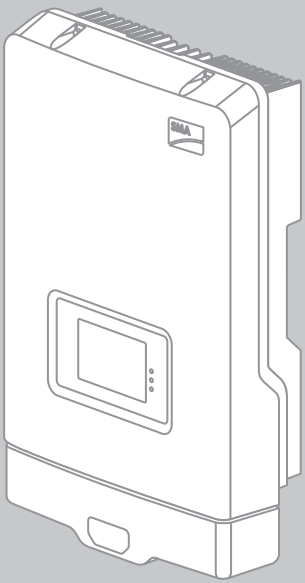
PV Inverter

SUNNY BOY 2000HF / 2500HF / 3000HF

Installation Manual



SB20HF-30HF-IA-IEN120431 | IMEN-SB20_25_30HF | Version 3.1

EN

Display

You can operate the display by tapping it:

- Tapping the enclosure lid once: The backlight is activated, switch between the power range of the last 16 feed-in hours to the energy yields of the last 16 days, switch to the next text line
- Tapping twice in quick succession (applies as of firmware version 2.30): The inverter shows the display messages from the startup phase again (see section 7.2)

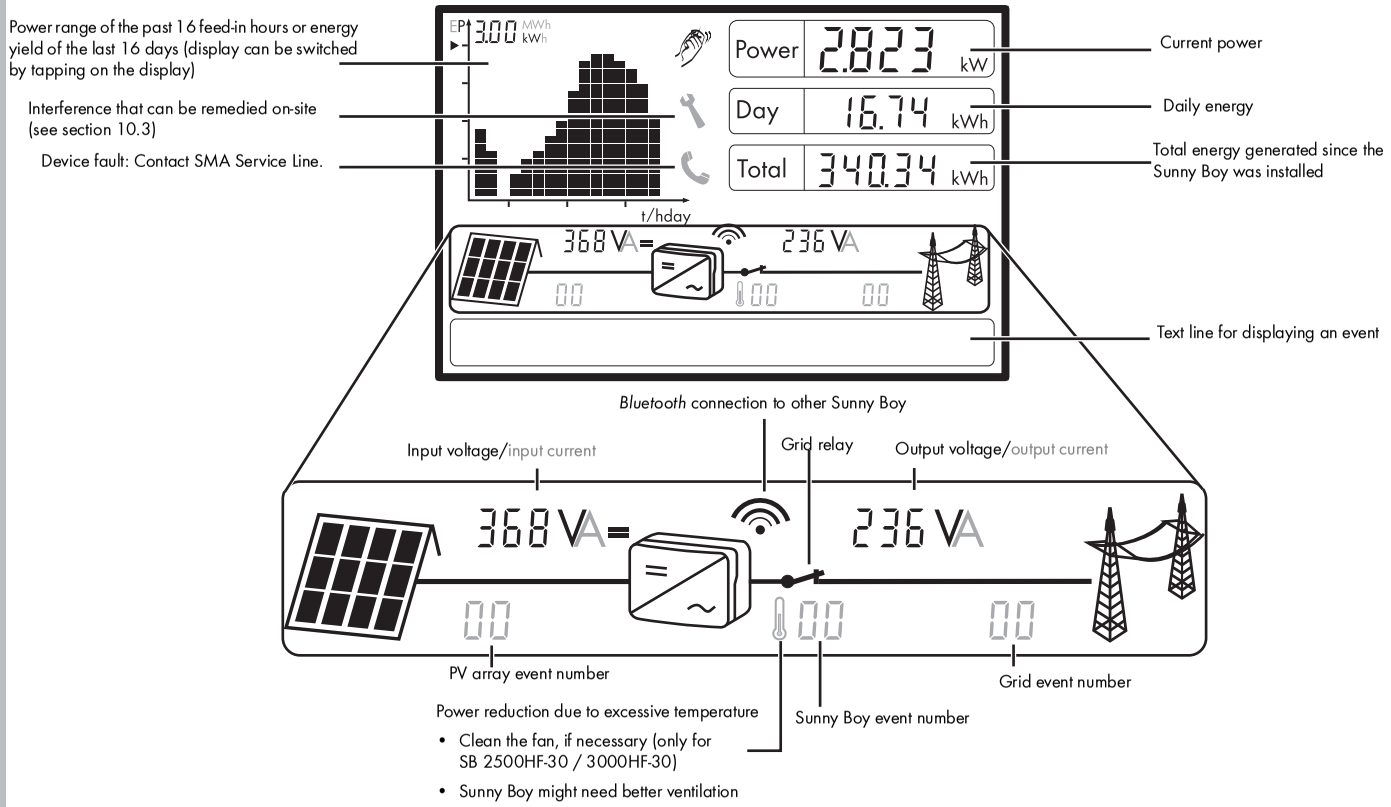


Table of Contents

1 Information on this Manual

1.1 Validity

This manual describes the mounting, installation, commissioning, maintenance, and troubleshooting procedures for the following SMA inverters:

- Sunny Boy 2000HF (SB 2000HF-30)
- Sunny Boy 2500HF (SB 2500HF-30)
- Sunny Boy 3000HF (SB 3000HF-30).

Keep this manual in a convenient place for future reference.

1.2 Target group

This manual is for electrically qualified persons. The tasks described in this manual may be performed by electrically qualified persons only.

1.3 Additional Information

You will find further information on special topics such as designing a miniature circuit-breaker or the description of the parameters and measured values at www.SMA.de/en.

Refer to the user manual provided for detailed information on operating the inverter.

1.4 Symbols Used

The following types of safety instructions and general information are used in this manual:

DANGER!

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

WARNING!

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

CAUTION!

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

NOTICE!

NOTICE indicates a situation that can result in property damage if not avoided.

Information

Information provides tips that are valuable for the optimal installation and operation of your product.

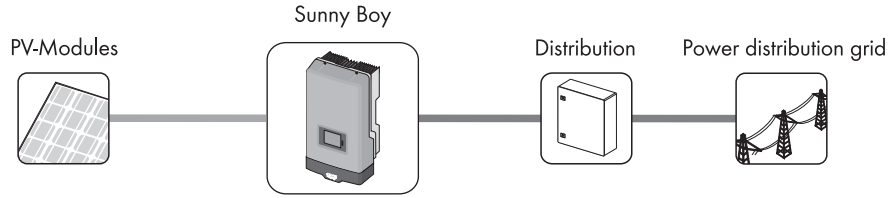
☑ This symbol indicates the result of an action.

2 Safety

2.1 Intended Use

The Sunny Boy is a PV inverter which converts the direct current of a PV array into grid-compliant alternating current and feeds this into the power distribution grid.

Principle of a PV plant with this Sunny Boy



The Sunny Boy is suitable for indoor and outdoor use.

The Sunny Boy may only be operated with PV arrays (PV modules and cabling) of protection class II. The PV modules used must be suitable for use with the Sunny Boy and must be released by the module manufacturer.

Alternative uses, modifications to the Sunny Boy, and installation of component parts not expressly recommended or sold by SMA Solar Technology AG are not permitted.

Persons with limited physical or mental abilities may only work with the Sunny Boy following proper instruction and under constant supervision. Children are forbidden to play with the Sunny Boy. Keep the Sunny Boy away from children.

Only use the Sunny Boy in accordance with the information provided in the enclosed documentation. Any other use can result in personal injury or property damage.

- Do not mount the inverter on flammable construction materials.
- Do not mount the inverter in areas where highly flammable materials are stored.
- Do not mount the inverter in potentially explosive atmospheres.

The enclosed documentation is part of this product. Read and follow the documentation for the proper and optimum use of the Sunny Boy. Keep this documentation in a convenient place for future reference.

2.2 Safety Instructions

DANGER!

Danger to life due to high voltages in the inverter.

- All work on the inverter may only be carried out by an electrically qualified person.

CAUTION!

Risk of burns due to hot enclosure parts.

The enclosure may become hot during operation.

- Do not touch the inverter's enclosure during operation.

CAUTION!

Possible damage to health as a result of the effects of irradiation.

- Do not stay closer than 20 cm from the inverter for any length of time.

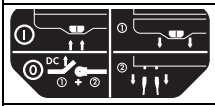
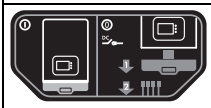
PV array grounding

Comply with local regulations when grounding the modules and the PV array.
SMA Solar Technology AG recommends connecting the array frame and other electrically conductive surfaces so that there is continuous conduction and to ground them in order to ensure maximum protection for property and persons.

2.3 Explanation of Symbols

This section gives an explanation of all the symbols found on the inverter and on the type label.

2.3.1 Symbols on the Inverter

Symbol	Explanation
	Operation display. Indicates the operating state of the inverter.
	An error has occurred. Read section 11 "Troubleshooting" (page 72) to remedy the error.
	*Bluetooth* ® Wireless Technology. Shows the status of *Bluetooth* communication.
 	DC load disconnection unit Electronic Solar Switch (ESS). • ❶ When the Electronic Solar Switch is plugged in, the DC electric circuit is closed. • ❼ To interrupt the DC electric circuit and disconnect the inverter securely under load, you have to first pull out the Electronic Solar Switch ❶ and then remove all DC connectors ❷ as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58).
	QR-Code®* for SMA Bonus program You will find information on the SMA bonus program at www.SMA-Bonus.com.

* QR-Code is a registered trademark of DENSO WAVE INCORPORATED.

2.3.2 Symbols on the Type Label

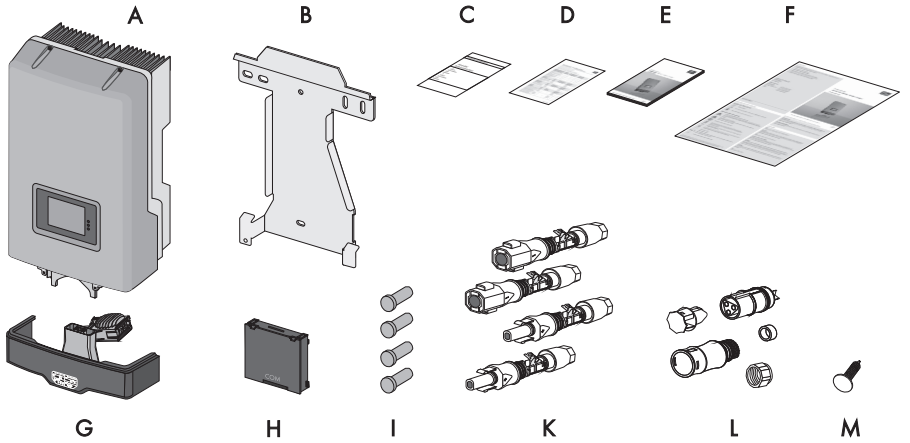
Symbol	Explanation
	Danger to life due to high voltages The inverter operates at high voltages. All work on the inverter may only be carried out by an electrically qualified person.
	Rist of burns due to hot enclosure parts The inverter can become hot during operation. Avoid contact during operation. Allow the inverter to cool down sufficiently before carrying out any work. Wear personal protective equipment such as safety gloves.

Symbol	Explanation
	Observe documentation Observe all documentation that is delivered with the inverter.
	Proper disposal Do not dispose of the inverter together with the household waste.
CE	CE mark. The inverter complies with the requirements of the applicable EC guidelines.
	The inverter has a transformer.
DC	Direct current (DC)
AC	Alternating current (AC)
IP65	Degree of protection The inverter is portected against dust intrusion and water jets from any angle.
	Outdoor The inverter is suitable for outdoor installation.
	RAL quality mark for solar products The inverter complies with the requirements of the German Institute for Quality Assurance and Labeling.
	Device class label. The inverter is equipped with a wireless component that complies with the harmonized standards.
	Certified safety The inverter was tested by VDE and complies with the requirements of the German Product Safety Act.
	Australian mark of conformity. The inverter complies with the requirements of the applicable Australian guidelines.
	Korean mark of conformity. The inverter complies with the requirements of the applicable Korean guidelines.

3 Unpacking

3.1 Scope of Delivery

Check the delivery for completeness and any visible external damage. Contact your specialty retailer if anything is damaged or missing.



Object	Quantity	Description
A	1	Sunny Boy
B	1	Wall mounting bracket
C	1	Document set
D	1	Additional sheet with inverter default settings
E	1	Installation manual
F	1	User manual
G	1	DC load disconnection unit Electronic Solar Switch*
H	1	Communication module (Quick Module)
I	4	Sealing plugs for DC connectors
K	4	DC connectors (2 x positive, 2 x negative)
L	1	AC coupling socket, protective cap for AC jack on inverter, threaded sleeve, sealing ring, clamping nut
M	1	Connection screw for anti-lifting lock

*for SB 2500HF-30 / 3000HF-30 with fan

3.2 Identifying the Inverter

You can identify the inverter using the type label. The type label is on the right-hand side of the enclosure.

The serial number (Serial No.) and the type (Type / Model) of the inverter, as well as device-specific characteristics, are specified on the type label.

4 Assembly

4.1 Safety

DANGER!

Danger to life due to fire or explosion.

Despite careful construction, electrical devices can cause fires.

- Do not mount the inverter on flammable construction materials.
- Do not mount the inverter in areas where highly flammable materials are stored.
- Do not mount the inverter in potentially explosive atmospheres.

CAUTION!

Risk of burns due to hot enclosure parts.

- Mount the inverter in such a way that it cannot be touched inadvertently during operation.

CAUTION!

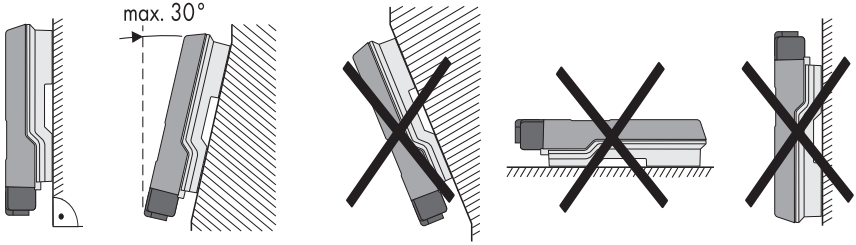
Risk of injury due to the heavy weight of the inverter.

- Take the inverter's weight of approx. 17 kg into account for mounting.

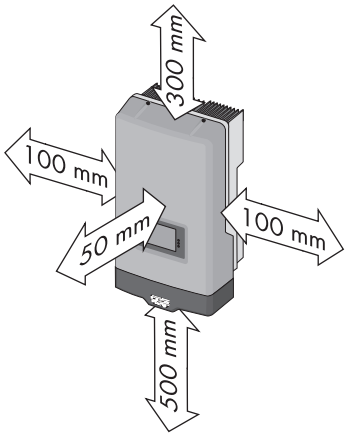
4.2 Selecting the Mounting Location

Consider the following requirements when selecting the mounting location:

- The mounting method and location must be suitable for the inverter's weight and dimensions (see section 13 "Technical Data" (page 81)).
- Mount on a solid surface.
- The mounting location must at all times be clear and safely accessible without the use of additional aids such as scaffolding or lifting platforms. Non-fulfillment of these criteria may restrict servicing.



- Mount vertically or tilted backwards at a maximum angle of 30°.
- The connection area must point downward.
- Never mount the device with a forward tilt.
- Never install the device with a sideways tilt.
- Do not mount horizontally.
- Mount at eye level to allow operating states to be read at all times.
- The ambient temperature should be below +40°C to ensure optimal operation.
- Do not expose the inverter to direct solar irradiation as this can cause excessive heating and thus power reduction.
- In living areas, do not mount the unit on plasterboard walls or similar to avoid audible vibrations. When in use, the inverter emits noises which may be perceived as a nuisance in a living area.
- Observe the minimum clearances to walls, other inverters, or objects as shown in the diagram in order to ensure sufficient heat dissipation and sufficient space for removing the Electronic Solar Switch.



Multiple inverters installed in areas with high ambient temperatures

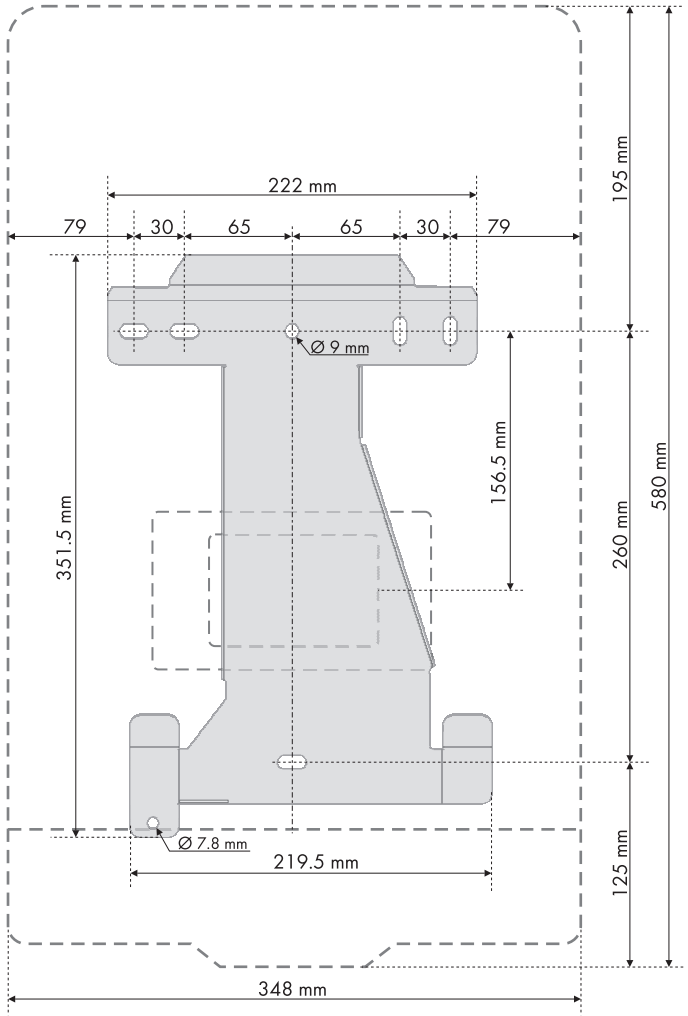
If necessary, increase the clearances between the individual inverters. In addition, make sure there is enough fresh-air supply to ensure sufficient cooling of the inverters.

4.3 Mounting the Inverter with the Wall Mounting Bracket

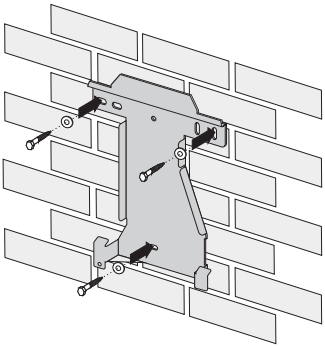
1. Use the wall mounting bracket as a drilling template and mark the positions of the drill holes.

Number of drill holes to use

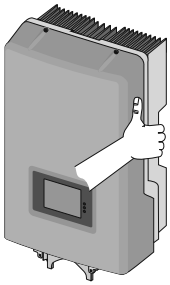
- When mounting onto the wall, use 1 top hole on the right-hand side and 1 top hole on the left-hand side. If necessary, use the lowest hole in the middle for extra support.
- Use the top and bottom center holes when mounting to a pillar.



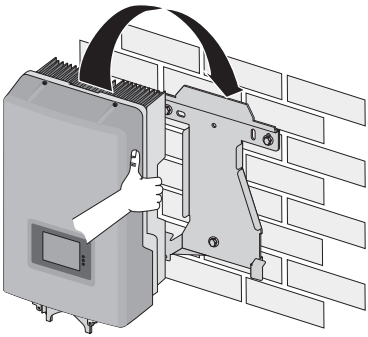
2. Attach the wall mounting bracket to the wall using appropriate screws
(diameter min. 6 mm, max 8 mm) and washers
(outer diameter min. 12 mm, max. 24 mm).



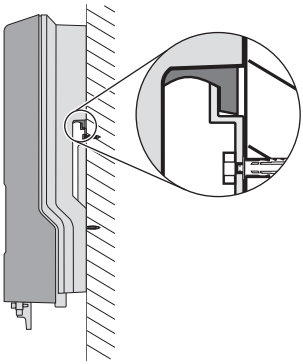
3. Transport the inverter using the handles on the sides.



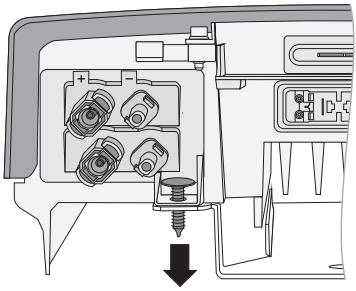
4. Insert the inverter into the wall mounting bracket from above using the mounting slots.



5. Check to ensure that the inverter is correctly seated.



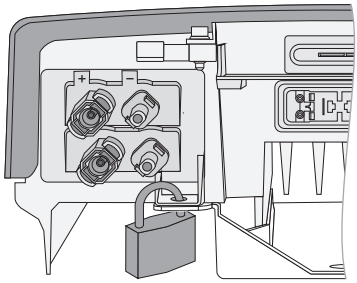
6. Use the connection elements (see item "M" in the scope of delivery on page 13) provided to fix the inverter and prevent it from being lifted out of place. To do this, push the connection elements through the plastic flap on the bottom of the inverter and into the wall mounting bracket.



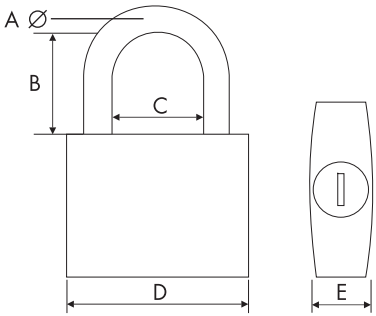
☑ The inverter is now securely mounted to the wall.

Optional Anti-Theft Protection

To protect the inverter from theft, you can lock it to the wall mounting bracket with a padlock.



The padlock must meet the following requirements:



- Size:
  A: maximum 6 mm diameter
  B: 21 – 35 mm
  C: 20 – 33 mm
  D: 40 – 60 mm
  E: 13 – 21 mm
- Stainless
- Hardened shackle
- Secured lock cylinder

Storage of the key

Store the key carefully for possible service purposes.

5 The Communication Module (Quick Module)

The inverter is equipped with a communication module (Quick Module) with a *Bluetooth* Wireless Technology interface as standard.

Quick Module with RS485 interface and multi-function relay (RS485-Quick Module)

You can purchase a Quick Module with an RS485 interface and a multi-function relay (RS485-Quick Module) from SMA Solar Technology AG or your specialty retailer (see section 14 "Accessories" (page 93). You will find detailed descriptions of the functions in the respective manual.

Configuring the Quick Module

You can configure the Quick Module before you connect it to the inverter.

5.1 Safety

DANGER!

Risk of lethal electric shock.

If you have already connected the Quick Module to the inverter, you have to disconnect the inverter from both the AC and DC supplies before you can configure the settings on the Quick Module.

- Disconnect the inverter as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58).

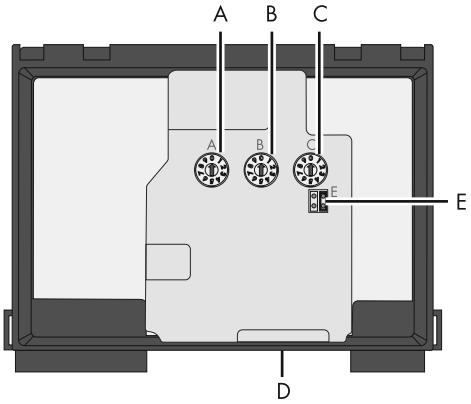
NOTICE!

Electrostatic discharges can damage the Quick Module or the inverter.

Internal component parts of the Quick Module or the inverter can be irreparably damaged by static electric discharge.

- Ground yourself before touching a component part.

5.2 Interior View of the Quick Module



Object	Description
A	Rotary switch for setting the country standard (switch A)
B	Rotary switch for setting the display language (switch B)
C	Rotary switch for the configuration of *Bluetooth* communication (switch C)
D	Slot for SD card (for service purposes only)
E	Jumper slot for setting the language to English (e)

5.3 Configuring the inverter via the Quick Module

There are two ways to configure the inverter to the required country standard:

- Before commissioning, you can configure the inverter using the two rotary switches in the Quick Module (switches A and B).
- You can adjust the parameters "CntrySet" or "Set country standard" using an external communication product with a *Bluetooth* interface.

Alternative parameterization with RS485

If your inverter is fitted with a Quick Module with RS485 interface, then your inverter can also communicate via RS485.

5.3.1 SMA Grid Guard Protected Country Data Sets

In some countries, the local grid connection requirements demand a mechanism which prevents the parameters for the grid feed-in from being changed. Some country data sets are therefore protected and can only be unlocked with a personal access code, the SMA Grid Guard code.

SMA Grid Guard protected country data sets are automatically blocked for 10 feed-in hours after commissioning, or after the last alteration. If the country data set is changed via the rotary switch after these 10 feed-in hours, the inverter will not accept the changes and displays the error message "Grid parameter locked". If, however, a later change to the country data set only relates to a change of the display language, this change is immediately applied.

It is also possible to set country data sets (parameter "CntrySet" or "Set country standard"), and to lock or unlock these manually via a communication product. To lock a data set, enter the digit sequence "54321" instead of the password into the SMA Grid Guard Code field. The data set can only be unlocked by entering a personal, 10-digit SMA Grid Guard code which is valid for a maximum of 10 feed-in hours. The application form for the personal access code is located in the download area at www.SMA.de/en, in the "Certificate" category for each inverter. The language can be configured without a password, regardless of the country data set.

Changing parameters in SMA Grid Guard protected country data sets

If the parameters within protected country data sets are changed, these are no longer protected and instead of the standard, "ADJ" or "Special setting" is displayed. In this case the parameters are not changed automatically after 10 feed-in hours, but have to be manually locked. To manually lock the parameters, set the SMA Grid Guard code to "54321".

Detailed information on parameter settings

You will find information on making adjustments and changing parameters in the corresponding user manual for your software.

The last change (executed via rotary switch or communication product) is always verified and activated if applicable. This means that you cannot always read off the actual country setting from the switch position.

5.3.2 Checking the Country Standard

The switch position 0 / 0 indicates the delivered state. If you have ordered the inverter with specific country settings, they will have already been preset at the factory via a communication product. In this case, you will not be able to recognize the setting by the switch position. If changes are made via the rotary switches or via a communication product, the default grid parameters are overwritten. They cannot be restored, and must be re-entered via a communication product. The display language can be changed at any time using the rotary switches, independently of the grid parameters. This means that the default grid parameters remain unchanged, but the display messages are shown in the set language. For devices ordered without any specified country of installation, the standard setting is "VDE0126-1-1" and the language "Deutsch" (German).

Changes will be accepted immediately after switching the miniature circuit-breaker on. If an unprogrammed switch setting is selected, the inverter issues an error message on the display and the last valid setting is retained.

Check whether the inverter is set to the installation country.

Before commissioning:

- Check that the country setting of the inverter is correct by comparing the additional sheet provided with the default settings of the inverter.

After commissioning:

- Check that the country standard is correct on the basis of the display message during (re-)commissioning (see section 7.2 "Display Messages During the Startup Phase" (page 51)).

  or

- Check that the country standard is correct using the "SMA grid guard" measuring channel via a communication product.

Display language

Once you have set the country standard, you can always set the display language later using rotary switch B. However, you have to then set rotary switch A to "0" in order to keep the country data set.

The operating parameters define which parameter set refers to which setting. The parameters can be read out using a communication product. A detailed description of the parameters and measured values for the inverter is available in the download area at www.SMA.de/en in the "Technical Description" category for the respective inverter.

(A)	(B)	Country data set	Display language	Grid Guard protection	Country
0	0	Delivery state	Delivery state	Dependent on parameter set	Dependent on parameter set
0	1	Retained	English	Dependent on parameter set	Dependent on parameter set
0	2	Retained	German	Dependent on parameter set	Dependent on parameter set

(A)	(B)	Country data set	Display language	Grid Guard protection	Country
0	3	Retained	French	Dependent on parameter set	Dependent on parameter set
0	4	Retained	Spanish	Dependent on parameter set	Dependent on parameter set
0	5	Retained	Italian	Dependent on parameter set	Dependent on parameter set
0	6	Retained	Unallocated*	Dependent on parameter set	Dependent on parameter set
0	7	Retained	Unallocated*	Dependent on parameter set	Dependent on parameter set
1	0	VDE0126-1-1	German	yes	Germany, Switzerland
1	2	VDE-AR-N4105[a)]	German	yes	Germany
1	8	VDE0126-1-1	French	yes	Switzerland, France
1	9	VDE0126-1-1/UTE[b)]	French	yes	France
2	0	VDE0126-1-1	Italian	yes	Switzerland
2	8	AS4777.3	English	no	Australia
3	0	Enel-GUIDA	Italian	no	Italy
3	8	Enel-GUIDA	German	no	Italy
4	0	RD1663-A	Spanish	yes	Spain
4	1	RD1663/661-"	Spanish	yes	Spain
4	8	PPC	Unallocated*	no	Greece
4	9	PPC	English	no	Greece
5	1	KEMCO 501/2009**	English	no	South Korea
5	8	G83/1-1	English	no	England
6	0	EN50438	German	yes	Various EU countries
6	1	EN50438	English	yes	
6	2	EN50438	French	yes	
6	3	EN50438	Italian	yes	
6	4	EN50438	Spanish	yes	
6	5	EN50438	Unallocated*	yes	
6	6	EN50438	Unallocated*	yes	
7	0	EN50438-CZ	Unallocated*	yes	Czech Republic
7	1	EN50438-CZ	English	yes	Czech Republic
7	2	EN50438-CZ	German	yes	Czech Republic
7	8	C10/11	French	yes	Belgium

(A)	(B)	Country data set	Display language	Grid Guard protection	Country
7	9	C10/11	English	yes	Belgium
7	A	C10/11	German	yes	Belgium
A	C	SI4777-2	English	no	Israel
B	8	IEC61727/MEA	English	no	Thailand
B	C	IEC61727/PEA	English	no	Thailand
D	0	Off-Grid 60Hz	English	no	Flexible
D	1	Off-Grid 60Hz	German	no	Flexible
D	2	Off-Grid 60Hz	French	no	Flexible
D	3	Off-Grid 60Hz	Spanish	no	Flexible
D	4	Off-Grid 60Hz	Italian	no	Flexible
D	5	Off-Grid 60Hz	Unallocated*	no	Flexible
D	6	Off-Grid 60Hz	Unallocated*	no	Flexible
E	0	Off-Grid 50Hz	English	no	Flexible
E	1	Off-Grid 50Hz	German	no	Flexible
E	2	Off-Grid 50Hz	French	no	Flexible
E	3	Off-Grid 50Hz	Spanish	no	Flexible
E	4	Off-Grid 50Hz	Italian	no	Flexible
E	5	Off-Grid 50Hz	Unallocated*	no	Flexible
E	6	Off-Grid 50Hz	Unallocated*	no	Flexible

a) Can be adjusted as of firmware version 2.30

b) Special setting: *Bluetooth* transmission power reduced (in accordance with French standards)

*) Currently unallocated. The previously configured display language remains set.

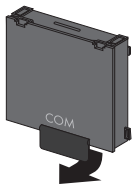
**) Only applies for SB 3000HF-30/V 0160

If the inverter is not set to the installation country, there are several ways of configuring the required country standard.

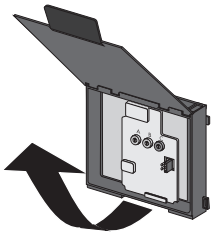
- Setting via 2 rotary switches in Quick Module, as described in section 5.3.4 "Setting the Country Standard and Language using the Rotary Switch" (page 28).
- Alternatively you can adjust the setting via the "CntrySet" or "Set country standard" parameters with a communication product (e.g. Sunny Data Control or Sunny Explorer), once you have commissioned the inverter.
- If you require adjusted parameter settings for your installation site, you can change these with the help of a communication product.

5.3.3 Opening the Quick Module

1. If the Quick Module is already connected to the inverter, proceed as follows:
   - Disconnect the inverter from the AC and DC side as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58).
   - Pull the Quick Module out to the first stopper.
2. Open the lower flap of the Quick Module.



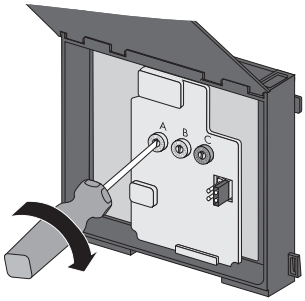
3. Open the lid of the Quick Module until it locks into place.



☑ The Quick Module is open. You can now set the installation country and the language via the rotary switches as described in the following section.

5.3.4 Setting the Country Standard and Language using the Rotary Switch

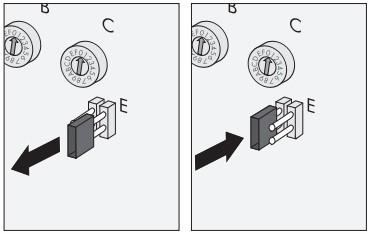
1. Open the Quick Module, as described in section 5.3.3 "Opening the Quick Module" (page 27).
2. Set the arrows on both left rotary switches (A and B) to the desired positions using a screwdriver (see table in section 5.3.2 "Checking the Country Standard" (page 24)). For this purpose, use a screwdriver with a blade width of 2.5 mm.



Jumper for English

You can also set the language to English by means of a jumper (e.g. for service purposes).

- To do this, place the jumper onto both left pins as shown in the diagram on the right.



☑ The country standard and the language are set.

5.3.5 Communication via *Bluetooth*

Communication via *Bluetooth* with a communication product is activated as standard. Networking via *Bluetooth* with other inverters is deactivated ex works.

The following configuration settings are possible via a rotary switch (switch C):

Switch position (NetID)	Setting
0	off
1	Communication via *Bluetooth* with communication product possible, no networking with other inverters (default settings)
2 ... F	Networking with other inverters and/or communication products

In order to restrict communication via *Bluetooth* between the inverters of your plant and those of neighboring plants, you can assign an individual NetID to the inverters of your plant (switch position 2 ... F). However, this is only necessary if neighboring plants are within a radius of 500 m.

So that all inverters in your PV plant are detected by your communication product, all inverters must have the same NetID.

Plant password for user and installer

If you communicate via *Bluetooth*, you can protect the inverter with 1 plant password for the user and 1 plant password for the installer. All inverters are delivered with the same factory-installed plant password. You must change plant passwords using a communication product in order to protect the plant from unauthorized access.

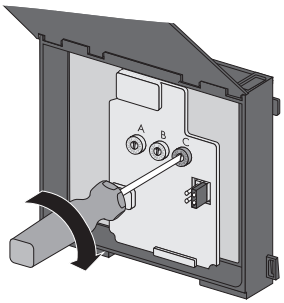
If you do not communicate using *Bluetooth*, deactivate the *Bluetooth* communication. This protects your plant from unauthorized access.

Changing the Plant Time

For communication via *Bluetooth* and Sunny Explorer, you must change the plant time (date and time) using a communication product after commissioning. This prevents errors when retrieving saved events.

Procedure

1. Open the Quick Module, as described in section 5.3.3 "Opening the Quick Module" (page 27).
2. Set the arrow on the rotary switch (C) to the required position using a screwdriver (2.5 mm). For this purpose, use a screwdriver with a blade width of 2.5 mm.

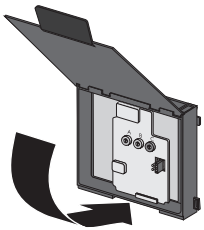


Acceptance of settings

The *Bluetooth* settings will first be accepted upon commissioning.

5.3.6 Closing the Quick Module

1. Close the lid of the Quick Module and flip the flap down again until it locks into place.



☑ You can now connect the Quick Module to the inverter, as described in the following section.

5.4 Mounting the Quick Module

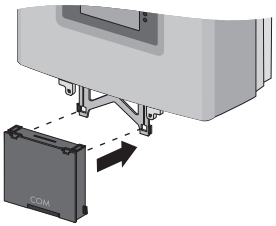
NOTICE!

Damage to the Quick Module due to improper installation in the inverter.

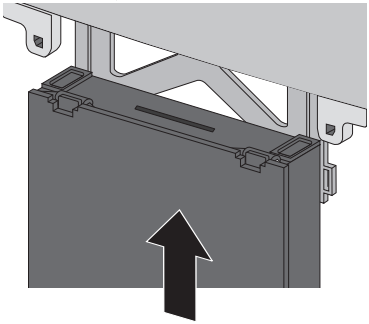
The Quick Module can be damaged if incorrectly installed in the inverter.

- Check the Quick Module for visible external damage before installation.
- **Carefully** install the Quick Module, as described in the following.

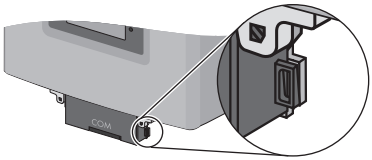
1. Disconnect the inverter from the AC and DC side as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58).
2. Make sure that the inverter has been secured with the connection element in order to prevent it from being lifted out, as per section 4.3 "Mounting the Inverter with the Wall Mounting Bracket" (page 17).
3. Put the Quick Module into the designated holes on the retainer.



4. Push the Quick Module upwards in the guide slot until it clicks into place.



5. Check that the Quick Module is correctly seated. The loops of the Quick Module and the retainer must be positioned flush on top of each other.

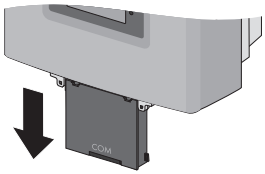


☑ The Quick Module is mounted.

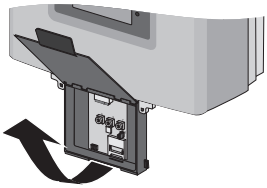
5.5 Changes via Rotary Switches after Installation of the Quick Module

If you have already connected the Quick Module to the inverter and would like for example to configure the installation country or the display language via the rotary switches, then proceed as follows:

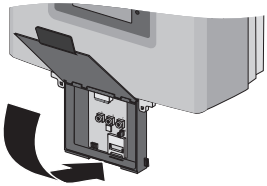
1. Disconnect the inverter from the AC and DC side as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58).
2. Make sure that the inverter has been secured with the connection element in order to prevent it from being lifted out, as per section 4.3 "Mounting the Inverter with the Wall Mounting Bracket" (page 17).
3. Pull the Quick Module out to the first stopper.



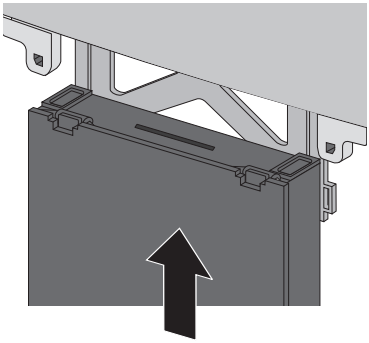
4. Flip the flap up and pen the lid until it locks into place.



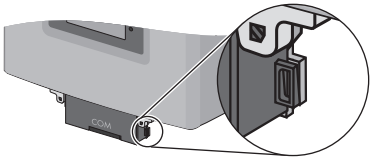
5. See section 5.3.4 "Setting the Country Standard and Language using the Rotary Switch" (page 28) for setting the installation country and the display language.
6. See section 5.3.5 "Communication via Bluetooth" (page 28) for assigning the NetID via *Bluetooth*.
7. Close the lid of the Quick Module and flip the flap down again until it locks into place.



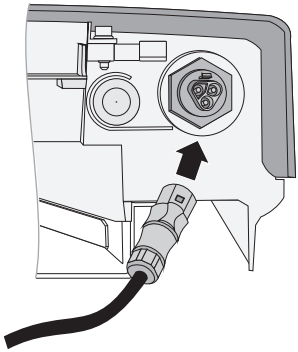
8. Push the Quick Module upwards in the guide slot until it clicks into place.



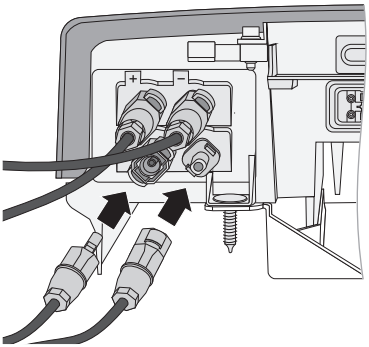
9. Check that the Quick Module is correctly seated. The loops of the Quick Module and the retainer must be positioned flush on top of each other.



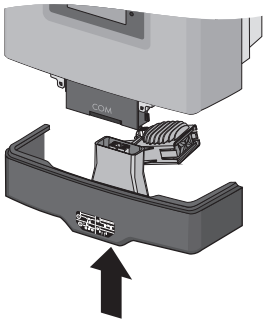
10. Connect the AC plug.



11. Check the DC connectors for correct polarity and connect them.



12. Plug in the Electronic Solar Switch. If an RS485 Quick Module is connected, route the cable for the RS485 bus along the side of the shaft for the Electronic Solar Switch.



NOTICE!

Damage to Electronic Solar Switch.

If it is not correctly connected, the Electronic Solar Switch can be damaged.

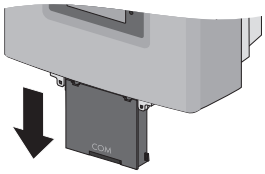
- Plug the handle firmly onto the jack of the Electronic Solar Switch.
- The handle must be flush with the enclosure.

13. If a multi-function relay is connected, switch on the multi-function relay supply voltage.
14. Switch on the miniature circuit-breaker.

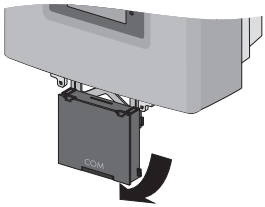
☑ The changes have been set.

5.6 Disassembling the Quick Module

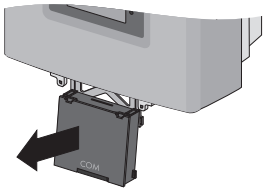
1. Disconnect the inverter from the AC and DC side as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58).
2. Pull the Quick Module out over the first stopper to the last stopper.



3. Press the Quick Module lightly upwards until the keys pass through the openings of the retainer.



4. Carefully take the Quick Module out of the retainer.



☑ The Quick Module is disassembled.

6 Electrical Connection

6.1 Safety

NOTICE!

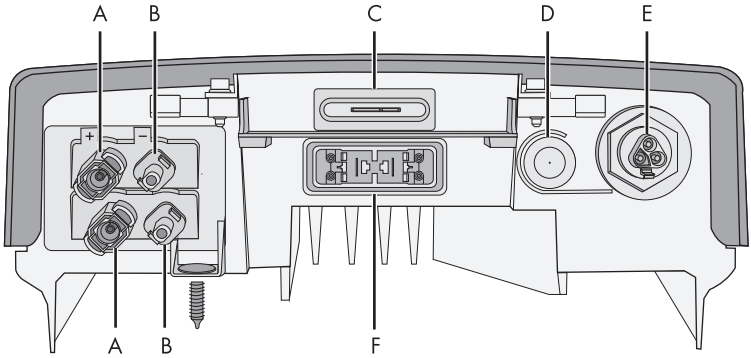
Electrostatic discharges can damage the inverter.

Internal component parts of the inverter can be irreparably damaged by electric discharge.

- Ground yourself before touching a component part.

6.2 Overview of the Connection Area

The following figure shows the assignment of the individual connection areas on the bottom of the inverter.



Object	Description
A	DC connectors (+) for connecting the PV strings
B	DC connectors (−) for connecting the PV strings
C	Slot for the communication module (Quick Module/RS485-Quick Module)
D	Slot with protective cap for optional grounding
E	Jack for the AC connection plug
F	Jack for connecting the Electronic Solar Switch (ESS)

6.3 Connection to the Power Distribution Grid (AC)

6.3.1 Conditions for the AC Connection

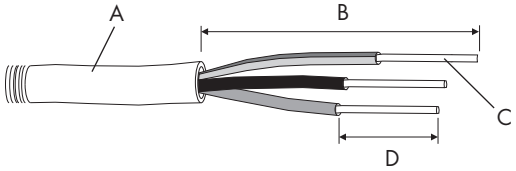
Connection requirements of the grid operator

Always observe the connection requirements of your grid operator.

Cable design

Use "Sunny Design" version 2.0 or higher for the dimensioning of the conductor cross-sectional areas (see "Sunny Design" design program at www.SMA.de/en).

Cable Requirements



Position	Designation	Value
A	External diameter	6 mm ... 14 mm
B	Stripping length	30 mm
C	Cable cross-section	2.5 mm² ... 4 mm²
D	Length of insulation to be stripped off	8 mm

Load Disconnection Unit

You must install a **separate** miniature circuit-breaker for each inverter in order to ensure that the inverter can be securely disconnected under load. The maximum permissible fuse protection can be found in section 13 "Technical Data" (page 81).

Detailed information and examples for the rating of a miniature circuit-breaker can be found in the Technical Information "Miniature Circuit-Breaker" in the SMA Solar Technology AG download area at www.SMA.de/en.

DANGER!

Danger to life due to fire.

When more than one inverter is connected in parallel to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. It can result in a cable fire or destruction of the inverter.

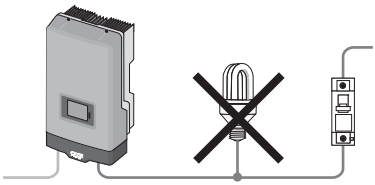
- Never connect several inverters to the same miniature circuit-breaker.
- Observe the maximum permissible fuse protection of the inverter when selecting the miniature circuit-breaker.

DANGER!

Danger to life due to fire.

When a generator (inverter) and a load are connected to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. The current from the inverter and the power distribution grid can accumulate to overcurrents which is not detected by the miniature circuit-breaker.

- Never connect loads between the inverter and the miniature circuit-breaker without fuse protection.
- Always protect consumers separately.



NOTICE!

Damage to the inverter by using screw type fuses as a load disconnection unit.

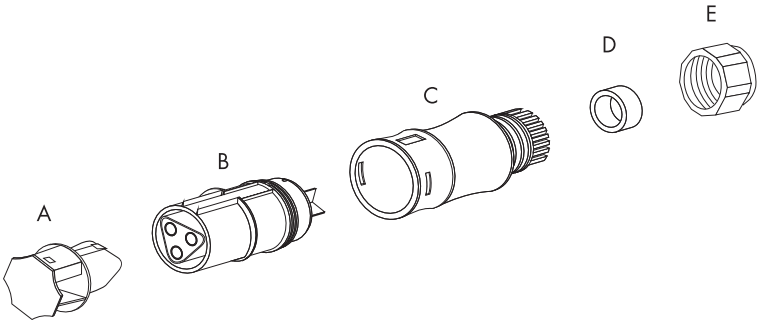
A screw type fuse, e.g. DIAZED fuse or NEOZED fuse, is not a switch-disconnector, and thus may not be used as a switch-disconnector. A screw type fuse only acts as cable protection.

When disconnecting under load using a screw type fuse, the inverter can be damaged.

- Use only a switch-disconnector or a miniature circuit-breaker as a load disconnection unit.

6.3.2 Connecting the Inverter to the Power Distribution Grid (AC)

Overview of the AC Coupling Socket

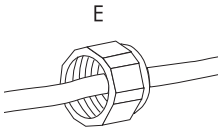


Object	Description
A	Protective cap for AC jack on inverter
B	Jack element
C	Threaded sleeve with sealing ring for cable diameters from 10 mm ... 14 mm
D	Sealing ring for cable diameters from 6 mm ... 10 mm
E	Pressure screw

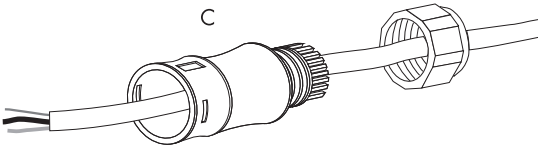
Connecting the Inverter to the Power Distribution Grid (AC)

1. Check that the country setting of the inverter is correct by using the additional sheet provided with the default settings.

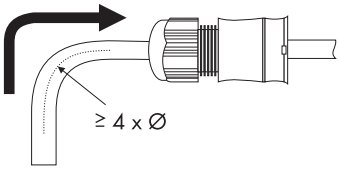
   If the inverter is not set to the desired country standard, then adjust the country standard using the rotary switches in the Quick Module as described in section 5.3.4 "Setting the Country Standard and Language using the Rotary Switch" (page 28).
2. Check the grid voltage and compare it with the permissible voltage range (V_{AC}) (see section 13 "Technical Data" (page 81)).
3. Disconnect the miniature circuit-breaker and secure against re-connection.
4. If necessary, replace the sealing ring of the threaded sleeve with the sealing ring provided.
   - Pull the sealing ring out of the threaded sleeve.
   - Insert the smaller sealing ring.
5. Pass the pressure screw (E) over the AC cable.



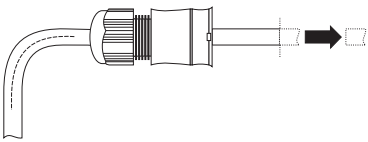
6. Thread the threaded sleeve (C) with the sealing ring over the AC cable.



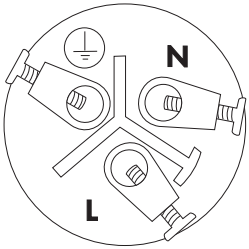
7. Bend the AC cable for the connection if necessary. The bending radius must be at least four times the cable diameter.



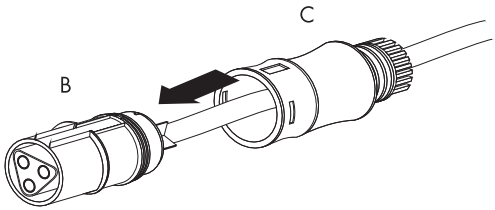
8. Shorten the AC cable.



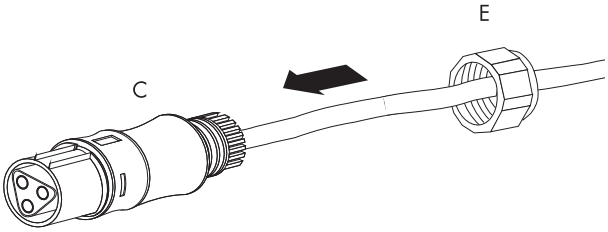
9. Strip approx. 30 mm from the AC cable.
10. Shorten phase L and neutral conductor N 4 to 5 mm.
    The PE protective conductor must be longer than the insulated conductors of N and L.
11. Strip 8 mm of insulation from the AC cable.
12. Insert the protective conductor PE (green-yellow) into the screw terminal with the ground sign on the jack element and tighten the screw.
13. Insert the neutral conductor N (blue) into the screw terminal N on the jack element and tighten the screw.
14. Insert phase L (brown or black) into screw terminal L on the jack element and tighten the screw.
15. Make sure the insulated conductors are securely connected.



16. Push the threaded sleeve (C) onto the jack element (B) until it audibly snaps into place.



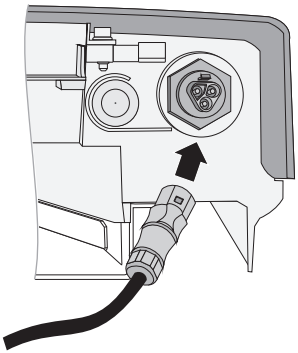
17. Screw the pressure screw (E) tightly onto the threaded sleeve (C). The pressure screw serves to seal and relieve strain.



☑ The AC connection socket has been screwed together.

18. If the AC connection socket is not immediately connected to the inverter, close the AC jack on the inverter with the protective cap provided.
19. Make sure that the inverter has been secured with the connection element in order to prevent it from being lifted out, as per section 4.3 "Mounting the Inverter with the Wall Mounting Bracket" (page 17).
20. Insert the AC connection socket into the AC jack on the inverter until it audibly snaps into place.

    Remove the protective cap beforehand, if required.



☑ The AC cable is connected to the inverter.

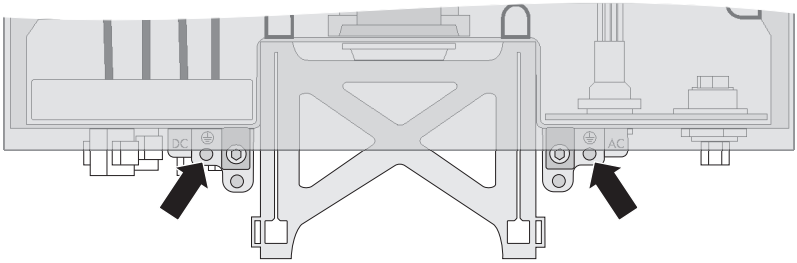
DANGER!

Danger to life due to high voltages in the inverter.

- Do not switch on the miniature circuit-breaker until the PV array has been connected and the inverter is securely closed.

6.3.3 Connecting Additional Grounding

If a second protective conductor connection, additional grounding, or equipotential bonding is required in the country of installation, you can also ground the inverter at the enclosure (see figure).



6.4 Connecting the PV Array (DC)

6.4.1 Conditions for the DC Connection

Use of Y adapters for parallel connection of strings

Y adapters may not be visible within close proximity of the inverter or freely accessible.

- The DC electric circuit must not be interrupted by adaptors.
- Observe the procedure for disconnecting the inverter as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58).

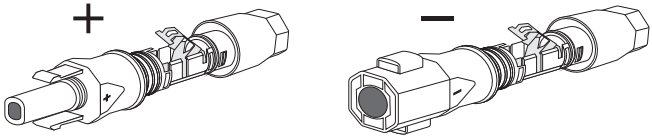
- Requirements for the PV modules of the connected strings:
  - Same type
  - Same number
  - Identical alignment
  - Identical tilt
- The connection cable of the PV modules must be equipped with connectors. The DC connectors for the DC connection are included in the delivery.
- The following limiting values at the DC input of the inverter must not be exceeded:

Sunny Boy	Maximum input voltage	Maximum input current
SB 2000HF-30	700 V	12 A
SB 2500HF-30	700 V	15 A
SB 3000HF-30	700 V	15 A

6.4.2 Assembling the DC Connectors

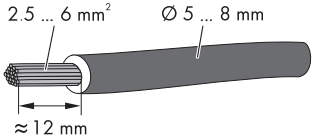
All PV module connection cables must be equipped with the included DC connectors before connecting them to the inverter.

To assemble the DC connectors, proceed as follows. Ensure the connectors have the correct polarity. The DC connectors have the symbols "+" and " – ".



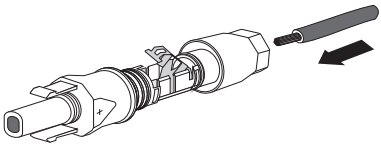
Cable Requirements

- Use a PV1-F cable.

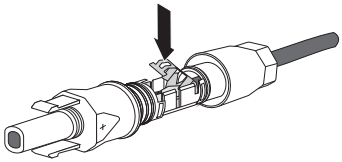


Procedure

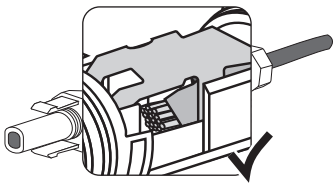
1. Lead the stripped cable all the way into the DC connector.

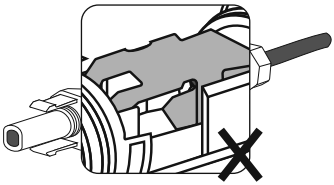
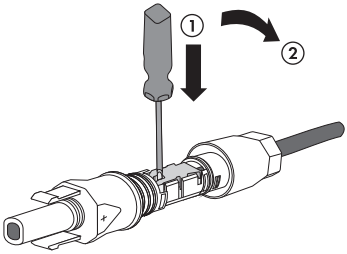


2. Press the clamping bracket down.
   ☑ The clamping bracket snaps audibly into place.

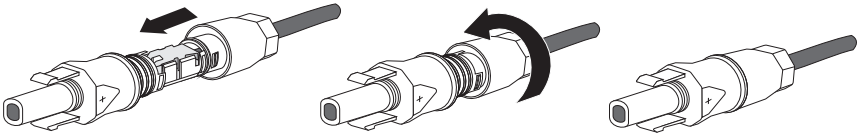


3. Ensure that the cable is correctly positioned:

Result	Measure
☑ If the stranded wire is visible in the chamber of the clamping bracket, the cable is correctly positioned. 	• Proceed to step 4.

Result	Measure
☑ If the stranded wires are **not** visible, the cable is not correctly positioned. 	• Loosen the clamping bracket. To do so, insert a 3.5 mm screwdriver into the clamping bracket and lever it out.  • Remove the cable and start again from step 1.

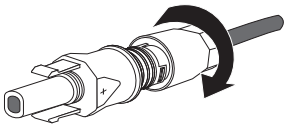
4. Push the cable gland towards the thread and tighten it (torque: 2 Nm).



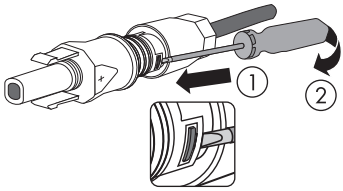
☑ The DC connectors are assembled and can now be connected to the inverter as described in section 6.4.4 "Connecting the PV Array (DC)" (page 46).

6.4.3 Opening the DC Connector

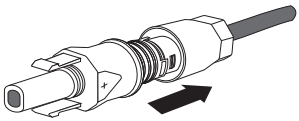
1. Unscrew the screw connection.



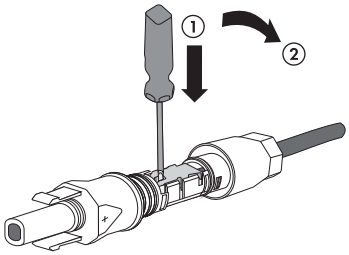
2. Unlocking the DC connector: Insert a 3.5 mm screwdriver into the snap slot on the side and lever it out.



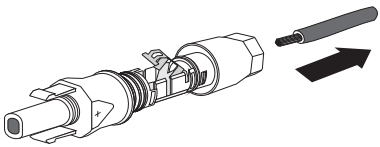
3. Carefully pull the DC connector apart.



4. Loosen the clamping bracket using a screwdriver. For this purpose, use a screwdriver with a blade width of 3.5 mm.



5. Remove the cable.



☑ The cable is removed from the DC connector.

6.4.4 Connecting the PV Array (DC)

DANGER!

Danger to life due to high voltages in the inverter.

- Before connecting the PV array, ensure that the AC miniature circuit-breaker is switched off and that it cannot be reactivated.

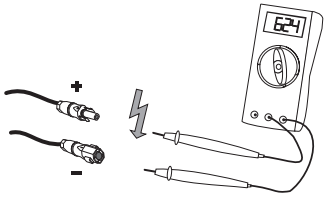
NOTICE!

Excessive voltages can destroy the measuring device.

- Only use measuring devices with a DC input voltage range up to at least 1 000 V.

1. Disconnect the miniature circuit-breaker and secure against re-connection.
2. Make sure that the inverter has been secured with the connection element in order to prevent it from being lifted out, as per section 4.3 "Mounting the Inverter with the Wall Mounting Bracket" (page 17).
3. Check the connection cable of the PV modules for correct polarity and make sure that the maximum input voltage of the inverter is not exceeded.

   At an ambient temperature above 10°C, the open-circuit voltage of the PV modules must not be more than 90% of the maximum inverter input voltage. Otherwise, check the plant design and the PV module connection. If this is not done, the maximum input voltage of the inverter can be exceeded at low ambient temperatures.



NOTICE!

Destruction of the inverter due to overvoltage.

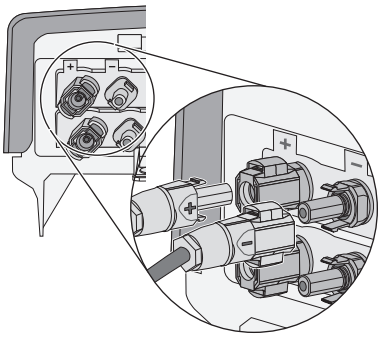
If the voltage of the PV modules exceeds the maximum input voltage of the inverter, it can be destroyed by the overvoltage. This will void all warranty claims.

- Do not connect strings with an open-circuit voltage greater than the maximum input voltage of the inverter.
- Check the plant design.

4. Check the strings for ground faults as described in section 11.1 "Checking the PV Array for Ground Faults" (page 72).

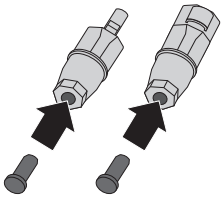
5. Check the assembled DC connectors for correct polarity and connect them to the inverter.

   ☑ The DC connectors click audibly into position. To unlock the DC connectors, see section 6.4.3 "Opening the DC Connector" (page 45).

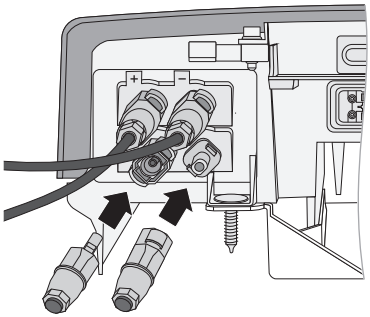


6. To create the seal on the inverter, all DC inputs that are not required must be closed as follows:

   – Insert the sealing plugs provided into the DC connectors that are not required. Do **not** insert the sealing plug into the DC inputs on the inverter.

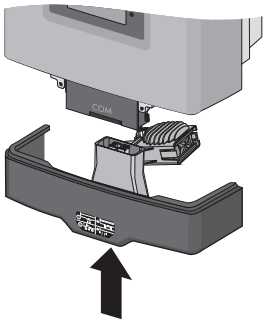


   – Insert the DC connectors with sealing plugs into the corresponding DC inputs on the inverter.



7. Ensure that all DC connectors are securely in place.
8. Mount the Quick Module, as described in section 5.4 "Mounting the Quick Module" (page 30).

9. Plug in the Electronic Solar Switch. If an RS485 Quick Module is connected, route the cable for the RS485 bus along the side of the shaft for the Electronic Solar Switch.



NOTICE!

Damage to Electronic Solar Switch.

If it is not correctly connected, the Electronic Solar Switch can be damaged.

- Plug the handle firmly onto the jack of the Electronic Solar Switch.
- The handle must be flush with the enclosure.

☑ The PV array is connected to the inverter. You can now commission the inverter as described in section 7 "Commissioning" (page 49).

7 Commissioning

7.1 Commissioning the Inverter

1. Check that the inverter is firmly mounted on the wall and secured against being lifted out (see section 4.3 "Mounting the Inverter with the Wall Mounting Bracket" (page 17)).
2. Check for correct country configuration (see section 5.3.2 "Checking the Country Standard" (page 24)).
3. Check that the AC cables are connected correctly (see section 6.3 "Connection to the Power Distribution Grid (AC)" (page 36)).
4. Check that the DC cables (PV strings) are connected correctly (see section 6.4 "Connecting the PV Array (DC)" (page 42)).
5. Close up unnecessary DC inputs with the DC connectors and sealing plugs (see section 6.4.4 "Connecting the PV Array (DC)" (page 46))..
6. Check whether all enclosure openings are closed.
7. Check whether the enclosure lid is firmly screwed in place.
8. Check that the Quick Module is connected correctly.
9. Firmly connect the Electronic Solar Switch.
10. Check that you have the correct type of miniature circuit-breaker.
11. Switch on the miniature circuit-breaker.
12. If a multi-function relay is connected, switch on the multi-function relay supply voltage.

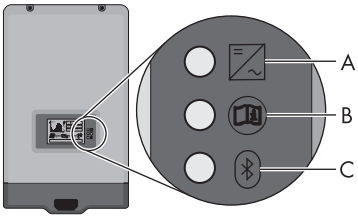
Self-test in accordance with ENEL guideline during initial start-up (only for Italy)

The Italian standard prescribes that an inverter can only operate on the power distribution grid after the disconnection times for overvoltage, undervoltage, minimum frequency and maximum frequency have been checked.

If you have configured the Enel-GUIDA country data set, start the self-test as described in section 7.3 "Self-Test in Accordance with ENEL Guideline, Ed. 1.1 (Applies to Italy Only)" (page 52). The test takes approx. 3 minutes.

13. Check whether the display and LEDs are indicating a normal operating state.

LED	Color	Significance
A	Green	Glowing: operation
		Flashing: wait for sufficient irradiation
B	Red	Disturbance
C	Blue	*Bluetooth* communication is active



☑ If the inverter has been commissioned successfully, the green LED should be glowing or flashing, provided there is sufficient solar irradiation. To find out what a glowing red LED and the event numbers on the display mean, refer to section 10.3 "Error Messages" (page 66).

14. For communication via *Bluetooth*, make the following settings using Sunny Explorer:
    - Change the plant time (see Sunny Explorer manual).
    - Change the plant password (see Sunny Explorer manual).

7.2 Display Messages During the Startup Phase

Illustrated display messages

The display messages illustrated in this section serve as examples and can, depending on the country setting, differ from the display messages of your inverter.

- Firstly, the firmware version of the internal processors appears in the text lines.

- After an interval of 5 seconds, or after tapping on the enclosure lid, the serial number (or the description of the inverter) and the NET ID for communication via Bluetooth will appear. The description of the inverter can be changed with a communication product.

- After a further 5 seconds, or when you tap again, the configured standard is displayed , (example: "VDE0126-1-1").

- After a further 5 seconds, or when you tap again, the configured language is displayed (example: "Sprache Deutsch" (Language German)).

- During normal operation, the text line of the display will subsequently be clear. For more information on the possible event messages in the scrolling lines and their meaning, see section 10 "Messages" (page 65).

Show display messages again (valid from firmware version 2.30)

If you want to view the display messages of the startup phase again while in normal operation, double tap the enclosure lid.

7.3 Self-Test in Accordance with ENEL Guideline, Ed. 1.1 (Applies to Italy Only)

7.3.1 Starting the Self-Test

You can start the self-test by tapping on the enclosure lid. The country configuration of the inverter must be set to Italy (Enel-GUIDA) or a reconfigured based on the Enel-GUIDA country data set before the self-test can be carried out. In addition, an undisturbed feed-in operation must be possible.

Display language during the self-test

Regardless of the configured language, the display messages for the self-test will always be displayed in Italian.

Proceed as follows for checking the disconnection times:

1. Commission the inverter as described in section 7 "Commissioning" (page 49).
   ☑ The inverter is now in the initialization phase.
   - Firstly, the firmware version of the internal processors appears in the text lines.
   - After 5 seconds or after tapping the enclosure lid, the serial number or the description of the inverter appears. The description of the inverter can be changed with a communication product.
   - After a further 5 seconds, or when you tap again, the configured standard is displayed.

2. In order to start the self-test, tap on the enclosure lid **within 10 seconds**.
   ☑ The message shown on the right appears in the display.

3. Now activate the self-test **within 20 seconds** by tapping on the enclosure lid again.

☑ Once you have started the test sequence, the inverter checks the disconnection times for overvoltage, undervoltage, maximum frequency and minimum frequency one after the other. During the tests, the inverter shows the values in the display which are described in section 7.3.2 "Test Sequence" (page 53).

7.3.2 Test Sequence

Note the values which are displayed during the test sequence. These values must be entered into a test report. The test results of the individual tests are displayed three times one after the other. When the inverter has carried out the 4 tests, it switches to normal operation. The original calibration values are reset.

Current values in the display

During the self-test the current voltage, the feed-in current and the frequency are displayed above the text rows, independently of the test values.

Overvoltage test

The inverter starts the overvoltage test and shows the adjacent display message for 5 seconds.

During the test sequence, the voltage limit applied is shown in the display of the inverter. The voltage limit is reduced successively until the shut-down threshold is reached and the inverter disconnects from the power distribution grid.

Once the inverter has disconnected from the power distribution grid, the display successively shows each of the following values one after the other for 10 seconds:

- Disconnection value,

1. 

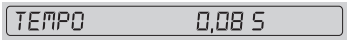
2. 

- Calibration value,

1. 

2. 

- Reaction time.

1. 

2. 

The change between the first and second display takes places every 2.5 seconds.

Undervoltage Test

The undervoltage test follows the overvoltage test and the inverter issues the adjacent display message for 5 seconds.

During the test sequence, the voltage limit applied is shown in the display of the inverter. The voltage limit is increased successively until the shut-down threshold is reached and the inverter disconnects from the power distribution grid.

Once the inverter has disconnected from the power distribution grid, the display successively shows each of the following values one after the other for 10 seconds:

- Disconnection value,

1. 

2. 

- Calibration value,

1. 

2. 

- Reaction time.

1. 

2. 

The change between the first and second display takes places every 2.5 seconds.

Maximum frequency

The maximum frequency test follows the undervoltage test and the inverter issues the adjacent display message for 5 seconds.

During the test sequence, the frequency limit applied is shown in the display of the inverter. The frequency limit is reduced successively until the shut-down threshold is reached and the inverter disconnects from the power distribution grid.

Once the inverter has disconnected from the power distribution grid, the display successively shows each of the following values one after the other for 10 seconds:

- Disconnection value,

1. 

2. 

- Calibration value,

1. 

2. 

- Reaction time.

1. 

2. 

The change between the first and second display takes places every 2.5 seconds.

Minimum frequency

After the maximum frequency test, the minimum frequency test takes place and the inverter shows the adjacent display message for 5 seconds.

During the test sequence, the frequency limit applied is shown in the display of the inverter. The frequency limit is increased successively until the shut-down threshold is reached and the inverter disconnects from the power distribution grid.

Once the inverter has disconnected from the power distribution grid, the display successively shows each of the following values one after the other for 10 seconds:

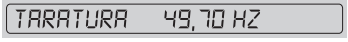
- Disconnection value,

1. 

2. 

- Calibration value,

1. 

2. 

- Reaction time.

1. 

2. 

The change between the first and second display takes places every 2.5 seconds.

7.3.3 Abortion of the Self-Test

If, during the self-test, an unexpected disconnection requirement occurs, the self-test is aborted. The same applies if the DC voltage is so low that the feed-in cannot be continued.

- The inverter then shows the adjacent display message for 10 seconds.

- Restart the self-test as described in the following section 7.3.4 "Restarting the Self-Test" (page 57).

7.3.4 Restarting the Self-Test

In order to restart the self-test, proceed as follows:

1. Disconnect the miniature circuit-breaker and secure against re-connection.
2. If a multi-function relay is connected, switch off the multi-function relay power supply.
3. Disconnect the Electronic Solar Switch from the inverter for 5 minutes and then connect it again.
4. Switch on the miniature circuit-breaker again.

☑ The inverter is now in the initialization phase and you can restart the self-test, as described in section 7.3.1 "Starting the Self-Test" (page 52) from step 3.

8 Disconnecting the Inverter from Voltage Sources

DANGER!

Danger to life due to high voltages in the inverter.

The inverter operates at high voltages.

- Disconnect the inverter from the AC and DC supplies as described below.

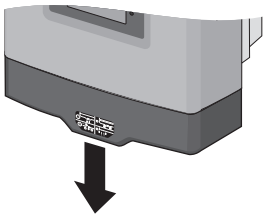
NOTICE!

Electrostatic discharges can damage the inverter.

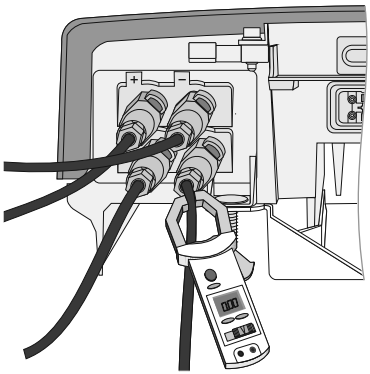
Internal component parts of the inverter can be irreparably damaged by electric discharge.

- Ground yourself before touching a component part.

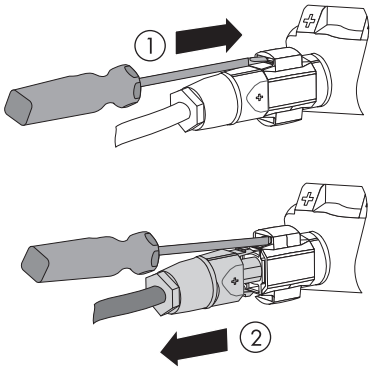
1. Disconnect the miniature circuit-breaker and secure against re-connection.
2. If a multi-function relay is connected, switch off the multi-function relay power supply.
3. Remove the Electronic Solar Switch.



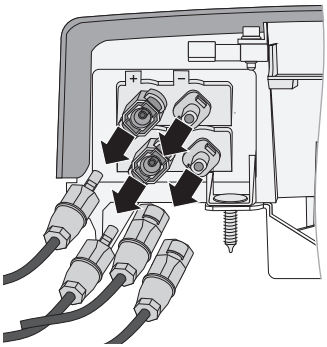
4. Use a current probe to ensure that no current is present in any of the DC cables.
   ☑ If current is present, check the installation.



5. Unlock and disconnect all DC connectors using a 3.5 mm screwdriver.
   - Insert a screwdriver into one of the side slots (1).
   - Disconnect the DC connectors (2).



☑ All DC connectors are disconnected from the inverter. The inverter is completely disconnected from the PV array.



DANGER!

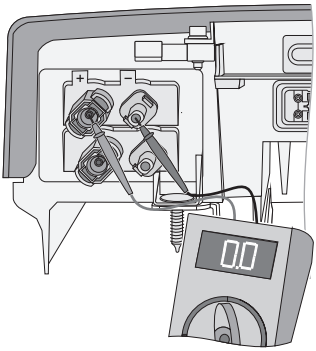
Danger to life due to high voltages in the inverter.

The capacitors in the inverter require 5 minutes to discharge.

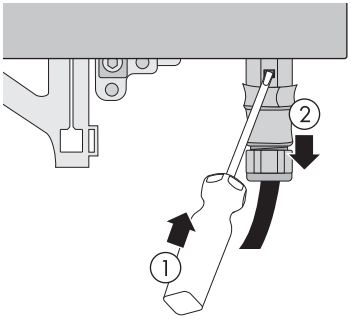
- Wait at least 5 minutes until the LEDs, the display and the fault sensor are no longer illuminated.

6. Ensure that no voltage is present at the DC plugs on the inverter.

   ☑ If voltage is present, check the installation.



7. Unlock and remove the AC plug using a screwdriver.



☑ The inverter is now dead.

9 Maintenance and Cleaning

9.1 Cleaning the Inverter

If the display is dirty and you find it difficult to read the operating data and operating states of the inverter, clean the display with a damp cloth. Do not use any corrosive substances (e.g. solvents, abrasives) for cleaning.

Check the inverter and cables for any signs of external damage. If the inverter is damaged, contact the SMA Service Line. If there is damage to the cables, perform repair work or replace the cables.

9.2 Checking the Heat Dissipation

If the inverter regularly reduces its output due to excessive heat (temperature symbol on the display illuminates), this may be for one of the following reasons:

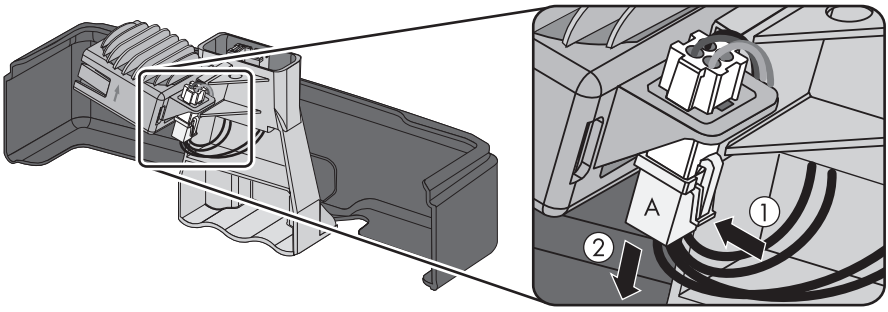
- The cooling fins on the rear side of the enclosure are clogged with dirt.
  - Clean the cooling fins with a soft brush if necessary.
- The fan is clogged with dirt (only possible for SB 2500HF-30 / 3000HF-30).
  - Clean the fan as described below.

9.2.1 Cleaning the Fans (only for SB 2500HF-30 / 3000HF-30)

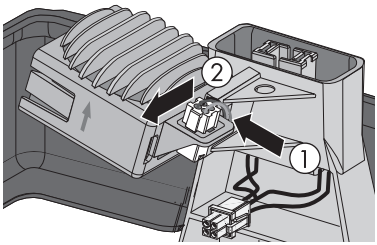
If the fan enclosure is only soiled with loose dust, it can be cleaned using a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, you can disassemble the fan for cleaning.

If the enclosure and fan are very dirty, proceed as follows:

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58).
2. Unlock (1) and pull out (2) the fan socket (A).



3. Push the latch on the retainer of the Electronic Solar Switch downwards (1) and at the same time remove the fan enclosure together with the fan (2).



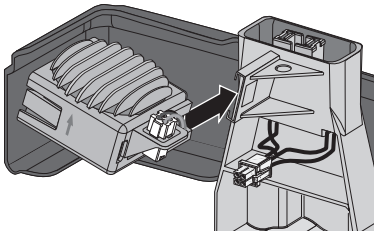
4. Clean the enclosure and the fan with a soft brush, a paint brush, or a damp cloth.

NOTICE!

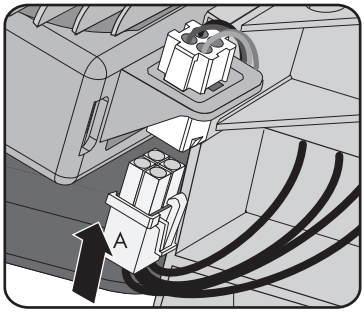
Damage to the fan through use of compressed air

- Do not use compressed air to clean the fan and its enclosure. This can damage the fan.

5. Fit the fan enclosure to the Electronic Solar Switch, ensuring that the arrow on the fan enclosure and the fins are pointing upwards.



6. Insert the fan plug (A) into the jack.
   ☑ The fan plug snaps audibly into place.



7. Recommission the inverter as described in section 7 "Commissioning" (page 49).

Checking the functionality of the fan.

You can check the functionality of the fan via a communications component as described in the following section9.2.2 "Checking the Fan (only for SB 2500HF-30 / 3000HF-30)" (page 63).

9.2.2 Checking the Fan (only for SB 2500HF-30 / 3000HF-30)

Checking the Fan

To test the fan you will need a special data capture device (e.g. Sunny WebBox) or a PC with appropriate software (e.g. Sunny Explorer) in order to change the parameters of the inverter.

You will also need the installer password to access the installer mode.

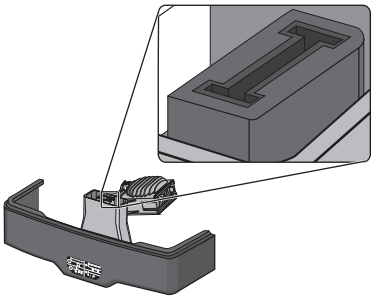
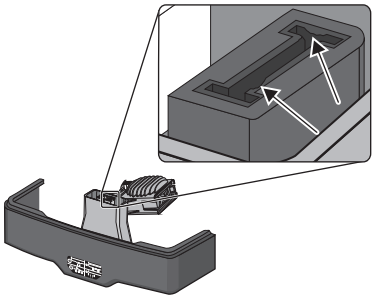
1. Enter the installer password.
2. Set parameters "CoolSys.FanTst" and/or "Fan test" to "On" in installer mode.
3. Check the air-flow of the fan.

   The inverter draws air in from underneath and then blows it out at the top. Listen for any unusual noise, which could indicate incorrect installation or that the fan is faulty.
4. After the test, set the parameter "CoolSys.FanTst" and/or "Fan test" back to the "Off" position.

☑ The fan test is completed.

9.3 Checking the Electronic Solar Switch (ESS) for Wear

Check the Electronic Solar Switch for wear before plugging it in.

Result	Measure
☑ The plastic in the Electronic Solar Switch is undamaged. 	• Make sure that the inverter has been secured with the connection element in order to prevent it from being lifted out, as per section 4.3 "Mounting the Inverter with the Wall Mounting Bracket" (page 17). • Insert the handle of the Electronic Solar Switch securely in the jack on the bottom of the enclosure. • Recommission the inverter as described in section 7 "Commissioning" (page 49).
☑ The plastic in the Electronic Solar Switch shows thermal deformation. 	The Electronic Solar Switch can no longer reliably disconnect the DC side. 1. Replace the Electronic Solar Switch handle before attaching it again (for the order number see section 14 "Accessories" (page 93)). 2. Commission the inverter as described in section 7 "Commissioning" (page 49).

10 Messages

10.1 Green LED glowing or flashing

Green LED on

- If the green LED is glowing, the inverter is in feed-in operation.

Green LED flashing

- If the green LED flashes over a long period, this can mean that there is insufficient DC voltage available due to insufficient irradiation.

No display in the event of insufficient DC voltage

Taking measurements and displaying messages is only possible when there is sufficient DC voltage.

10.2 Event Messages

During an update, the relevant display message is shown in the text line of the display.

Message	Description
< Avvio Autotest >	Only relevant for an installation in Italy: start the self-test by tapping on the display according to ENEL-Guida (see section 7.3 "Self-Test in Accordance with ENEL Guideline, Ed. 1.1 (Applies to Italy Only)" (page 52)).
< Inst.code valid >	The SMA Grid Guard code you have entered is valid. The configured country data set is now unblocked and can be changed. If the configured country data set is protected, the unlocking is valid for a maximum of 10 feed-in hours.
< No new update SDcard >	There is no update file relevant for this inverter on the SD card or the available update has already been carried out.
< Grid param.unchanged >	The selected switch setting is not programmed or there is no country data set available on the SD card.
< Parameters set successfully >	A new country data set has been configured.
< SD card is read >	The inverter is currently reading the SD card.
< Set parameter >	The inverter sets the parameters.
< Update completed >	The inverter has successfully completed the update.
< Update Bluetooth >	Successful update of the *Bluetooth* components.
< Update display >	Successful update of display.
< Update main CPU >	Successful update of inverter component.
< Update communication >	Successful update of communication component.

Message	Description
< Update RS485I module >	Successful update of communication interface.
< Upd. language table >	Successful update of language table.
< Update file OK >	The update file found is valid.

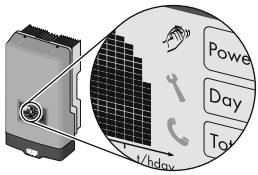
10.3 Error Messages

The text lines on the display show the relevant messages whenever an error occurs. The event numbers for the displayed error messages will appear in the text lines. By tapping on the enclosure lid, you can scroll through multi-line messages.

If the error persists for a long period of time, the red LED begins to glow and the multi-function relay is switched (if available).

In addition, depending on the severity of the fault the "wrench" or "telephone receiver" symbol on the display will light up.

- Wrench: Signifies a fault that can be remedied on-site.
- Telephone receiver: Signifies a device fault. Contact the SMA Service Line.



Event no.	Display message and cause	Corrective measures
1	< Grid fault > The line voltage has exceeded the permissible range. This error can have the following causes: • The grid voltage at the termination point of the inverter is too high. • Grid impedance at the termination point of the inverter is too high. The inverter disconnects itself from the power distribution grid for safety reasons.	• Check the grid voltage and connection on the inverter. If the line voltage lies outside the permissible range due to local grid conditions, ask your grid operator if the voltage can be adjusted at the feeding point or if it would be acceptable to change the monitored operational limits. If the grid voltage lies within the tolerance range, yet this error is still being displayed, contact the SMA Service Line.

Event no.	Display message and cause	Corrective measures
2	< Grid fault > The line voltage has fallen below the permissible range. This error can have the following causes: • Power distribution grid disconnected • AC cable damaged • The grid voltage at the termination point of the inverter is too low. The inverter disconnects itself from the power distribution grid for safety reasons.	• Check for tripping of the miniature circuit-breaker. • Check the grid voltage and connection on the inverter. If the line voltage lies outside the permissible range due to local grid conditions, ask your grid operator if the voltage can be adjusted at the feeding point or if it would be acceptable to change the monitored operational limits. If the grid voltage lies within the tolerance range, yet this error is still being displayed, contact the SMA Service Line.
3	< Grid fault > The 10-minute average line voltage is no longer within the permissible range. This can have the following causes: • The grid voltage at the termination point of the inverter is too high. • Grid impedance at the termination point of the inverter is too high. The inverter disconnects to assure compliance with the power quality of the power distribution grid.	• Check the grid voltage at the termination point of the inverter: If, due to local grid conditions, the grid voltage exceeds the configured limiting value, ask the grid operator whether the voltage can be adjusted at the feeding point, or whether it would be acceptable to modify the limiting value for power quality monitoring. If the grid voltage is continuously within the tolerance range, and this error is still displayed, contact the SMA Service Line.
4	< Grid fault > The inverter is no longer in grid parallel operation and has stopped feed-in operation for safety reasons.	• Check the grid connection for strong, short-term frequency variations.
5	< Grid fault > The power frequency is not within the permissible range. The inverter disconnects itself from the power distribution grid for safety reasons.	• If possible, check the power frequency and observe how often major deviations occur. If there are frequent fluctuations and this error occurs as a result, ask your grid operator if it would be acceptable to change the operating parameters. Discuss the proposed parameters with the SMA Service Line.

Event no.	Display message and cause	Corrective measures
6	< Grid fault > The internal monitoring function of the inverter has detected an excessively high proportion of direct current in the grid current.	• Check the grid connection for direct current. • If this is a recurrent phenomenon, check with the grid operator whether it is possible to raise the limiting value of monitoring.
7	< Frq. not permitted > The power frequency is outside the permissible range. The inverter disconnects itself from the power distribution grid for safety reasons.	• If possible, check the power frequency and observe how often major deviations occur. If there are frequent fluctuations and this error occurs as a result, ask your grid operator if it would be acceptable to change the operating parameters. Discuss the proposed parameters with the SMA Service Line.
8	< Waiting for grid voltage > < Grid failure > < Check fuse >	• Check fuse. • Check AC installation. • Check whether there is a general power outage.
33	< Unstable operation > There is not enough power at the DC input of the inverter for stable operation. This may be caused by snow on the PV modules.	• Wait for more sunlight. • If this event recurs at medium irradiation, check the PV plant design and correct the connection of the PV array.
34	< DC overvoltage > < Disconnect generator > The DC input voltage connected to the inverter is too high.	• **Immediately disconnect the inverter from the PV array, as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58)! The inverter may otherwise be destroyed.** • Check the DC voltage of the strings for adherence to the maximum input voltage of the inverter before reconnecting the inverter to the PV array.

Event no.	Display message and cause	Corrective measures
35	< Insulation resist. > < Check generator > The inverter has detected a ground fault in the PV array. However, the inverter continues feeding into the grid.	• Check the strings for ground faults as described in section 11.1 "Checking the PV Array for Ground Faults" (page 72). • The installer of the PV array must remedy the ground faults before you re-connect the affected string.
	< Ground fuse fault > < Check ground fuse > The inverter has detected a ground voltage in the grounding path.	• Check the ground fuse as described in the installation manual of the SMA Plug-in Grounding. • Check the strings for ground faults as described in section 11.1 "Checking the PV Array for Ground Faults" (page 72).
38	< DC overcurrent > < Check generator > The inverter switches off due to an overcurrent on the DC side.	If this event occurs frequently: • Check the design and the wiring of the PV array.
39	< Waiting for DC start conditions > < Start cond. not met > The feed-in power or feed-in voltage of the PV modules is insufficient for feeding into the power distribution grid.	• Wait for more sunlight. • If this event recurs even when the amount of sunlight is average, check the design of your PV plant and make sure the PV array is wired properly.
42	< Wrong earthing type; check earthing set > The SMA Plug-in Grounding polarity does not correspond to the polarity set in the inverter.	• Correct the grounding type as described in the installation manual for the SMA Plug-in Grounding.
60 - 64	< Self diagnosis > < Interference device >	• Contact the SMA Service Line (see section 15 "Contact" (page 94)).
65	< Self diagnosis > < Overtemperature > The inverter switches off due to too high temperature	• Ensure sufficient ventilation. • Check the heat dissipation as described in section 9.2 "Checking the Heat Dissipation" (page 61).
66	< Self diagnosis > < Overload >	• Contact the SMA Service Line (see section 15 "Contact" (page 94)).
67	< Comm. disturbed > A fault has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid.	If this event occurs frequently: • Contact the SMA Service Line (see section 15 "Contact" (page 94)).

Event no.	Display message and cause	Corrective measures
68	< Self diagnosis > < Input A defective >	• Contact the SMA Service Line (see section 15 "Contact" (page 94)).
70	< Sensor fault fan permanently on >	• Contact the SMA Service Line (see section 15 "Contact" (page 94)).
71	< SD card defective >	Re-format the SD card. • Re-save the files to the SD card.
	< Parameter file not found or defective >	• Copy the parameter file into the card drive:\PARASET directory.
	< Param. setting failed >	• Check the parameters for valid values. • Ensure change rights via SMA Grid Guard Code.
	< Update file defect. >	• Re-format the SD card. • Re-save the files to the SD card.
	< No update file found >	• Copy the update file into the SD card drive:\UPDATE directory.
72	< Data stor. not poss. > An internal device fault that does not prevent the inverter from feeding power to the grid.	• If this fault occurs frequently, contact the SMA Service Line (see section 15 "Contact" (page 94)).
73	< Update main CPU failed > Internal device fault.	• Contact the SMA Service Line (see section 15 "Contact" (page 94)).
	< Update RS485I module failed > An internal device fault that does not prevent the inverter from feeding power to the grid.	• Re-try update. • If this fault occurs again, contact the SMA Service Line (see section 15 "Contact" (page 94)).
	< Update Bluetooth failed > An internal device fault that does not prevent the inverter from feeding power to the grid.	
	< Upd. display failed > An internal device fault that does not prevent the inverter from feeding power to the grid.	
	< Update language table failed > An internal device fault that does not prevent the inverter from feeding power to the grid.	

Event no.	Display message and cause	Corrective measures
74	< Varistor defective >	• Check the varistors as described in section 11.2 "Checking the Function of the Varistors" (page 74).
75	< Fan fault > < Clean fan >	• Check the heat dissipation as described in section 9.2 "Checking the Heat Dissipation" (page 61).
77	< Self diagnosis > < Interference device >	• Contact the SMA Service Line (see section 15 "Contact" (page 94)).
80	< Derating occurred > The power supplied by the inverter was reduced to below the nominal power due to high temperature for more than 10 minutes.	If this event occurs frequently: • Ensure sufficient ventilation. • Check the heat dissipation as described in section 9.2 "Checking the Heat Dissipation" (page 61).
81	< Comm. disturbed > A fault has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid.	If this event occurs frequently: • Contact the SMA Service Line (see section 15 "Contact" (page 94)).
90	< Inst. code invalid > The SMA Grid Guard Code entered (personal installer password) is invalid.	• A valid SMA Grid Guard Code has been entered.
	< Grid param. locked > The current country data set is locked.	• Enter the valid SMA Grid Guard Code for changing the country data set.
	< Abort self-test >	• Contact the SMA Service Line (see section 15 "Contact" (page 94)).
	< Changing grid param. not possible > • The selected rotary switch setting for the country configuration is not programmed. • The parameters to be changed are protected. < Ensure DC supply > The DC voltage for the writing procedure is not sufficient.	• Check the setting of the rotary switch (see section 5.3.2 "Checking the Country Standard" (page 24)). • Enter the SMA Grid Guard Code. • Ensure that sufficient DC voltage is available.

11 Troubleshooting

11.1 Checking the PV Array for Ground Faults

If the inverter displays event number "35" and the red LED glows at the same time, then there is probably a ground fault in the PV array.

Check the strings for ground faults as described below:

1. Disconnect the inverter from the AC and DC side as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58).

DANGER!

Risk of lethal electric shock.

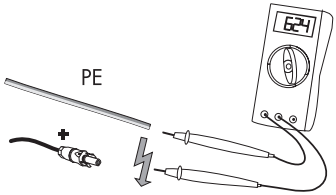
- Only touch the cables of the PV array on their insulation.
- Do not connect strings with ground faults to the inverter.

NOTICE!

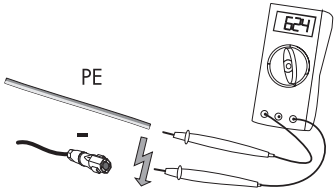
Excessive voltages can destroy the measuring device.

- Only use measuring devices with a DC input voltage range up to at least 1 000 V.

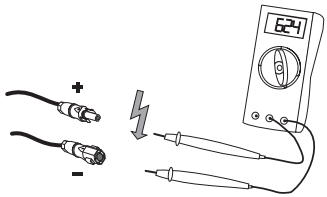
2. Measure the voltages between the positive pole of each string and the ground potential (PE).



3. Measure the voltages between the negative pole of each string and the ground potential (PE).



4. Measure the voltages between the positive and negative poles of each string.



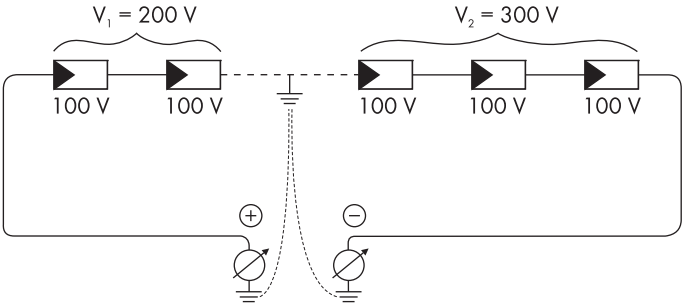
☑ A ground fault exists if the measured voltages are stable and the sum of the voltages from the positive pole to the ground potential and from the negative pole to the ground potential of a string is approximately equal to the voltage between the positive and negative poles.

Result	Measure
☑ You **have** found a ground fault.	• The installer of the PV array must remedy the ground fault in the affected string. You can determine the location of the ground fault as described below. • Do **not** reconnect the faulty string. • Recommission the inverter as described in section 7 "Commissioning" (page 49).
☑ You have found **no** ground fault.	It is likely that one of the thermally monitored varistors is defective. • Check the function of the varistors as described in section 11.2 "Checking the Function of the Varistors" (page 74).

Location of the ground fault

The approximate position of the ground fault can be determined from the ratio of the measured voltages between the positive pole against ground potential (PE) and the negative pole against ground potential (PE).

Example:



In this case, the ground fault is between the second and third PV modules.

☑ The ground fault check is finished.

11.2 Checking the Function of the Varistors

If the inverter displays event number "74", one of the varistors is probably defective.

Varistors are wear parts. Their functional efficiency diminishes with age or following repeated responses as a result of overvoltages. It is therefore possible that one of the thermally monitored varistors has lost its protective function.

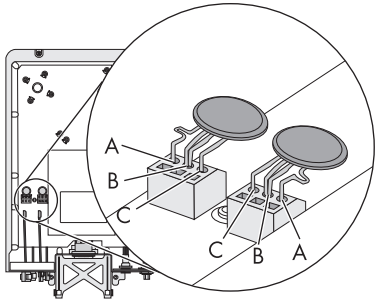
Position of varistors

You can determine the position of the varistors using the illustration below.

The varistors are bent upon delivery.

Observe the following assignment of the terminals.

- Terminal A: outer terminal (varistor connection **with loop** [crimp]).
- Terminal B: Middle terminal.
- Terminal C: outer terminal (varistor connection **without loop** [crimp]).



You can check the functionality of the varistors in the following manner:

1. Disconnect the inverter from the AC and DC side as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58).

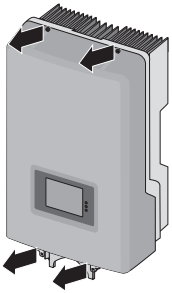
DANGER!

Danger to life due to high voltages in the inverter.

The capacitors require 5 minutes to discharge.

- Wait 5 minutes before opening the enclosure lid, in order to allow time for the capacitors to discharge.

2. Loosen the screws of the enclosure lid.
3. Remove the enclosure lid.



NOTICE!

Electrostatic discharges can damage the inverter.

The internal component parts of the inverter can be irreparably damaged by electrostatic discharge.

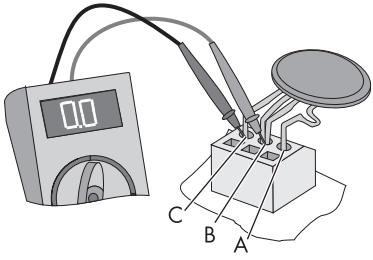
- Ground yourself before touching a component part.

NOTICE!

Excessive voltages can destroy the measuring device.

- Only use measuring devices with a DC input voltage range up to at least 1 000 V.

4. Use a multimeter to ensure that all of the varistors in the installed state have a conducting connection between connectors B and C.



Result	Measure
☑ There is a **conducting** connection.	There is probably a different error in the inverter. • Proceed to step 9. • Consult the SMA Service Line for details on further procedure.
☑ There is **no conducting** connection.	The respective varistor is defective and must be replaced. Varistor failure is generally due to influences which affect all varistors similarly (temperature, age, induced overvoltages). SMA Solar Technology AG recommends replacing all varistors. The varistors are specially manufactured for use in the inverter and are not commercially available. They must be ordered directly from SMA Solar Technology AG (see section 14 "Accessories" (page 93)). • To replace the varistors, proceed to step 5.

NOTICE!

Destruction of the inverter due to DC overvoltage.

If varistors are missing, the inverter is no longer protected against DC overvoltages.

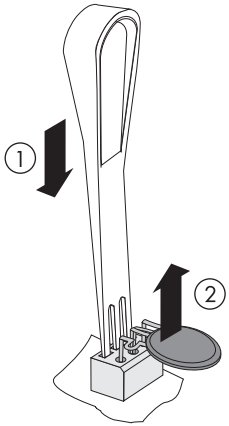
- Do not operate the inverter without varistors in PV plants with a high risk of DC overvoltages.
- Replacement varistors should be obtained as soon as possible.

5. Insert an insertion tool into the openings of the terminal contacts (1).

   ☑ The terminals will loosen.

   If you do not receive an insertion tool for operating the terminals with your replacement varistors, contact SMA Solar Technology AG. As an alternative, the individual terminal contacts can be operated using a 3.5 mm wide screwdriver.

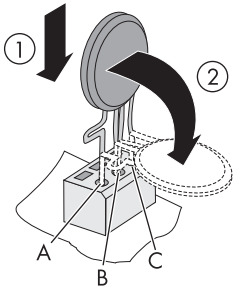
6. Remove the varistor (2).



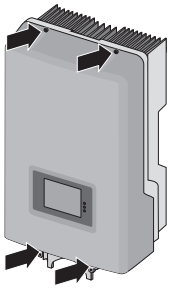
7. Insert the new varistor (1).

   The pole with the small loop (crimp) must be fitted to terminal 1 when replacing the varistor.

8. Bend new varistor upwards (2).



9. Re-attach the enclosure lid.
10. Tighten the screws.



11. Recommission the inverter as described in section 7 "Commissioning" (page 49).

☑ The check and replacement of the varistors is completed.

12 Decommissioning

12.1 Disassembling the Inverter

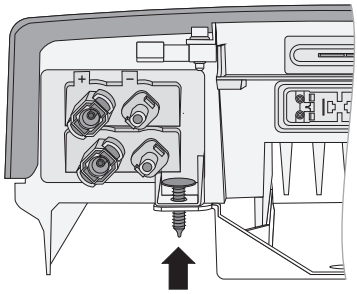
1. Disconnect the inverter from the AC and DC side as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 58).

CAUTION!

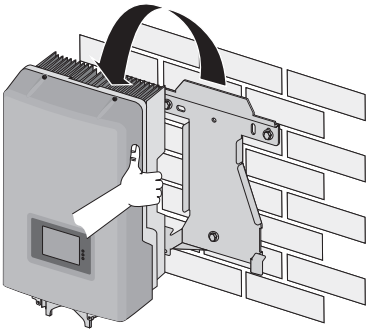
Risk of burns due to hot enclosure parts.

- Wait 30 minutes for the enclosure to cool down before disassembling.

2. Unfasten the connection element between the enclosure and the wall or the security lock.



3. Remove the inverter from the wall mounting bracket.



☑ The inverter is disassembled.

12.2 Replacing the Enclosure Lid

In the event of a fault, your inverter may need to be replaced. In this case you will receive a replacement device with a transport lid.

Prior to returning your inverter to SMA Solar Technology AG, you must swap over the enclosure lid of your inverter with the corresponding transport lid.

1. Disassemble the inverter as described in section 12.1 "Disassembling the Inverter" (page 78).

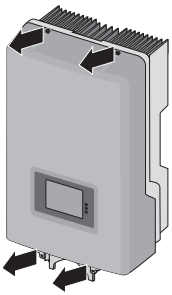
DANGER!

Danger to life due to high voltages in the inverter.

The capacitors in the inverter require 5 minutes to discharge.

- Wait at least 5 minutes until the LEDs, the display and the fault sensor are no longer illuminated.

2. Loosen the screws of the enclosure lid.
3. Remove the enclosure lid.



4. Remove the transport lid from the replacement device in the same manner.

Now mount the transport lid of the replacement device onto your inverter:

1. Put on the transport lid.
2. Tighten the screws.

   ☑ You can now send your inverter with transport lid to SMA Solar Technology AG.
3. Attach the enclosure lid of your inverter onto the replacement device.
4. Mount (see section 4 "Assembly" (page 15)) and connect the replacement device as described in section 6 "Electrical Connection" (page 35).

12.3 Packing the Inverter

If possible, always pack the inverter in its original packaging. If it is no longer available, you can also use an equivalent carton. The carton must be completely closeable, have a handle system and be made to support both the weight and size of the inverter.

12.4 Storing the Inverter

Store the inverter in a dry place where ambient temperatures are always between –25°C and +60°C.

12.5 Disposing of the Inverter

Dispose of the inverter at the end of its service life in accordance with the current locally applicable disposal regulations for electronic waste. Alternatively, send it back to SMA Solar Technology AG with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("for disposal") (contact see page Page 94).

13 Technical Data

13.1 Sunny Boy 2000HF

DC Input

Maximum DC power at cos φ = 1	2 100 W
Maximum input voltage*	700 V
MPP voltage range	175 V ... 560 V
Rated input voltage	530 V
Minimum input voltage	175 V
Start input voltage	220 V
Maximum input current	12.0 A
Maximum input current per string	12.0 A
Number of independent MPP inputs	1
Strings per MPP input	2

* The maximum open-circuit voltage, which can occur at a cell temperature of – 10°C, must not exceed the maximum input voltage.

AC output

Rated power at 230 V, 50 Hz	2 000 W
Maximum apparent AC power	2 000 VA
Rated grid voltage	230 V
Nominal AC voltage	220 V/230 V/240 V
AC voltage range*	180 V ... 280 V
Nominal AC current at 220 V	9.1 A
Nominal AC current at 230 V	8.7 A
Nominal AC current at 240 V	8.3 A
Maximum output current	11.4 A
Total harmonic factor of output current at AC THF < 2 % AC power > 0.5 nominal AC power	≤ 3%
Rated power frequency	50 Hz
AC power frequency*	50 Hz/60 Hz
Operating range at AC power frequency 50 Hz	45.5 Hz ... 54.5 Hz
Operating range at AC power frequency 60 Hz	55.5 Hz ... 64.5 Hz
Power factor at rated power	1
Feed-in phases	1
Connection phases	1

Overvoltage category as per IEC 60644-1	III

* Depending on country configuration

Protective devices

DC reverse polarity protection	Short-circuit diode
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	Thermally monitored varistors
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 3
Maximum permissible fuse protection	25 A
Ground fault monitoring	Insulation monitoring: R_{iso} > 1 MΩ
Galvanic isolation	Available

General Data

Width x height x depth with Electronic Solar Switch	348 mm x 580 mm x 145 mm
Weight	17 kg
Length x width x height of packaging	600 mm x 400 mm x 450 mm
Transport weight	21 kg
Climatic category according to IEC 60721-2-1	4K4H
Operating temperature range	– 25°C ... +60°C
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above mean sea level	3 000 m
Noise emission (typical)	≤ 38 dB(A)
Power loss in night operation	< 1 W
Topology	HF transformer
Cooling concept	Convection
Degree of protection according to IEC 60529	IP65
Protection class (according to IEC 62103)	I

Country standards, as of 08/2011*	AS4777 (2005) C10/11 (05.2009) Enel-GUIDA Ed. 1.1 EN 50438:2008 G83/1-1:2008 IEC61727 (MEA) IEC61727 (PEA) PPC (2006/06) PPDS: 2009 RD 1663/2000 RD 661/2007 SI4777 VDE 0126-1-1 (2006/02) VDE-AR-N-4105 UTE C15-712-1

* C10/11 (05/2009): Only possible when the phase voltage is 230 V.
EN 50438: Does not apply to all country standard deviations of EN 50438
VDE-AR-N-4105: Valid from firmware version 2.30. Setting in accordance with VDE-AR-N-4105 (Germany) for PV plants ≤ 3.68 kVA.

Climatic conditions in accordance with IEC 60721-3-4, installation type C, class 4K4H

Extended temperature range	– 25°C ... +60°C
Extended humidity range	0% ... 100%
Extended air pressure range	79.5 kPa ... 106 kPa

Climatic conditions in accordance with IEC 60721-3-4, transport type E, class 2K3

Temperature range	– 25°C ... +70°C

Features

DC terminal	SUNCLIX DC connector
AC connection	AC connector
Display	LC graphic display
Bluetooth	As standard
RS485, galvanically isolated	Optional, in RS485-Quick Module
Multi-function relay	Optional, in RS485-Quick Module

Electronic Solar Switch

Electrical endurance in the event of a short circuit, with a nominal current of 35 A	Min. 50 switching processes
Maximum switching current	35 A
Maximum switching voltage	800 V
Maximum PV power	12 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP65

Torque

Enclosure lid screws	6 Nm
Additional grounding screw	6 Nm
SUNCLIX lock nut	2 Nm
Multi-function relay connection	0.5 Nm

Grounding systems

IT grid	Suitable with ungrounded PV array
TN-C grid	Suitable
TN-S grid	Suitable
TN-C-S grid	Suitable
TT grid	Suitable
Split Phase	Suitable

Data storage capacity

Daily energy yield	63 days
Daily yields	30 years
Event messages for users	250 events
Event messages for installers	250 events

Efficiency

Maximum efficiency, η_{max}	96.3%
European weighted efficiency, η_{EU}	95.0%

13.2 Sunny Boy 2500HF

DC Input

Maximum DC power at cos φ = 1	2 650 W
Maximum input voltage*	700 V
MPP voltage range	175 V ... 560 V
Rated input voltage	530 V
Minimum input voltage	175 V
Start input voltage	220 V
Maximum input current	15.0 A
Maximum input current per string	15.0 A
Number of independent MPP inputs	1
Strings per MPP input	2

* The maximum open-circuit voltage, which can occur at a cell temperature of – 10°C, must not exceed the maximum input voltage.

AC output

Rated power at 230 V, 50 Hz	2 500 W
Maximum apparent AC power	2 500 VA
Rated grid voltage	230 V
Nominal AC voltage	220 V/230 V/240 V
AC voltage range*	180 V ... 280 V
Nominal AC current at 220 V	11.4 A
Nominal AC current at 230 V	10.9 A
Nominal AC current at 240 V	10.4 A
Maximum output current	14.2 A
Total harmonic factor of output current at AC THF < 2% AC power > 0.5 nominal AC power	≤ 3%
Rated power frequency	50 Hz
AC power frequency*	50 Hz/60 Hz
Operating range at AC power frequency 50 Hz	45.5 Hz ... 54.5 Hz
Operating range at AC power frequency 60 Hz	55.5 Hz ... 64.5 Hz
Power factor at rated power	1
Feed-in phases	1
Connection phases	1
Overvoltage category as per IEC 60644-1	III

* Depending on country configuration

Protective devices

DC reverse polarity protection	Short-circuit diode
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	Thermally monitored varistors
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 3
Maximum permissible fuse protection	25 A
Ground fault monitoring	Insulation monitoring: R_{iso} > 1 MΩ
Galvanic isolation	Available

General Data

Width x height x depth with Electronic Solar Switch	348 mm x 580 mm x 145 mm
Weight	17 kg
Length x width x height of packaging	600 mm x 400 mm x 450 mm
Transport weight	21 kg
Climatic category according to IEC 60721-2-1	4K4H
Operating temperature range	– 25°C ... +60°C
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above mean sea level	3 000 m
Noise emission (typical)	≤ 38 dB(A)
Power loss in night operation	< 1 W
Topology	HF transformer
Cooling concept	OptiCool: temperature-controlled fan
Fan connection	Designed for safe disconnection in accordance with DIN EN 50178:1998-04
Degree of protection according to IEC 60529	IP65
Protection class (according to IEC 62103)	I

Country standards, as of 08/2011*	AS4777 (2005) C10/11 (05.2009) Enel-GUIDA Ed. 1.1 EN 50438:2008 G83/1-1:2008 IEC61727 (MEA) IEC61727 (PEA) PPC (2006/06) PPDS: 2009 RD 1663/2000 RD 661/2007 SI4777 VDE 0126-1-1 (2006/02) VDE-AR-N-4105 UTE C15-712-1

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EN 50438: Does not apply to all country standard deviations of EN 50438
VDE-AR-N-4105: Valid from firmware version 2.30. Setting in accordance with VDE-AR-N-4105 (Germany) for PV plants ≤ 3.68 kVA.

Climatic conditions in accordance with IEC 60721-3-4, installation type C, class 4K4H

Extended temperature range	– 25°C ... +60°C
Extended humidity range	0% ... 100%
Extended air pressure range	79.5 kPa ... 106 kPa

Climatic conditions in accordance with IEC 60721-3-4, transport type E, class 2K3

Temperature range	– 25°C ... +70°C

Features

DC terminal	SUNCLIX DC connector
AC connection	AC connector
Display	LC graphic display
Bluetooth	As standard
RS485, galvanically isolated	Optional, in RS485-Quick Module
Multi-function relay	Optional, in RS485-Quick Module

Electronic Solar Switch

Electrical endurance in the event of a short circuit, with a nominal current of 35 A	Min. 50 switching processes
Maximum switching current	35 A
Maximum switching voltage	800 V
Maximum PV power	12 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP65

Torque

Enclosure lid screws	6 Nm
Additional grounding screw	6 Nm
SUNCLIX lock nut	2 Nm
Multi-function relay connection	0.5 Nm

Grounding systems

IT grid	Suitable with ungrounded PV array
TN-C grid	Suitable
TN-S grid	Suitable
TN-C-S grid	Suitable
TT grid	Suitable
Split Phase	Suitable

Data storage capacity

Daily energy yield	63 days
Daily yields	30 years
Event messages for users	250 events
Event messages for installers	250 events

Efficiency

Maximum efficiency, η_{max}	96.3%
European weighted efficiency, η_{EU}	95.3%

13.3 Sunny Boy 3000HF

DC Input

Maximum DC power at cos φ = 1	3 150 W
Maximum input voltage*	700 V
MPP voltage range	210 V ... 560 V
Rated input voltage	530 V
Minimum input voltage	175 V
Start input voltage	220 V
Maximum input current	15.0 A
Maximum input current per string	15 A
Number of independent MPP inputs	1
Strings per MPP input	2

* The maximum open-circuit voltage, which can occur at a cell temperature of – 10°C, must not exceed the maximum input voltage.

AC output

Rated power at 230 V, 50 Hz	3 000 W
Maximum apparent AC power	3 000 VA
Rated grid voltage	230 V
Nominal AC voltage	220 V/230 V/240 V
AC voltage range*	180 V ... 280 V
Nominal AC current at 220 V	13.6 A
Nominal AC current at 230 V	13.0 A
Nominal AC current at 240 V	12.5 A
Maximum output current	15 A
Total harmonic factor of output current at AC THF < 2% AC power > 0.5 nominal AC power	≤ 3%
Rated power frequency	50 Hz
AC power frequency*	50 Hz/60 Hz
Operating range at AC power frequency 50 Hz	45.5 Hz ... 54.5 Hz
Operating range at AC power frequency 60 Hz	55.5 Hz ... 64.5 Hz
Power factor at rated power	1
Feed-in phases	1
Connection phases	1
Overvoltage category as per IEC 60644-1	III

* Depending on country configuration

Protective devices

DC reverse polarity protection	Short-circuit diode
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	Thermally monitored varistors
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 3
Maximum permissible fuse protection	25 A
Ground fault monitoring	Insulation monitoring: R_{iso} > 1 MΩ
Galvanic isolation	Available

General Data

Width x height x depth with Electronic Solar Switch	348 mm x 580 mm x 145 mm
Weight	17 kg
Length x width x height of packaging	600 mm x 400 mm x 450 mm
Transport weight	21 kg
Climatic category according to IEC 60721-2-1	4K4H
Operating temperature range	– 25°C ... +60°C
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above mean sea level	3 000 m
Noise emission (typical)	≤ 38 dB(A)
Power loss in night operation	< 1 W
Topology	HF transformer
Cooling concept	OptiCool: temperature-controlled fan
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VDE-AR-N-4105: Valid from firmware version 2.30. Setting in accordance with VDE-AR-N-4105 (Germany) for PV plants ≤ 3.68 kVA.

Climatic conditions in accordance with IEC 60721-3-4, installation type C, class 4K4H

Extended temperature range	– 25°C ... +60°C
Extended humidity range	0% ... 100%
Extended air pressure range	79.5 kPa ... 106 kPa

Climatic conditions in accordance with IEC 60721-3-4, transport type E, class 2K3

Temperature range	– 25°C ... +70°C

Features

DC terminal	SUNCLIX DC connector
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Multi-function relay connection	0.5 Nm

Grounding systems

IT grid	Suitable with ungrounded PV array
TN-C grid	Suitable
TN-S grid	Suitable
TN-C-S grid	Suitable
TT grid	Suitable
Split Phase	Suitable

Data storage capacity

Daily energy yield	63 days
Daily yields	30 years
Event messages for users	250 events
Event messages for installers	250 events

Efficiency

Maximum efficiency, η_{max}	96.3%
European weighted efficiency, η_{EU}	95.4%

14 Accessories

You will find the corresponding accessories and spare parts for your product in the following overview. If required, you can order these from SMA Solar Technology AG or your specialty retailer.

Designation	Brief Description	SMA order number
Replacement varistors	Set of thermally monitored varistors (2 pc.)	MSWR-TV 7
Electronic Solar Switch	ESS handle spare part (with fan)	ESS-HANDLE:07
Optional Quick Module with RS485 interface and multi-function relay	SMA RS485-Quick Module as retrofit kit with RS485 interface and multi-function relay	485QM-10-NR
Pluggable grounding set "SMA Plug-in Grounding"	SMA Plug-in Grounding as retrofit kit (stick) for positive or negative grounding of the DC input	PLUGIN-GRD-10-NR
Spare fuses for grounding set SMA Plug-in Grounding	Spare fuses for grounding set PLUGIN-GRD-10-NR, 1 A, 600 V, 10 pcs.	KLKD-1
SUNCLIX DC connector	SUNCLIX field connector for cross-sections from 2.5 to 6 mm², Set (+/–) for 10 strings	SUNCLIX-FC6-SET

15 Contact

If you have technical problems concerning our products, contact the SMA Service Line. We require the following information in order to provide you with the necessary assistance:

- Inverter type
- Inverter serial number
- Type and number of PV modules connected
- Event number or display message on the inverter
- Optional equipment (e.g. communication products)
- Type of multi-function relay connected, if applicable

SMA Solar Technology AG

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SMA Factory Warranty

The current guarantee conditions come enclosed with your device. These are also available online at www.SMA.de and can be downloaded or are available on paper from the usual sales channels if required.

Trademarks

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