



PV Inverter

SUNNY BOY 2000HF/2500HF/3000HF

Installation Guide



Display

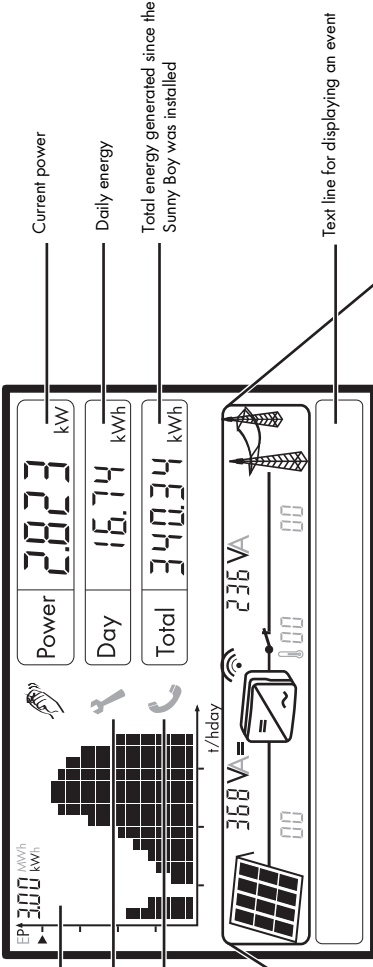
Tapping on the enclosure lid:

- Activating the background illumination
- Switching through the energy values of the past 16 feeding operations to the daily energy values of the past 16 days
- Switching through the text line display

Power range of the past 16 feed-in operations or energy yield of past 16 days (display can be switched by tapping on the display)

Disturbance that can be remedied on-site (see section 10.3)

Device fault:
Contact the SMA ServiceLine.



Current power

Daily energy

Total energy generated since the Sunny Boy was installed

Text line for displaying an event

Bluetooth connection to other Sunny Boy

Input voltage/input current

Grid relay

Output voltage/output current

PV array event number

Grid event number

Sunny Boy event number

Power reduction due to excessive temperature

- Fan might need cleaning
- Sunny Boy might need better ventilation

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1 Notes on this Guide

1.1 Validity

This guide describes the assembly, installation, commissioning, maintenance and failure search 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 guide in a convenient place for future reference.

1.2 Target Group

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






1.3 Additional Information

You will find further information on special topics such as designing a line circuit breaker or the description of the parameters and measurement readings in the download area 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 guide:

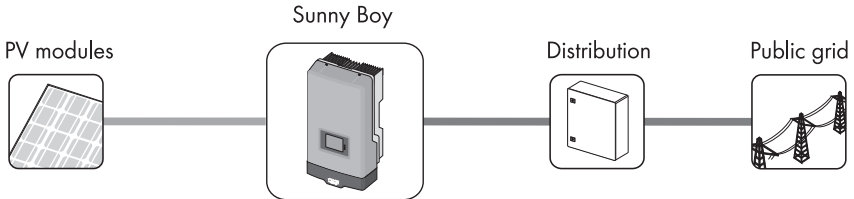
 <p>DANGER!</p> <p>"DANGER" indicates a hazardous situation which, if not avoided, will result in death or serious injury.</p>
 <p>WARNING!</p> <p>"WARNING" indicates a hazardous situation which, if not avoided, could result in death or serious injury.</p>
 <p>CAUTION!</p> <p>"CAUTION" indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</p>
 <p>NOTICE!</p> <p>"NOTICE" indicates a situation that can result in property damage, if not avoided.</p>
 <p>Information</p> <p>Information provides tips that are valuable for the optimal installation and operation of your product.</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> This symbol indicates the result of an action.

2 Safety

2.1 Appropriate Usage

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

Principle of a PV plant with this Sunny Boy



The Sunny Boy may only be operated with PV array (modules and cabling) of protection class II. Do not connect any sources of energy other than PV modules to the Sunny Boy.

When designing the PV plant, ensure that the values comply with the permitted operating range of all components at all times. The free design program "Sunny Design" (www.SMA.de/en/SunnyDesign) will assist you. The manufacturer of the PV modules must have approved the modules for use with this Sunny Boy device. You must also ensure that all measures recommended by the module manufacturer for long-term maintenance of the module properties are taken (see also Technical Description "Module Technology", in the download area of www.SMA.de/en).

Do not use the Sunny Boy for purposes other than those described here. Alternative uses, modifications to the Sunny Boy or the installation of components not expressly recommended or sold by SMA Solar Technology AG shall void any warranty claims and the operation permission.

2.2 Safety Instructions

**DANGER!**

Danger to life due to high voltages in the inverter.

- All work on the inverter must be carried out by qualified personnel.
- The appliance is not to be used by children or persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.
- Children should be supervised to ensure that they do not play with the appliance.

**CAUTION!**

Danger of burn injuries 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.




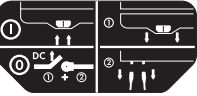
**Grounding the PV array**

Comply with the local regulations for grounding the modules and the PV array. SMA Solar Technology AG recommends connecting the array rack 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 operation state of the inverter.
	An error has occurred. Read section 11 "Failure search" (page 69) to remedy the error.
	Bluetooth [®] Wireless Technology. Shows the status of Bluetooth Communication.
	Electronic Solar Switch (ESS) DC load disconnection unit <ul style="list-style-type: none"> ① When the Electronic Solar Switch is plugged in, the DC circuit is closed. ② To interrupt the DC circuit and disconnect the inverter securely under load, you have to first pull out the Electronic Solar Switch ① and then remove all DC plug connectors ②, as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 55).

2.3.2 Symbols on the Type Label

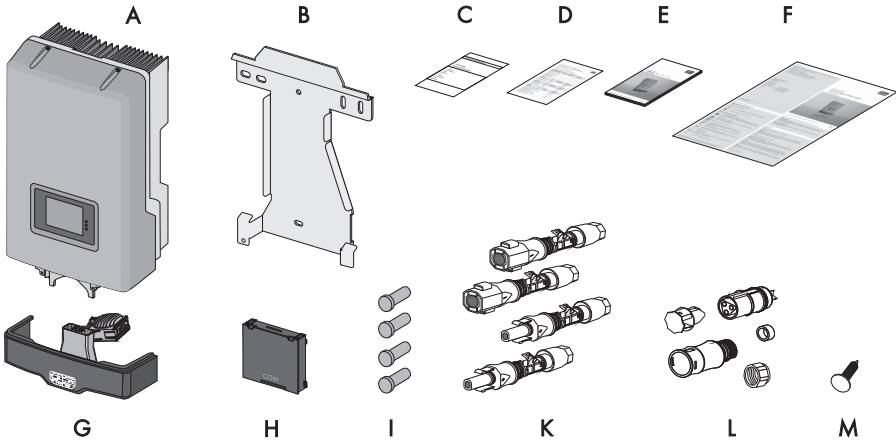
Symbol	Explanation
	Beware of dangerous electrical voltage. The inverter operates at high voltages. All work on the inverter may only be carried out by an electrically skilled person.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Observe all documentation that accompanies the inverter.
	The inverter must not be disposed of together with household waste. For more information on disposal, see section 12.5 "Disposing of the Inverter" (page 77).

Symbol	Explanation
	<p>CE mark. The inverter complies with the requirements of the applicable EC guidelines.</p>
	<p>The inverter has a transformer.</p>
	<p>Direct Current (DC)</p>
	<p>Alternating current (AC)</p>
	<p>Degree of protection IP65. The inverter is protected against penetration by dust particles and water jets from any angle.</p>
	<p>RAL quality mark for solar products. The inverter complies with the requirements of the German Institute for Quality Assurance and Labeling.</p>
	<p>Device class label. The inverter is equipped with a wireless component that complies with the harmonized standards.</p>
	<p>Certified safety The inverter complies with the requirements of the Equipment and Product Safety Act in Europe.</p>
	<p>Australian mark of conformity The inverter complies with the requirements of the applicable guidelines.</p>
	<p>Korean mark of conformity The inverter complies with the requirements of the applicable guidelines.</p>

3 Unpacking

3.1 Scope of Delivery

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



Object	Quantity	Description
A	1	Sunny Boy
B	1	Wall mounting bracket
C	1	Document set
D	1	Supplementary sheet with inverter factory settings
E	1	Installation guide
F	1	User manual
G	1	Electronic Solar Switch (ESS handle with fan) DC switch disconnecter
H	1	Communication module (Quick Module)
I	4	Sealing plugs for DC plug connectors
K	4	DC plug connectors (2 x positive, 2 x negative)
L	1	AC coupling socket, protective cap for AC socket on inverter, threaded sleeve, sealing ring, clamping nut
M	1	Connection element for anti-lifting lock

3.2 Identifying the Inverter

You can identify the inverter using the type label. The type label is on the right 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 Mounting

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 areas with a risk of explosion.

CAUTION!
 Danger of burn injuries due to hot enclosure parts!

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

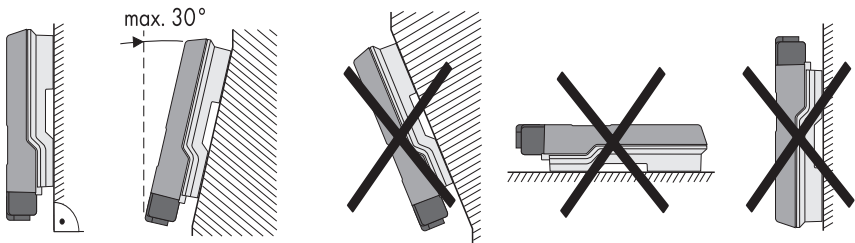
CAUTION!
 Risk of injury due to the heavy weight of the inverter.

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

4.2 Selecting the Mounting Location

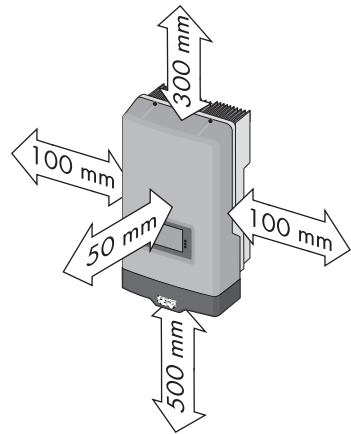
Consider the following points when selecting where to install:

- The mounting method and location must be suitable for the inverter's weight and dimensions (see section 13 "Technical data" (page 78)).
- 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 downwards.
- 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 state 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 sunlight, as this can cause excessive heating and 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 ventilation to ensure sufficient cooling of the inverters.

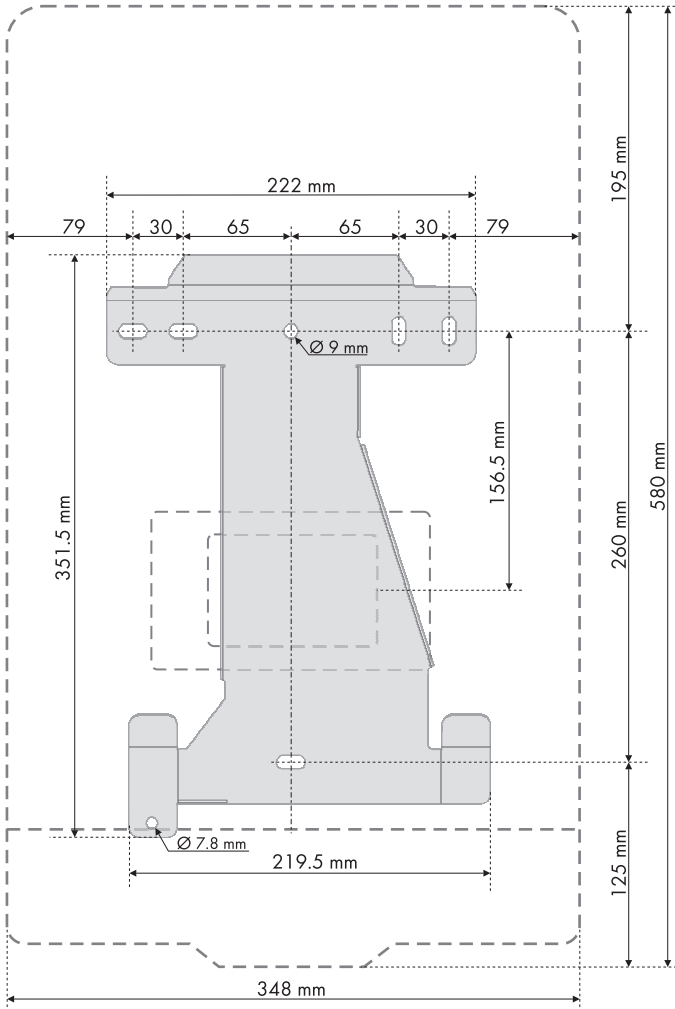
4.3 Mounting the Inverter with the Wall Mounting Bracket

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

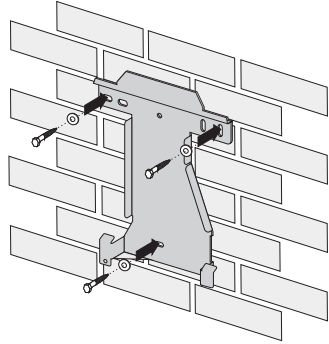


Number of holes to use

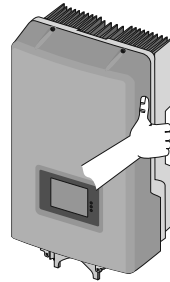
- When mounting onto the wall, use 1 top hole on the right-hand side and 1 top hole on the left-hand side. If necessary, use the lowest hole in the middle for extra support.
- Use the top and bottom center holes when mounting to a pillar.



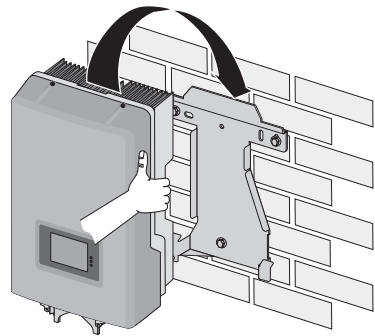
2. Attach the wall mounting bracket to the wall using appropriate screws (diameter min. 6 mm, max. 8 mm) and washers (outer diameter min. 12 mm, max. 24 mm).



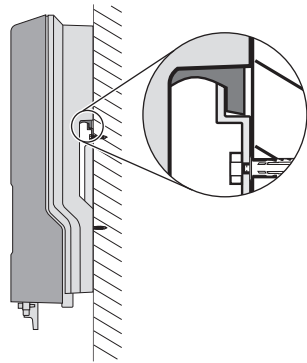
3. Transport the inverter using the handles on the sides.



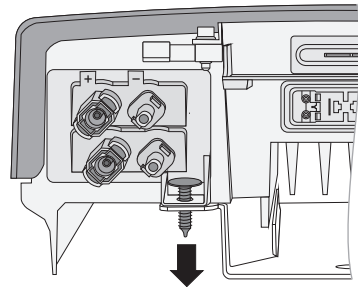
4. Insert the inverter into the wall mounting from above using the mounting slots.



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



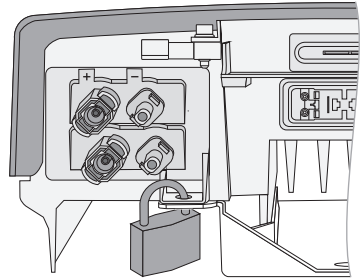
6. Use the connection element (see item "M" in the scope of delivery on page 13) provided to fix the inverter and prevent it from being lifted out of place. To do this, push the connection element through the plastic flap on the bottom of the inverter and into the wall mounting bracket.



- The inverter is now securely mounted to the wall.

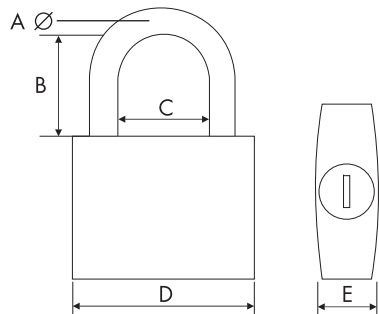
Optional Theft Protection

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



The lock 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 dealer (see section 14 "Accessories" on page 93). You will find detailed descriptions of the functions in the respective manual.




Configuring the Quick Module

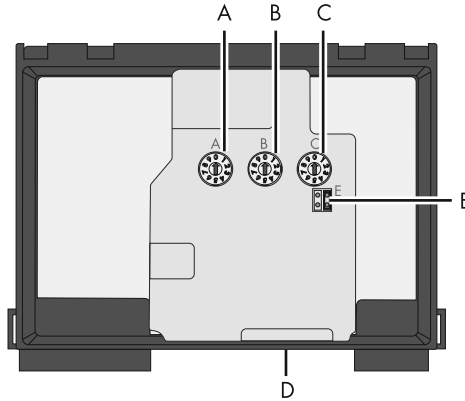
You can configure the Quick Module before you connect it to the inverter.

5.1 Safety

 <p>DANGER! Risk of lethal electric shock.</p>
<p>If you have already connected the Quick Module to the inverter, then you have to disconnect the inverter from both the AC and DC supplies before you accept the settings on the Quick Module.</p> <ul style="list-style-type: none"> • Disconnect the inverter as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 55).

 <p>NOTICE!</p>	<p>Electrostatic discharges can damage the Quick Module or the inverter.</p> <p>Internal components of the Quick Module or the inverter can be irreparably damaged by static discharge.</p> <ul style="list-style-type: none"> • Ground yourself before you touch a component.
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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 configuring <i>Bluetooth</i> 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).
- Alternatively you can adjust the settings after commissioning via the parameter "CntrySet" or "Set country standard" using an external communication device with a *Bluetooth* interface.



Alternative configuration 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 feeding operations after commissioning, or after the last alteration. If the country data set is changed via the rotary switch after these 10 feeding operations, 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 use a communication device to configure country data sets ("CntrySet" or "Set country standard"), and to manually block or unblock them. To block 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 feeding operations. 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 feeding operations, 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 device) 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, these will have already been preset in the factory via a communication device. 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 device, the default grid parameters are overwritten. They cannot be restored, and must be re-entered via a communication device. 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 is German.

Changes will be accepted immediately after switching the line 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 supplement provided with the factory 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 during Initialization" (page 49)).
- or
- Check that the country standard is correct on the basis of the "SMA Grid Guard" measuring channel via a communication device.



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 device. A detailed description of the parameters and measurement 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	Not used*	Dependent on parameter set	Dependent on parameter set
0	7	Retained	Not used*	Dependent on parameter set	Dependent on parameter set
1	0	VDE0126-1-1	German	Yes	Germany, Switzerland
1	8	VDE0126-1-1	French	Yes	Switzerland, France
1	9	VDE0126-1-1B ^{a)}	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	RD1663/661-1	Spanish	Yes	Spain
4	8	PPC	Not used*	No	Greece
4	9	PPC	English	No	Greece
5	1	KEMCO 501/2008**	English	No	South Korea
5	8	G83/1-1	English	No	England
6	0	EN 50438	German	Yes	Various EU countries
6	1	EN 50438	English	Yes	
6	2	EN 50438	French	Yes	
6	3	EN 50438	Italian	Yes	
6	4	EN 50438	Spanish	Yes	
6	5	EN 50438	Not used*	Yes	
6	6	EN 50438	Not used*	Yes	
7	0	EN50438-CZ	Not used*	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
7	9	C10/11	English	Yes	Belgium

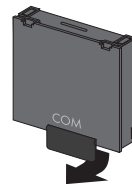
(A)	(B)	Country data set	Display language	Grid Guard protection	Country
7	A	C10/11	German	Yes	Belgium
8	0	UL1741/208 ***	English	No	USA
8	1	UL1741/208 ***	Spanish	No	USA
8	2	UL1741/208 ***	French	No	USA
8	8	UL1741/240 ***	English	No	USA
8	9	UL1741/240 ***	Spanish	No	USA
8	A	UL1741/240 ***	French	No	USA
9	8	UL1741/auto ***	English	No	USA
9	9	UL1741/auto ***	Spanish	No	USA
9	A	UL1741/auto ***	French	No	USA
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	Any
D	1	Off-Grid 60Hz	German	No	Any
D	2	Off-Grid 60Hz	French	No	Any
D	3	Off-Grid 60Hz	Spanish	No	Any
D	4	Off-Grid 60Hz	Italian	No	Any
D	5	Off-Grid 60Hz	Not used*	No	Any
D	6	Off-Grid 60Hz	Not used*	No	Any
E	0	Off-Grid 50Hz	English	No	Any
E	1	Off-Grid 50Hz	German	No	Any
E	2	Off-Grid 50Hz	French	No	Any
E	3	Off-Grid 50Hz	Spanish	No	Any
E	4	Off-Grid 50Hz	Italian	No	Any
E	5	Off-Grid 50Hz	Not used*	No	Any
E	6	Off-Grid 50Hz	Not used*	No	Any
<p>a) Special setting: Bluetooth transmission power reduced (in accordance with French standards)</p> <p>*) Currently unallocated. The previously configured display language remains set.</p> <p>**) Only applies for SB 3000HF-30/V 0160</p> <p>***) This country standard must only be set for Sunny Boy 2000HF-US/2500HF-US/3000HF-US.</p>					

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

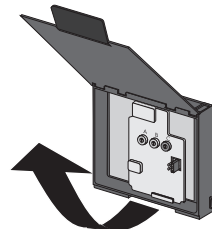
- Setting via 2 rotary switches in Quick Module, as described in section 5.3.4 "Setting the Country Standard and Language using Rotary Switches" (page 27).
- Alternatively you can adjust the setting via the "CntrySet" or "Set country standard" parameters with a communication device (e.g. Sunny Data Control or Sunny Explorer), once you have commissioned the inverter.
- If you require adjusted parameter settings for your installation location, you can change these with the help of a communication device.

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 supplies as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 55).
 - Pull the Quick Module out to the first stopper.
2. Open the lower flap of the Quick Module.



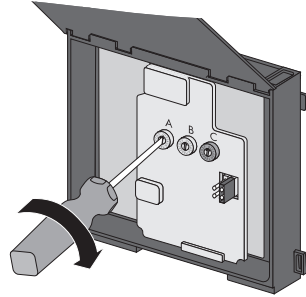
3. Open the lid of the Quick Module until it locks in place.



- 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 Rotary Switches

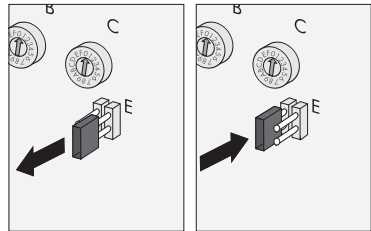
1. Open the Quick Module, as described in section 5.3.3 "Opening the Quick Module" (page 26).
2. Set the arrows on both left rotary switches (A and B) to the desired positions using a screw driver (see table in section 5.3.2 "Checking the Country Standard" (page 23)). For this purpose, use a screwdriver with a 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 on the right.



- The country standard and the language are set.

5.3.5 Communication via Bluetooth

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

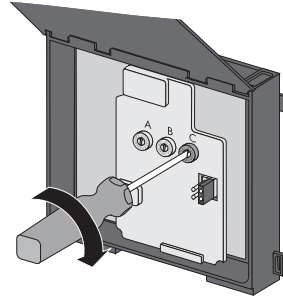
The following configuration settings are possible via a rotary switch (switch C):

Switch position (NetID)	Setting
0	Off
1	Communication via <i>Bluetooth</i> with communication device possible, no networking with other inverters (factory setting)
2 ... F	Networking with other inverters and/or communication devices

In order to restrict communication via *Bluetooth* between the inverters of your system and those of neighboring systems, you can assign an individual NetID to the inverters of your system (switch position 2 ... F). However, this is only necessary if neighboring systems are within a radius of 500 m. So that all inverters in your PV plant are detected by your communication device, all inverters must have the same NetID.

Procedure

1. Open the Quick Module, as described in section 5.3.3 "Opening the Quick Module" (page 26).
2. Set the arrow on the rotary switch (C) to the required position using a screwdriver. For this purpose, use a screwdriver with a width of 2.5 mm.

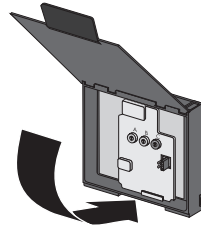


Acceptance of settings

The *Bluetooth* settings not be accepted until commissioning is complete.

5.3.6 Closing the Quick Module

1. Close the lid of the Quick Module and flip the flap closed 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



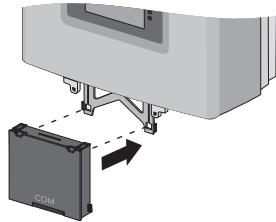
NOTICE!

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

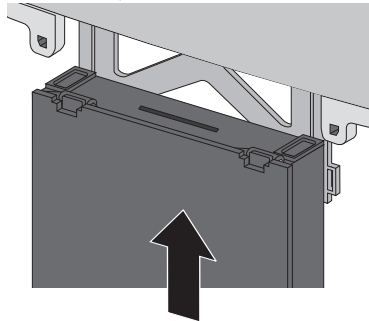
The Quick Module can be damaged if incorrectly installed in the inverter.

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

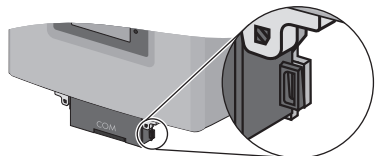
1. Disconnect the inverter from the AC and DC supplies as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 55).
2. Make sure that the inverter has been secured with the connection element in order to prevent it from being lifted out, as per section 4.3 "Mounting the Inverter with the Wall Mounting Bracket" (page 16).
3. Put the Quick Module into the designated holes on the bracket.



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 bracket must be positioned flush on top of each other.

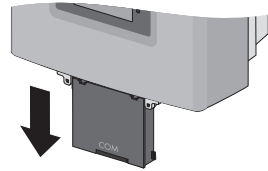


- The Quick Module is mounted.

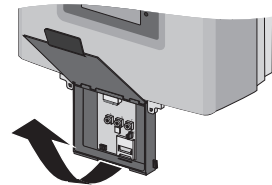
5.5 Changes via rotary switches after installation of the Quick Module

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:

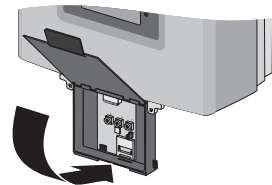
1. Disconnect the inverter from the AC and DC supplies as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 55).
2. Make sure that the inverter has been secured with the connection element in order to prevent it from being lifted out, as per section 4.3 "Mounting the Inverter with the Wall Mounting Bracket" (page 16).
3. Pull the Quick Module out to the first stopper.



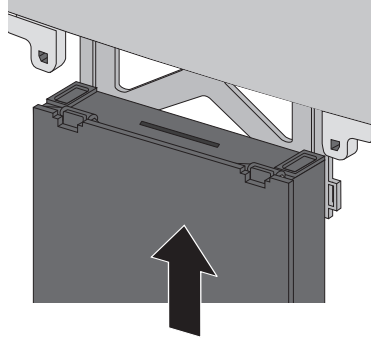
4. Flip the flap up and pen the lid until it locks in place.



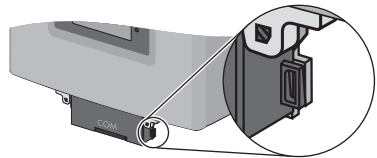
5. See section 5.3.4 "Setting the Country Standard and Language using Rotary Switches" (page 27) for setting the installation country and the display language.
6. See section 5.3.5 "Communication via Bluetooth" (page 27) for assigning the NetID via Bluetooth.
7. Close the lid of the Quick Module and flip the flap down again until it locks into place.



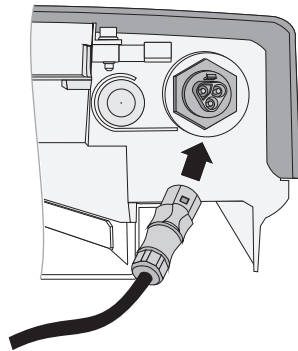
8. Push the Quick Module upwards in the guide slot until it clicks into place.



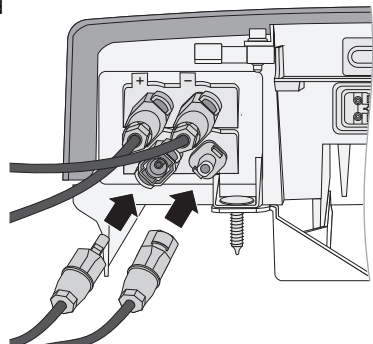
9. Check that the Quick Module is correctly seated. The loops of the Quick Module and the bracket must be positioned flush on top of each other.



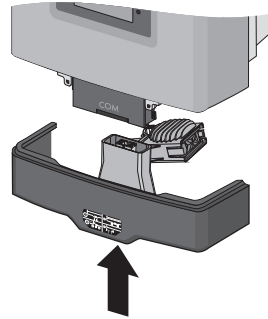
10. Connect the AC plug.



11. Check the DC plug connector for correct polarity and connect it.



12. Connect 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.**

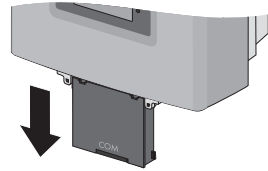
If it is not correctly connected, the Electronic Solar Switch can be damaged.

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

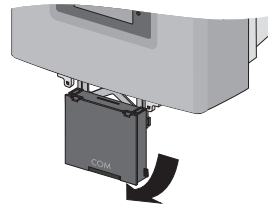
13. If a multi-function relay is connected, switch on the multi-function relay supply voltage.
 14. Switch on the line circuit breaker.
- The changes have been set.

5.6 Disassembling the Quick Module

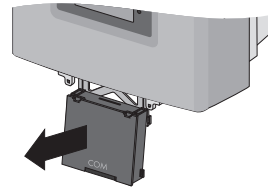
1. Disconnect the inverter from the AC and DC supplies as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 55).
2. Pull the Quick Module out over the first stopper to the last stopper.



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



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



- The Quick Module is disassembled.

6 Electrical Connection

6.1 Safety



NOTICE!

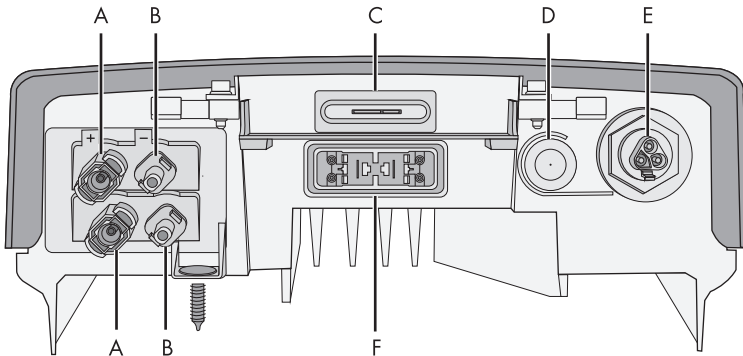
Damage to the inverter through electrostatic discharges.

Internal components of the inverter can be irreparably damaged by static discharge.

- Ground yourself before you touch a component.

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 plug connectors (+) for connecting the PV strings
B	DC plug connectors (-) for connecting the PV strings
C	Slot for the communication module (Quick Module/RS485 Quick Module)
D	Slot for optional grounding with protective cap
E	Socket for the AC connection plug
F	Socket for the connection of 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 network operator

Always observe the connection requirements of your network operator.

Cable sizing

The grid impedance of the AC cable must not exceed 1Ω .

The conductor cross-section should be dimensioned such that cable losses do not exceed 1% at rated output power. Use "Sunny Design" (www.SMA.de/en/SunnyDesign) for this.

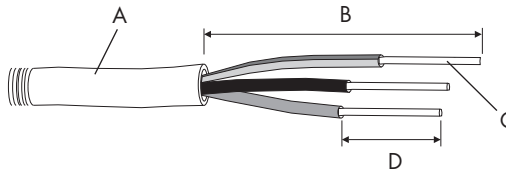
The maximum cable lengths relative to the conductor cross-section are shown in the following table. Do not exceed the maximum cable length.

Conductor cross-section	Max. cable length		
	SB 2000HF-30	SB 2500HF-30	SB 3000HF-30
2.5 mm ²	18 m	14.5 m	12 m
4.0 mm ²	29 m	23 m	19 m

The conductor cross-sectional area required in individual cases depends on many factors, including the following:

- Ambient temperature
- Routing method
- Cable losses
- Valid installation requirements of the respective country (installation location)

Cable Requirements



Item	Description	Value
A	External diameter	6 mm ... 14 mm
B	Stripping length	30 mm
C	Conductor cross-section	2.5 mm ² ... 4 mm ²
D	Strip insulation	8 mm

Load disconnection unit

You must install a **separate** line circuit breaker for each inverter in order to ensure that the inverter can be securely disconnected under load. The maximum permissible rating can be found in section 13 "Technical data" (page 78).

Detailed information and examples for the rating of a line circuit breaker can be found in the Technical Information "Line 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 to the same line circuit breaker, the protective function of the line 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 line circuit breaker.
- Observe the maximum permissible fuse protection of the inverter when selecting the line circuit breaker.

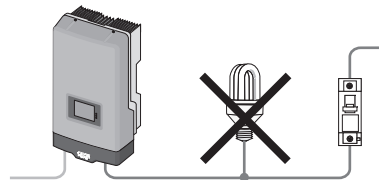


DANGER!

Danger to life due to fire.

When a producer (inverter) and a consumer are connected to the same line circuit breaker, the protective function of the line circuit breaker is no longer guaranteed. The current from the inverter and the grid can accumulate to excessive current that is not detected by the line circuit breaker.

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



NOTICE!

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

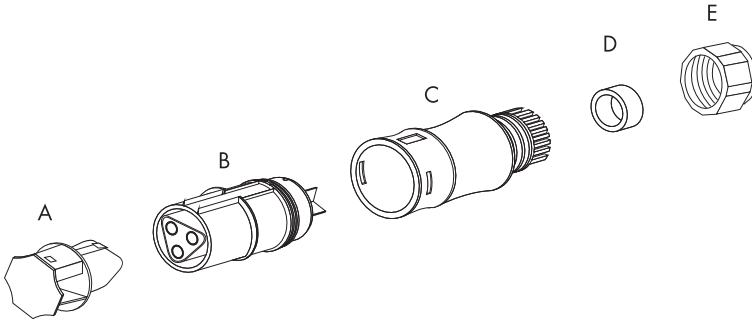
A screw type fuse element, e.g. D system (Diazed) or DO system (Neozed) is not a load disconnection unit, and thus must **not** be used as a switch disconnecter. A screw type fuse element serves as line fuse only.

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

- Use only a switch disconnecter or a line circuit breaker as a load disconnection unit.

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

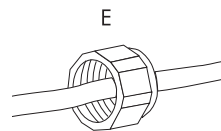
Overview of the AC Coupling Socket



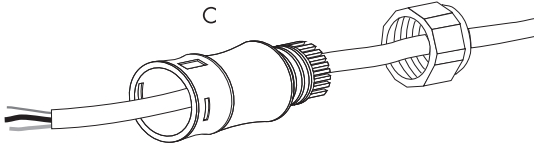
Object	Description
A	Protective cap for AC socket on inverter
B	Socket element
C	Threaded sleeve with sealing ring for cable diameters from 10 ... 14 mm
D	Sealing ring for cable diameters of 6 mm ... 10 mm
E	Clamping nut

Connecting the Inverter to the Power Distribution Grid (AC)

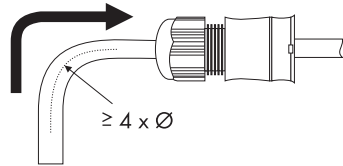
1. Check that the country setting of the inverter is correct by using the supplement provided with the factory settings.
If the inverter is not set to the desired country standard, then adjust the country standard using the rotary switches in the Quick Module as described in section 5.3.4 "Setting the Country Standard and Language using Rotary Switches" (page 27).
2. Check the grid voltage and compare it with the permissible voltage range (V_{AC}) (see section 13 "Technical data" (page 78)).
3. Disconnect the line circuit breaker and prevent it from being reactivated.
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 clamping nut (E) over the AC cable.



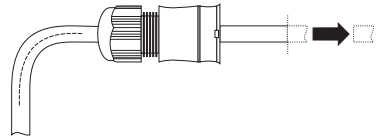
6. Thread the threaded sleeve (C) over the AC cable.



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

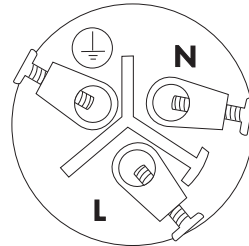


8. Shorten the AC cable.

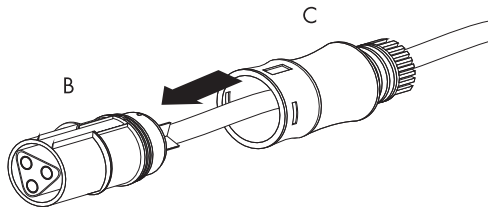


9. Strip approx. 30 mm from the AC cable.
10. Shorten phase L and neutral conductor N 4 mm to 5 mm. The PE protective conductor must be longer than the connection wires of N and L.

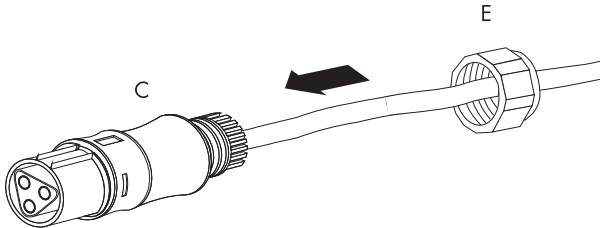
11. Strip 8 mm of insulation from the AC cable.
12. Insert the protective conductor PE (green-yellow) into the screw terminal with the ground sign on the socket element and tighten the screw.
13. Insert the neutral conductor N (blue) into screw terminal N on the socket element and tighten the screw.



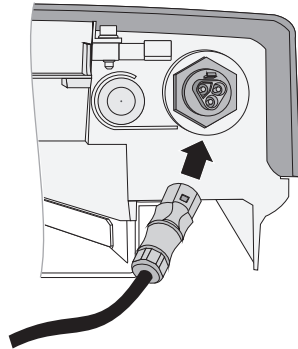
14. Insert phase L (brown or black) into screw terminal L on the socket element and tighten the screw.
15. Make sure the wires are securely connected.
16. Push the threaded sleeve (C) onto the socket element (B) until it audibly snaps into place.



17. Screw the clamping nut (E) tightly onto the threaded sleeve (C). The clamping nut 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 up the AC socket 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 16).
20. Insert the AC connection socket into the AC socket on the inverter audibly snaps into place.
Remove the protective cap beforehand, if required.



- The AC cable is now connected to the inverter.

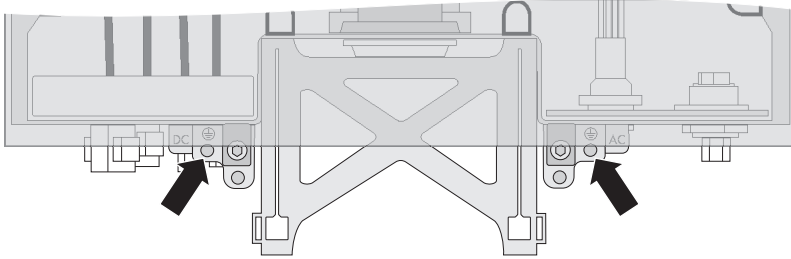
**DANGER!**

Danger to life due to high voltages in the inverter.

- Do not switch on the line 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 illustration).



6.4 Connecting the PV array (DC)

6.4.1 Conditions for the DC Connection



Use of Adaptors

Adaptors (branch plug connectors) must not be visible or freely accessible in the immediate surroundings of the inverter.

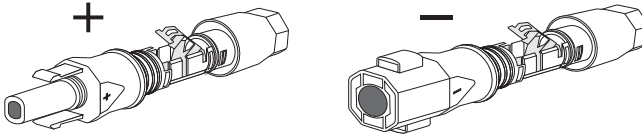
- The DC circuit must not be interrupted by adaptors.
- Observe the procedure for disconnecting the inverter as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 55).
- Requirements for the PV modules of the connected strings:
 - Same type
 - Same number
 - Identical alignment
 - Identical tilt
- The connecting cables of the PV modules must be equipped with plug connectors. You will find the necessary DC plug connector for DC connection in the delivery.
- The following limit 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 plug connector

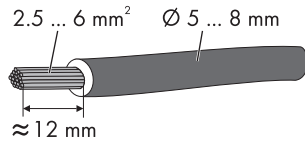
In order to be connected to the inverter, all connection cables of the PV modules must be equipped with the DC plug connectors provided.

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



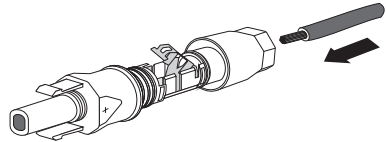
Cable Requirements

- Use a PV1-F cable.

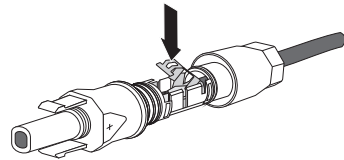


Procedure

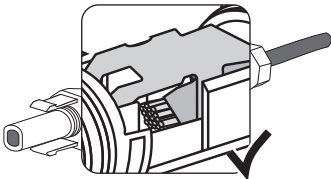
1. Insert stripped cable into the plug up to the limit.

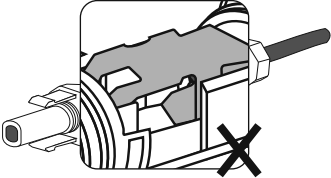
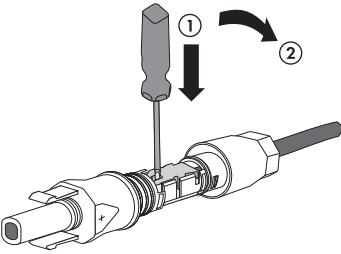


2. Press the clamping clip down **until it audibly snaps into place.**

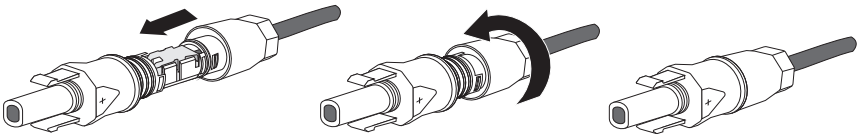


3. Ensure the cable is correctly in place.

Result	Measure
<p>☑ If the conductors are visible in the hollow cavity of the clamping clip, the cable is in the correct position.</p> 	<ul style="list-style-type: none"> • Proceed to step 4.

Result	Measure
<p><input checked="" type="checkbox"/> If the conductors are not visible in the hollow cavity, the cable is not in the correct position.</p> 	<ul style="list-style-type: none"> Loosen the clamping clip. For this purpose, use a screwdriver with a width of 3.5 mm.  <ul style="list-style-type: none"> Remove cable and start again from step 1.

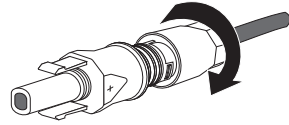
4. Push the threaded joint up to the thread and screw into place with a torque of 2 Nm.



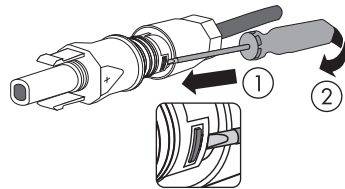
- The DC plug connectors are now assembled and can be connected to the inverters, as described in section 6.4.4 "Connecting the PV Array (DC)" (page 45).

6.4.3 Opening the DC plug connector

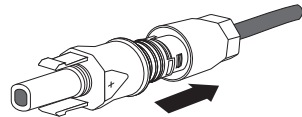
1. Unscrew and remove the threaded joint.



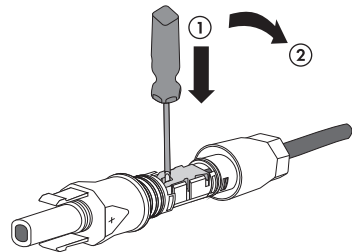
2. To release the plug connector, slot a screw driver into the side catch mechanism and lever out. For this purpose, use a screwdriver with a width of 3.5 mm.



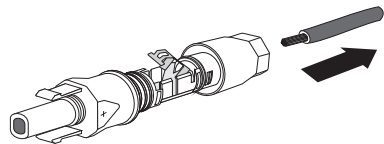
3. Carefully pull the DC plug connector apart.



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



5. Remove the cable.



- The cable is now removed from the DC plug 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 line circuit breaker is switched off and that it cannot be reactivated.



NOTICE!

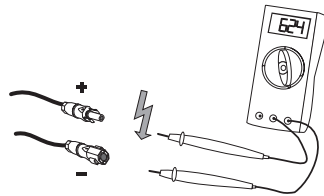
Excessive voltages can destroy the measuring device!

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

1. Disconnect the line circuit breaker and prevent it from being reactivated.
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 16).
3. Check the connection cables 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 inverter input voltage can be exceeded at low ambient temperatures.



NOTICE!

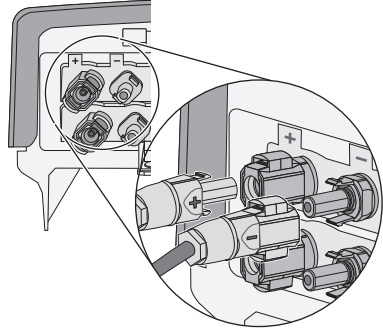
Destruction of the inverter due to overvoltage.

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.

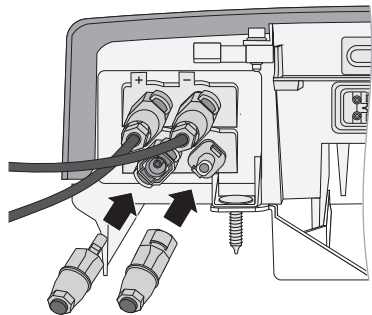
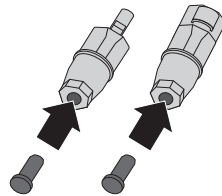
- Do not connect strings with an open circuit voltage greater than the maximum input voltage of the inverter.
- Check the plant design.

4. Check the strings for ground faults, as described in section 11.1 "Checking the PV Array for a Ground Fault" (page 69).

5. Check the DC plug connector for correct polarity and connect it. To release the plug connectors see section 1 "Disconnect the line circuit breaker and prevent it from being reactivated." (page 55).

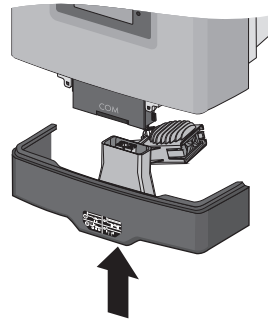


6. To create the seal on the inverter, all DC inputs that are not required must be closed as follows:
 - Insert the sealing plugs provided into the DC plug connectors that are not required. Do **not** insert the sealing plus into the DC inputs on the inverter.
 - Insert the DC plug connectors with sealing plugs into the corresponding DC inputs on the inverter.



7. Mount the Quick Module, as described in section 5.4 "Mounting the Quick Module" (page 29).

8. Connect 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 socket of the Electronic Solar Switch.
- The handle must close 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 48).

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 16)).
2. Check for correct country configuration (see section 5.3.2 "Checking the Country Standard" (page 23)).
3. Check that the AC grid cable is connected correctly (see section 6.3 "Connection to the Power Distribution Grid (AC)" (page 35)).
4. Check that the DC cables (PV strings) are connected correctly (see section 6.4 "Connecting the PV array (DC)" (page 41)).
5. Close up unnecessary DC inputs with the DC plug connectors and sealing plugs (see section 6.4.4 "Connecting the PV Array (DC)" (page 45)).
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 line circuit breaker.
11. Switch on the line circuit breaker.
12. If a multi-function relay is connected, switch on the multi-function relay supply voltage.



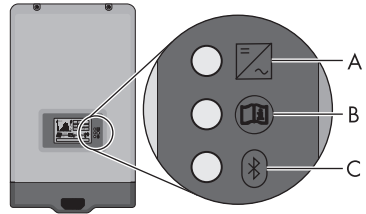
Self-test in accordance with ENEL guideline during initial commissioning (only for Italy)

The Italian standard prescribes that an inverter can only operate on the public 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 Directive, Ed. 1.1 (Applies to Italy Only)" (page 50). The test takes approx. 3 minutes.

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

LED	Color	Meaning
A	Green	Glowing: operation
		Flashing: wait for sufficient irradiation
B	Red	Error
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. The meaning of the illuminated red LED and the meaning of the event numbers on the display are described in section 10.3 "Fault indications" (page 63).

7.2 Display during Initialization



Display messages

The display messages shown 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 device.
- 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: "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 62).

FW PACK XXXX HP XXXX

SN 2120237148 XXXX

VDE0126-1-1

SPRACHE DEUTSCH

7.3 Self-Test in Accordance with ENEL Directive, 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 48).
 - 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 device.
 - After a further 5 seconds, or when you tap again, the configured standard is displayed.

ENEL-GUIDA
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.

AVVIO AUTOTEST
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 51).

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.

AUTOTEST V AC MAX

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 grid.

V AC MAX 245,0 V

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1. VALORE DI 233,0 V

2. SOGLIA COM 233,0 V

- Calibration value,

1. VALORE DI 276,0 V

2. TEMPERATURA 276,0 V

- Reaction time.

1. TEMPO 0,08 S

2. INTERVENTO 0,08 S

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

Undervoltage Test

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

AUTOTEST V AC MIN

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

V AC MIN 221,0 V

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1. VALORE DI 232,0 V

2. SOGLIA COM 232,0 V

- Calibration value,

1. VALORE DI 184,0 V

2. TARATURA 184,0 V

- Reaction time.

1. TEMPO 0,15 S

2. INTERVENTO 0,15 S

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.

AUTOTEST F AC MAX

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

F AC MAX 50,20 HZ

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1. VALORE DI 50,05 HZ

2. SOGLIA COM 50,05 HZ

- Calibration value,

1. VALORE DI 50,30 HZ

2. TARATURA 50,30 HZ

- Reaction time.

1. TEMPO 0,07 S

2. INTERVENTO 0,07 S

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.

AUTOTEST F AC MIN

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

F AC MIN 49,85 HZ

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1. VALORE DI 50,00 HZ

2. SOGLIA COM 50,00 HZ

- Calibration value,

1. VALORE DI 49,70 HZ

2. TARATURA 49,70 HZ

- Reaction time.

1. TEMPO 0,08 S

2. INTERVENTO 0,08 S

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 54).

AUTOTEST INTERROTTO

7.3.4 Restarting the Self-Test

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

1. Disconnect the line circuit breaker and prevent it from being reactivated.
 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 line 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 50) 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.



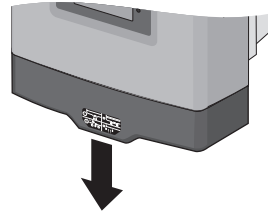
NOTICE!

Damage to the inverter through electrostatic discharges.

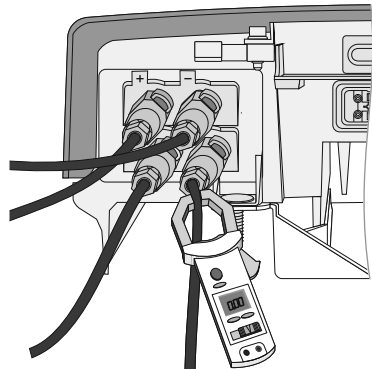
Internal components of the inverter can be irreparably damaged by static discharge.

- Ground yourself before you touch a component.

1. Disconnect the line circuit breaker and prevent it from being reactivated.
2. If a multi-function relay is connected, switch off the multi-function relay power supply.
3. Remove the Electronic Solar Switch.



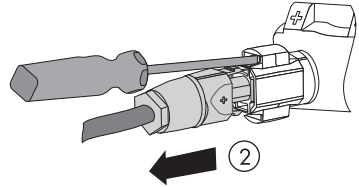
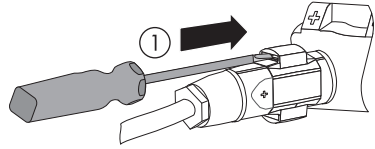
4. Using a current probe, ensure that no current is present at all DC cables.
 - If current present, check the installation.



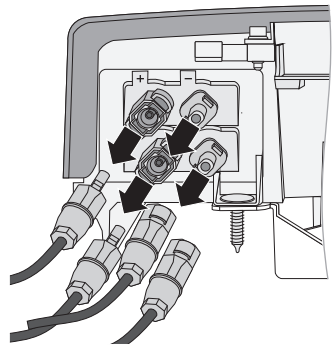
5. Unlock all DC plug connectors using a screwdriver:

For this purpose, use a screwdriver with a width of 3.5 mm.

 - Insert a screwdriver into one of the side slits (1).
 - Disconnect DC plug connectors (2).



6. Remove all DC plug connectors to disconnect the PV array from the inverter.



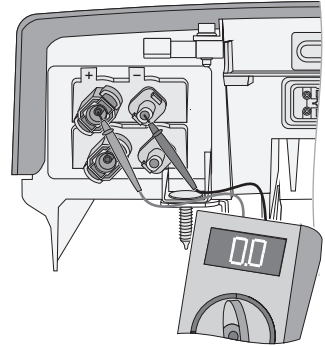
DANGER!

Danger to life due to high voltages in the inverter.

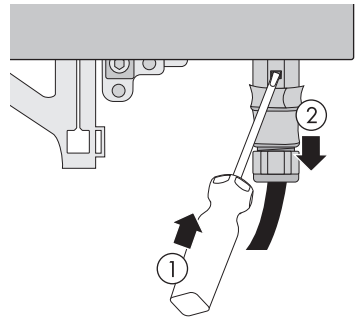
The capacitors in the inverter require 5 minutes to discharge.

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

7. Ensure that no voltage is present at the DC plugs on the inverter.
 If voltage is present, check the installation.



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



- The inverter is now free of voltage.

9 Maintenance and Cleaning

Impurities such as dust or airborne pollen can cause a buildup of heat that can lead to yield losses. Check the inverter and cables for any signs of external damage. If the inverter is damaged, contact the SMA Serviceline. If there is damage to the lines, do not perform any repair work or yourself or replace the lines.

9.1 Checking 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:

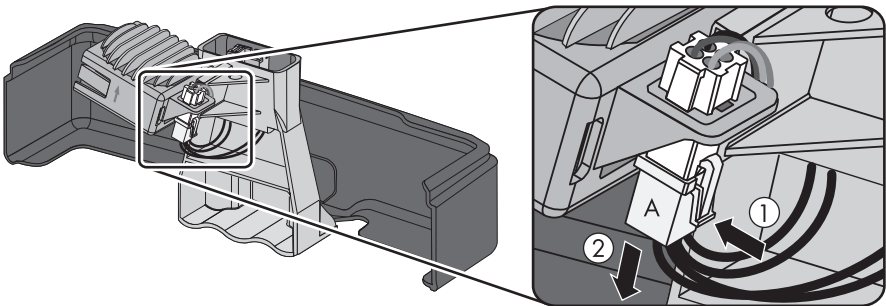
- The cooling fins on the rear side of the enclosure are clogged with dirt.
 - Clean the cooling fins with a soft brush if necessary.
- The fan is clogged.
 - Clean the fan as described below.

9.1.1 Cleaning the fan

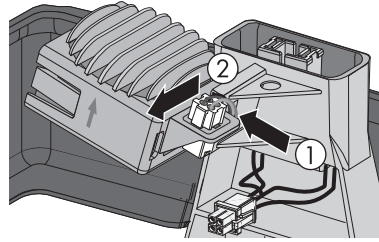
If the fan enclosure is only soiled with loose dust, it can be cleaned using a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, you can disassemble the fan for cleaning.

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 55).
2. Unlock (1) and pull out (2) the fan socket (A).



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



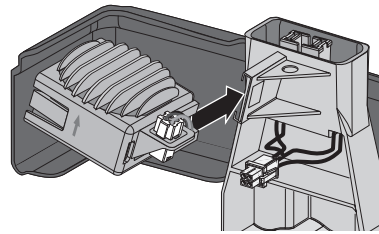
4. Clean the enclosure and the fan with a soft brush, a paint brush, or a damp cloth.

**NOTICE!**

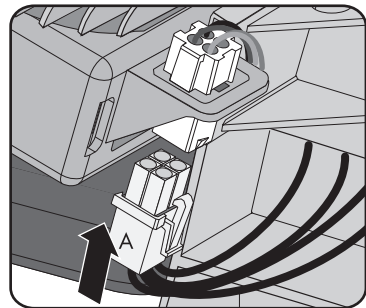
Damage to the fan through the use of compressed air.

- 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 socket.
 - ☑ The fan plug snaps audibly into place.



7. Re-commission the inverter as described in section 7 "Commissioning" (page 48).

**Checking the functionality of the fan.**

You can check the functionality of the fan via a communications component as described in the following section 9.1.2 "Checking the Fan" (page 60).

9.1.2 Checking the Fan



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.

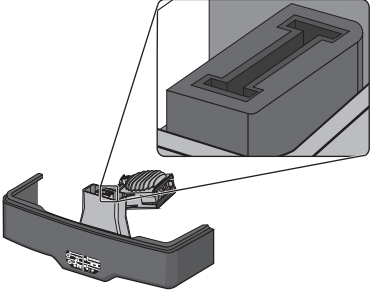
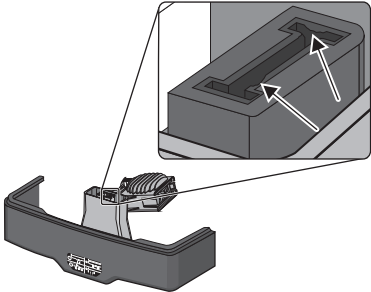
1. Enter the installer password.
2. Set parameter "CoolSys.FanTst" or "Fan test" to "On" in installer mode.
3. Check the air-flow of the fan.

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" or "Fan test" back to the "Off" position.
- You have finished checking the fan.

9.2 Checking the Electronic Solar Switch (ESS) for Wear

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

Result	Measure
<p><input checked="" type="checkbox"/> The plastic in the Electronic Solar Switch is undamaged.</p> 	<ul style="list-style-type: none"> • 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 16). • Insert the handle of the Electronic Solar Switch securely in the socket on the bottom of the enclosure. • Re-commission the inverter as described in section 7 "Commissioning" (page 48).
<p><input checked="" type="checkbox"/> The plastic in the Electronic Solar Switch shows thermal deformation.</p> 	<p>The Electronic Solar Switch can no longer reliably disconnect the DC supply.</p> <ol style="list-style-type: none"> 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 48).

10 Messages

10.1 Green LED glowing or flashing

Green LED glowing

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

Green LED is 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

Measurements and the issuing of messages are 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.

Display	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 Directive, Ed. 1.1 (Applies to Italy Only)" (page 50)).
< 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 feeding operations.
< 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 <i>Bluetooth</i> components.
< Update display >	Successful update of display.
< Update main CPU >	Successful update of inverter component.

Display	Description
< Update communication >	Successful update of communication component.
< 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.

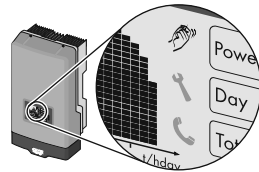
10.3 Fault indications

When errors occur, a display message including the corresponding event number will appear in the text line of the display. 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 failure which can be remedied on site.
- Telephone receiver: signifies device failure Contact the SMA Serviceline.



Event no.	Display message and cause	Corrective measures
1	<p>< Grid fault ></p> <p>The grid voltage has exceeded the permissible range. This error can have the following causes:</p> <ul style="list-style-type: none"> • The grid voltage at the connection point of the inverter is too high. • Grid impedance at the connection point of the inverter is too high. <p>For safety reasons, the inverter disconnects itself from the grid.</p>	<ul style="list-style-type: none"> • Check the grid voltage and connection on the inverter. <p>If the grid voltage lies outside the tolerance range because of local grid conditions, ask the network operator if the voltage can be adjusted at the feeding point or if it would agree to changes in the values of the monitored operational limits.</p> <p>If the grid voltage lies within the tolerance range, yet this error is still being displayed, contact the SMA Serviceline.</p>

Event no.	Display message and cause	Corrective measures
2	<p>< Grid fault ></p> <p>The grid voltage has fallen below the permissible range. This error can have the following causes:</p> <ul style="list-style-type: none"> • Grid disconnected • AC cable damaged • The grid voltage at the point of connection of the inverter is too low. <p>For safety reasons, the inverter disconnects itself from the grid.</p>	<ul style="list-style-type: none"> • Check for tripping of the line circuit breaker. • Check the grid voltage and connection on the inverter. <p>If the grid voltage lies outside the tolerance range because of local grid conditions, ask the network operator if the voltage can be adjusted at the feeding point or if it would agree to changes in the values of the monitored operational limits.</p> <p>If the grid voltage lies within the tolerance range, yet this error is still being displayed, contact the SMA Serviceline.</p>
3	<p>< Grid fault ></p> <p>The average grid voltage over 10 minutes is no longer within the permissible range. This can have the following causes:</p> <ul style="list-style-type: none"> • The grid voltage at the connection point of the inverter is too high. • Grid impedance at the connection point of the inverter is too high. <p>The inverter disconnects to assure compliance with the power quality of the grid.</p>	<ul style="list-style-type: none"> • Check the grid voltage at the point of connection of the inverter: <p>If, due to local grid conditions, the grid voltage exceeds the configured limiting value, ask the network provider whether the voltage can be adjusted at the feeding point, or whether it would agree to a modification of the limiting value for voltage quality monitoring.</p> <p>If the grid voltage is continually within the tolerance range, and this error is still displayed, contact the SMA Serviceline.</p>
4	<p>< Grid fault ></p> <p>The inverter has left the grid parallel operation and for safety reasons interrupted feeding-in.</p>	<ul style="list-style-type: none"> • Check the grid connection for strong, short-term frequency variations.
5	<p>< Grid fault ></p> <p>The grid frequency is not within the permissible range. For safety reasons, the inverter disconnects itself from the grid.</p>	<ul style="list-style-type: none"> • If possible, check the grid frequency and observe how often major deviations occur. <p>If repeated frequency variations occur and as a result this error occurs, ask the network operator if they agree to modifying the operating parameters.</p> <p>Discuss the proposed parameters with the SMA Serviceline.</p>

Event no.	Display message and cause	Corrective measures
6	<p>< Grid fault ></p> <p>The internal inverter monitoring has detected an impermissibly high proportion of direct current in the grid current.</p>	<ul style="list-style-type: none"> • Check the grid connection for direct current. • If this is a recurrent phenomenon, check with the network operator whether it is possible to raise the limiting value of monitoring.
7	<p>< Frq. not permitted ></p> <p>The grid frequency has left the permissible range. For safety reasons, the inverter disconnects itself from the grid.</p>	<ul style="list-style-type: none"> • If possible, check the grid frequency and observe how often major deviations occur. <p>If repeated frequency variations occur and as a result this error occurs, ask the network operator if they agree to modifying the operating parameters.</p> <p>Discuss the proposed parameters with the SMA Serviceline.</p>
8	<p>< Waiting for grid voltage ></p> <p>< Grid failure ></p> <p>< Check fuse ></p>	<ul style="list-style-type: none"> • Check fuse. • Check AC installation. • Check whether there is a general power failure.
33	<p>< Unstable operation ></p> <p>The supply at the DC input of the inverter is not sufficient for stable operation. This could be caused by snow on the PV modules.</p>	<ul style="list-style-type: none"> • Wait for higher irradiation. • If this event recurs at medium irradiation, check the PV plant design and correct the connection of the PV array.
34	<p>< DC overvoltage ></p> <p>< Disconnect generator ></p> <p>The DC input voltage connected to the inverter is too high.</p>	<ul style="list-style-type: none"> • Immediately disconnect the inverter from the PV array, as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 55)! Otherwise, the inverter may be destroyed. • Check the DC voltage of the strings for adherence to the maximum input voltage of the inverter, before you re-connect the inverter to the PV array.

Event no.	Display message and cause	Corrective measures
35	<p>< Insulation resist. > < Check generator > The inverter has detected a ground fault in the PV array. However, the inverter continues feeding into the grid.</p>	<ul style="list-style-type: none"> Check the strings for ground faults, as described in section 11.1 "Checking the PV Array for a Ground Fault" (page 69). The installer of the PV array must remedy the ground faults before you re-connect the affected string.
	<p>< Ground fuse fault > < Check ground fuse > The inverter has detected a ground voltage in the grounding path.</p>	<ul style="list-style-type: none"> Check the ground fuse as described in the installation guide of the SMA Plug-in Grounding. Check the strings for ground faults, as described in section 11.1 "Checking the PV Array for a Ground Fault" (page 69).
38	<p>< DC overcurrent > < Check generator > An overcurrent condition occurs on the DC side of the inverter and it switches off.</p>	<p>If this event occurs often:</p> <ul style="list-style-type: none"> Check the layout and the wiring of the PV array.
39	<p>< Waiting for DC start conditions > < Start cond. not met > The input power or the voltage of the PV modules is not sufficient for feeding into the grid.</p>	<ul style="list-style-type: none"> Wait for higher irradiation. If this event recurs at medium irradiation, check the PV plant design and correct the connection of the PV array.
42	<p>< Wrong earthing type; check earthing set > The SMA Plug-in Grounding polarity does not correspond to the polarity set in the inverter.</p>	<ul style="list-style-type: none"> Correct the grounding type as described in the installation guide for the SMA Plug-in Grounding.
60 - 64	<p>< Self diagnosis > < Interference device ></p>	<ul style="list-style-type: none"> Contact the SMA Serviceline (see section 15 "Contact" (page 94)).
65	<p>< Self diagnosis > < Overtemperature > The inverter switches off due to too high temperature</p>	<ul style="list-style-type: none"> Ensure sufficient ventilation. Check heat dissipation as described in section 9.1 "Checking Heat Dissipation" (page 58).
66	<p>< Self diagnosis > < Overload ></p>	<ul style="list-style-type: none"> Contact the SMA Serviceline (see section 15 "Contact" (page 94)).

Event no.	Display message and cause	Corrective measures
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 often: <ul style="list-style-type: none"> Contact the SMA Serviceline (see section 15 "Contact" (page 94)).
68	< Self diagnosis > < Input A defective >	<ul style="list-style-type: none"> Contact the SMA Serviceline (see section 15 "Contact" (page 94)).
70	< Sensor fault fan permanently on >	<ul style="list-style-type: none"> Contact the SMA Serviceline (see section 15 "Contact" (page 94)).
71	< SD card defective >	Re-format the SD card. <ul style="list-style-type: none"> Re-save the files to the SD card.
	< Parameter file not found or defective >	<ul style="list-style-type: none"> Copy the parameter file into the card drive:\PARASET directory.
	< Param. setting failed >	<ul style="list-style-type: none"> Check the parameters for valid values. Ensure change rights via SMA Grid Guard Code.
	< Update file defect. >	<ul style="list-style-type: none"> Re-format the SD card. Re-save the files to the SD card.
	< No update file found >	<ul style="list-style-type: none"> Copy the update file into the SD card drive:\UPDATE directory.
72	< Data stor. not poss. > Internal device fault: however, the inverter continues to feed in.	<ul style="list-style-type: none"> If this fault occurs often, contact the SMA Serviceline (see section 15 "Contact" (page 94)).
73	< Update main CPU failed > Internal device fault.	<ul style="list-style-type: none"> Contact the SMA Serviceline (see section 15 "Contact" (page 94)).
	< Update RS485I module failed > Internal device fault: however, the inverter continues to feed in.	<ul style="list-style-type: none"> Re-try update. If this fault occurs again, contact the SMA Serviceline (see section 15 "Contact" (page 94)).
	< Update BT failed > Internal device fault: however, the inverter continues to feed in.	
	< Upd. display failed > Internal device fault: however, the inverter continues to feed in.	
	< Update language table failed > Internal device fault: however, the inverter continues to feed in.	

Event no.	Display message and cause	Corrective measures
74	< Varistor defective >	<ul style="list-style-type: none"> Check the varistors as described in section 11.2 "Checking the Function of the Varistors" (page 71).
75	< Fan fault > < Clean fan >	<ul style="list-style-type: none"> Check heat dissipation as described in section 9.1 "Checking Heat Dissipation" (page 58).
77	< Self diagnosis > < Interference device >	<ul style="list-style-type: none"> Contact the SMA Serviceline (see section 15 "Contact" (page 94)).
80	< Derating occurred > The delivered power of the inverter was reduced below rated output power due to an excessive temperature for more than 10 minutes.	<p>If this event occurs often:</p> <ul style="list-style-type: none"> Ensure sufficient ventilation. Check heat dissipation as described in section 9.1 "Checking Heat Dissipation" (page 58).
81	< Comm. disturbed > A fault has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid.	<p>If this event occurs often:</p> <ul style="list-style-type: none"> Contact the SMA Serviceline (see section 15 "Contact" (page 94)).
90	< Inst. code invalid > The SMA Grid Guard Code entered (personal installer password) is invalid.	<ul style="list-style-type: none"> A valid SMA Grid Guard Code has been entered.
	< Grid param. locked > The current country data set is locked.	<ul style="list-style-type: none"> Enter the valid SMA Grid Guard Code for changing the country data set.
	< Abort self-test >	<ul style="list-style-type: none"> Contact the SMA Serviceline (see section 15 "Contact" (page 94)).
	< Changing grid param. not possible > <ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Check setting of the rotary switch (see section 5.3.2 "Checking the Country Standard" (page 23)). Enter the SMA Grid Guard Code <ul style="list-style-type: none"> Ensure sufficient DC voltage is available.

11 Failure search

11.1 Checking the PV Array for a Ground Fault

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 supplies as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 55).



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.

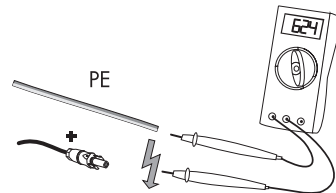


NOTICE!

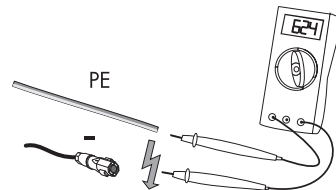
Excessive voltages can destroy the measuring device!

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

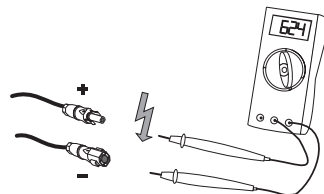
2. Measure the voltages between the plus pole of each string and the ground potential (PE).



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



4. Measure the voltages between the plus pole and the minus pole of each string.



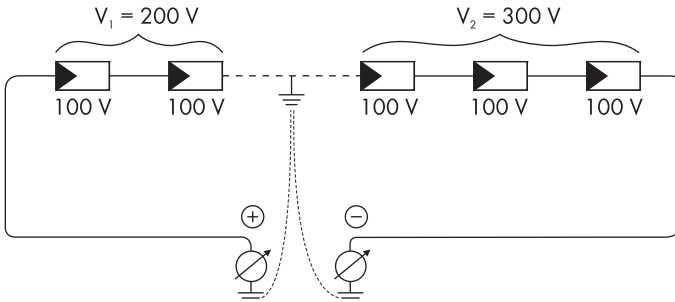
- ☑ A ground fault exists if the measured voltages are stable and the sum of the voltages from the plus pole to the ground potential and from the minus pole to the ground potential of a string are almost the same as the voltage between the plus and minus poles.

Result	Measure
☑ You have found a ground fault.	<ul style="list-style-type: none"> 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. Re-commission the inverter as described in section 7 "Commissioning" (page 48).
☑ You have found no ground fault.	<p>It is likely that one of the thermally monitored varistors is defective.</p> <ul style="list-style-type: none"> Check the function of the varistors as described in section 11.2 "Checking the Function of the Varistors" (page 71).

Location of the ground fault

The approximate position of the ground fault can be determined from the ratio of the measured voltages between the plus pole against ground potential (PE) and the minus 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 the event number "74", then 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.



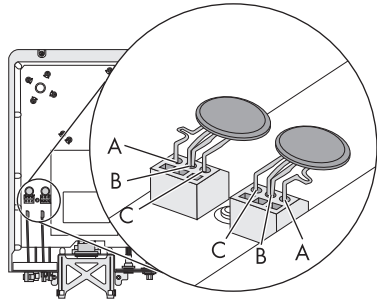
Position of Varistors

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 supplies as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 55).



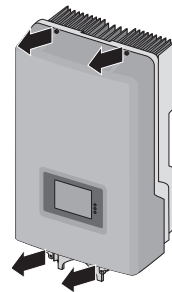
DANGER!

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!
Damage to the inverter through electrostatic discharges.

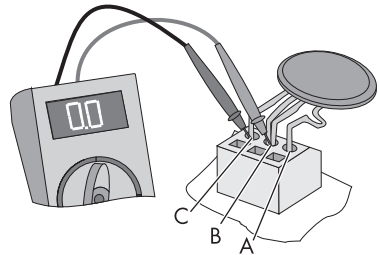
Internal components of the inverter can be irreparably damaged by electrostatic discharge.

- Ground yourself before you touch a component.

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 plug connectors B and C.



Result	Measure
<input checked="" type="checkbox"/> There is a conducting connection.	There is probably a different fault in the inverter. <ul style="list-style-type: none"> • Proceed to step 9. • Consult the SMA Serviceline for details on further procedure.
<input checked="" type="checkbox"/> 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)). <ul style="list-style-type: none"> • To replace the varistors, proceed to step 5.

**NOTICE!****Destruction of the inverter by DC overvoltage.**

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

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

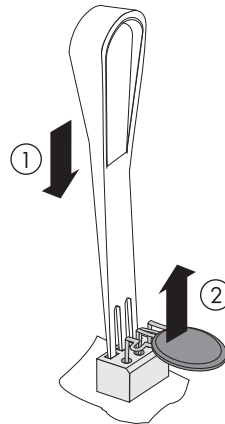
5. Insert an insertion tool into the openings of the terminal contacts (1).

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.

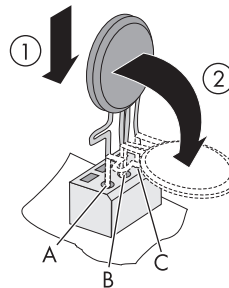
6. Remove varistor (2).



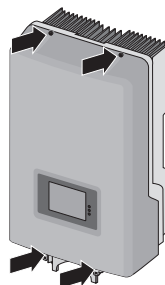
7. Insert new varistor (1).

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

8. Bend new varistor upwards (2).



9. Replace the enclosure lid.
10. Tighten the screws.



11. Re-commission the inverter as described in section 7 "Commissioning" (page 48).
 - 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 supplies as described in section 8 "Disconnecting the Inverter from Voltage Sources" (page 55).

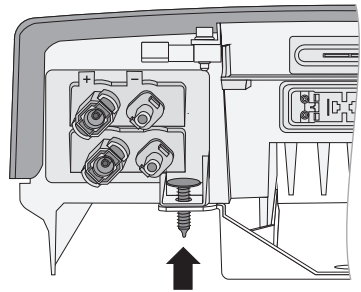


CAUTION!

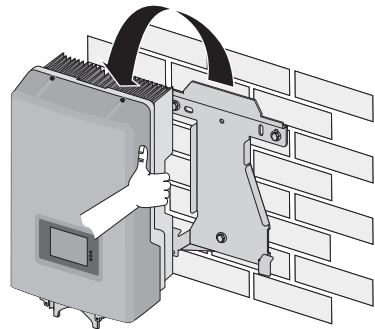
Danger of burn injuries due to hot enclosure parts!

- 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

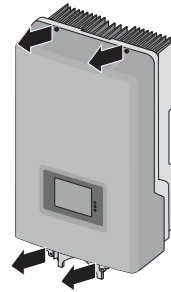
In the event of a fault your inverter may need replacing. In this case you will receive a replacement device with a transport lid.

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 75).

	<p>DANGER! Danger to life due to high voltages in the inverter.</p>
<p>The capacitors in the inverter require 5 minutes to discharge.</p> <ul style="list-style-type: none"> • 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. Fix the enclosure lid of your inverter onto the replacement device.
4. Mount (see section 4 "Mounting" (page 14)) and connect the replacement device as described in section 6 "Electrical Connection" (page 34).

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 $+60\text{ °C}$.

12.5 Disposing of the Inverter

Dispose of the inverter at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation location at that time. Alternatively, send it back to SMA Solar Technology AG with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("for disposal") (contact see section Page 94).

13 Technical data

13.1 Sunny Boy 2000HF

DC Input

Maximum DC power at $\cos \varphi = 1$	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 $-10\text{ }^{\circ}\text{C}$, must not exceed the maximum input voltage.

AC Output

Rated output power at 230 V, 50 Hz	2 000 W
Maximum AC apparent power	2 000 VA
Rated grid voltage	230 V
AC nominal 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 distortion of output current at AC THD voltage < 2 % AC power > 0.5 nominal AC power	$\leq 3\%$
Rated grid frequency	50 Hz
AC grid frequency*	50 Hz/60 Hz
Operating range at AC grid frequency 50 Hz	45.5 Hz ... 54.5 Hz
Operating range at AC grid frequency 60 Hz	55.5 Hz ... 64.5 Hz
Power factor at rated power	1
Feed phases	1
Connection phases	1

Overvoltage category as per IEC 60644-1	III
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* 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 tolerance	Current control
Grid Monitoring	SMA Grid Guard 3
Maximum permissible fuse protection	25 A
Ground fault monitoring	Insulation monitoring: $R_{ISO} > 1 \text{ M}\Omega$
Galvanic isolation	Present

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 as per IEC 60721-2-1	4K4H
Operation 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
Protection rating according to IEC 60529)	IP65
Protection class in accordance with IEC 62103	I

Country standards, status 01/2011 *	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) UTE C15-712-1
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* 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

UTE C15-712-1: Applies for Firmware Version 2.10 and higher

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
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Features

DC connection	SUNCLIX DC plug connector
AC connection	AC plug connector
Display	LC graphic display
<i>Bluetooth</i>	Standard
RS485, galvanically isolated	Optional, in RS485 Quick Module
Multi-function relay	Optional, in RS 485 Quick Module

Electronic Solar Switch

Electric service life in the event of a short circuit, with a nominal current of 35 A	A minimum of 50 switching operations
Maximum switching current	35 A
Maximum switching voltage	800 V
Maximum PV power	12 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP65

Torque

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

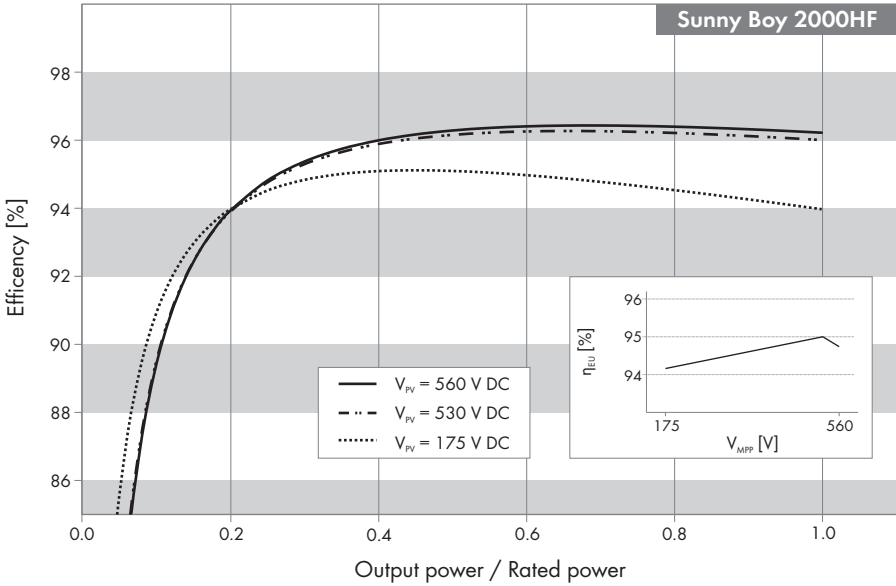
Grid Forms

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 efficiency, η_{EU}	95.0 %

Efficiency profile

Standardized output power	Efficiency		
	Minimum MPP voltage	Rated input voltage	Maximum MPP voltage
	175 V	530 V	560 V
5 %	85.1 %	80.8 %	80.5 %
10 %	90.8 %	89.6 %	89.0 %
20 %	93.7 %	93.9 %	93.6 %
25 %	94.6 %	95.0 %	94.8 %
30 %	94.8 %	95.3 %	95.1 %
50 %	95.2 %	96.2 %	96.1 %
75 %	94.5 %	96.3 %	96.3 %
100 %	94.0 %	96.2 %	96.0 %

13.2 Sunny Boy 2500HF

DC Input

Maximum DC power at $\cos \varphi = 1$	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 $-10\text{ }^{\circ}\text{C}$, must not exceed the maximum input voltage.

AC Output

Rated output power at 230 V, 50 Hz	2 500 W
Maximum AC apparent 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 distortion of output current at AC THD voltage < 2 % AC power > 0.5 nominal AC power	$\leq 3\%$
Rated grid frequency	50 Hz
AC grid frequency*	50 Hz/60 Hz
Operating range at AC grid frequency 50 Hz	45.5 Hz ... 54.5 Hz
Operating range at AC grid frequency 60 Hz	55.5 Hz ... 64.5 Hz
Power factor at rated power	1
Feed 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 tolerance	Current control
Grid Monitoring	SMA Grid Guard 3
Maximum permissible fuse protection	25 A
Ground fault monitoring	Insulation monitoring: $R_{iso} > 1 \text{ M } \Omega$
Galvanic isolation	Present

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 as per IEC 60721-2-1	4K4H
Operation 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
Protection rating according to IEC 60529)	IP65
Protection class in accordance with IEC 62103	I

Country standards, status 01/2011 *	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) UTE C15-712-1
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* 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

UTE C15-712-1: Applies for Firmware version 2.10 and higher

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
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Features

DC connection	SUNCLIX DC plug connector
AC connection	AC plug connector
Display	LC graphic display
Bluetooth	Standard
RS485, galvanically isolated	Optional, in RS485 Quick Module
Multi-function relay	Optional, in RS 485 Quick Module

Electronic Solar Switch

Electric service life in the event of a short circuit, with a nominal current of 35 A	A minimum of 50 switching operations
Maximum switching current	35 A
Maximum switching voltage	800 V
Maximum PV power	12 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP65

Torque

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

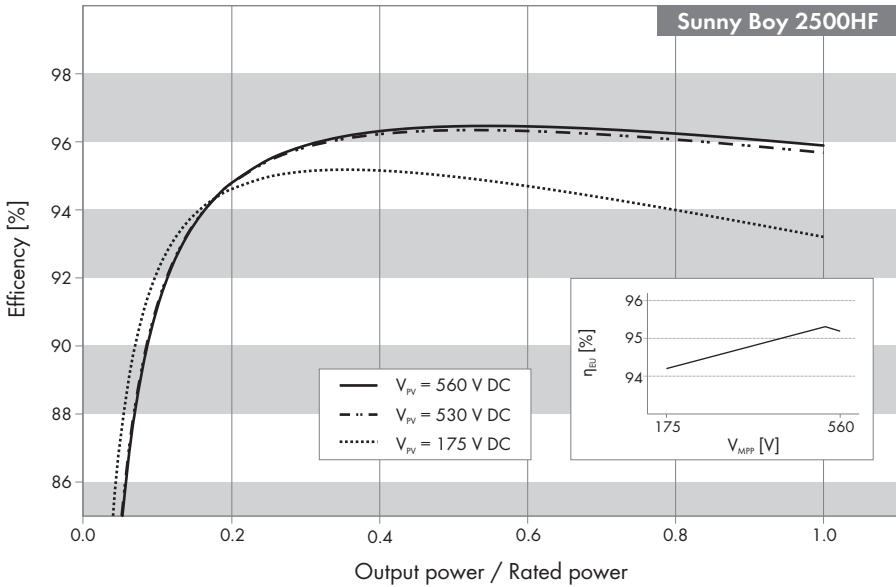
Grid Forms

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 efficiency, η_{EU}	95.3 %

Efficiency profile

Standardized output power	Efficiency		
	Minimum MPP voltage 175 V	Rated input voltage 530 V	Maximum MPP voltage 560 V
5 %	87.0 %	84.4 %	84.1 %
10 %	92.1 %	91.2 %	91.0 %
20 %	94.4 %	94.8 %	94.5 %
25 %	95.0 %	95.6 %	95.5 %
30 %	95.1 %	95.8 %	95.7 %
50 %	95.1 %	96.3 %	96.3 %
75 %	93.8 %	96.2 %	96.2 %
100 %	93.3 %	95.8 %	95.7 %

13.3 Sunny Boy 3000HF

DC Input

Maximum DC power at $\cos \varphi = 1$	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 $-10\text{ }^{\circ}\text{C}$, must not exceed the maximum input voltage.

AC Output

Rated output power at 230 V, 50 Hz	3 000 W
Maximum AC apparent 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 distortion of output current at AC THD voltage < 2 % AC power > 0.5 nominal AC power	$\leq 3\%$
Rated grid frequency	50 Hz
AC grid frequency*	50 Hz/60 Hz
Operating range at AC grid frequency 50 Hz	45.5 Hz ... 54.5 Hz
Operating range at AC grid frequency 60 Hz	55.5 Hz ... 64.5 Hz
Power factor at rated power	1
Feed 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 tolerance	Current control
Grid Monitoring	SMA Grid Guard 3
Maximum permissible fuse protection	25 A
Ground fault monitoring	Insulation monitoring: $R_{iso} > 1 \text{ M } \Omega$
Galvanic isolation	Present

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 as per IEC 60721-2-1	4K4H
Operation 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
Protection rating according to IEC 60529)	IP65
Protection class in accordance with IEC 62103	I

Country standards, status 01/2011 *	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) UTE C15-712-1 KEMCO PV2008:501
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* 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

UTE C15-712-1: Applies for Firmware version 2.10 and higher

KEMCO PV2008 (501): (only applies for SB 3000HF-30/V 0160)

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
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Features

DC connection	SUNCLIX DC plug connector
AC connection	AC plug connector
Display	LC graphic display
Bluetooth	Standard
RS485, galvanically isolated	Optional, in RS485 Quick Module
Multi-function relay	Optional, in RS 485 Quick Module

Electronic Solar Switch

Electric service life in the event of a short circuit, with a nominal current of 35 A	A minimum of 50 switching operations
Maximum switching current	35 A
Maximum switching voltage	800 V
Maximum PV power	12 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP65

Torque

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

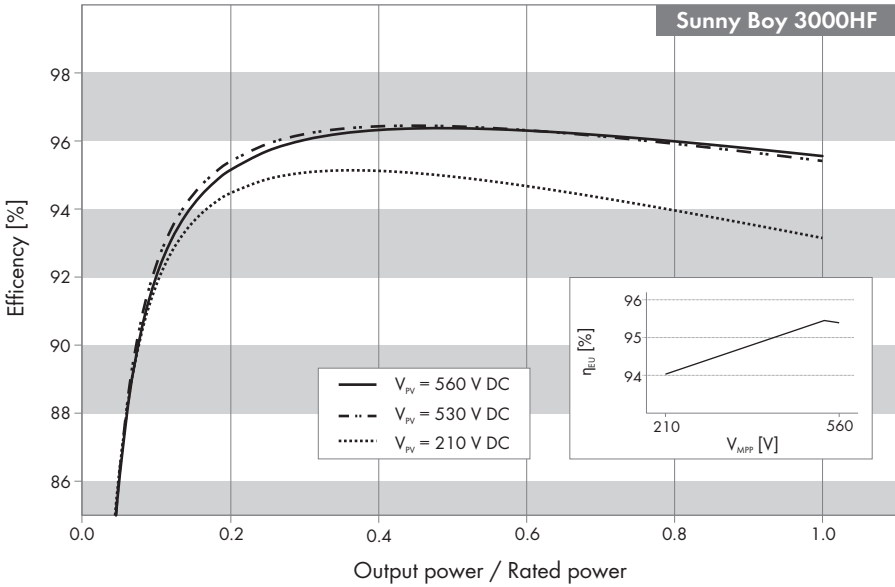
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Efficiency profile

Standardized output power	Efficiency		
	Minimum MPP voltage	Rated input voltage	Maximum MPP voltage
	210 V	530 V	560 V
5 %	86.0 %	85.9 %	85.8 %
10 %	91.8 %	92.3 %	91.9 %
20 %	94.2 %	95.3 %	95.1 %
25 %	94.9 %	96.0 %	95.8 %
30 %	95.0 %	96.1 %	95.9 %
50 %	95.1 %	96.3 %	96.3 %
75 %	94.0 %	96.0 %	96.0 %
100 %	93.2 %	95.4 %	95.5 %

14 Accessories

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

Description	Brief description	SMA order number
Replacement varistors	Set of thermally monitored varistors (2 pc.)	MSWR-TV 7
ESS handle with fan	ESS handle replacement part (with fan)	ESS-HANDLE:07
Optional Quick Module with RS485 interface and multi-function relay	SMA RS485 Quick Module as upgrade kit with RS485 interface and multi-function relay	485QM-10-NR
Plug-in grounding set "SMA Plug-in Grounding"	SMA Plug-in Grounding as upgrade 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 plug connectors	SUNCLIX field plug connectors for cross-sections from 2.5 mm ² ... 6 mm ² , Set (+/-) for 10 strings	SUNCLIX-FC6-SET

15 Contact

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

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

SMA Solar Technology AG

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