Installation and Operating Manual

RPI M15A
RPI M20A

United Kingdom Europe general

This manual applies to the following inverter models:

- **RPI M15A**
- **RPI M20A**

with model numbers:

RPI153FA0E0000, **RPI203FA0E0000**

and

with firmware versions:

DSP: 2.24 / RED: 1.60 /COMM: 2.36

The model number is located on the type plate for the inverter. The firmware versions are listed on the display in the **`Inverter Information`** menu.

If you should detect discrepancies between the descriptions in this manual and the information on the inverter display, please download the version of the manual that corresponds to the firmware version of your inverter from www.solar-inverter.com.

Delta Energy Systems (Germany) GmbH

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79331 Teningen

Germany

This manual is intended for use by fitters.

The information contained in this manual may not be reproduced without prior written consent from Delta Energy Systems. The information contained in this manual may not be used for any purpose that is not directly connected with the use of the inverter.

All information and specifications are subject to change without prior notice.

Contents

Contents

1. About this manual

1.1 Purpose of this manual

This manual is a component part of the inverter and will assist you during the installation, commissioning and operation of the inverter.

Read this manual **before** starting work on the inverter.

Always follow the safety instructions and work instructions in this manual. In this way you will make sure that the inverter can be safely installed, commissioned and operated.

Keep this manual in a safe place close to the inverter so that it will be readily available when working on the inverter.

Delta Energy Systems is not liable for damage arising from non-compliance with the safety instructions and work instructions in this manual.

1.2 Target group of this manual

This manual is aimed at fitters who are trained and approved for the installation, commissioning and operation of solar inverters in grid-connected solar installations.

1.3 Warning notices and warning symbols

In this manual, the following warning notices and warning symbols are used to describe potential dangers and measures to reduce these dangers.

Always follow the instructions that are given in these warning notices.

Warning levels

DANGER

Indicates a dangerous situation which, if not avoided, will **always** result in death or severe injuries.

WARNING

Indicates a dangerous situation which, if not avoided, **may result** in death or severe injuries.

CAUTION

Indicates a dangerous situation which, if not avoided, **may result** in slight or moderate injuries.

ATTENTION

Indicates potential **material damage** that the inverter may cause to other property.

A Notice contains information on the efficient use of the inverter or of this manual.

If required, the warning notices are supplemented by warning symbols indicating the source of the danger.

High voltages or currents

Hot surfaces

Heavy weight

General danger

1.4 Writing and identification conventions

Certain contents in this manual are specially identified.

Identification of work instructions

Work instructions that must be carried out in a specific order are numbered. Numbered work instructions must **always** be carried out in the specified order.

1. First work step

→ If required, the result of the work step is described here. This serves as a check that the work step has been performed correctly.

2. Second work step

3. Third work step

If a work instruction consists of only a single work step or if the work steps may be carried out in any order, the work steps are identified as follows:

► Work step
► Work step

Identification of parts of the inverter

Buttons: ENT.

LEDs: ***ALARM*** LED

LED	Meaning
	LED is permanently lit.
	LED is flashing.
	LED is off.

Identification of information shown on the display

Names of menus or menu entries: **User settings**

Names of parameters: ***Cos phi***

2. Basic safety instructions

DANGER

Electric shock

During operation there is a potentially lethal voltage present inside the inverter. Even after the inverter has been disconnected from all power sources, this voltage is present in the inverter for up to a further 80 seconds.
Therefore always perform the following work steps before working on the inverter

1. Turn the DC disconnector to the **OFF** position.
2. Disconnect the inverter from all AC and DC sources and make sure that none of the connections can be inadvertently re-established.
3. Wait at least 80 seconds to allow the internal capacitors to discharge.

DANGER

Electric shock

There is a potentially lethal voltage present on the DC terminals of the inverter. The solar modules start to produce current as soon as light falls on them. This occurs even if the light is not falling directly on the solar modules.

- ► Never disconnect the inverter from the solar modules when it is under load.
- ► Turn the DC disconnector to the **OFF** position.
- ► Disconnect the connection to the grid so that the inverter cannot supply any energy to it.
- ► Disconnect the inverter from all AC and DC sources. Make sure that none of the connections can be inadvertently re-established.
- ► Protect the DC cables from being inadvertently touched.

- In order to meet the safety requirements of IEC 62109-5.3.3 and to avoid personal injury and material damage, the inverter must be installed and operated in accordance with the safety instructions and work instructions in this manual. Delta Energy Systems is not liable for damage arising from non-compliance with the safety instructions and work instructions in this manual.
- The inverter may only be installed and commissioned by fitters who are trained and approved in the installation and commissioning of grid-connected solar inverters.
- All repairs to the inverter must be carried out by Delta Energy Systems. Otherwise the guarantee will be void.
- Warning notices and warning symbols that have been attached to the inverter by Delta Energy Systems must not be removed.
- The inverter has a high leakage current. The grounding cable **must** be connected before putting the inverter into operation.
- Do not disconnect any cables when the inverter is under load, as there is a risk of arcing.
- To prevent damage caused by lightning strikes, observe the regulations that are applicable in your country.
- The surface of the inverter can become very hot in operation. Do not touch any part of the inverter except for the display unless you are wearing safety gloves.
- The inverter is very heavy. The inverter must be lifted and carried by at least two people.
- Only SELV-compliant (EN 60950) devices may be connected to the RS485 ports.
- To ensure protection class IP65, all connections must be adequately sealed. Unused connectors must be sealed with cover caps.

3. Intended use

The inverter may only be used for its intended purpose.

The intended use of the inverter is defined as follows:

- Use in static solar installations that are connected to the public power grid, to convert the direct current generated by the solar modules in the solar installation into alternating current which is fed into the public power grid.
- Use in compliance with the power values and ambient conditions stipulated by the manufacturer.

The following uses are considered to be not as intended:

- Use in isolated “island” operation, i.e., with no connection to the public power grid. The inverter has functions to prevent island operation.
- Use in mobile solar installations

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-M15A, RPI-M20A**

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+A1:2011 / EN 61000-6-4:2007+A1:2011
EN 61000-3-11:2000 / EN 61000-3-12:2005
EN 61000-6-2:2005 / EN 61000-6-1:2007
EN 61000-4-2:2009 /EN 61000-4-3:2010
EN 61000-4-4:2012 /EN 61000-4-5:2006
EN 61000-4-6:2009
EN 61000-4-8:2010
EN 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, Jan 16th 2015

Patrick Schahl
Product Management LOB SPE
Name, Function

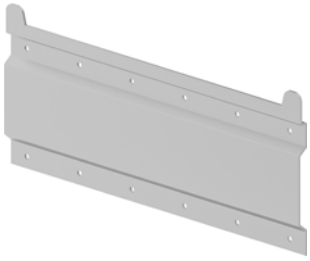
Andreas Hoischen
Head of LOB SPE
Name, Function

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.

Deschap RPI M15A M20A EC_Decl EN 20151.doc

4. Product overview

4.1 Scope of delivery

Part	Quantity	Picture/Description
Inverter	1	
Mounting plate	1	
DC plugs	4	Multi-contact MC4 for DC+ for 4/6 mm² (32.0017P0001-UR) 
	4	Multi-contact MC4 for DC– for 4/6 mm² (32.0016P0001-UR) 

Part	Quantity	Picture/Description
AC plug	1	Amphenol C16-3 
Installation quick start and basic safety instructions	1	

Before starting the installation work, check the delivery for completeness and all components for damage.

Do not use any damaged components.

Keep the packaging.

4 Product overview

4.2 Overview of components and connections

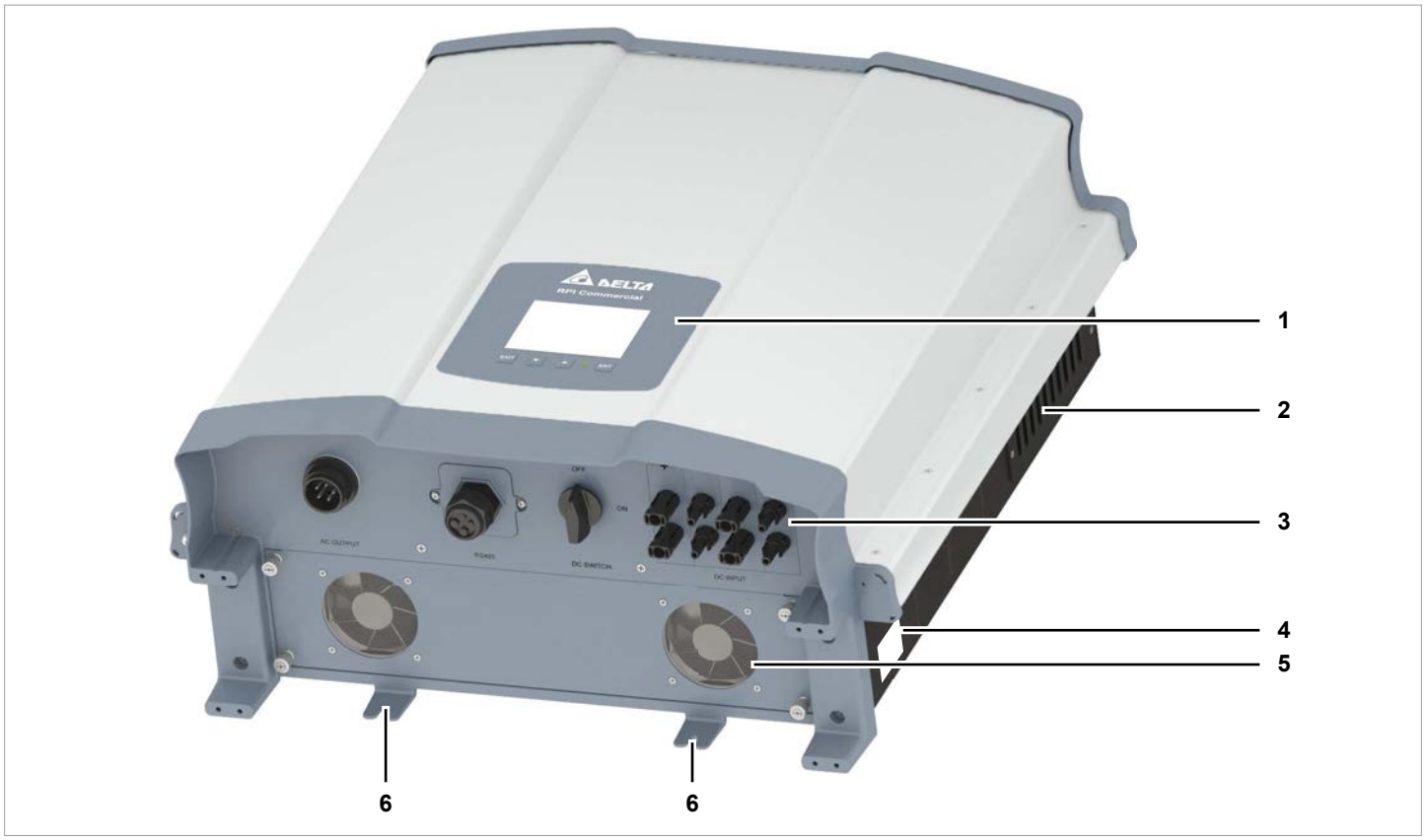
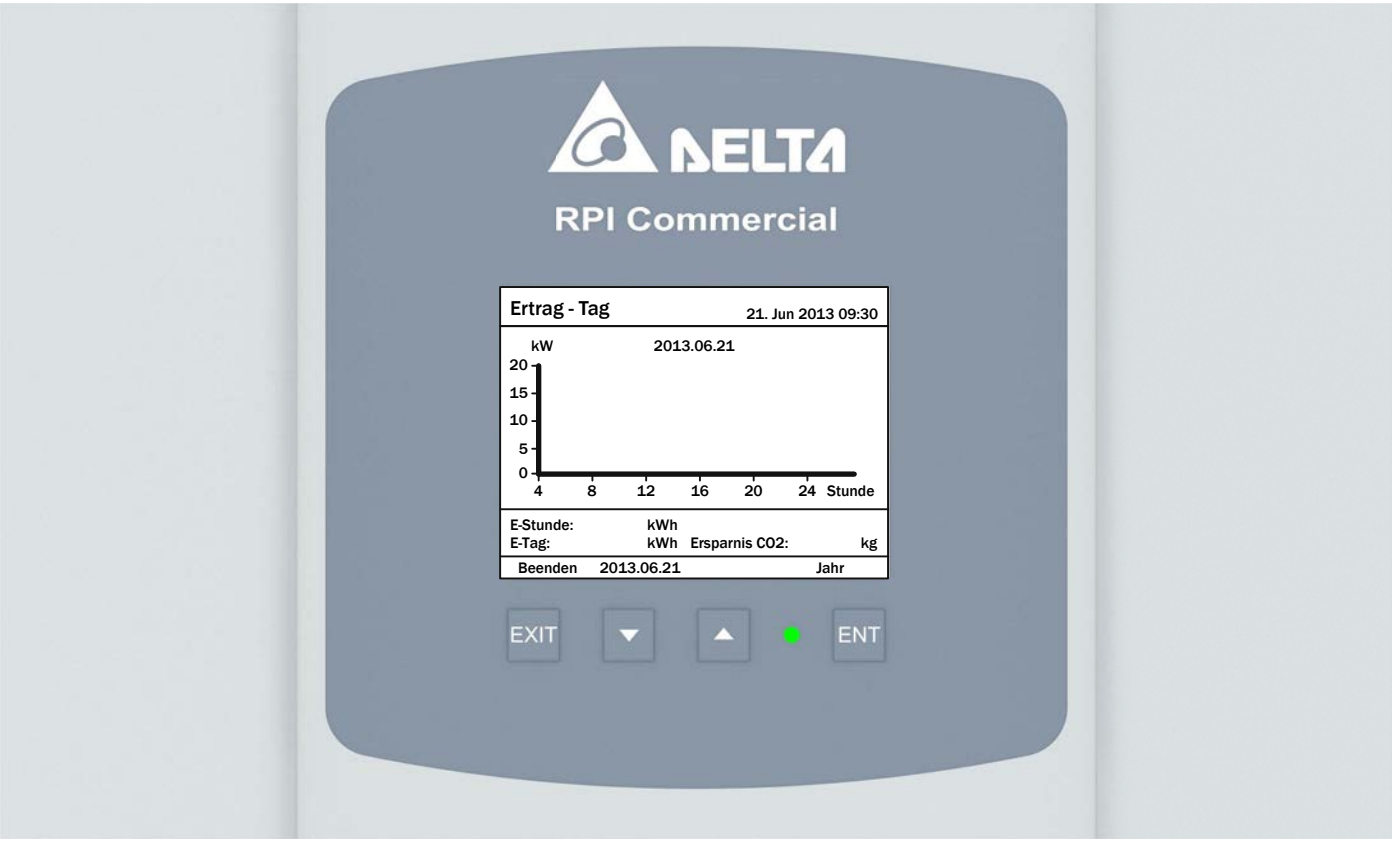


Fig. 4.1: Overview of components and connections

	Component/Connection	Description
1	Display, buttons, status LEDs	Refer to “4.3 Display, buttons, status LEDs”, page 13
2	Air outlets	Refer to “4.5 Fans and air outlets”, page 17
3	Electrical terminals	Refer to “4.4 Electrical terminals”, page 14
4	Type plate	Refer to “4.7 Information on the type plate”, page 19
5	Fan	Refer to “4.5 Fans and air outlets”, page 17
6	Mounting holes	Refer to “4.6 Mounting holes”, page 18

4.3 Display, buttons, status LEDs



Component	Description	Use
LEDs		
Status		Multi-coloured LED; indicates the current operating status.
Buttons		
EXIT	Exit	Exit the current menu. Cancel the setting of a parameter. Changes are not adopted.
▼	Down	Move down through the menu. Reduce the value of a settable parameter.
▲	Up	Move up through the menu. Increase the value of a settable parameter.
ENT	Enter	Select a menu entry. Open a settable parameter for editing. Finalize the setting of a parameter. Changes are adopted.

4 Product overview

4.4 Electrical terminals

4.4.1 Overview

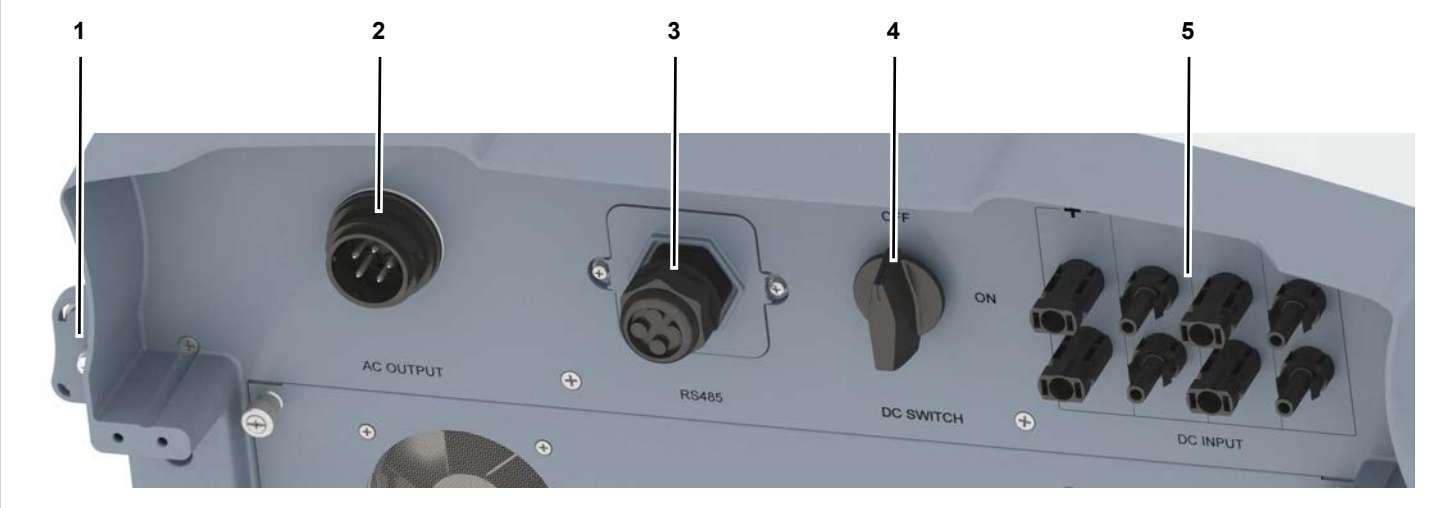


Fig. 4.2: Overview of the electrical terminals

	Component/Connection	Identification on the inverter	Description
1	Grounding connection		Refer to “4.4.2 Grounding connection”, page 15
2	AC terminal	AC OUTPUT	Refer to “4.4.3 AC terminal (AC OUTPUT)”, page 15
3	Connector for RS485, dry contacts and digital inputs	RS485	Refer to “4.4.4 Terminal for RS485, dry contacts and external power off (RS485)”, page 16
4	DC disconnector	DC SWITCH	Refer to “4.4.5 DC disconnector (DC SWITCH)”, page 16
5	DC terminals	DC INPUT	Refer to “4.4.6 DC terminals (DC INPUT)”, page 17

4.4.2 Grounding connection

Fig. 4.3: Position of the grounding connection on the inverter

The inverter housing can be grounded by means of the grounding connection.

M4 screw, spring washer, flat washer and serrated washer are fitted to the inverter.

4.4.3 AC terminal (AC OUTPUT)

Fig. 4.4: Position of the AC terminal on the inverter

The inverter is connected to the public grid by means of the AC terminal.

Purpose:

- To supply alternating current to the public grid.
- To supply power to the display when no supply voltage is available from the solar modules.

Usable grid types

- Grids with 3 phases and a neutral conductor: 3P4W (L1, L2, L3, N, PE)
- Grids with 3 phases, no neutral conductor: 3P3W (L1, L2, L3, PE).

Required plug type:

Amphenol C16-3 (C016 20E004 800 2)

The AC plug is included in the delivery.

4.4.4 Terminal for RS485, dry contacts and external power off (RS485)

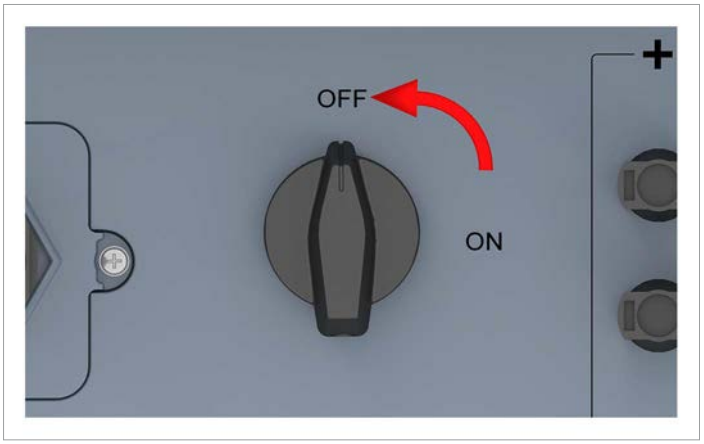
Fig. 4.5: Position of the RS485 connector on the inverter

Available connections:

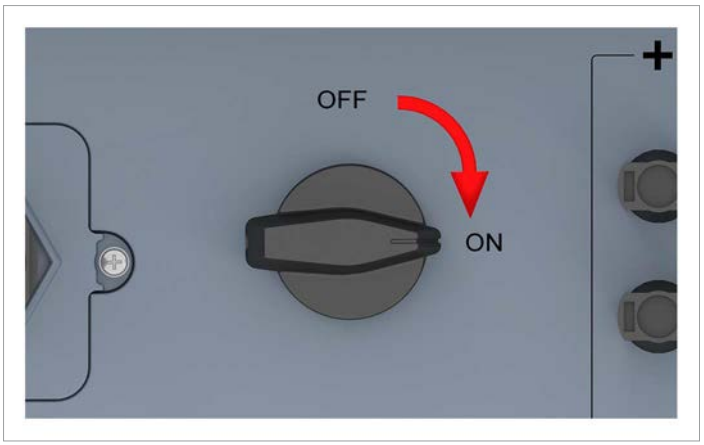
Connection	Connection type
2x RS485 (DATA+ and DATA–)	Terminal block
1x VCC (12 V, 0.5 A)	Terminal block
1x dry contacts	Terminal block
1x external power off (EPO)	RJ45

4.4.5 DC disconnector (DC SWITCH)

Fig. 4.6: Position of the DC disconnector on the inverter



The inverter is **disconnected** from the solar modules when the DC disconnector is in the **OFF** position.



The inverter is **connected** to the solar modules when the DC disconnector is in the **ON** position.

4.4.6 DC terminals (DC INPUT)

Fig. 4.7: Position of the DC terminals on the inverter

The solar modules are connected to the DC terminals.

Required plug type:

- Multi-contact MC4 32.0017P0001-UR for DC+
- Multi-contact MC4 32.0016P0001-UR for DC–

4 pairs of DC plugs are included in the delivery.

4.5 Fans and air outlets

Fig. 4.8: Position of the fans on the inverter

Fig. 4.9: Position of the air outlets on the inverter

Ambient air is drawn in by the fans and fed through the inverter for cooling. The warmed air is returned to the environment via the air outlets.

4.6 Mounting holes

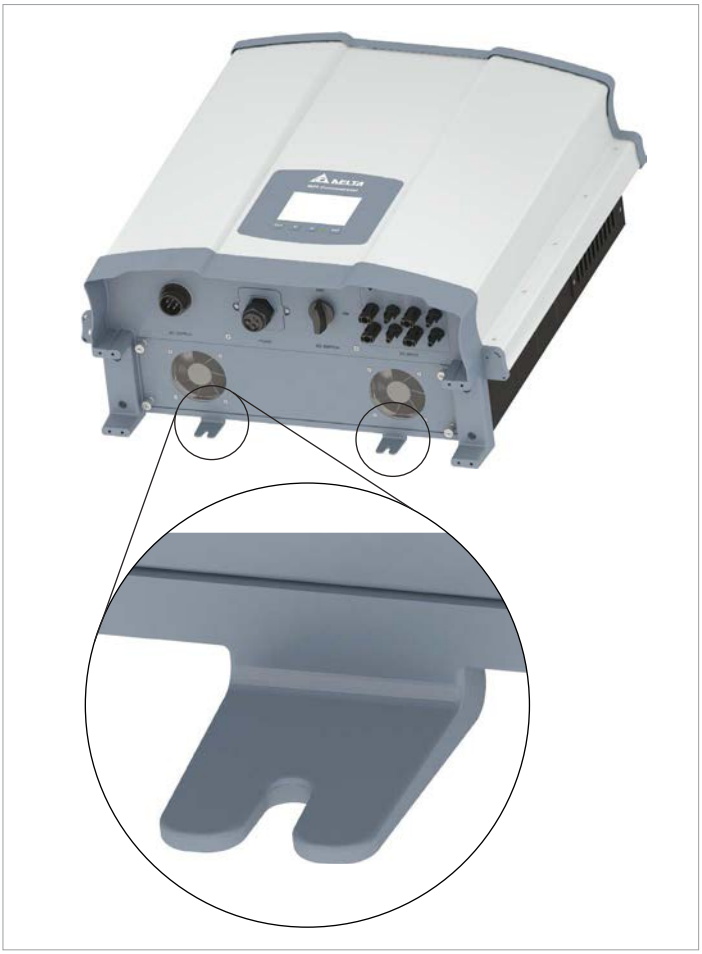


Fig. 4.10: Position of the mounting holes on the inverter

The mounting holes are used to bolt the inverter to the wall or to the mounting system.

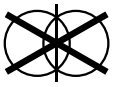
The mounting holes are a fit for M6 bolts.

4.7 Information on the type plate

Fig. 4.11: M15A type plate

Fig. 4.12: M20A type plate

Symbols on the type plate

Symbol	Description
	**Potentially lethal electric shock** When the inverter is in operation, there is a potentially lethal voltage inside which persists for a further 80 seconds after the power supply is disconnected. Never open the inverter housing. The inverter does not contain any parts that can be serviced or repaired by the operator or the fitter. Opening the inverter housing will invalidate the guarantee.
	Before starting any work on the inverter, read the supplied manual and follow the instructions contained therein.
	Hot surfaces. The inverter housing can become very hot during operation.
	The inverter does not contain a transformer.
	The inverter meets the Australian standard for electrical safety and the EMC standard. Applies only to Australia and New Zealand.

4 Product overview

Information on the type plate

M15A	M20A	
Solar inverter	Solar inverter	This is a solar inverter.
Model: RPI M15A	Model: RPI M20A	Delta model name
Part number: RPI802FA0E1000	Part number: RPI103FA0E1000	Delta part number
DC input		DC input
200-1000Vdc	200-1000Vdc	DC input voltage range
MPPT 355-820Vdc	MPPT 470-820Vdc	MPP input voltage range at full power (with symmetrically configured DC inputs)
1000Vdc max	1000Vdc	Maximum DC input voltage
22A*2 max	22A*2 max	Maximum DC input current (22 A on each of DC1 and DC2)
AC Output		AC output
220/380, 230/400 Vac	220/380, 230/400 Vac	Nominal AC voltage
50/60 Hz	50/60 Hz	Nominal AC frequency
15kVA nom	20kVA nom	Nominal reactive power
15.75kVA max	21kVA max	Maximum reactive power
24A max	32A max	Maximum AC current
3P3W or 3P4W	3P3W or 3P4W	The inverter can be connected to 3-phase grids with no neutral conductor (3P3W, 3 phases + PE) and 3-phase grids with a neutral conductor (3P4W, 3 phases + N + PE).
cosφ 0.8ind~0.8cap	cosφ 0.8ind~0.8cap	Setting range of the cos φ displacement factor
IP Code: IP65 (Electronics)	IP Code: IP65 (Electronics)	Protection class for the internal electronics according to EN 60529
Protective Class: I	Protective Class: I	Protection class according to EN 61140
Overvoltage Category: III	Overvoltage Category: III	Overvoltage category according to IEC 62109-1
Assembled in China	Assembled in China	Made in China
VDE 0126-1-1/A1	VDE 0126-1-1/A1	The inverter meets the requirements of VDE 0126-1-1/A1.
VDE-AR-N 4105	VDE-AR-N 4105	The inverter meets the requirements of VDE-AR-N 4105.
IP65	IP65	Protection class IP65
CE	CE	CE marking. With this marking, Delta declares that the inverter meets the stipulations of the applicable EU directives.

5. Operating behaviour

5.1 General mode of operation

The inverter converts the direct current generated by the solar modules into alternating current which is then fed into the public grid.

5.2 MPP tracking

MPP tracking is an automatic function which continuously ensures that the inverter is always operating in the maximum output range possible under the current ambient conditions. The DC input voltage is used as the reference for this.

The inverter has 2 MPP trackers, one for each of DC1 and DC2. The solar modules that are connected to the two DC inputs do not need to have the same output. Within certain limits, module strings with differing outputs can be connected (see “14. Technical data” page 162).

5.3 Anti-islanding device

In the event of a grid failure, the integrated anti-islanding device shuts the inverter down.

5.4 Temperature control

The specific values for the technical parameters described in this section can be found in the chapter “14. Technical data” page 162.

The inverter has two operating temperature ranges that are important for its operating behaviour.

- *Operating temperature range*
- *Operating temperature range without limiting*

The *operating temperature range* is greater than the *operating temperature range without limiting*.

If the ambient temperature lies within the *operating temperature range without limiting*, the inverter works at the maximum possible output power. If the ambient temperature is higher, but still within the *operating temperature range,* the output power will be continually reduced with rising ambient temperature. If the ambient temperature rises above the *operating temperature range*, the AC output will be switched off and the inverter will no longer feed energy into the public grid.

The inverter is cooled by means of fans.

5.5 Influence of DC input voltage

The specific values for the technical parameters described in this section can be found in the chapter “14. Technical data” page 162.

The *maximum DC input voltage* must never be exceeded. Measure the DC input voltage and use an overvoltage protector on the DC side to prevent higher DC input voltages. The maximum open circuit voltage occurs at the lowest ambient temperatures that can be assumed.

The *DC input voltage range* is used to define the DC input voltages for which the inverter will supply power to the public grid.

The *MPP input voltage range* is used to define the DC input voltages for which the MPP trackers are activated.

The *MPP input voltage range at full power* is used to define the DC input voltages for which the inverter can deliver the maximum output power. However the actual output power still depends on other conditions such as, for example, the ambient temperature.

5.6 Functions for influencing the operating behaviour

The inverter provides various functions which can be used to influence the operating behaviour.

- Active power control
- Reactive power control
- Insulation and grounding monitoring

A detailed description of these functions can be found in the chapter “9. Settings” page 72.

5.7 Power grid imbalance compensation

The inverter has an integrated power grid imbalance compensator. This ensures that the supplied power is always distributed evenly across all the phases.

6. Planning the installation

This chapter is intended only as an aid to **planning** the installation work. The **implementation** of the installation work and the associated dangers are described in the chapter “Installation”.

6.1 Installation location

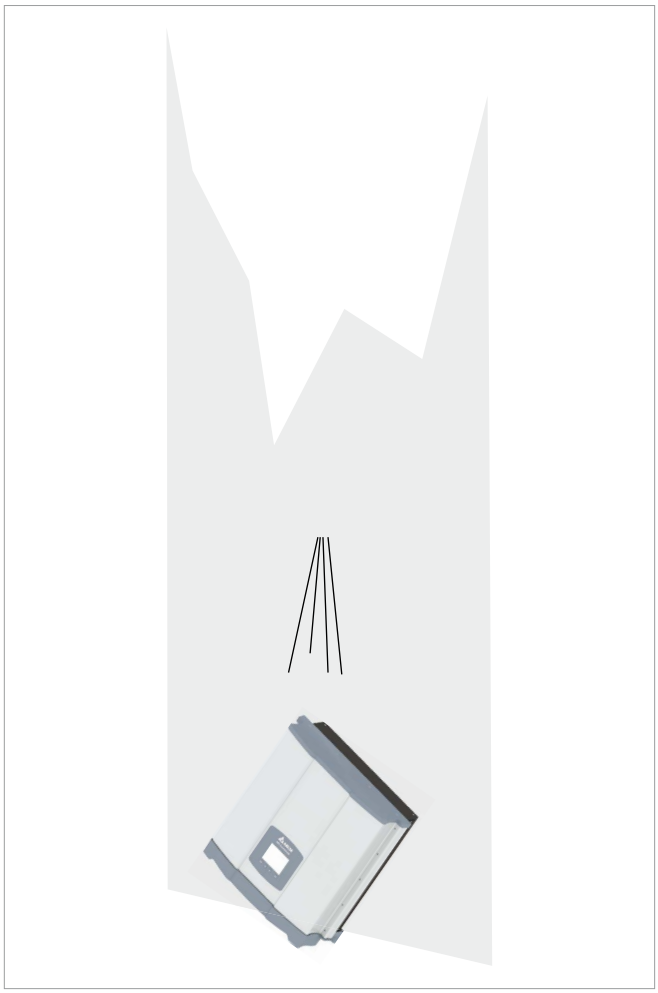


Fig. 6.1: Installation location – condition of the wall

- ► The inverter is very heavy. The wall must be able to bear the heavy weight of the inverter.
- ► Always use the mounting plate that is supplied with the inverter.
- ► Use mounting materials (wall plugs, screws, etc.) that are suitable for the wall or the mounting system as well as the heavy weight of the inverter.
- ► To prevent malfunctions, mount the inverter on a vibration-free wall.
- ► When the inverter is used in residential areas or in buildings with animals, possible noise emissions may cause a disturbance. Therefore take care when choosing the mounting location.
- ► Mount the inverter on a fire-resistant wall.

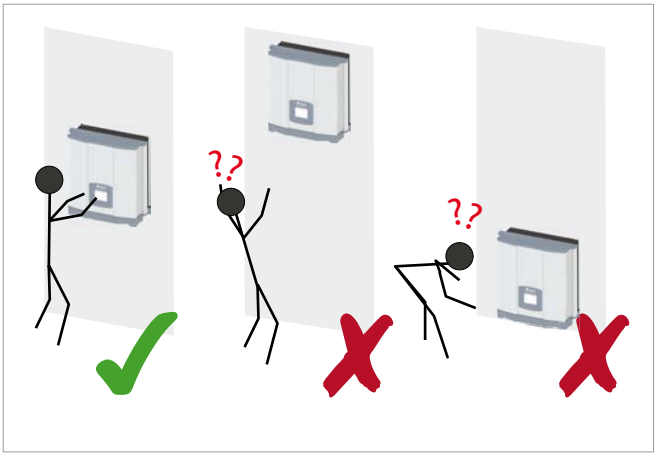


Fig. 6.2: Mounting location – installation height

- ► Mount the inverter so that the information on the display can be read without difficulty and the buttons can be operated.

6.2 Mounting position

Fig. 6.3: Mounting position

- ► Mount the inverter vertically.

6.3 Outside installations

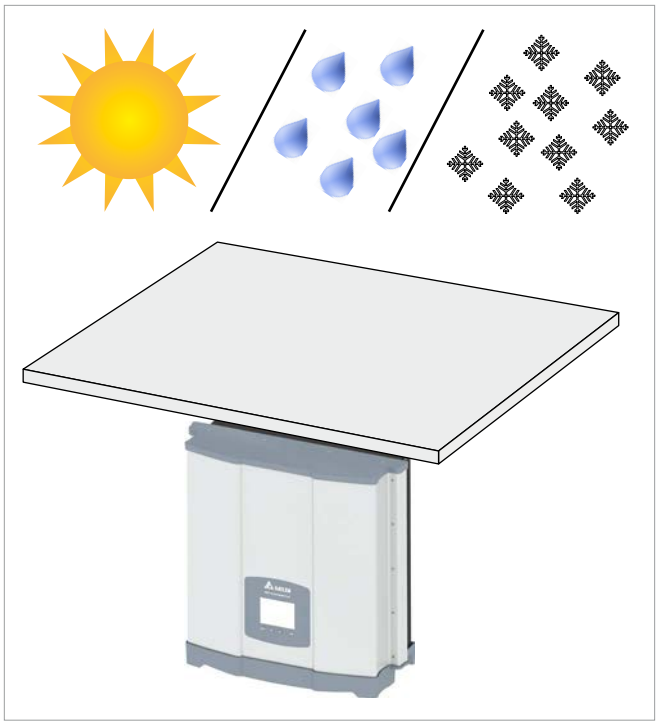


Fig. 6.4: Outside installations

► The inverter is classified IP65 and can be installed inside and outside. Nevertheless, the inverter should be protected from direct solar irradiation, rain and snow by means of a roof. If, for example, the inverter becomes too hot as a result of solar irradiation, the output will be reduced. This is normal operating behaviour for the inverter and is necessary to protect the internal electronics.

6 Planning the installation

6.4 Environmental conditions and air circulation

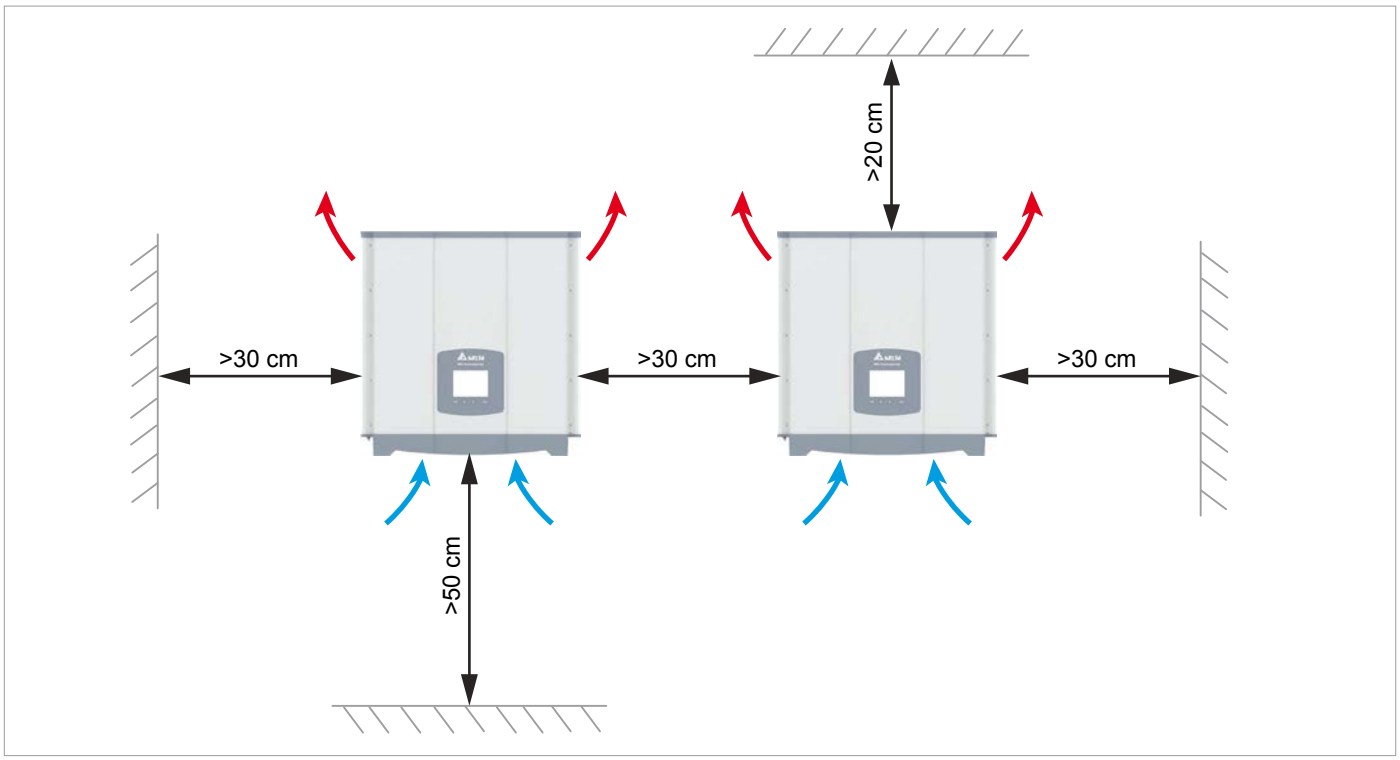


Fig. 6.1: Mounting clearances and air circulation

- ► Ensure adequate air circulation. Warm air must be able to escape upwards. Leave sufficient space around each inverter.
- ► Do not install inverters directly one above another as this might cause mutual heating.
- ► Take note of the *operating temperature range without limiting* and the *operating temperature range*. If the *operating temperature range without limiting* is exceeded, the inverter limits the AC power that is fed into the grid. If the *operating temperature range* is exceeded, the inverter stops supplying the grid. This is normal operating behaviour for the inverter and is necessary to protect the internal electronics.
- ► In areas with many trees or meadows, pollen can block the air inlets and outlets and impede the air flow.

6.5 Characteristics

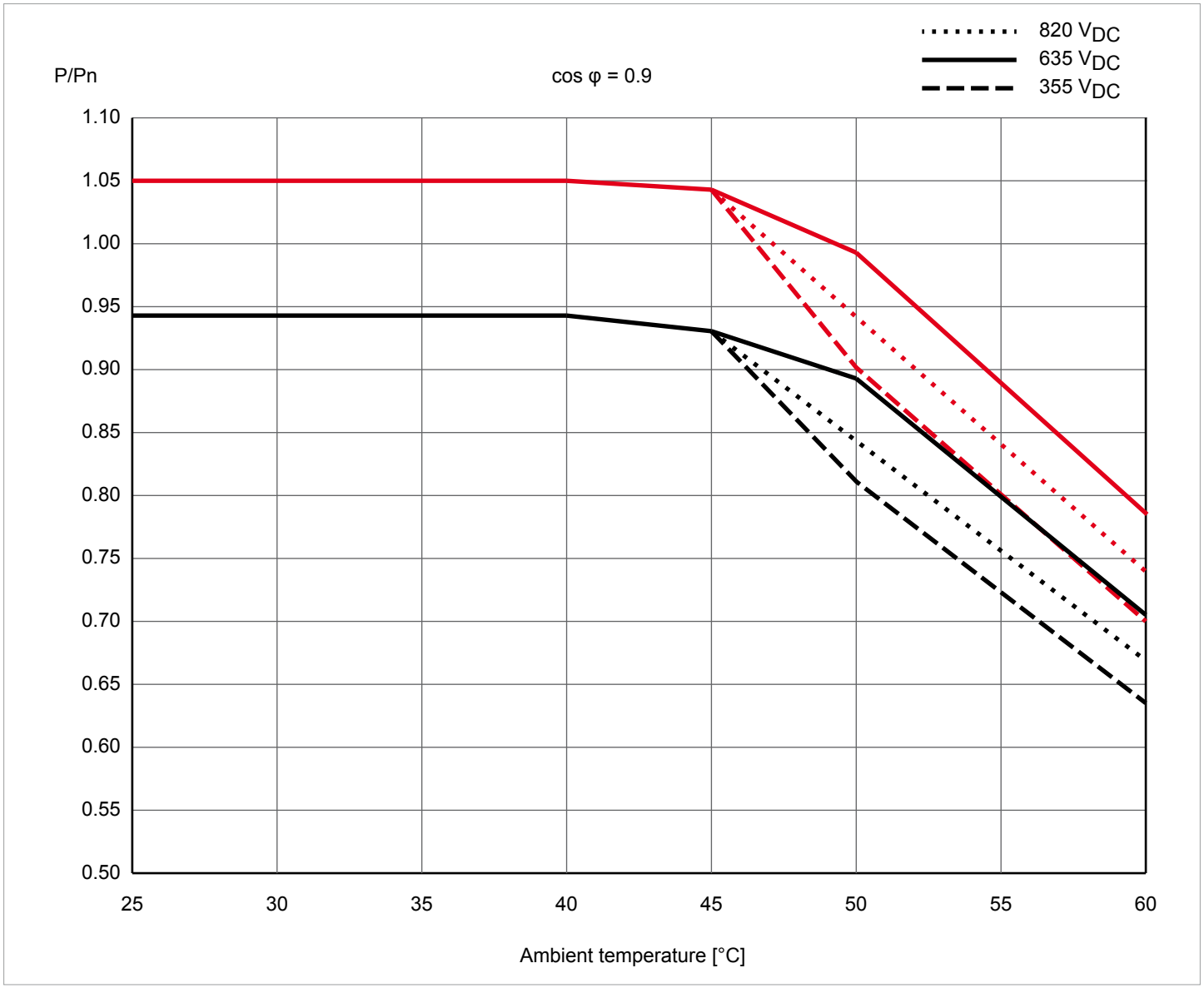


Fig. 6.2: M15A characteristic "Power limiting as a function of ambient temperature, cos φ = 0.90"

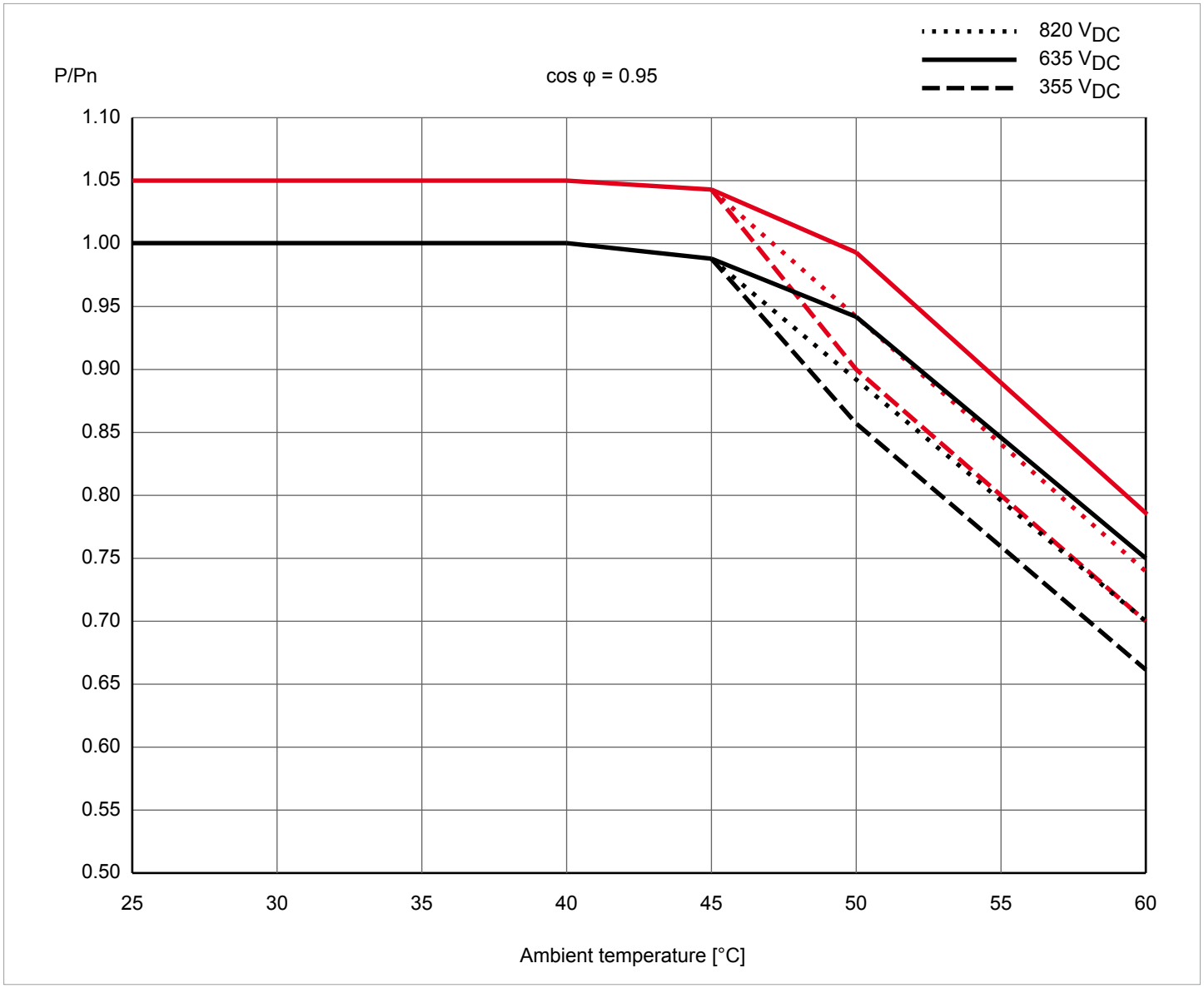


Fig. 6.3: M15A characteristic “Power limiting as a function of ambient temperature, cos φ = 0.95"

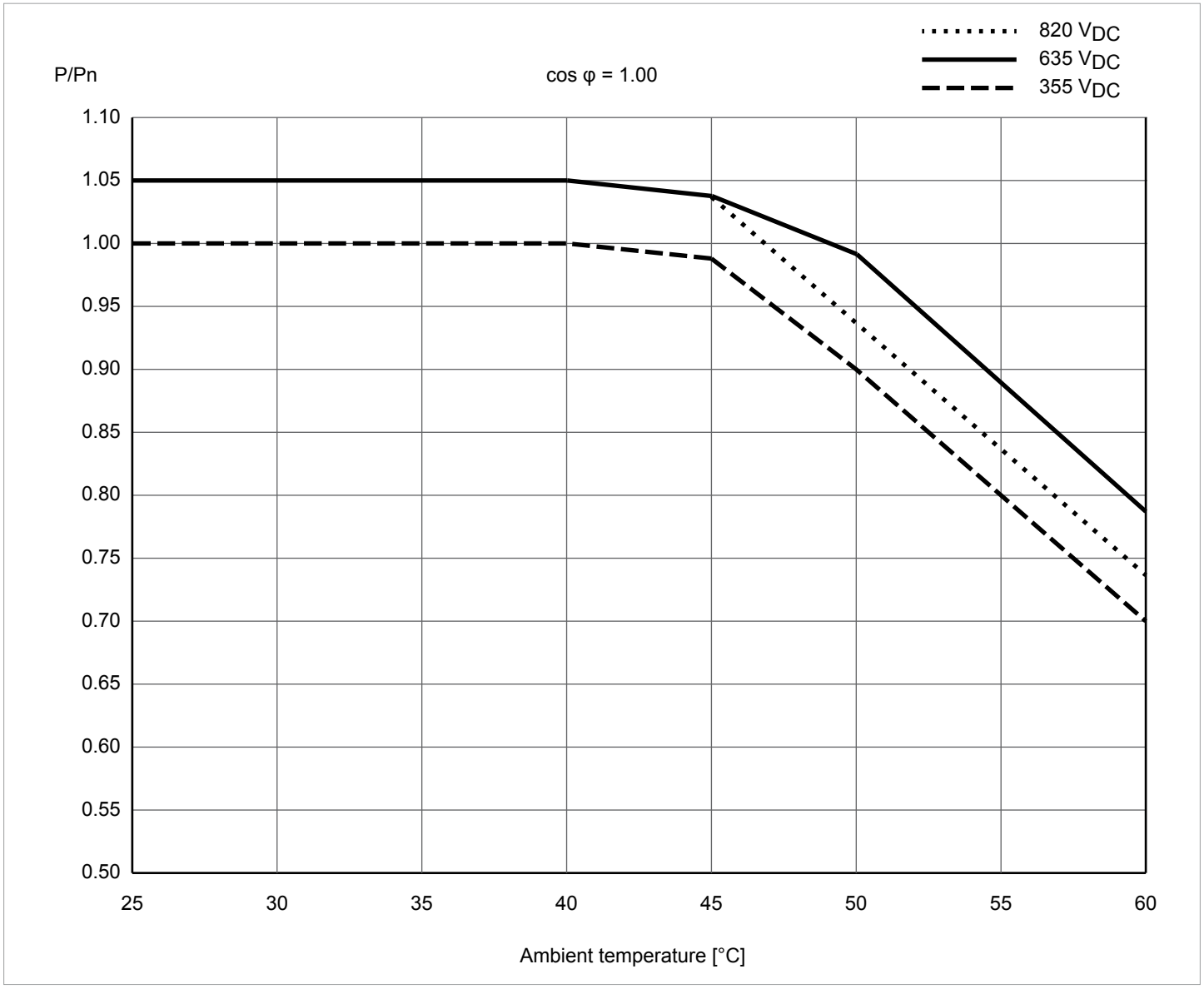


Fig. 6.4: M15A characteristic “Power limiting as a function of ambient temperature, cos φ = 1.0

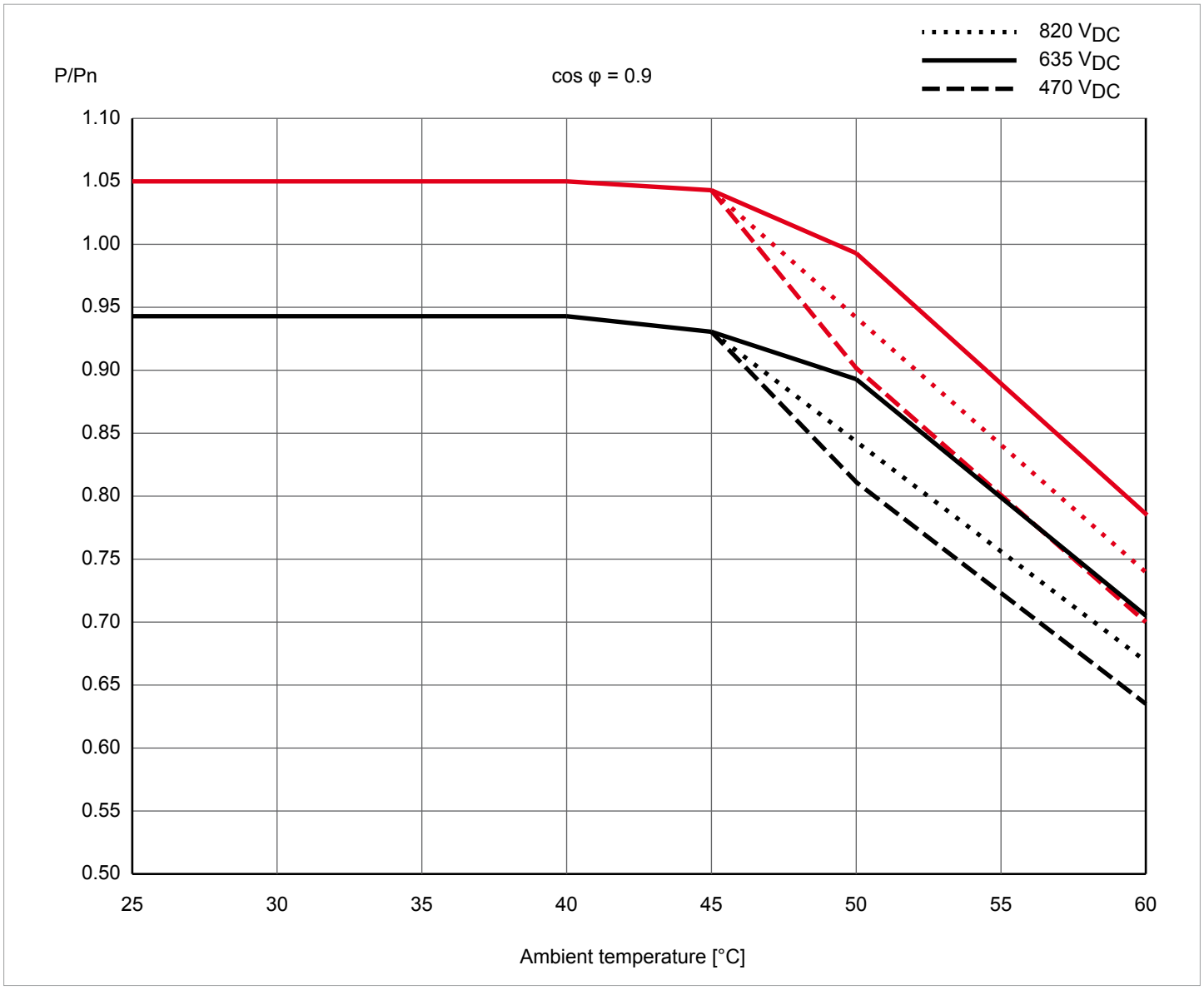


Fig. 6.5: M20A characteristic "Power limiting as a function of ambient temperature, cos φ = 0.90"

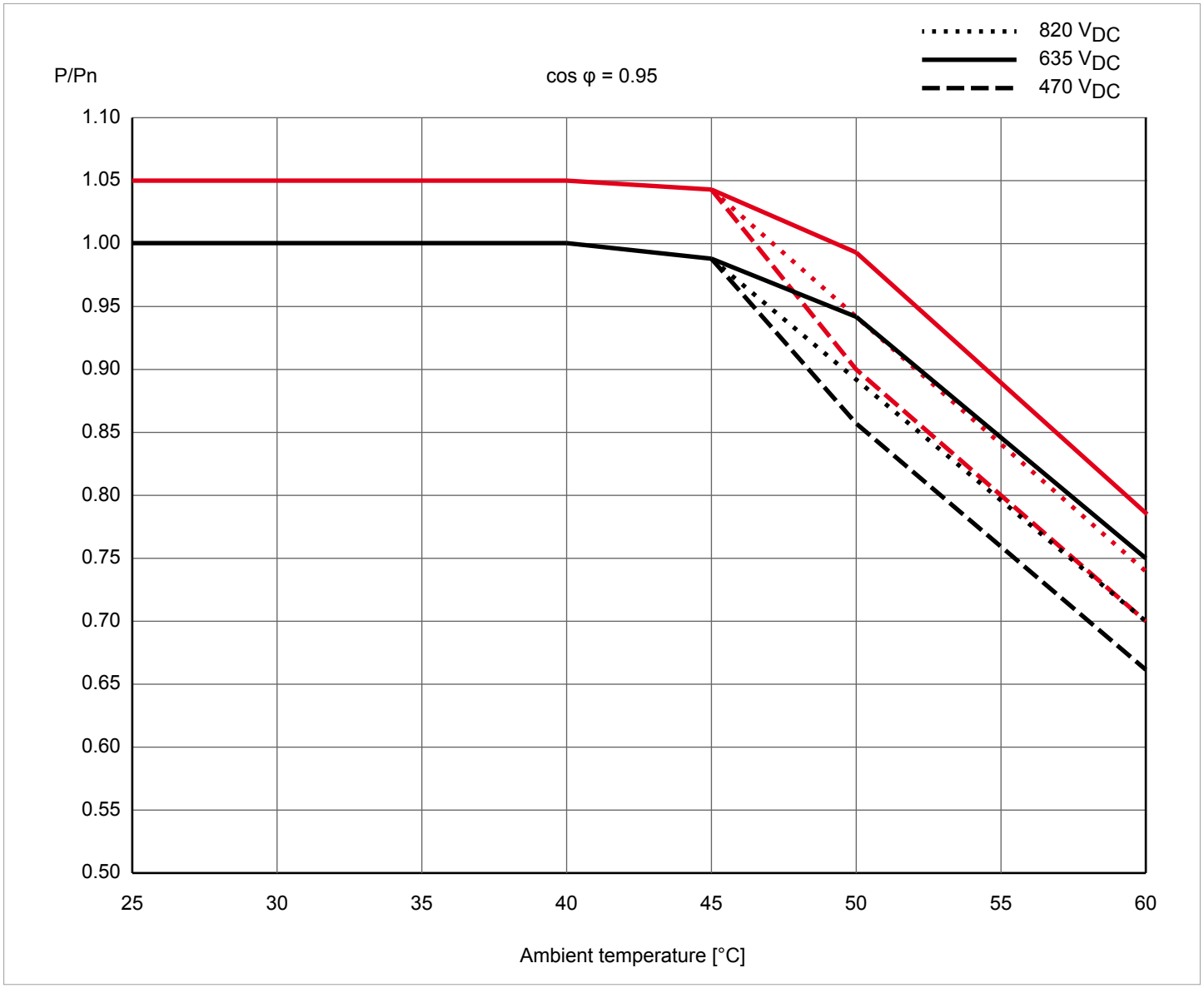


Fig. 6.6: M20A characteristic “Power limiting as a function of ambient temperature, cos φ = 0.95"

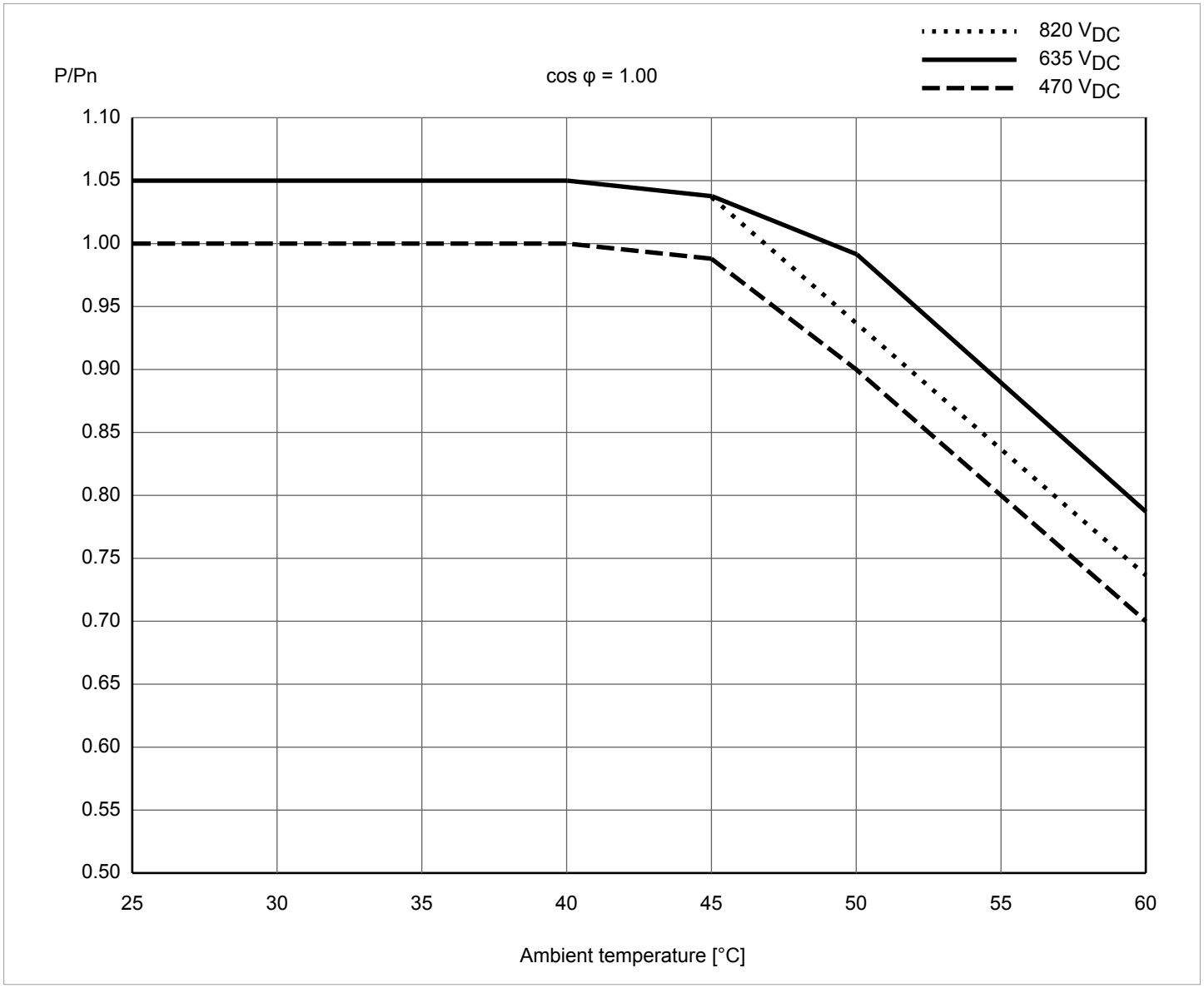


Fig. 6.7: M20A characteristic “Power limiting as a function of ambient temperature, cos φ = 1.0

6.6 Dimensions

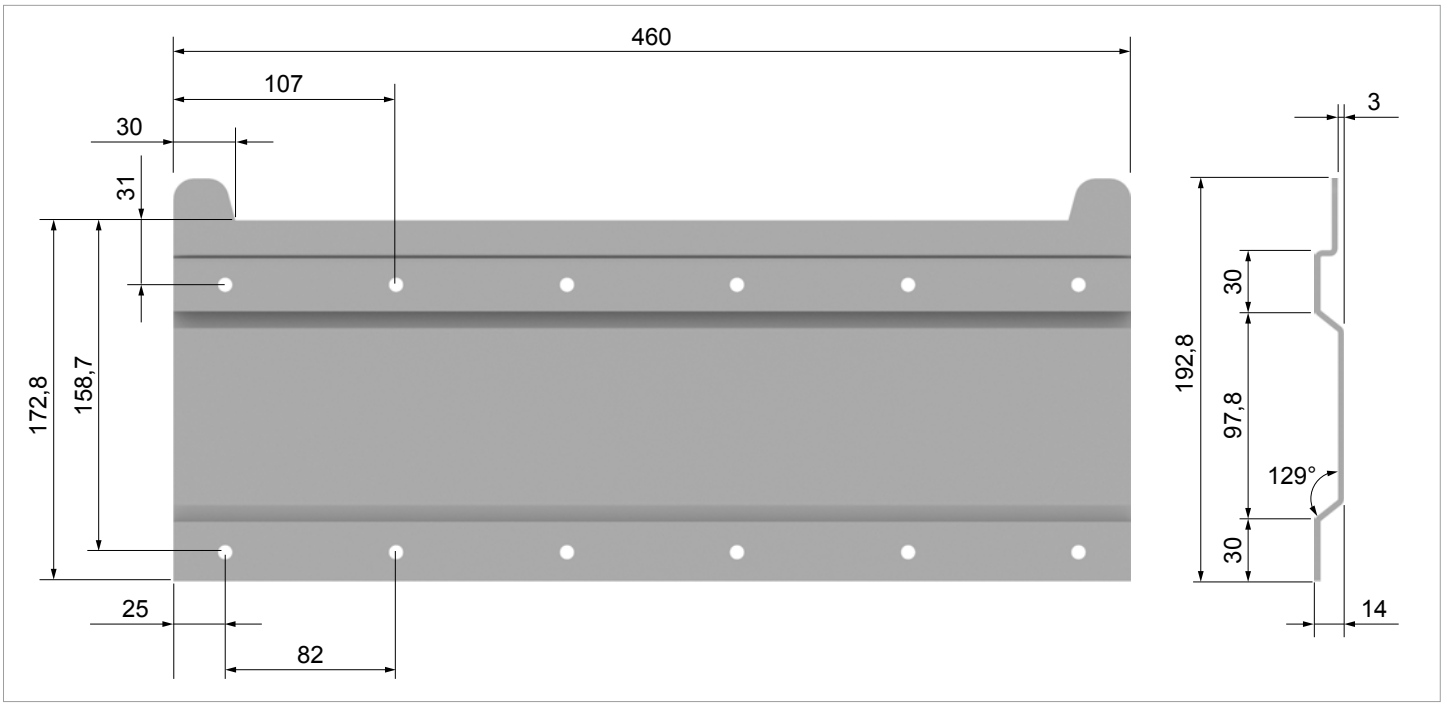


Fig. 6.8: Dimensions of mounting plate (in mm)

Fig. 6.9: Dimensions of inverter (in mm)

6.7 AC connection (grid)

- ► Always comply with the specific regulations that apply in your country or region.
- ► Always comply with the specific regulations of your energy provider.
- ► Install all the prescribed safety and protective devices (for example, automatic circuit breakers and/or overvoltage protection devices).
- ► Protect the inverter with a suitable upstream contact breaker:

Model	Upstream contact breaker
RPI M15A	30 A
RPI M20A	40 A

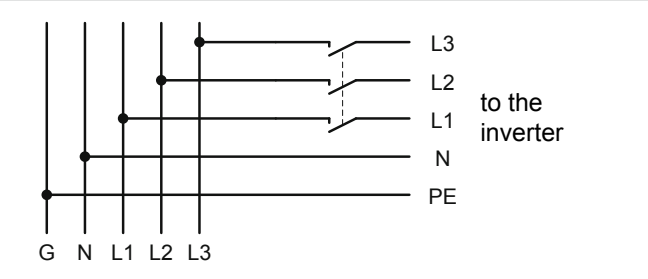


Fig. 6.10: Position of the upstream contact breaker

Residual current device

Because of its design, the inverter cannot feed any DC residual current into the grid. The inverter thus meets the requirements of DIN VDE 0100-712.

Possible fault events have been investigated by Delta in compliance with the currently applicable installation standards. The investigations have shown that no dangers arise if the inverter is operated in combination with an upstream residual current device (RCD), Type A. The use of a residual current device, Type B, is not necessary.

Minimum tripping current of a residual current device, Type A	≥100 mA

The tripping current required by the residual current device depends primarily on the quality of the solar modules, the size of the PV installation and the ambient conditions (e.g. humidity). However the tripping current must not be lower than the specified minimum tripping current.

Integrated residual current monitoring unit

The integrated residual current monitoring unit (RCMU) is certified in accordance with VDE 0126 1-1/A1:2012-02 §6.6.2.

Permissible grounding systems

Grounding system	TN-S	TN-C	TN-C-S	TT	IT
Permissible	Yes	Yes	Yes	Yes	No

Requirements for the grid voltage

3P3W	Voltage range	3P4W	Voltage range
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%

6.8 DC connection

NOTE

Incorrectly dimensioned solar installation.
An incorrectly dimensioned solar installation can cause damage to the inverter.
► When calculating the number of solar modules, always take heed of the inverter's technical specifications (input voltage range, maximum current and maximum input power).

NOTE

Overheating of the DC terminals.
Exceeding the maximum current can cause overheating of the DC terminals and lead to a fire.
► Always take into account the maximum current through the DC terminals when planning the installation.

6.8.1 Symmetric and asymmetric configuration of the DC inputs

The inverter has an MPP tracker for each DC input (DC 1 and DC 2).

The two MPP trackers work independently of one another; the optimum operating point is thus set separately for DC 1 and DC 2 For this reason, the module strings on DC 1 and DC 2 can have different alignments or dimensioning. A classic application example is a building with a gable roof on which the roofs face east and west.

Variant 1: Symmetric configuration of the DC inputs

The total input power is always evenly distributed (50%/50%) between DC 1 and DC 2.

Variant 2: Asymmetric configuration of the DC inputs

The maximum permitted total input power can be distributed between DC 1 and DC 2 in the range 67%/33% to 33%/67%. Thus, for example, a distribution of 60%/40% or 45%/55% is possible.

The percentages always refer to the instantaneous value of the input power. Consequently for an east-west roof installation it is possible to install 67% of the maximum input power on both roofs. It is then possible to exploit the effect that the solar modules on the two roofs reach their maximum at different times of the day.

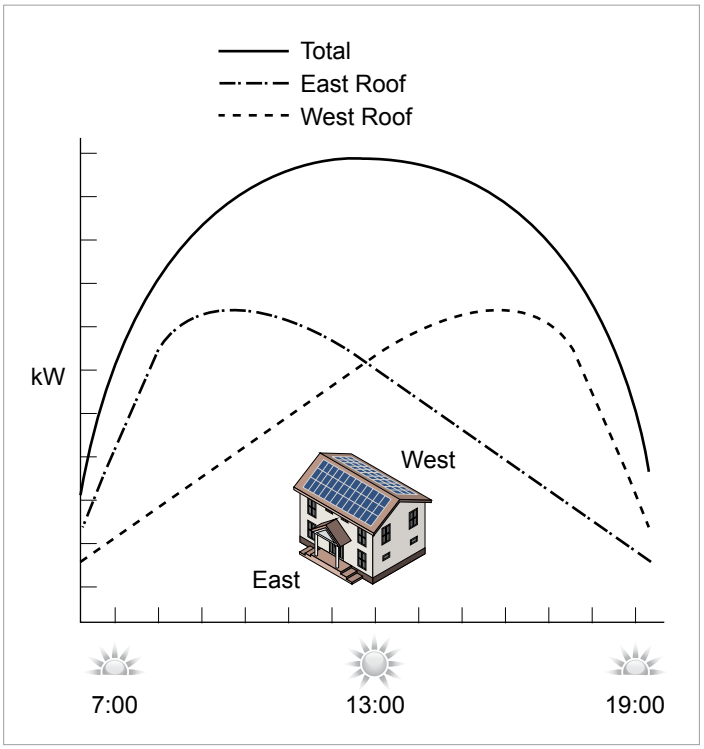
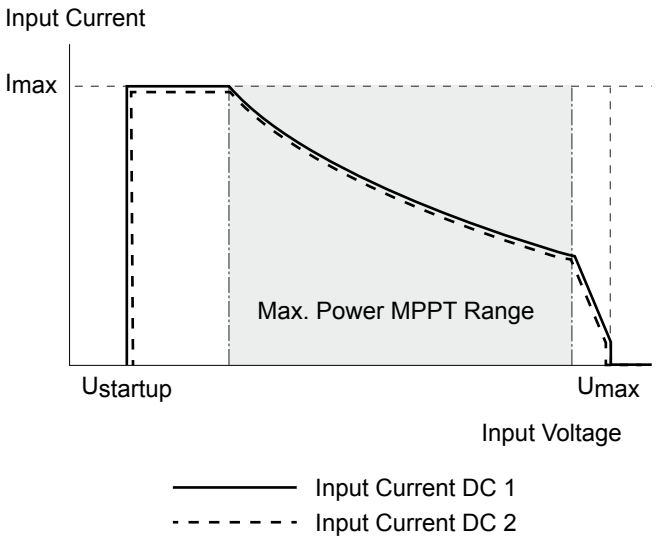


Fig. 6.11: Design concept of a system with 2 MPP trackers with asymmetric loading of the DC inputs

Symmetric configuration



Asymmetric configuration

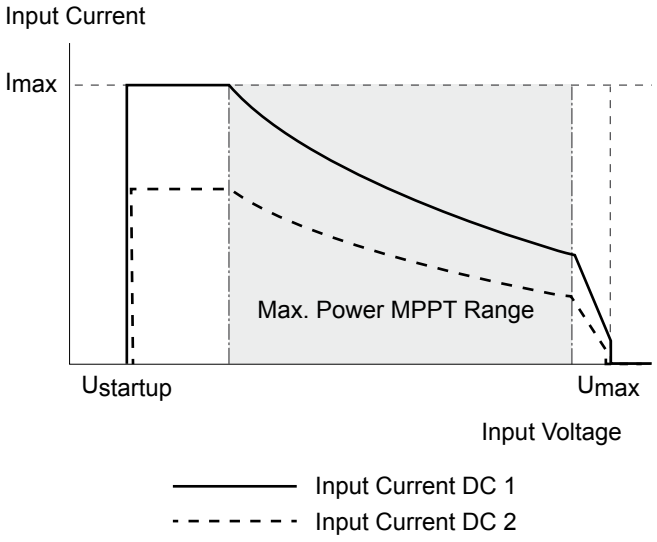


Fig. 6.12: I-V characteristics for symmetric and asymmetric configuration of the DC inputs (illustration of principle)

For currents and voltages, refer to “14. Technical data”, page 162.

6.8.2 Separate and parallel connected DC inputs

The inverter can be used with separately or parallel connected DC inputs.

Separately connected DC inputs

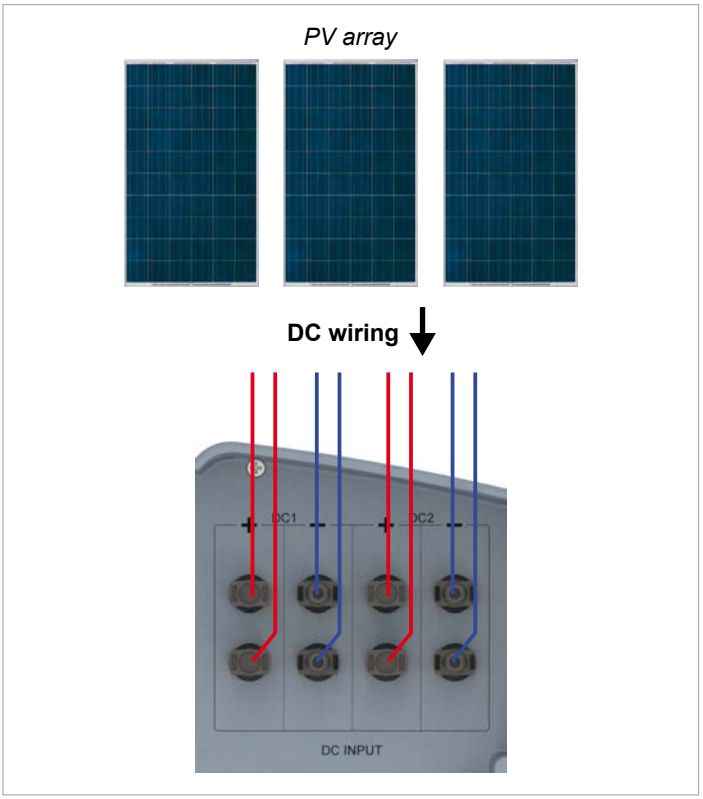


Fig. 6.13: Separately connected DC inputs

In this case the module strings for DC 1 are connected separately from those for DC 2. MPP tracker 1 controls the module strings on DC 1 and MPP tracker 2 controls the module strings on DC 2.

This way, symmetrically and asymmetrically configured DC inputs can be implemented.

This variant of the DC cabling **cannot** be used for solar modules that are grounded.

Parallel-connected DC inputs

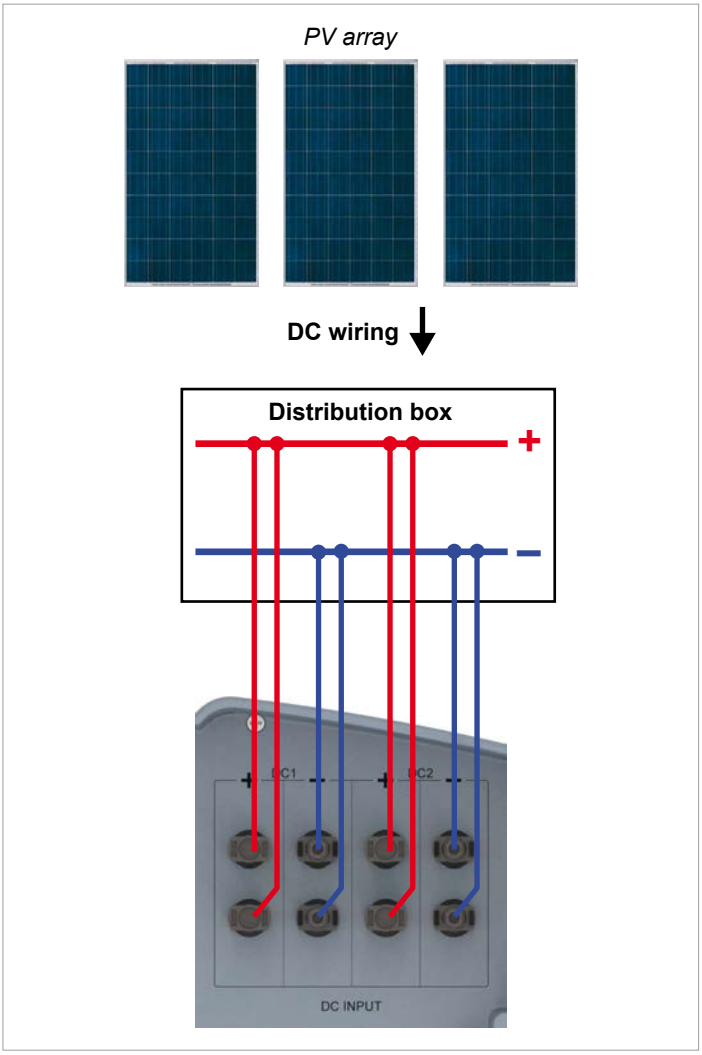


Fig. 6.14: Parallel-connected DC inputs

The module strings are brought together in a distribution box and then the DC cables are connected to DC 1 and DC 2. MPP tracker 1 controls all the module strings; MPP tracker 2 is not used.

This way, only symmetrically configured DC inputs can be implemented.

This variant of the DC cabling is **mandatory** for solar modules that are grounded.

6.8.3 Connecting to ungrounded solar modules

When solar modules that are not grounded are used, the DC inputs can be connected separately or in parallel.

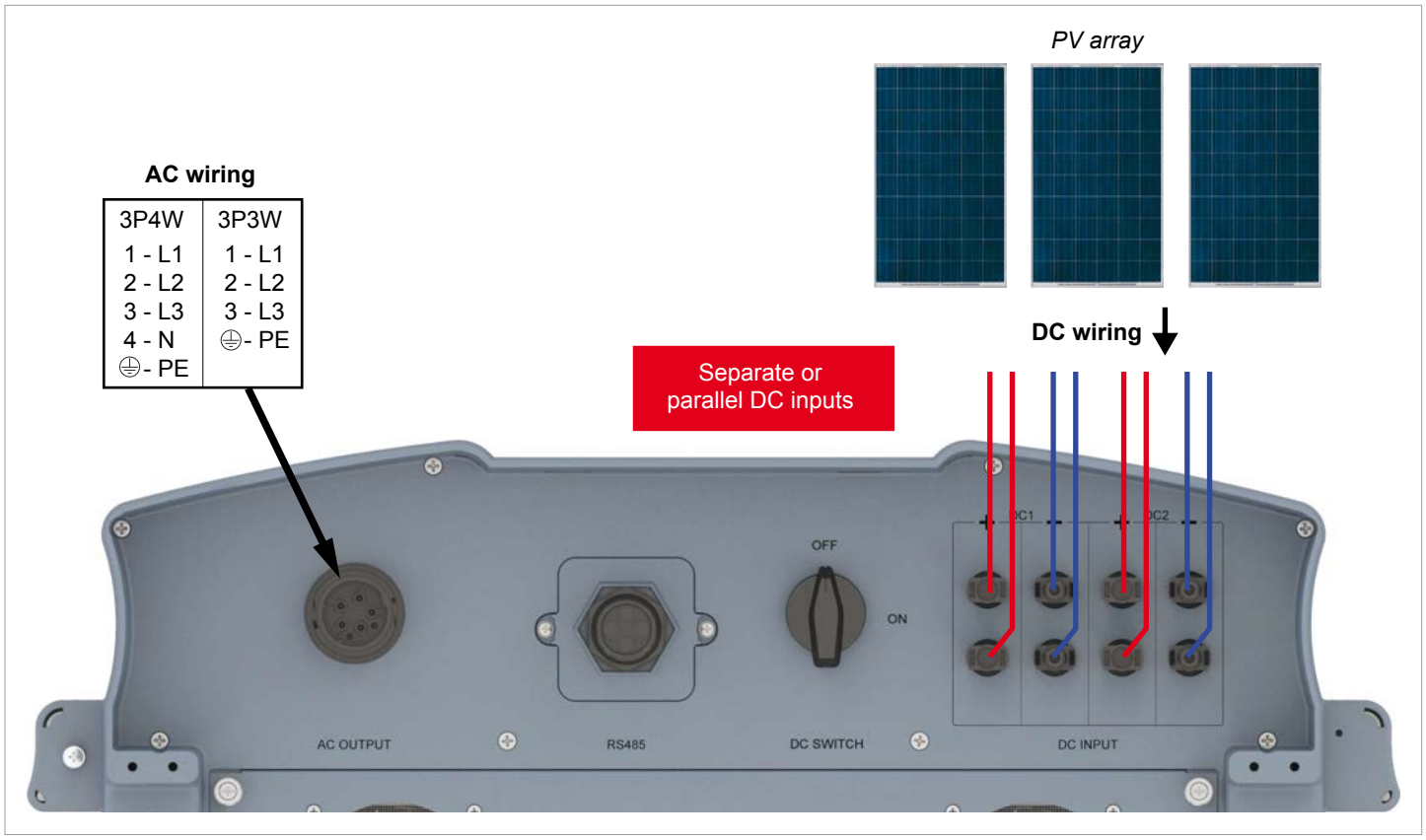


Fig. 6.15: System design when using solar modules that are not grounded

6.8.4 Connecting to grounded solar modules

When grounded solar modules are used, the DC inputs must be connected in parallel.

There must be an isolating transformer connected between the connection to the grid and the AC terminal on the inverter.

After commissioning, the insulation monitoring on the inverter display must be set, see “9.12 Insulation mode and insulation resistance”, page 94.

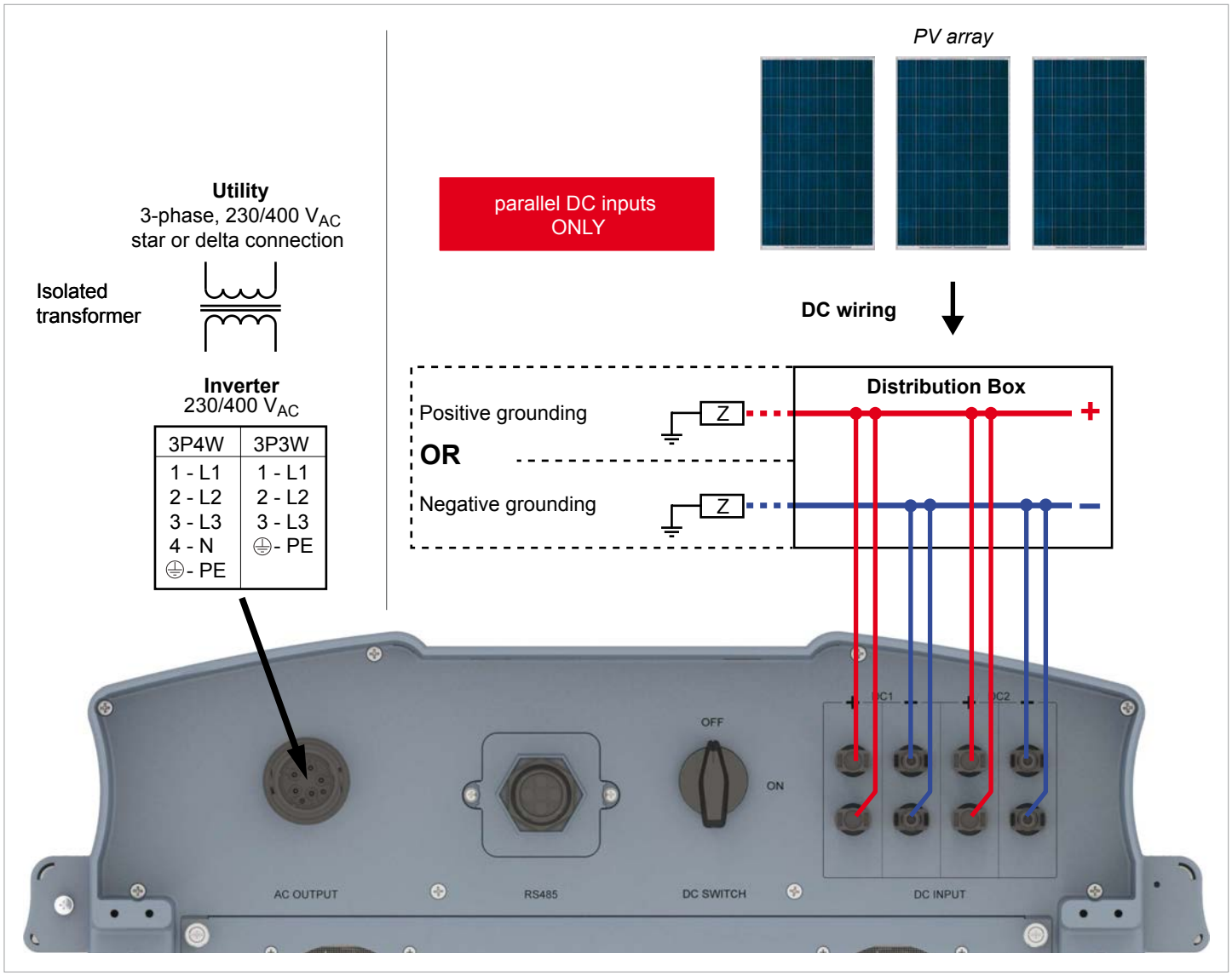


Fig. 6.16: System design when using grounded solar modules

6.8.5 Connecting the DC strings to the DC inputs

Check the polarity of the DC voltage before connecting the solar modules to the inverter.

The negative terminals of the solar modules must be connected to DC–, the positive terminals to DC+.

The connection schemes shown in the following can also be mixed.

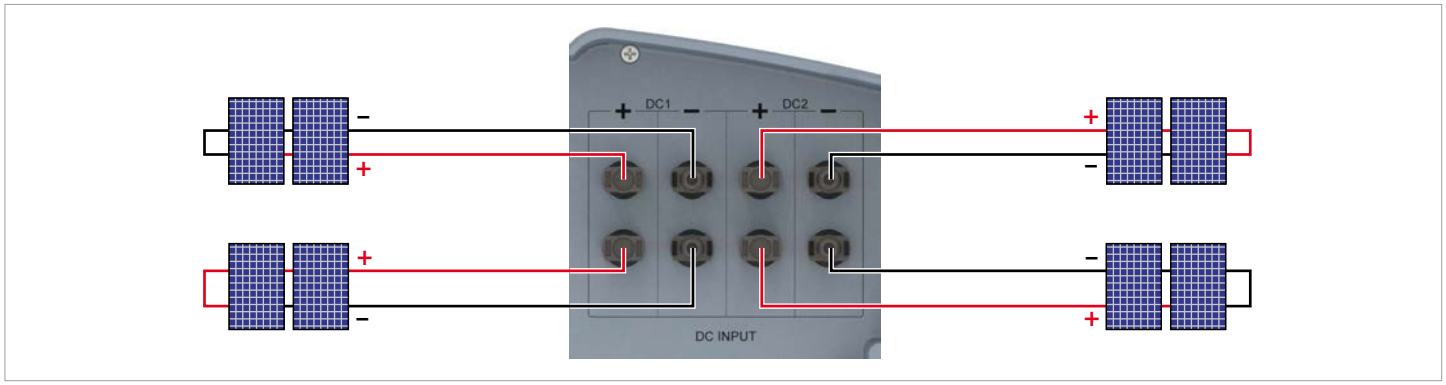


Fig. 6.17: Connecting one string to a DC connection

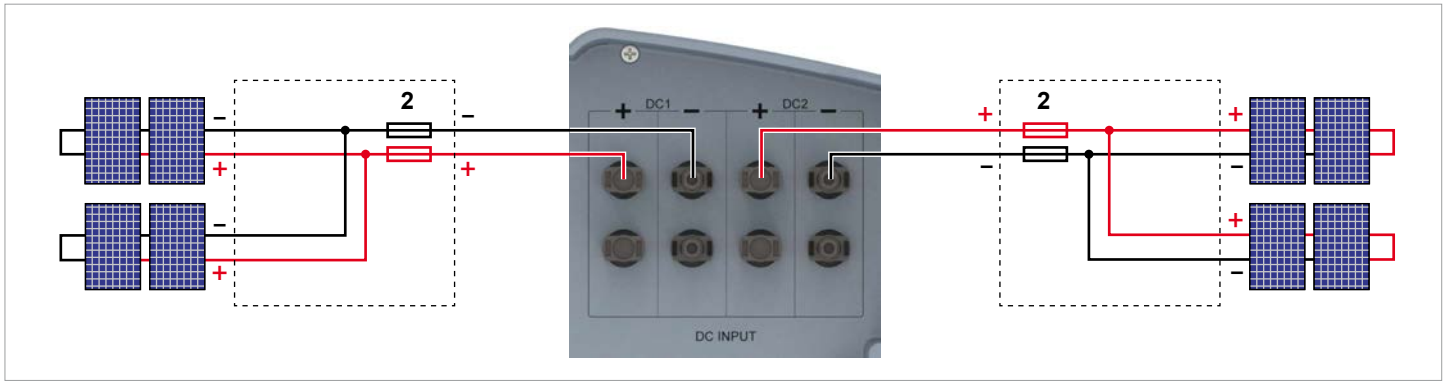


Fig. 6.18: Connecting two strings to a DC connection

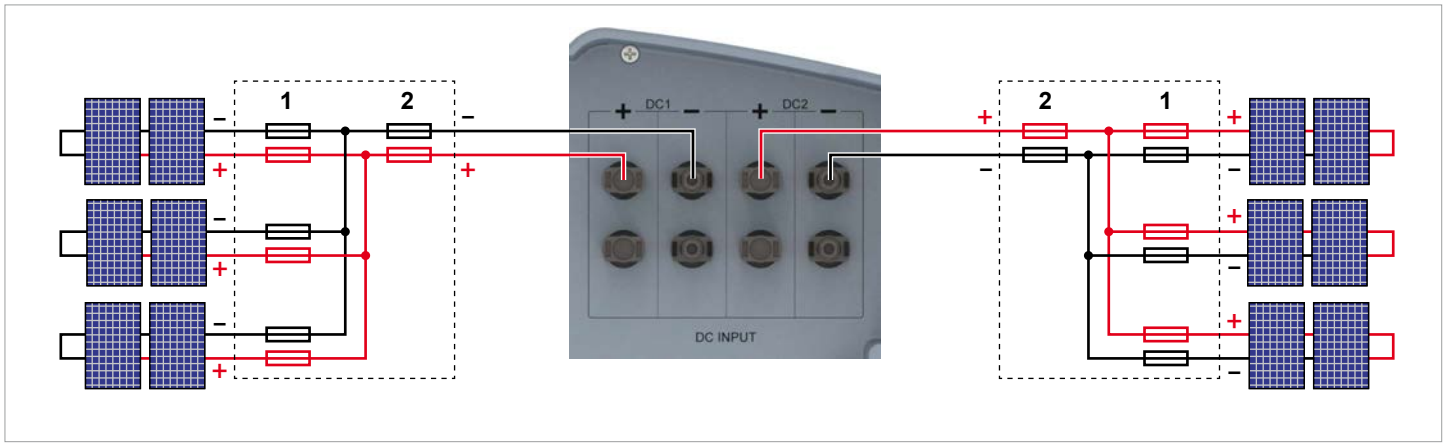


Fig. 6.19: Connecting three strings to a DC connection

1	Always take account of the **maximum reverse current loading capability** of the solar modules when selecting protective devices (for example fuses).
2	Always take account of the local safety regulations when selecting protective devices.

6.9 Connecting to a data logger

The inverter can be connected to a data logger via RS485, for example to monitor the PV installation or to change the settings on the inverter.

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

The following recommendations must be taken into consideration for a stable data link.

Connecting a single inverter to a data logger

► Switch on the RS485 termination resistor.
► Run the RS485 cable at a distance from the other cables to prevent interference to the data link.

Connecting several inverters to a data logger

► Switch on the RS485 termination resistor on the last inverter in the chain.
► If the data logger has no internal RS485 termination resistor, then switch on the RS485 termination resistor on the first inverter in the chain as well.
► Switch off the RS485 termination resistor on all the other inverters.
► A different inverter ID must be set on each inverter. Otherwise the data logger will not be able to identify the individual inverters.
► Set the same baud rate for RS485 on each inverter.
► Run the RS485 cable at a distance from the other cables to prevent interference to the data link.

Requirements for the cables

- Twisted and shielded cable
- Cable diameter: 5 mm
- Wire cross-section: 1 mm²

6.10 Dry contacts

An external audible or visual alarm device can be connected to the dry contacts on the inverter.

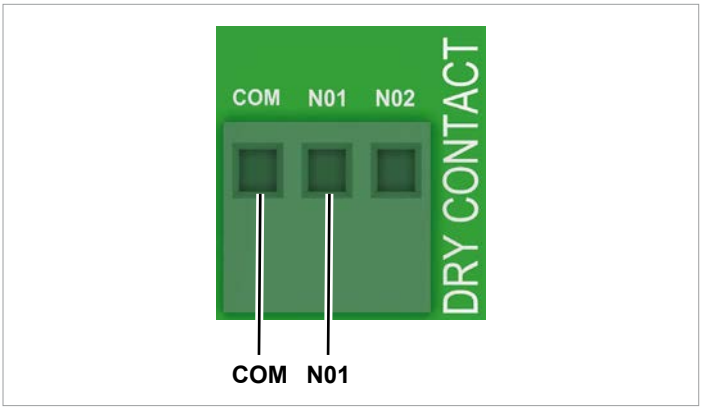


Fig. 6.20: Pin assignment of the dry contacts

If the fans fail, ***COM*** and ***N01*** will be closed.

Requirements for the cables

- Twisted and shielded cables (CAT5 or CAT6) with 2 cores
- Cable diameter: 5 mm
- Wire cross-section: 1 mm²

6.11 Connecting a ripple control receiver

Please contact Delta customer service if you want to connect a ripple control receiver. You will find the contact data on the last page of this document.

6.12 Using an external grid and system protection device

For PV installations larger than 30 kVA, the German standard VDE-AR-N 4105, Section 6.1 requires the use of an external grid and installation protection device with section switch.

Alternatively, VDE-AR-N 4105, Section 6.4.1 allows the use of an inverter with an internal section switch if the switch disconnects the inverter from the grid in less than 100 ms.

This inverter meets the requirements of VDE-AR-N 4105, Section 6.4.1 if the following firmware is installed: DSP ≥ 2.20 / COMM ≥ 2.32. In this case, no external grid and installation protection device is needed.

6 Planning the installation

6.13 Connecting a PC to the inverter

The inverter settings can be changed with the aid of a PC. The following accessories will be required for this.

Accessory	Description
USB-RS485 adapter with RS485 cable	To connect a PC to the inverter
Delta Service Software	To change the settings on the inverter

USB-RS485-Adapter and Delta Service Software are available from Delta. Please contact Delta customer service in your own country. You will find the contact data on the last page of this document.

6.14 What you need

Only tools and materials that are not included in the delivery are listed in this section.

6.14.1 To assemble the inverter

Part	Quantity	Description
Mounting bolts	6 to 12	The mounting plate must be fastened with 6 to 12 M6 bolts. Depending on where the inverter is to be mounted (e.g. brick wall, concrete wall, metal frame, etc.), additional mounting aids will be needed: wall plugs, washers, serrated washers, nuts, etc. Always take note of the conditions at the installation location when selecting the mounting materials. Galvanic corrosion may occur when mounting material consisting of differing metals is used.

6.14.2 To connect the inverter to the grid (AC)

Part	Quantity	Description	
AC cable	-	The AC plug supplied with the inverter has the following technical features:	
		Plug type	Amphenol C16-3 (C016 20E004 800 2)
		Rated current	40 A
		Min. / max. cable diameter	11 / 20 mm
		Min. / max. wire cross-section	2.5 / 6 mm^2
		Recommended torque for clamping screws	≥ 0.7 Nm
		The AC plug can only be used with flexible copper cable. When calculating the cable cross-section, take the following influencing factors into account: ● Cable material ● Temperature conditions ● Cable length ● Installation type ● Voltage drop ● Power losses in the cable Always comply with the installation regulations that are applicable in your country. France: Comply with the installation regulations of UTE 15-712-1. This standard includes regulations concerning minimum cable cross-sections and about preventing overheating caused by high currents. Germany: Comply with the installation regulations of VDE 0100-712. This standard includes regulations concerning minimum cable cross-sections and about preventing overheating caused by high currents. Australia/New Zealand: Comply with the installation regulations of AS/NZS 5033:2005. This standard includes regulations concerning minimum cable cross-sections and about preventing overheating caused by high currents.	

Part	Quantity	Description
Wire end ferrules	4 - 5	Ferrules must be used on the wire ends of the AC cable to ensure that there is adequate electrical contact between the AC plug and the AC cable. Use crimping pliers to attach the ferrules to the wires. 

6.14.3 To connect the inverter to the solar modules

Part	Quantity	Description
DC plugs	4 pairs	The required number of DC plugs is supplied with the inverter. Should you need a different size or a replacement, order the required version using the following table. Available from Multi-Contact.
DC cable	-	Cable cross-section must match the supplied DC plugs.

DC terminals on the inverter		DC plugs for DC cable			
			a	b	Multi-Contact
			mm²	mm	
DC–			1.5 / 2.5	3-6	32.0010P0001-UR
				5.5-9	32.0012P0001-UR
			4 / 6	3–6	32.0014P0001-UR
				5.5-9	32.0016P0001-UR [1]
DC+			1.5 / 2.5	3-6	32.0011P0001-UR
				5.5-9	32.0013P0001-UR
			4 / 6	3-6	32.0015P0001-UR
				5.5-9	32.0017P0001-UR [1]

[1] Supplied with the inverter

Part	Quantity	Description
DC protective caps	Up to 8	To secure the DC plugs so that they can only be removed from the DC terminals with the DC open end spanner. Available from Multi-Contact. Comply with the local regulations concerning the use of the DC protective caps. France: The DC protective caps must be used. 
DC open end spanner	1	Open end spanner for disconnecting the DC plugs and the protective caps from the DC terminals. Available from Multi-Contact. 

6.14.4 To ground the inverter housing

Part	Quantity	Description
Grounding cable with terminal lug	1	Typically a yellow-green copper cable with a cross-section of at least 6 mm^2. M4 screw, spring washer, flat washer and serrated washer are already fitted to the inverter. Always comply with the local regulations regarding the requirements for the grounding cable.

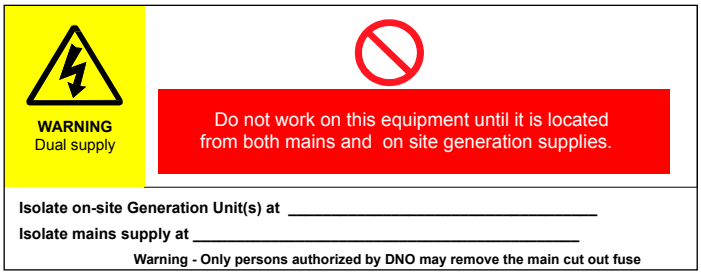
6.14.5 To wire up the RS485 and the dry contacts

Part	Quantity	Description
Cable	-	Twisted and shielded cable (CAT5 or CAT6) with a cable diameter of 5 mm and a wire cross-section of 1 mm^2.
SOLIVIA Gateway M1 G2	1	For connecting to SOLIVIA Monitor, the internet-based monitoring system from Delta. 

6.14.6 To connect a PC

Part	Quantity	Description
USB-RS485 adapter	1	To connect a PC to the inverter. Available from Delta 
2-core conductor	1	Bell wire. Both ends open.
Delta Service Software	1	To change the settings on the inverter. Available from Delta

6.14.7 Other parts

Part	Quantity	Description
Warning labels	-	Comply with the local regulations concerning the attachment of warning labels.   

7. Installation

► Read the chapter “1. Planning the installation”, page 1 and this chapter through completely before starting work on the installation.

7.1 Safety information

DANGER

Electric shock
During operation there is a potentially lethal voltage present inside the inverter. Even after the inverter has been disconnected from all power sources, this voltage is present in the inverter for up to a further 80 seconds.
Therefore always perform the following work steps before working on the inverter

1. Turn the DC disconnector to the **OFF** position.
2. Disconnect the inverter from all AC and DC sources and make sure that none of the connections can be inadvertently re-established.
3. Wait at least 80 seconds to allow the internal capacitors to discharge.

DANGER

Electric shock
There is a potentially lethal voltage present on the DC terminals of the inverter. The solar modules start to produce current as soon as light falls on them. This occurs even if the light is not shining directly on the solar modules.

- ► Never disconnect the inverter from the solar modules when it is under load.
- ► Turn the DC disconnector to the **OFF** position.
- ► Disconnect the connection to the grid so that the inverter cannot supply any energy to it.
- ► Disconnect the inverter from all AC and DC sources. Make sure that none of the connections can be inadvertently re-established.
- ► Protect the DC cables from being inadvertently touched.

WARNING

Heavy weight
The inverter is very heavy.

- ► The inverter must be lifted and carried by at least 2 people or with suitable lifting gear.

NOTE

Water ingress.

- ► All sealing caps that were removed during the installation should be kept for future use (e.g. transport or storage).

► Never open the inverter housing! Otherwise the guarantee will be void.

7.2 Sequence of installation steps

The connections for RS485, the dry contacts and the external power off (EPO) are all located on the communications card. These installation tasks can therefore be combined.

Recommended sequence of installation steps:

1. Installing the inverter
2. Grounding the inverter housing
3. Connecting the communications card [1)]
4. Connecting the dry contacts and the external power off (optional)
5. Connecting the grid (AC)
6. Connecting the solar modules (DC)

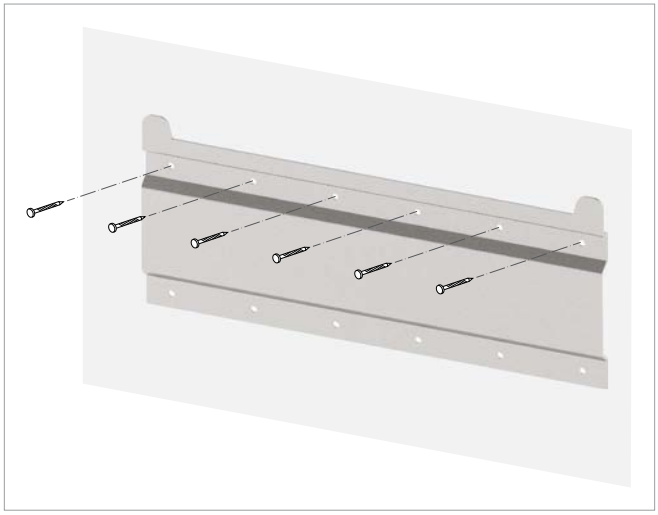
7 Installation

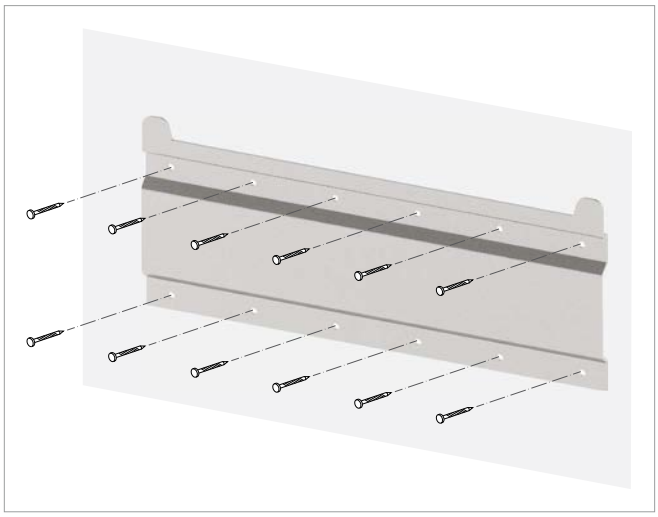
7.3 Installing the inverter

WARNING

Heavy weight
The inverter is very heavy.
► The inverter must be lifted and carried by at least 2 people or with suitable lifting gear.

1. Fasten the mounting plate to the wall or to the mounting system using 6 to 12 M6 screws.

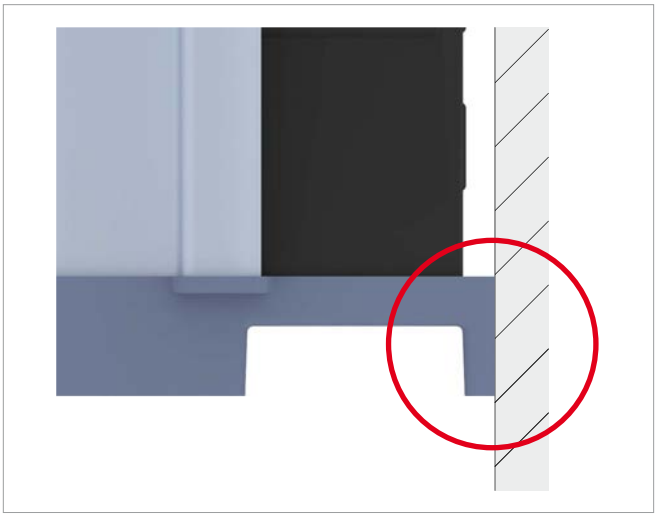




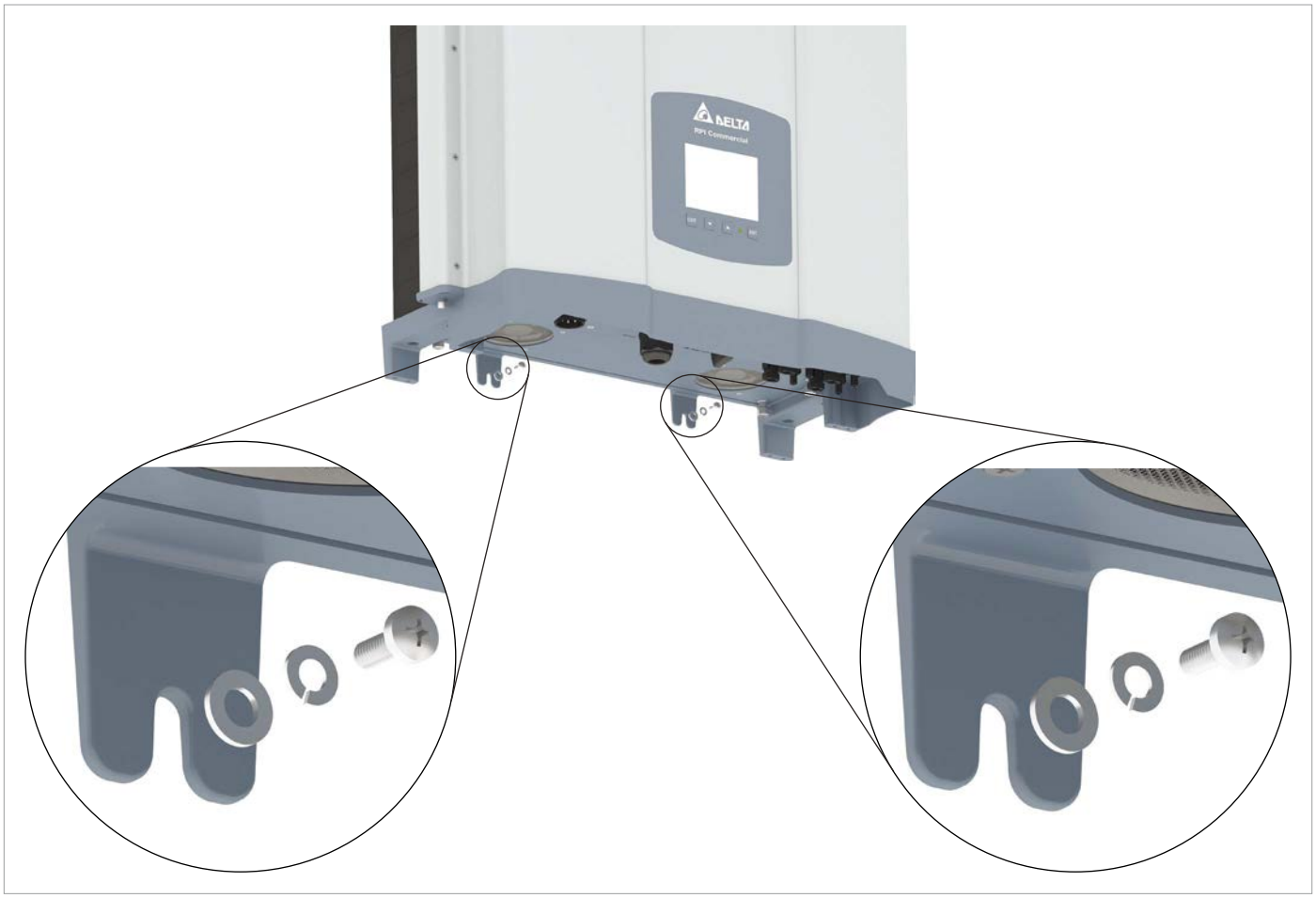
2. Fit the inverter into the mounting plate.

3. Check that the inverter is hanging correctly in the mounting plate.

4. Check that the lower edge of the inverter is resting correctly against the wall or mounting system.



5. Fasten the inverter to the wall or mounting system.



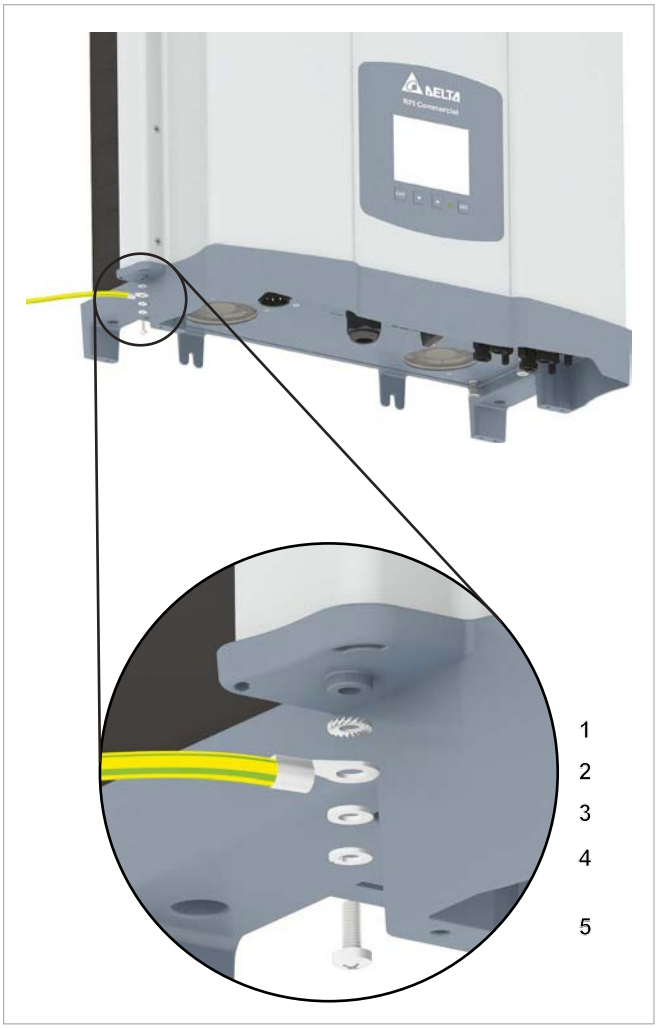
7.4 Grounding the inverter housing

WARNING

High current

- ► Always comply with the local regulations regarding the requirements for the grounding cable.
- ► Even if there are no local regulations, the inverter housing should always be grounded to increase safety.
- ► Always ground the inverter housing before connecting the inverter to the grid and the solar modules.

1. Bolt the grounding cable to the inverter. M4 screw, spring washer, flat washer and serrated washer are already fitted to the inverter.



1 Serrated washer
2 Grounding cable with terminal lug
3 Flat washer
4 Spring washer
5 M4 bolt

2. Perform a continuity test of the grounding connection. If the connection is not adequately conductive, scrape away the paint from the inverter housing under the serrated washer to achieve a better electrical contact.

7.5 Connecting a data logger via RS485

The connections for RS485, the dry contacts and the external power off (EPO) are all located on the communications card. These installation tasks can therefore be combined.

NOTE

Water ingress.

► All sealing caps that were removed during the installation should be kept for future use (e.g. transport or storage).

7.5.1 Introduction

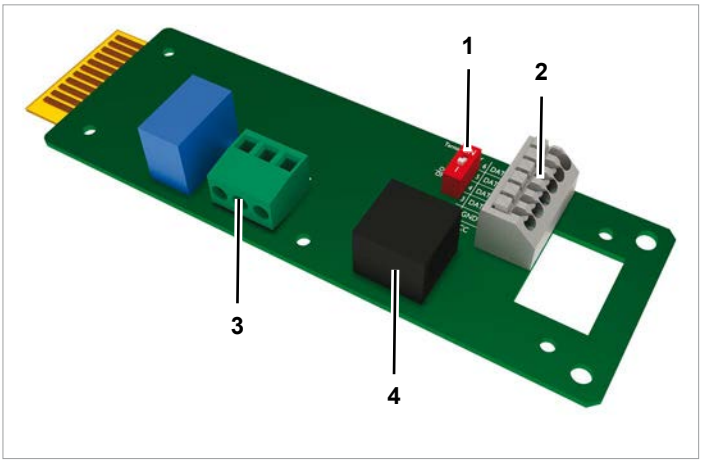


Fig. 7.1: Components on the communications card

1 DIP switch for RS485 termination resistor
2 RS485 (terminal block)
3 Dry contacts (terminal block)
4 External power off (RJ45)

Terminal assignment of the RS485 terminal block

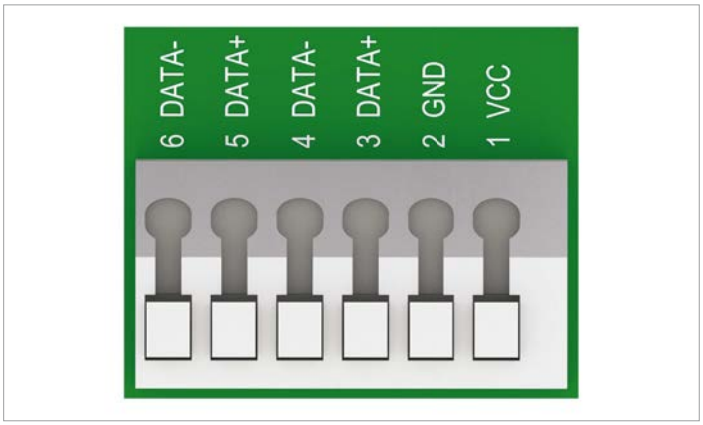


Fig. 7.2: Terminal assignment of the RS485 terminal block

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

Terminal pair 3/4 or 5/6 may be used. The second terminal pair is only needed if several inverters are connected with one another via RS485.

Data format

Baud rate	9600, 19200, 38400; Default: 19200
Data bits	8
Stop bit	1
Parity	n/a

After commissioning, the baud rate can be set on the inverter display, see “9.8 Baud rate for RS485”, page 86.

DIP switch for RS485 termination resistor

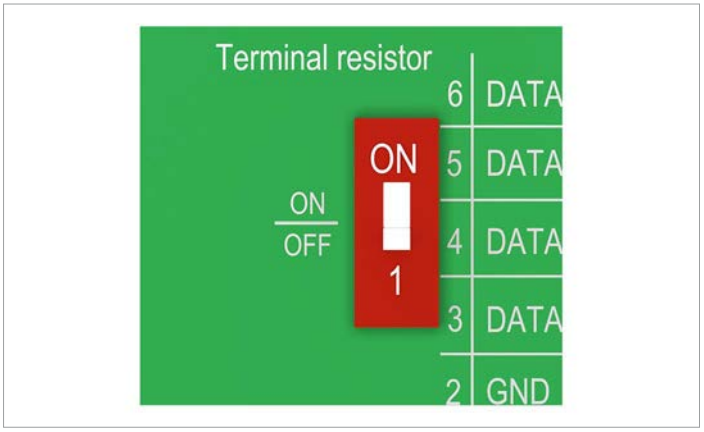


Fig. 7.3: DIP switch for RS485 termination resistor

Connection to a Delta SOLIVIA Gateway M1 G2

Individual wires are connected at the inverter end; an RJ45 plug is used at the Gateway end.

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

Connection diagram for an individual inverter

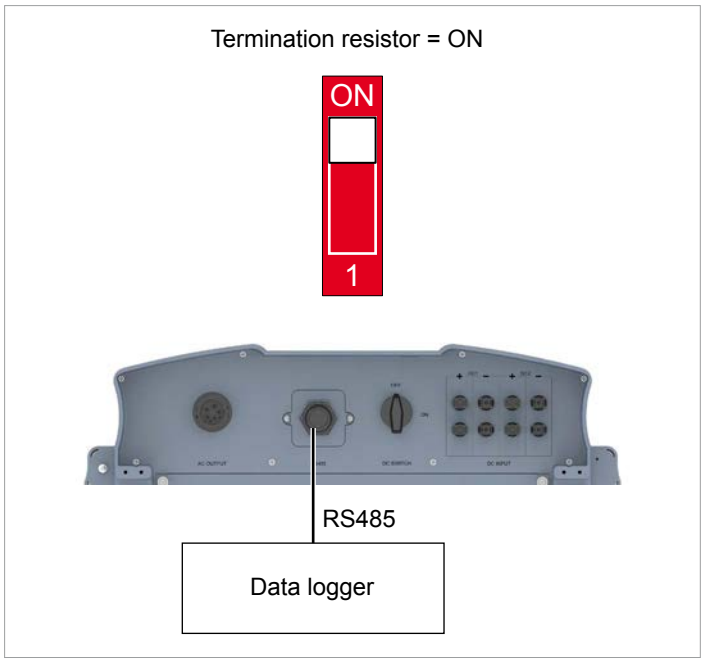


Fig. 7.4: Connection diagram: Single inverter to data logger

Connection diagram for several inverters

- ► If the data logger has no integrated RS485 termination resistor, then switch on the RS485 termination resistor on the first inverter.
- ► After commissioning, set a different inverter ID on each inverter, see “9.9 Inverter ID”, page 88.

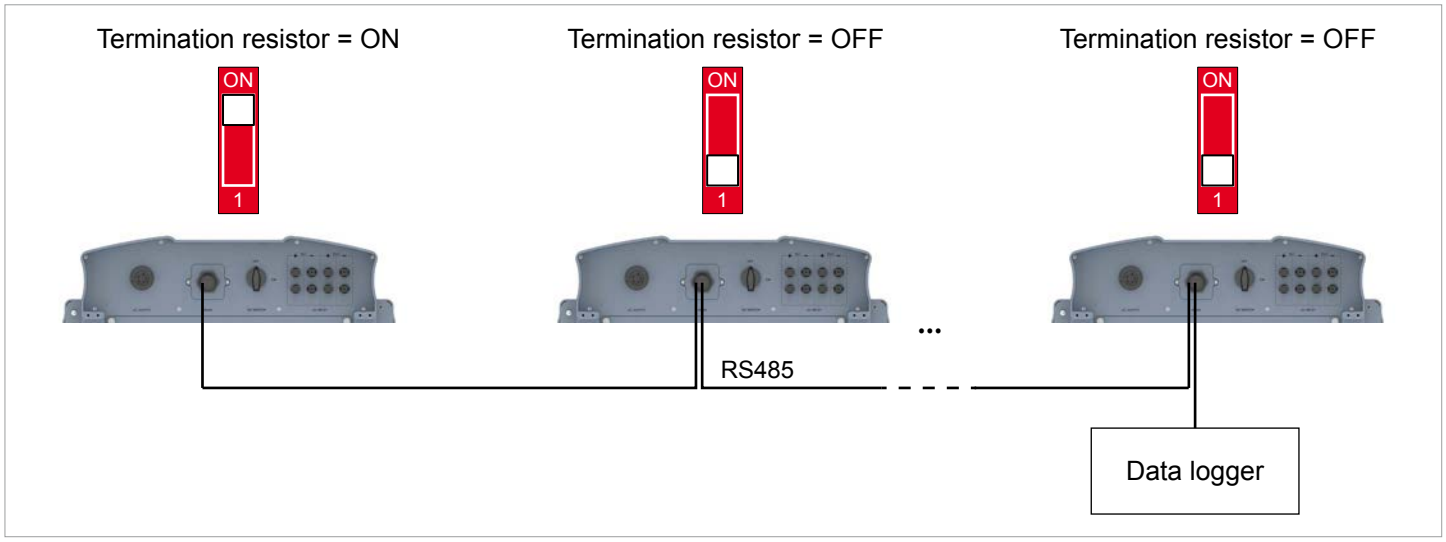


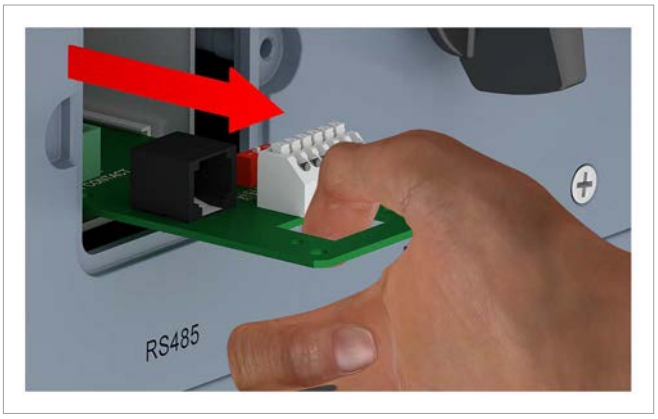
Fig. 7.5: Connection diagram: Several inverters to data logger

7.5.2 Wiring a single inverter

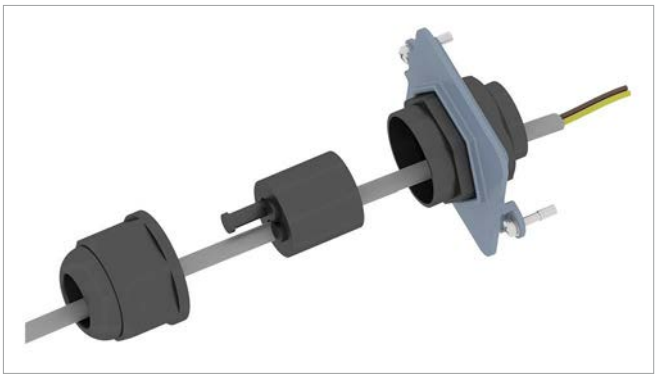
1. Twist off the cable gland from the communications connector and remove the gland and seal.

2. Remove the cover screws and then the cover.

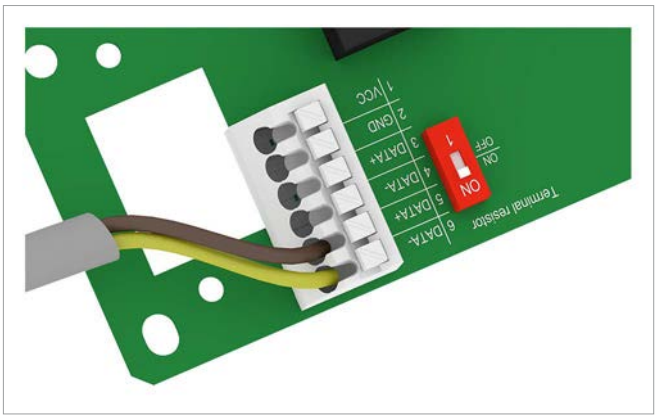
3. Withdraw the communications card.



4. Pull the cable through the cable gland and seal.
Do not remove the rubber plugs from the unused lead-throughs in the seal.

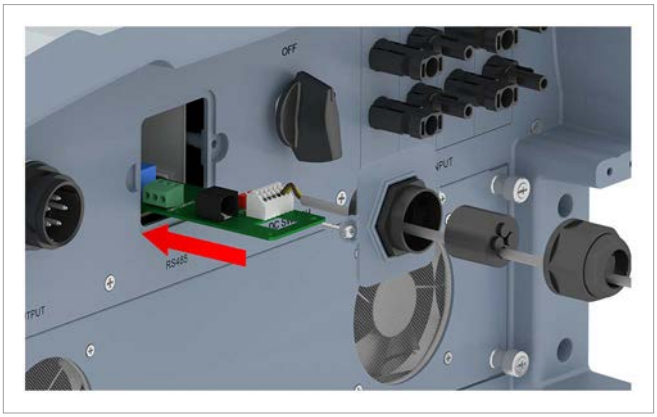


5. Connect the wire for DATA+ to terminal 5 and the wire for DATA– to terminal 6.

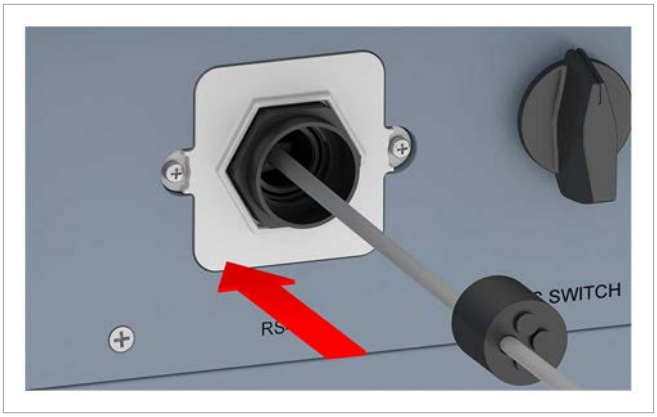


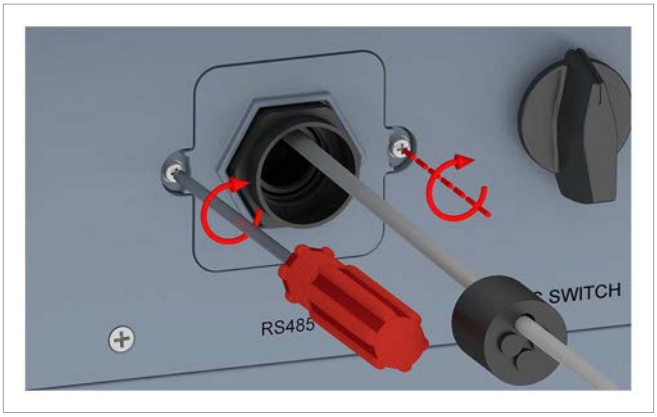
6. Set the DIP switch for the RS485 termination resistor to the **ON** position.

7. Insert the communications card.



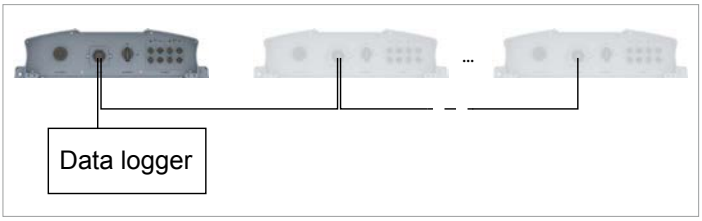
8. Fit the cover and tighten the screws.





9. Fit the seal and cable gland and tighten the cable gland.

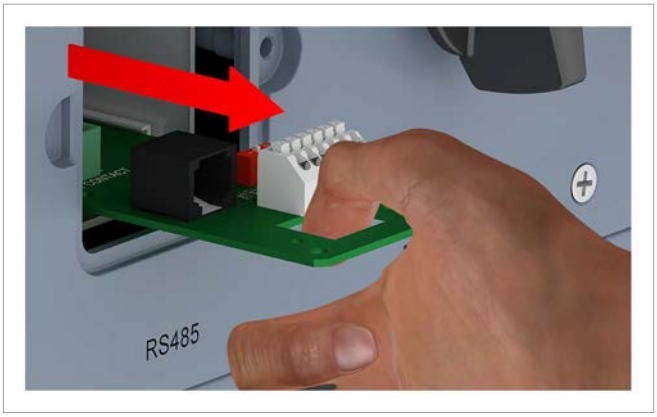
7.5.3 Wiring several inverters



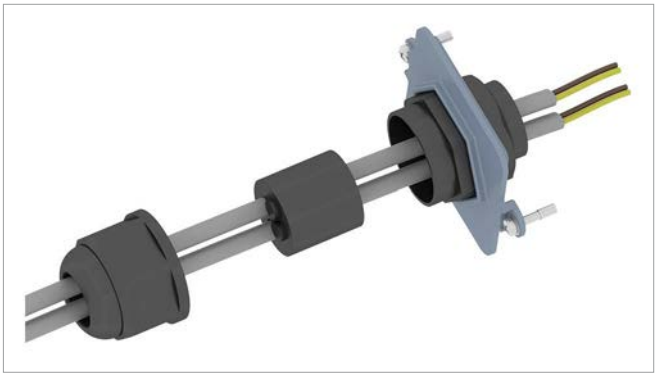
1. On the first inverter: Twist off the cable gland from the communications connector and remove the gland and seal.

2. Remove the cover screws and then the cover.

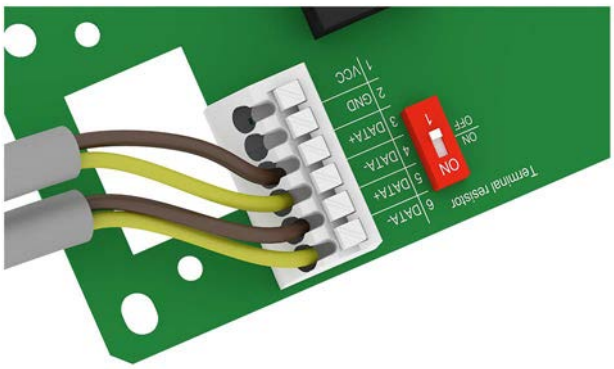
3. Withdraw the communications card.

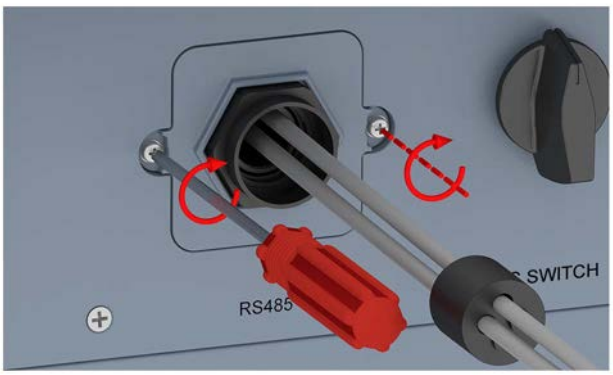


4. Pull the cable coming from the data logger and the cable going to the second inverter through the gland and the seal. Do **not** remove the rubber plugs from the unused lead-throughs in the seal.



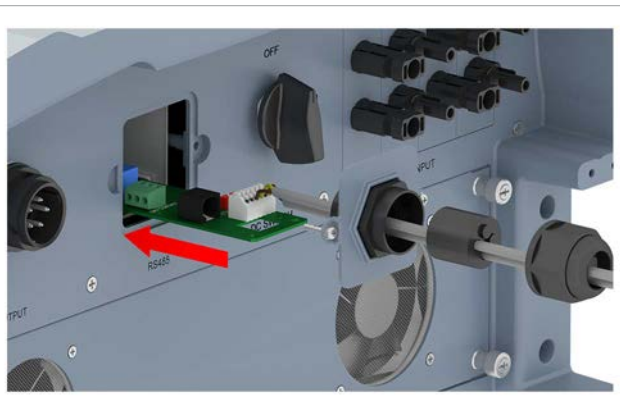
5. On the cable coming from the data logger: Connect the wire for DATA+ to terminal 5 and the wire for DATA– to terminal 6. On the cable going to the next inverter: Connect the wire for DATA+ to terminal 3 and the wire for DATA– to terminal 4.



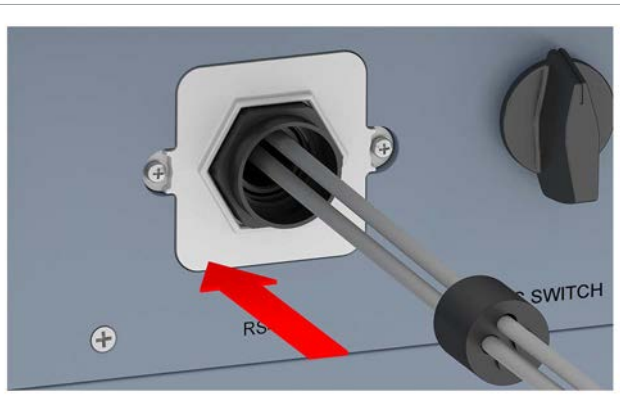


6. Set the DIP switch for the RS485 termination resistor to the **OFF** position.

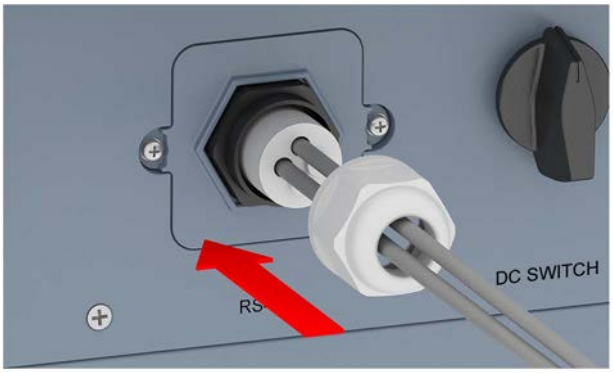
7. Insert the communications card.

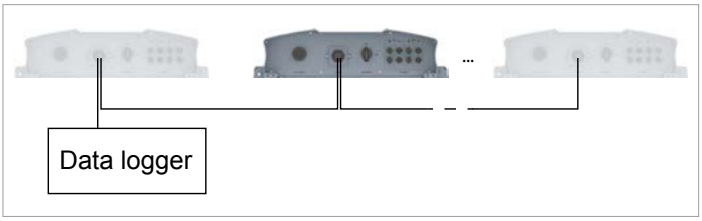


8. Fit the cover and tighten the screws.



9. Fit the seal and cable gland and tighten the cable gland.

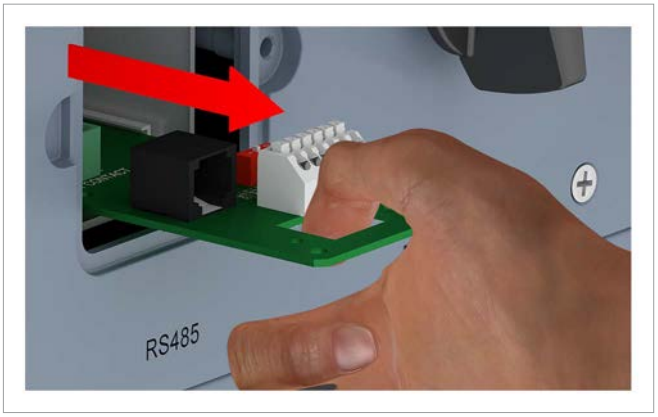




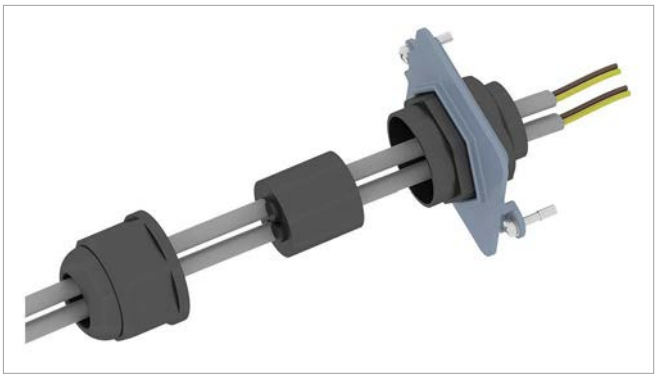
1. On the second and every additional inverter (apart from the last): Twist off the cable gland from the communications connector and remove the gland and seal.

2. Remove the cover screws and then the cover.

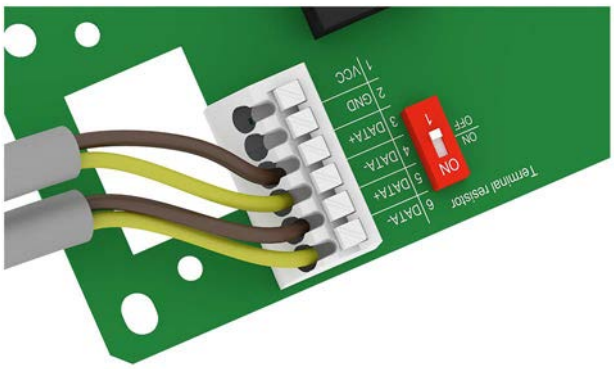
3. Withdraw the communications card.

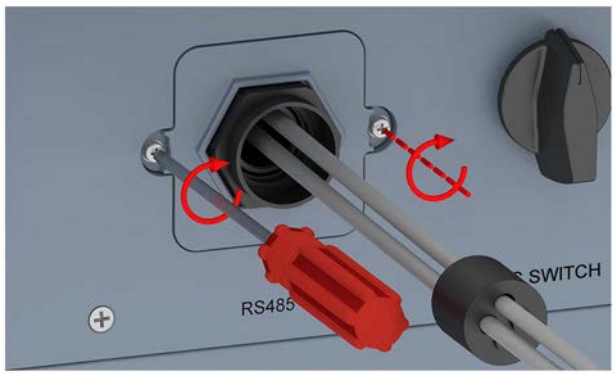


4. Pull the cable coming from the previous inverter and the cable going to the next inverter through the gland and the seal. Do **not** remove the rubber plugs from the unused lead-throughs in the seal.



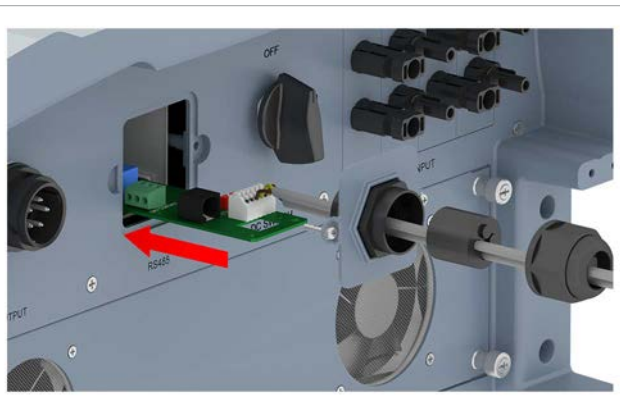
5. On the cable coming from the previous inverter: Connect the wire for DATA+ to terminal 5 and the wire for DATA– to terminal 6.
On the cable going to the next inverter: Connect the wire for DATA+ to terminal 3 and the wire for DATA– to terminal 4.



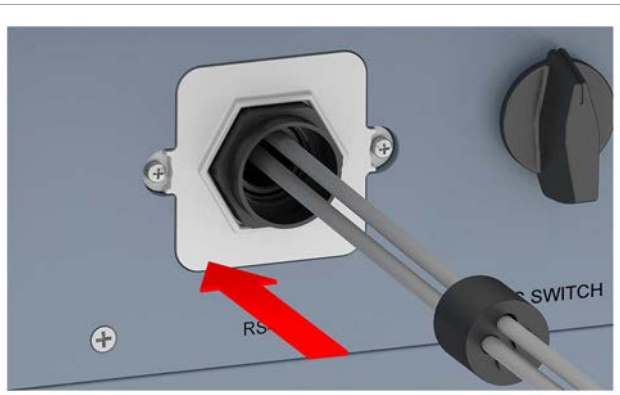


6. Set the DIP switch for the RS485 termination resistor to the **OFF** position.

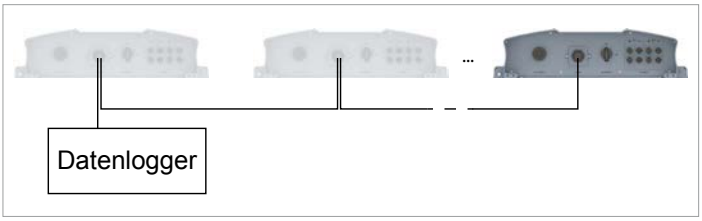
7. Insert the communications card.



8. Fit the cover and tighten the screws.



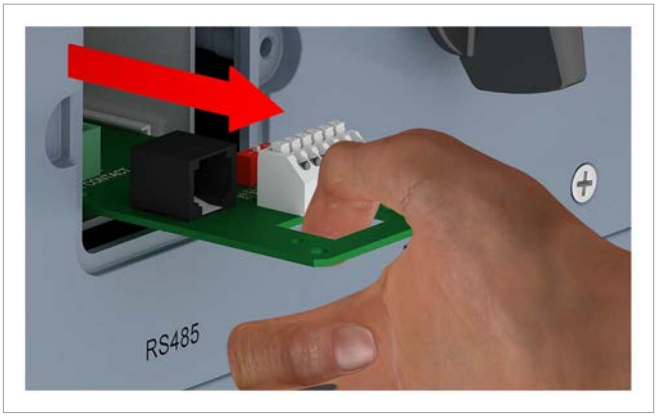
9. Fit the seal and cable gland and tighten the cable gland.



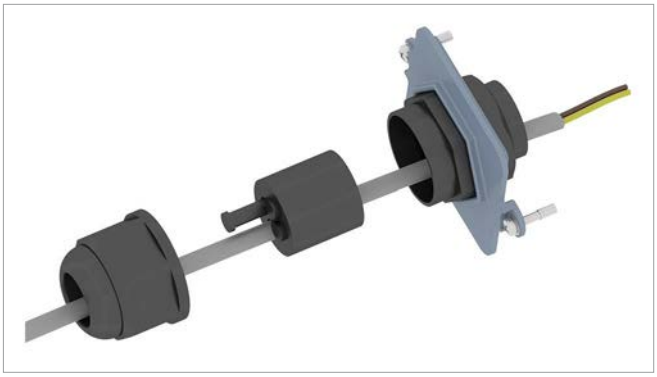
1. On the last inverter: Twist off the cable gland from the communications connector and remove the gland and seal.

2. Remove the cover screws and then the cover.

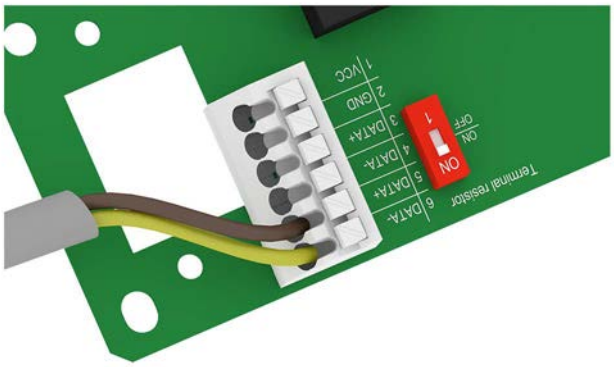
3. Withdraw the communications card.



4. Pull the cable coming from the penultimate inverter through the cable gland and seal.
Do **not** remove the rubber plugs from the unused lead-throughs in the seal.

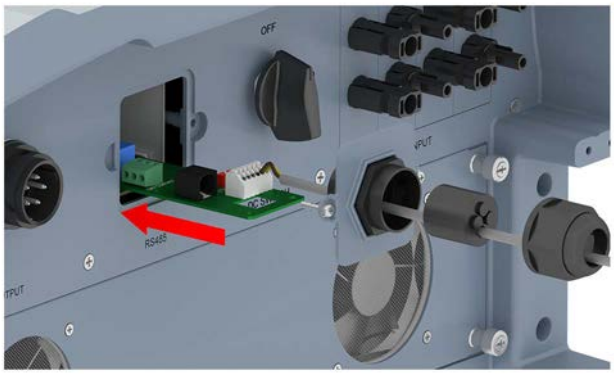


5. Connect the wire for DATA+ to terminal 5 and the wire for DATA– to terminal 6.

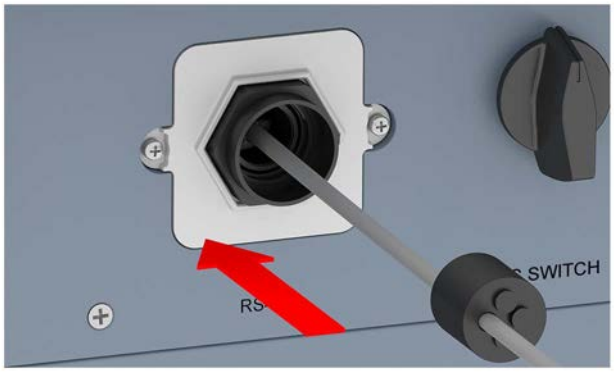


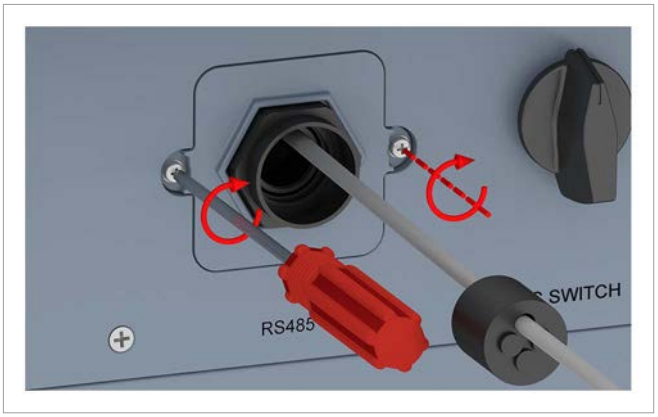
6. Set the DIP switch for the RS485 termination resistor to the **ON** position.

7. Insert the communications card.



8. Fit the cover and tighten the screws.





9. Fit the seal and cable gland and tighten the cable gland.

7.6 Connecting the dry contacts

7.6.1 Introduction

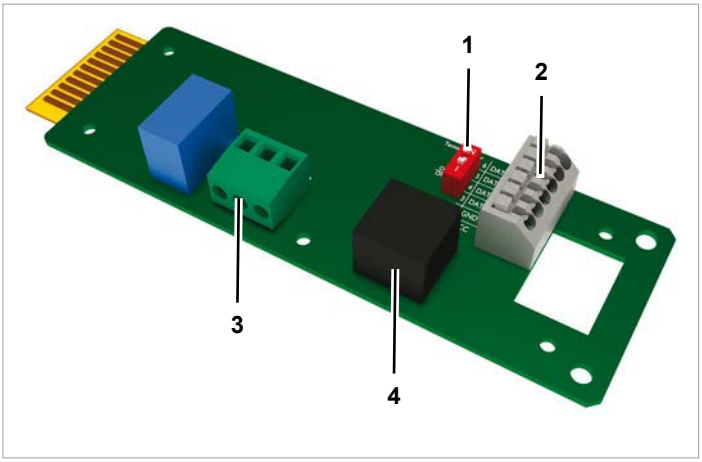


Fig. 7.1: Components on the communications card

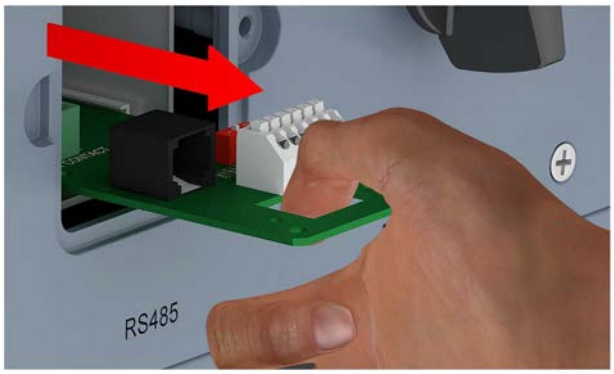
1 DIP switch for RS485 termination resistor
2 RS485 (terminal block)
3 Dry contacts (terminal block)
4 External power off (RJ45)

7.6.2 Wiring dry contacts with no 12 V_{DC} supply

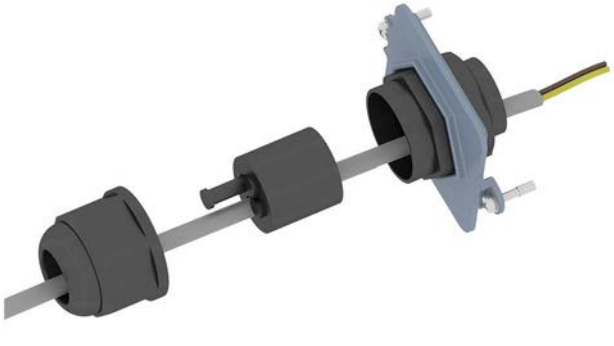
1. Twist off the cable gland from the communications connector and remove the gland and seal.

2. Remove the cover screws and then the cover.

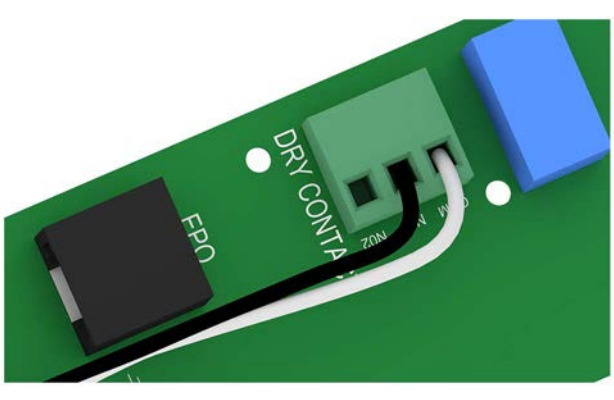
3. Withdraw the communications card.



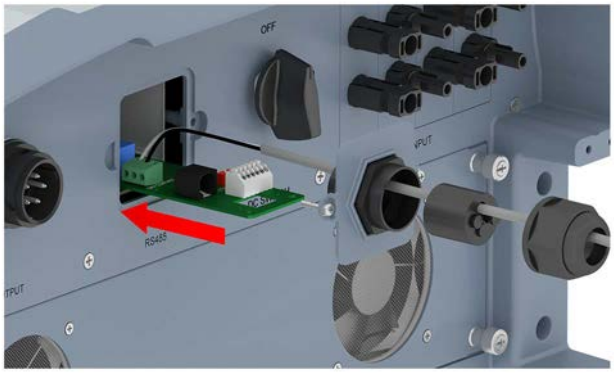
4. Pull the cable through the cable gland and seal.
Do not remove the rubber plugs from the unused lead-throughs in the seal.



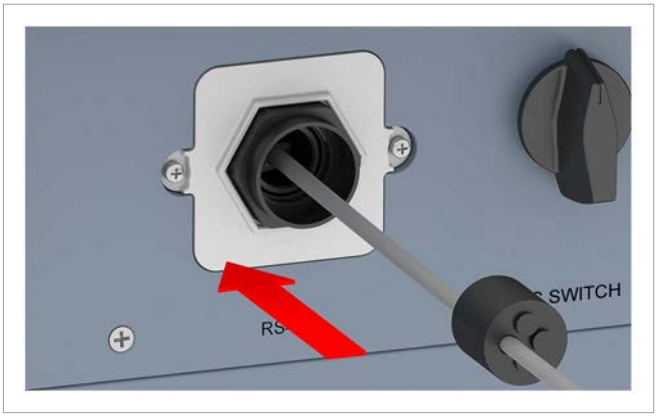
5. Connect the two wires to *COM* and *N01*.

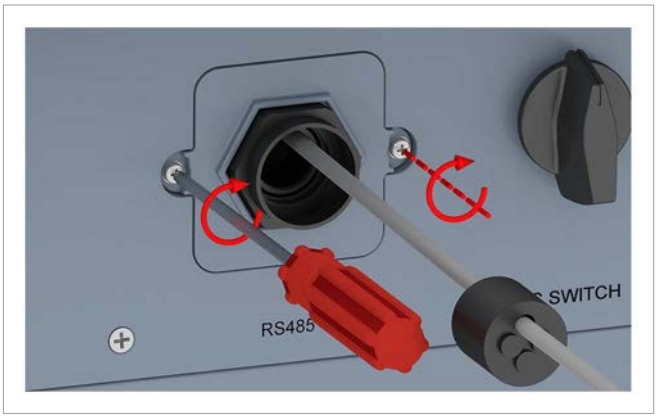


6. Insert the communications card.



7. Fit the cover and tighten the screws.





8. Fit the seal and cable gland and tighten the cable gland.

7.6.3 Wiring dry contacts with an internal 12 V_{DC} supply

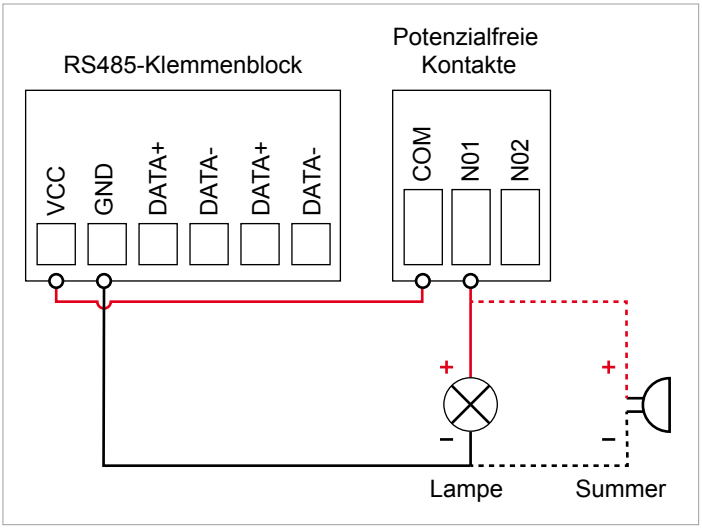


Fig. 7.2: Dry contacts with internal 12 V_{DC} supply for external alarm device, Variant 1

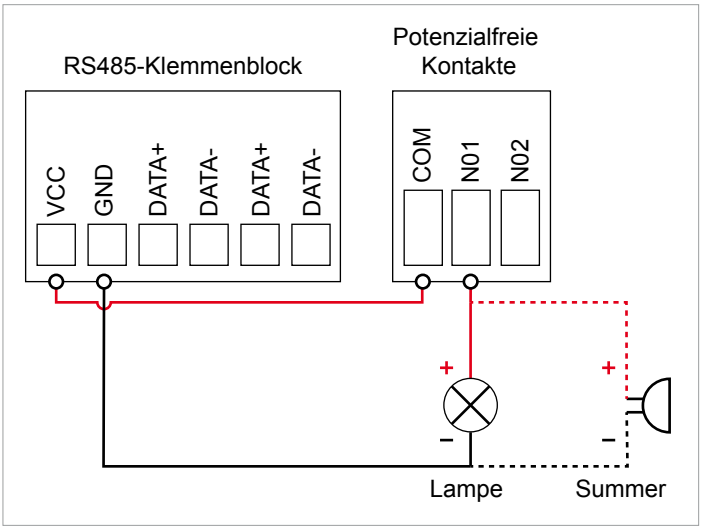
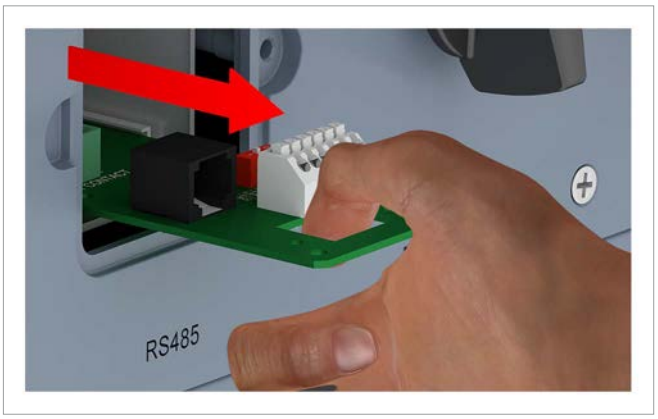


Fig. 7.3: Dry contacts with internal 12 V_{DC} supply for external alarm device, Variant 2

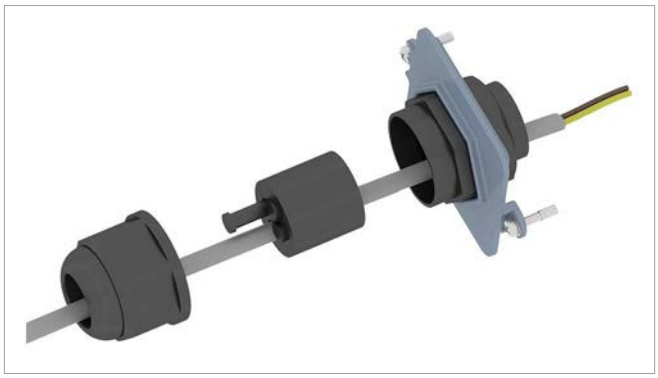
1. Twist off the cable gland from the communications connector and remove the gland and seal.

2. Remove the cover screws and then the cover.

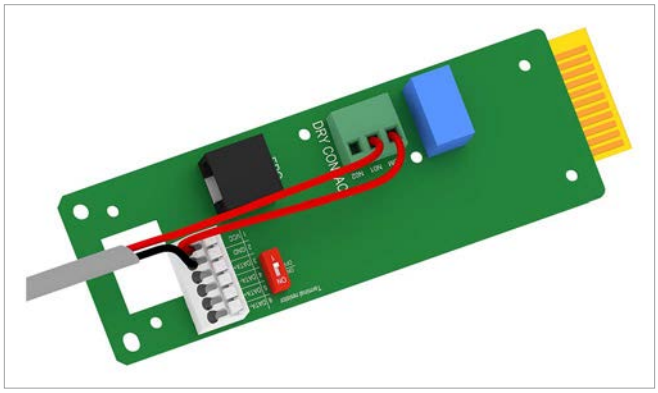
3. Withdraw the communications card.



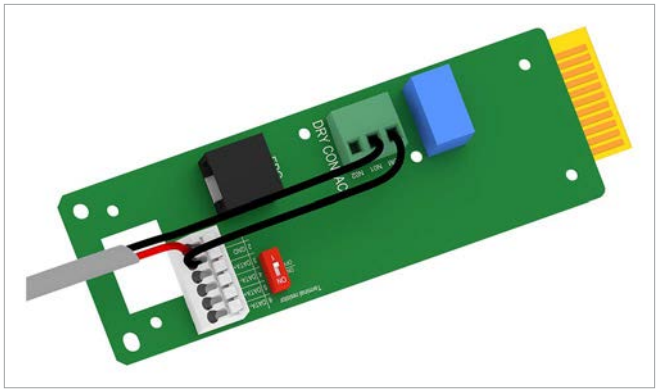
4. Pull the cable through the cable gland and seal.
Do not remove the rubber plugs from the unused lead-throughs in the seal.



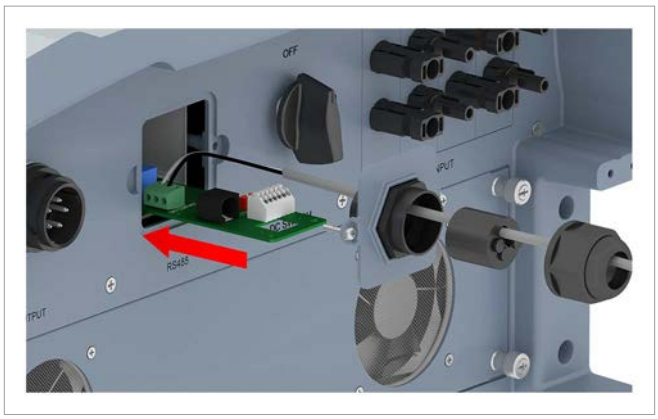
5. Connect the wires according to one of the two variants.
Wiring according to Variant 1 should look like this:



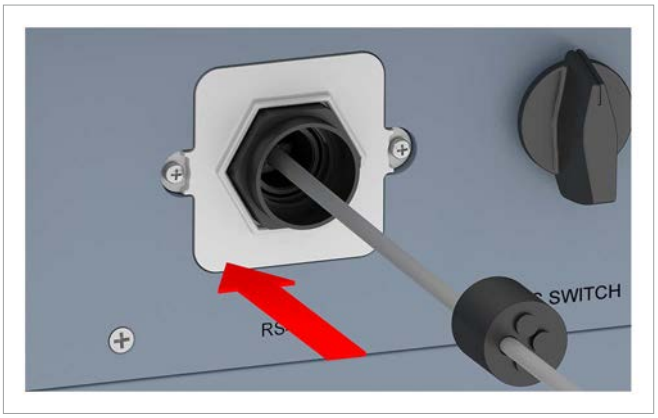
Wiring according to Variant 2 should look like this:

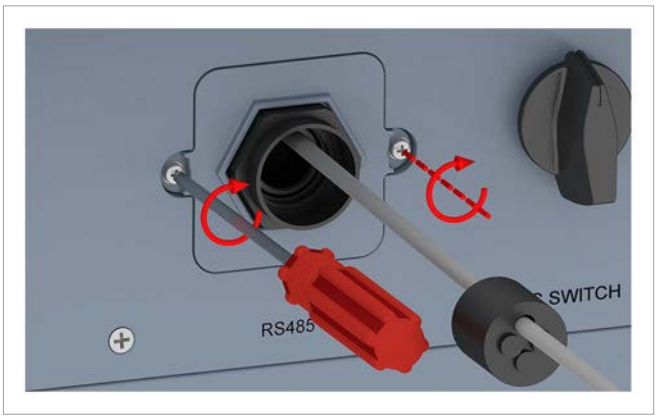


6. Insert the communications card.



7. Fit the cover and tighten the screws.





8. Fit the seal and cable gland and tighten the cable gland.

7.7 Connecting the external power off (EPO)

7.7.1 Introduction

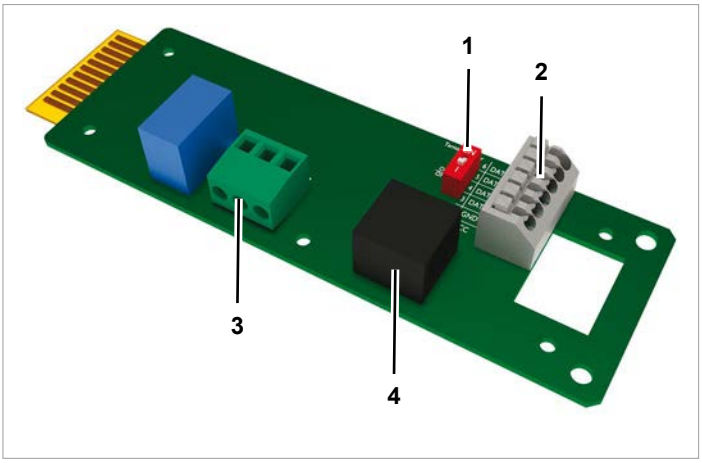


Fig. 7.1: Components on the communications card

1 DIP switch for RS485 termination resistor
2 RS485 (terminal block)
3 Dry contacts (terminal block)
4 External power off (RJ45)

Pin assignment

Pin	Designation	Short-circuit	Assigned action
1	V1	–	–
2	K0	V1 + K0	External power off (EPO)
3	K1	V1 + K1	–
4	K2	V1 + K2	–
5	K3	V1 + K3	–
6	K4	V1 + K4	–
7	K5	V1 + K5	Reserved
8	K6	V1 + K6	Reserved

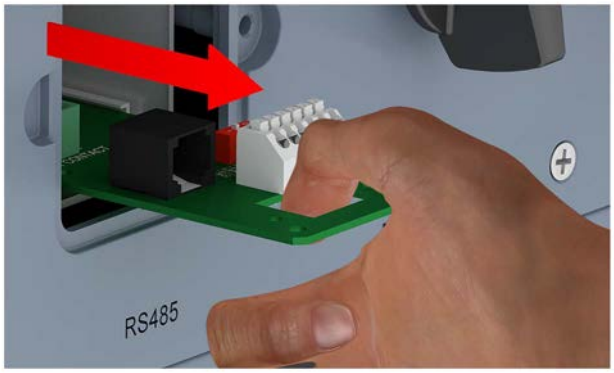
The relay for the external power off can be set as normally open or normally closed on the display, see “9.16 External power off (EPO)”, page 102.

7.7.2 Cabling the external power off

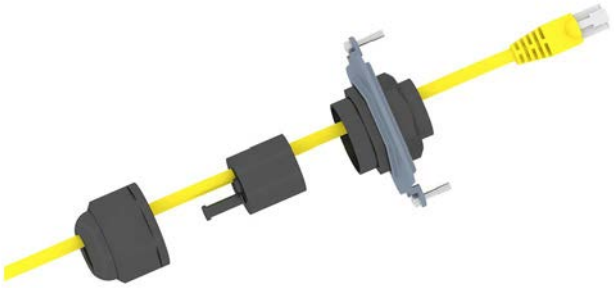
1. Twist off the cable gland from the communications connector and remove the gland and seal.

2. Remove the cover screws and then the cover.

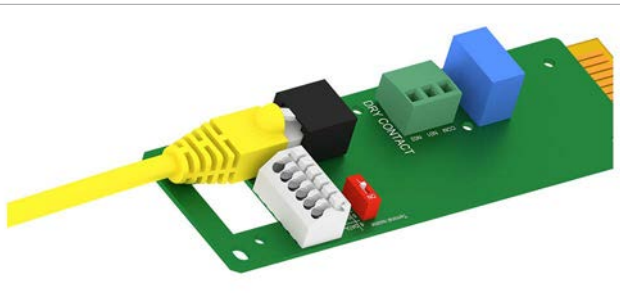
3. Withdraw the communications card.



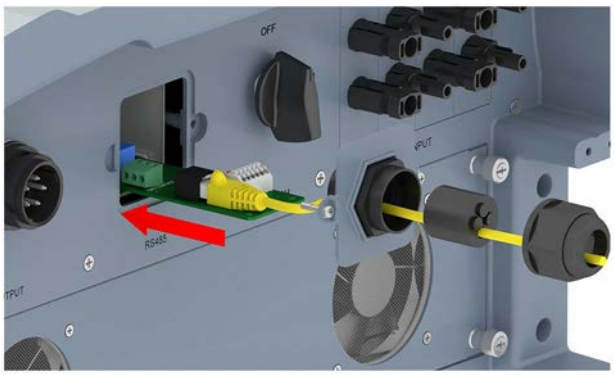
4. Pull the cable through the cable gland and seal.
Do not remove the rubber plugs from the unused lead-throughs in the seal.



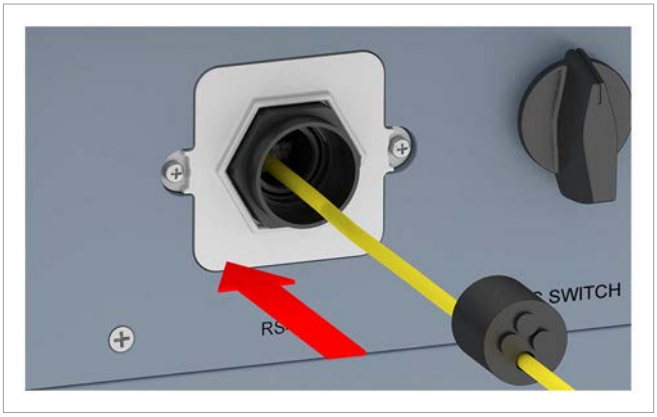
5. Plug the cable connector into the RJ45 socket.

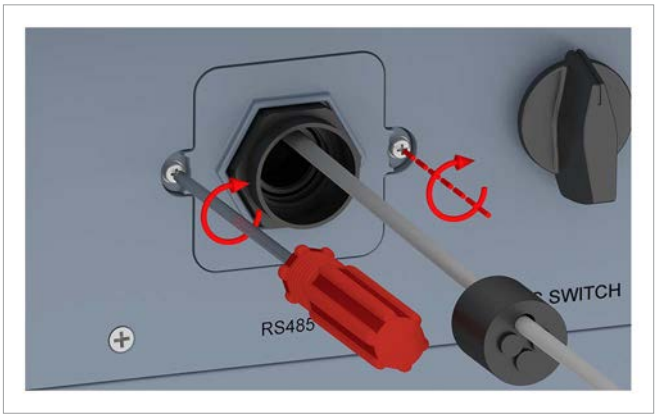


6. Insert the communications card.



7. Fit the cover and tighten the screws.





8. Fit the seal and cable gland and tighten the cable gland.

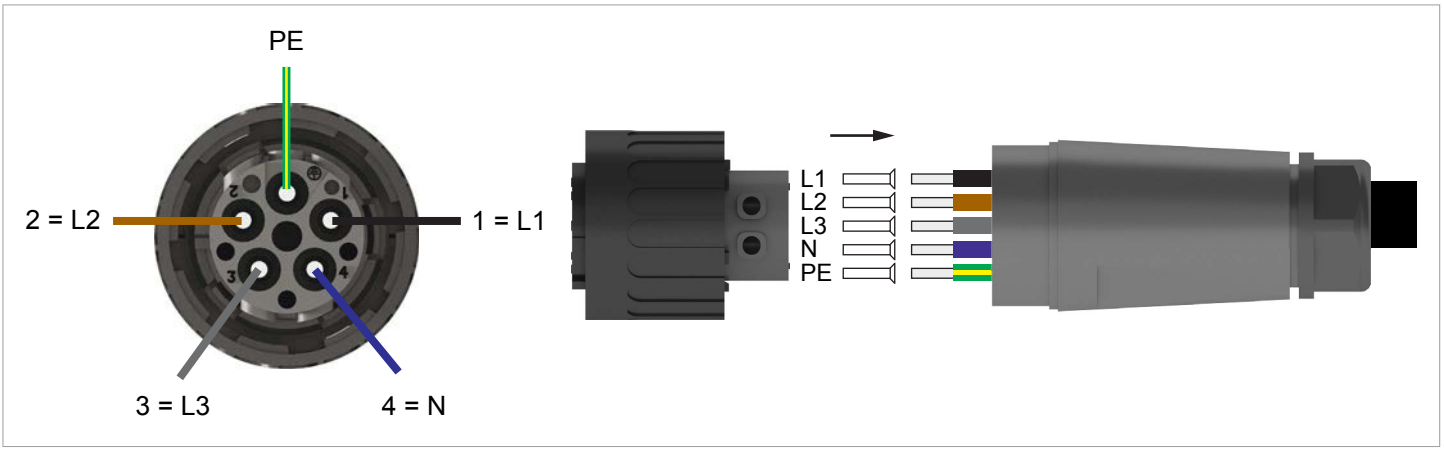
7 Installation

7.8 Connecting to the grid (AC)

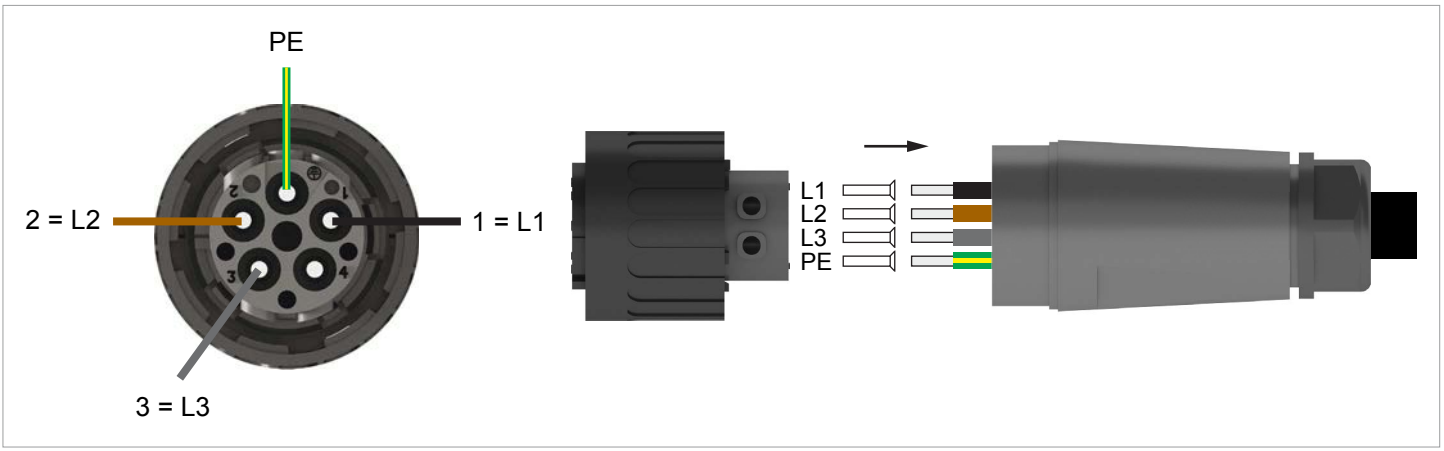
The inverter can be connected to 3-phase grids with no neutral conductor (3P3W, 3 phases + PE) and 3-phase grids with a neutral conductor (3P4W, 3 phases + N + PE).

► If the inverter is connected to a grid without neutral conductors, the AC connection type must be changed to 3P3W on the display after commissioning, see "9.17 AC connection type", page 104.

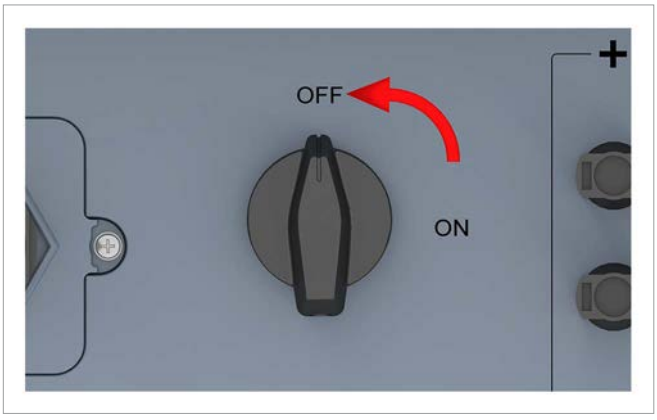
Connecting to 3-phase grids with neutral conductors (3P4W)



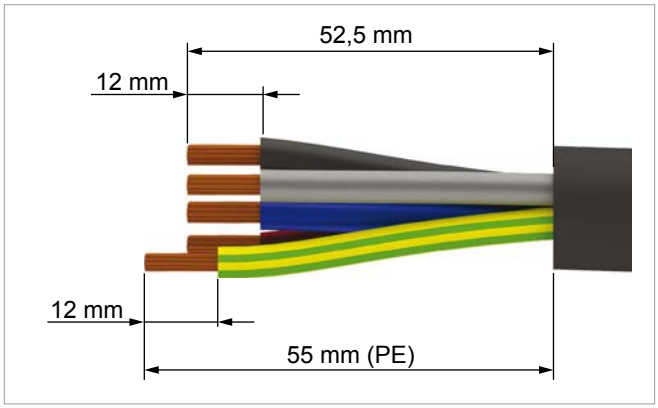
Connecting to 3-phase grids without neutral conductors (3P3W)



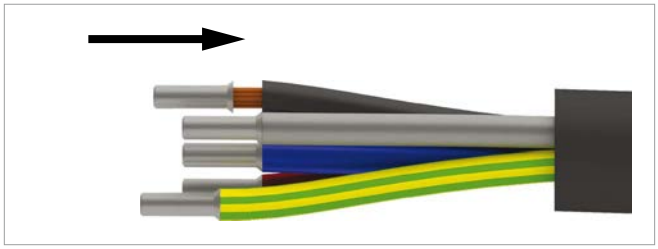
1. Turn the DC disconnector to the **OFF** position.



2. Remove the insulation from the cable and the wires. Do not twist the wire ends as the contact area with the ferrules will be reduced as a result.



3. Push the ferrules on to the wire ends and crimp them.



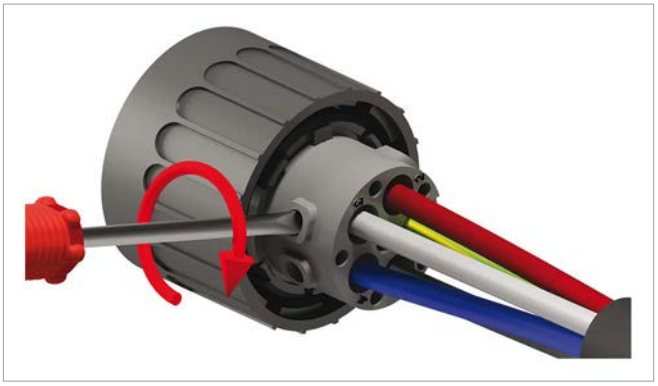
4. Unscrew the nut and housing from the AC plug.

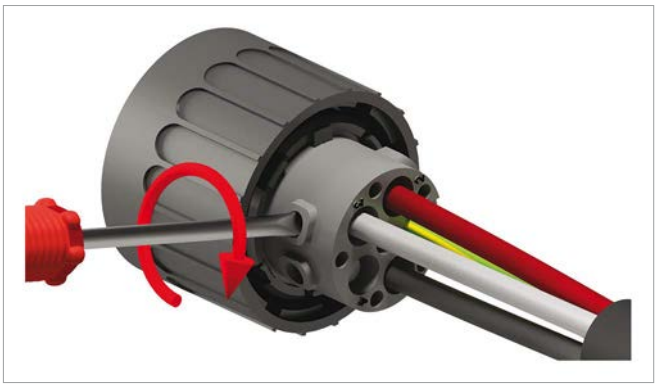
5. Pull the cable through the nut and the housing.

NOTE

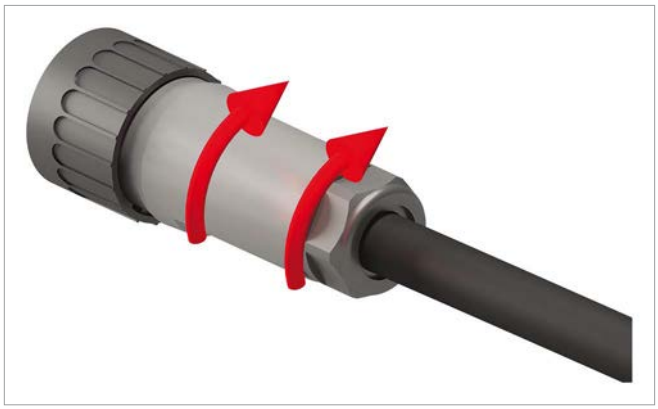
Pay attention to the phase assignment when connecting the AC cable to the AC plug. Incorrect wiring can destroy the inverter.

6. Push the wires of the AC cable into the correct pin inserts and tighten with a screwdriver.
The first picture shows the wiring for 3-phase grids with neutral conductors (3P4W); the second for 3-phase grids without neutral conductors (3P3W).

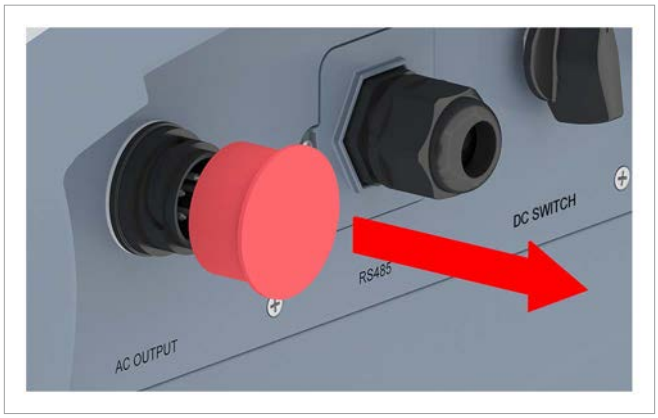




7. Fit the housing and nut and tighten the nut.



8. Remove the sealing cap from the AC terminal and **keep it**.



9. Plug the AC plug into the AC terminal on the inverter and tighten.

10. Secure the AC cable with a strain relief.

11. If the inverter is connected to a grid without neutral conductors, set the connection type to 3P3W on the display **after** commissioning, see “9.17 AC connection type”, page 104.

7.9 Connecting to the solar modules (DC)

DANGER

Electric shock

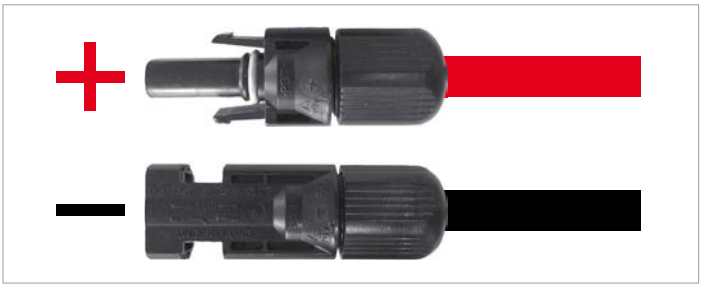
There is a potentially lethal voltage present on the DC terminals of the inverter. The solar modules start to produce current as soon as light falls on them. This occurs even if the light is not shining directly on the solar modules.

- ► Never disconnect the inverter from the solar modules when it is under load.
- ► Turn the DC disconnector to the **OFF** position.
- ► Disconnect the connection to the grid so that the inverter cannot supply any energy to it.
- ► Disconnect the inverter from all AC and DC sources. Make sure that none of the connections can be inadvertently re-established.
- ► Protect the DC cables from being inadvertently touched.

Colour of the DC cables

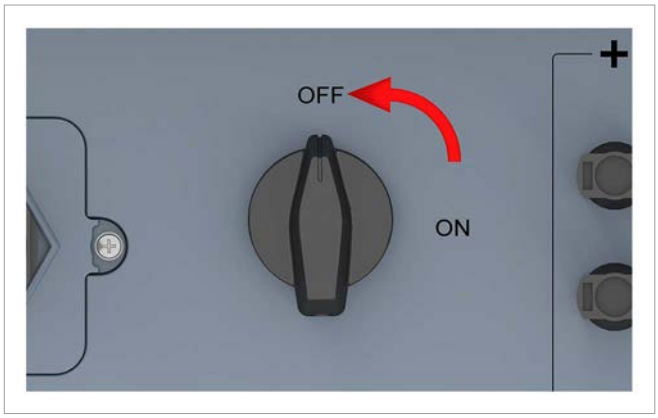
For DC+, use a red cable; for DC–, a black cable.

- ► Check the polarity with a voltmeter.

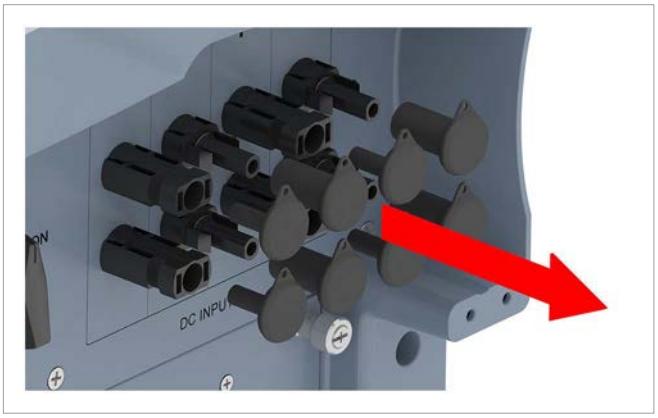


Connecting the DC cables

1. Turn the DC disconnector to the **OFF** position.

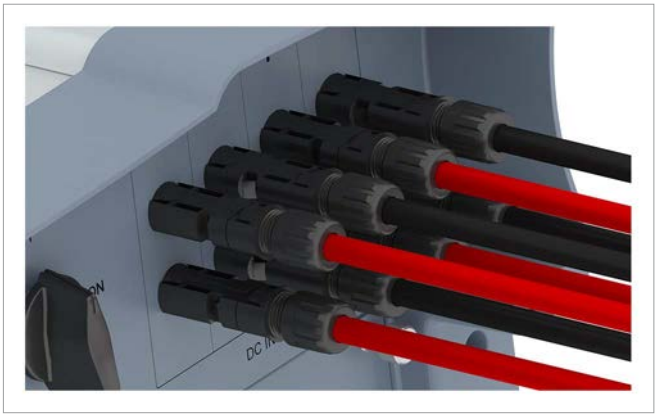


2. Remove the sealing caps from the DC terminals and **keep them**. Do **not** remove the sealing caps from unused DC terminals.



3. Insert the DC plugs with the DC cables into the DC terminals on the inverter.

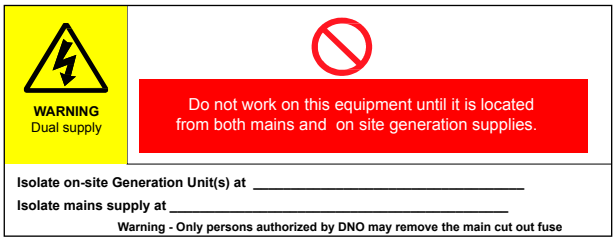
→ If all the DC terminals are used, the installation should appear as shown in the picture.



7.10 Attaching warning labels to the inverter

► Attach all the necessary warning labels to the inverter. Always comply with the local regulations when doing this.

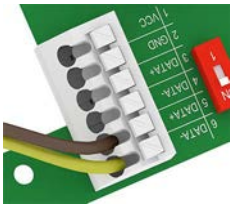
Some examples of warning labels are shown below.



Warning
Two voltage sources present
- Distribution network
- PV modules

Disconnect both sources before carrying out any work

7.11 Connecting a PC via RS485

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

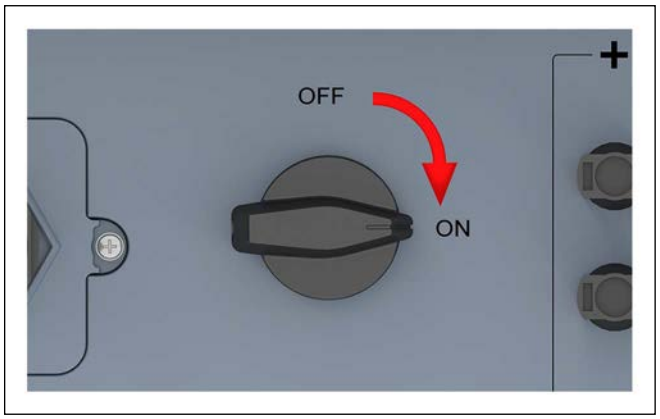
8. Commissioning

The inverter must be installed correctly, see “7. Installation”, page 45.

For information on operating the display buttons, see “7. Installation”, page 45.

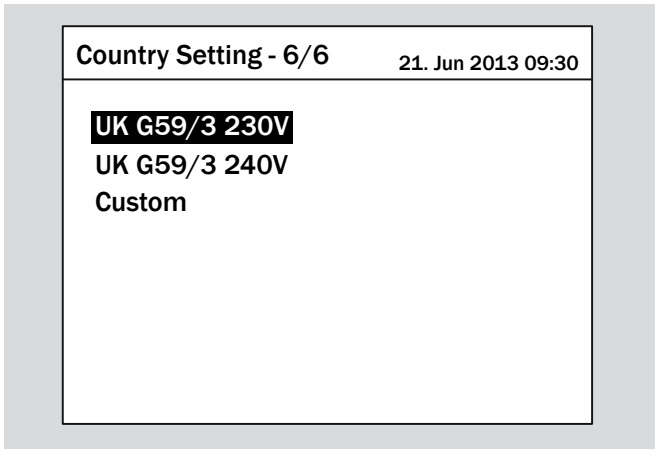
In order for the commissioning to be carried out, the inverter must be supplied with alternating current (grid) or direct current (solar modules).

1. Turn the DC disconnector to the **ON** position.



→ The inverter runs through an internal check that can take up to 2 minutes. The remaining time is shown on the display.

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



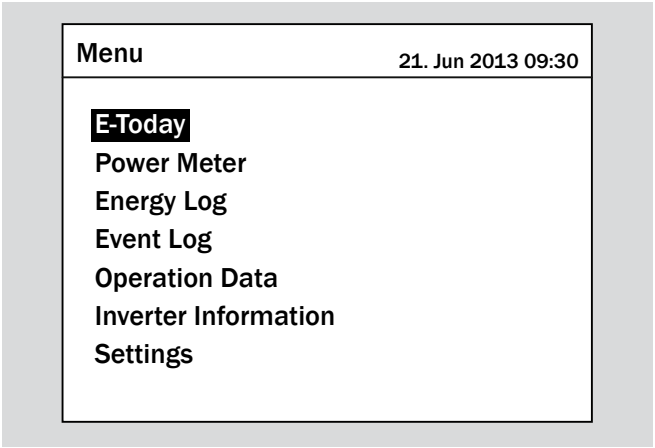
Country	Available grids
United Kingdom	UK G59/3 230V
	UK G59/3 240V

3. Press the ENT button to confirm.

4. Press the ENT button to confirm the selection.

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

☑ The commissioning is concluded. The main menu is displayed.



► Using chapter “9. Settings”, page 72, check if you need to make other settings.

9. Settings

9.1 Overview

9.2 Display language

Overview

You can set the display language with this function.

Path to the menu item

Main Menu > **Settings** > **Personal Settings** > **Language**

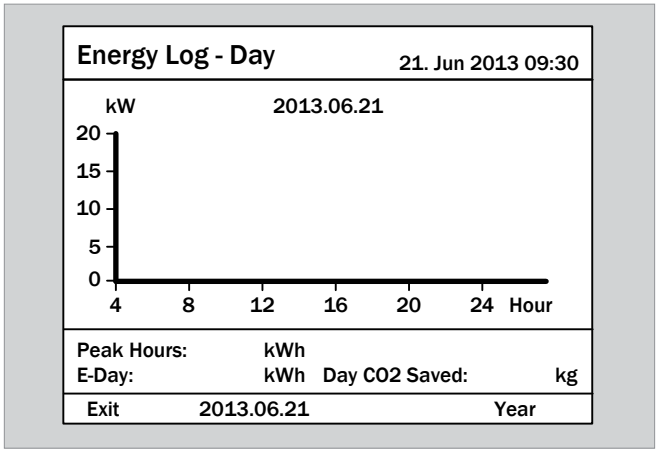
Setting options

Parameter	Description
Language	Set the display language. Setting range: **English** | **Nederlands** | **Français** | **Deutsch** | **Italiano** | **Español**

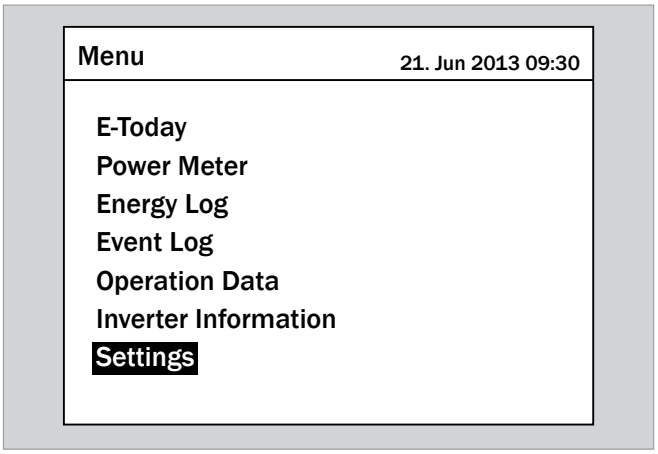
Setting the display language

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

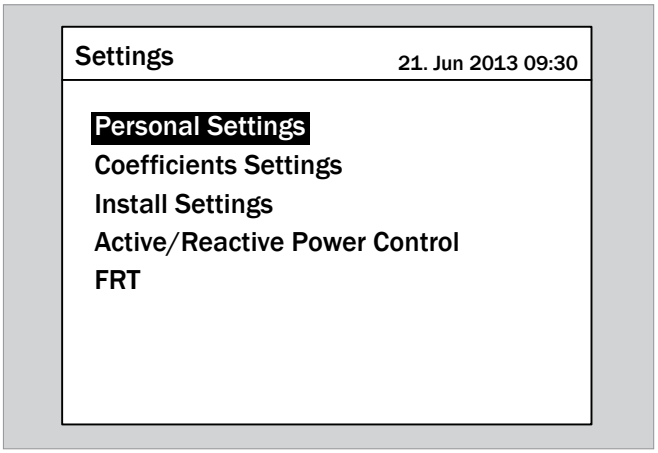
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



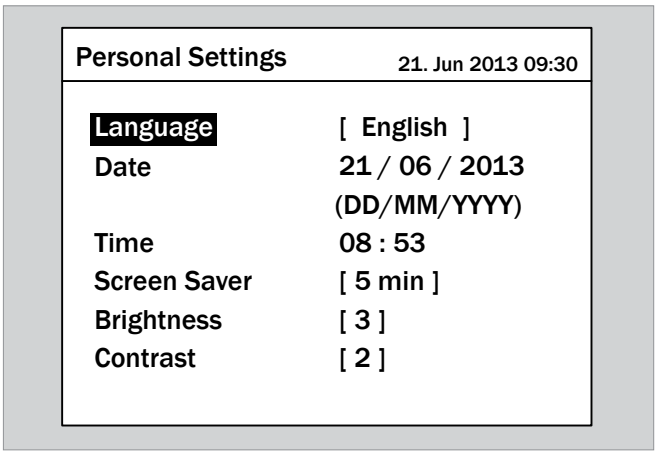
2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



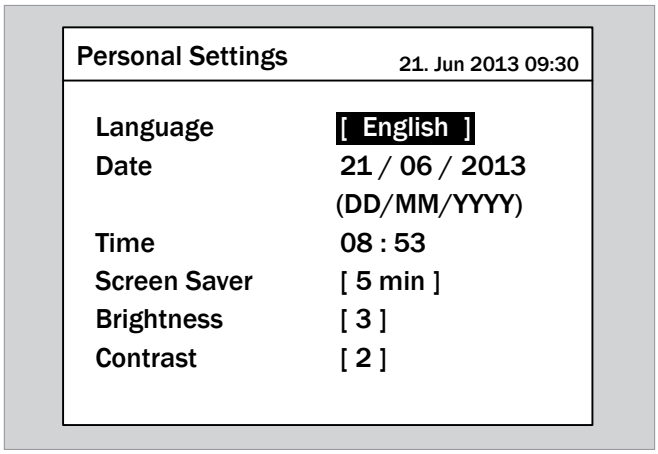
3. Using the ▼ and ▲ buttons, select the **Personal Settings** entry and press the ENT button.



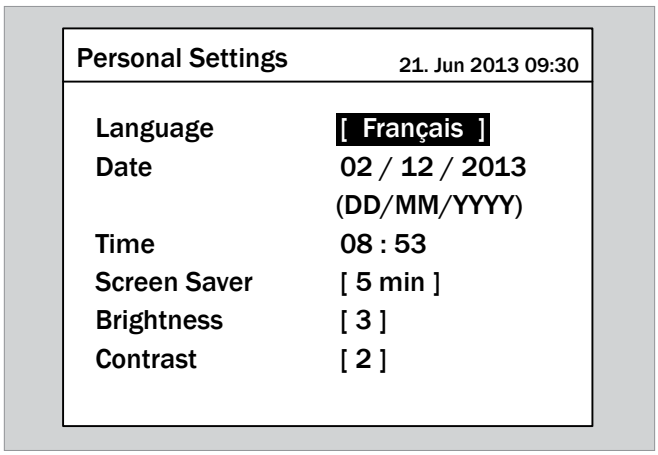
4. Using the ▼ and ▲ buttons, select the **Language** entry and press the ENT button.



→ The language is highlighted and can be changed.

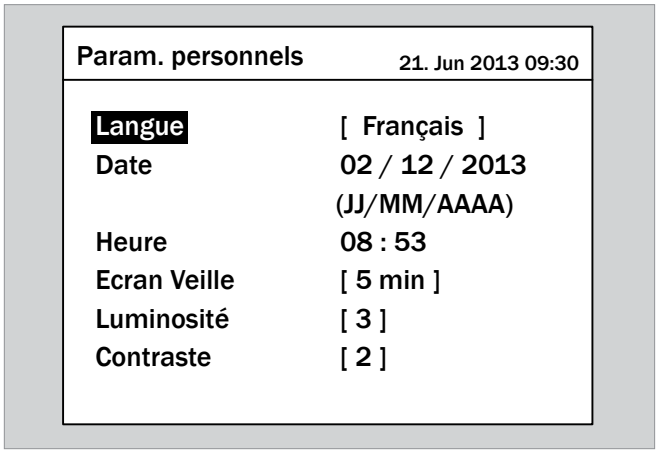


5. Use the ▼ and ▲ buttons to select a language.



6. Press the ENT button to confirm the selection.

☑ The new language is set.



9.3 Display contrast

Overview

You can set the display contrast with this function.

Path to the menu item

Main Menu > **Settings** > **Personal Settings** > **Contrast**

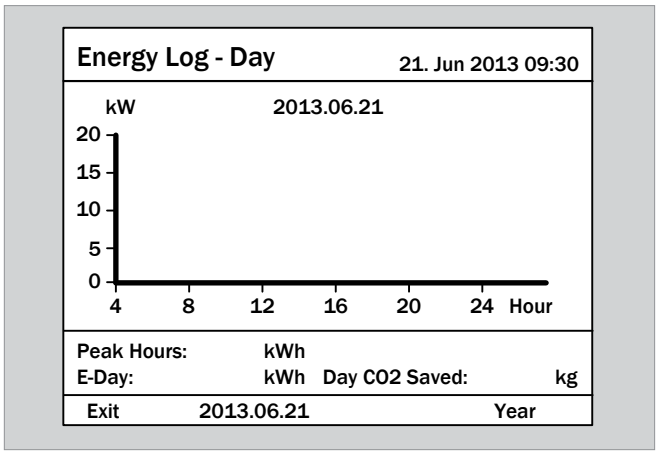
Setting options

Parameter	Description / Setting range
	Display contrast
Contrast	Setting range:
	1 .. 5

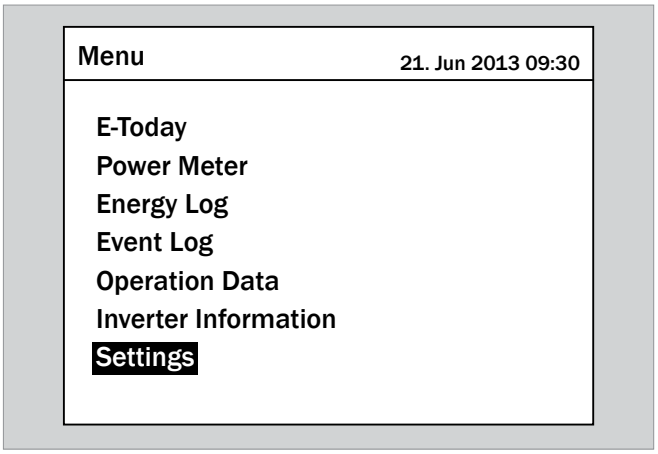
Setting the display contrast

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

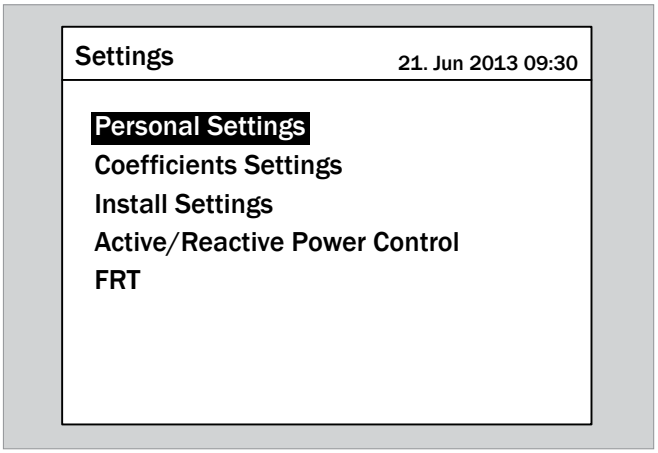
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



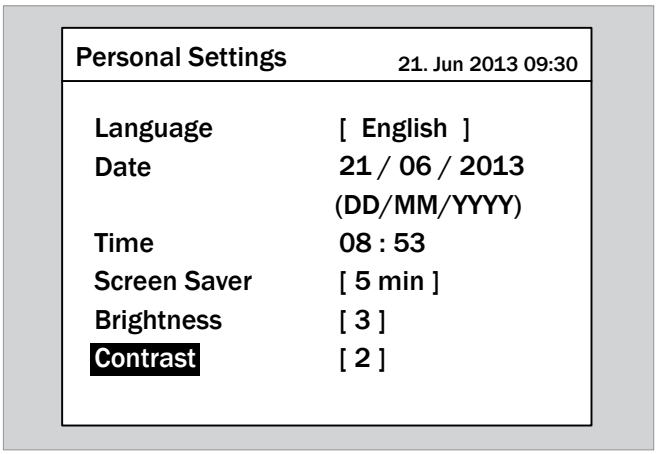
2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



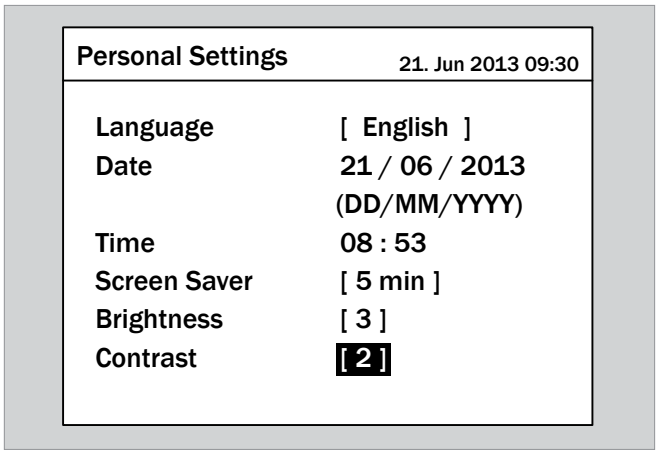
3. Using the ▼ and ▲ buttons, select the **Personal Settings** entry and press the ENT button.



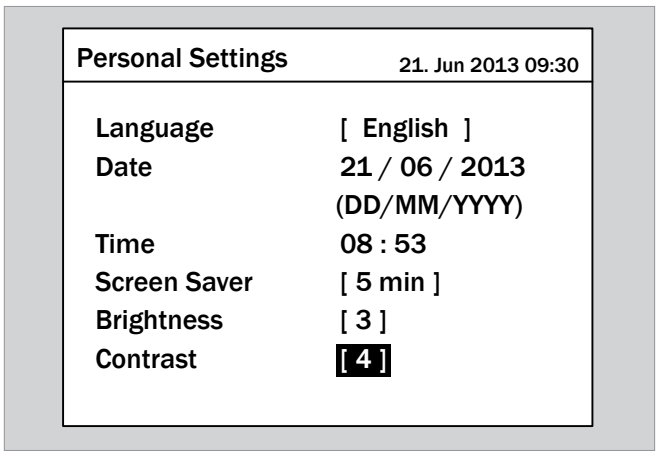
4. Using the ▼ and ▲ buttons, select the **Contrast** entry and press the ENT button.



→ The value is highlighted and can be changed.

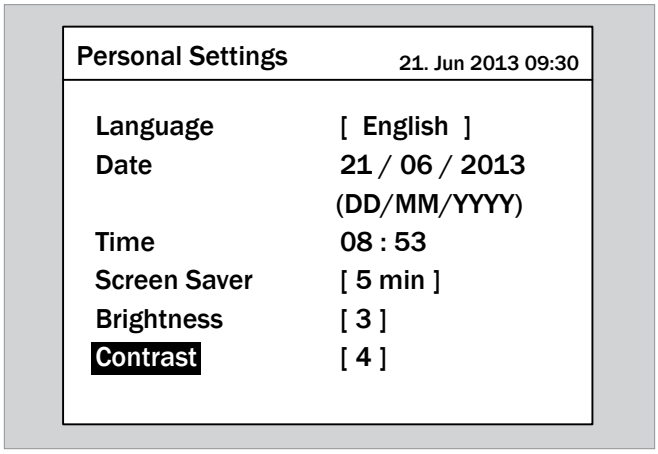


5. Use the ▼ and ▲ buttons to select the value.



6. Press the ENT button to confirm.

☑ The display contrast is set.



9.4 Display brightness

Overview

You can set the display brightness with this function.

Path to the menu item

`Main Menu` > `Settings` > `Personal Settings` > `Brightness`

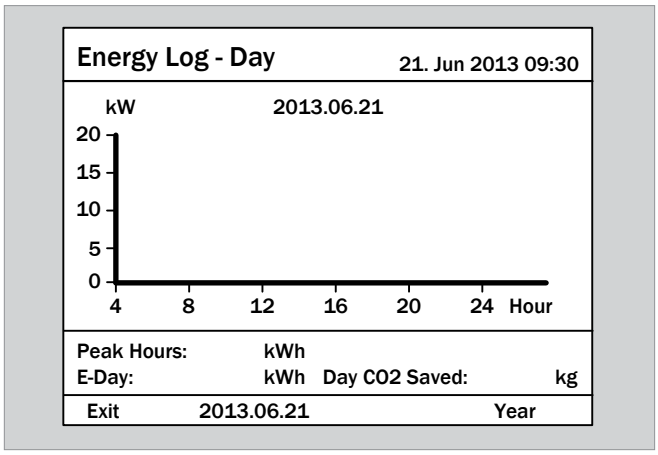
Setting options

Parameter	Description / Setting range
	Display brightness
`Brightness`	Setting range:
	`1 .. 5`

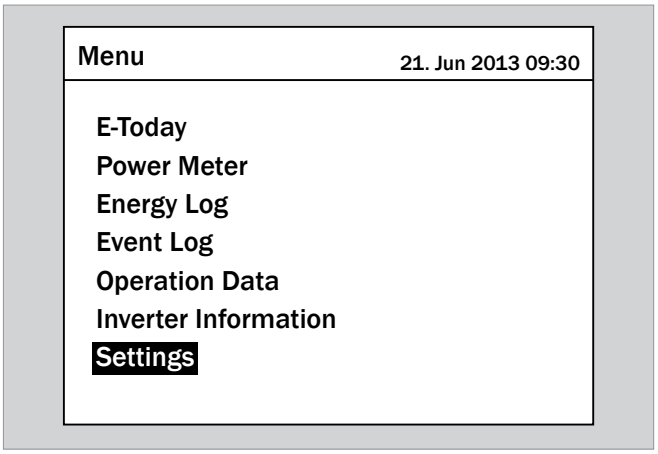
Setting the display brightness

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

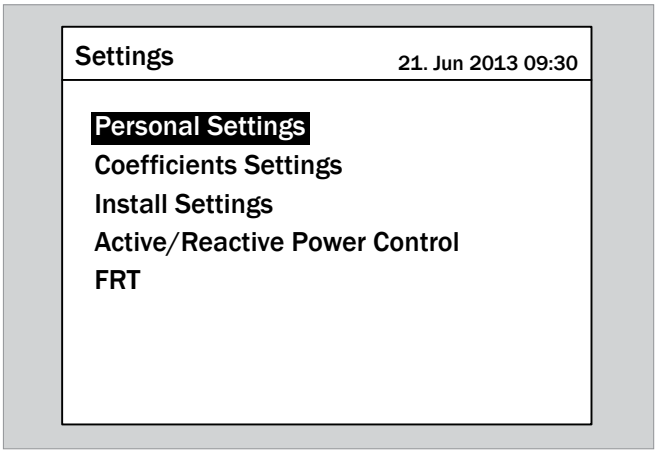
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



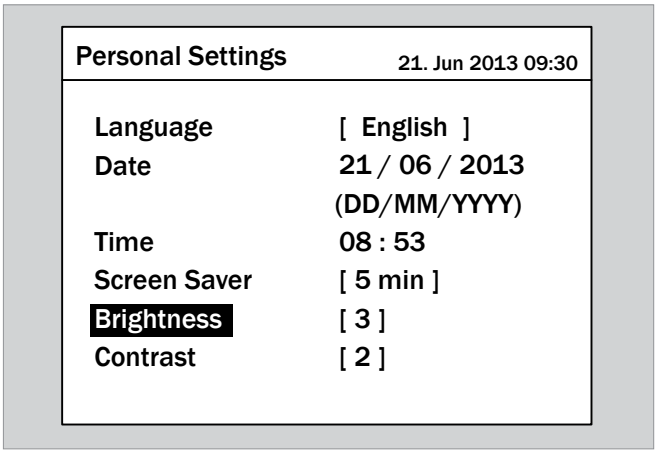
2. Using the ▼ and ▲ buttons, select the **`Settings`** entry and press the ENT button.



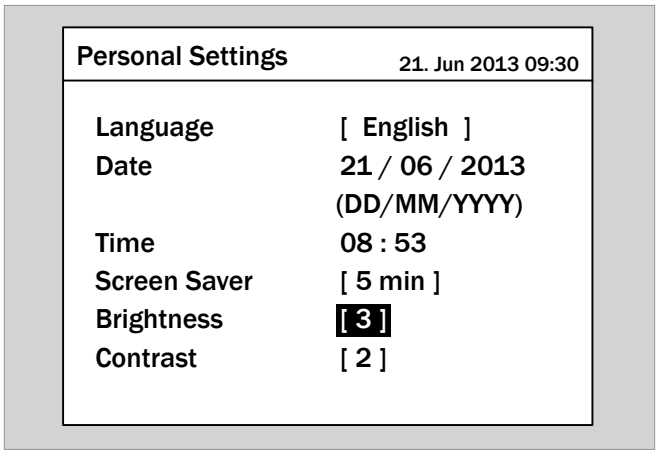
3. Using the ▼ and ▲ buttons, select the **`Personal Settings`** entry and press the ENT button.



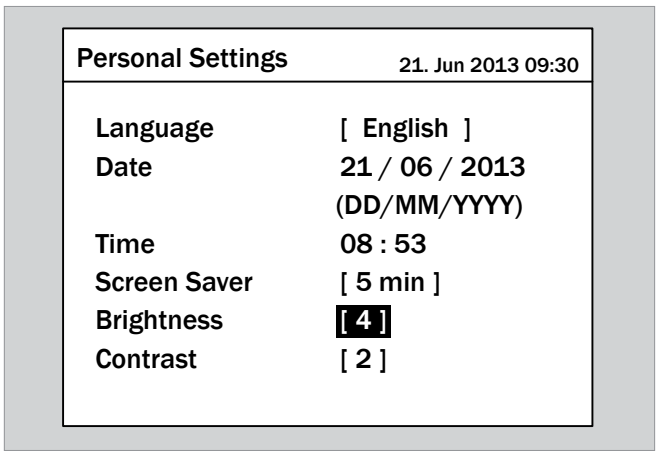
4. Using the ▼ and ▲ buttons, select the **`Brightness`** entry and press the ENT button.



→ The value is highlighted and can be changed.

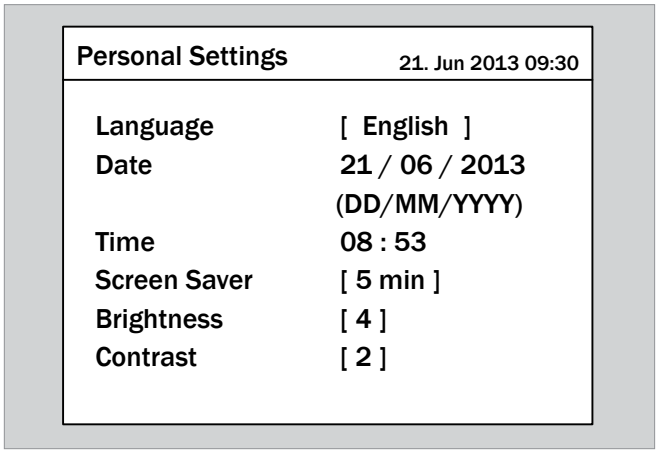


5. Use the ▼ and ▲ buttons to select the value.



6. Press the ENT button to confirm.

☑ The display brightness is set.



9.5 Automatic switch-off of display illumination

Overview

Using this function, you can set the number of minutes until the display illumination switches off automatically.

Path to the menu item

`Main Menu` > `Settings` > `Personal Settings` > `Screen Saver`

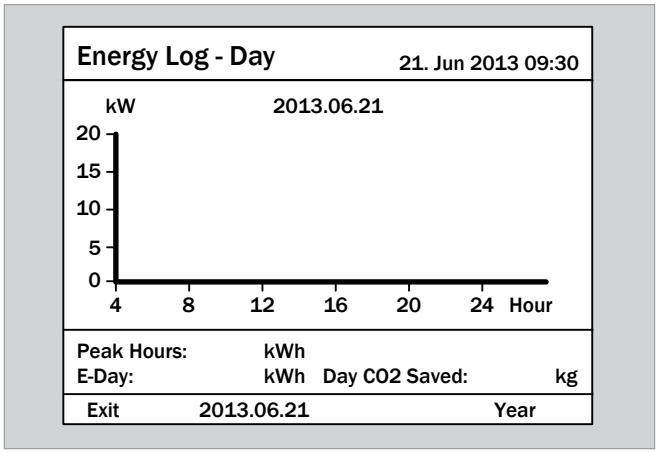
Setting options

Parameter	Description / Setting range
`Screen saver`	Time in minutes until the display illumination switches off automatically. Setting range: `5 .. 60 min`

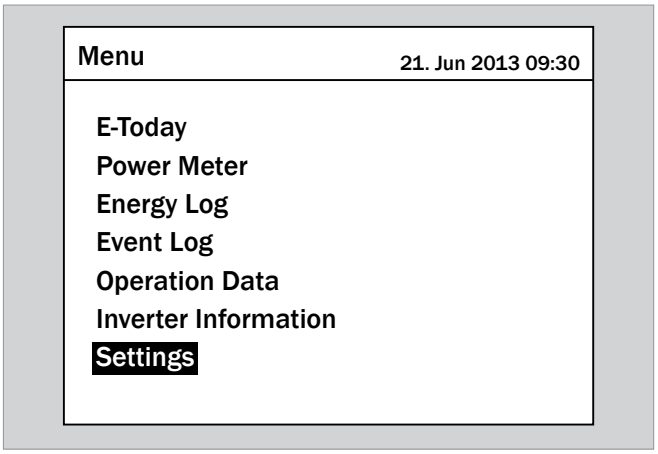
Setting the automatic screen saver

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

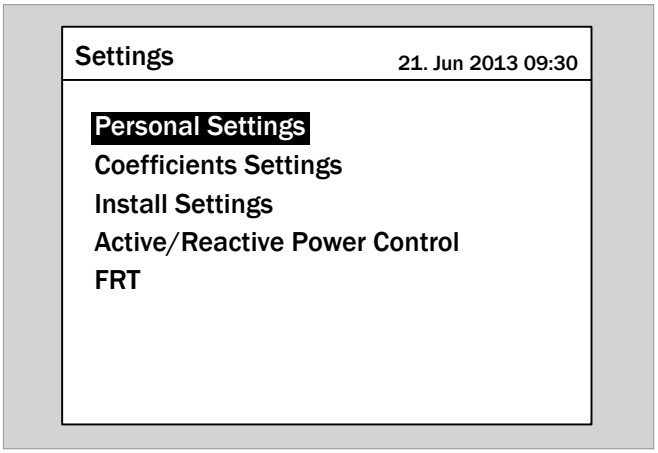
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



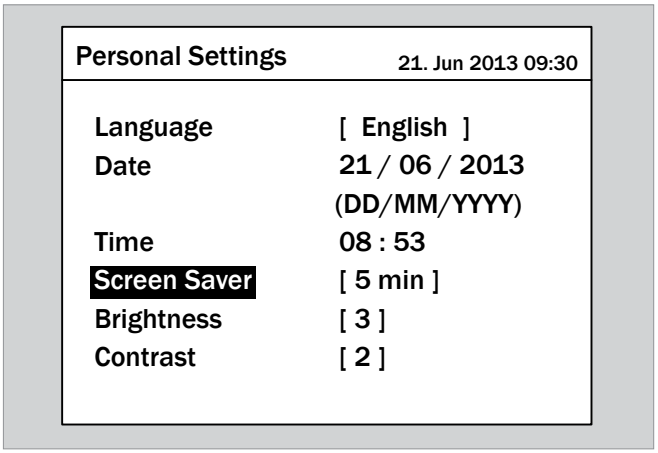
2. Using the ▼ and ▲ buttons, select the `Settings` entry and press the ENT button.



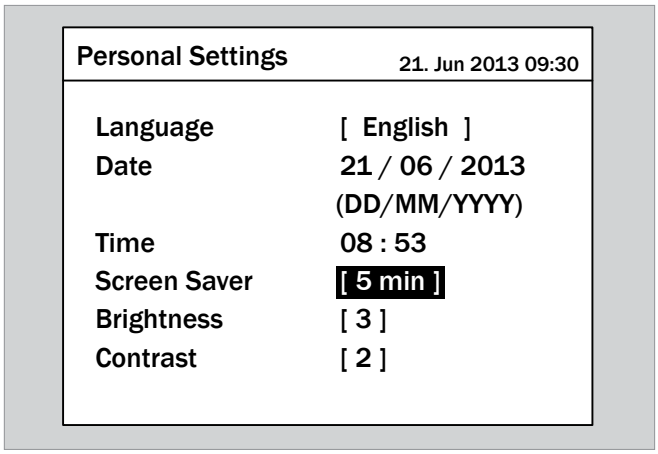
3. Using the ▼ and ▲ buttons, select the `Personal Settings` entry and press the ENT button.



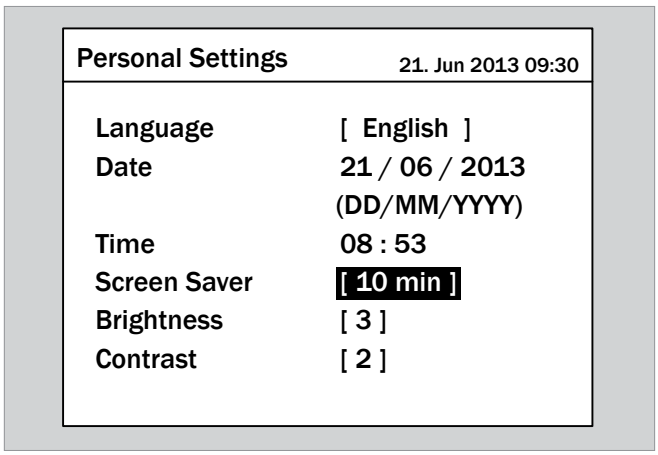
4. Using the ▼ and ▲ buttons, select the `Screen saver` entry and press the ENT button.



→ The value is highlighted and can be changed.

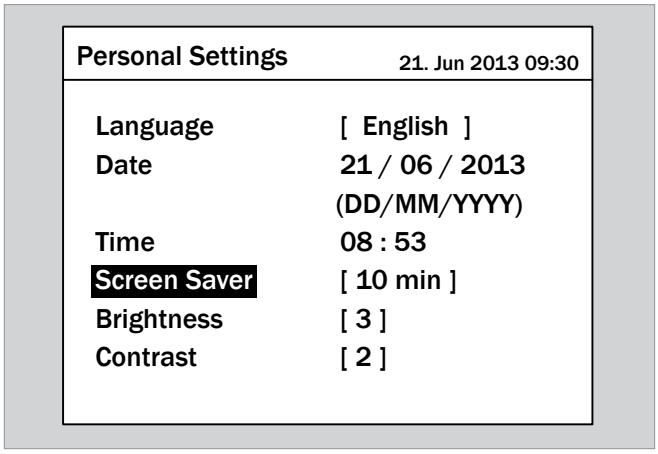


5. Use the ▼ and ▲ buttons to select the value.



6. Press the ENT button to confirm.

☑ The automatic screen saver is set.



9.6 Date

Overview

You can set the date with this function.

► The date and time must be correctly set to ensure accurate calculation of the statistics in the inverter and in monitoring systems.

Path to the menu item

Main Menu > **Settings** > **Personal Settings** > **Date**

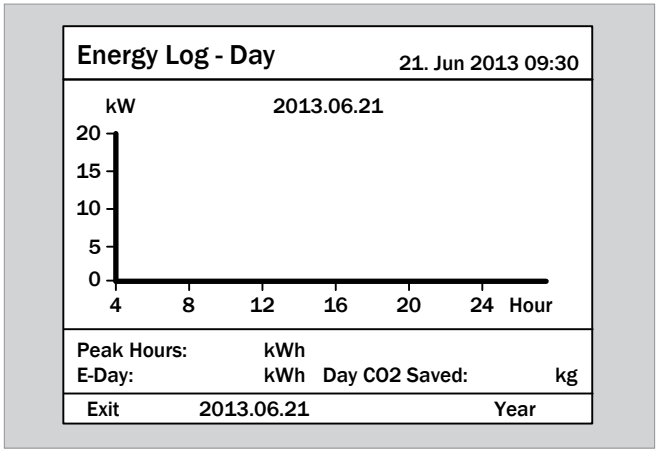
Setting options

Parameter	Description / Range of values
Date	The date in DD / MM / YYYY format.

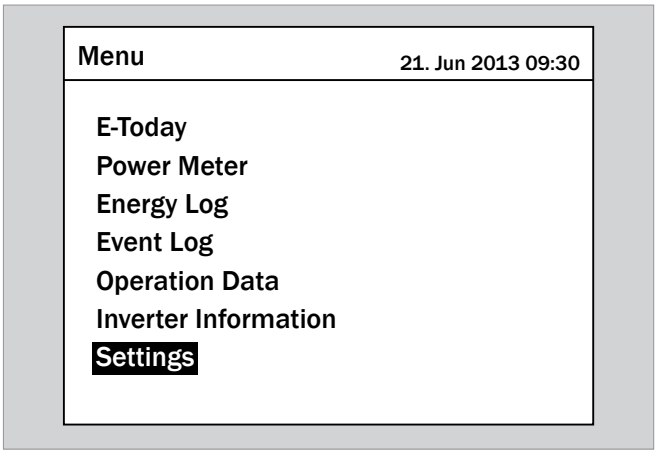
Setting the date

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

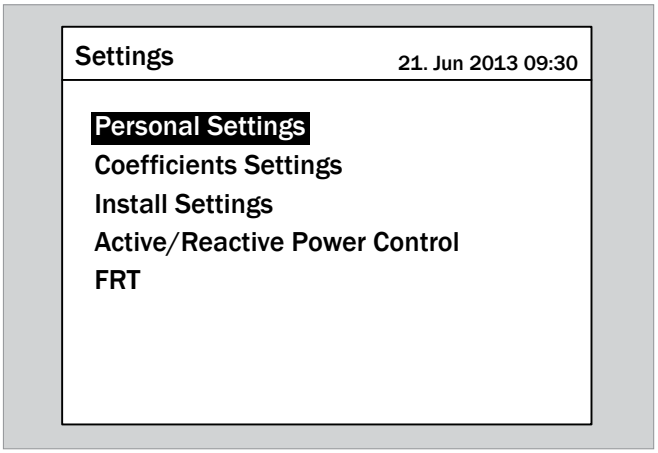
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



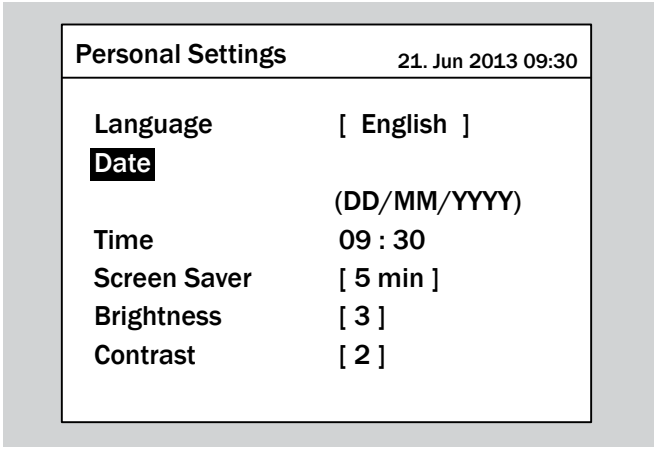
2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



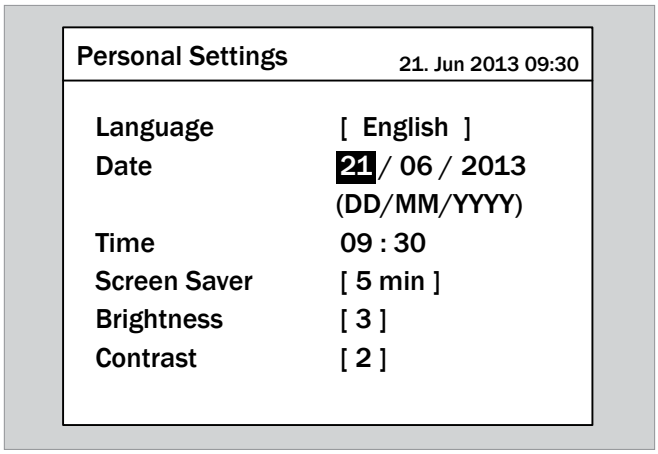
3. Using the ▼ and ▲ buttons, select the **Personal Settings** entry and press the ENT button.



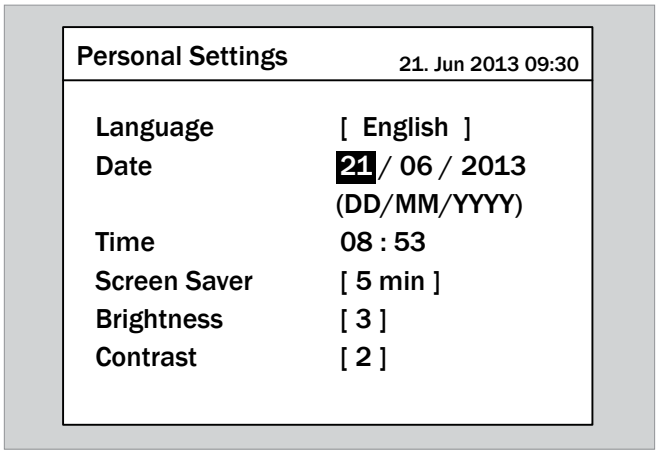
4. Using the ▼ and ▲ buttons, select the **Date** entry and press the ENT button.



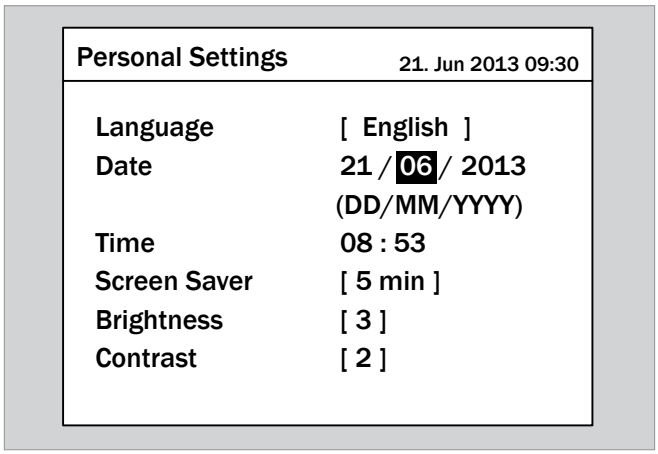
→ The day is highlighted.



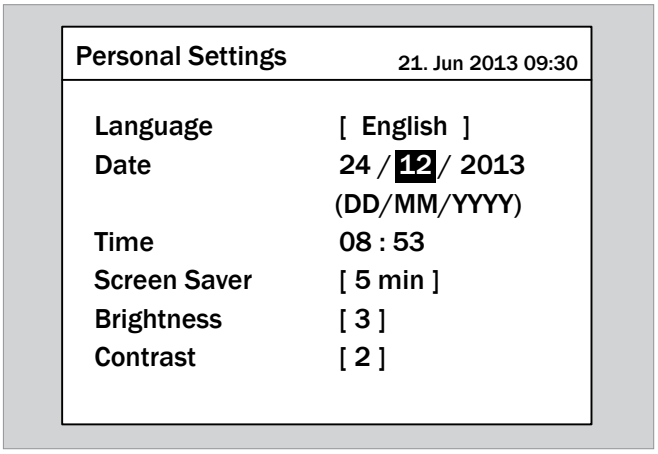
5. Using the ▼ and ▲ buttons, set the value and press the ENT button.



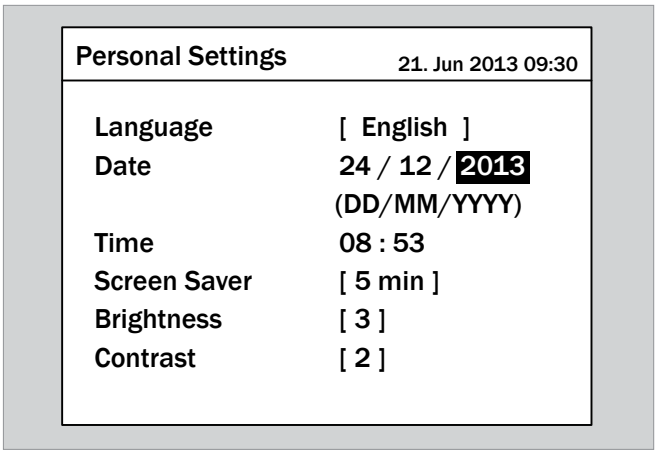
→ The month is highlighted.



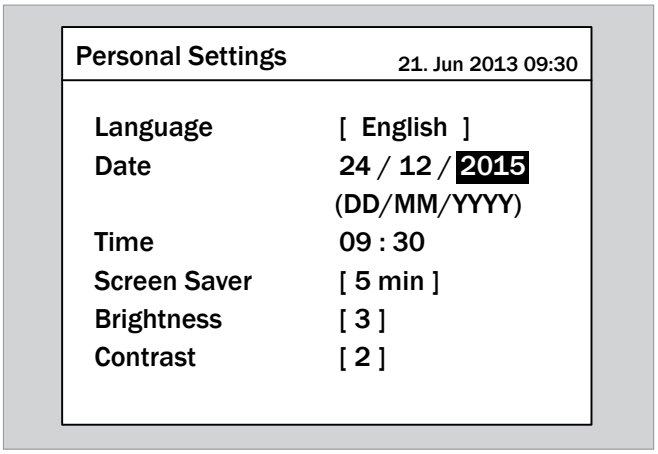
6. Using the ▼ and ▲ buttons, set the value and press the ENT button.



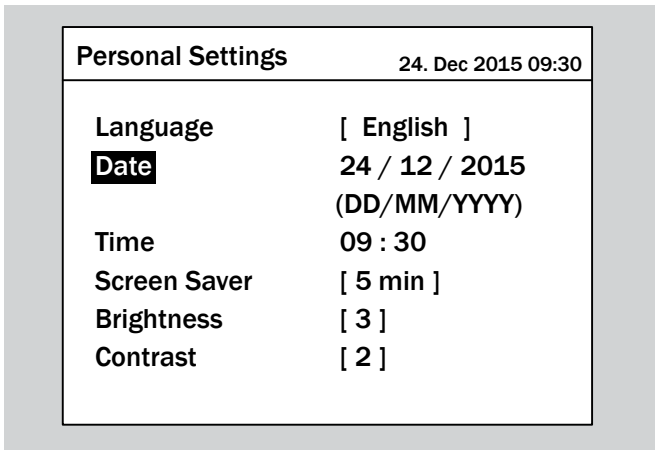
→ The year is highlighted.



7. Using the ▼ and ▲ buttons, set the value and press the ENT button.



☑ The date is set.


Personal Settings
24. Dec 2015 09:30
Language
[English]
Date
24 / 12 / 2015
(DD/MM/YYYY)
Time
09 : 30
Screen Saver
[5 min]
Brightness
[3]
Contrast
[2]

9.7 Time

Overview

You can set the time with this function.

► The date and time must be correctly set to ensure accurate calculation of the statistics in the inverter and in monitoring systems.

Path to the menu item

Main Menu > **Settings** > **Personal Settings** > **Time**

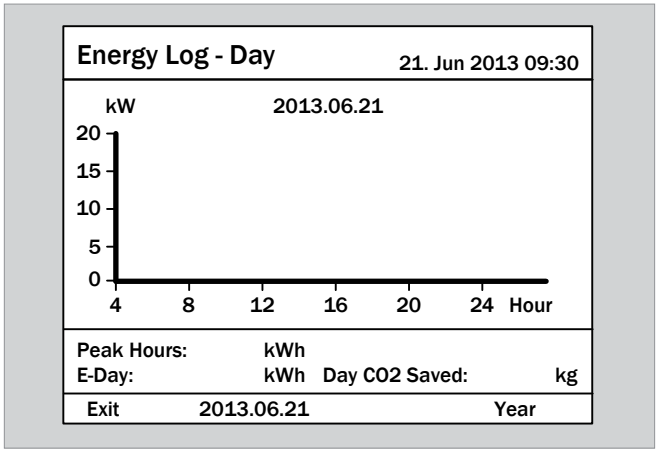
Setting options

Parameter	Description / Range of values
Time	The time in 24-hour format.

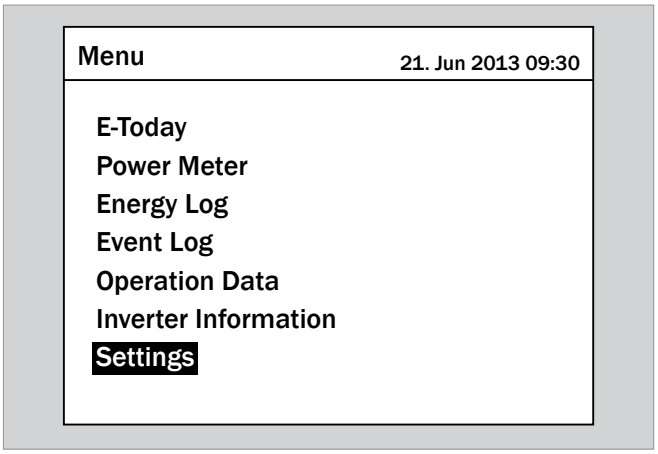
Setting the time

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

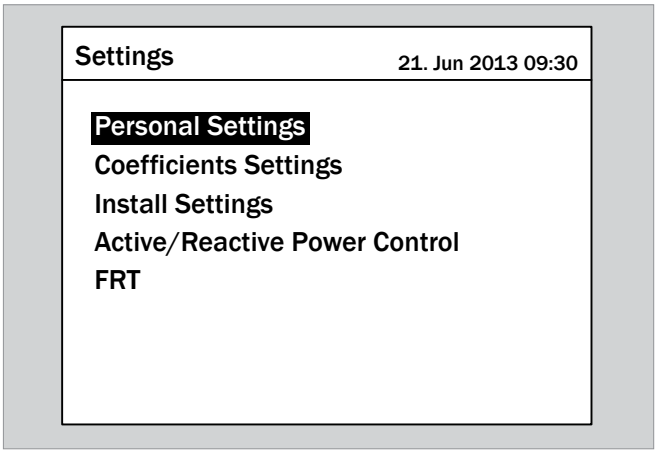
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



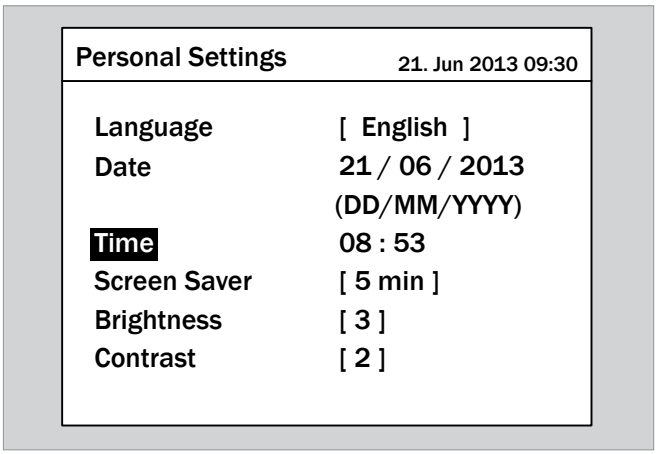
2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



3. Using the ▼ and ▲ buttons, select the **Personal Settings** entry and press the ENT button.

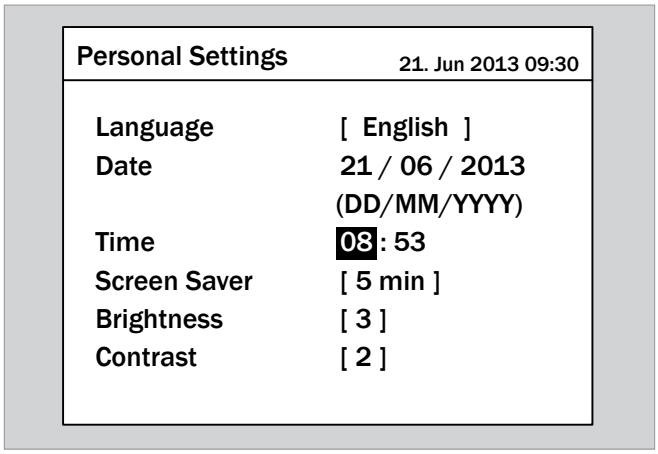


4. Using the ▼ and ▲ buttons, select the **Time** entry and press the ENT button.



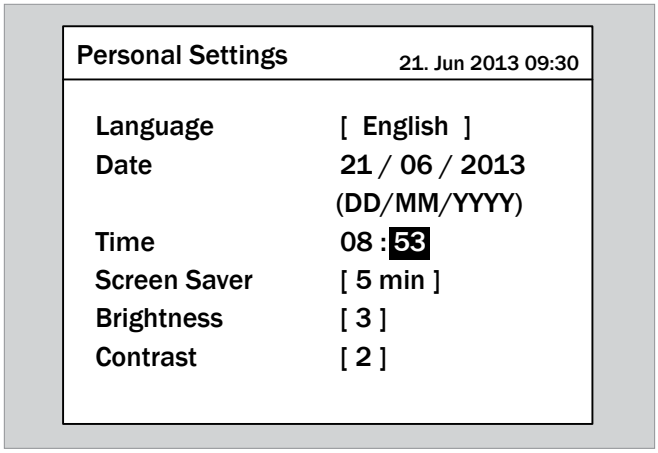
→ The hours are highlighted.

5. Using the ▼ and ▲ buttons, set the value and press the ENT button.

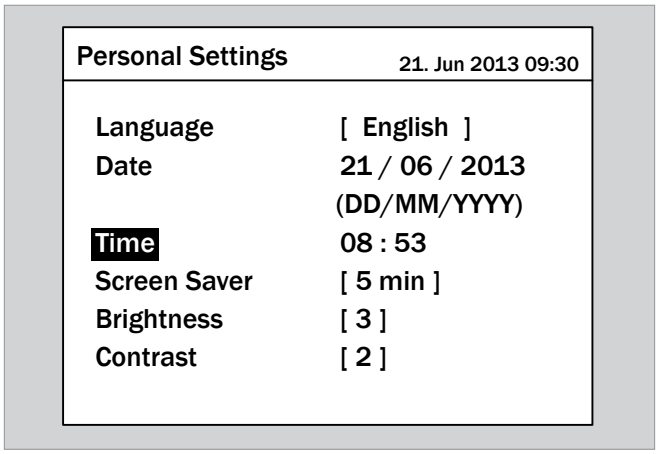


→ The minutes are highlighted.

6. Using the ▼ and ▲ buttons, set the value and press the ENT button.



☑ The time is set.



9.8 Baud rate for RS485

Overview

You can set the baud rate for RS485 with this function.

► If several inverters are interconnected via RS485, the same baud rate must be set on each inverter.

Path to the menu item

Main Menu > **Settings** > **Coefficients Settings** > **Baud rate**

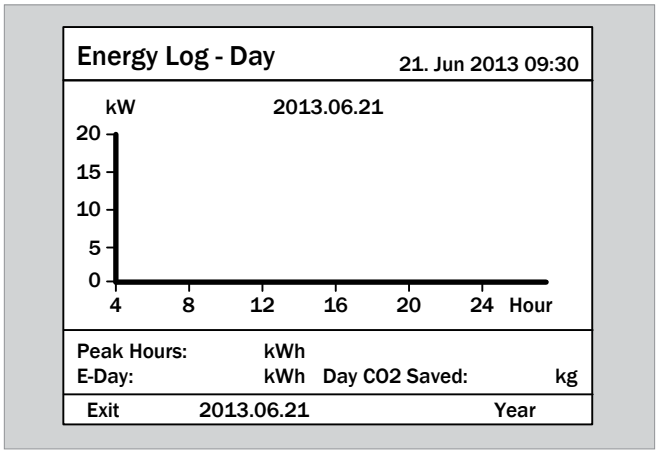
Setting options

Parameter	Description / Setting range
Baud rate	The baud rate for the RS485 link. Setting range: **9600** | **19200** | **38400**

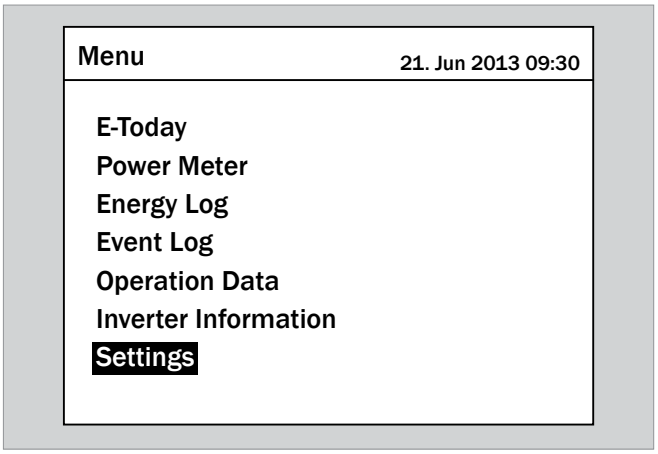
Setting the baud rate for RS485

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

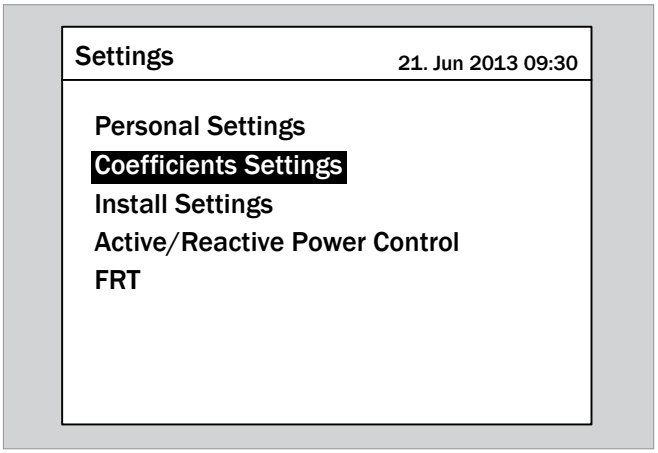
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



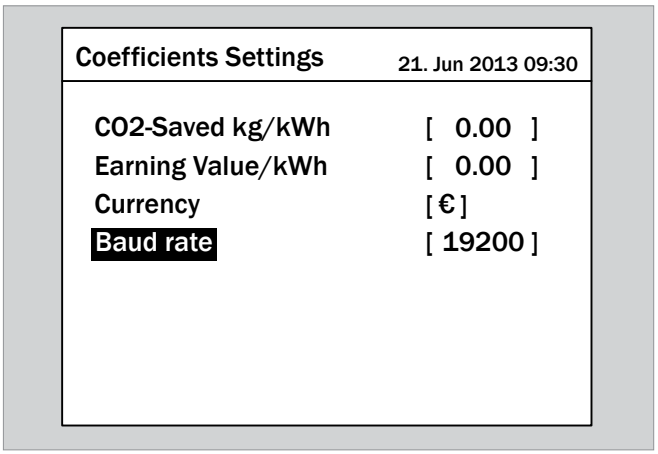
2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



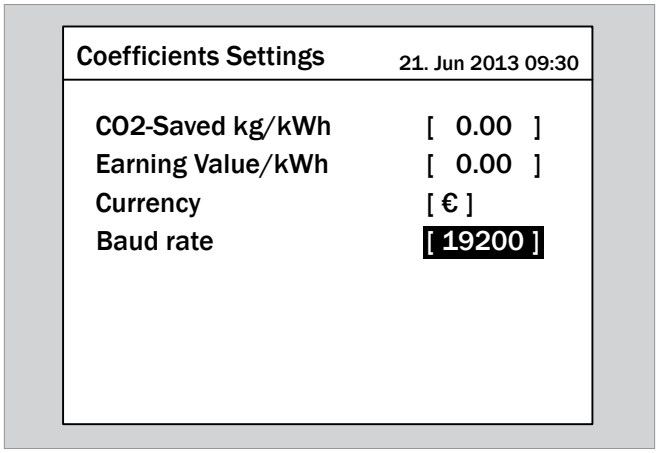
3. Using the ▼ and ▲ buttons, select the **Coefficients Settings** entry and press the ENT button.



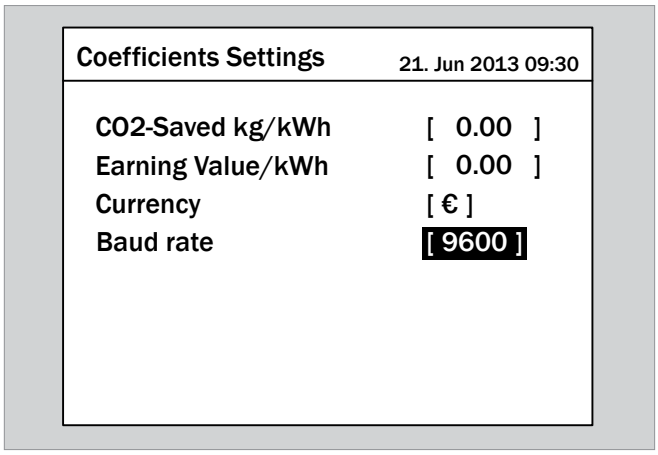
4. Using the ▼ and ▲ buttons, select the **Baud rate** entry and press the ENT button.



→ The value is highlighted and can be changed.

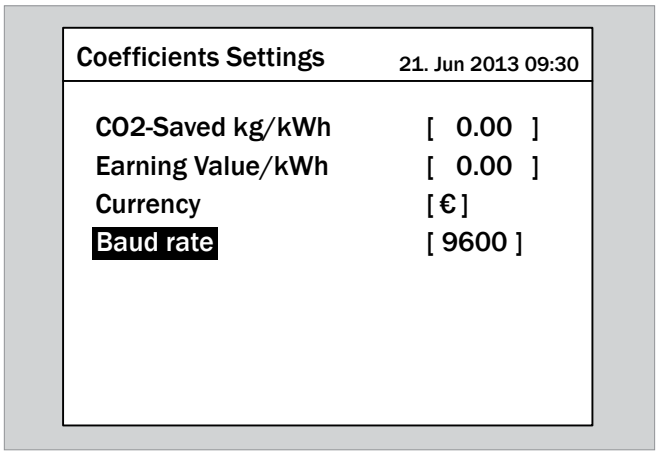


5. Use the ▼ and ▲ buttons to select the value.



6. Press the ENT button to confirm.

☑ The baud rate is set.



9 Settings

9.9 Inverter ID

Overview

You can set the inverter ID with this function.

If there are several inverters interconnected in the PV installation, a different inverter ID must be defined for each inverter. The inverter ID is used in the monitoring system, for example, in order to be able to identify the inverter uniquely.

Path to the menu item

`Main Menu` > `Settings` > `Install Settings` > `Inverter ID`

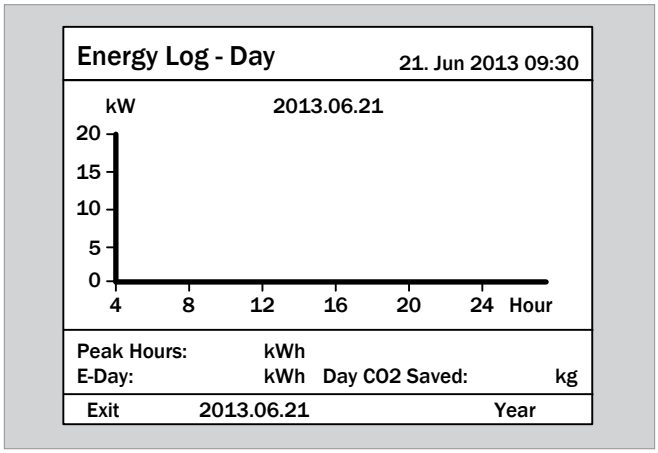
Setting options

Parameter	Description / Setting range
`Inverter ID`	Inverter ID. Setting range: `001 ... 254`

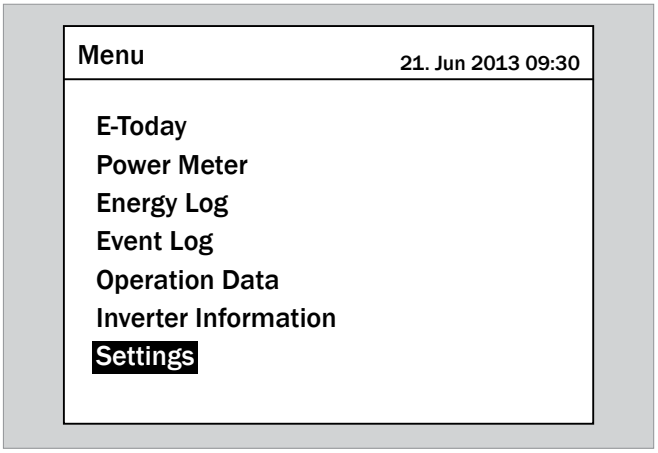
Setting the inverter ID

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

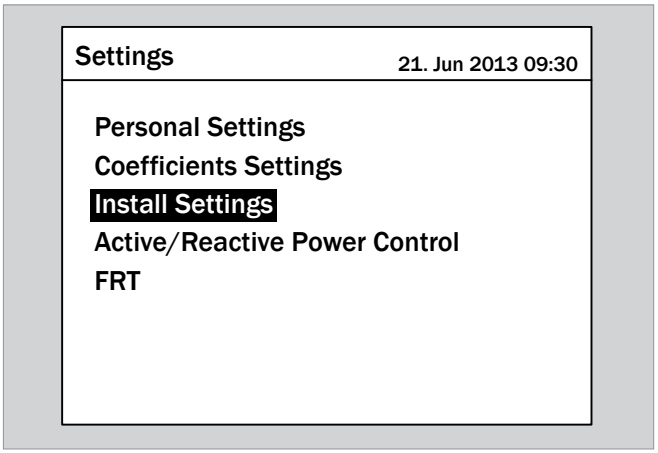
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



2. Using the ▼ and ▲ buttons, select the `Settings` entry and press the ENT button.



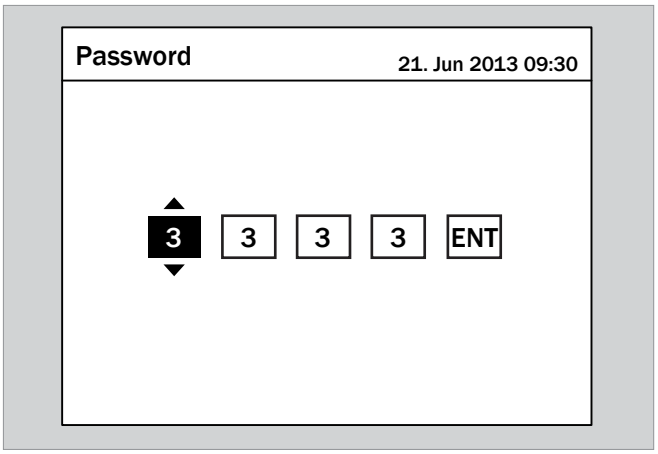
3. Using the ▼ and ▲ buttons, select the `Install Settings` entry and press the ENT button.



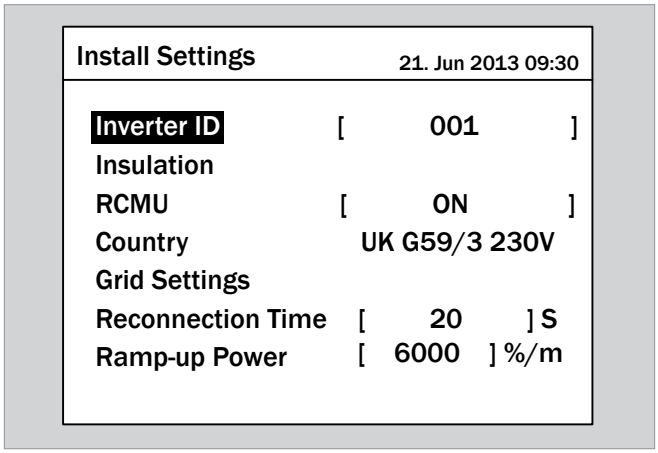
4. The function is protected with the password 5555.

Use the ▼ and ▲ buttons to set the individual digits.

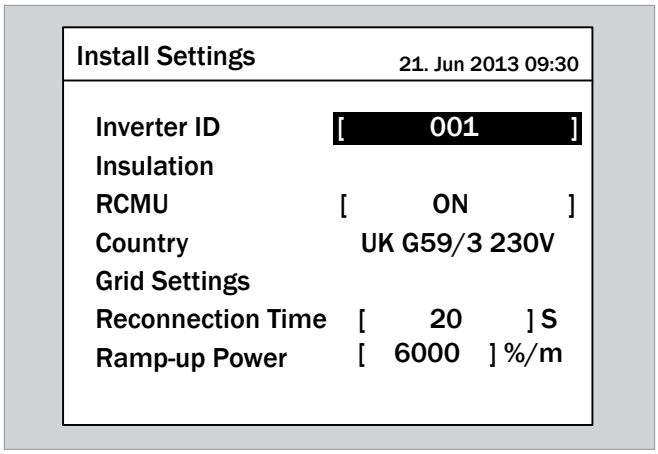
Press the ENT button to confirm a digit.



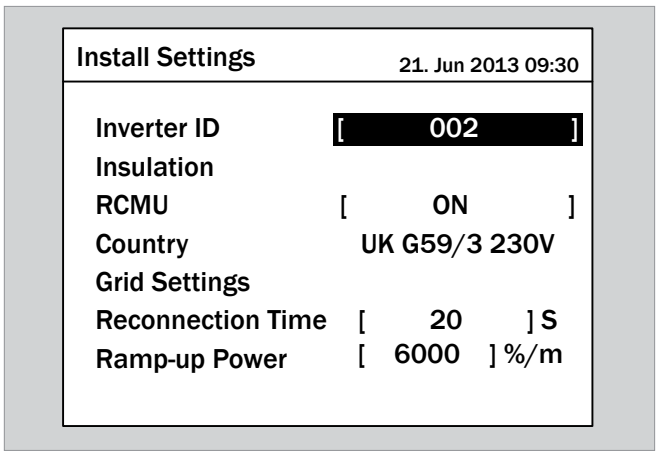
5. Using the ▼ and ▲ buttons, select the **`Inverter ID`** entry and press the ENT button.



→ The value is highlighted and can be changed.

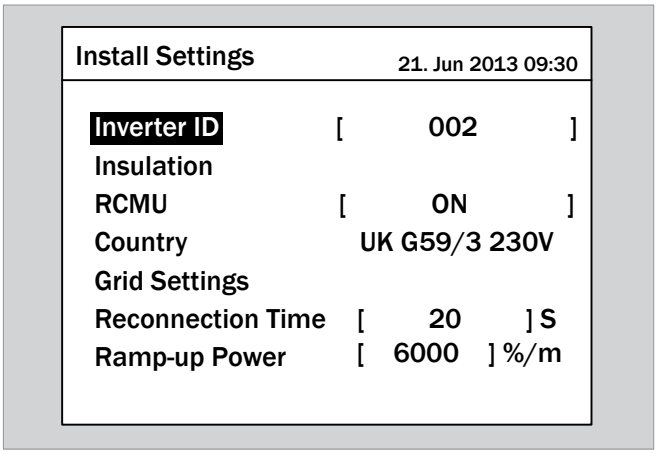


6. Use the ▼ and ▲ buttons to select the value.



7. Press the ENT button to confirm.

☑ The inverter ID is set.



9.10 CO_2 savings

Overview

This function can be used to enter how many kilograms of CO2 are saved per kWh on the inverter.

The value is used for the calculation of total savings.

Path to the menu item

Main Menu > **Settings** > **Coefficients Settings** > **CO2 Saved kg/kWh**

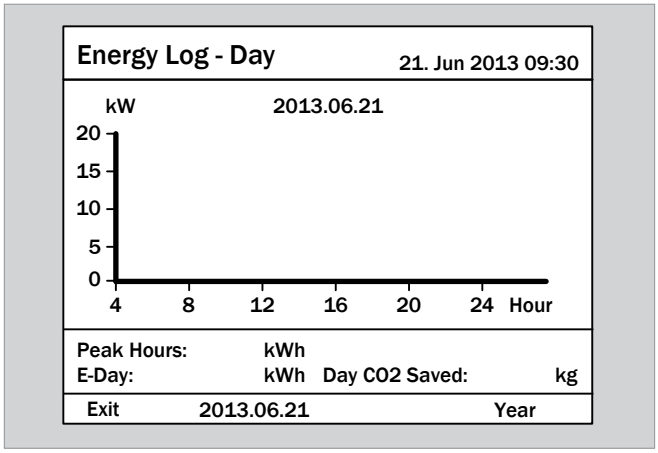
Setting options

Parameter	Description / Setting range
	CO_2 savings in kg per kWh.
CO2 Saved kg/kWh	Setting range:
	0 .. 9.99

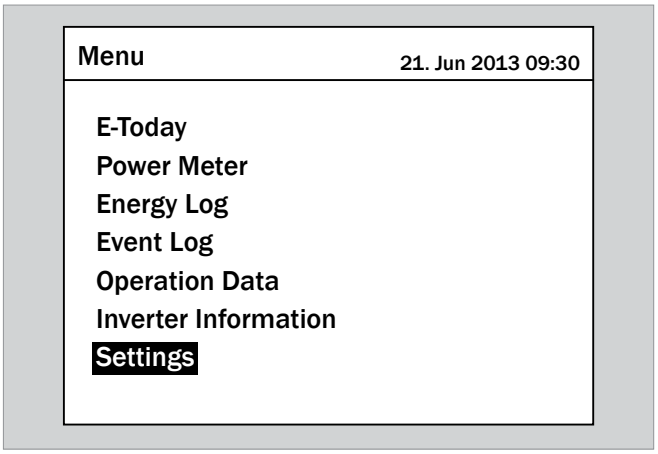
Setting the CO_2 savings

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

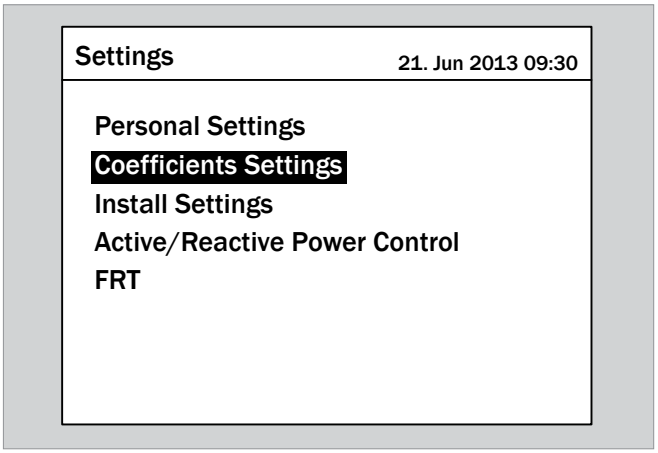
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



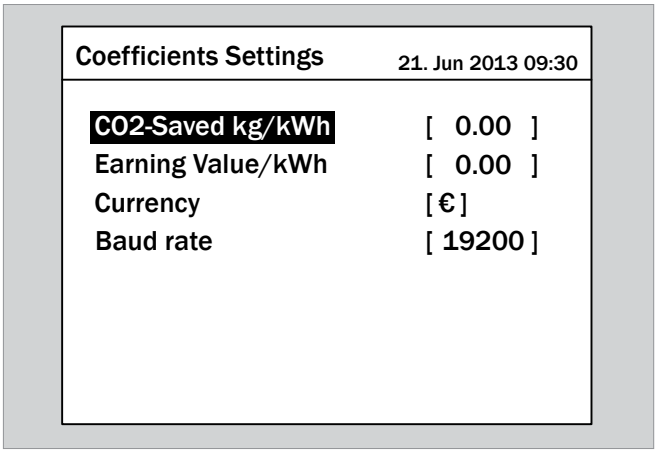
2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



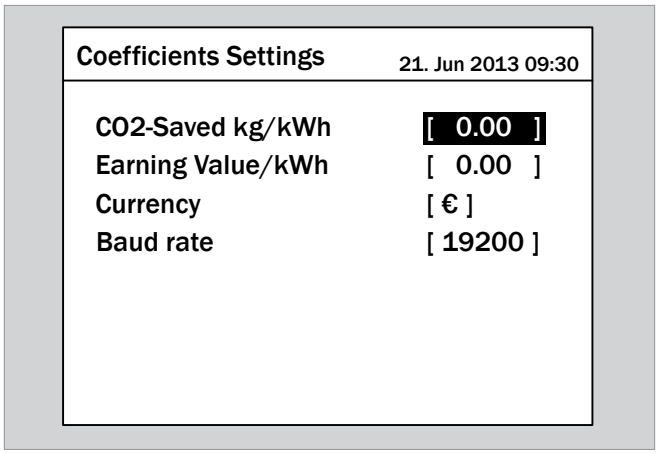
3. Using the ▼ and ▲ buttons, select the **Coefficients Settings** entry and press the ENT button.



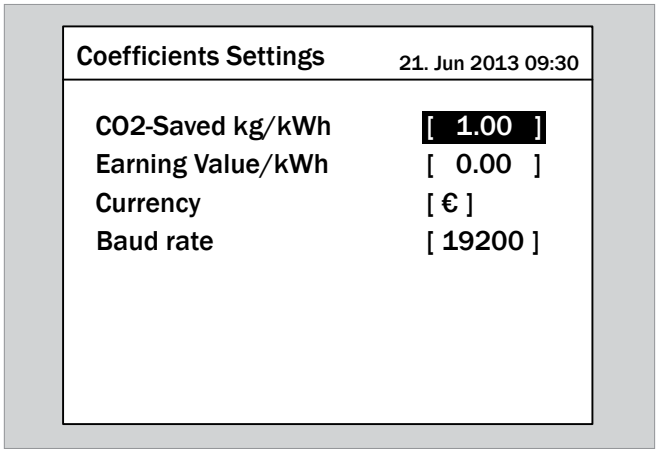
4. Using the ▼ and ▲ buttons, select the **CO2 Saved kg/kWh** entry and press the ENT button.



→ The value is highlighted and can be changed.

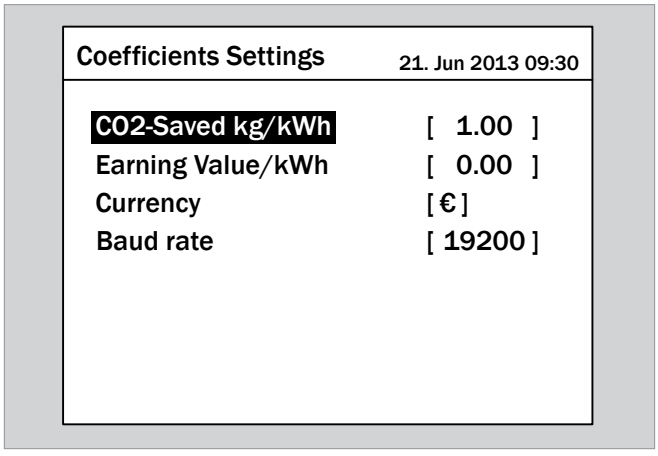


5. Use the ▼ and ▲ buttons to select the value.



6. Press the ENT button to confirm.

☑ The CO_2 saved per kWh is set.



9 Settings

9.11 Currency

Overview

This function can be used to set the currency for calculating the feed-in remuneration.

Path to the menu item

`Main Menu` > `Settings` > `Coefficients Settings` > `Currency`

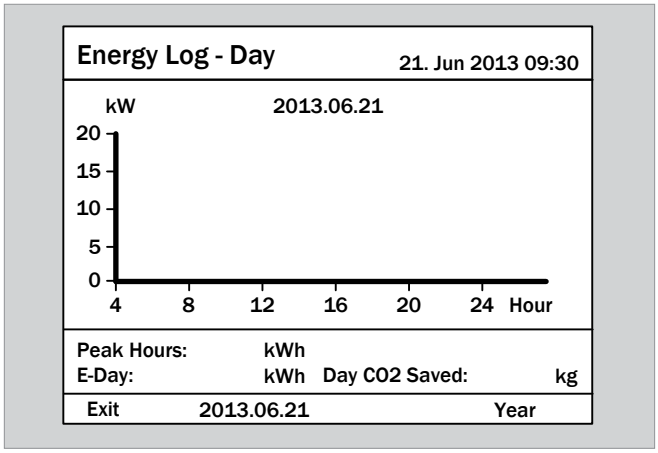
Setting options

Parameter	Description / Setting range
`Currency`	The currency for calculating the feed-in remuneration Setting range: **€ | $**

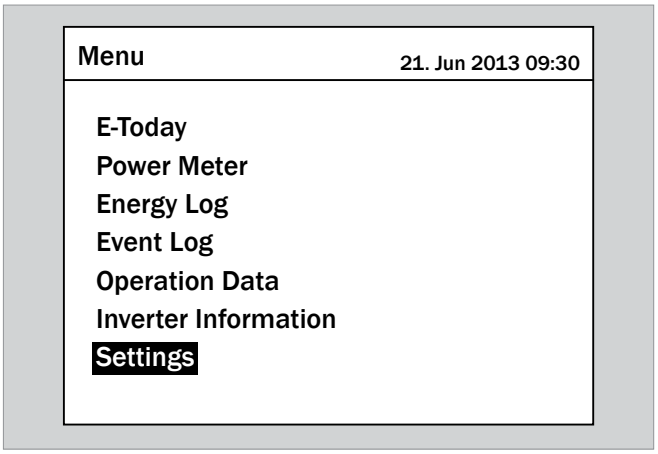
Setting the currency

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

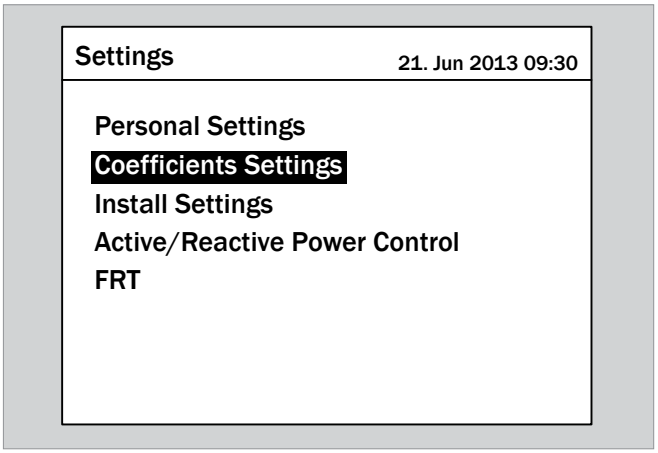
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



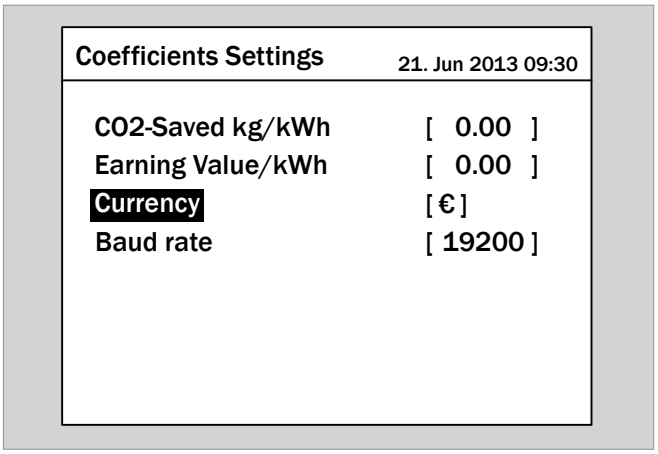
2. Using the ▼ and ▲ buttons, select the `Settings` entry and press the ENT button.



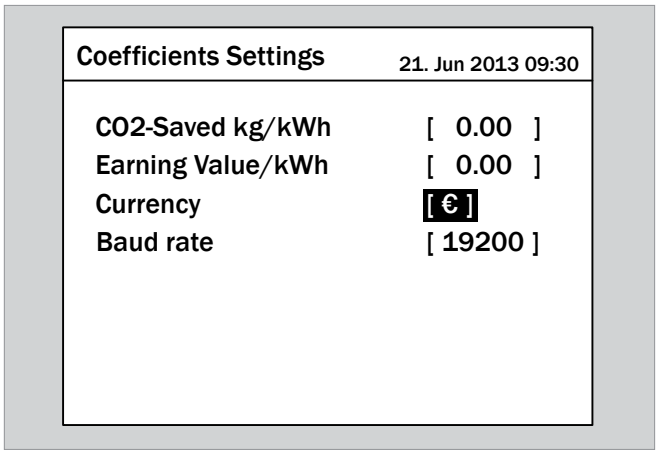
3. Using the ▼ and ▲ buttons, select the `Coefficients Settings` entry and press the ENT button.



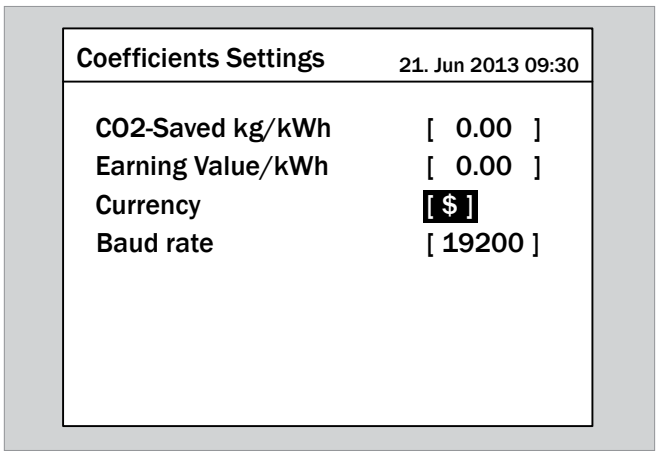
4. Using the ▼ and ▲ buttons, select the `Currency` entry and press the ENT button.



→ The value is highlighted and can be changed.

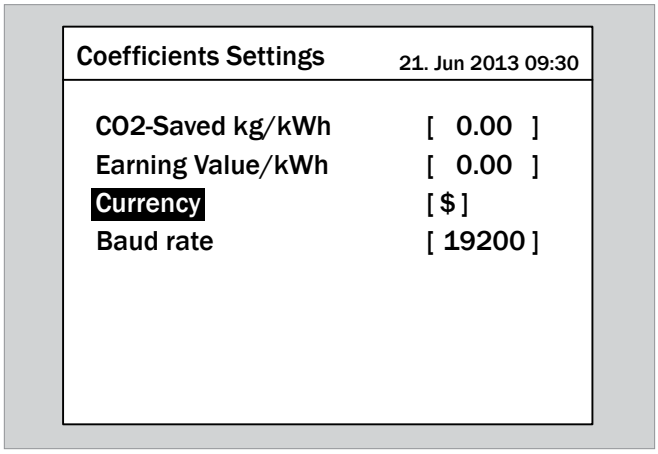


5. Use the ▼ and ▲ buttons to select the value.



6. Press the ENT button to confirm.

☑ The currency is set.



9.12 Insulation mode and insulation resistance

This setting should only be changed after consultation with Delta customer service.

Overview

You can set the insulation mode and insulation resistance with this function.

Path to the menu item

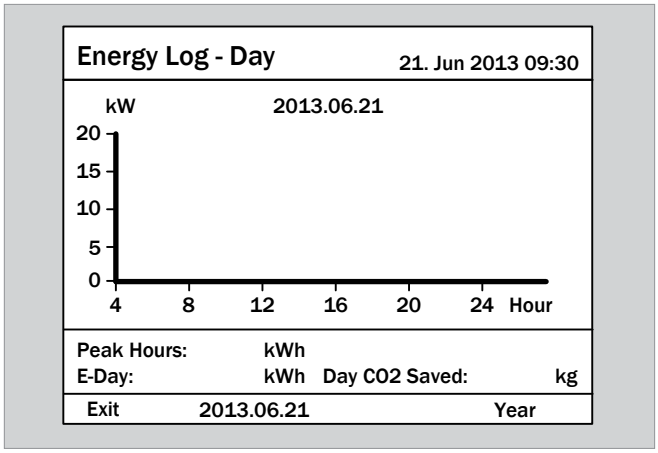
Main Menu > **Settings** > **Install Settings** > **Insulation**

Setting options

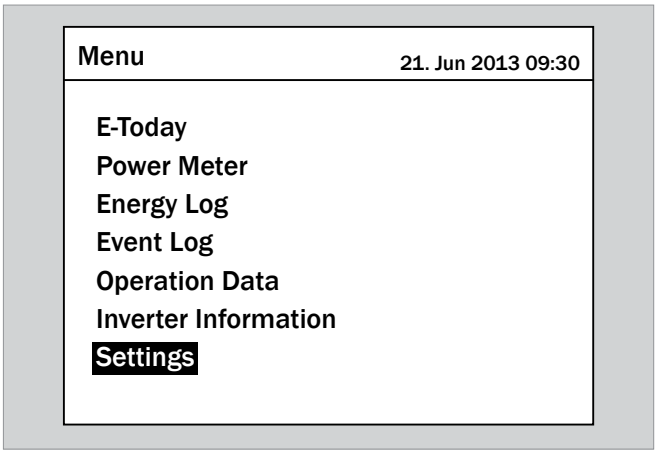
Parameter	Description / Setting range
Mode	Insulation mode Setting range: **Negative Ground** | **Positive Ground** | **DC1 only** | **DC2 only** | **OFF** | **ON**
Resistance	Insulation resistance in kΩ Setting range: **300** | **550** | **1200**

Setting the insulation mode and insulation resistance

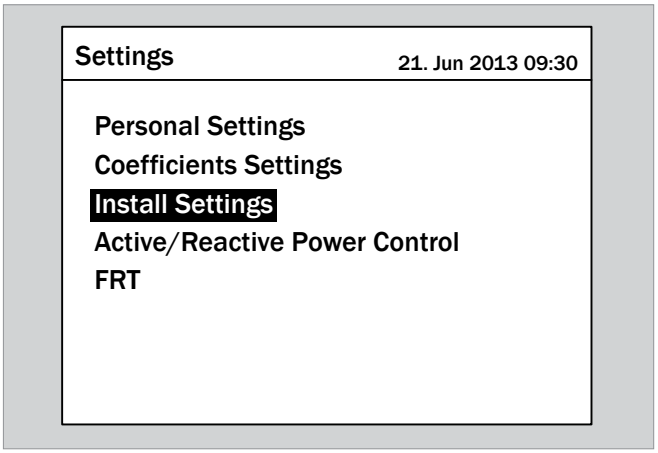
1. If the default information is displayed, press the EXIT button to open the main menu.
   Alternatively, press the EXIT button repeatedly until the main menu is displayed.



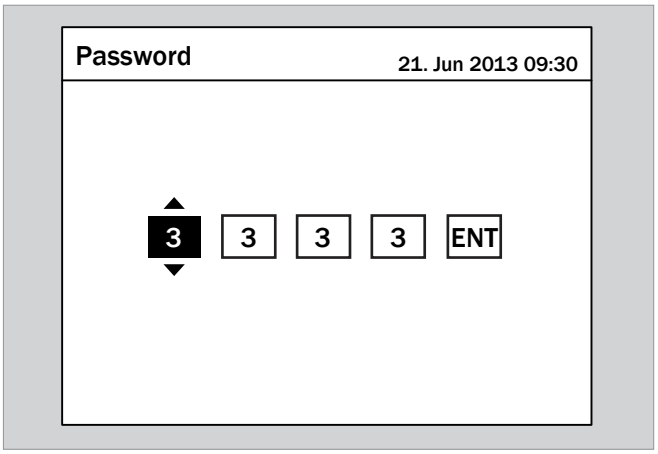
2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



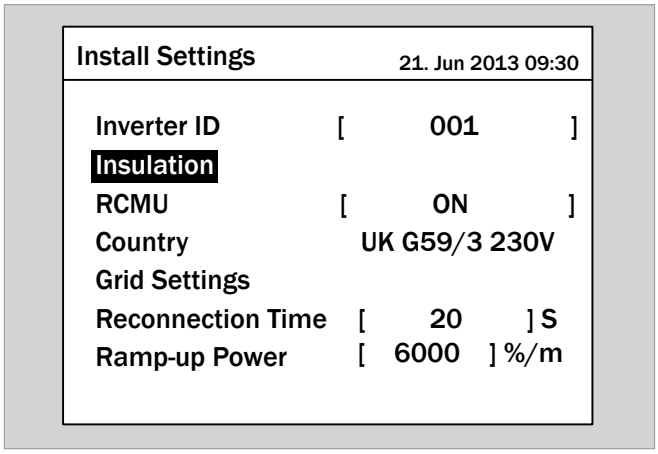
3. Using the ▼ and ▲ buttons, select the **Install Settings** entry and press the ENT button.



4. The function is protected with the password 5555.
   Use the ▼ and ▲ buttons to set the individual digits.
   Press the ENT button to confirm a digit.

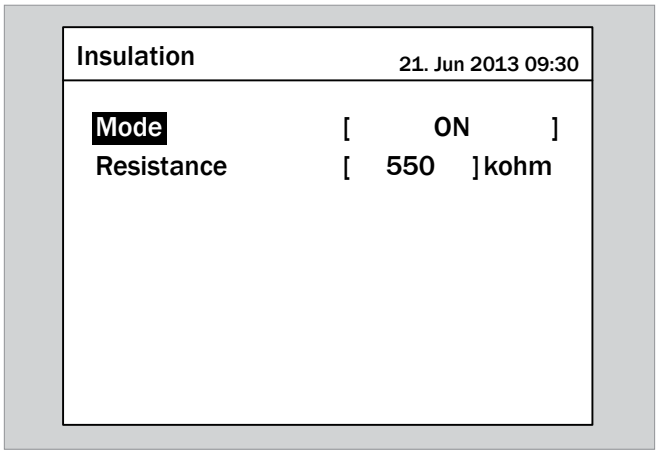


5. Using the ▼ and ▲ buttons, select the **Insulation** entry and press the ENT button.

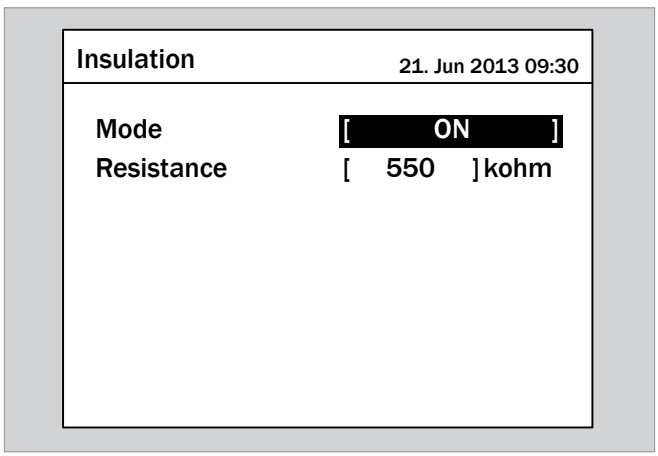


If you only want to set the insulation resistance, you can go directly to Step 9.

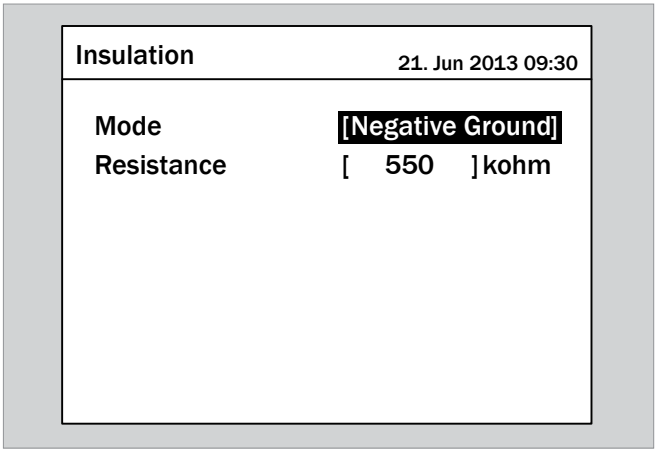
6. Using the ▼ and ▲ buttons, select the **Mode** entry and press the ENT button.



→ The present mode is highlighted and can be changed.

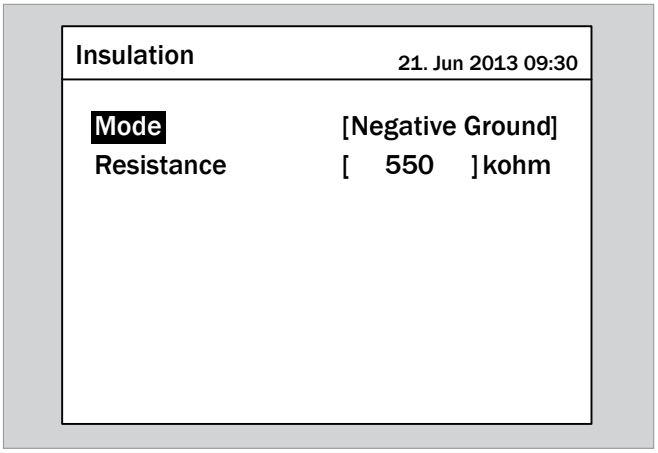


7. Use the ▼ and ▲ buttons to select a mode.

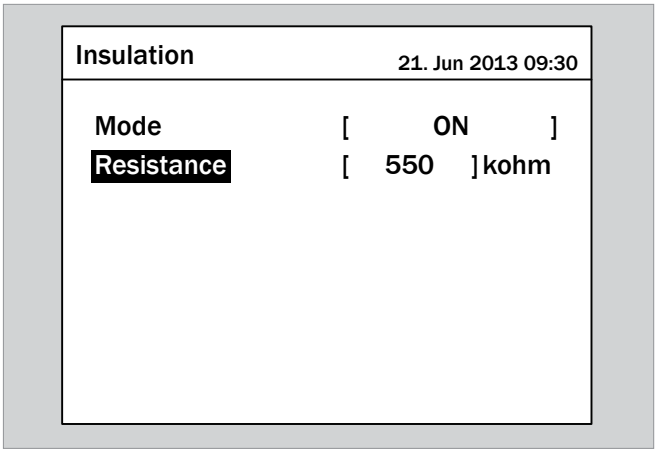


8. Press the ENT button to confirm.

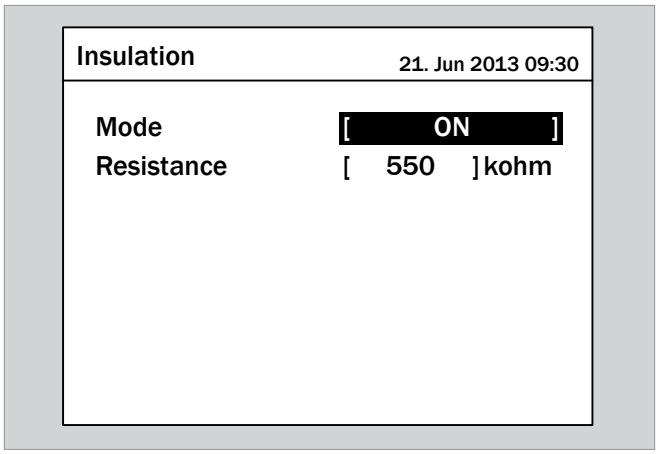
☑ The new mode is set.



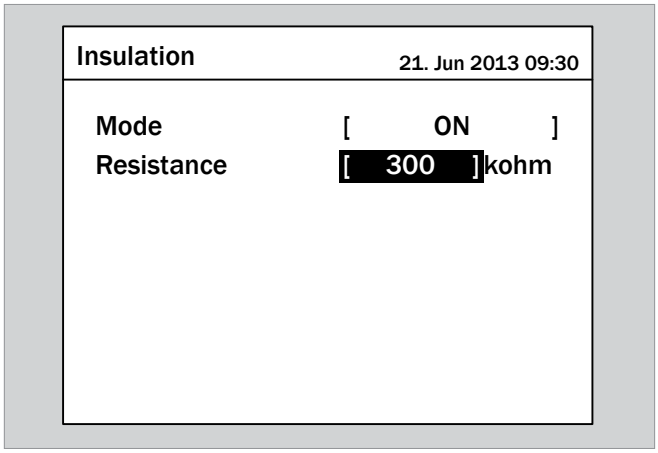
9. Using the ▼ and ▲ buttons, select the **Resistance** entry and press the ENT button.



→ The value is highlighted and can be changed.

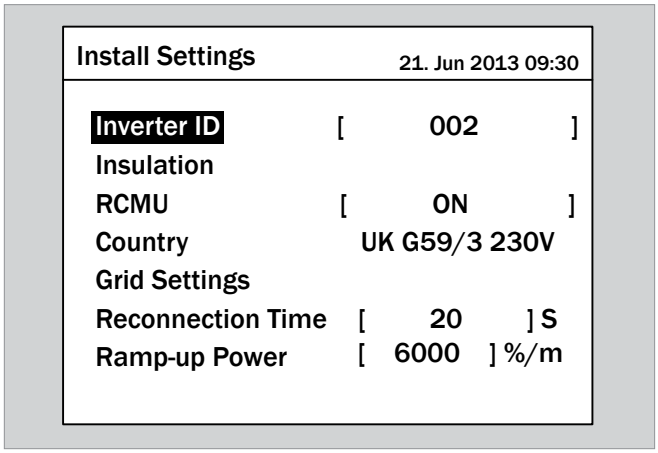


10. Use the ▼ and ▲ buttons to select the value.



11. Press the ENT button to confirm.

☑ The insulation mode and insulation resistance are set.



9.13 Reconnection time

This setting should only be changed after consultation with Delta customer service.

Overview

Using this function you can set a reconnection time for occasions when the inverter disconnects from the grid as a result of a voltage error or a frequency error.

After the error has disappeared, the inverter waits for the preset reconnection time before connecting to the grid again.

Path to the menu item

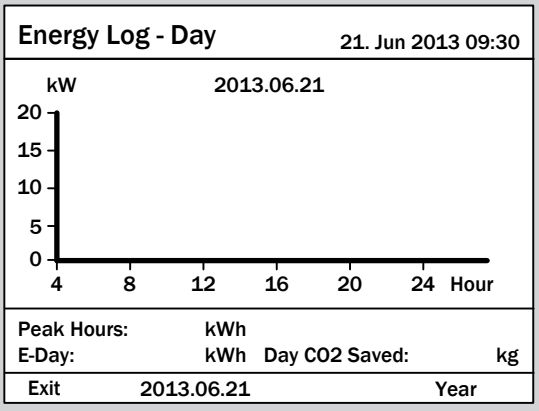
Main Menu > **Settings** > **Install Settings** > **Reconnection Time**

Setting options

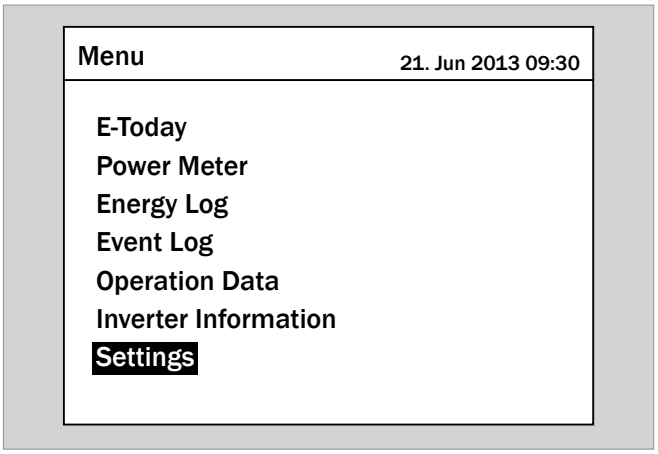
Parameter	Description / Setting range
Reconnection Time	Reconnection time in seconds

Setting the reconnection time

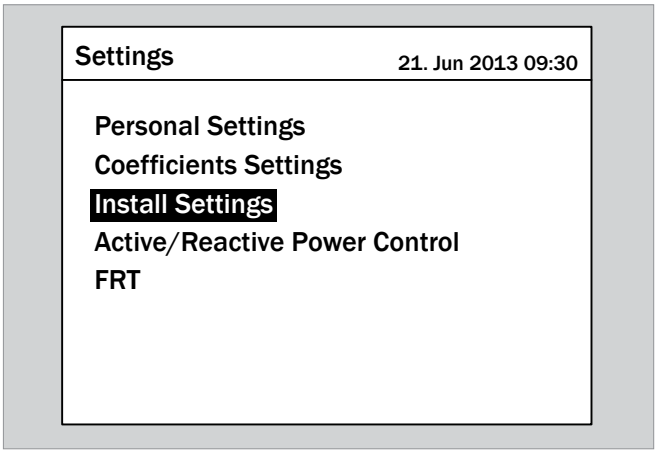
1. If the default information is displayed, press the EXIT button to open the main menu.
   Alternatively, press the EXIT button repeatedly until the main menu is displayed.



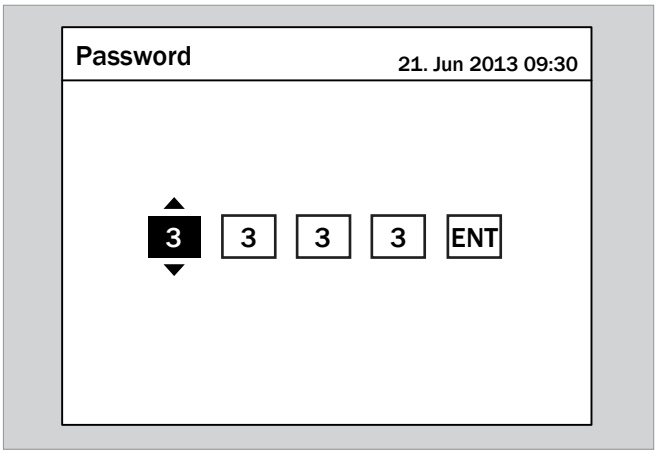
2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



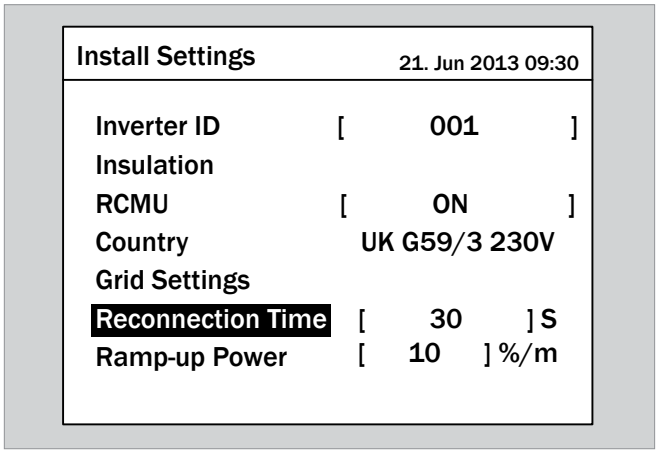
3. Using the ▼ and ▲ buttons, select the **Install Settings** entry and press the ENT button.



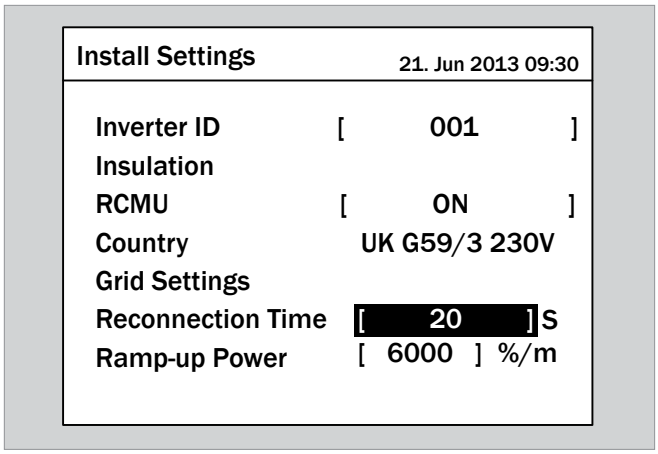
4. The function is protected with the password 5555.
   Use the ▼ and ▲ buttons to set the individual digits.
   Press the ENT button to confirm a digit.



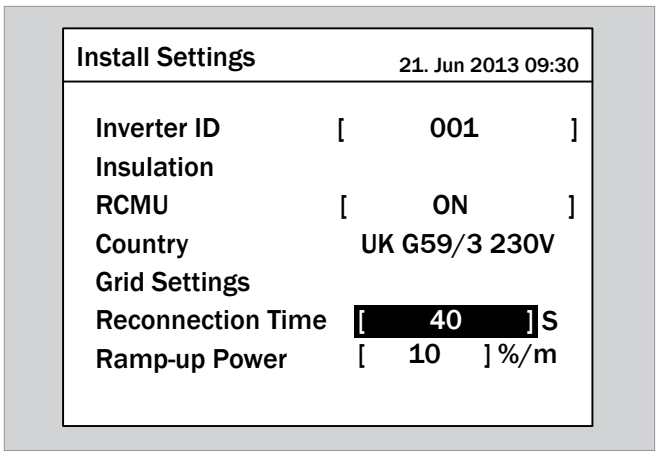
5. Using the ▼ and ▲ buttons, select the **Reconnection Time** entry and press the ENT button.



→ The value is highlighted and can be changed.

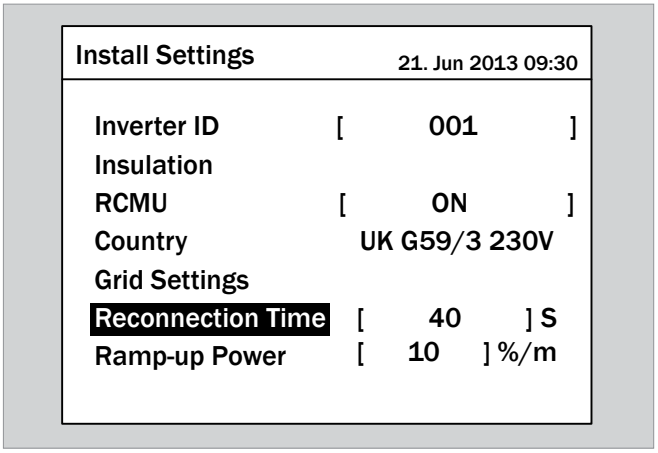


6. Use the ▼ and ▲ buttons to select the value.



7. Press the ENT button to confirm.

☑ The reconnection time is set.



9.14 Ramp-up power

This setting should only be changed after consultation with Delta customer service.

Overview

Using this function you can define the rise in active power for occasions when the inverter disconnects from the grid as a result of a voltage error or a frequency error.

After the error has disappeared, the active power is continuously increased according to the preset rise rate.

Path to the menu item

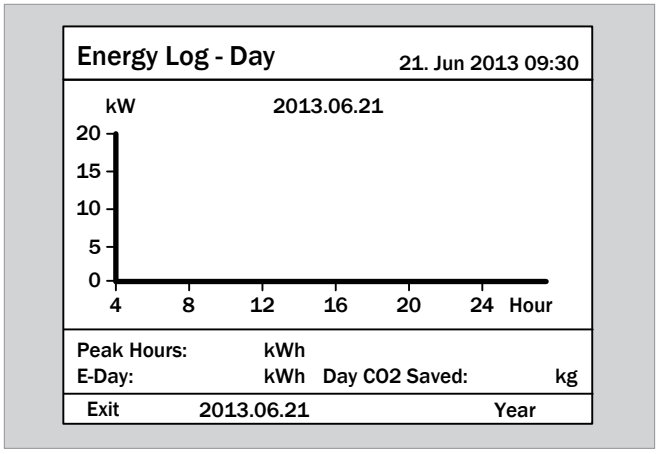
`Main Menu` > `Settings` > `Install Settings` > `Ramp-up Power`

Setting options

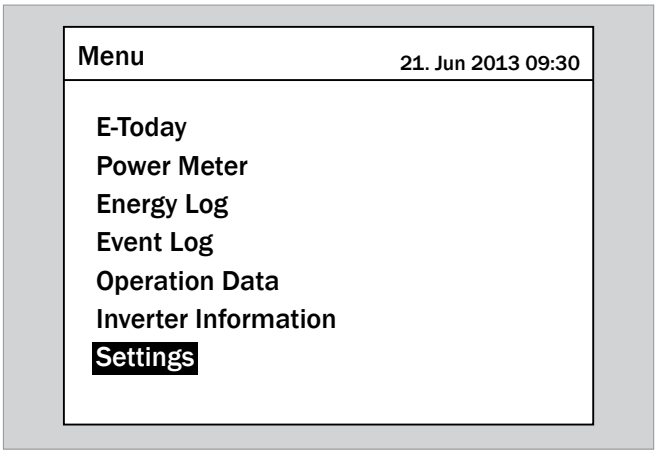
Parameter	Description / Setting range
`Ramp-up Power`	Rise in active power in percent per minute. Setting range: `0 ... 6000 %/min`

Setting the ramp-up power

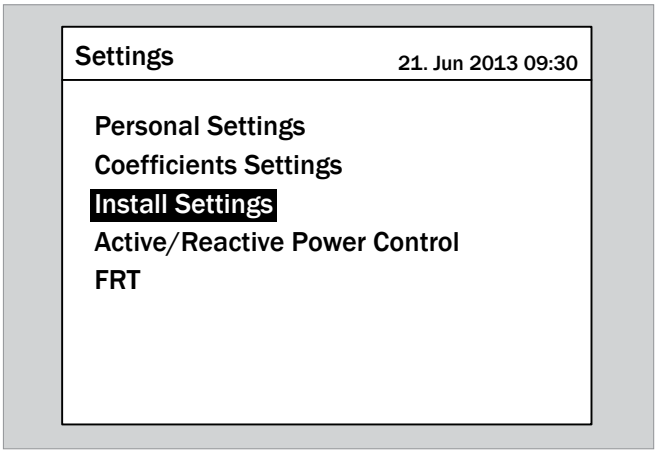
1. If the default information is displayed, press the EXIT button to open the main menu.
   Alternatively, press the EXIT button repeatedly until the main menu is displayed.



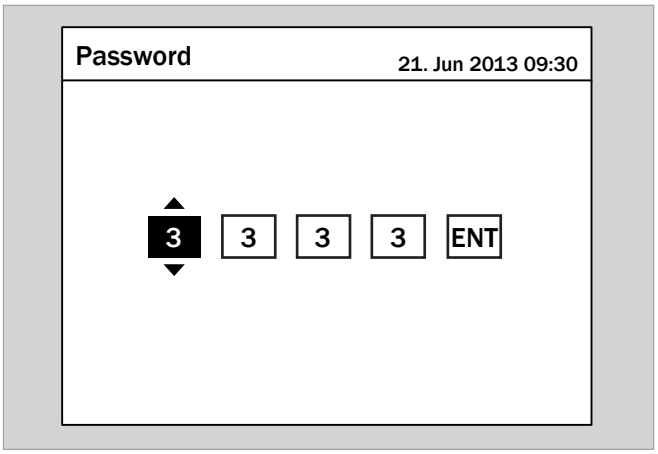
2. Using the ▼ and ▲ buttons, select the `Settings` entry and press the ENT button.



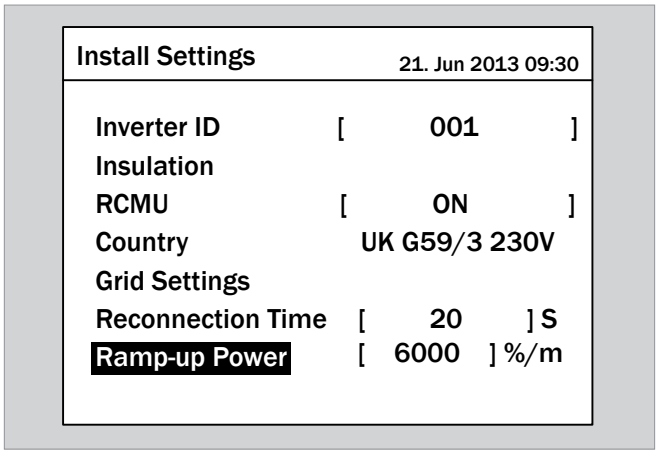
3. Using the ▼ and ▲ buttons, select the `Install Settings` entry and press the ENT button.



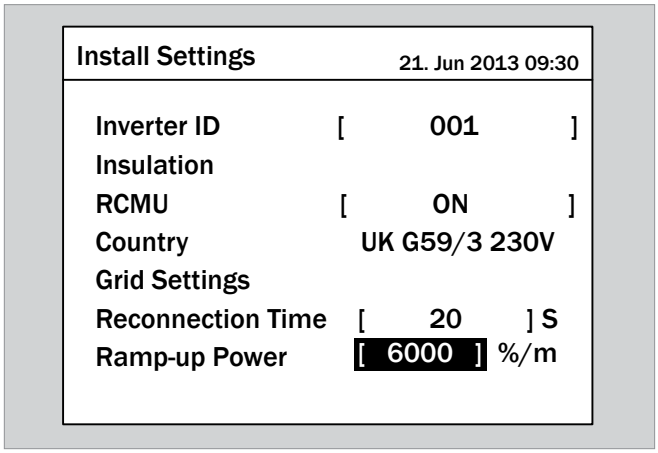
4. The function is protected with the password 5555.
   Use the ▼ and ▲ buttons to set the individual digits.
   Press the ENT button to confirm a digit.



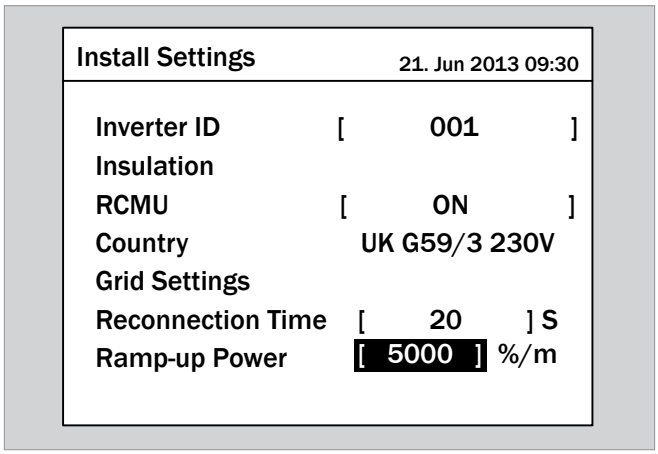
5. Using the ▼ and ▲ buttons, select the **Ramp-up Power** entry and press the ENT button.



→ The value is highlighted and can be changed.

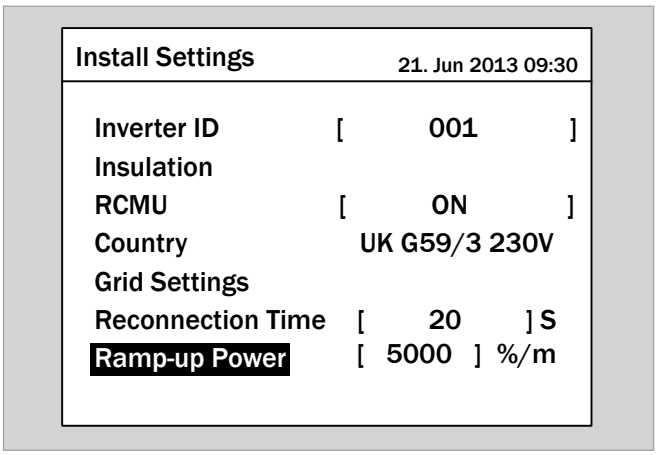


6. Use the ▼ and ▲ buttons to select the value.



7. Press the ENT button to confirm.

☑ The reconnection time is set.



9.15 Dry contacts

Overview

This function has no setting options.

Path to the menu item

`Main Menu` > `Settings` > `Install Settings` > `Dry contact`

9.16 External power off (EPO)

Overview

You can use this function to set the relay for external power off (EPO) as normally open or normally closed.

To change this setting you will need a special password which you can obtain from Delta customer service. You will find the contact data on the last page of this document.

Path to the menu item

`Main Menu` > `Settings` > `Install Settings` > `EPO 1`

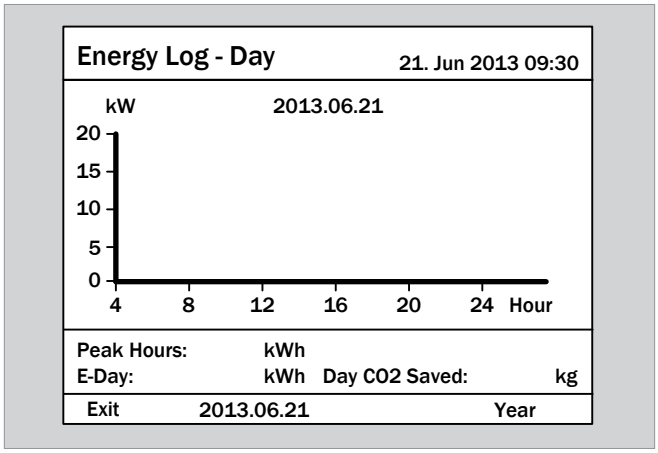
Setting options

Parameter	Description / Setting range
`EPO 1`	Setting the relay as (Normally closed) or (Normally open). Setting range: `Normal open` | `Normal close`

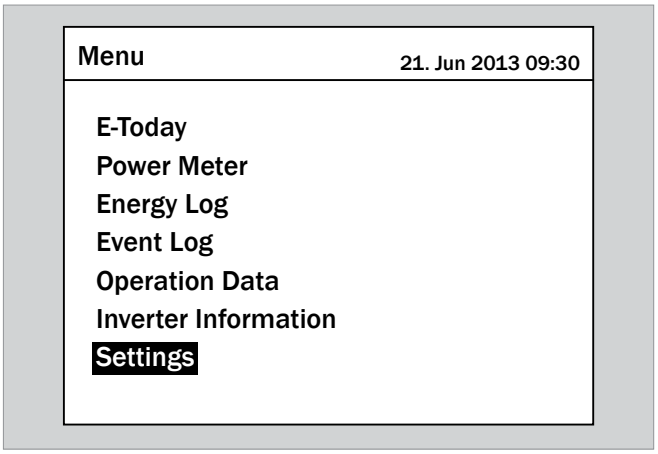
Setting the relay for EPO 1

The procedure is identical for both relays.

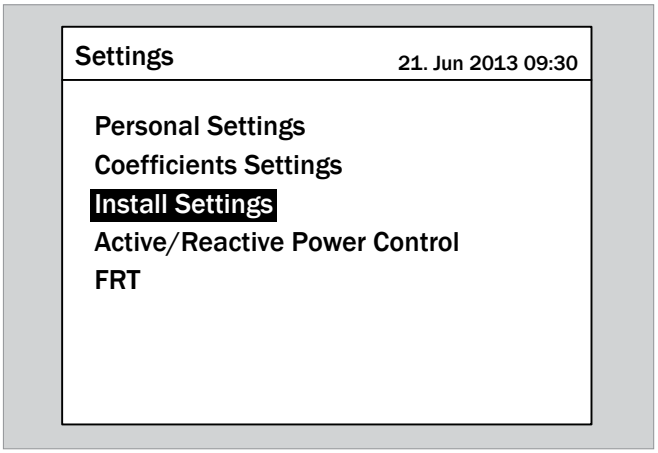
1. If the default information is displayed, press the EXIT button to open the main menu.
   Alternatively, press the EXIT button repeatedly until the main menu is displayed.



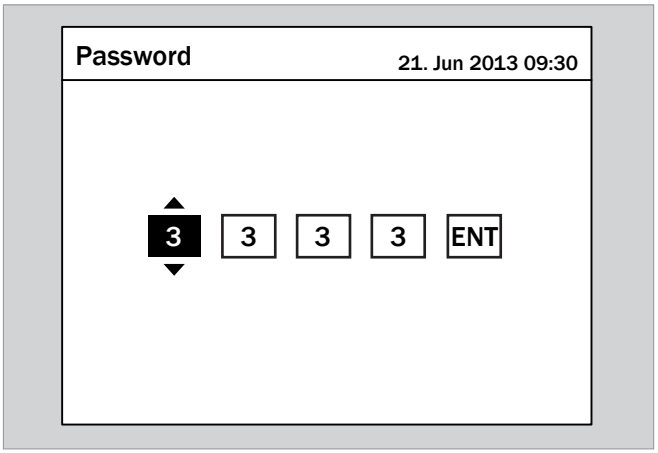
2. Using the ▼ and ▲ buttons, select the `Settings` entry and press the ENT button.



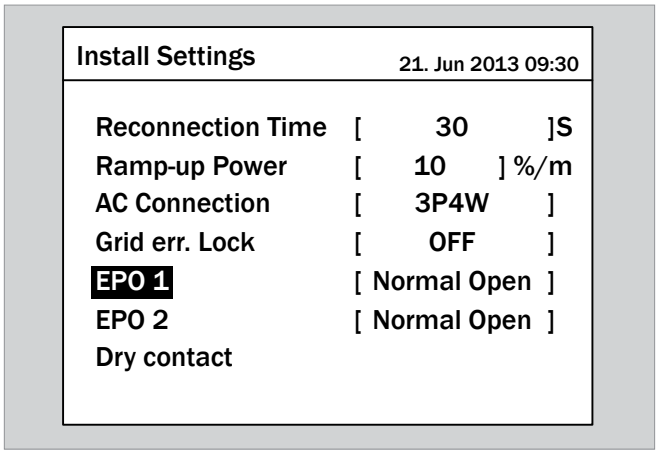
3. Using the ▼ and ▲ buttons, select the `Install Settings` entry and press the ENT button.



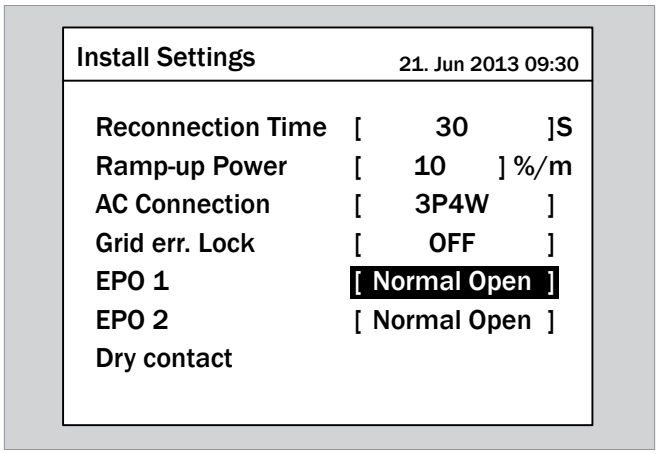
4. Enter the password that you received from Delta customer service.
   Use the ▼ and ▲ buttons to set the individual digits.
   Press the ENT button to confirm a digit.



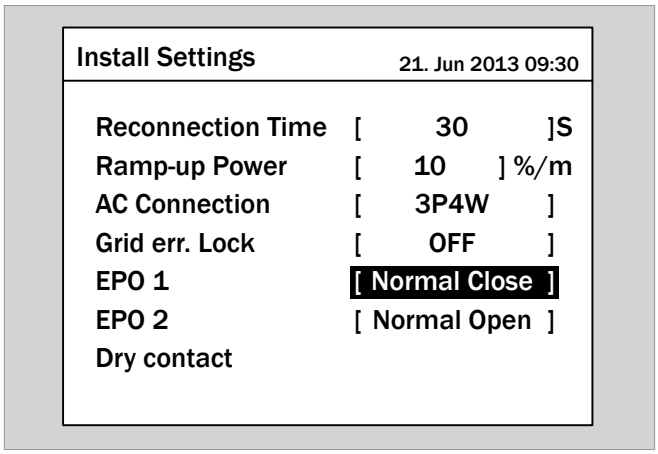
5. Using the ▼ and ▲ buttons, select the **EP0 1** entry and press the ENT button.



→ The currently set option is highlighted and can be changed.

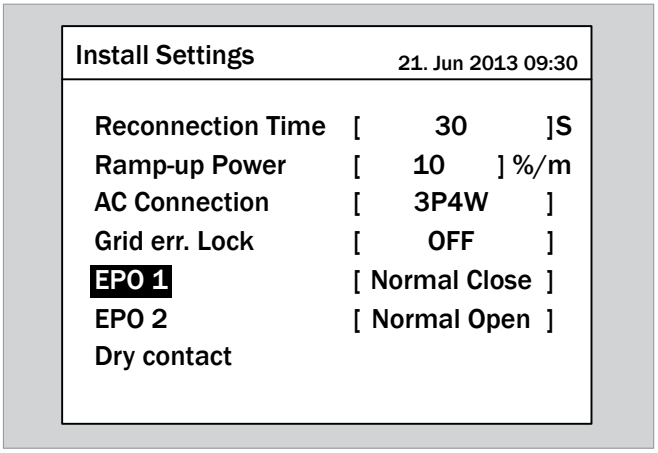


6. Use the ▼ and ▲ buttons to select an option.



7. Press the ENT button to confirm.

☑ The relay is set.



9.17 AC connection type

Overview

By default, the inverter is set for an AC connection with 3 phases and a neutral conductor (3P4W). If you are connecting the inverter without a neutral conductor, you must change the AC connection type after commissioning.

Path to the menu item

Main Menu > **Settings** > **Install Settings** > **AC Connection**

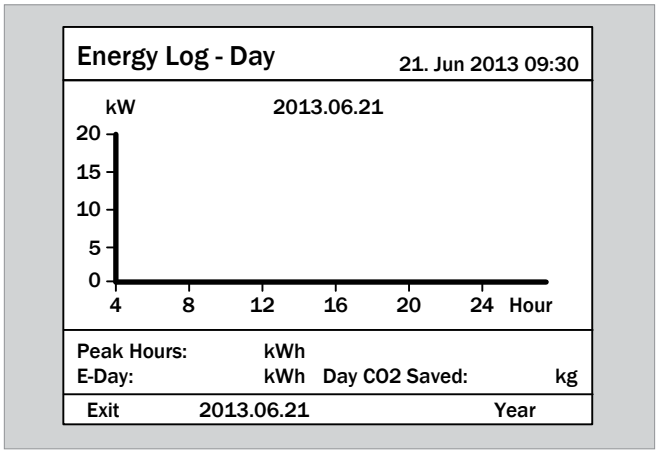
Setting options

Parameter	Description / Setting range
AC Connection	Set the AC connection type. Setting range: **3P3W**: 3-phase system (L1, L2, L3, PE) **3P4W**: 3-phase system with neutral conductor (L1, L2, L3, N, PE)

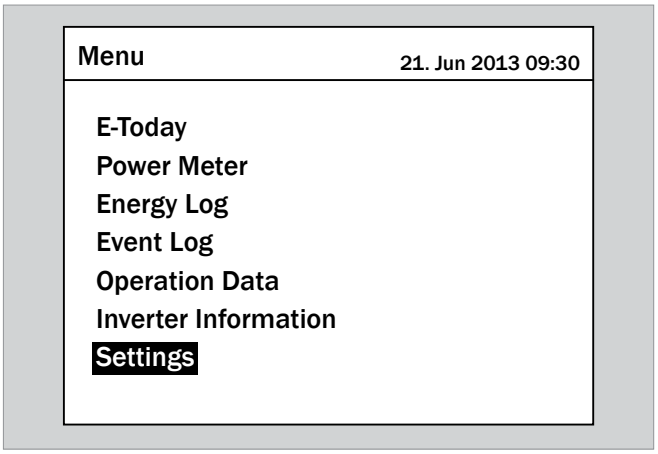
Setting the AC connection type

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

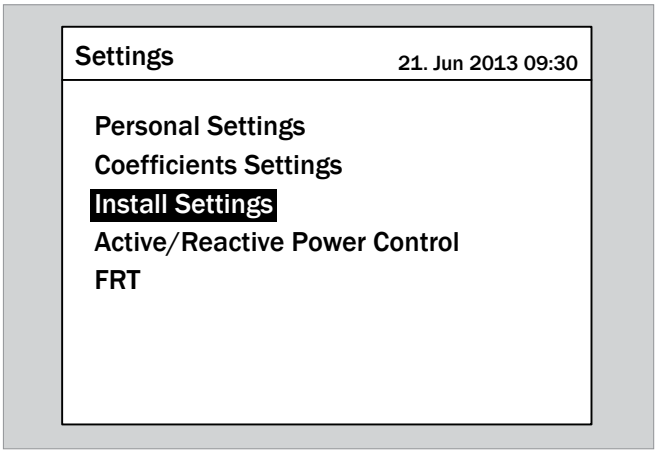
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



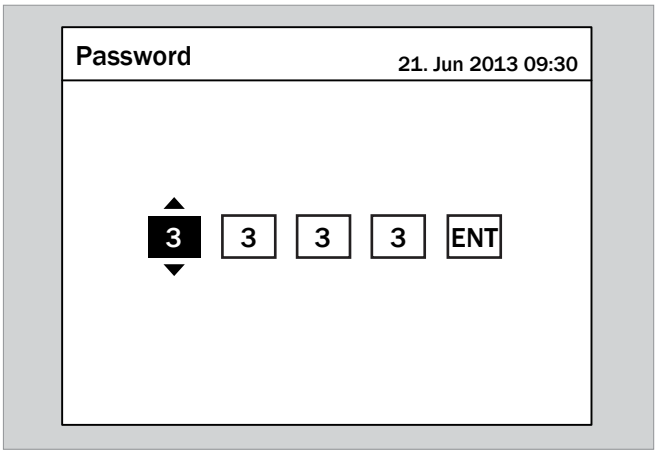
3. Using the ▼ and ▲ buttons, select the **Install Settings** entry and press the ENT button.



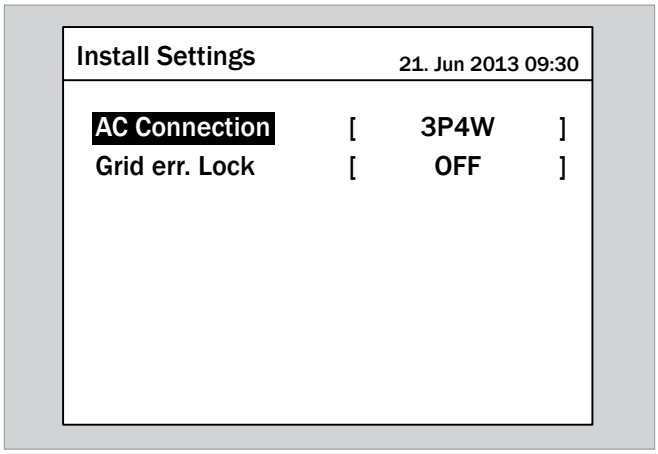
4. The function is protected with the password 5555.

Use the ▼ and ▲ buttons to set the individual digits.

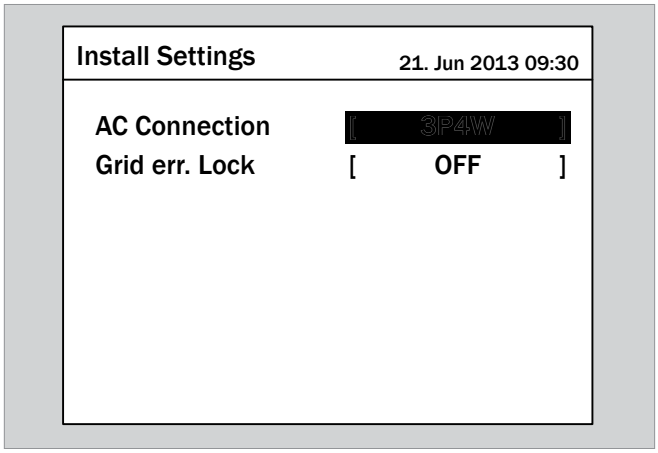
Press the ENT button to confirm a digit.



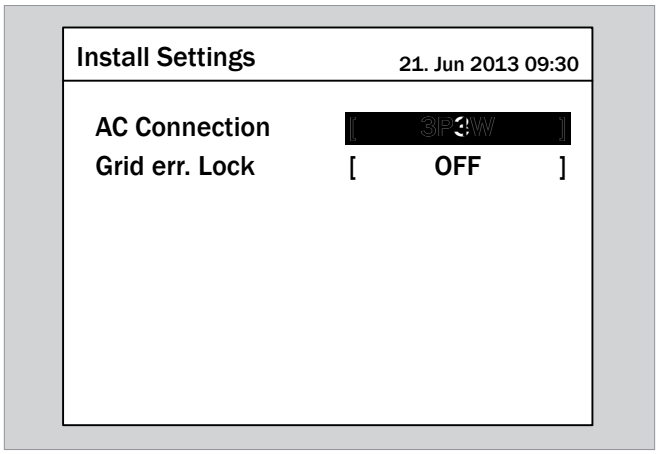
5. Using the ▼ and ▲ buttons, select the **AC Connection** entry and press the ENT button.



→ The currently set option is highlighted and can be changed.

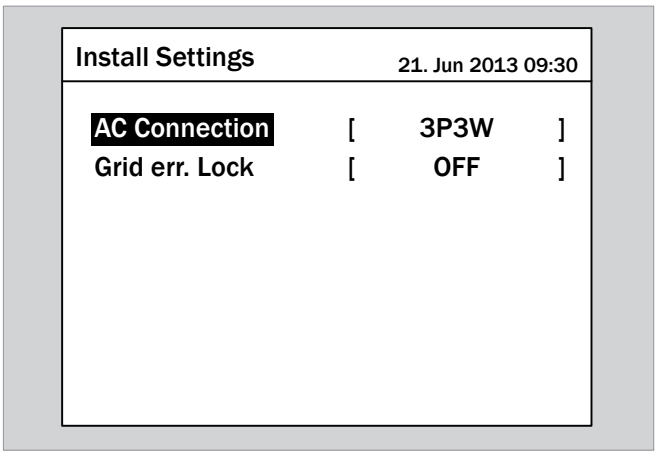


6. Use the ▼ and ▲ buttons to select an option.



7. Press the ENT button to confirm.

☑ The AC connection type is set.



9.18 Country/Grid type

Overview

Country or grid type is set during commissioning.

With this function you can change the country or the grid type after commissioning.

Path to the menu item

Main Menu > **Settings** > **Install Settings** > **Country**

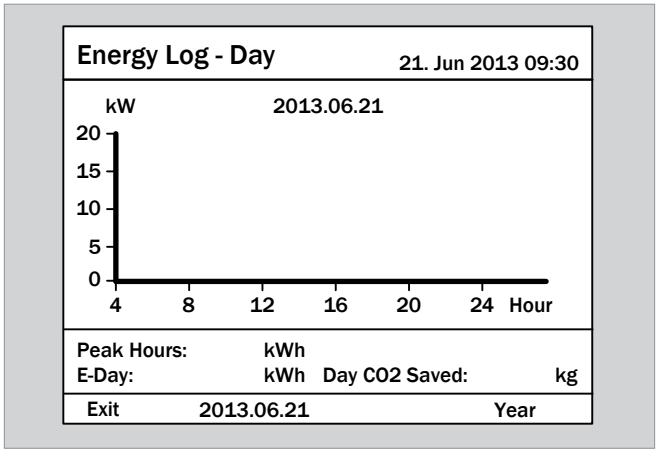
Setting options

Parameter	Description / Setting range
Country	Country or grid type Setting range: depends on the version of firmware installed

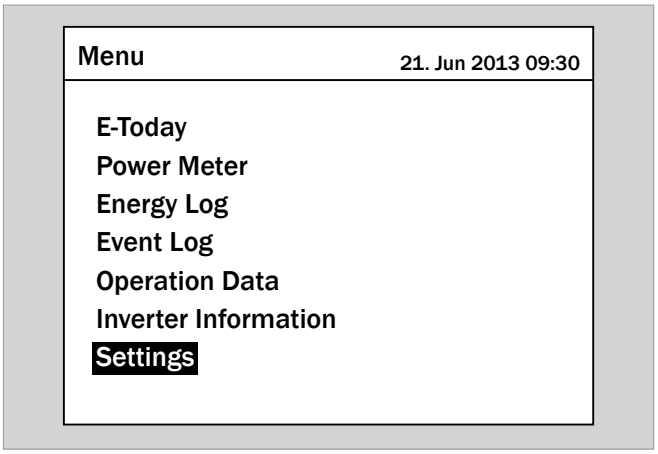
Setting the country or grid type

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

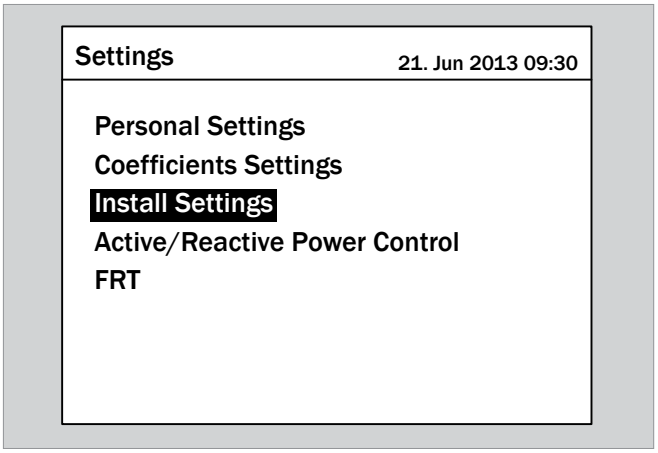
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



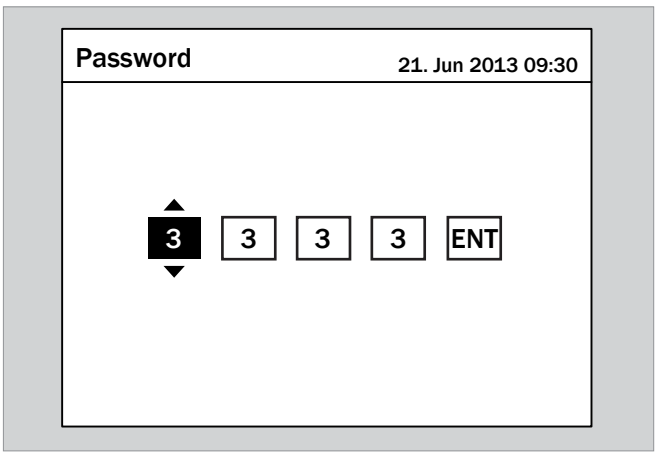
3. Using the ▼ and ▲ buttons, select the **Install Settings** entry and press the ENT button.



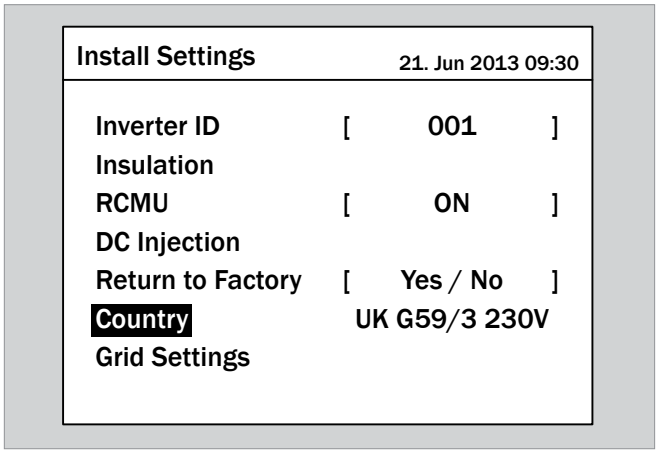
4. The function is protected with the password 5555.

Use the ▼ and ▲ buttons to set the individual digits.

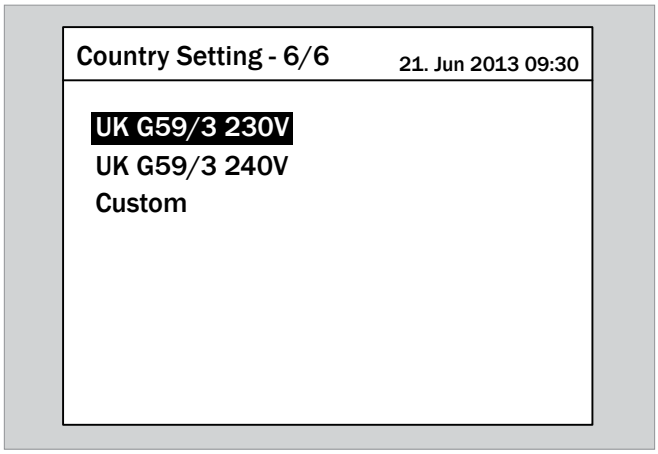
Press the ENT button to confirm a digit.



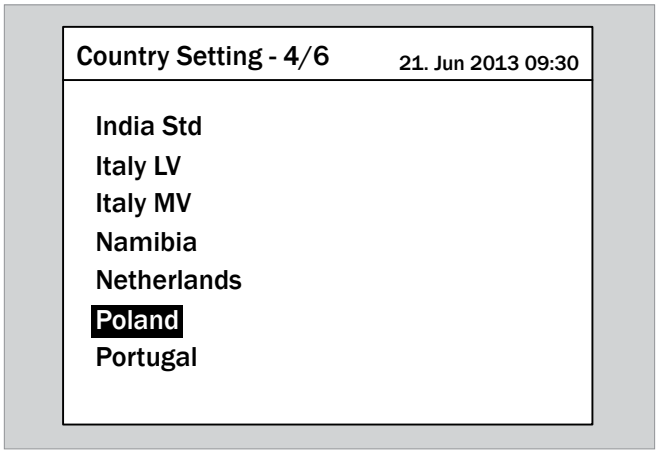
5. Using the ▼ and ▲ buttons, select the **Country** entry and press the ENT button.



→ The list of countries and grid types is displayed. The currently set country is highlighted.

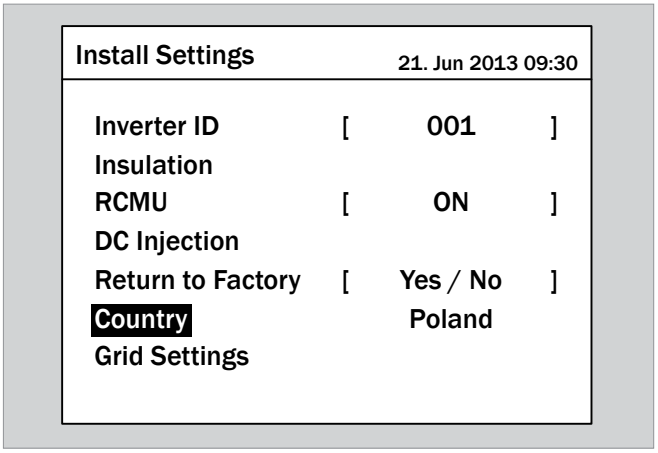


6. Use the ▼ and ▲ buttons to select a country or a grid type.



7. Press the ENT button to confirm.

☑ The country or the grid type is set.



9.19 Residual current monitoring unit (RCMU)

This setting should only be changed after consultation with Delta customer service.

Overview

You can switch the integrated Residual Current Monitoring Unit (RCMU) on and off with this function.

Path to the menu item

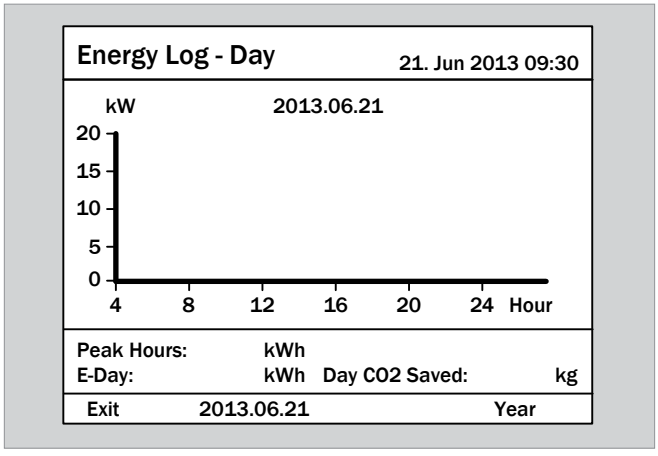
`Main Menu` > `Settings` > `Install Settings` > `RCMU`

Setting options

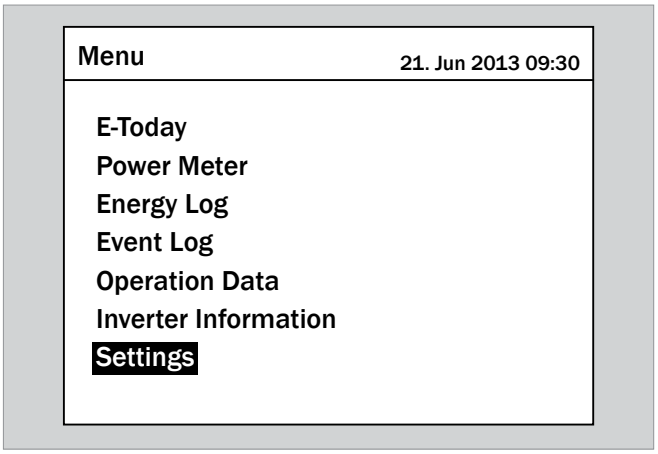
Parameter	Description / Setting range
`RCMU`	Switch the integrated RCMU on or off. Setting range: `ON` | `OFF`

Setting the integrated RCMU

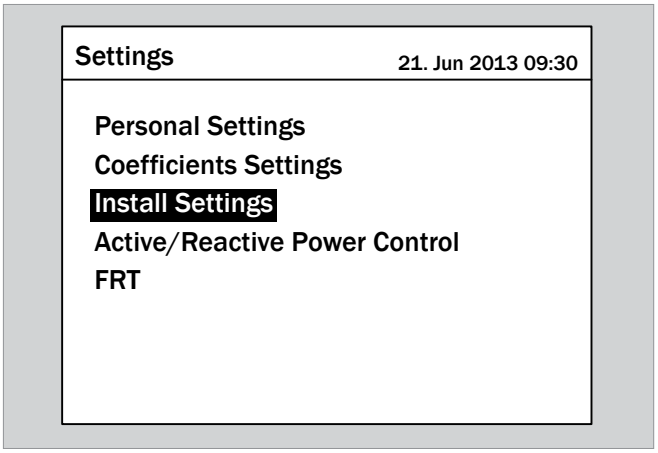
1. If the default information is displayed, press the EXIT button to open the main menu.
   Alternatively, press the EXIT button repeatedly until the main menu is displayed.



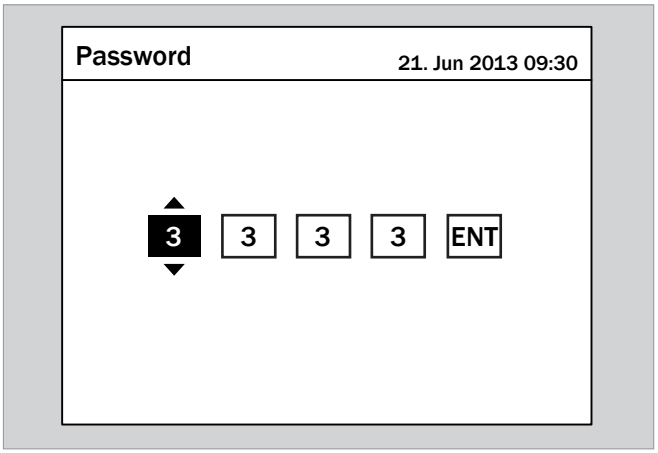
2. Using the ▼ and ▲ buttons, select the `Settings` entry and press the ENT button.



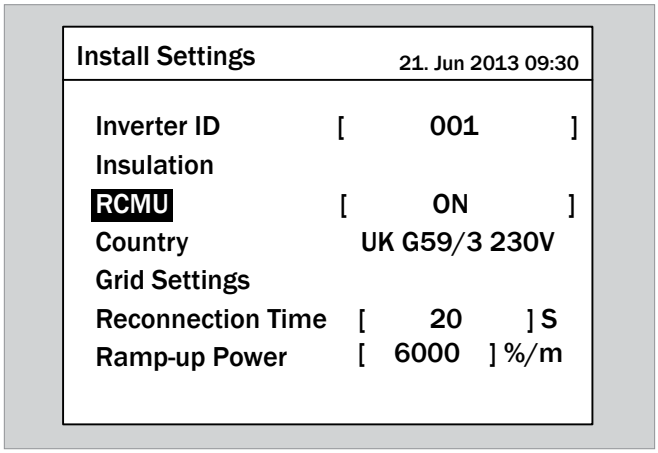
3. Using the ▼ and ▲ buttons, select the `Install Settings` entry and press the ENT button.



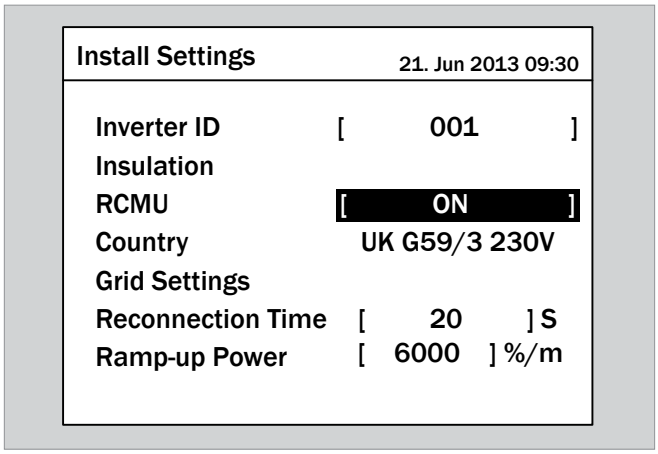
4. The function is protected with the password 5555.
   Use the ▼ and ▲ buttons to set the individual digits.
   Press the ENT button to confirm a digit.



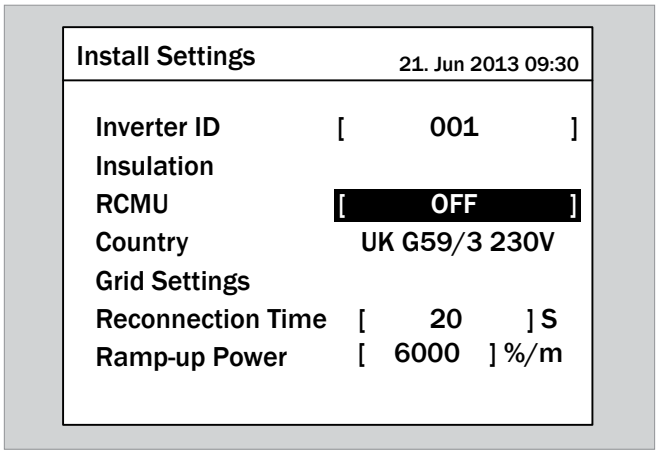
5. Using the ▼ and ▲ buttons, select the **RCMU** entry and press the ENT button.



→ The currently set option is highlighted and can be changed.

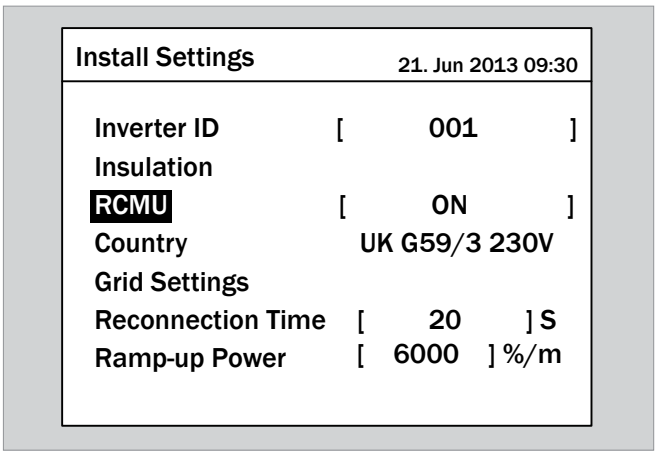


6. Use the ▼ and ▲ buttons to select an option.



7. Press the ENT button to confirm.

☑ The integrated RCMU is set.



9.20 DC injection

This setting should only be changed after consultation with Delta customer service.

Overview

With this function you can determine how the inverter behaves if a DC component appears while the grid is being supplied.

To change this setting you will need a special password which you can obtain from Delta customer service. You will find the contact data on the last page of this document.

Path to the menu item

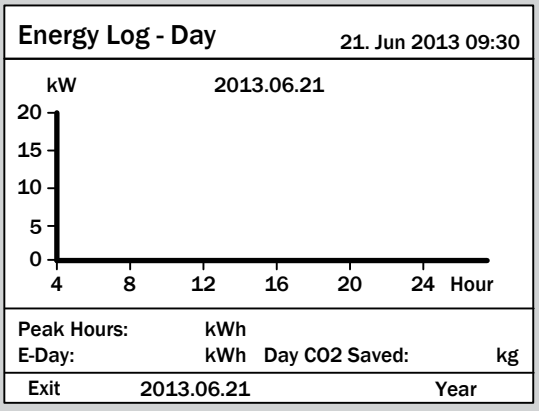
Main Menu > **Settings** > **Install Settings** > **DC Injection**

Setting options

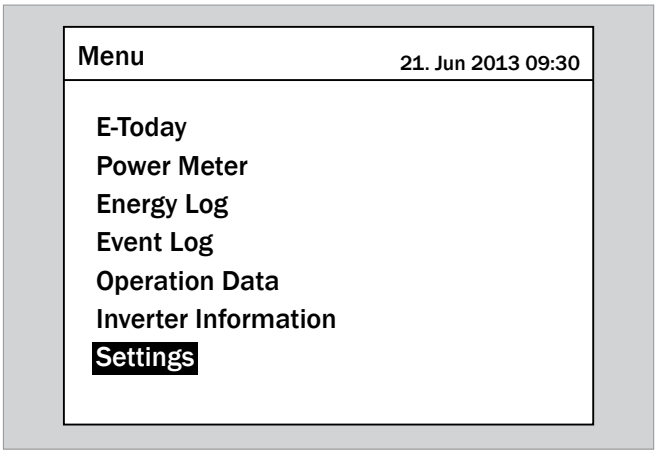
Parameter	Description / Setting range
Mode	Switch the function on or off. Setting range: **ON** | **OFF**
Trip value	The current in the DC component at which the inverter stops supplying the grid.
Trip time	If the trip value is exceeded, the inverter waits for the specified trip time to allow the current to fall below the trip value again. If the trip time is exceeded, the inverter shuts down.

Calling up the menu item

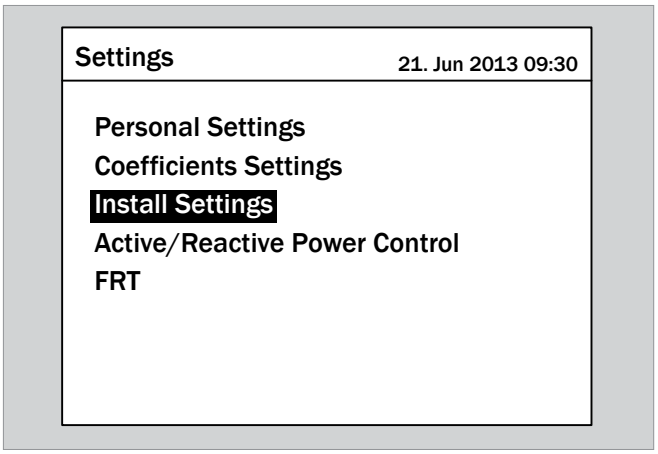
1. If the default information is displayed, press the EXIT button to open the main menu.
   Alternatively, press the EXIT button repeatedly until the main menu is displayed.



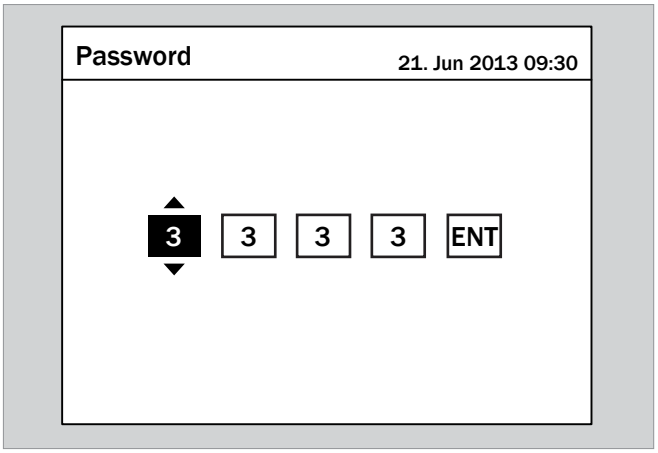
2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



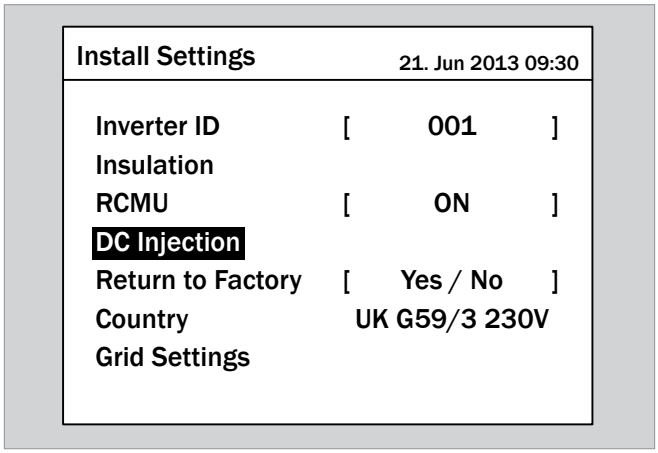
3. Using the ▼ and ▲ buttons, select the **Install Settings** entry and press the ENT button.



4. Enter the password that you received from Delta customer service.
   Use the ▼ and ▲ buttons to set the individual digits.
   Press the ENT button to confirm a digit.

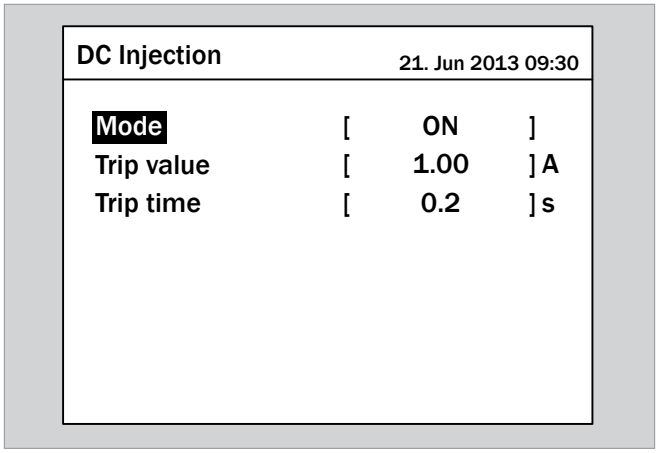


5. Using the ▼ and ▲ buttons, select the **DC Injection** entry and press the ENT button.

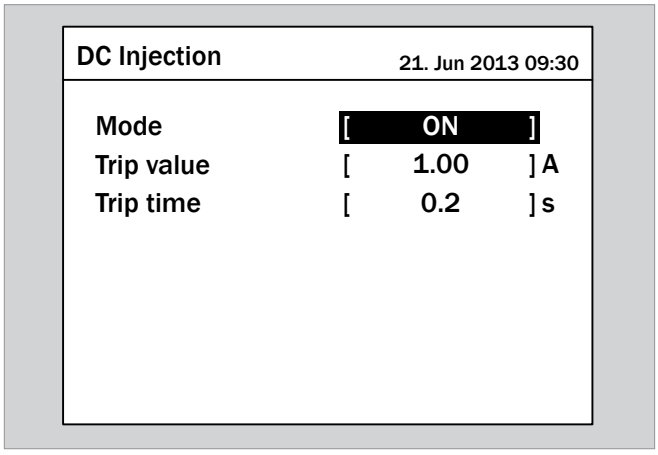


Setting the mode

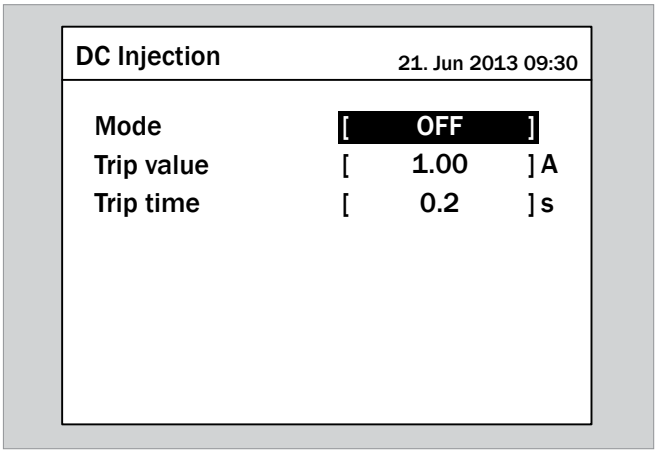
1. Using the ▼ and ▲ buttons, select the **Mode** entry and press the ENT button.



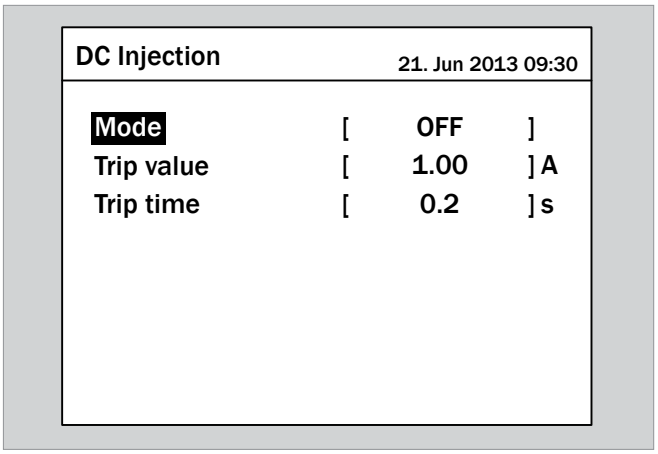
→ The currently set mode is highlighted and can be changed.



2. Using the ▼ and ▲ buttons, select a mode and press the ENT button.



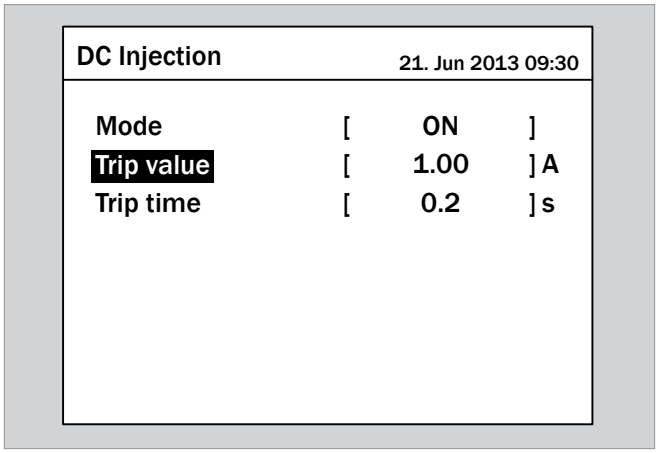
→ The mode is set.



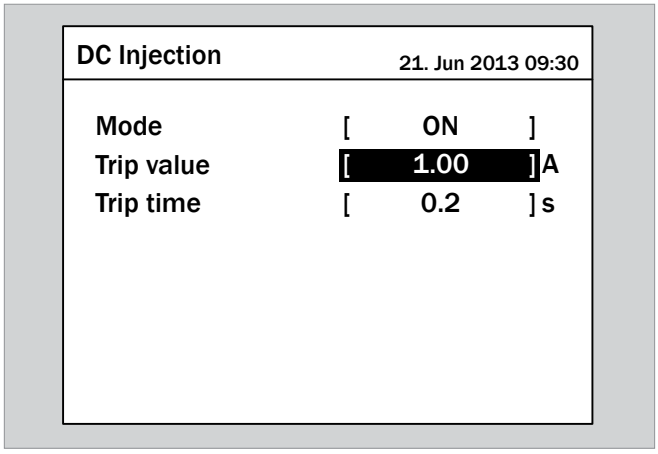
Changing settings

The procedure is identical for all parameters.

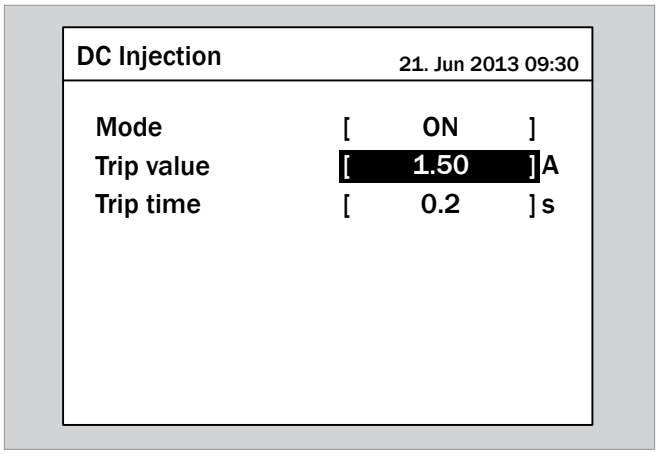
1. Using the ▼ and ▲ buttons, select a parameter and press the ENT button.



→ The value is highlighted and can be changed.

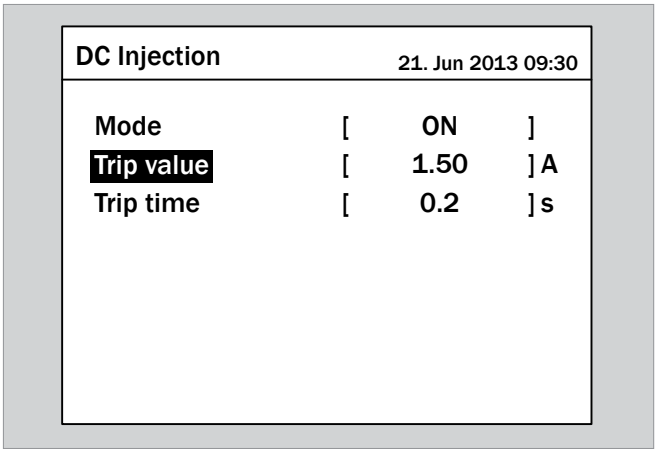


2. Use the ▼ and ▲ buttons to select the value.



3. Press the ENT button to confirm.

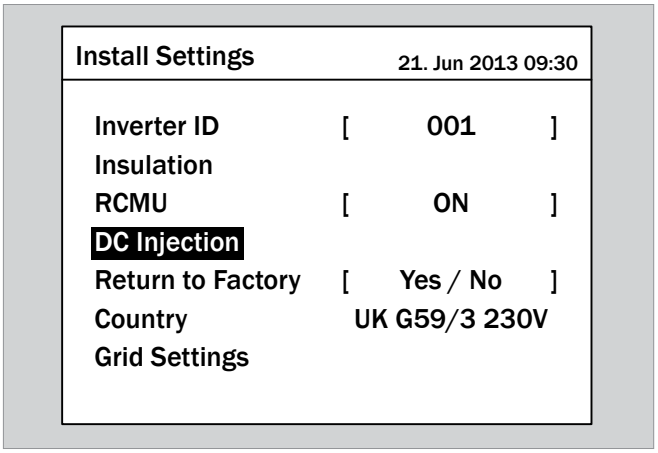
→ The parameter is set.



Finalising the setting

1. Press the EXIT button to finalise the setting.

☑ The function is set.



9.21 Resetting the inverter to default settings

This setting should only be changed after consultation with Delta customer service.

Overview

You can reset the inverter to its default settings with this function. This will start a new commissioning procedure.

To change this setting you will need a special password which you can obtain from Delta customer service. You will find the contact data on the last page of this document.

Path to the menu item

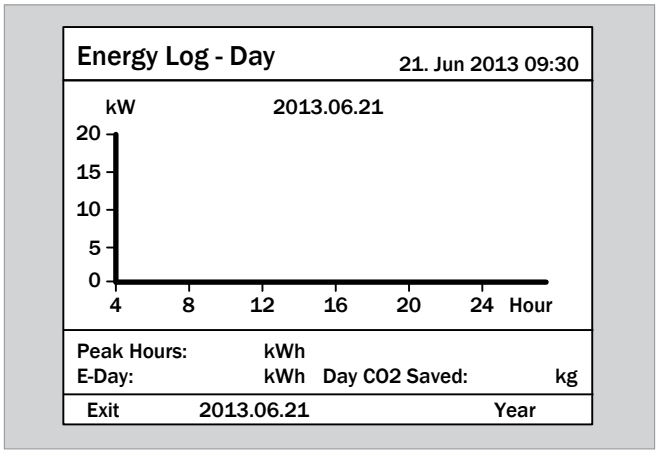
Main Menu > **Settings** > **Install Settings** > **Return to Factory**

Setting options

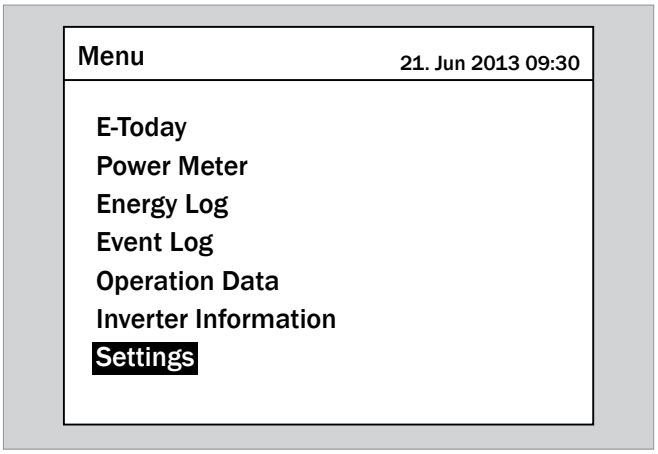
Parameter	Description / Setting range
Return to Factory	Reset the inverter to factory settings. Setting range: **Yes** | **No**

Resetting the inverter to default settings

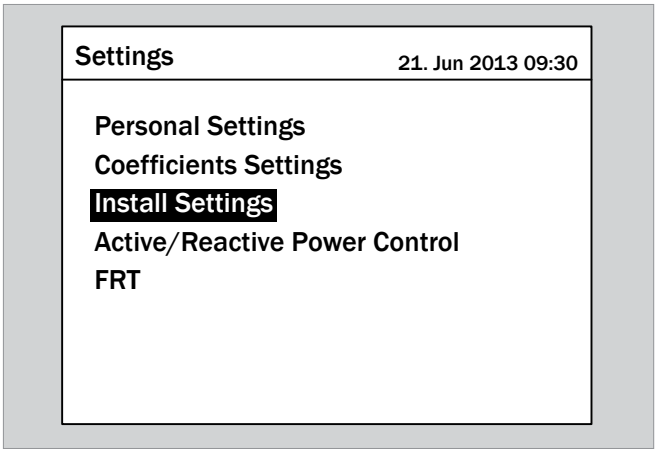
1. If the default information is displayed, press the EXIT button to open the main menu.
   Alternatively, press the EXIT button repeatedly until the main menu is displayed.



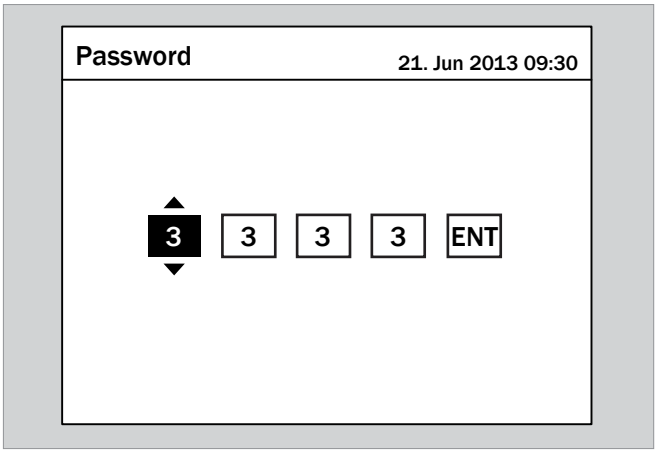
2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



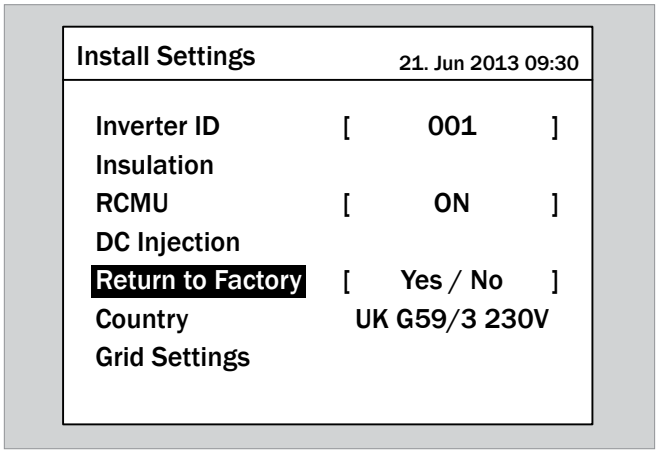
3. Using the ▼ and ▲ buttons, select the **Install Settings** entry and press the ENT button.



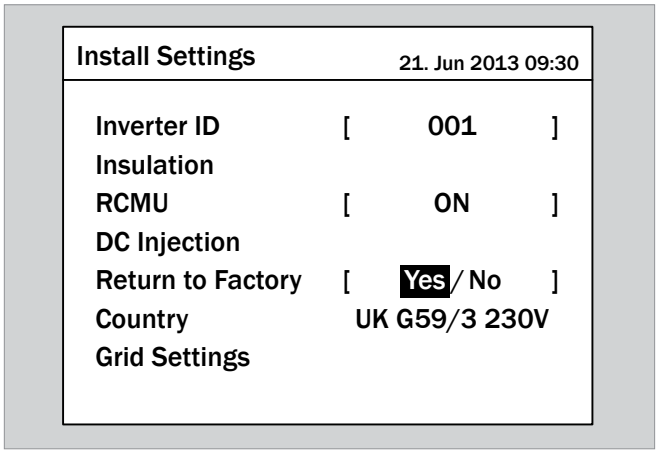
4. Enter the password that you received from Delta customer service.
   Use the ▼ and ▲ buttons to set the individual digits.
   Press the ENT button to confirm a digit.



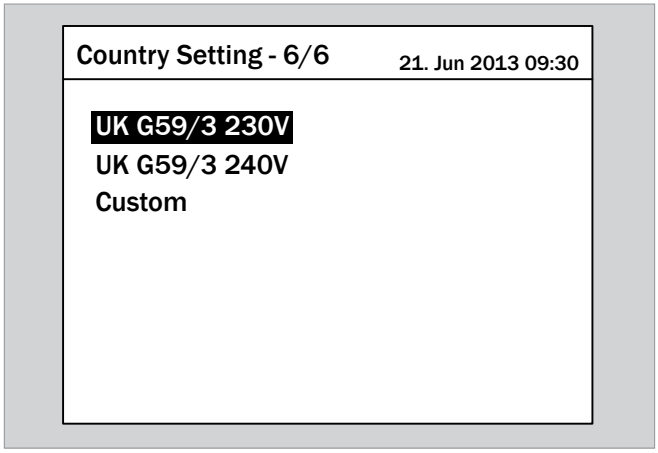
5. Using the ▼ and ▲ buttons, select the **Return to Factory** entry and press the ENT button.



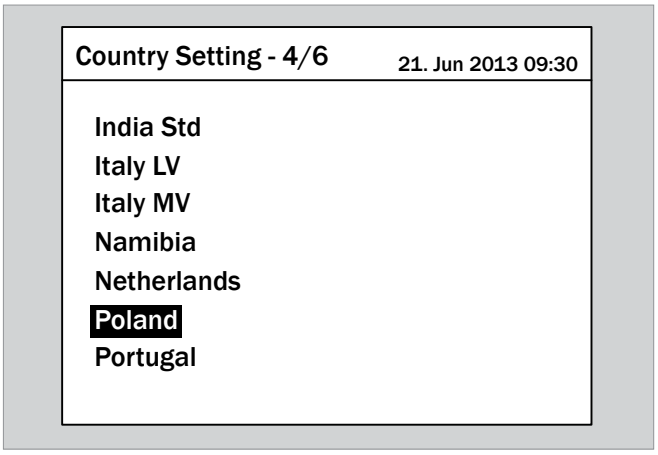
6. Using the ▼ and ▲ buttons, select the **Yes** entry and press the ENT button.



→ The inverter will be reset to the default settings and the country list displayed. The currently set country is highlighted.



7. Using the ▼ and ▲ buttons, select a country and press the ENT button.

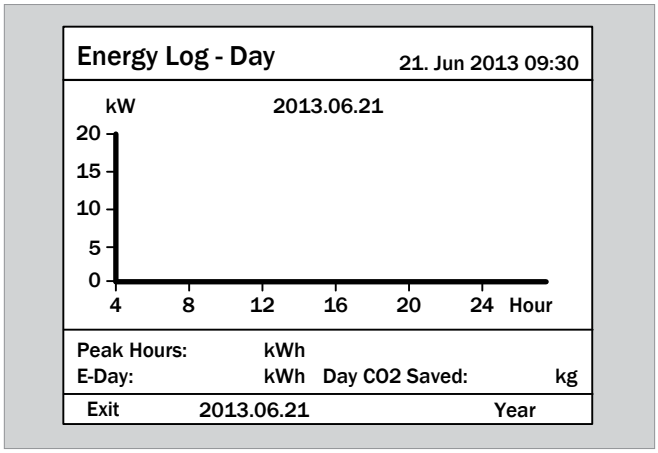


8. Press the ENT button to confirm.

→ The menu for selecting the display language is displayed.

9. Using the ▼ and ▲ buttons, select a language and press the ENT button.

☑ The inverter has been reset to the default settings. The default information is displayed.



9.22 Active power limiting

This setting should only be changed after consultation with Delta customer service.

Overview

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

To change this setting you will need a special password which you can obtain from Delta customer service. You will find the contact data on the last page of this document.

Path to the menu item

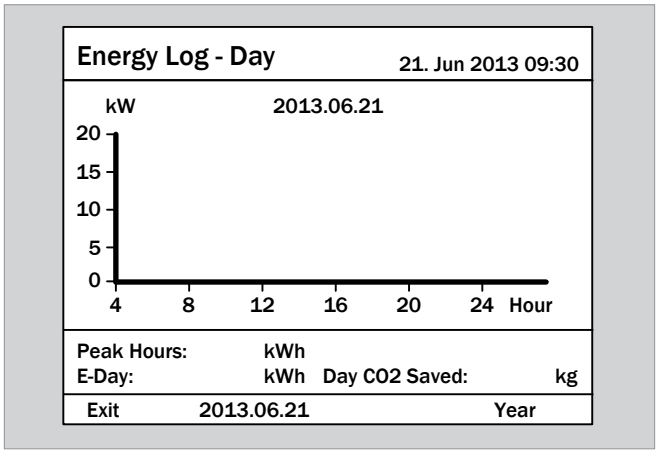
Main Menu > **Settings** > **Active / Reactive Power Control** > **Active Power Control** > **Power Limit**

Setting options

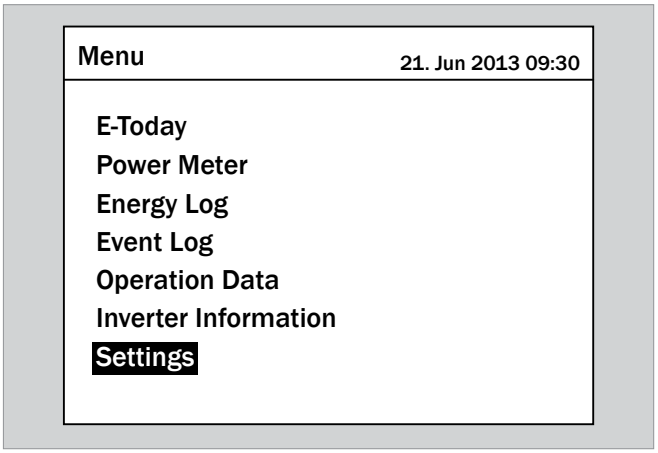
Parameter	Description / Setting range
Set Point	Maximum active power as a percentage of the actual power or the rated power. Setting range: **0 .. 100 %**
Actual / Rated Power	The parameter is permanently set to **Rated** and cannot be changed.
Mode	Setting range: **ON**: The function is switched on. **OFF**: The function is switched off.

Calling up the menu item

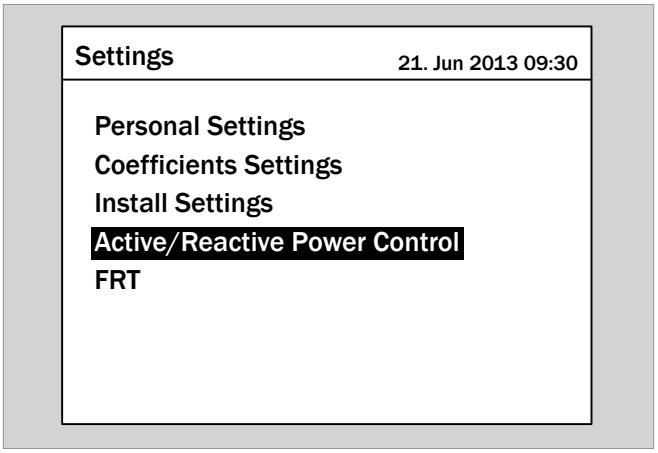
1. If the default information is displayed, press the EXIT button to open the main menu.
   Alternatively, press the EXIT button repeatedly until the main menu is displayed.



2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



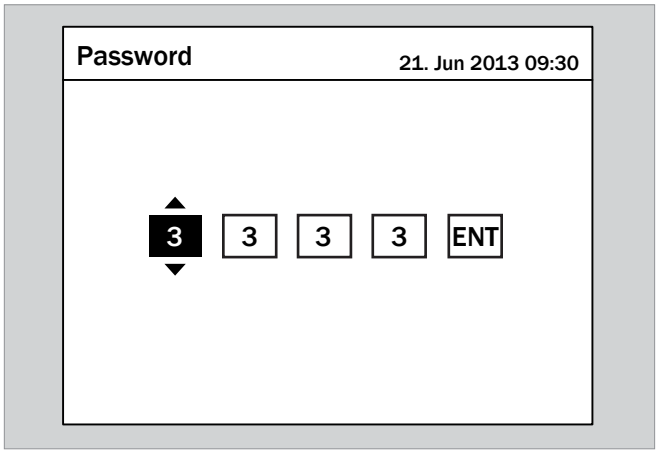
3. Using the ▼ and ▲ buttons, select the **Active/Reactive Power Control** entry and press the ENT button.



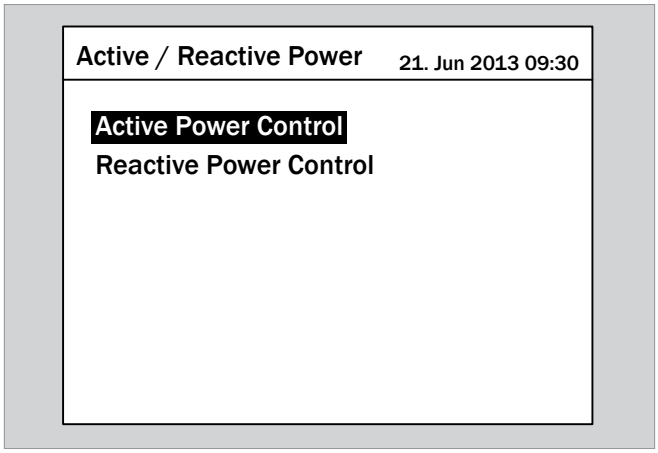
4. Enter the password that you received from Delta customer service.

Use the ▼ and ▲ buttons to set the individual digits.

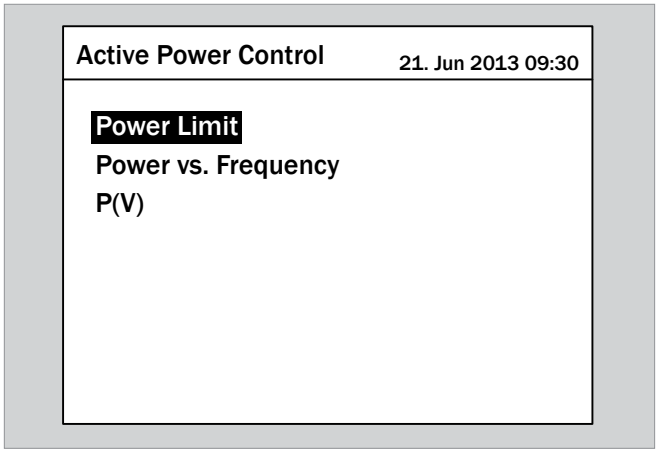
Press the ENT button to confirm a digit.



5. Using the ▼ and ▲ buttons, select the **`Active Power Control`** entry and press the ENT button.

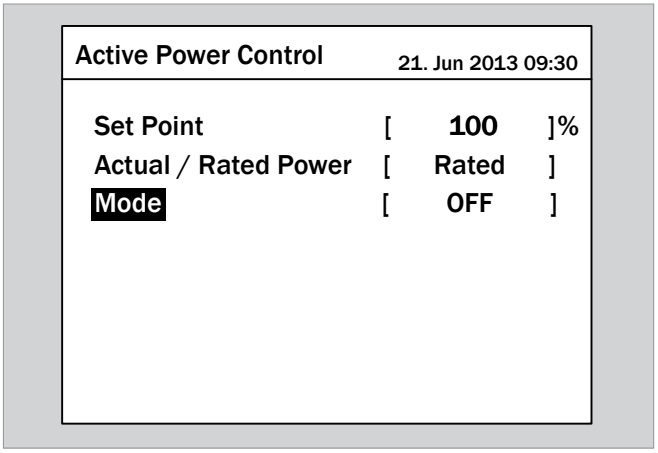


6. Using the ▼ and ▲ buttons, select the **`Power Limit`** entry and press the ENT button.

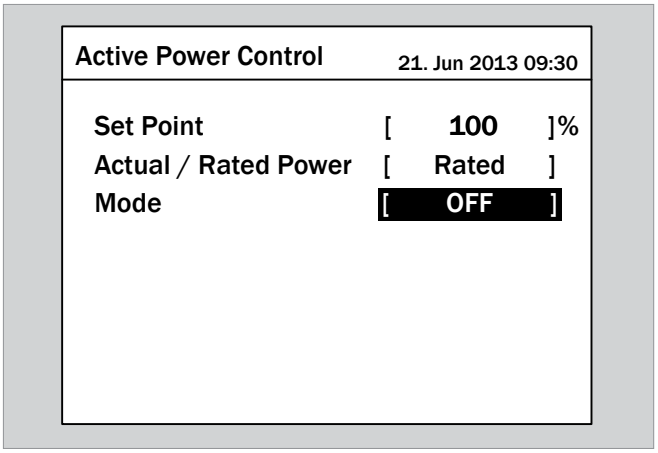


Switching the function on/off

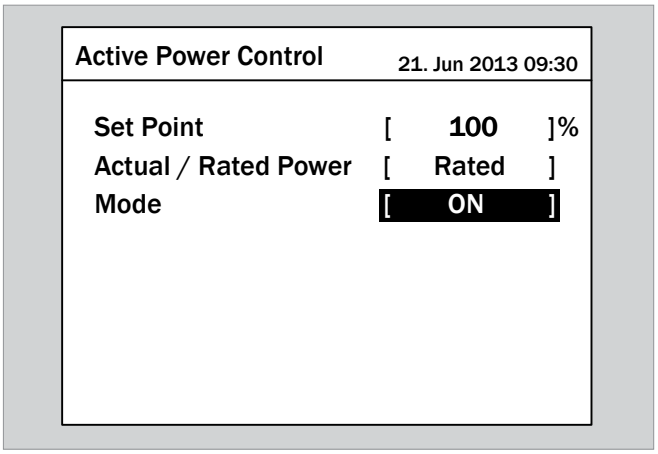
1. Using the ▼ and ▲ buttons, select the **`Mode`** entry and press the ENT button.



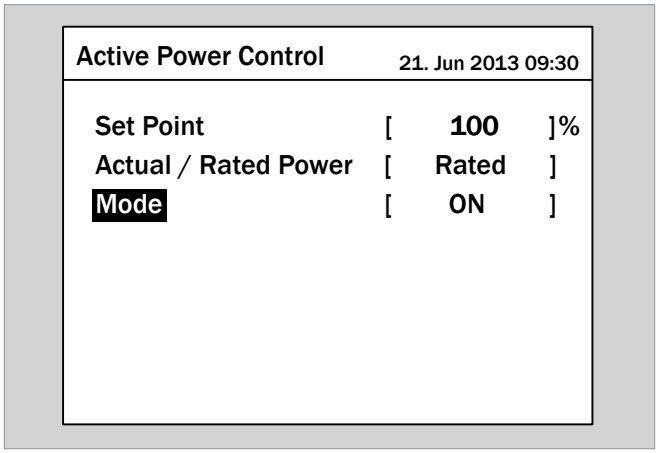
→ The currently set mode is highlighted and can be changed.



2. Using the ▼ and ▲ buttons, select a mode and press the ENT button.



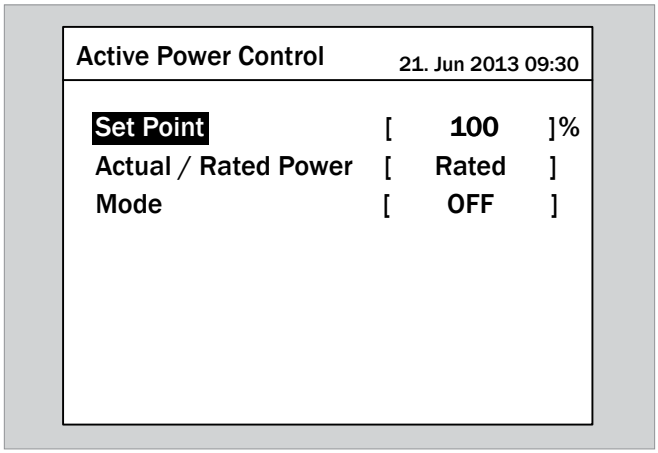
→ The mode is set.



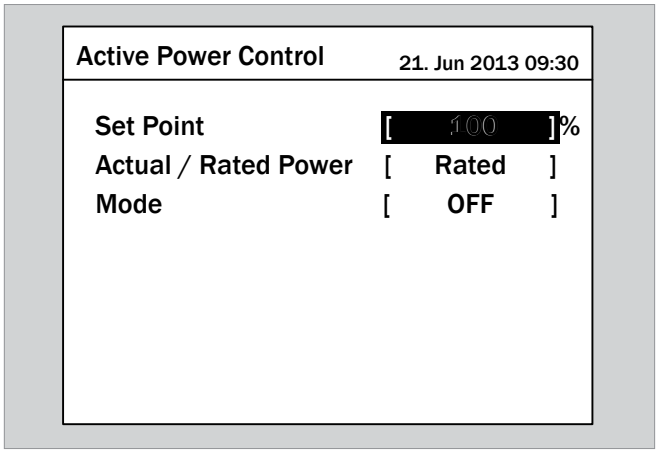
Changing settings

The procedure is identical for all parameters.

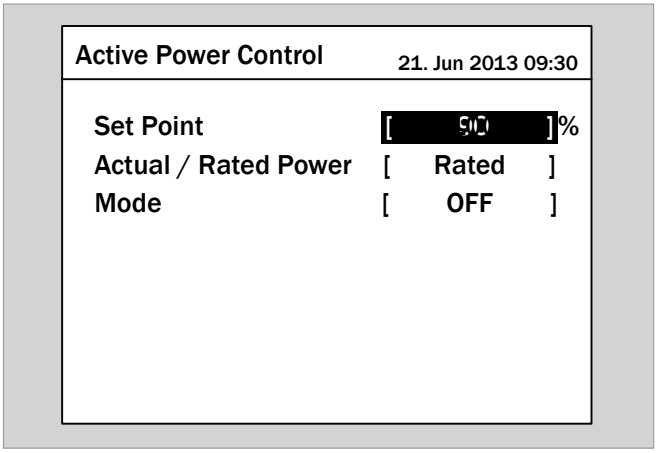
1. Using the ▼ and ▲ buttons, select a parameter and press the ENT button.



→ The value is highlighted and can be changed.

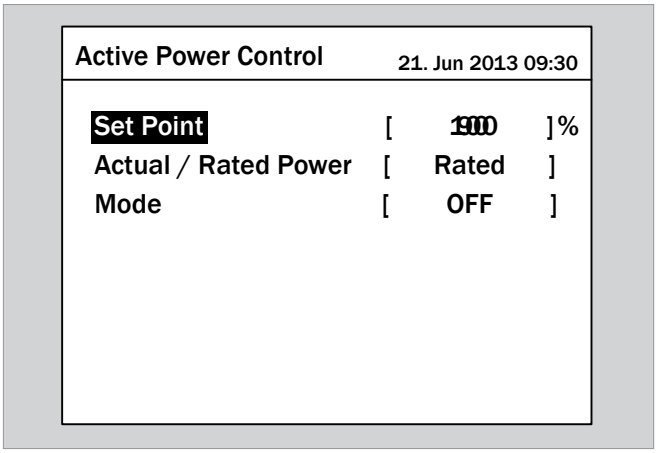


2. Use the ▼ and ▲ buttons to select the value.



3. Press the ENT button to confirm.

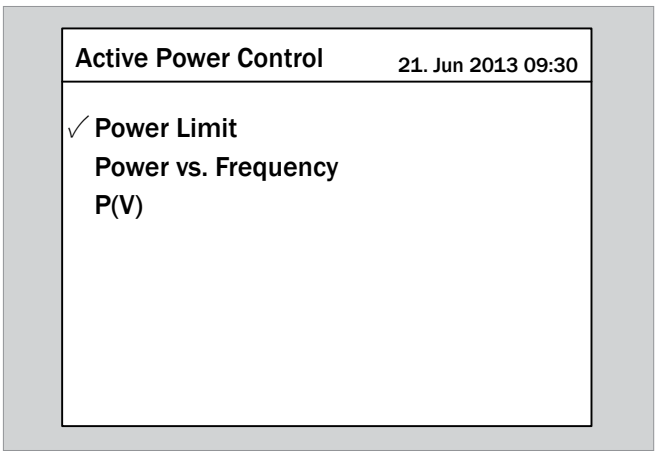
→ The parameter is set.



Finalising the setting

1. Press the EXIT button to finalise the setting.

☑ When the function is switched on, a check mark will be displayed before the function name.



9.23 Controlling the power by means of frequency

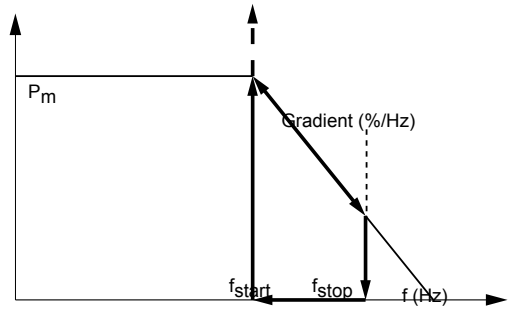
The parameters are set according to the requirements of the selected country. A change to the parameter settings may result in the approval being lost. This setting should only be changed after consultation with Delta customer service.

Overview

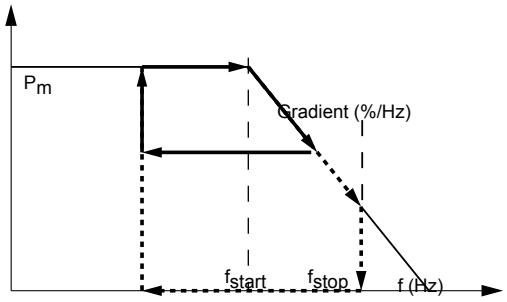
With this function you can control the active power that is fed into the grid by means of the grid frequency.

To change this setting you will need a special password which you can obtain from Delta customer service. You will find the contact data on the last page of this document.

Default behaviour for `Germany LV` (VDE-AR-N 4105) grid



Default behaviour for `Germany LV` (BDEW) grid



Path to the menu item

`Main Menu` > `Settings` > `Active / Reactive Power Control` > `Active Power Control` > `Power vs. Frequency`

Setting options

Parameter	Description / Setting range
`Actual / Rated Power`	The parameter is permanently set to **`Rated`** and cannot be changed.

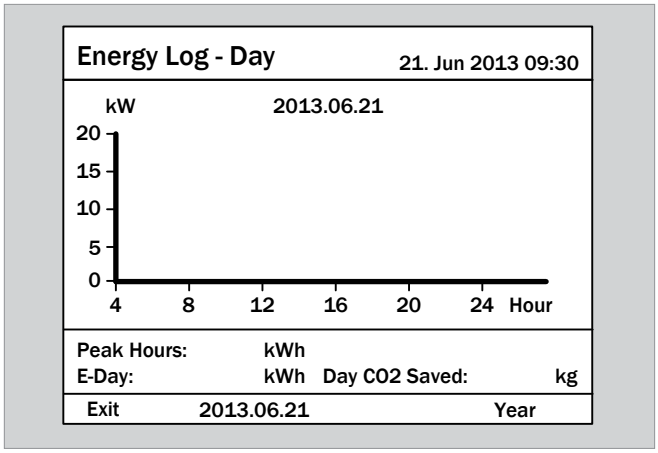
Parameter	Description / Setting range
`Start Frequency`	The grid frequency at which the active power fed into the grid is reduced according to the preset gradient. Setting range: **`50.00 .. 55.00 Hz`**
`Stop Frequency`	The grid frequency at which feeding into the grid is stopped. Setting range: **`50.00 .. 55.00 Hz`**
`Recovery Frequency`	The grid frequency at which the inverter once more feeds the full active power into the grid. Setting range: **`50.00 .. 55.00 Hz`**
`Gradient`	If the grid frequency falls below the value in the **`Recovery Frequency`** parameter again, the active power will be continuously increased by the value set here until the full active power is reached. Setting range: **`0 .. 100 %/Hz`**
`Recovery Time`	If the grid frequency falls below the value in the **`Recovery Frequency`** parameter again, the inverter waits for the time set here before supplying power to the grid. Setting range: **`0 .. 600 s`**
`Mode`	Setting range: **`ON`**: The function is switched on. **`OFF`**: The function is switched off.

9 Settings

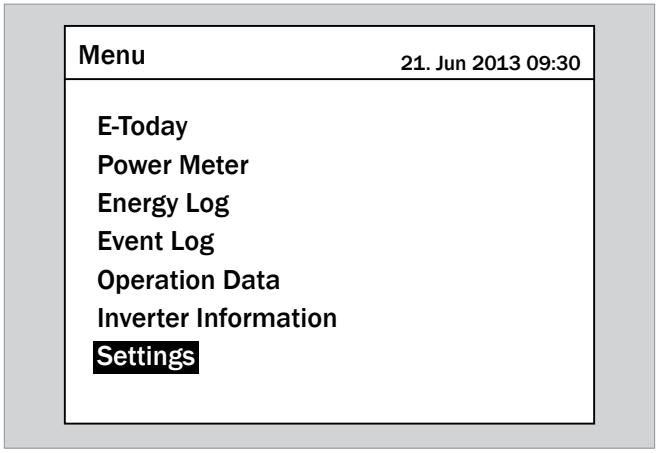
Calling up the menu item

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

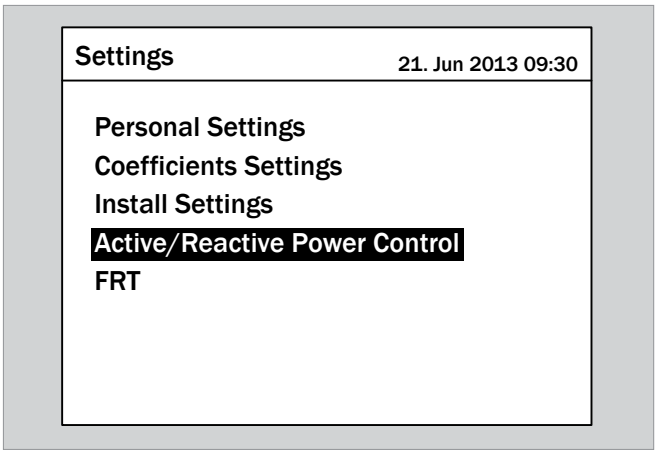
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



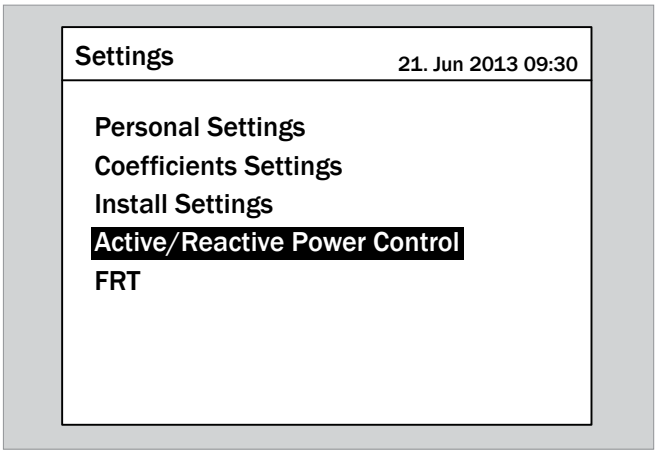
2. Using the ▼ and ▲ buttons, select the **`Settings`** entry and press the ENT button.



3. Using the ▼ and ▲ buttons, select the **`Active/Reactive Power Control`** entry and press the ENT button.



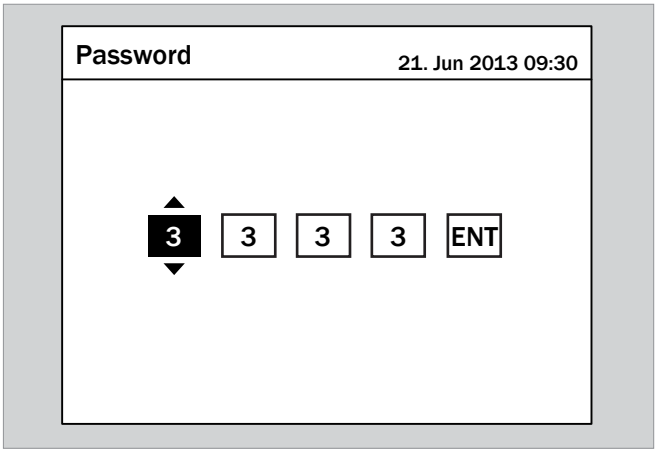
4. Using the ▼ and ▲ buttons, select the **`Active/Reactive Power Control`** entry and press the ENT button.



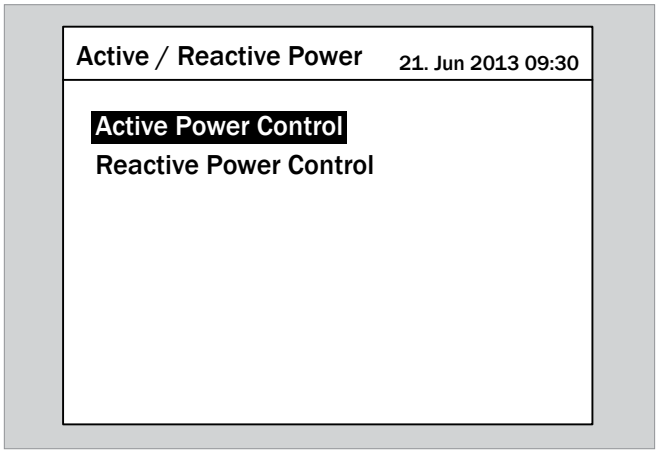
5. Enter the password that you received from Delta customer service.

Use the ▼ and ▲ buttons to set the individual digits.

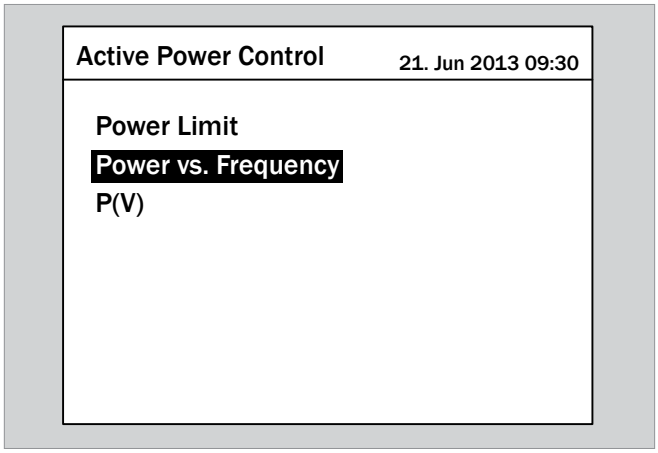
Press the ENT button to confirm a digit.



6. Using the ▼ and ▲ buttons, select the **Active Power Control** entry and press the ENT button.

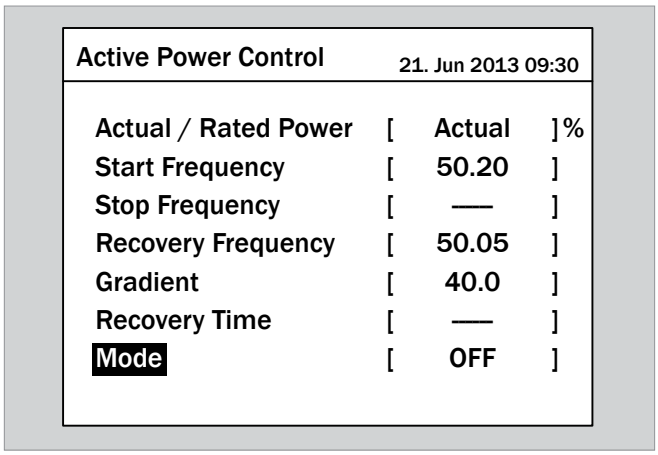


7. Using the ▼ and ▲ buttons, select the **Power vs. Frequency** entry and press the ENT button.

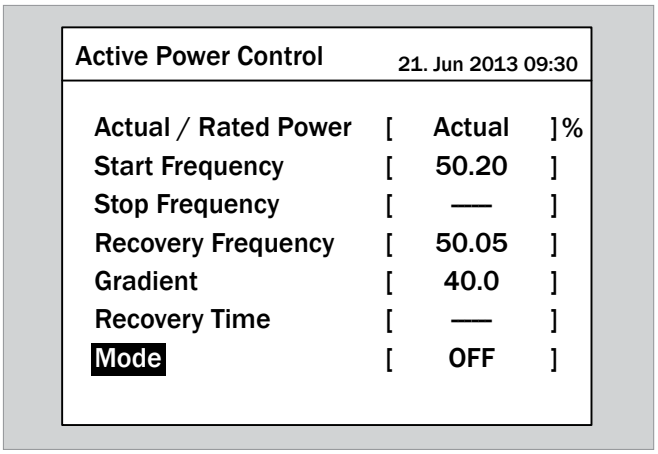


Switching the function on/off

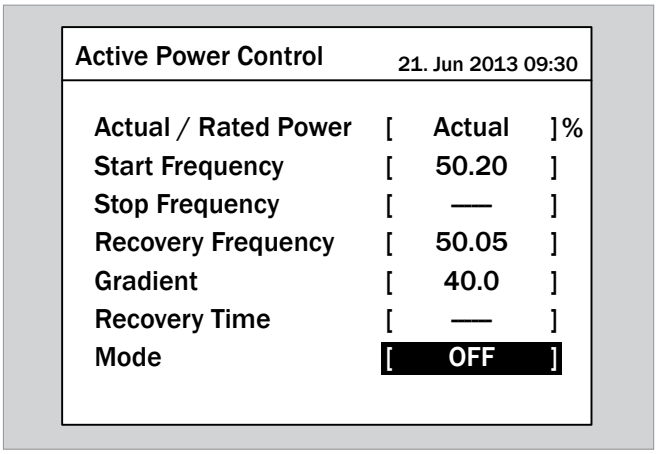
1. Using the ▼ and ▲ buttons, select the **Mode** entry and press the ENT button.



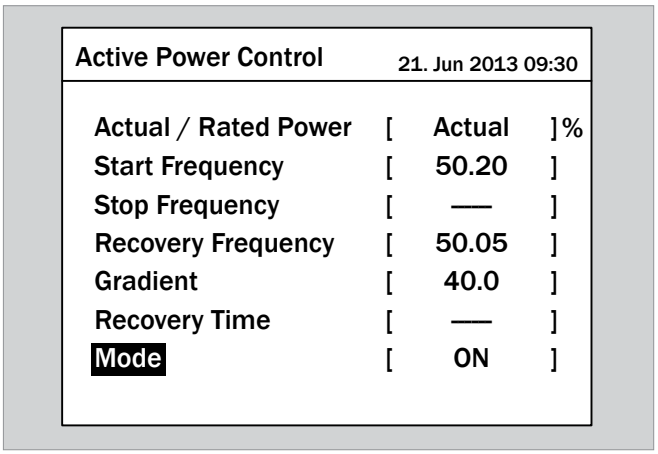
→ The currently set mode is highlighted and can be changed.



2. Using the ▼ and ▲ buttons, select a mode and press the ENT button.



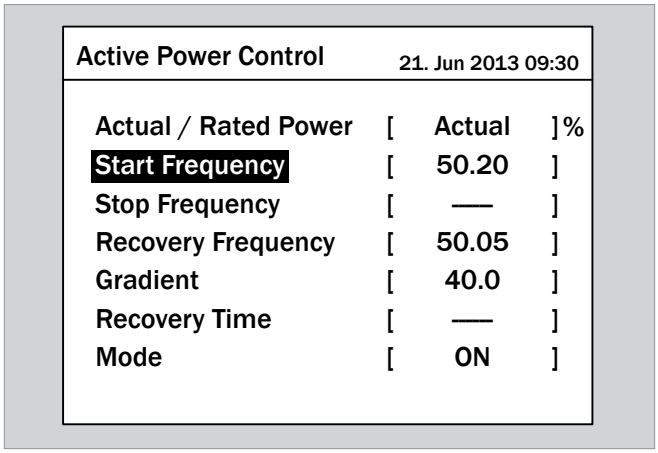
→ The mode is set.



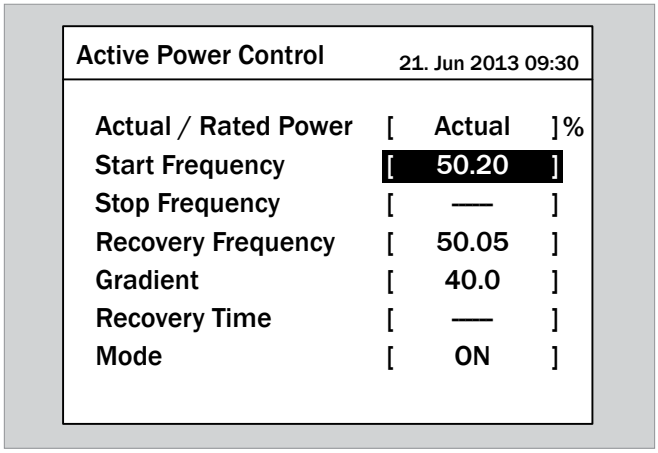
Changing settings

The procedure is identical for all parameters.

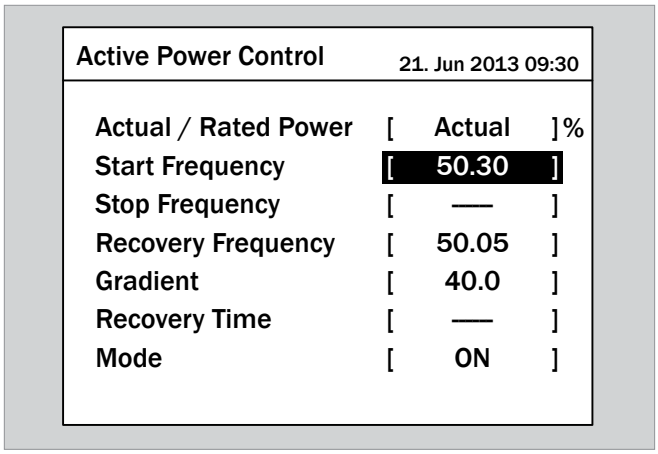
1. Using the ▼ and ▲ buttons, select a parameter and press the ENT button.



→ The value is highlighted and can be changed.

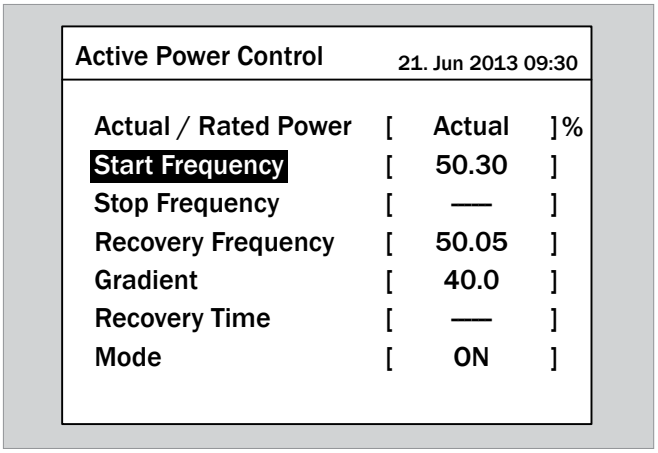


2. Use the ▼ and ▲ buttons to select the value.



3. Press the ENT button to confirm.

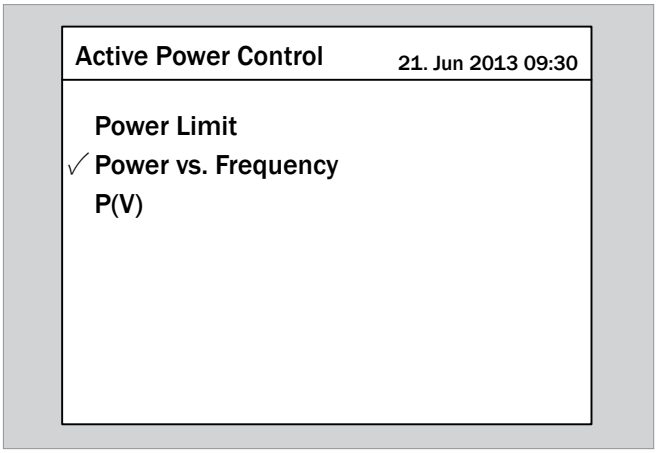
→ The parameter is set.



Finalising the setting

1. Press the EXIT button to finalise the setting.

→ When the function is switched on, a check mark will be displayed before the function name.



9.24 Constant cos φ

This setting should only be changed after consultation with Delta customer service.

Overview

With this function you can set a constant cos φ.

To change this setting you will need a special password which you can obtain from Delta customer service. You will find the contact data on the last page of this document.

Path to the menu item

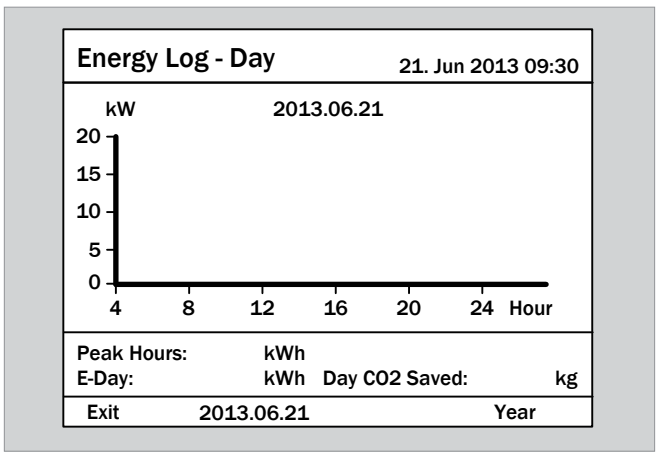
Main Menu > **Settings** > **Active / Reactive Power Control** > **Reactive Power Control** > **Constant cos ϕ**

Setting options

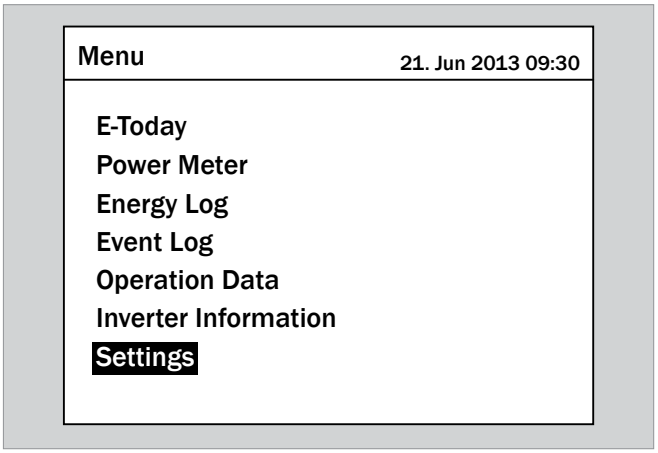
Parameter	Description / Setting range
cos ϕ	Constant cos φ Setting range: **ind 0.80 ... ind 0.99** **1.00** **cap 0.80 ... cap 0.99**
Mode	Setting range: **ON**: The function is switched on. **OFF**: The function is switched off.

Calling up the menu item

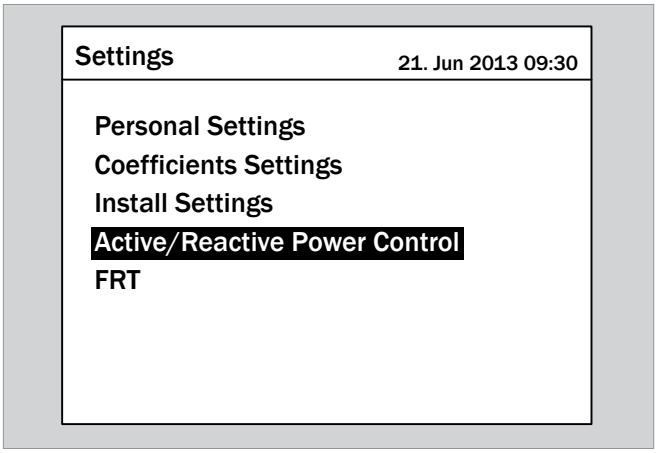
1. If the default information is displayed, press the EXIT button to open the main menu.
   Alternatively, press the EXIT button repeatedly until the main menu is displayed.



2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



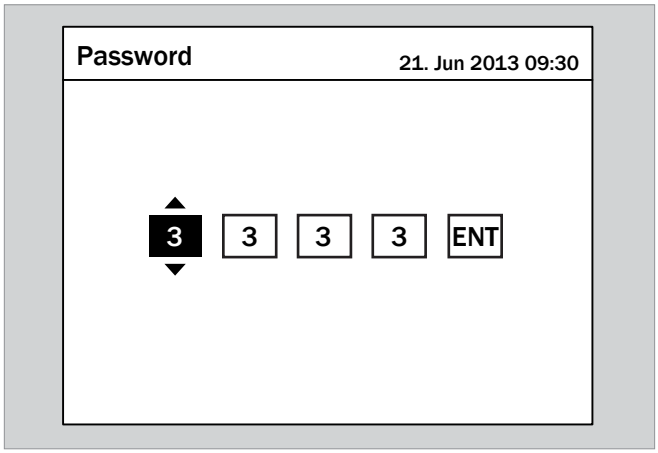
3. Using the ▼ and ▲ buttons, select the **Active/Reactive Power Control** entry and press the ENT button.



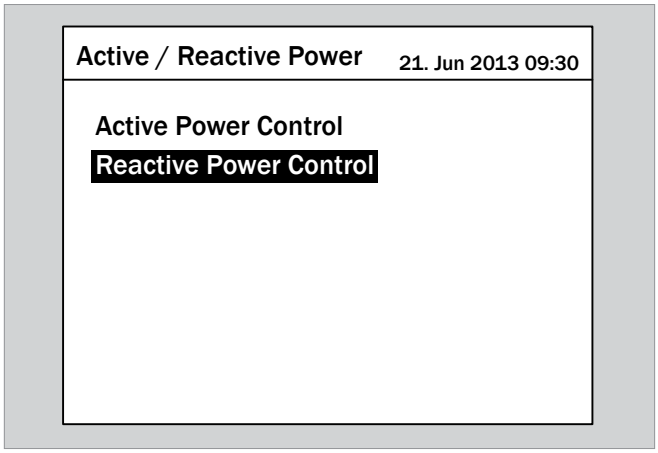
4. Enter the password that you received from Delta customer service.

Use the ▼ and ▲ buttons to set the individual digits.

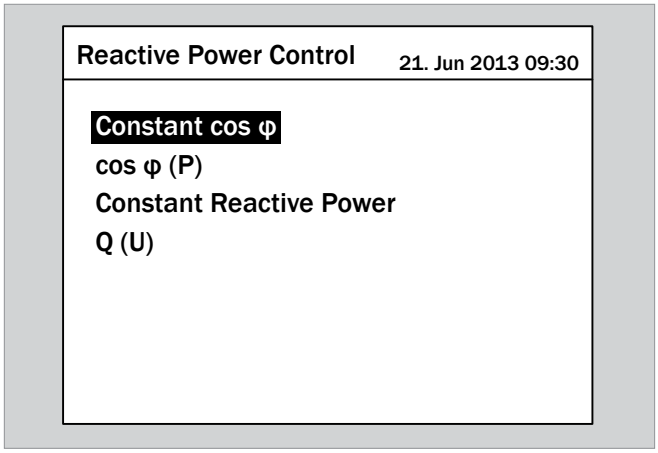
Press the ENT button to confirm a digit.



5. Using the ▼ and ▲ buttons, select the **`Reactive Power Control`** entry and press the ENT button.

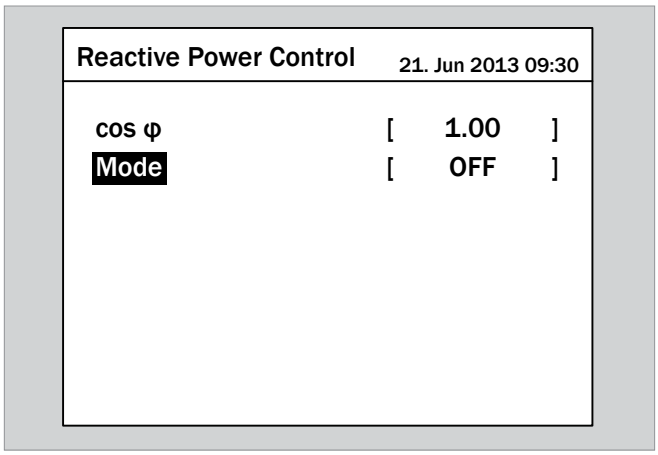


6. Using the ▼ and ▲ buttons, select the **`Constant cos ϕ`** entry and press the ENT button.

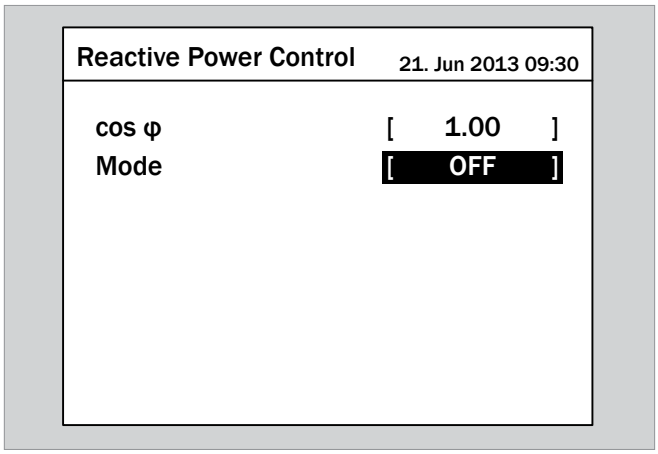


Switching the function on/off

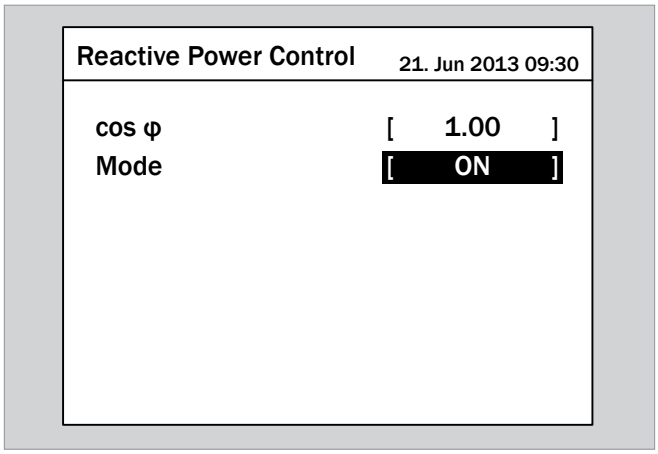
1. Using the ▼ and ▲ buttons, select the **Mode** entry and press the ENT button.



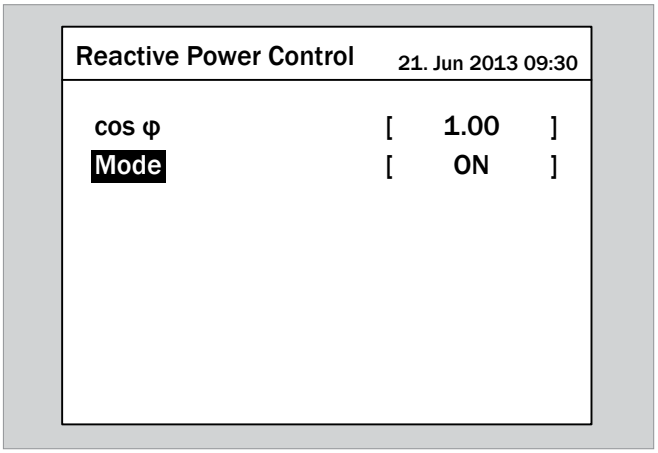
→ The currently set mode is highlighted and can be changed.



2. Using the ▼ and ▲ buttons, select a mode and press the ENT button.



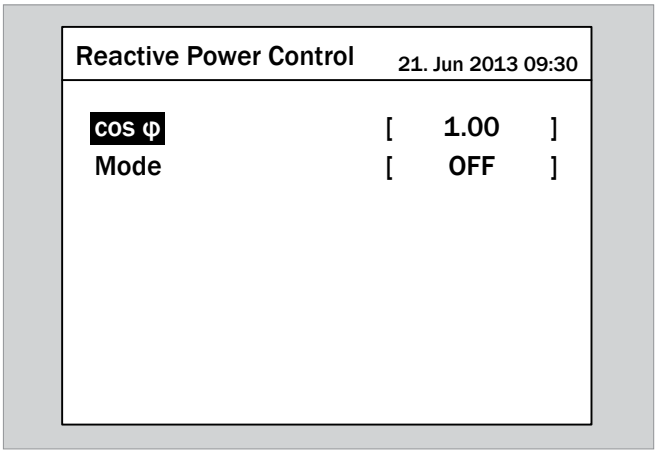
→ The mode is set.



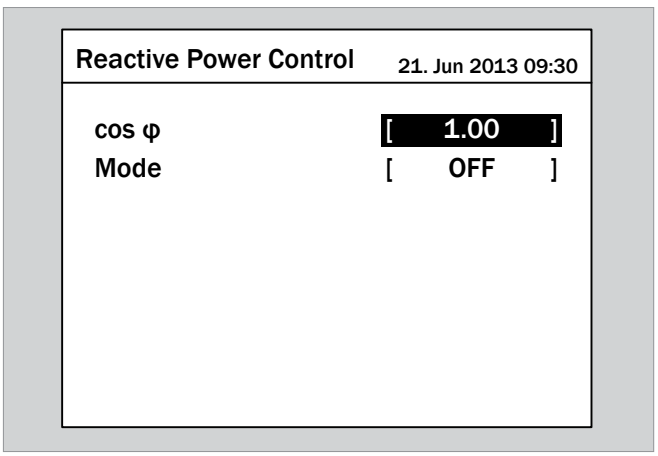
Changing settings

The procedure is identical for all parameters.

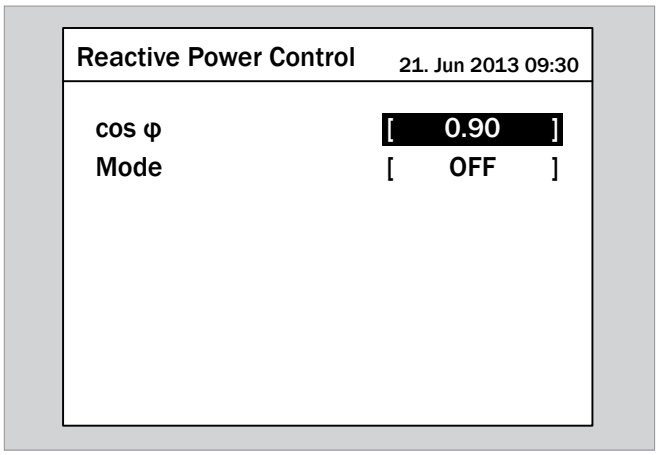
1. Using the ▼ and ▲ buttons, select a parameter and press the ENT button.



→ The value is highlighted and can be changed.

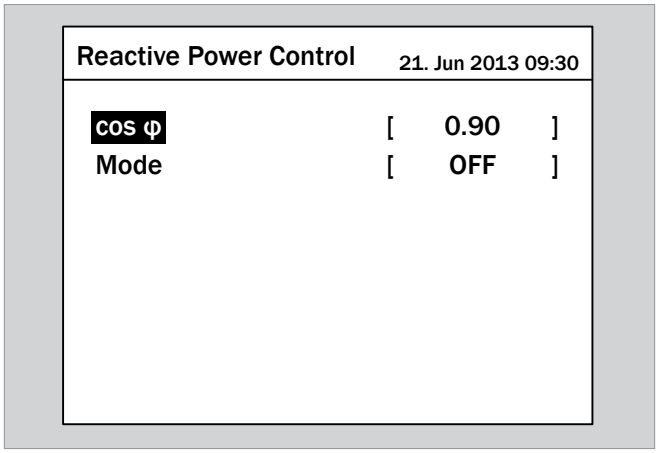


2. Use the ▼ and ▲ buttons to select the value.



3. Press the ENT button to confirm.

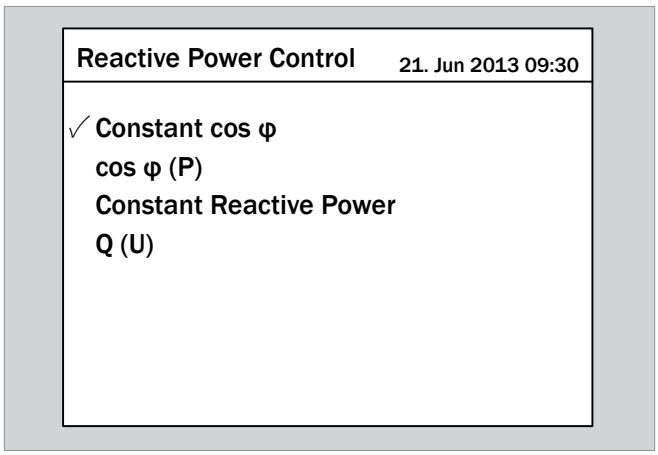
→ The parameter is set.



Finalising the setting

1. Press the EXIT button to finalise the setting.

☑ When the function is switched on, a check mark will be displayed before the function name.



9.25 Cos φ (P)

The parameters are set according to the requirements of the selected country. A change to the parameter settings may result in the approval being lost. This setting should only be changed after consultation with Delta customer service.

Overview

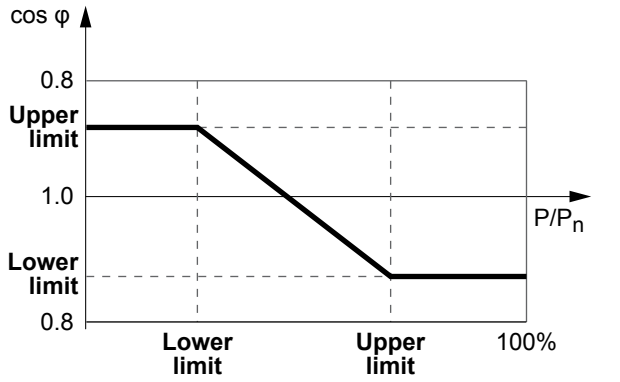
With this function you can determine how cos φ changes as a function of the active power.

To change this setting you will need a special password which you can obtain from Delta customer service. You will find the contact data on the last page of this document.

Path to the menu item

Main Menu > **Settings** > **Active / Reactive Power Control** > **Reactive Power Control** > **Constant cos ϕ**

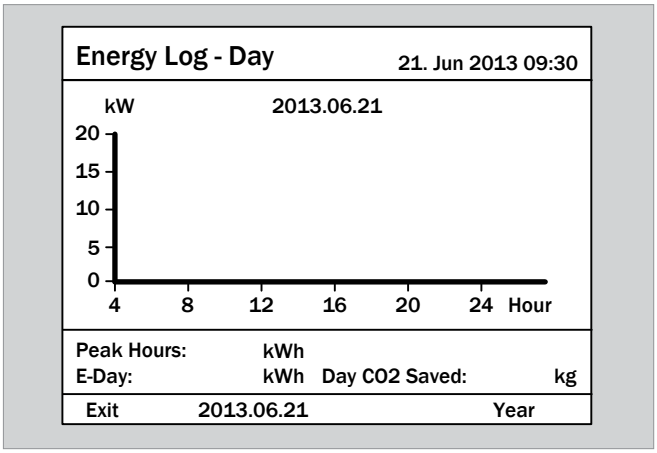
Setting options



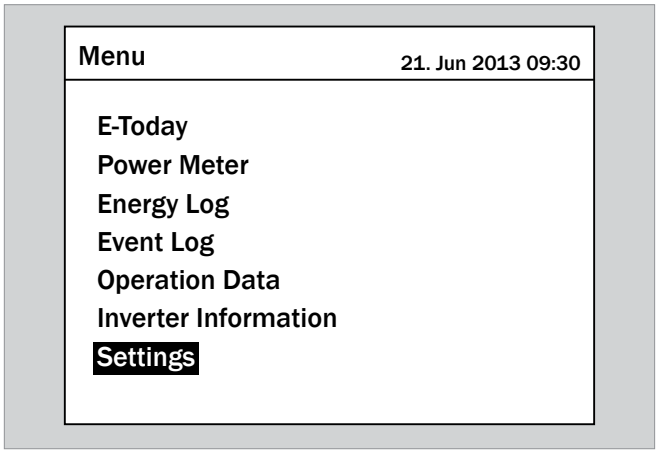
Parameter	Description / Setting range
Upper limit - cos ϕ	Upper limit of cos φ. Setting range: **ind 0.80 ... ind 0.99** **1.00** **cap 0.80 ... cap 0.99**
Lower Power	Lower power limit as a percentage of the rated power. Setting range: **0 ... 100%**
Lower limit - cos ϕ	Lower limit of cos φ. Setting range: **ind 0.80 ... ind 0.99** **1.00** **cap 0.80 ... cap 0.99**
Upper Power	Upper power limit as a percentage of the rated power. Setting range: **0 ... 100%**
Lock-in Voltage	The upper limit of the grid voltage range in which the function is active. Setting range: **230.0 .. 253.0 V**
Lock-out Voltage	The lower limit of the grid voltage range in which the function is active. Setting range: **207.0 .. 230.0 V**
Mode	Setting range: **ON**: The function is switched on. **OFF**: The function is switched off.

Calling up the menu item

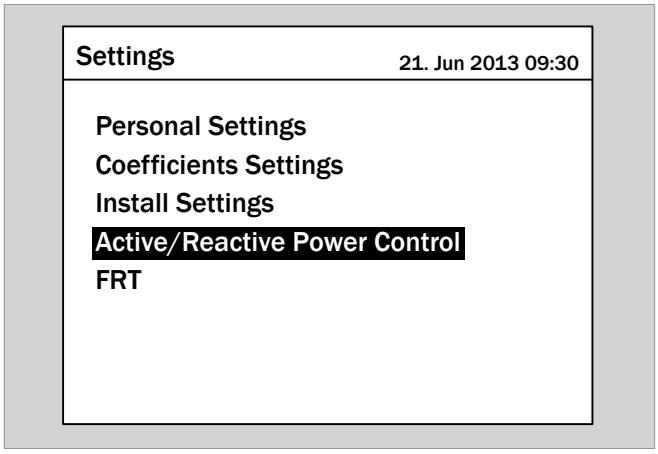
1. If the default information is displayed, press the EXIT button to open the main menu.
   Alternatively, press the EXIT button repeatedly until the main menu is displayed.



2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



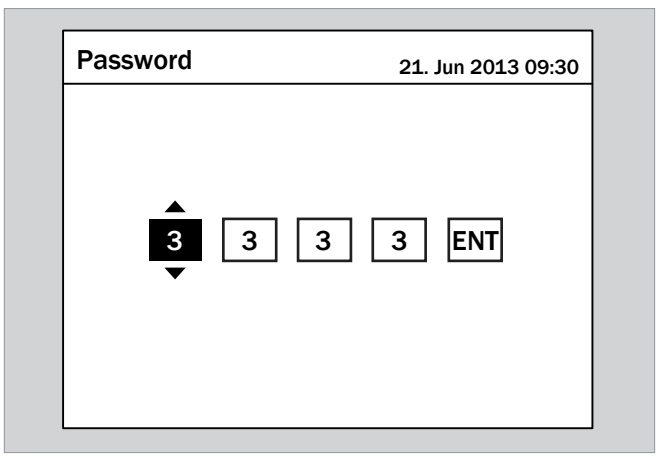
3. Using the ▼ and ▲ buttons, select the **Active/Reactive Power Control** entry and press the ENT button.



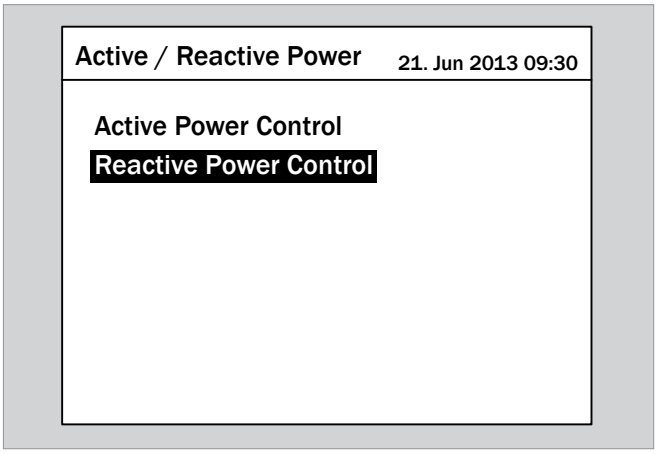
4. Enter the password that you received from Delta customer service.

Use the ▼ and ▲ buttons to set the individual digits.

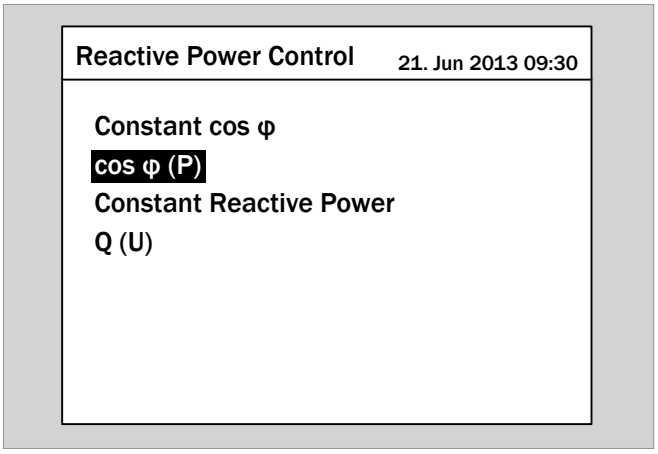
Press the ENT button to confirm a digit.



5. Using the ▼ and ▲ buttons, select the **Reactive Power Control** entry and press the ENT button.

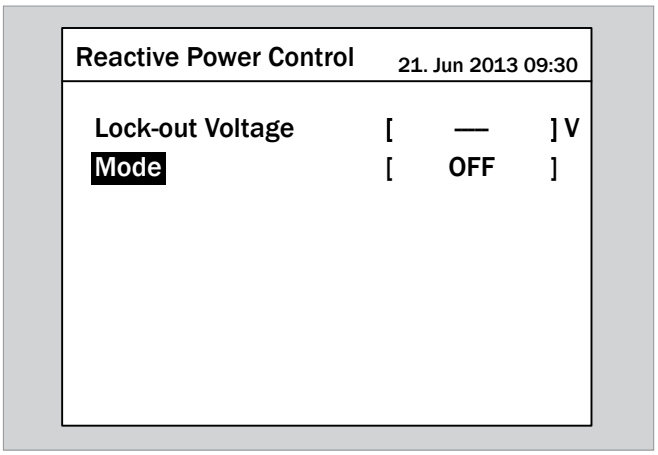


6. Using the ▼ and ▲ buttons, select the **cos ϕ (P)** entry and press the ENT button.

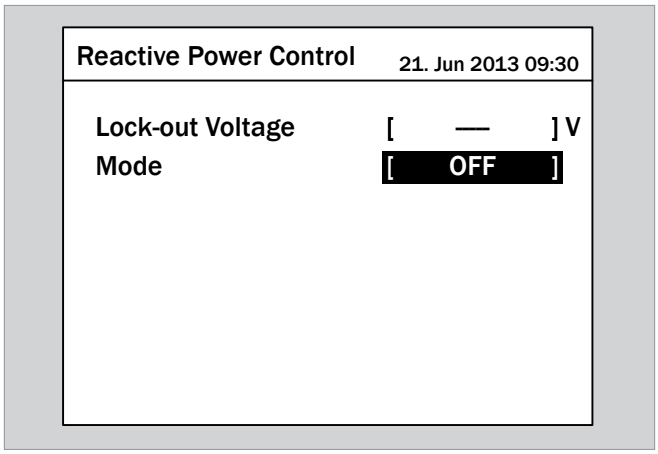


Switching the function on/off

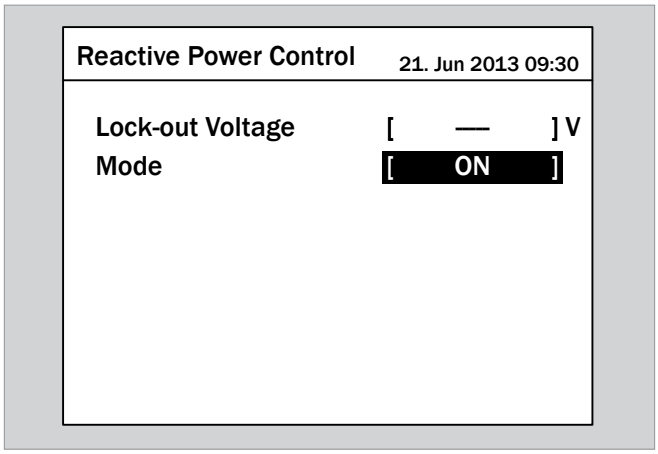
1. Using the ▼ and ▲ buttons, select the **Mode** entry and press the ENT button.



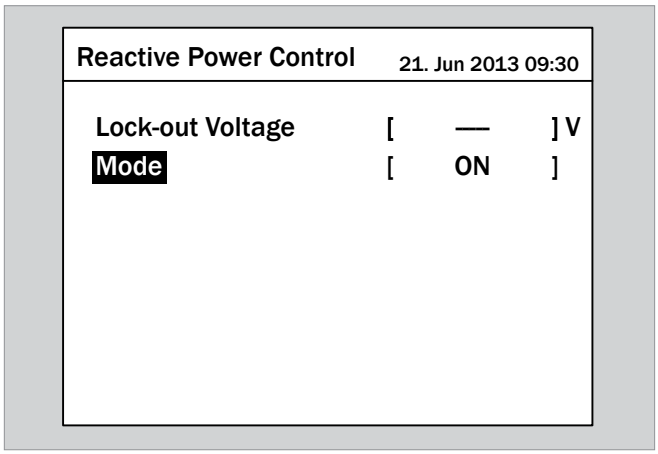
→ The currently set mode is highlighted and can be changed.



2. Using the ▼ and ▲ buttons, select a mode and press the ENT button.



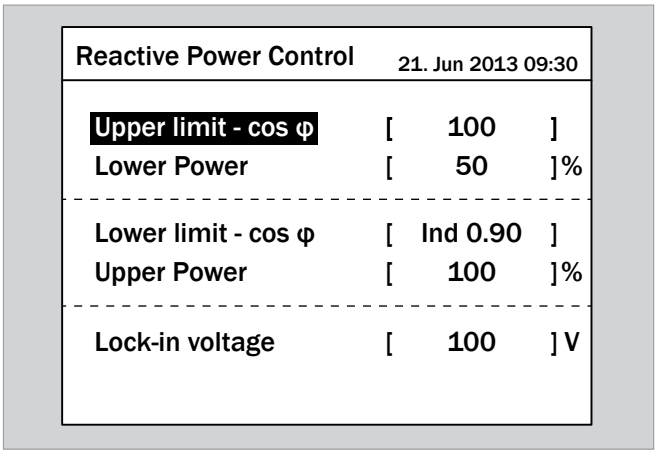
→ The mode is set.



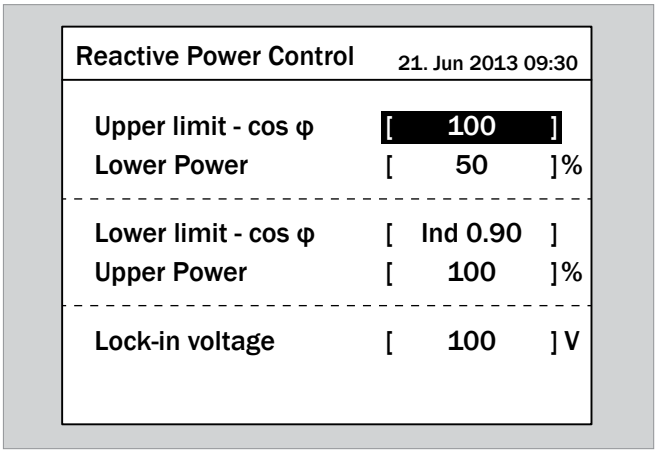
Changing settings

The procedure is identical for all parameters.

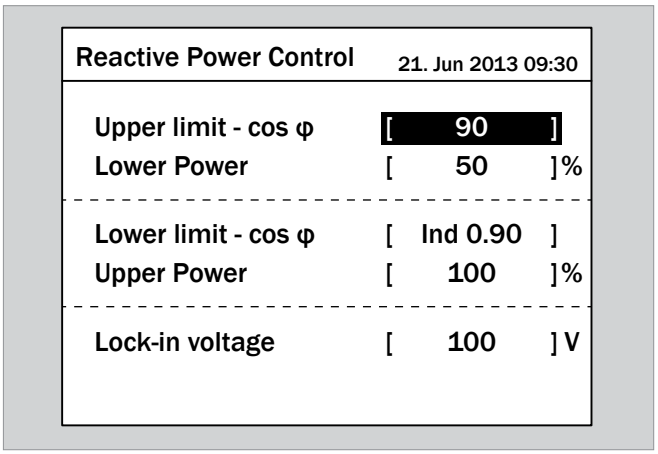
1. Using the ▼ and ▲ buttons, select a parameter and press the ENT button.



→ The value is highlighted and can be changed.

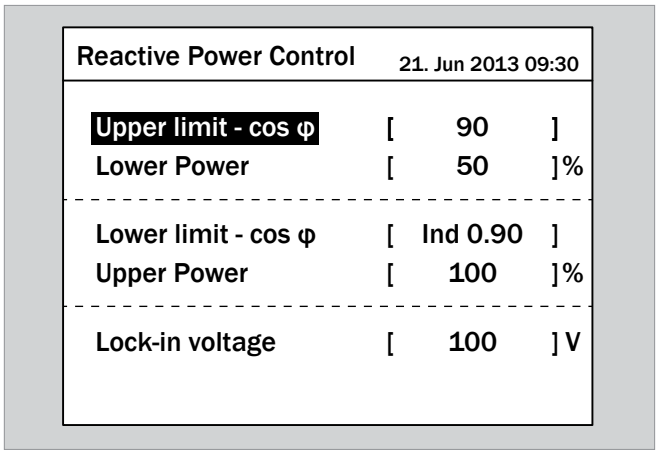


2. Use the ▼ and ▲ buttons to select the value.



3. Press the ENT button to confirm.

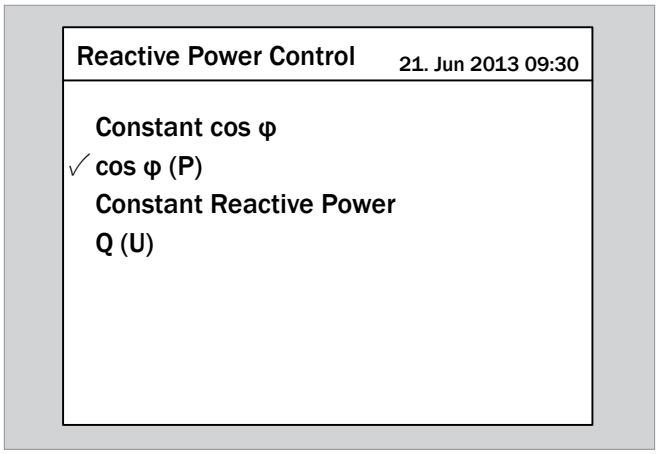
→ The parameter is set.



Finalising the setting

1. Press the EXIT button to finalise the setting.

☑ When the function is switched on, a check mark will be displayed before the function name.



9.26 Constant reactive power

The parameters are set according to the requirements of the selected country. A change to the parameter settings may result in the approval being lost. This setting should only be changed after consultation with Delta customer service.

Overview

You can set a constant reactive power with this function.

To change this setting you will need a special password which you can obtain from Delta customer service. You will find the contact data on the last page of this document.

Path to the menu item

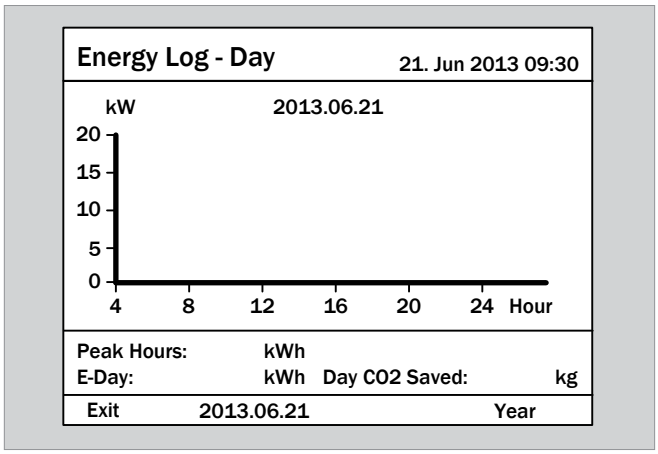
Main Menu > **Settings** > **Active / Reactive Power Control** > **Reactive Power Control** > **Constant Reactive Power**

Setting options

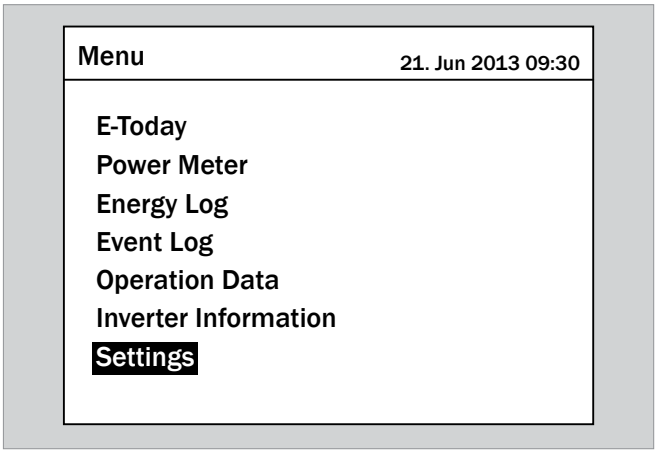
Parameter	Description / Setting range
Reactive Power (Q/Sn)	Reactive power as a percentage of the apparent power **0** **ind 1 .. ind 63 %** **kap 1 .. kap 63 %**
Mode	Setting range: **ON**: The function is switched on. **OFF**: The function is switched off.

Calling up the menu item

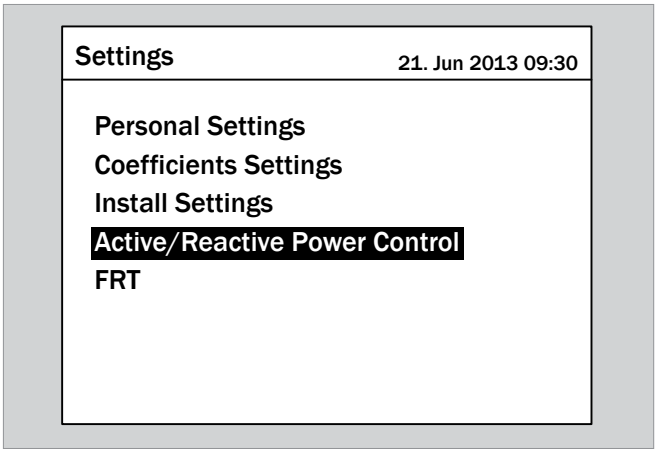
1. If the default information is displayed, press the EXIT button to open the main menu.
   Alternatively, press the EXIT button repeatedly until the main menu is displayed.



2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



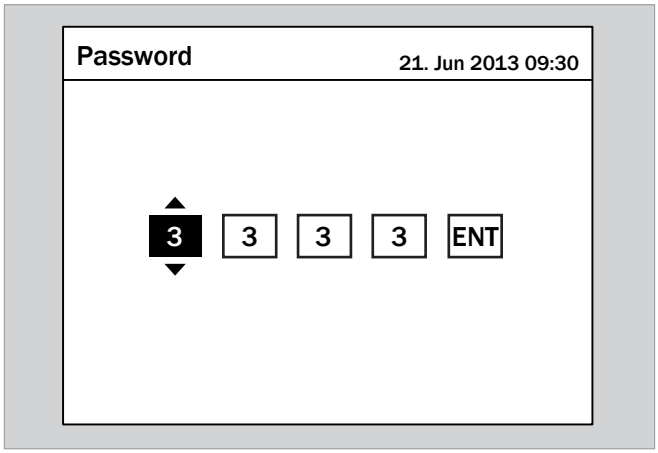
3. Using the ▼ and ▲ buttons, select the **Active/Reactive Power Control** entry and press the ENT button.



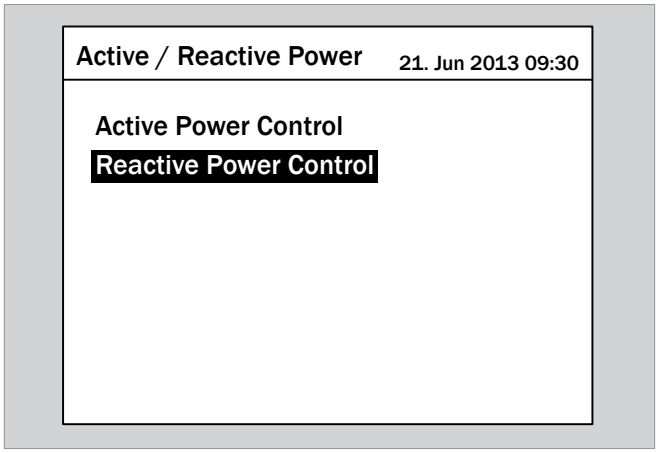
4. Enter the password that you received from Delta customer service.

Use the ▼ and ▲ buttons to set the individual digits.

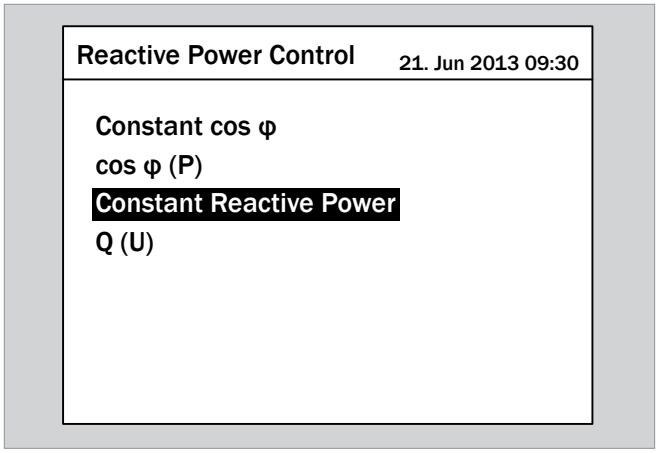
Press the ENT button to confirm a digit.



5. Using the ▼ and ▲ buttons, select the **Reactive Power Control** entry and press the ENT button.

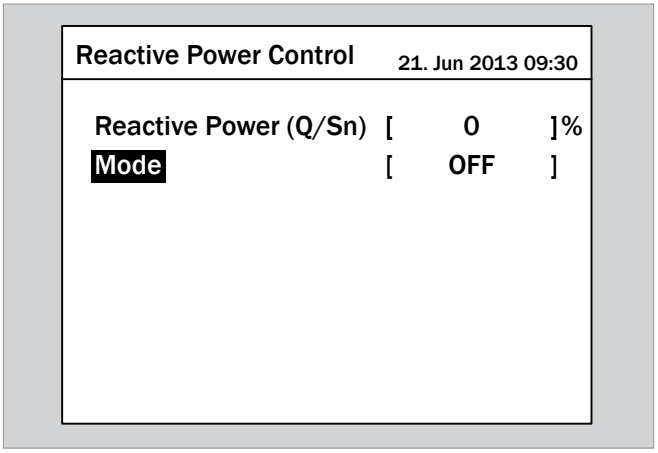


6. Using the ▼ and ▲ buttons, select the **Constant Reactive Power** entry and press the ENT button.

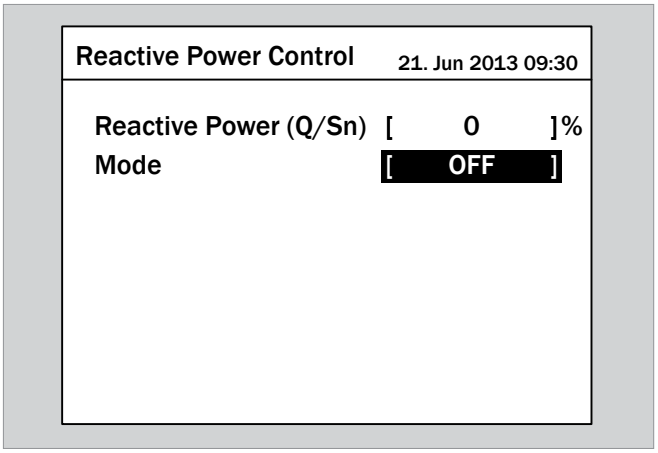


Switching the function on/off

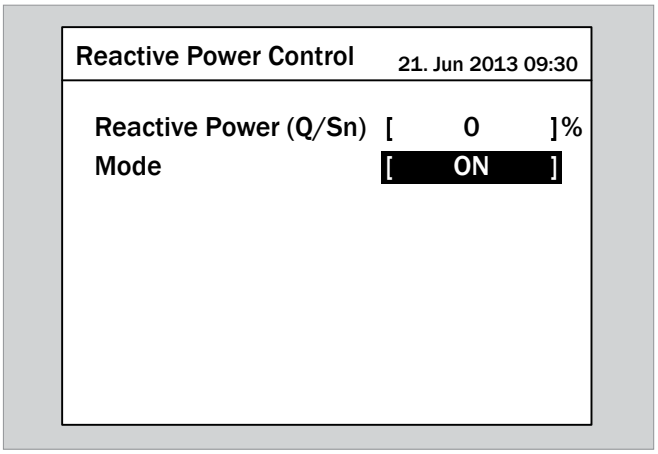
1. Using the ▼ and ▲ buttons, select the **Mode** entry and press the ENT button.



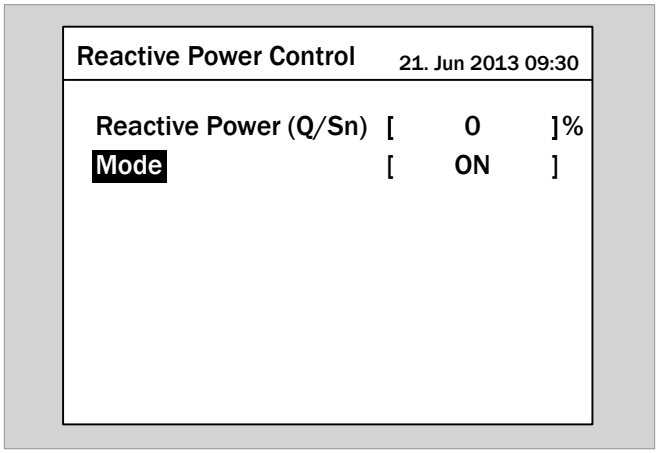
→ The currently set mode is highlighted and can be changed.



2. Using the ▼ and ▲ buttons, select a mode and press the ENT button.



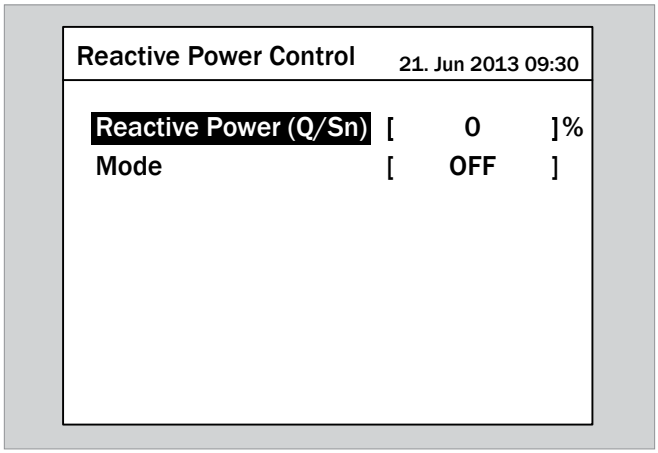
→ The mode is set.



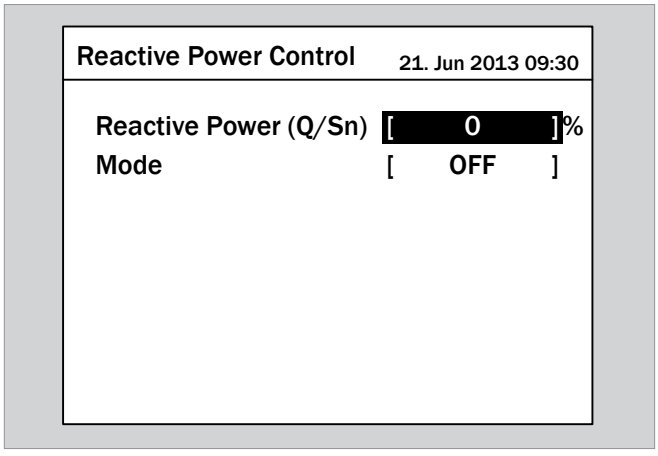
Changing settings

The procedure is identical for all parameters.

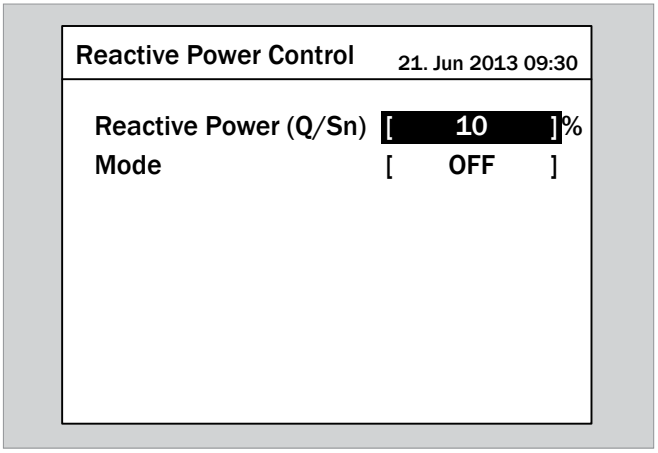
1. Using the ▼ and ▲ buttons, select a parameter and press the ENT button.



→ The value is highlighted and can be changed.

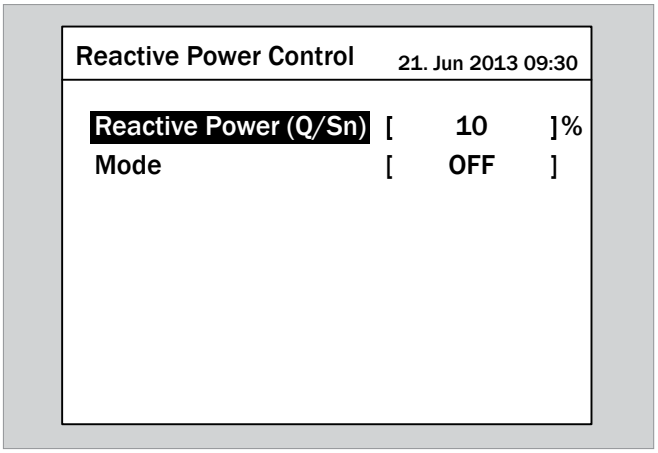


2. Use the ▼ and ▲ buttons to select the value.



3. Press the ENT button to confirm.

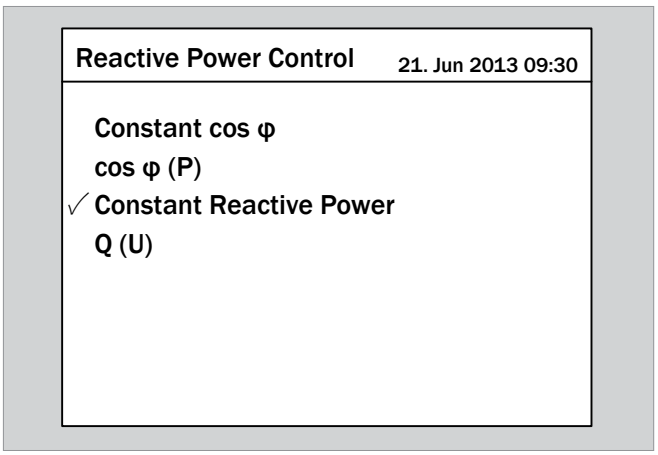
→ The parameter is set.



Finalising the setting

1. Press the EXIT button to finalise the setting.

☑ When the function is switched on, a check mark will be displayed before the function name.



9.27 Q (U) – Reactive power by means of voltage

The parameters are set according to the requirements of the selected country. A change to the parameter settings may result in the approval being lost. This setting should only be changed after consultation with Delta customer service.

Overview

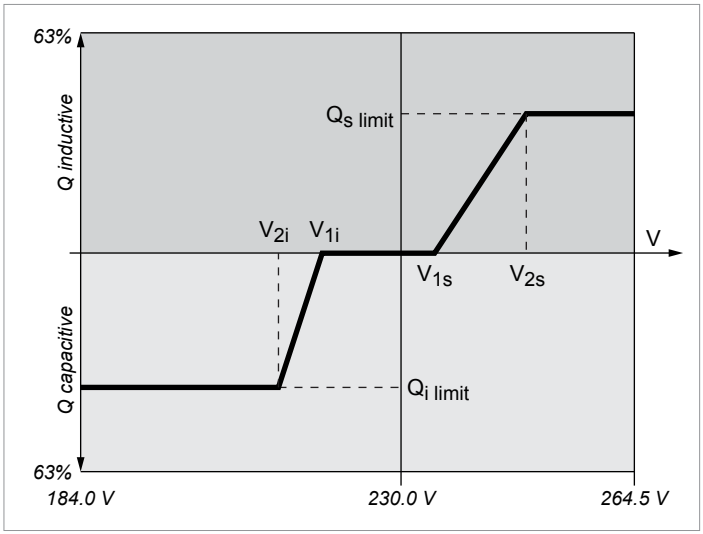
Using this function, you can determine how much reactive power is fed into the grid as a function of grid voltage.

To change this setting you will need a special password which you can obtain from Delta customer service. You will find the contact data on the last page of this document.

Path to the menu item

Main Menu > **Settings** > **Active / Reactive Power Control** > **Reactive Power Control** > **Q (U)**

Setting options



Case 1: Grid voltage > Nominal voltage

When the grid voltage rises above the lower voltage limit **V1s**, the inverter starts to supply inductive reactive power.

If the **Delay Time** is greater than 0, the inverter will wait for this time to allow the grid voltage to fall below **V1s** again before it supplies capacitive reactive power.

If the grid voltage continues to rise, the inductive reactive power will rise following the ramp defined by the characteristic diagram.

If the grid voltage exceeds the upper voltage limit **V2s**, the inductive reactive power remains at the level defined in **Qs Limit**.

Case 2: Grid voltage < Nominal voltage

If the grid voltage falls below the upper voltage limit **V1i**, the inverter starts to supply capacitive reactive power.

If the **Delay Time** is greater than 0, the inverter will wait for this time to allow the grid voltage to rise above **V1i** again before it supplies capacitive reactive power.

If the grid voltage continues to rise, the capacitive reactive power will rise following the ramp defined by the characteristic diagram.

If the grid voltage falls below the lower voltage limit **V2i**, the capacitive reactive power remains at the level defined in **Qi Limit**.

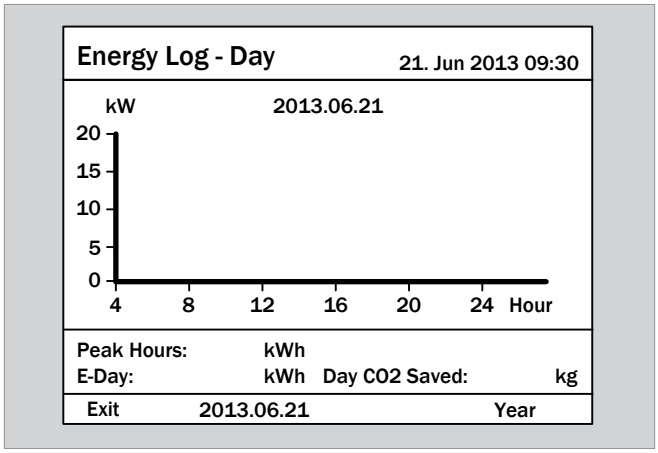
Parameter	Description / Setting range
V1s	The lower voltage limit for supplying inductive reactive power. Setting range: **230.0 ... 264.5 V**
V2s	The upper voltage limit for supplying inductive reactive power. Setting range: **230.0 ... 264.5 V**
Qs limit	The limiting value for inductive apparent power. The value is set as a percentage of the nominal apparent power S_n. This value is linked to the parameter **V2s**. Setting range: **0 ... ind 63 %**
V1i	The upper voltage limit for supplying capacitive reactive power. Setting range: **184.0 ... 230.0 V**
V2i	The lower voltage limit for supplying capacitive reactive power. Setting range: **184.0 ... 230.0 V**
Qi limit	The limiting value for inductive apparent power. The value is set as a percentage of the nominal apparent power S_n. This value is linked to the parameter **V2i**. Setting range: **0 ... kap 63 %**
Delay Time	Delay time before reactive power is supplied. Setting range: **0 ... 120.00 s**
Lock-in Power	The upper limit of the active power range in which the function is active. The parameter is specified as a percentage of the rated power. Setting range: **10 ... 100 %**

Parameter	Description / Setting range
`Lock-out Power`	The lower limit of the active power range in which the function is active. The parameter is specified as a percentage of the rated power. Setting range: `5 ... 10 %`
`Mode`	Setting range: `ON`: The function is switched on. `OFF`: The function is switched off.

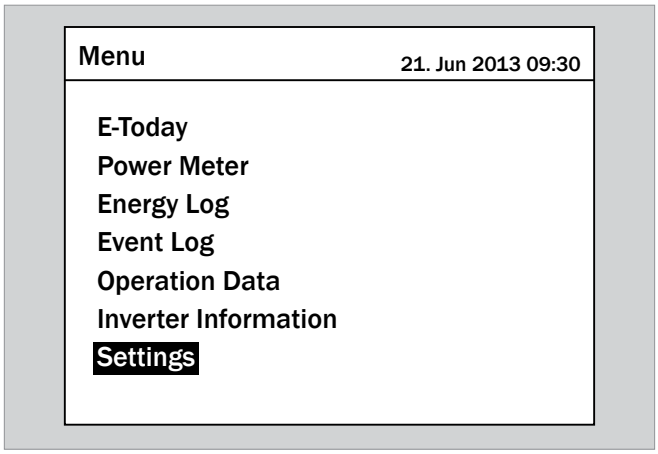
Calling up the menu item

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

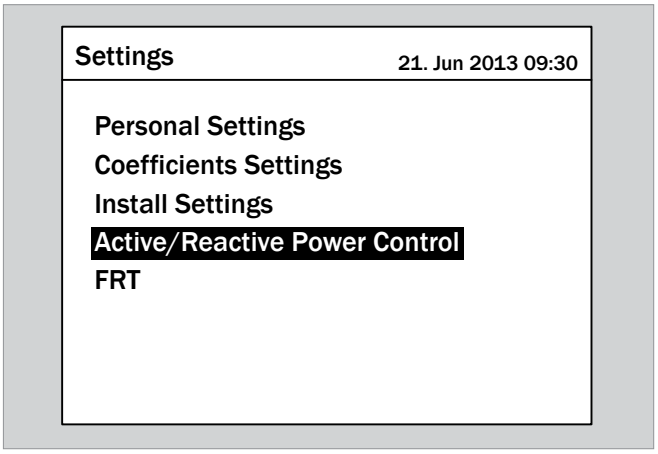
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



2. Using the ▼ and ▲ buttons, select the **`Settings`** entry and press the ENT button.



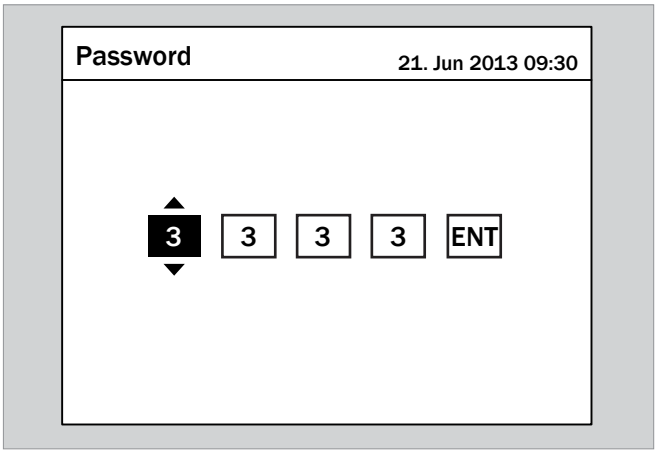
3. Using the ▼ and ▲ buttons, select the **`Active/Reactive Power Control`** entry and press the ENT button.



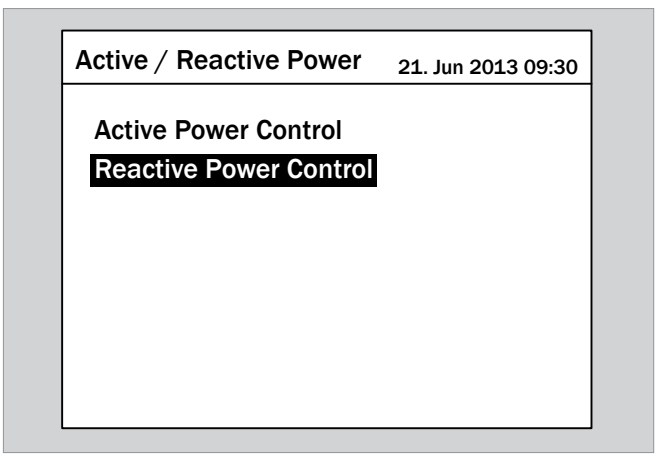
4. Enter the password that you received from Delta customer service.

Use the ▼ and ▲ buttons to set the individual digits.

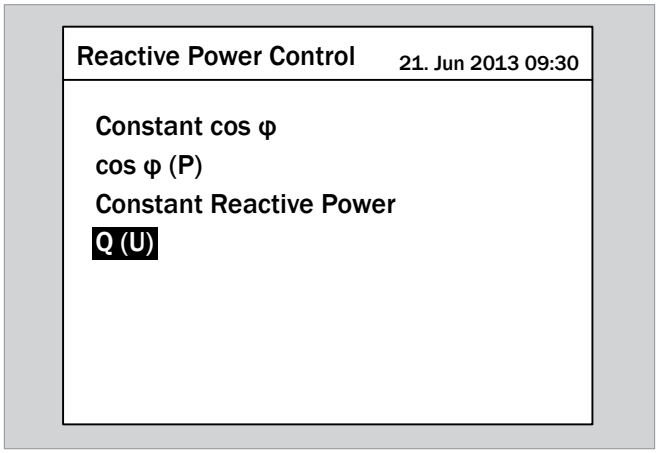
Press the ENT button to confirm a digit.



5. Using the ▼ and ▲ buttons, select the **`Reactive Power Control`** entry and press the ENT button.

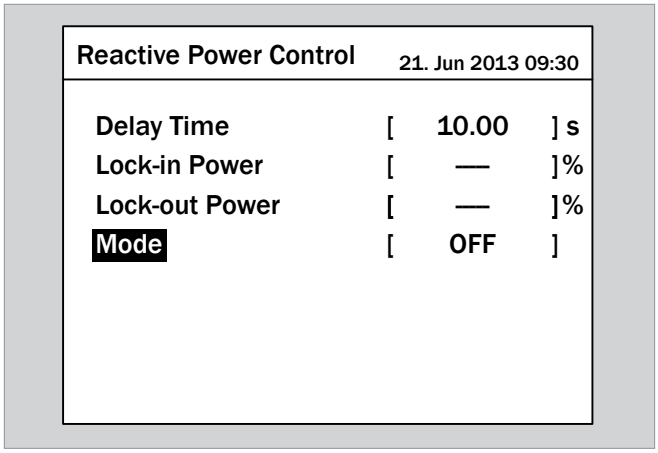


6. Using the ▼ and ▲ buttons, select the **Q (U)** entry and press the ENT button.

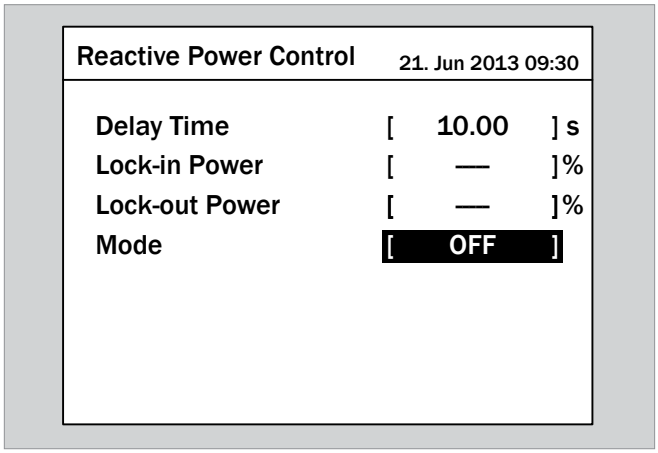


Switching the function on/off

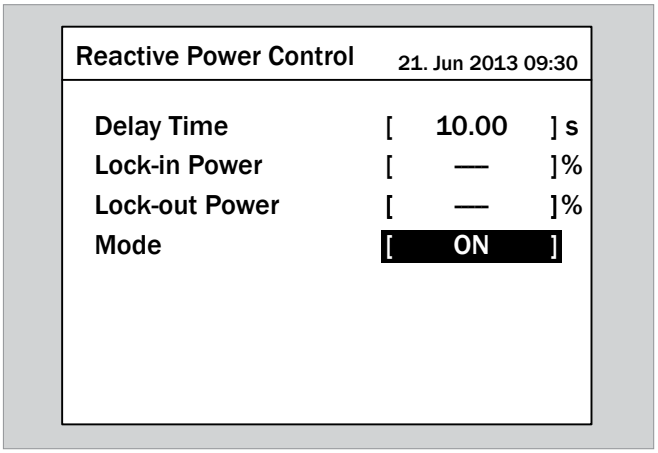
1. Using the ▼ and ▲ buttons, select the **Mode** entry and press the ENT button.



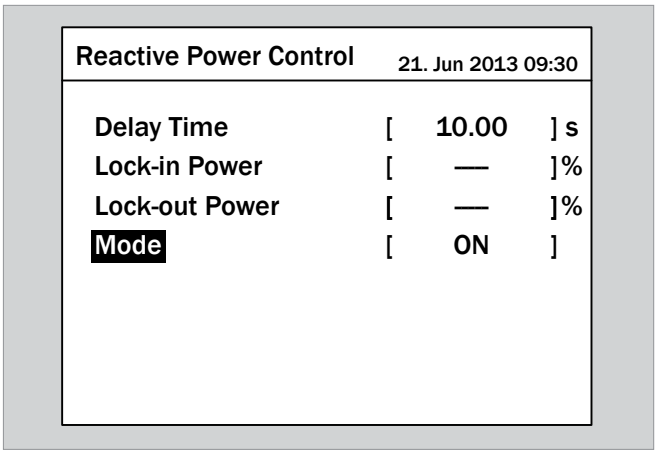
→ The currently set mode is highlighted and can be changed.



2. Using the ▼ and ▲ buttons, select a mode and press the ENT button.



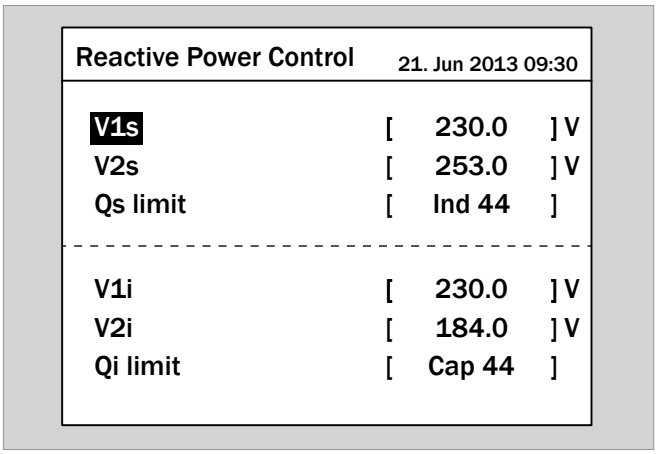
→ The mode is set.



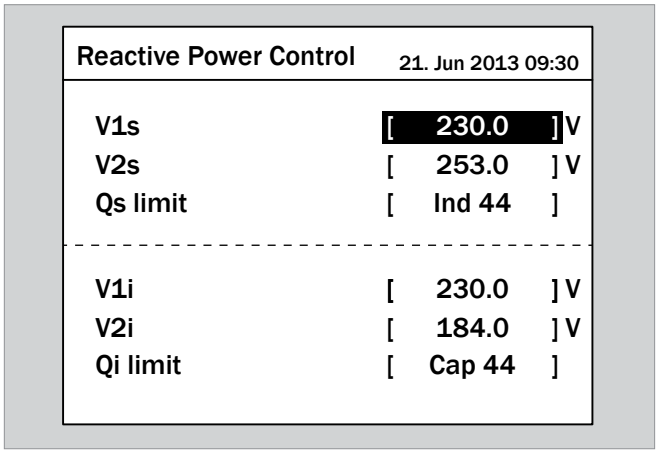
Changing settings

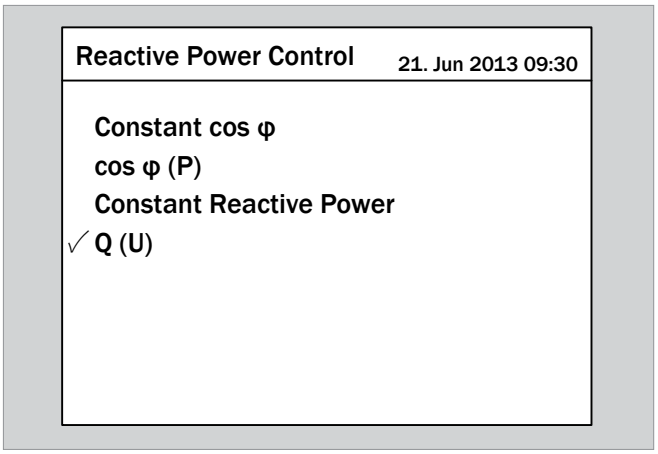
The procedure is identical for all parameters.

1. Using the ▼ and ▲ buttons, select a parameter and press the ENT button.

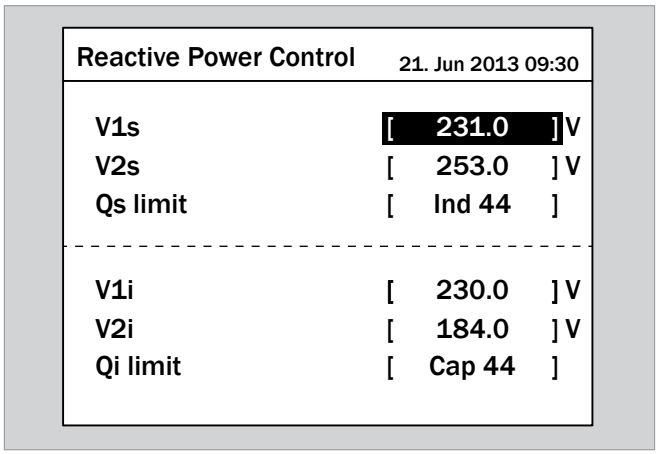


→ The value is highlighted and can be changed.



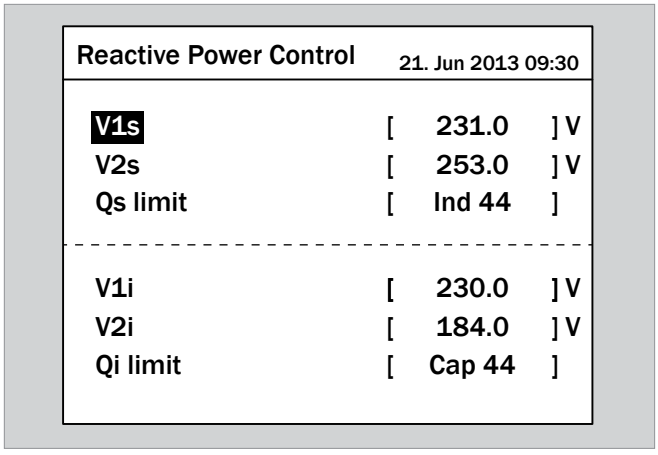


2. Use the ▼ and ▲ buttons to select the value.



3. Press the ENT button to confirm.

→ The parameter is set.



Finalising the setting

1. Press the EXIT button to finalise the setting.

☑ When the function is switched on, a check mark will be displayed before the function name.

9.28 FRT - Fault ride through

The parameters are set according to the requirements of the selected country. A change to the parameter settings may result in the approval being lost. This setting should only be changed after consultation with Delta customer service.

Overview

With this function you can determine how the inverter behaves in the event of temporary voltage dips on the grid.

To change this setting you will need a special password which you can obtain from Delta customer service. You will find the contact data on the last page of this document.

Path to the menu item

`Main Menu` > `Settings` > `FRT`

Setting options

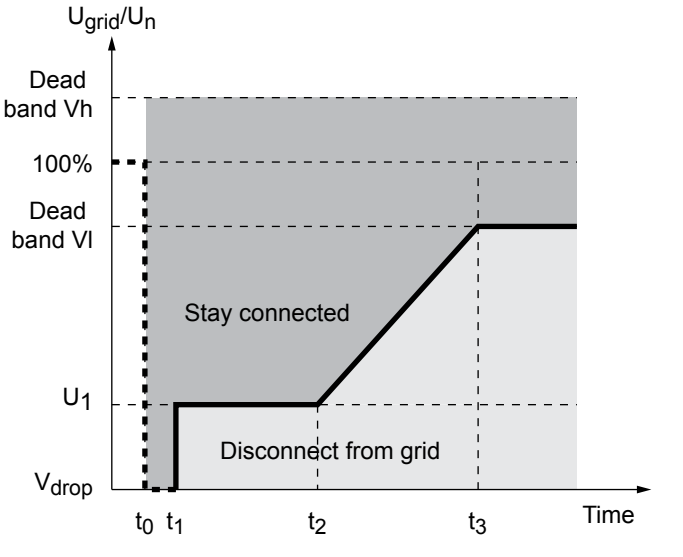


Fig. 9.2: Operating behaviour for FRT (Fault Ride Through)

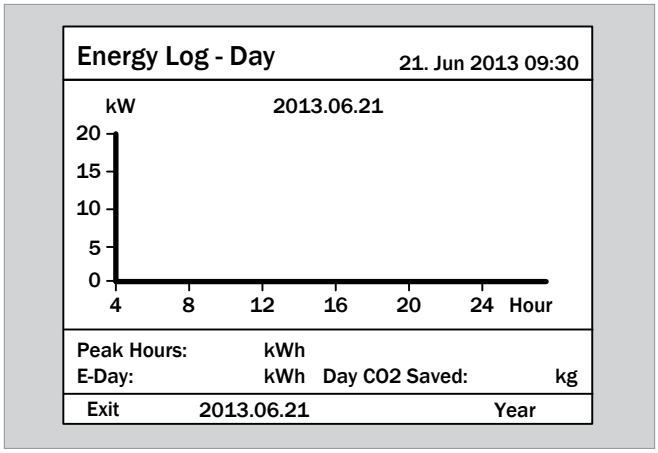
t_o : The time at which the fault occurs.

Parameter	Description / Setting range
`Dead band Vh`	The upper limit of the voltage range in which the function is **not** active. The percentage value refers to the nominal voltage. Setting range: `0 .. +20 %`
`Dead band Vl`	The lower limit of the voltage range in which the function is not active. The percentage value refers to the nominal voltage. Setting range: `0 .. -20 %`
`K factor`	Spike factor Setting range: `0 .. 10.0 %`
`Vdrop`	Voltage drop in percent. Setting range: `0 .. 90 %`
`t1`	Setting range: `0 .. 5.00 s`
`U1`	Setting range: `20 .. 90 %`
`t2`	Time t2. Setting range: `0 .. 5.00 s`
`t3`	Setting range: `0 ... 5.00 s`
`Mode`	Setting range: `ON`: The function is switched on. `OFF`: The function is switched off.

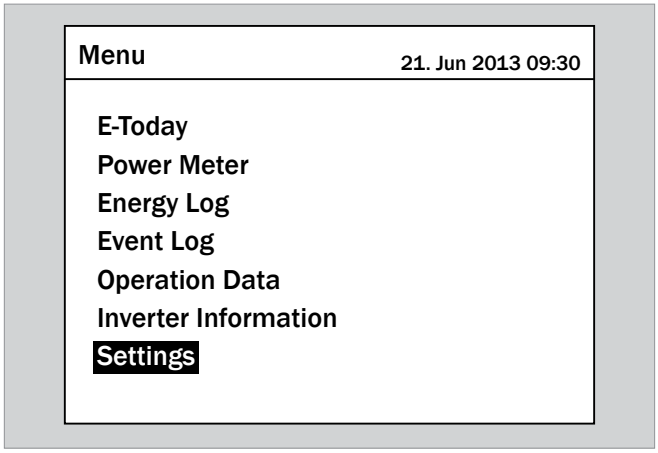
Calling up the menu item

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

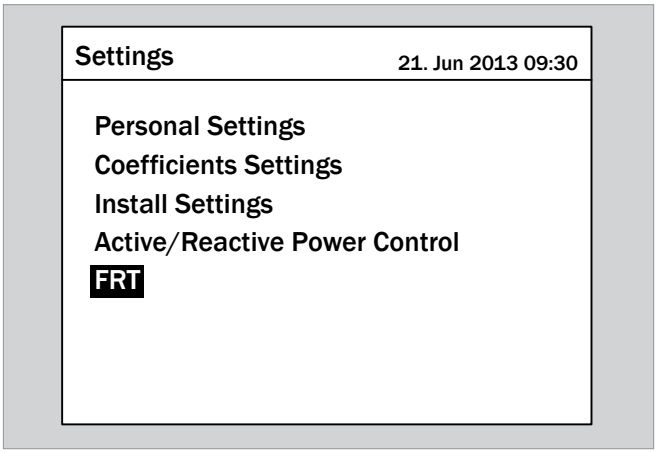
Alternatively, press the EXIT button repeatedly until the main menu is displayed.



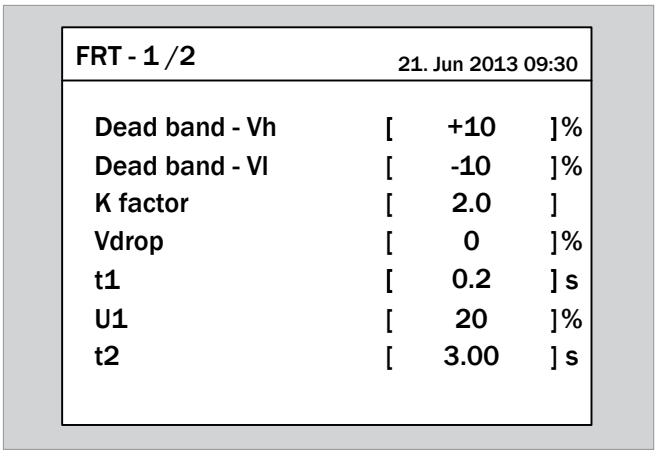
2. Using the ▼ and ▲ buttons, select the **Settings** entry and press the ENT button.



3. Using the ▼ and ▲ buttons, select the **FRT** entry and press the ENT button.

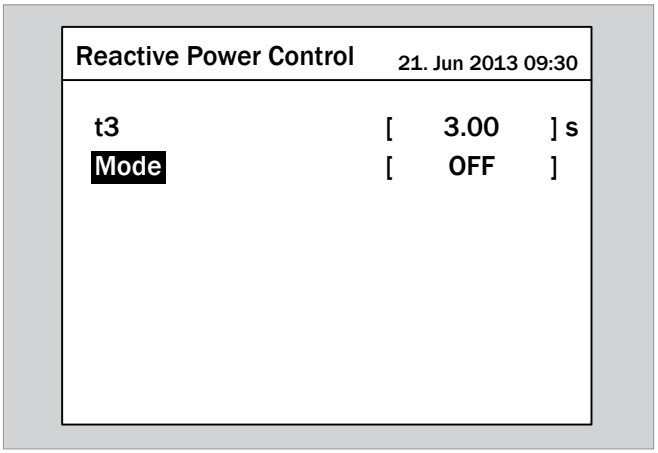


→ The menu for selecting the function is displayed.

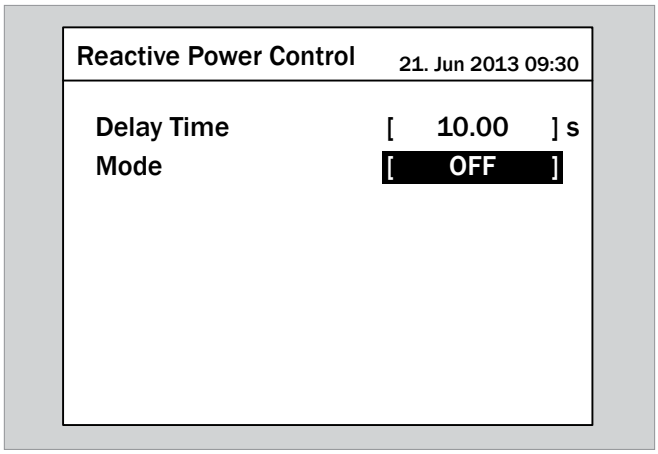


Switching the function on/off

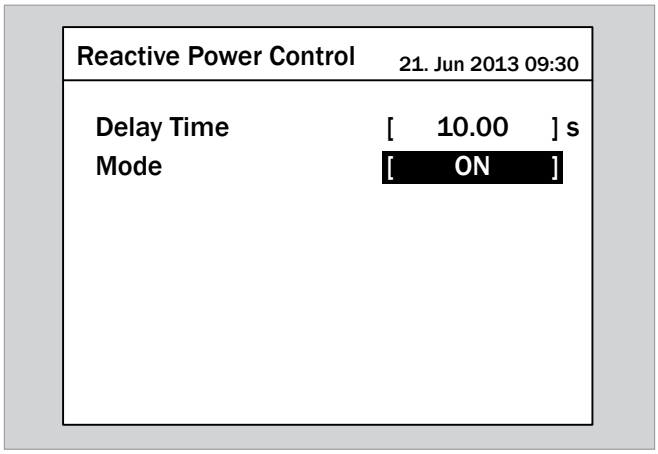
1. Using the ▼ and ▲ buttons, select the **Mode** entry and press the ENT button.



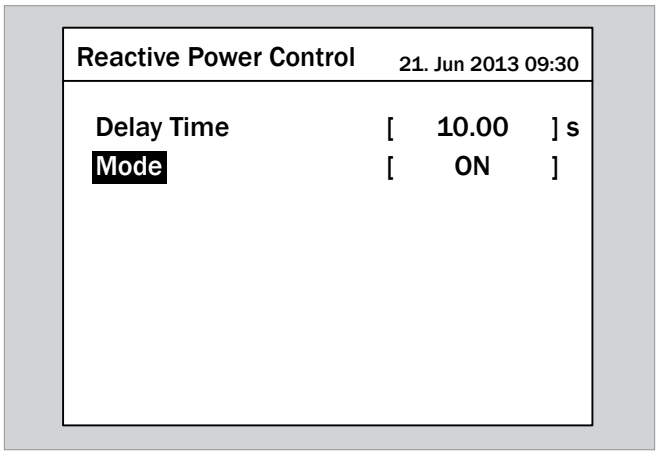
→ The currently set mode is highlighted and can be changed.



2. Using the ▼ and ▲ buttons, select a mode and press the ENT button.



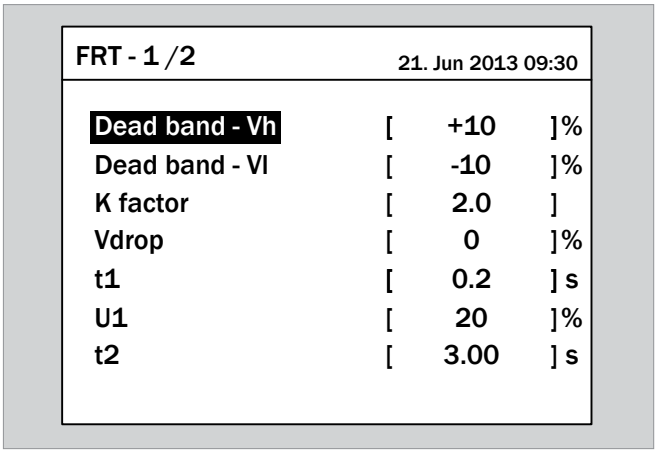
→ The mode is set.



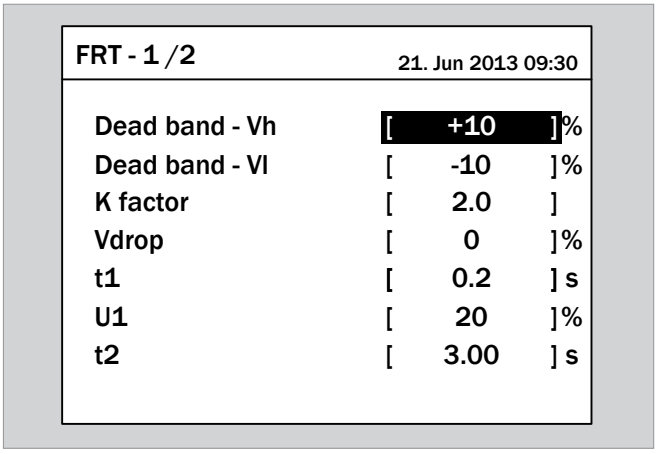
Changing settings

The procedure is identical for all parameters.

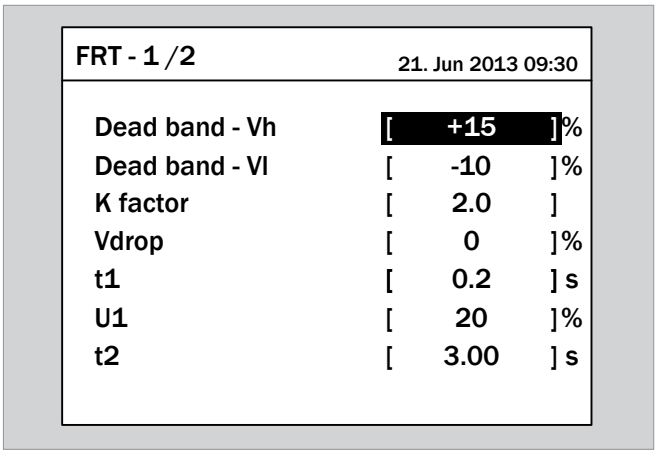
1. Using the ▼ and ▲ buttons, select a parameter and press the ENT button.



→ The value is highlighted and can be changed.

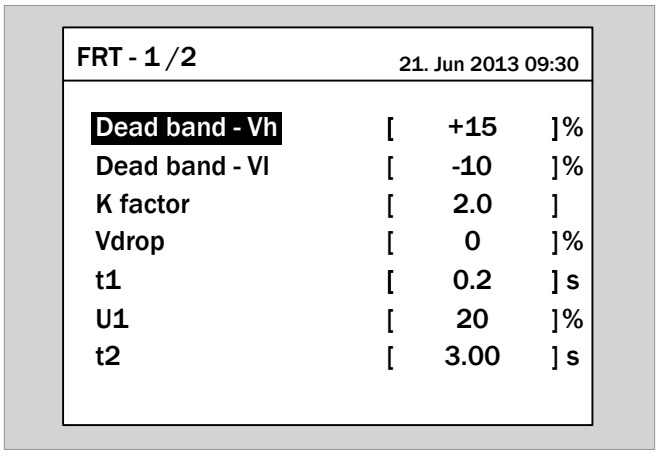


2. Use the ▼ and ▲ buttons to select the value.



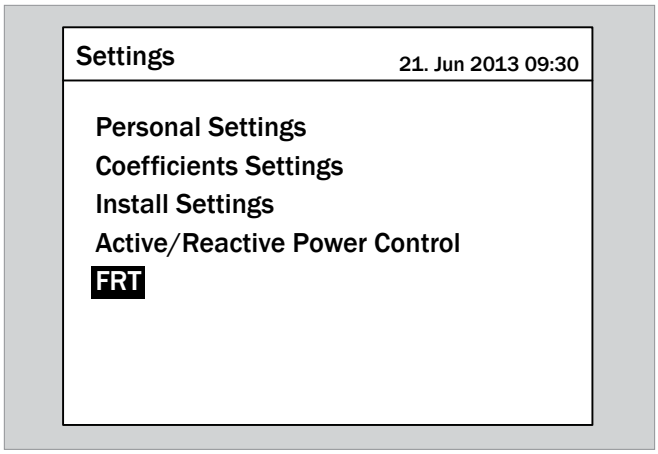
3. Press the ENT button to confirm.

→ The parameter is set.



Finalising the setting

1. Press the EXIT button to finalise the setting.



10. Statistics

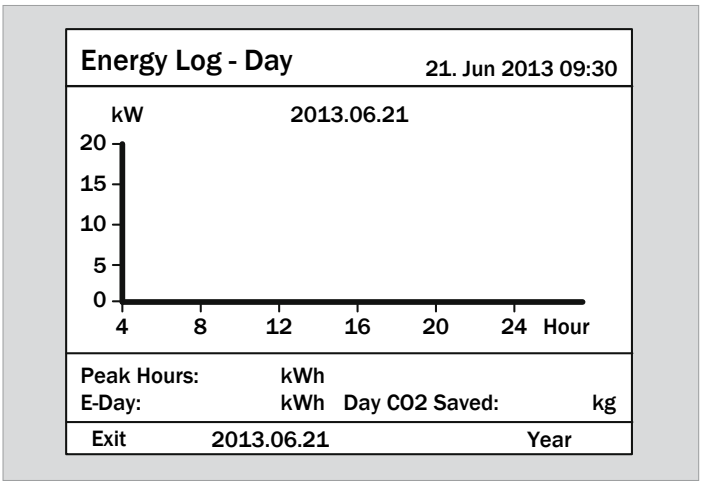
10.1 Where can I find what information

There are various menus available on the inverter display which provide statistics and general information about the inverter.

Menu	Description
E-Today	Power and energy generated for the current day
Power Meter	Current data for the most important AC and DC parameters
Energy Log	Energy generated, sorted by day, month and year
Event Log	A list of the last 30 error messages and their frequency
Inverter Information	General information about the inverter such as, for example, installation date, firmware versions or grid settings

10.2 Standard information

If no button on the display has been pressed for at least 5 minutes, the default information will be displayed.



10.3 Power meter

Overview

The instantaneous values for the DC input and the AC output are shown in this menu.

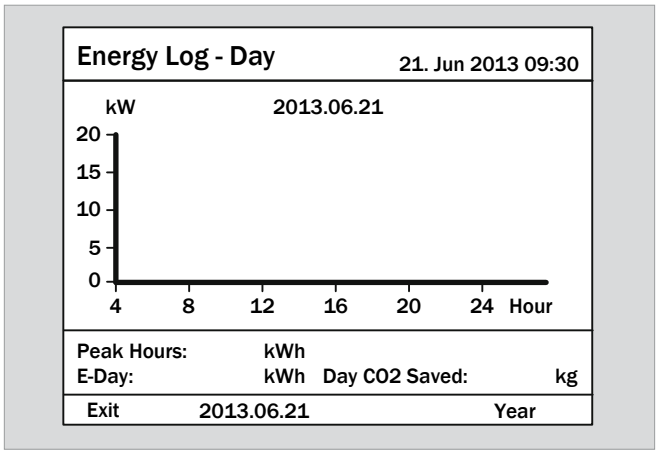
Path to the menu item

`Main Menu` > `Power Meter`

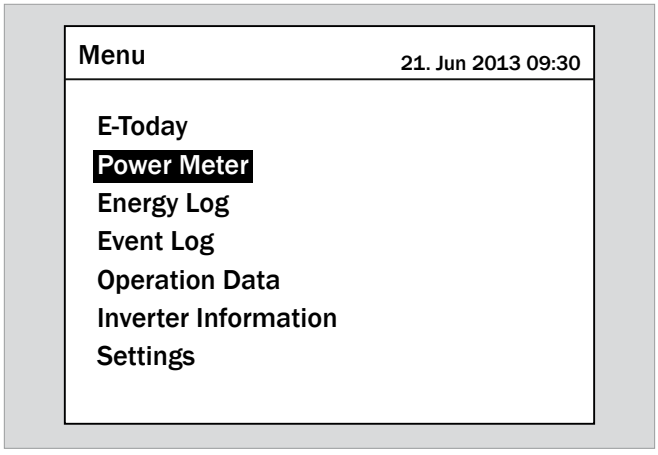
Calling up the menu item

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

   Alternatively, press the EXIT button as often as necessary until the main menu is displayed.

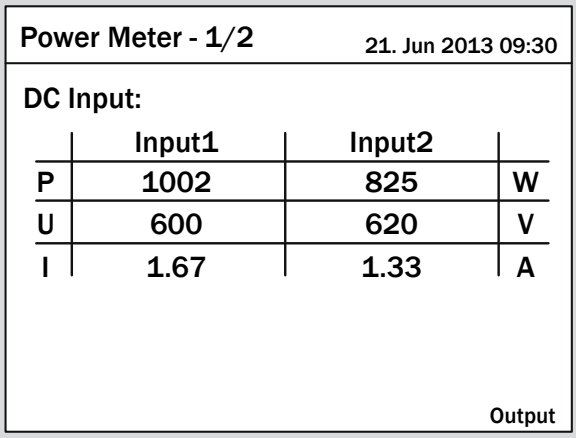


2. Using the ▼ and ▲ buttons, select the `Power Meter` entry and press the ENT button.

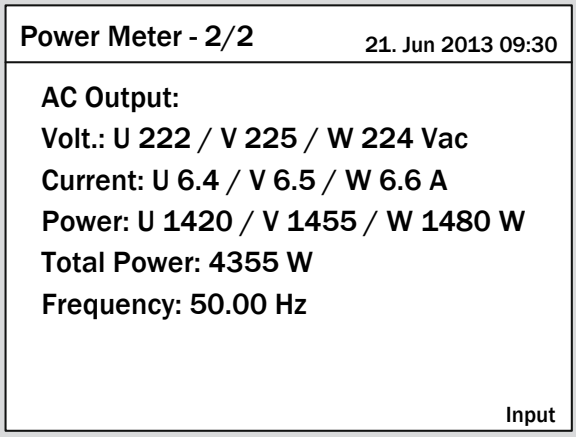


Displayed information

- ► Press the ENT button to scroll.
- ► Press the EXIT button to exit the menu.



Page 1: DC Input	
P	Present power
U	Present voltage
I	Present current



Page 2: AC Output	
Volt.	Voltage for each phase
Current	Current for each phase
Power	Active power for each phase
Total power	Total power
Frequency	Grid frequency

10.4 Energy log

Overview

The statistics for energy supplied, CO_2 saving, runtime and earnings are displayed in this menu.

The information is displayed by life runtime, year, month and day.

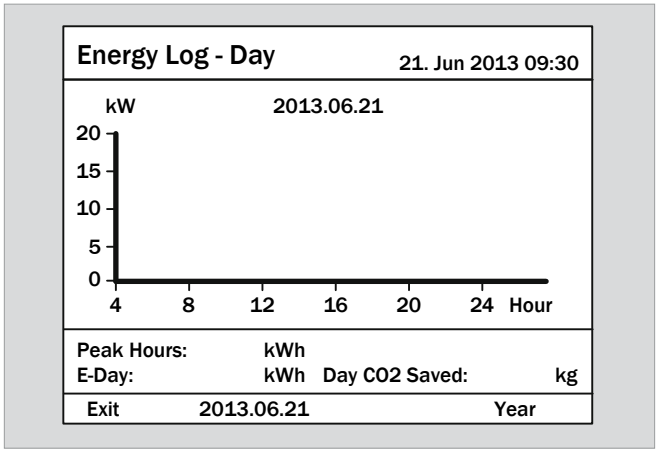
Path to the menu item

`Main Menu` > `Energy Log`

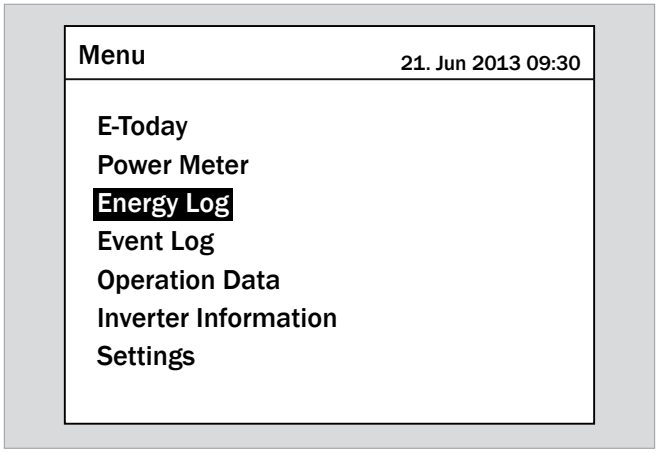
Calling up the menu item

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

   Alternatively, press the EXIT button as often as necessary until the main menu is displayed.

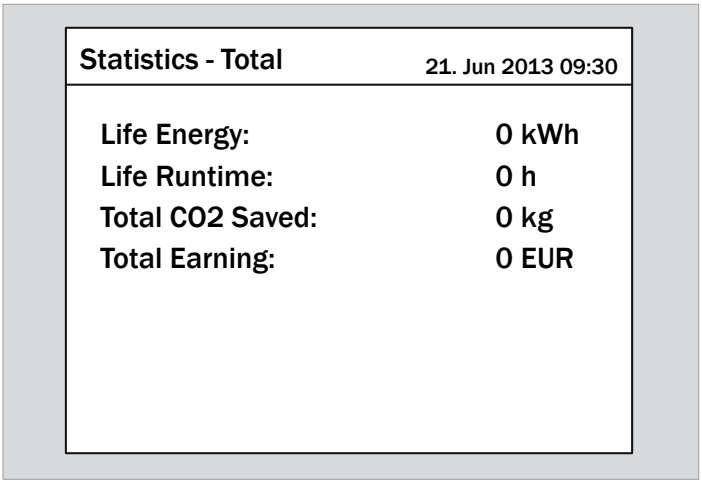


2. Using the ▼ and ▲ buttons, select the `Energy Log` entry and press the ENT button.



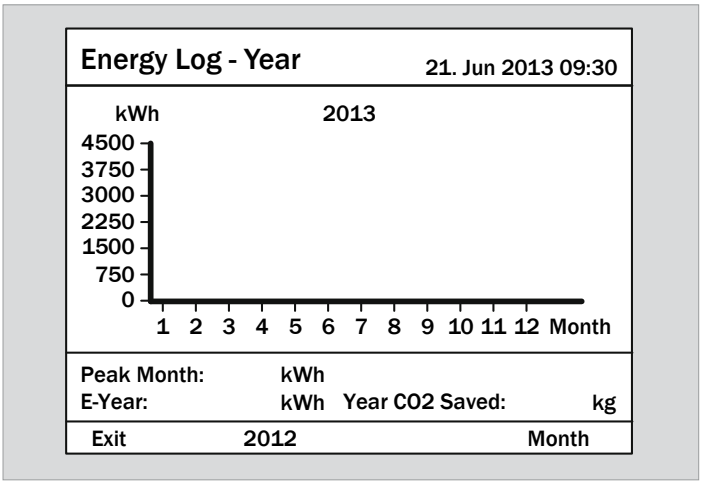
Displayed information

Page 1: Life Runtime



► Press the ENT button to display the next page.

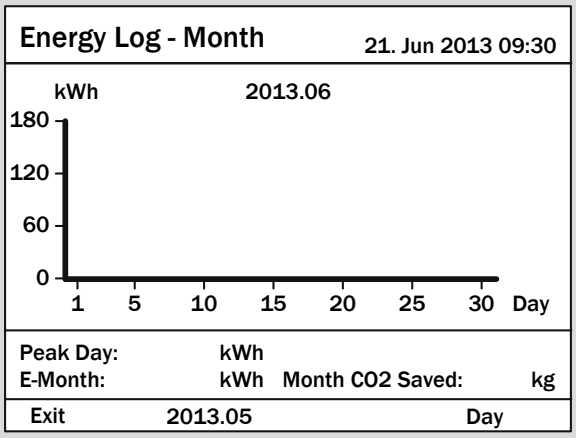
Page 2: Annual statistics



► To scroll between the years, press the ▼ and ▲ buttons.

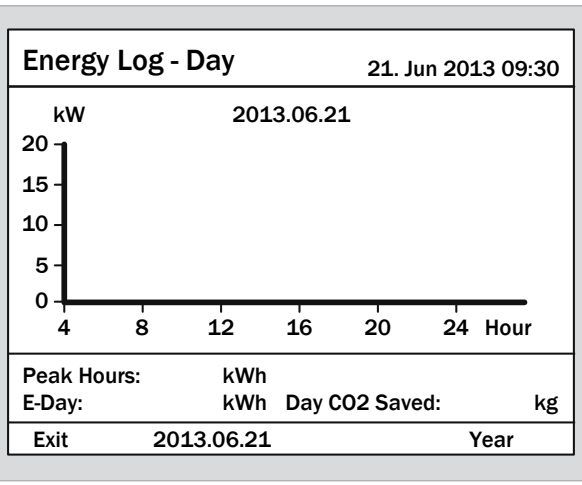
► Press the ENT button to display the next page.

Page 3: Monthly statistics



- ► To scroll between the months, press the ▼ and ▲ buttons.
- ► Press the ENT button to display the next page.

Page 4: Daily statistics



- ► To scroll between the days, press the ▼ and ▲ buttons.
- ► Press the EXIT button to exit the menu.

10.5 Event log

Overview

The last 30 error messages and their frequency are stored in this menu.

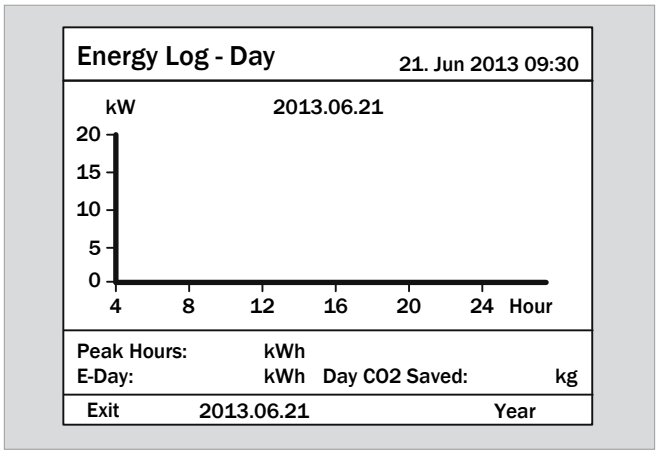
Path to the menu item

`Main Menu` > `Event Log`

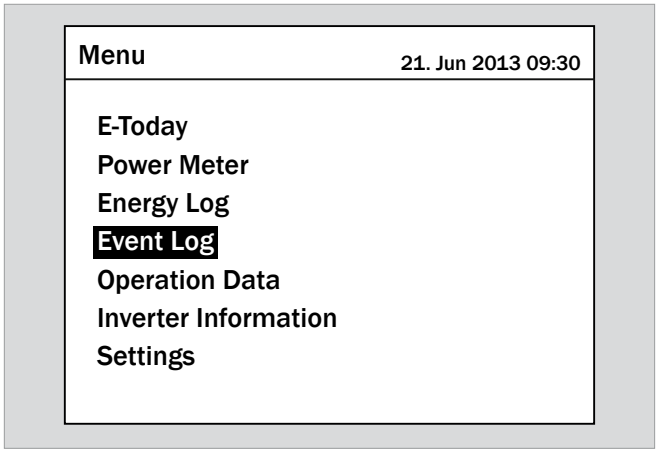
Calling up the menu item

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

   Alternatively, press the EXIT button as often as necessary until the main menu is displayed.

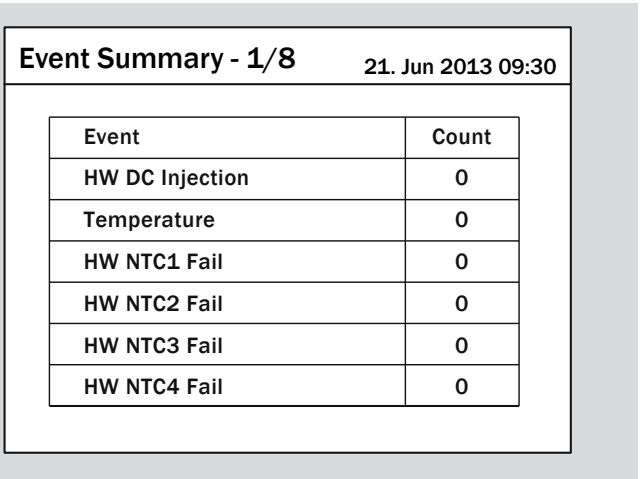


2. Using the ▼ and ▲ buttons, select the **`Event Log`** entry and press the ENT button.



Displayed information

- ► Press the ▼ and ▲ buttons to scroll.
- ► Press the EXIT button to exit the menu.



You will find further information in the chapter “11. Error messages and troubleshooting”, page 148.

10.6 Inverter information

Overview

All the important information about the inverter is stored in this menu.

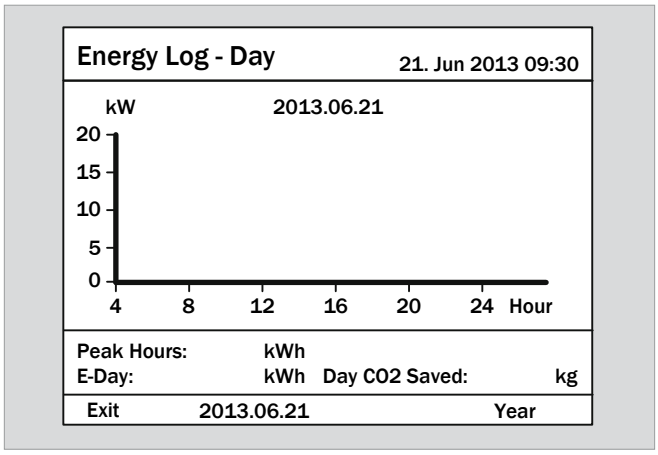
Path to the menu item

Main Menu > **Inverter Information**

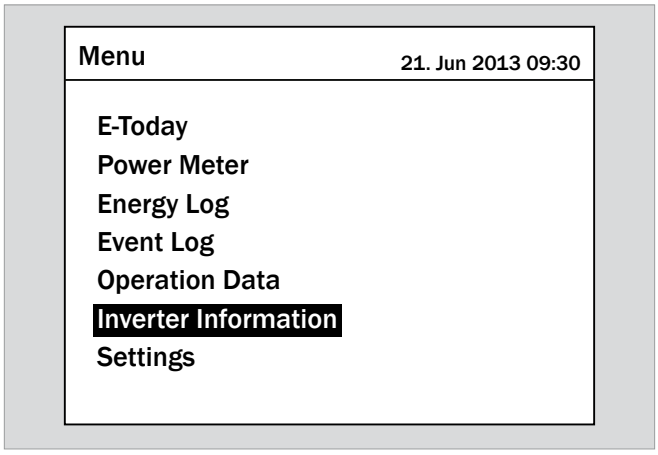
Calling up the menu item

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

   Alternatively, press the EXIT button as often as necessary until the main menu is displayed.

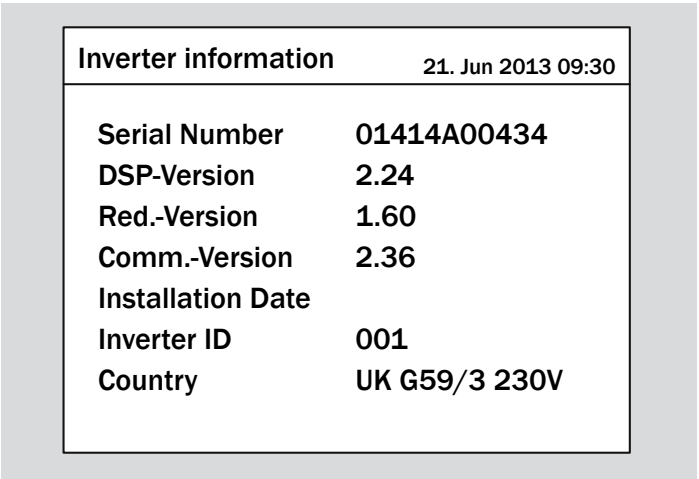


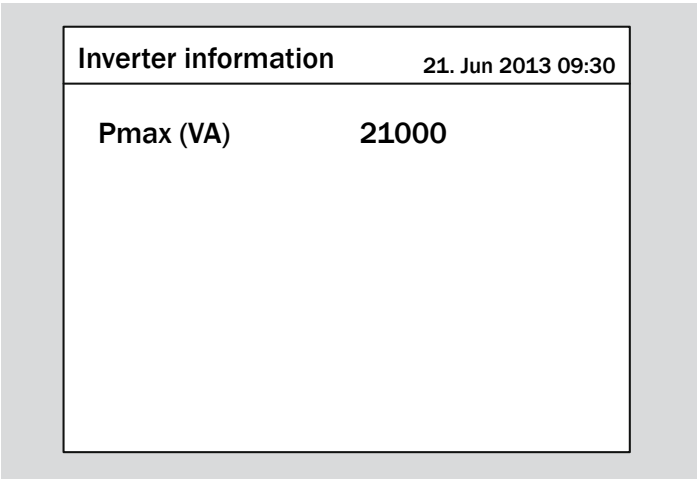
2. Using the ▼ and ▲ buttons, select the **Inverter Information** entry and press the ENT button.



Displayed information

- ► Press the ▼ and ▲ buttons to scroll.
- ► Press the EXIT button to exit the menu.





Entry	Description
Serial Number	Serial number of the inverter. This is also on the type plate.
DSP-Version	Firmware version of the DSP controller
Red.-Version	Firmware version of the Red. controller
Comm.-Version	Firmware version of the communication controller
Installation Date	Date of inverter commissioning
Inverter ID	Inverter ID. Can be changed, see “9.9 Inverter ID”, page 88
Country	The country for which the inverter parameters are set. This is set during commissioning.
Pmax (VA)	The maximum power that the inverter can supply. Can be changed

11. Error messages and troubleshooting

DANGER

Electric shock
During operation there is a potentially lethal voltage present inside the inverter. Even after the inverter has been disconnected from all power sources, this voltage is present in the inverter for up to a further 80 seconds.
Therefore always perform the following work steps before working on the inverter

1. Turn the DC disconnector to the **OFF** position.
2. Disconnect the inverter from all AC and DC sources and make sure that none of the connections can be inadvertently re-established.
3. Wait at least 80 seconds to allow the internal capacitors to discharge.

DANGER

Electric shock
There is a potentially lethal voltage present on the DC terminals of the inverter. The solar modules start to produce current as soon as light falls on them. This occurs even if the light is not shining directly on the solar modules.

- ► Never disconnect the inverter from the solar modules when it is under load.
- ► Turn the DC disconnector to the **OFF** position.
- ► Disconnect the connection to the grid so that the inverter cannot supply any energy to it.
- ► Disconnect the inverter from all AC and DC sources. Make sure that none of the connections can be inadvertently re-established.
- ► Protect the DC cables from being inadvertently touched.

WARNING

Heavy weight
The inverter is very heavy.

- ► The inverter must be lifted and carried by at least 2 people or with suitable lifting gear.

Repair work and the replacement of components in the inverter may only be undertaken by Delta customer service.
Exceptions:

- ► Replacing fans.
- ► Cleaning air inlets/outlets.

Failure to comply with these requirements will result in the guarantee being voided.
You will find the contact data for Delta customer service in your country on the last page of this document.

11.1 Errors

Number	Message	Possible cause of error	Suggestions for troubleshooting
E01	**AC Freq High**	Power grid frequency is above the ***OFR*** setting (overfrequency recognition).	Check the grid frequency on the inverter display.
		Incorrect country setting.	Check the country setting on the inverter display.
E02	**AC Freq Low**	Power grid frequency is below the ***UFR*** setting (underfrequency recognition).	Check the grid frequency on the inverter display.
		Incorrect country or grid setting.	Check the country and grid settings.
E11, E13, E16, E18, E21, E23	**AC Volt High**	Power grid voltage is above the ***OVR*** setting (overvoltage recognition).	Check the grid voltage on the inverter display.
		Supply voltage is above the ***OVR Langs.*** setting during operation.	Check the grid voltage on the inverter display.
		Incorrect country or grid setting.	Check the country and grid settings.
E10, E15, E20	**AC Volt Low**	Power grid voltage is below the ***UVR*** setting (undervoltage recognition).	Check the grid connection at the inverter terminal block.
		Incorrect country or grid setting.	Check the country and grid settings.
		Incorrect wiring in the AC plug.	Check the wiring of the AC plug.
E07	**Grid Quality**	Non-linear load on the grid and close to the inverter.	The grid connection of the inverter must be far removed from a non-linear load, if required.
E08	**HW Connect Fail**	Incorrect wiring in the AC plug.	Check the wiring of the AC plug.
E34	**Insulation**	Insulation fault in the PV installation.	Check the insulation of the DC inputs.
		Large PV installation capacitance between Plus and ground or Minus and ground or both.	Check the capacitance; if necessary, dry the PV modules.
E09	**No Grid**	The AC/DC disconnector is in the **OFF** position.	Move the AC/DC disconnector to the **ON** position.
		AC plug is not properly connected.	Check the connections in the AC plug and its connection to the inverter.
		Incorrect wiring in the AC plug.	Check the wiring of the AC plug.
E30	**Solar1 High**	DC input voltage at DC1 is above the maximum permissible DC input voltage.	Change the solar installation setting so that the DC input voltage at DC1 is below the maximum permissible DC input voltage.
E31	**Solar2 High**	DC input voltage at DC2 is above the maximum permissible DC input voltage.	Change the solar installation setting so that the DC input voltage at DC1 is below the maximum permissible DC input voltage.

11 Error messages and troubleshooting

11.2 Warnings

Number	Message	Possible cause of error	Suggestions for troubleshooting
W01	**Solar1 Low**	DC input voltage at DC1 is below the minimum required DC input voltage.	Check the DC input voltage at DC1 on the inverter display. The solar irradiation is possibly too low.
W02	**Solar2 Low**	DC input voltage at DC2 is below the minimum required DC input voltage.	Check the DC input voltage at DC2 on the inverter display. The solar irradiation is possibly too low.
W11	**HW Fan**	One or more fans are blocked.	Remove all 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 has been struck by lightning.	Check the inverter status.
		One or more surge protection devices are defective.	Replace the defective surge protection devices.
		One or more surge protection devices are not properly fitted.	Check all surge protection devices.

11.3 Malfunctions

Number	Message	Possible cause of error	Suggestions for troubleshooting
F36, F37, F38, F39, F40, F41	**AC Current High**	Overvoltage during operation.	Consult Delta customer service.
		Internal fault.	Consult Delta customer service.
F30	**Bus Unbalance**	Not completely independent or parallel between inputs.	Check the input connections.
		Ground leak in the PV installation.	Check the insulation of the PV installation.
		Internal fault.	Consult Delta customer service.
F60, F61, F70, F71	**DC Current High**	Internal fault.	Consult Delta customer service.
F24	**Ground Current**	Insulation fault in the PV installation.	Check the insulation of the DC inputs.
		Large PV installation capacitance between Plus and ground or Minus and ground.	Check the capacitance; it must be < 2.5 µF. If needed, install an external transformer.
		Internal fault.	Consult Delta customer service.
F45	**HW AC OCR**	Large grid harmonics.	Check grid waveform. The grid connection of the inverter must be far removed from non-linear loads, if required.
		Internal fault.	Consult Delta customer service.
F31, F33, F35	**HW Bus OVR**	DC input voltage is above the maximum permissible DC input voltage.	Change the solar installation setting so that the DC input voltage at DC1 is below the maximum permissible DC input voltage.
		Overvoltage during operation.	Consult Delta customer service.
		Internal fault.	Consult Delta customer service.
F23	**HW COMM1**	Internal fault.	Consult Delta customer service.
F22	**HW COMM2**	Internal fault.	Consult Delta customer service.
F26	**HW Connect Fail**	Internal fault.	Consult Delta customer service.
F42	**HW CT A Fail**	Internal fault.	Consult Delta customer service.
F43	**HW CT B Fail**	Internal fault.	Consult Delta customer service.
F44	**HW CT C Fail**	Internal fault.	Consult Delta customer service.
F01, F02, F03	**HW DC Injection**	The grid waveform is not normal.	Check grid waveform. The grid connection of the inverter must be far removed from non-linear loads, if required.
		Internal fault.	Consult Delta customer service.
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. The solar irradiation is possibly too low.
		Internal fault.	Consult Delta customer service.
F20	**HW Efficiency**	Incorrect calibration.	Check the accuracy of the voltage and power.
		Internal fault.	Consult Delta customer service.

11 Error messages and troubleshooting

Number	Message	Possible cause of error	Suggestions for troubleshooting
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 environment of the installation.
		Malfunction of the recognition circuit.	Check the recognition circuit in the *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. The solar irradiation is possibly too low.
		Internal fault.	Consult Delta customer service.
F50	**HW ZC Fail**	Internal fault.	Consult Delta customer service.
F27	**RCMU Fail**	Internal fault.	Consult Delta customer service.
F13, F29	**Relay Open**	Internal fault.	Consult Delta customer service.
F28	**Relay Short**	Internal fault.	Consult Delta customer service.
		Malfunction in the relay driver circuit.	Check the driver circuit in the *inverter*.
F05	**Temperature High**	The ambient temperature is > 60 °C.	Check the environment of the installation.
F07	**Temperature Low**	The ambient temperature is < -30 °C.	Check the environment of the installation.
		Internal fault.	Consult Delta customer service.

12. Maintenance

DANGER

Electric shock

During operation there is a potentially lethal voltage present inside the inverter. Even after the inverter has been disconnected from all power sources, this voltage is present in the inverter for up to a further 80 seconds.
Therefore always perform the following work steps before working on the inverter

1. Turn the DC disconnector to the **OFF** position.
2. Disconnect the inverter from all AC and DC sources and make sure that none of the connections can be inadvertently re-established.
3. Wait at least 80 seconds to allow the internal capacitors to discharge.

DANGER

Electric shock

There is a potentially lethal voltage present on the DC terminals of the inverter. The solar modules start to produce current as soon as light falls on them. This occurs even if the light is not shining directly on the solar modules.

- ► Never disconnect the inverter from the solar modules when it is under load.
- ► Turn the DC disconnector to the **OFF** position.
- ► Disconnect the connection to the grid so that the inverter cannot supply any energy to it.
- ► Disconnect the inverter from all AC and DC sources. Make sure that none of the connections can be inadvertently re-established.
- ► Protect the DC cables from being inadvertently touched.

Repair work and the replacement of components in the inverter may only be undertaken by Delta customer service.
Exceptions:

- ► Replacing fans.
- ► Cleaning air inlets/outlets.

Failure to comply with these requirements will result in the guarantee being voided.
You will find the contact data for Delta customer service in your country on the last page of this document.

12.1 Regular checks

To ensure proper operation, carry out the following **visual inspections** every 6 months:

- ► Check that all visible connectors, screws and cables are correctly seated. Do not touch the components.
- ► Check for damaged components. Do not touch the damaged components.
- ► Check the fans, air inlets and air outlets for contamination and clean if necessary.

12.2 Cleaning/replacing fans

NOTE

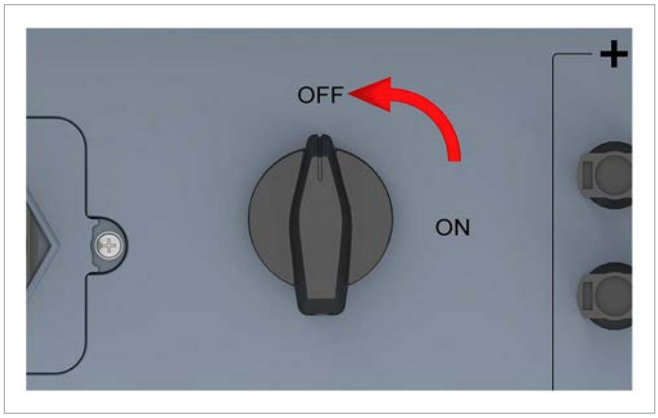
After the fan block has been unscrewed, the full weight of the block is hanging on the power supply cables for the two fans.

► Support the fan block with one hand while unscrewing it.

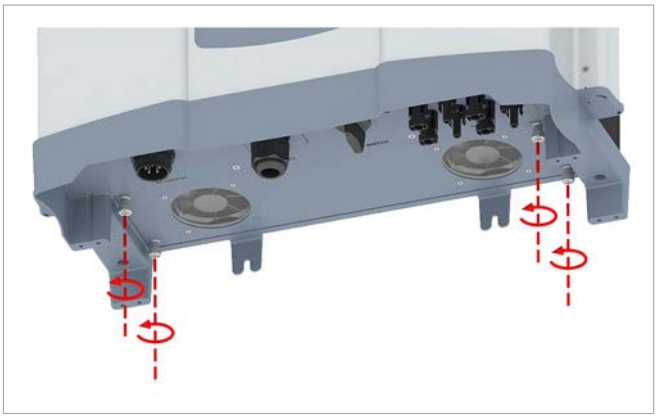
NOTE

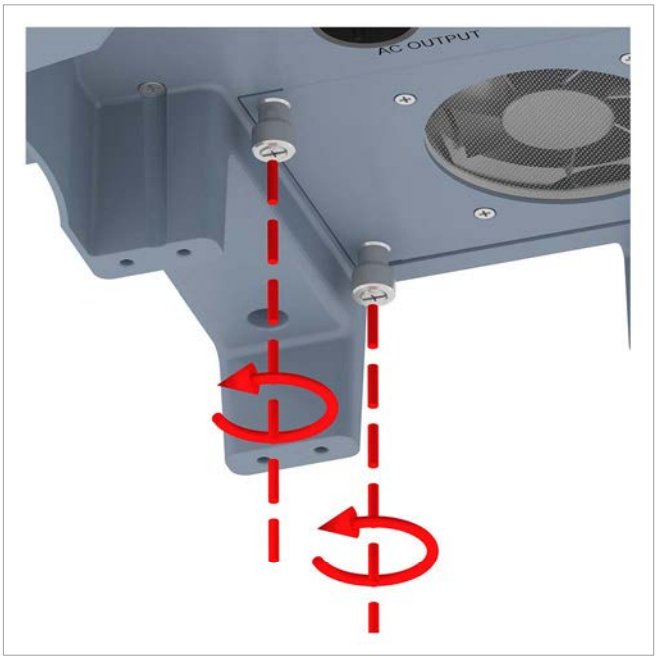
Do not use any sharp, pointed or hard objects for cleaning.
Do not use any liquids for cleaning.

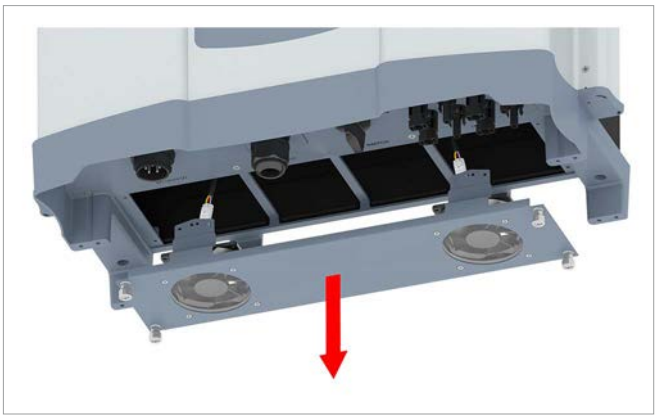
1. Turn the DC disconnector to the **OFF** position.



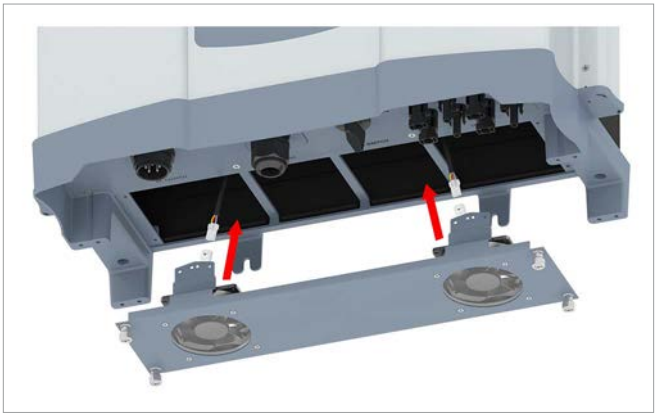
2. Unscrew and carefully withdraw the fan block.

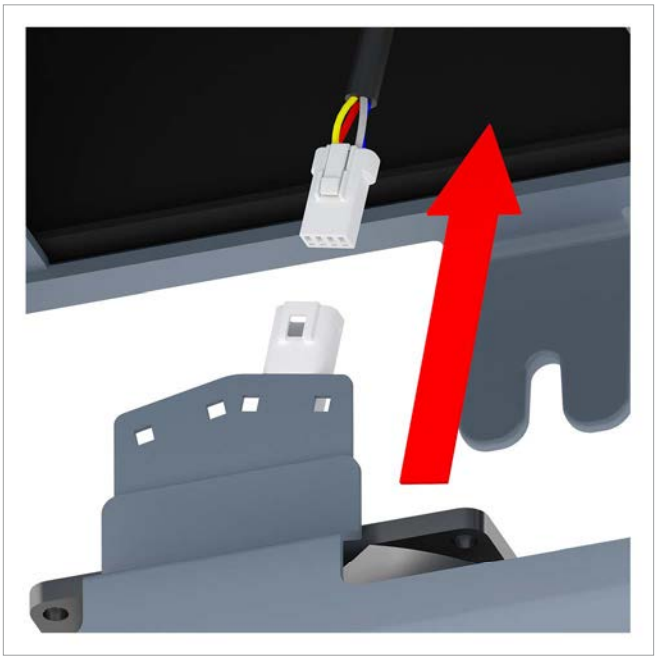




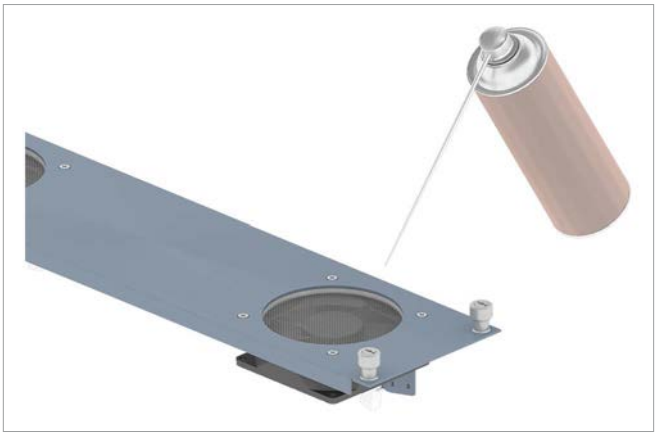


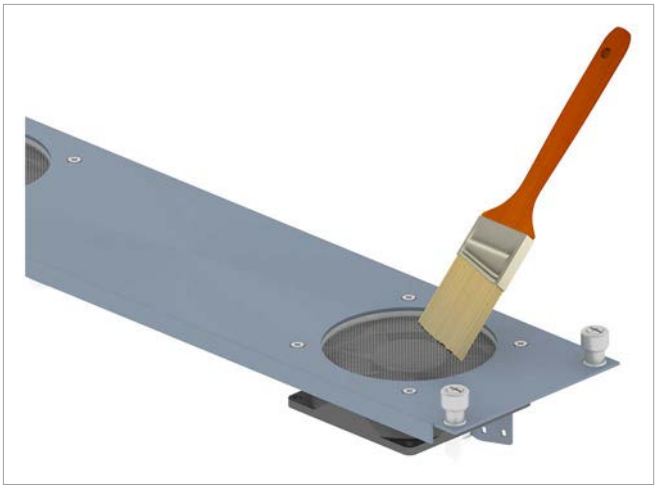
3. Unplug the power supply cables from the fan connections.



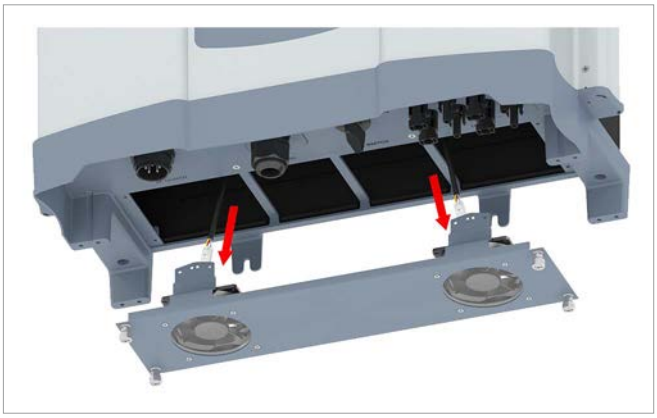


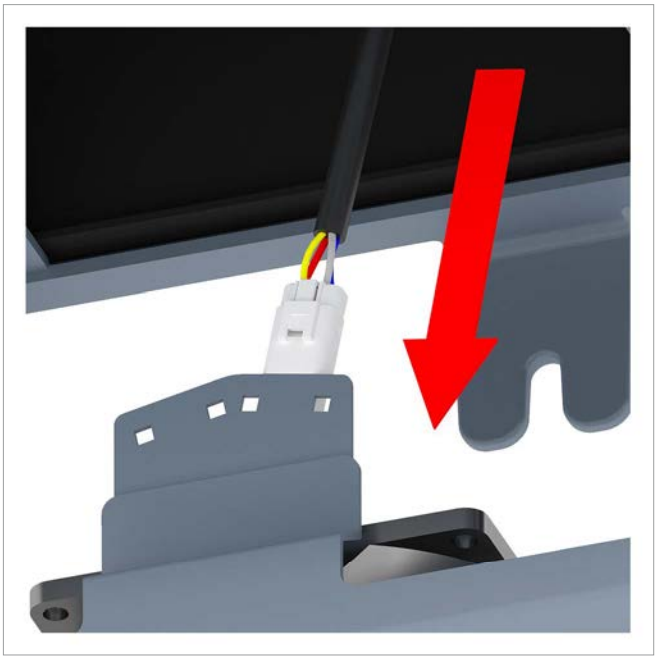
4. Clean the fans with a compressed air cleaner or a stiff brush.



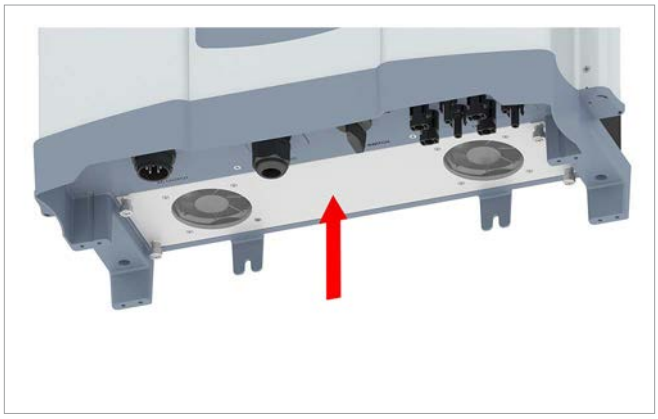


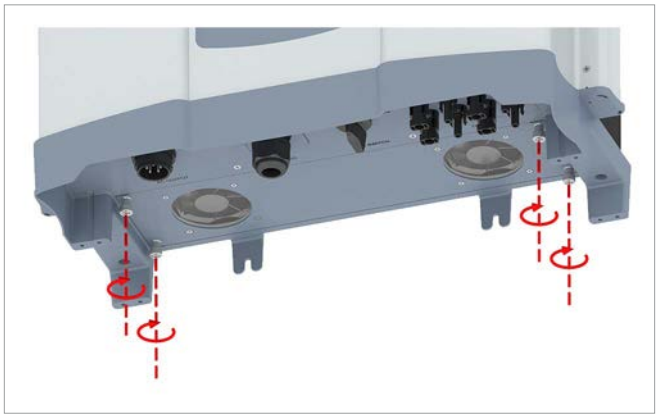
5. Plug the power supply cables back into the fan connections.

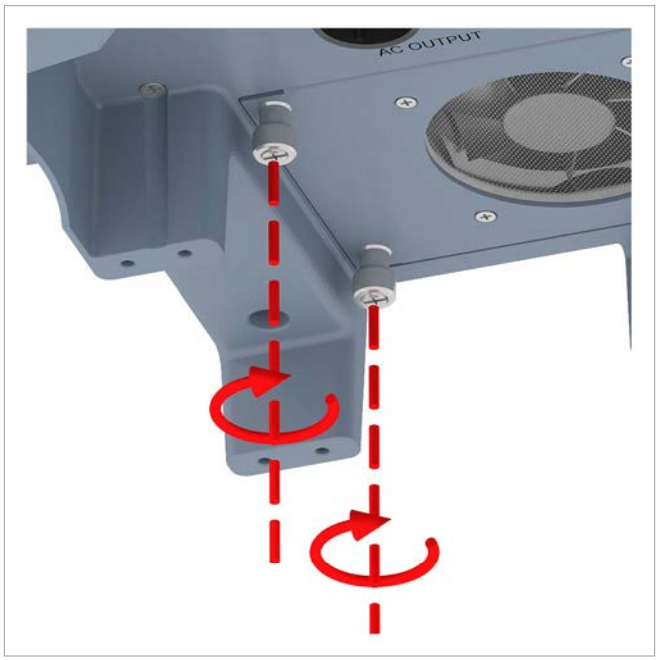




6. Insert the fan block and screw it on.





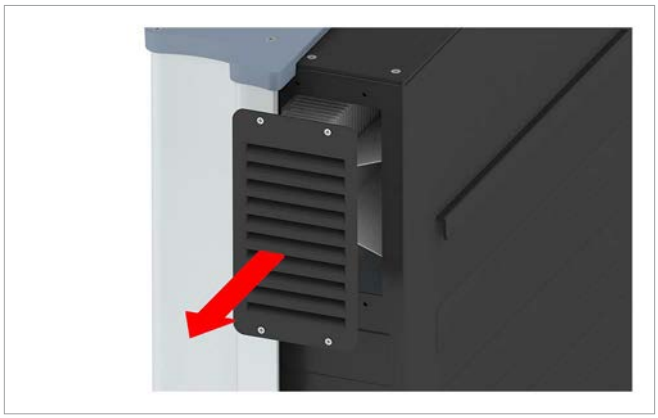


12.3 Cleaning air outlets

NOTE

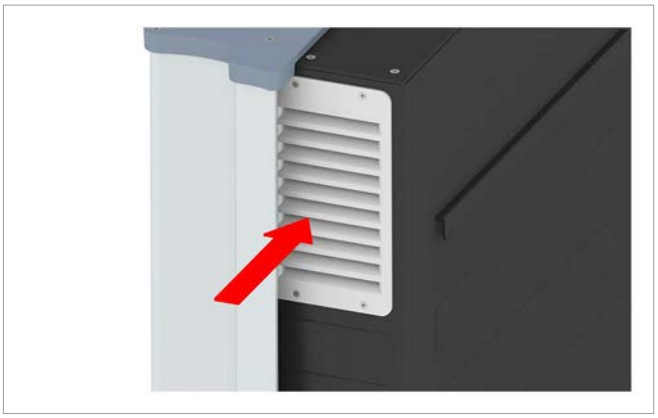
Do not use any sharp, pointed or hard objects for cleaning.

1. Unscrew and remove the covers of the air outlets on both sides.



2. Clean the filters with a compressed air cleaner or a stiff brush.

3. Fit the covers to the air outlets and screw them on.



13. Shutdown, storage

DANGER

Electric shock

During operation there is a potentially lethal voltage present inside the inverter. Even after the inverter has been disconnected from all power sources, this voltage is present in the inverter for up to a further 80 seconds.
Therefore always perform the following work steps before working on the inverter

1. Turn the DC disconnector to the **OFF** position.
2. Disconnect the inverter from all AC and DC sources and make sure that none of the connections can be inadvertently re-established.
3. Wait at least 80 seconds to allow the internal capacitors to discharge.

DANGER

Electric shock

There is a potentially lethal voltage present on the DC terminals of the inverter. The solar modules start to produce current as soon as light falls on them. This occurs even if the light is not shining directly on the solar modules.

- ► Never disconnect the inverter from the solar modules when it is under load.
- ► Turn the DC disconnector to the **OFF** position.
- ► Disconnect the connection to the grid so that the inverter cannot supply any energy to it.
- ► Disconnect the inverter from all AC and DC sources. Make sure that none of the connections can be inadvertently re-established.
- ► Protect the DC cables from being inadvertently touched.

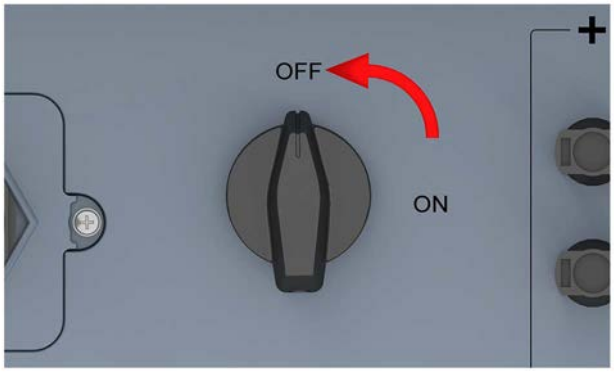
WARNING

Heavy weight

The inverter is very heavy.

- ► The inverter must be lifted and carried by at least 2 people or with suitable lifting gear.

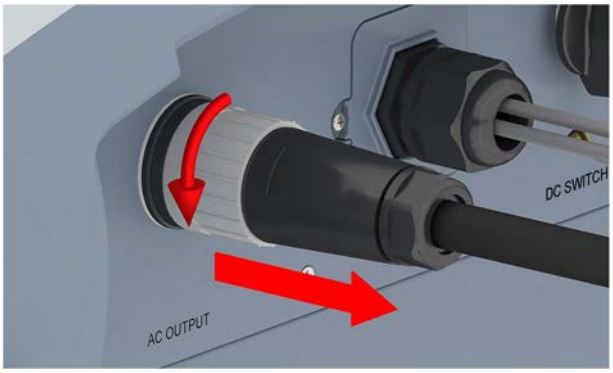
1. Turn the DC disconnector to the **OFF** position.



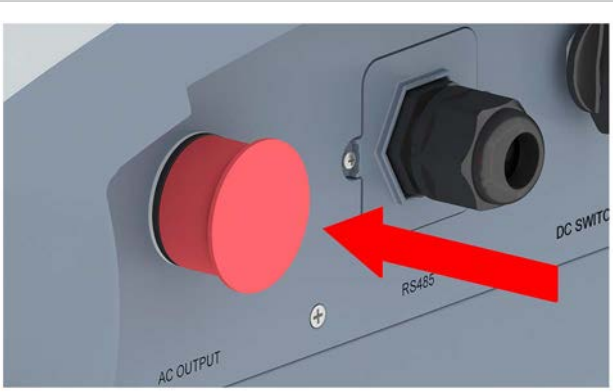
2. Disconnect the connection between the inverter and the solar modules (DC).
3. Disconnect the connection between the inverter and the grid (AC).
4. Use a voltmeter to check that there is no voltage on the AC and DC connections.

Removing the AC plug

5. Unscrew the AC plug and withdraw it.

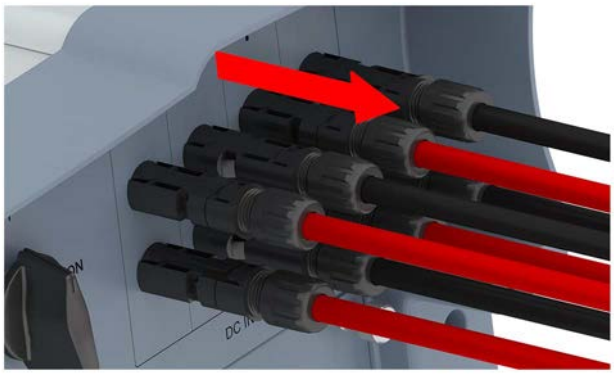


6. Fit the sealing cap on the AC terminal.



Removing the DC plugs

7. Unfasten the DC plugs with the open end spanner and withdraw them.

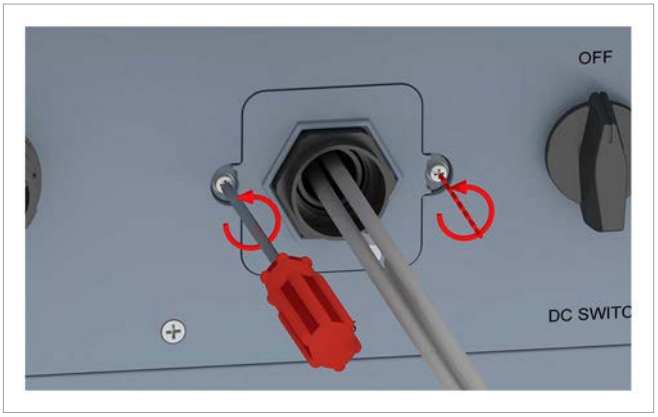


8. Close the DC terminals with the sealing caps.

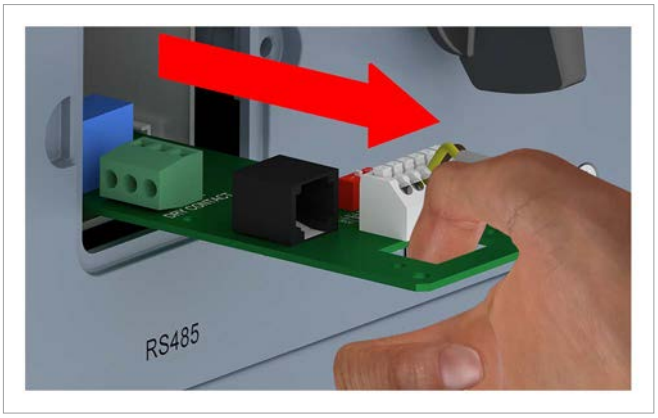
Removing the communications cable

9. Twist off the cable gland from the communications connector and withdraw the gland and seal.

10. Remove the cover screws and then the cover.



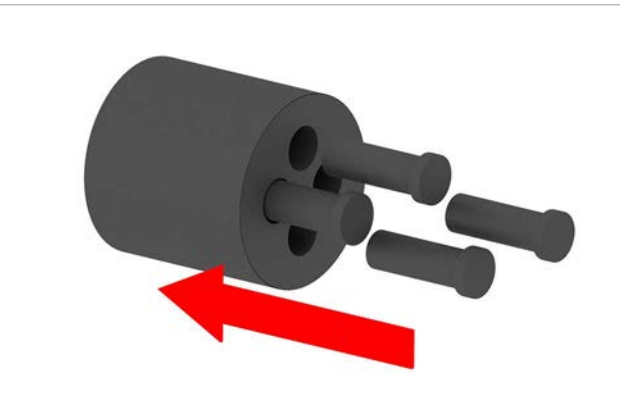
11. Withdraw the communications card.



12. Remove the cables and reinsert the communications card.

13. Fit the cover and tighten the screws.

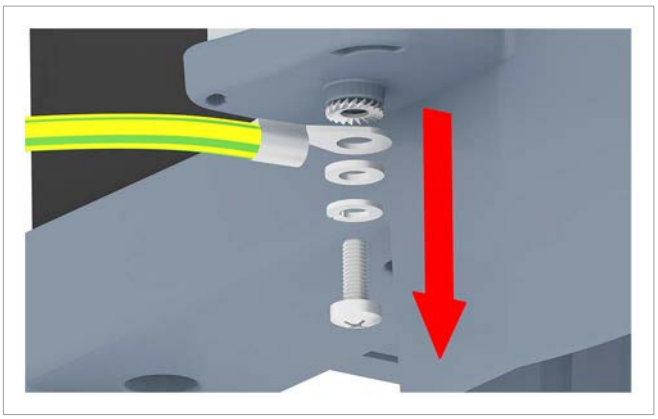
14. Insert the grommets in the seal.



15. Fit the seal and cable gland and tighten the cable gland.

Removing the grounding cable

16. Unscrew the grounding cable.



17. Refit the grounding screw, spring washer, flat washers and serrated washer.

Removing the inverter

18. Unscrew the inverter from the wall or the mounting system on both sides.

19. Lift the inverter out of the mounting plate.

20. Place the inverter in its original box.

21. To store the inverter, pack all the parts that were delivered (see “4.1 Scope of delivery”, page 11) in the original box.

22. Observe the ambient conditions when storing the inverter, see “14. Technical data”, page 162.

14. Technical data

Input (DC)	RPI M15A	RPI M20A
Maximum recommended PV power [1]	19 kW_P	25 kW_P
Maximum input power (per input)	16.5 kW (11.1 kW)	22 kW (14.8 kW)
Nominal power	15.6 kW	20.6 kW
Input voltage range	200 ... 1000 V_{DC}	
Maximum input voltage	1000 V_{DC}	
Nominal voltage	635 V_{DC}	
Lock-in Voltage	250 V_{DC}	
Switch-on power	40 W	
MPP input voltage range	200 ... 1000 V_{DC}	
MPP input voltage range at full power		
Symmetric configuration	355 ... 820 V_{DC}	470 ... 820 V_{DC}
Asymmetric configuration (67%)	475 ... 820 V_{DC}	635 ... 820 V_{DC}
Asymmetric configuration (33%)	235 ... 820 V_{DC}	310 ... 820 V_{DC}
Maximum ratio for asymmetric configuration	67/33% ; 33/67%	
Maximum short circuit current in the event of a failure	24 A (12 A per string)	
Maximum input current, total (DC1 / DC2)	44 A (22 A / 22 A)	44 A (22 A / 22 A)
Number of MPP trackers	Parallel inputs: 1 MPP tracker; separate inputs: 2 MPP trackers	
Number of DC inputs, total (DC1 / DC2)	4 (2 / 2)	
Galvanic isolation	No	
Overvoltage category [2]	II	

Output (AC)	RPI M15A	RPI M20A
Max. apparent power	15.75 kVA	21 kVA
Nominal apparent power	15 kVA [3]	20 kVA [3]
Nominal voltage [4]	230 ±20 % / 400 V_{AC} ±20 %, 3 phases + PE or 3 phases + N + PE	
Nominal current	22 A	29 A
Maximum current	24 A	32 A
Switch-on current	150 A / 100 µs	
Nominal frequency	50 / 60 Hz	
Frequency range [4]	45 ... 65 Hz	
Adjustable power factor	0.8 cap ... 0.8 ind	
Total harmonic distortion	<3%	
DC current injection	< 0.5% of nominal current	
Energy consumption in night operation	<2 W	
Overvoltage category [3]	III	

[1] For operation with symmetric configuration (50/50 %)
[2] IEC 60664-1, IEC 62109-1
[3] For cos phi = 1 (VA = W)
[4] AC voltage and AC frequency range are programmed using the respective country regulations.

Mechanical design	RPI M15A	RPI M20A
Dimensions (W x H x D)	612 x 625 x 278 mm	
Weight	43 kg	
Cooling	Fan	
AC connection type	AC plug Amphenol C16-3 (C016 20E004 800 2)	
DC terminal type	Multi-Contact MC4	
Communications interfaces	2 x RS485, 1 x dry contact, 1 x external power off (EPO)	

General specifications	RPI M15A	RPI M20A
Delta model name	RPI-M15A	RPI-M20A
Delta part number	RPI153FA0E0000	RPI203FA0E0000
Maximum efficiency	98.3%	98.4%
EU efficiency	97.9%	98.1%
Operating temperature range	-25 ... +60 °C	
Operating temperature range without limiting	-25 ... +40 °C	-25 ... +47 °C [5]
Storage temperature range	-25 ... +60 °C	
Relative humidity	0 ... 100 %, non-condensing	
Maximum operating altitude	2000 m above sea level	

Standards and Directives	RPI M15A	RPI M20A
Protection class	IP65	
Safety class	I	
Contamination level	II	
Overload behaviour	Current limiting, power limiting	
Safety	IEC 62109-1 / -2, CE conformity	
EMC	EN 61000-6-2, EN 61000-6-3	
Noise immunity	IEC 61000-4-2 / -3 / -4 / -5 / -6 / -8	
Harmonic distortion	EN 61000-3-2	
Fluctuations and flicker	EN 61000-3-3	
Grid connection guidelines	See www.solar-inverter.com	

[5] The full power is available up to 47 °C if the nominal voltages are present on the AC and DC sides.

Belgium	support.belgium@solar-inverter.com	0800 711 35 (toll-free)
Bulgaria	support.bulgaria@solar-inverter.com	+421 42 4661 333
Denmark	support.danmark@solar-inverter.com	8025 0986 (toll-free)
Germany	service.deutschland@solar-inverter.com	0800 800 9323 (toll-free)
France	support.france@solar-inverter.com	0800 919 816 (toll-free)
Greece	support.greece@solar-inverter.com	+49 7641 455 549
Great Britain	support.uk@solar-inverter.com	0800 051 4281 (toll-free)
Israel	supporto.israel@solar-inverter.com	800 787 920 (toll-free)
Italy	supporto.italia@solar-inverter.com	800 787 920 (toll-free)
Netherlands	ondersteuning.nederland@solar-inverter.com	0800 022 1104 (toll-free)
Austria	service.oesterreich@solar-inverter.com	0800 291 512 (toll-free)
Poland	serwis.polska@solar-inverter.com	+48 22 335 26 00
Portugal	suporte.portugal@solar-inverter.com	+49 7641 455 549
Slovakia/Poland	podpora.slovensko@solar-inverter.com	0800 005 193 (toll-free)
Slovenia	podpora.slovenija@solar-inverter.com	+421 42 4661 333
Spain	soporto.espana@solar-inverter.com	900 958 300 (toll-free)
Switzerland	support.switzerland@solar-inverter.com	0800 838 173 (toll-free)
Czech Republic	podpora.czechia@solar-inverter.com	800 143 047 (toll-free)
Turkey	support.turkey@solar-inverter.com	+421 42 4661 333
Other European countries	support.europe@solar-inverter.com	+49 7641 455 549