive Power Ctrl**. The current setting is displayed behind the menu entry.



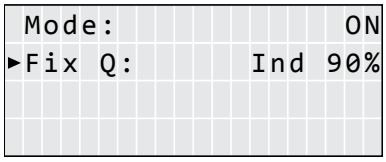
5. Use the buttons ▼ and ▲ to select **Constant Q**. The current setting is displayed behind the menu entry.



6. To change the mode, use the buttons ▼ and ▲ to select **Mode** and press the button ENT.

To switch the function **on**, select **ON** and press the button ENT.

To switch the function **off**, select **OFF** and press the button ENT. When you switch the function off, you can ignore the following steps.



7. If you need to change the parameter **Fix Q**, use the buttons ▼ and ▲ to select the parameter and press the button ENT.

8. To change the parameter value, use the buttons ▼ and ▲.

To confirm your setting, press the button ENT.

To cancel the action, press the button ESC.

9. Repeat steps 7 to 8 for other parameters if you need to change them.

Configurable Parameters

Parameter	Description	Value range
Mode	Switches the function on and off.	**ON** | **OFF** Default value: **OFF**
Fix Q	Sets up a constant reactive power which is set in per cent of the nominal apparent power S_n.	**cap 0 ... 100%** | **0** | **ind 0 ... 100%**

Do not change this setting without prior consultation with Delta Solar Support.

8.19 Q (V) - Apparent power versus voltage

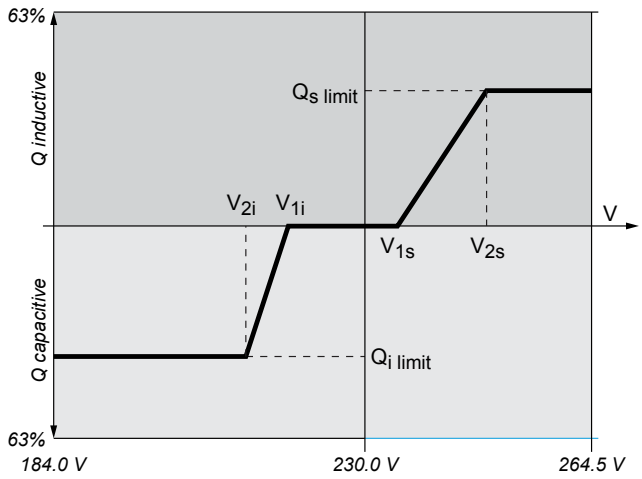
Overview

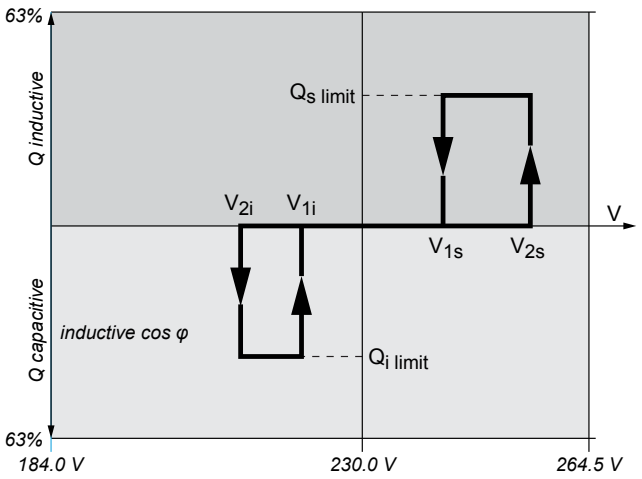
Values have been set based upon country standards. If you modify these values, you will lose certification. Therefore you should set this function only when requested by country regulations, authorities or your grid operator.

With this function you can set the apparent power as a function of the grid voltage.

This function is available for medium voltage grids only.

(1) Behavior for Curve A	(2) Behavior for Curve B





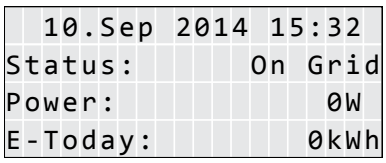
Operating behavior for curve A

When the grid voltage increases to the lower voltage limit **V1s**, the inverter starts to feed-in inductive reactive power. When you set the parameter **T** inductive, the inverter will wait for this period time for the grid voltage falling back to a level below **V1s** before it starts feeding in inductive reactive power. When the grid voltage continues to increase, the inductive reactive power will be increased according to the ramp defined by the curve. If the grid voltage exceeds the upper voltage limit **V2s**, the inductive active power remains at the level defined in **Qs limit**.

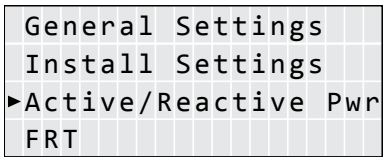
When the grid voltage falls to the upper voltage limit **V1i**, the inverter starts to feed-in inductive reactive power. When you set the parameter **T delay**, the inverter will wait for this period time for the grid voltage rising back to a level above **V1i** before it starts feeding in inductive reactive power. When the grid voltage continues to fall, the inductive reactive power will be increased according to the ramp defined by the curve. If the grid voltage exceeds the upper voltage limit **V2i**, the inductive active power remains at the level defined in **Qi limit**.

Accessing the menu

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

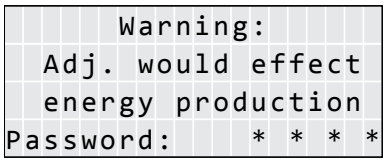


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



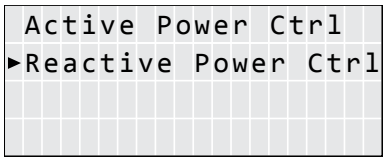
2. Use the buttons ▼ and ▲ to select **Active/Reactive Pwr**.

   To confirm your selection, press the button ENT.

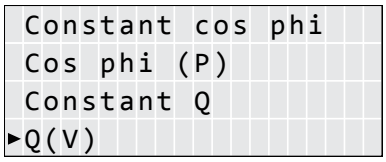


3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

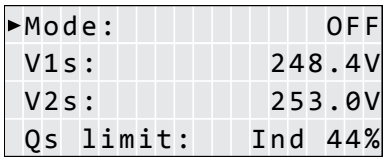
   To confirm a digit, press the button ENT.



4. Use the buttons ▼ and ▲ to select **Reactive Power Ctrl**. The current setting is displayed behind the menu entry.



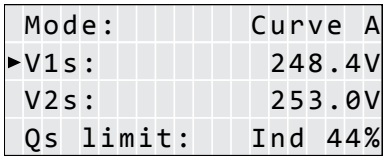
5. Use the buttons ▼ and ▲ to select **Q (V)**. The current setting is displayed behind the menu entry.



6. To change the mode, use the buttons ▼ and ▲ to select **Mode** and press the button ENT.

   To switch the function **on**, select a mode and press the button ENT.

   To switch the function **off**, select **OFF** and press the button ENT. When you switch the function off, you can ignore the following steps.



7. If you need to change a parameter, use the buttons ▼ and ▲ to select the parameter and press the button ENT.

8. To change the parameter value, use the buttons ▼ and ▲.

   To confirm your setting, press the button ENT.

   To cancel the action, press the button ESC.

9. Repeat steps 7 to 8 for other parameters if you need to change them.

Do not change this setting without prior consultation with Delta Solar Support.

Configurable Parameters

Parameter	Description	Value range
Mode	**OFF** Switches the function on and off. **Curve A** **Curve B**	**OFF** | **Curve A** | **Curve B** Default value: **OFF**
V1s	The lower voltage limit for feeding-in capacitive reactive power.	**230.0 ... 264.5 V**
V2s	The upper voltage limit for feeding-in capacitive reactive power.	**230.0 ... 264.5 V**
Qs limit	The limit for the inductive apparent power. The value is set in per cent of the rated apparent power S_n. This value is connected with parameter **V2s**.	**0 ... cap 63%**
V1i	The upper voltage limit for feeding-in inductive reactive power.	**184.0 ... 230.0 V**
V2i	The upper voltage limit for feeding-in inductive reactive power.	**84.0 ... 230.0 V**
Qi limit	The limit for the inductive apparent power. The value is set in per cent of the rated apparent power S_n. This value is connected with parameter **V2i**.	**0 ... ind 63%**
T delay	Internal parameter	**0 ... 120.00 s**
P lock-in	The lower limit of the active power range within which the function is active. The parameter is given in percent of the nominal power. Used for Italy only.	**10 ... 100%**
P lock-out	The upper limit of the active power range within which the function is active. The parameter is given in percent of the nominal power. Used for Italy only.	**5 ... 10%**

8.20 FRT (Fault Ride Through)

Overview

Values have been set based upon country standards. If you modify these values, you will lose certification. Therefore you should set this function only when requested by country regulations, authorities or your grid operator.

With this function you can set the operation behavior of the inverter for FRT (Fault Ride Through).

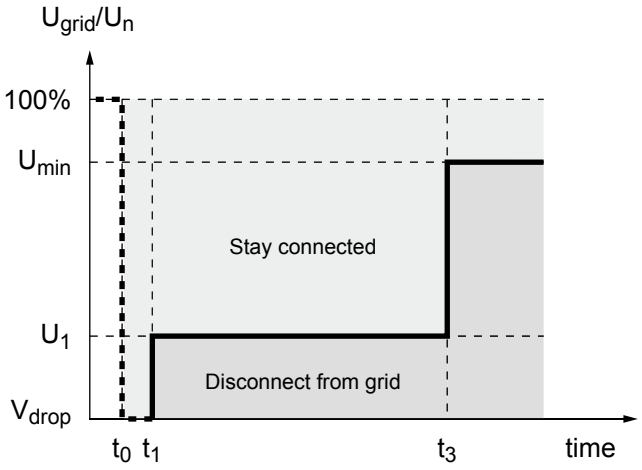
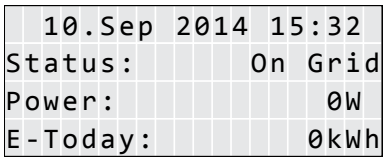


Fig. 8.41: Operation behavior for FRT (Fault Ride Through)

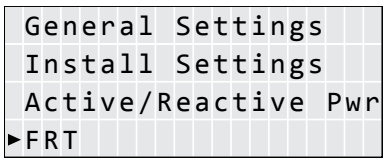
t1 : The point in time when the fault occurs.

Accessing the menu

Main menu > FRT

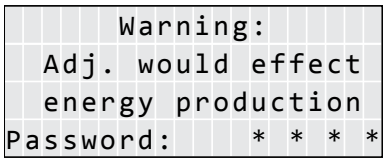


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



2. Use the buttons ▼ and ▲ to select **FRT**.

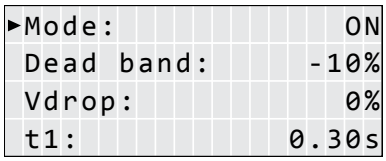
To confirm your selection, press the button ENT.



3. The menu is protected by password 5555. Use the buttons ▼ and ▲ to set each digit.

To confirm a digit, press the button ENT.

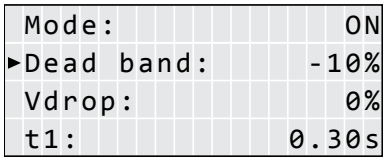
Do not change this setting without prior consultation with Delta Solar Support.



4. To change the mode, use the buttons ▼ and ▲ to select **Mode** and press the button ENT.

To switch the function **on**, select **Mode = ON** and press the button ENT.

To switch the function **off**, select **Mode = OFF** and press the button ENT. When you switch the function off, you can ignore the following steps.



5. If you need to change a parameter, use the buttons ▼ and ▲ to select the parameter and press the button ENT.

6. To change the parameter value, use the buttons ▼ and ▲.

To confirm your setting, press the button ENT.

To cancel the action, press the button ESC.

7. Repeat steps 5 to 6 for all parameters you need to change.

Configurable Parameters

Parameter	Description	Value range
Mode	Switches the function on and off.	**OFF | ON** Default value: Depends on the selected country/grid.
Dead band	Dead band	**-20 .. 0%**
Vdrop	Drop voltage	**0 .. 90%**
t1	Time t1	**0 .. 5.00 s**
U1	Voltage U1	**20 .. 90 %**
t3	Time t3	**0 .. 5.00 s**
K factor	K factor	**0 .. 10.0**

9. Measurements and statistics

The inverter provides several measurements and statistics about the operating behavior and events that can have an influence on the operating behavior.

The following types of measurements and statistics are available:

Type of information	Description
Meter	Current data of many parameters.
Energy log	Energy information for total lifetime.
Event log	A list of important events like failures, parameter changes etc. with date and time.
Inverter information	Basic information like general settings, software versions etc.

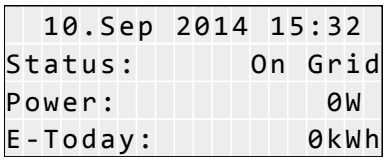
9.1 Meter

Description

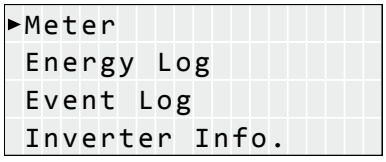
In this menu you find the current data of several parameters in real time. The meter statistics consist of three pages. The information can only be read and not edited.

Accessing the Menu

Main menu > Meter

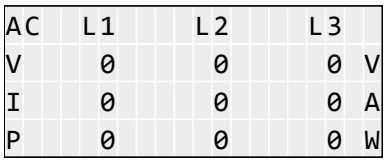


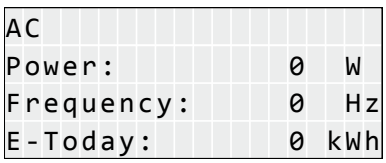
1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.

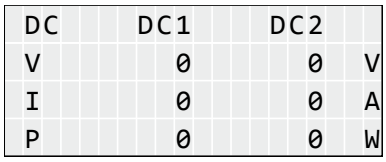


2. Use the buttons ▼ and ▲ to select ***Meter***.

   To confirm your selection, press the button ENT.







3. Use the buttons ▼ and ▲ to scroll through the meter statistics.

4. To close the meter statistics, press the button ESC.

9 Measurements and statistics

Displayed Parameters

Parameter	Description
Page 1	**AC side**
	For the AC side in total is displayed:
Power	Currently produced active power, in W.
Frequency	Current grid frequency, in Hz.
E-Today	Total energy produced on this day, in kWh.
Page 2	**AC side**
	For each phase (L1, L2, L3) is displayed:
V	Voltage, in V
I	Current, in A
P	Active Power, in W
Page 3	**DC side**
	For each DC input is displayed:
V	Voltage, in V
I	Current, in A
P	Power, in W

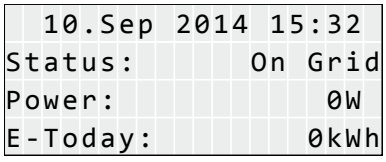
9.2 Energy log

Description

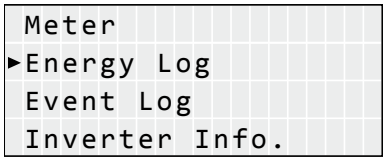
In these statistics you find several values for the total lifetime of the *inverter*.

Accessing the Menu

Main menu > Energy log

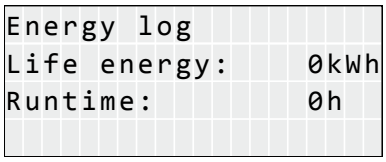


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



2. Use the buttons ▼ and ▲ to select ***Energy log***.

To confirm your selection, press the button ENT.



3. To close the energy log, press the button ESC.

Displayed Parameters

Parameter	Description
Life energy	Total amount of energy produced by the *inverter*, in kWh.
Runtime	The total time that the inverter was in operation.

9 Measurements and statistics

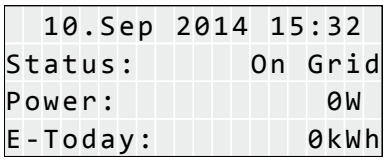
9.3 Event log

Description

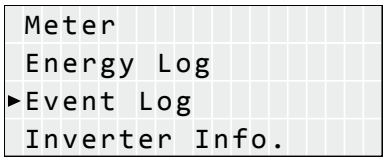
The event log is a list of important events that happened during operation.

Accessing the Menu

Main menu > Event log



1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



2. Use the buttons ▼ and ▲ to select ***Event log***.

   To confirm your selection, press the button ENT.

3. Use the buttons ▼ and ▲ to scroll through the event log.

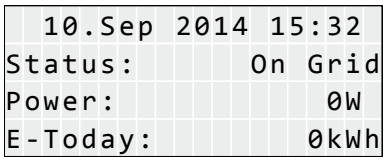
9.4 Inverter information

Description

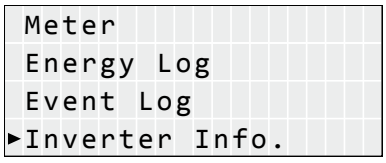
In this section you find general information about the inverter.

Accessing the Menu

Main menu > Event log

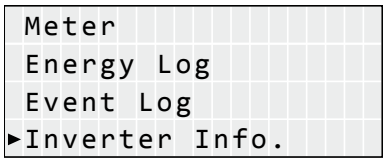


1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button ESC until the main menu is displayed.



2. Use the buttons ▼ and ▲ to select ***Inverter Info.***

   To confirm your selection, press the button ENT.



3. Use the buttons ▼ and ▲ to scroll through the inverter information.

Displayed Parameters

Parameter	Description
S/N	Serial number.
DSP, Red, Comm, Wifi	The software versions of the various controllers.
ID	The currently set inverter ID for RS485. For a description how to change the inverter ID, see “8.6 Inverter ID”, p. 70.
Country	The currently set country/grid.
Insulation	The currently set insulation resistance in kΩ. For a description how to change the insulation settings, see “8.7 Insulation mode and insulation resistance”, p. 71.
Baud rate	The currently set baud rate for RS485. For a description how to change the baud rate, see “8.5 Baud rate for RS485”, p. 69.
Install	The date of installation.
AC connection	The currently chosen type of AC connection. For a description how to set a different type of AC connection, see “8.11 AC Connection type”, p. 82.
Pmax	The currently set maximum active power that the inverter feeds into the grid. For a description how to change the maximum active power, see “8.12 Max. Power (Maximum feed-in power)”, p. 83.

10. Error messages and trouble shooting

DANGER

Risk of death by electrocution
Potentially fatal voltage is applied to the inverter during operation. This potentially fatal voltage is still present for some time after all power sources have been disconnected.

- ► Never open the inverter.
- ► Always disconnect the inverter from power before installation, open the AC/DC Disconnection switch and make sure neither can be accidentally reconnected.
- ► Wait 30 seconds until the capacitors have discharged.

DANGER

Risk of death or serious injury from electrocution
Potentially fatal voltage may be applied to the DC connections of the inverter. When light is falling on solar modules, they immediately start producing energy. They do so, even when the sun is not shining directly onto the solar modules.

- ► Never disconnect the solar modules when the inverter is powered.
- ► First switch off the grid connection so that the inverter cannot feed energy into the grid.
- ► Turn the AC/DC Disconnection switch to position **OFF**.
- ► Make sure the DC connections cannot be accidentally touched.

The inverter contains no internal components that must be maintained or repaired by the operator or installer. All repairs must be performed by Delta Energy Systems. Opening the cover will void the warranty.

10.1 Errors

Number	Message	Possible cause	Solution
E01	AC Freq High	Current grid frequency is above the ***OFR*** setting (over frequency recognition).	Check the grid frequency on the inverter display.
		Incorrect country setting.	Check country setting on the inverter display.
E02	AC Freq Low	Current grid frequency is below the ***UFR*** setting (under frequency recognition).	Check the grid frequency on the inverter display.
		Incorrect country or grid setting.	Check country and grid setting.
E11, E13, E16, E18, E21, E23	AC Volt High	Current grid voltage is above the ***OVR*** setting (over voltage recognition).	Check the grid voltage on the inverter display.
		Grid voltage is over the ***Slow OVR*** setting during operation.	Check the grid voltage on the inverter display.
		Incorrect country or grid setting.	Check country and grid settings.
E10, E15, E20	AC Volt Low	Current grid voltage is under the ***UVR*** setting (under voltage recognition).	Check the grid voltage connection to inverter terminal.
		Incorrect country or grid setting.	Check country and grid setting.
		Wrong wiring in AC plug.	Check wiring of AC plug.
E07	Grid Quality	Non-linear load in grid and near to inverter.	Grid connection of inverter needs to be far away from non-linear load if necessary.
E08	HW Connect Fail	Wrong wiring in AC plug.	Check wiring of AC plug.
E34	Insulation	PV array insulation fault.	Check the insulation of DC inputs.
		Large PV array capacitance between Plus and Ground, or Minus and Ground, or both.	Check the capacitance, dry PV panels if necessary.
E09	No Grid	AC/DC disconnection switch is in position **OFF**.	Turn the AC/DC disconnection switch to position **ON**.
		AC plug is not properly connected.	Check the connection in AC plug and make sure it connects to inverter.
		Wrong wiring in AC plug	Check wiring of AC plug.
E30	Solar1 High	DC input voltage at DC1 is above the maximum allowed DC input voltage.	Modify the solar array setting, so that the DC input voltage at DC1 is below the maximum allowed DC input voltage.
E31	Solar2 High	DC input voltage at DC2 is above the maximum allowed DC input voltage.	Modify the solar array setting, so that the DC input voltage at DC1 is below the maximum allowed DC input voltage.

10 Error messages and trouble shooting

10.2 Warnings

Number	Message	Possible cause	Solution
W01	Solar1 Low	DC input voltage at DC1 is below the minimum required DC voltage.	Check the DC input voltage at DC1 on the inverter display. Maybe the solar irradiation is too low.
W02	Solar2 Low	DC input voltage at DC2 is below the minimum required DC voltage.	Check the DC input voltage at DC2 on the inverter display. Maybe the solar irradiation is too low.
W11	HW Fan	One or more fans are blocked.	Remove any objects that might block the fans.
		One or more fans are defective.	Replace the fans.
		One or more fans are disconnected.	Check the connections of all fans.
	SPD Fail	Inverter was struck by a lightning.	Check inverter status.
		One or more SPDs (surge protection devices) are defective.	Replace the defective SPDs.
		One or more SPDs are not correctly inserted.	Check all SPDs.

10.3 Faults

Number	Message	Possible cause	Solution
F36, F37, F38, F39, F40, F41	AC Current High	Surge occurs during operation.	Call Delta Support.
		Internal failure.	Call Delta Support.
F30	Bus Unbalance	Not totally independent or parallel between inputs.	Check the input connections.
		PV array short to ground.	Check the PV array insulation.
		Internal failure.	Call Delta Support.
F60, F61, F70, F71	DC Current High	Internal failure.	Call Delta Support.
F24	Ground Current	PV array insulation fault.	Check the insulation of DC inputs.
		Large PV array capacitance between Plus and Ground, or Minus and Ground.	Check the capacitance, must be < 2.5 µF. Install an external transformer if necessary.
		Internal failure.	Call Delta Support.
F45	HW AC OCR	Large grid harmonics.	Check the grid waveform. Grid connection of inverter needs to be far away from non-linear loads if necessary.
		Internal failure.	Call Delta Support.
F31, F33, F35	HW Bus OVR	DC input voltage is above the maximum allowed DC input voltage.	Modify the solar array setting, so that the DC input voltage at DC1 is below the maximum allowed DC input voltage.
		Surge occurs during operation.	Call Delta Support.
		Internal failure.	Call Delta Support.
F23	HW COMM1	Internal failure.	Call Delta Support.
F22	HW COMM2	Internal failure.	Call Delta Support.
F26	HW Connect Fail	Internal failure.	Call Delta Support.
F42	HW CT A Fail	Internal failure.	Call Delta Support.
F43	HW CT B Fail	Internal failure.	Call Delta Support.

Number	Message	Possible cause	Solution
F44	HW CT C Fail	Internal failure.	Call Delta Support.
F01, F02, F03	HW DC Injection	Grid waveform is abnormal.	Check the grid waveform. Grid connection of inverter needs to be far away from non-linear loads if necessary.
		Internal failure.	Call Delta Support.
F15, F16, F17	HW DSP ADC1, HW DSP ADC2, HW DSP ADC3	DC input voltage is below the minimum required DC voltage.	Check the DC input voltage on the inverter display. Maybe the solar irradiation is too low.
		Internal failure.	Call Delta Support.
F20	HW Efficiency	The calibration is incorrect.	Check the accuracy of current and power.
		Internal failure.	Call Delta Support.
F06, F08, F09, F10	HW NTC1 Fail, HW NTC2 Fail, HW NTC3 Fail, HW NTC4 Fail	Ambient temperature is > 90 °C or < -30 °C.	Check the installation environment.
		Detection circuit malfunction.	Check the detection circuit inside *inverter*.
F18, F19	HW Red ADC1, HW Red ADC2	DC input voltage is below the minimum required DC voltage.	Check the DC input voltage on the inverter display. Maybe the solar irradiation is too low.
		Internal failure.	Call Delta Support.
F50	HW ZC Fail	Internal failure.	Call Delta Support.
F27	RCMU Fail	Internal failure.	Call Delta Support.
F13, F29	Relay Open	Internal failure.	Call Delta Support.
F28	Relay Short	Internal failure.	Call Delta Support.
		The driver circuit for the relay malfunction.	Check the driver circuit inside *inverter*.
F05	Temperature High	Ambient temperature is > 60 °C.	Check the installation environment.
F07	Temperature Low	Ambient temperature is < -30 °C.	Check the installation environment.
		Internal failure.	Call Delta Support.

11. Maintenance

DANGER

Risk of death by electrocution
Potentially fatal voltage is applied to the solar inverter during operation. This potentially fatal voltage is still present for 60 seconds after all power sources have been disconnected.

- ► Never open the solar inverter.
- ► Always disconnect the solar inverter from power before installation, open the AC/DC isolating switch and make sure neither can be accidentally reconnected.
- ► Wait at least 60 seconds until the capacitors have discharged.

DANGER

Risk of death or serious injury from electrocution
Potentially fatal voltage may be applied to the DC connections of the solar inverter. When light is falling on solar modules, they immediately start producing energy. They do so, even when the sun is not shining.

- ► Never disconnect the solar modules when the solar inverter is powered.
- ► First switch off the grid connection so that the solar inverter cannot feed energy into the grid.
- ► Turn the AC/DC isolating switch to position **OFF**.
- ► Make sure the DC connections cannot be accidentally touched.

The inverter contains no internal components that must be maintained or repaired by the operator or installer. All repairs must be performed by Delta Energy Systems. Opening the cover will void the warranty.

In order to ensure the normal operation of the inverter, do the following **visual inspections** every 6 months.

- Check on the display that the inverter operates correctly. Check data history and error messages, too.
- Check the correct position of visible terminals, screws and cables but do not touch any of these parts.
- Check for damaged parts but do not touch any of these parts.

If some parts are damaged, call a qualified electrician to have them replaced.

12. Decommissioning

DANGER

Risk of death by electrocution

Potentially fatal voltage is applied to the *inverter* during operation. This potentially fatal voltage is still present for some time after all power sources have been disconnected.

- ► Never open the *inverter*.
- ► Always disconnect the *inverter* from power before installation, open the *AC/DC Disconnection switch* and make sure neither can be accidentally reconnected.
- ► Wait 30 seconds until the capacitors have discharged.

DANGER

Risk of death or serious injury from electrocution

Potentially fatal voltage may be applied to the DC connections of the *inverter*. When light is falling on solar modules, they immediately start producing energy. They do so, even when the sun is not shining directly onto the solar modules.

- ► Never disconnect the solar modules when the *inverter* is powered.
- ► First switch off the grid connection so that the *inverter* cannot feed energy into the grid.
- ► Turn the *AC/DC Disconnection switch* to position **OFF**.
- ► Make sure the DC connections cannot be accidentally touched.

WARNING

Heavy weight

The inverter is heavy.

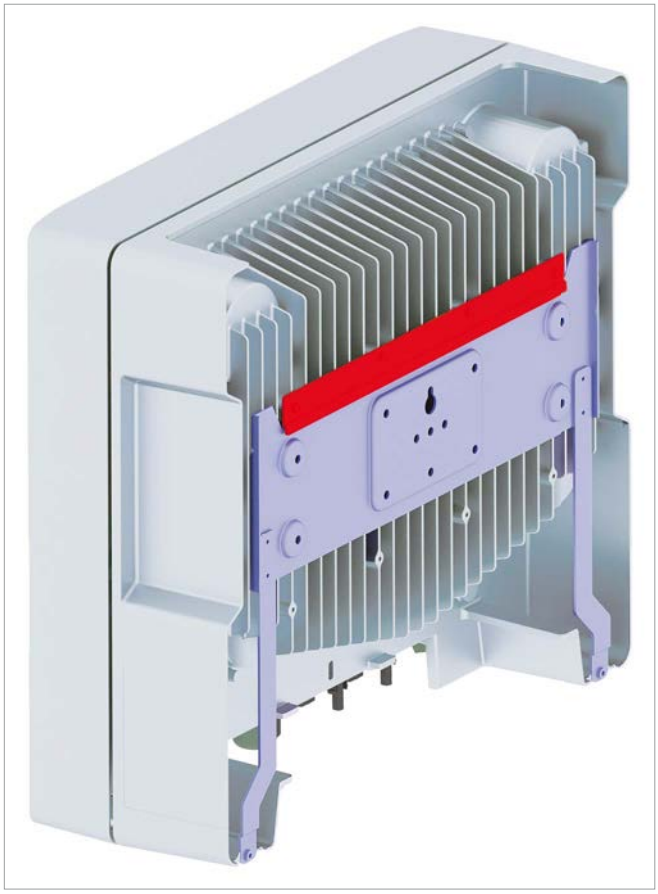
- ► The inverter must be lifted and carried by at least two people or with an appropriate lifting equipment.

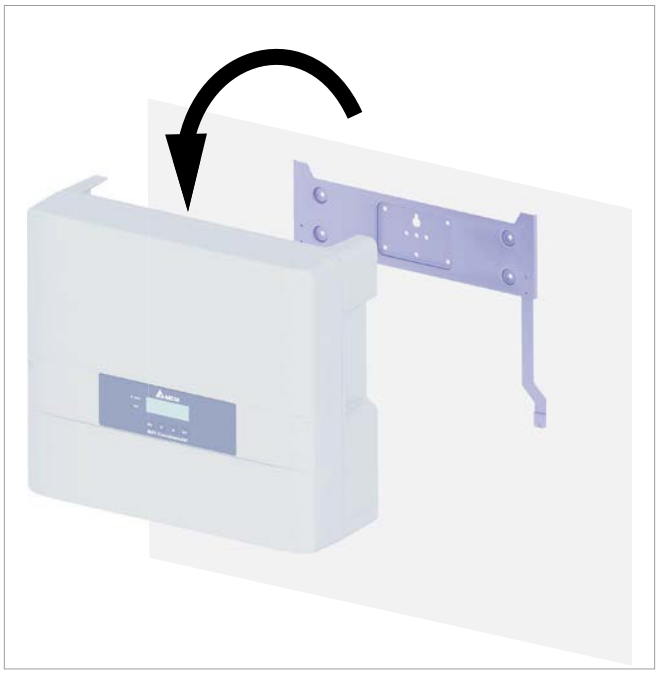
To put the inverter out of operation, e.g. for maintenance or to send it for repair, follow the instructions below:

1. Turn the *AC/DC Disconnection switch* to position **OFF**.

2. Disconnect the inverter from the solar modules (DC).
3. Disconnect the inverter from the grid (AC).
4. Use a voltmeter to confirm that the AC and DC power connections are de-energized.
5. Pull out the AC plug.
6. Pull out the DC plugs.
7. If installed, disconnect the cables from the communication port.
8. If installed, disconnect the grounding cable from the inverter housing.

9. Remove the inverter from the mounting bracket.





10. Put the inverter into the original box.

11. When you store the inverter, consider the ambient conditions for storing, see “13. Technical data”, p. 113.

13. Technical data

Input (DC)	RPI M6A	RPI M8A	RPI M10A
Maximum recommended PV power [1]	7500 W_P	10000 W_P	12500 W_P
Maximum power	6600 W	8800 W	11000 W
Input voltage range	200 ... 1000 V_{DC}		
Maximum input voltage	1000 V_{DC}		
Nominal voltage	600 V_{DC}		
Startup voltage	>250 V_{DC}		
Startup power	40 W		
MPP operating voltage range	200 ... 1000 V_{DC}		
MPP operating voltage range with full power			
Symmetrical load	315 ... 800 V_{DC}	415 ... 800 V_{DC}	415 ... 800 V_{DC}
Asymmetrical load (60/40%)	425 ... 800 V_{DC}	565 ... 800 V_{DC}	415 ... 800 V_{DC}
Maximum input current; total (DC1 / DC2)	20 A (10 A / 10 A)	20 A (10 A / 10 A)	25 A (15 A / 10 A)
Maximum short circuit current in case of a failure	13 A / 13 A	13 A / 13 A	19.5 A / 13 A
Number of MPP trackers	Parallel inputs: 1 MPP tracker; Separate inputs: 2 MPP trackers		
Maximum asymmetry	60/40%		
Number of DC inputs; total (DC1 / DC2)	2 (1 / 1)	2 (1 / 1)	3 (2 / 1)
Galvanic isolation	No		
Overvoltage category [2]	II		

Output (AC)	RPI M6A	RPI M8A	RPI M10A
Maximum apparent power [3]	6300 VA	8400 VA	10500 VA
Nominal apparent power	6000 VA [4]	8000 VA	10000 VA
Voltage range [5]	230 ± 20 % / 400 V_{AC} ± 20%; 3 phase + PE or 3 phase + N + PE		
Nominal current	8.7 A	11.6 A	14.5 A
Maximum current	9.7 A	13 A	16 A
Inrush current	31 A / 100 µs		
Nominal frequency	50 / 60 Hz		
Frequency range [5]	50 ± 5 Hz / 60 ± 5 Hz		
Power factor adjustable	0.8 cap ... 0.8 ind		
Total harmonic distortion	<3%		
DC current injection	<0.5% rated current		
Night-time loss	<2 W		
Overvoltage category [2]	III		

13 Technical data

Mechanical Design	RPI M6A	RPI M8A	RPI M10A
Dimensions (W x H x D)	510 x 445 x 177 mm		
Weight	25 kg	25 kg	26 kg
Cooling	Natural convection		
AC Connector type	Amphenol C16-3		
DC Connector type	Multi-Contact MC4		
Communication interfaces	2 x RS485, 1 x Dry contacts, 1 x EPO (External Power Off), 6 x Digital inputs		

General Specification	RPI M6A	RPI M8A	RPI M10A
Delta model name	RPI M6A	RPI M8A	RPI M10A
Delta part number	RPI602FA0E1000	RPI802FA0E1000	RPI103FA0E1000
Maximum efficiency	98.3%	98.3%	98.3%
EU efficiency	97.6%	97.9%	98.0%
Operating temperature range	-25 ... +60 °C		
Operating temperature range without derating	-25 ... +40 °C		
Storage temperature range	-25 ... +60 °C		
Relative humidity	0 ... 100 %, non-condensing		
Maximum operating altitude	2000 m above sea level		

Standards and Directives	RPI M6A	RPI M8A	RPI M10A
Protection degree	IP65		
Safety class	I		
Pollution degree	II		
Overload behavior	Current limitation; power limitation		
Safety	IEC 62109-1 / -2, CE compliance		
EMC	EN 61000-6-2, EN 61000-6-3		
Immunity	IEC 61000-4-2 / -3 / -4 / -5 / -6 / -8		
Harmonics	EN 61000-3-2		EN 61000-3-12
Variations and flicker	EN 61000-3-3		EN 61000-3-11
Grid interfaces	For Europe: see www.solar-inverter.com For Australia/New Zealand: AS3100 / AS4777		

[1] When operated with balanced DC inputs (50/50 %)
[2] IEC 60664-1, IEC 62109-1
[3] The maximum AC apparent power indicates the power an inverter is able to deliver. This maximum apparent power may not necessarily be reached.
[4] Limited to 4.99 kVA when grid type “AU/NZ PL 4.99k” is selected.
[4] AC voltage and frequency range will be programmed according to the individual country requirements.

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