



PV Inverter

# SUNNY BOY 2000HF / 2500HF / 3000HF

Installation Guide



# Display

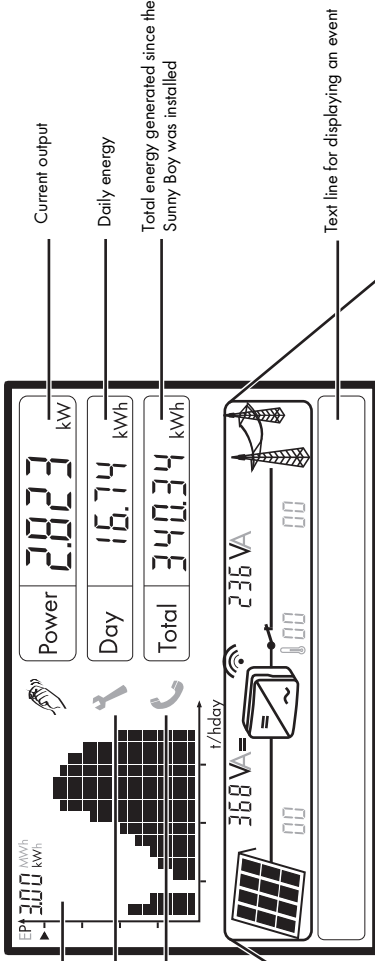
Tapping on the lower lid:

- Activating the background illumination
- Switching through the energy values of the past 16 feed-in hours to the daily energy values of the past 16 days
- Switching through the line display

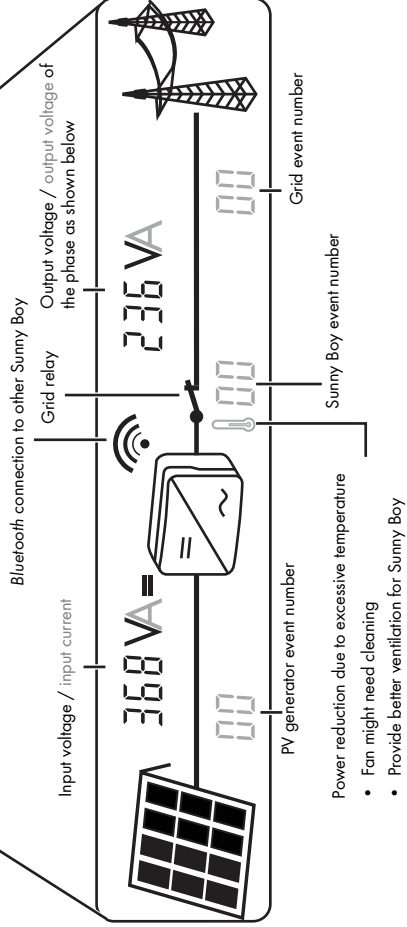
Power curve of the past 16 feed-in hours or past 16 days (switching the display is done by tapping on the display)

Disturbance that can be remedied onsite (see section 10.3 )

Device disturbance  
Contact SMA Serviceline



Text line for displaying an event



# Table of Contents

<b>1</b>	<b>Notes on this Manual.</b> . . . . .	<b>7</b>
1.1	Scope of Validity. . . . .	7
1.2	Target Group . . . . .	7
1.3	Additional Information . . . . .	7
1.4	Symbols Used . . . . .	8
<b>2</b>	<b>Safety</b> . . . . .	<b>9</b>
2.1	Appropriate Usage. . . . .	9
2.2	Safety Precautions. . . . .	11
2.3	Explanation of Symbols . . . . .	12
2.3.1	Symbols on the Inverter. . . . .	12
2.3.2	Symbols on the Type Label . . . . .	12
<b>3</b>	<b>Unpacking.</b> . . . . .	<b>14</b>
3.1	Scope of Delivery . . . . .	14
3.2	Identifying the Inverter . . . . .	15
<b>4</b>	<b>Mounting the Device</b> . . . . .	<b>16</b>
4.1	Safety . . . . .	16
4.2	Selecting the Mounting Location. . . . .	16
4.3	Mounting the Inverter with the Wall Mounting Bracket . . . . .	18
<b>5</b>	<b>The communication module (Quick Module).</b> . . . . .	<b>22</b>
5.1	Safety . . . . .	22
5.2	Inner View of the Quick Module. . . . .	23
5.3	Configuration of the inverter via the Quick Module . . . . .	23
5.3.1	SMA Grid Guard Protected Country Data Sets . . . . .	24
5.3.2	Checking the Country Standard . . . . .	25
5.3.3	Opening the Quick Module . . . . .	28
5.3.4	Setting the Country Standard and Language using Rotary Switches . . . . .	29

5.3.5	Communication via <i>Bluetooth</i> . . . . .	30
5.3.6	Closing the Quick Module . . . . .	31
5.4	Mounting the Quick Module . . . . .	32
5.4.1	Changes via rotary switches after installation of the Quick Module. . . . .	33
5.5	Dismantling the Quick Module . . . . .	36
5.6	Slot for SD card . . . . .	37
<b>6</b>	<b>Electrical Connection . . . . .</b>	<b>38</b>
6.1	Overview of the Connection Area . . . . .	38
6.2	Connection to the Public Grid (AC) . . . . .	39
6.2.1	Conditions for the AC Connection . . . . .	39
6.2.2	Connecting the Inverter to the Public Grid (AC) . . . . .	41
6.2.3	Connecting Additional Grounding . . . . .	44
6.3	Connection of the PV Generator (DC) . . . . .	45
6.3.1	Conditions for the DC Connection . . . . .	45
6.3.2	Assembling the DC Plug Connector . . . . .	46
6.3.3	Opening the DC Plug Connector . . . . .	48
6.3.4	Connecting the PV Generator (DC) . . . . .	49
<b>7</b>	<b>Commissioning . . . . .</b>	<b>52</b>
7.1	Commissioning the Inverter . . . . .	52
7.2	Display during Initialization . . . . .	53
7.3	Self-Test in accordance with ENEL Directive, Ed. 1.1 (Applies to Italy only) . . . . .	54
7.3.1	Starting the Self-Test . . . . .	54
7.3.2	Test Sequence . . . . .	55
7.3.3	Interruption of the Self-Test . . . . .	58
7.3.4	Restarting the Self-Test. . . . .	59
<b>8</b>	<b>Disconnect the Inverter from Voltage Sources . . . . .</b>	<b>60</b>
8.1	Safety . . . . .	60
8.2	Disconnect the Inverter from Voltage Sources . . . . .	60

<b>9</b>	<b>Maintenance and Cleaning</b> . . . . .	<b>63</b>
9.1	Checking Heat Dissipation . . . . .	63
9.1.1	Cleaning the fan . . . . .	63
9.1.2	Checking the Fans. . . . .	66
<b>10</b>	<b>Messages</b> . . . . .	<b>67</b>
10.1	The green LED is glowing or flashing . . . . .	67
10.2	Event messages. . . . .	67
10.3	Error Messages. . . . .	68
<b>11</b>	<b>Failure Search</b> . . . . .	<b>74</b>
11.1	Checking the PV Generator for a Ground Fault . . . . .	74
11.2	Checking the Functioning of the Varistors . . . . .	76
<b>12</b>	<b>Decommissioning</b> . . . . .	<b>80</b>
12.1	Dismantling the Inverter. . . . .	80
12.2	Replacing the Enclosure Lid . . . . .	81
12.3	Packing the Inverter. . . . .	82
12.4	Storing the Inverter . . . . .	82
12.5	Disposing of the Inverter . . . . .	82
<b>13</b>	<b>Technical Data</b> . . . . .	<b>83</b>
13.1	Sunny Boy 2000HF . . . . .	83
13.2	Sunny Boy 2500HF . . . . .	86
13.3	Sunny Boy 3000HF . . . . .	89
<b>14</b>	<b>Accessories</b> . . . . .	<b>92</b>
<b>15</b>	<b>Contact</b> . . . . .	<b>93</b>



# 1 Notes on this Manual

## 1.1 Scope of Validity

This manual describes the assembly, installation, commissioning and maintenance of the following SMA inverters:

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

Store this manual where it can be accessed at all times.

## 1.2 Target Group

This manual is for qualified personnel. The tasks described in this manual must only be performed by qualified personnel.


## 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](http://www.SMA.de/en).


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


## 1.4 Symbols Used

The following types of safety precautions and general information are used in this guide:

	<b>DANGER!</b>
DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.	

	<b>WARNING!</b>
"WARNING" indicates a hazardous situation which, if not avoided, could result in death or serious injury.	

	<b>CAUTION!</b>
"CAUTION" indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.	

	<b>NOTICE!</b>
"NOTICE" indicates a situation that can result in property damage if not avoided.	

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

- This symbol indicates the result of an action.

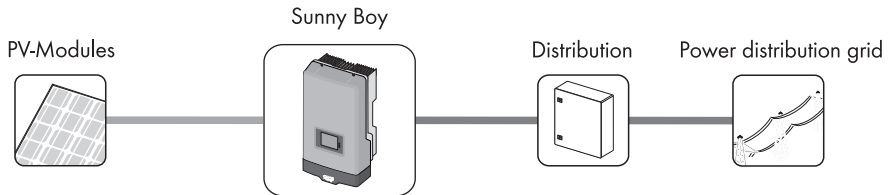


## 2 Safety

### 2.1 Appropriate Usage

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

#### Principle of a PV plant with this Sunny Boy



The Sunny Boy must only be operated with PV generators (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 system, 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](http://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 Information "Module Technology", in the download area of [www.SMA.de/en](http://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 void the warranty claims and operation permission.

## Certified Countries

The Sunny Boy 2000HF / 2500HF / 3000HF (with according configuration) fulfill the requirements specified in the following standards and directives (dated: 05/2010):

- AS4777 (2005) \*
- CER/06/190 (10.2006) \*
- C10/11 (05.2009)
- Enel-GUIDA Ed. 1.1 \*
- EN 50438:2008 \*\*
- G83/1-1:2008 \*
- IEC61727 \*
- PPC (06.2006) \*
- PPDS: 2009 \*
- RD 1663/2000 \*
- RD 661/2007 \*
- SI4777 \*
- VDE 0126-1-1 (02.2006)

\* On request

\*\* does not apply to national standard deviations of EN 50438

SMA Solar Technology AG can preset special grid parameters for other countries / installation locations according to customer request, after evaluation by SMA Solar Technology AG.

You can make later modifications yourself by changing software parameters with respective communication products (e.g. Sunny Data Control or Sunny Explorer). To change grid-relevant parameters, you need a personal access code - the so-called SMA Grid Guard Code. The application form for the personal access code is located in the download area at [www.SMA.de/en](http://www.SMA.de/en), in the "Certificate" category for each inverter.

## 2.2 Safety Precautions

**DANGER!**

**Danger to life due to high voltages in the inverter.**

- All work on the inverter must be carried out by qualified personnel only.
- 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 can 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 radiation!**

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




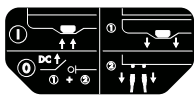
**Grounding the PV generator**

Comply with the local requirements for grounding the modules and the PV generator. SMA Solar Technology AG recommends connecting the generator frame and other electricity-conducting surfaces such that there is continuous conduction and to connect them to the ground in order to reach maximum protection for property and persons.





## 2.3 Explanation of Symbols











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

### 2.3.1 Symbols on the Inverter

Symbol	Explanation
	Operation Display. Indicates the operation condition of the inverter.
	An error has occurred. Read section 11 "Failure Search" (page 74) to remedy the error.
	Bluetooth <sup>®</sup> Wireless Technology. Shows the status of Bluetooth Communication.
	Electronic Solar Switch (ESS) DC load disconnection unit <ul style="list-style-type: none"> <li>① When the Electronic Solar Switch is plugged in, the DC circuit is closed.</li> <li>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 "Disconnect the Inverter from Voltage Sources" (page 60).</li> </ul>

### 2.3.2 Symbols on the Type Label

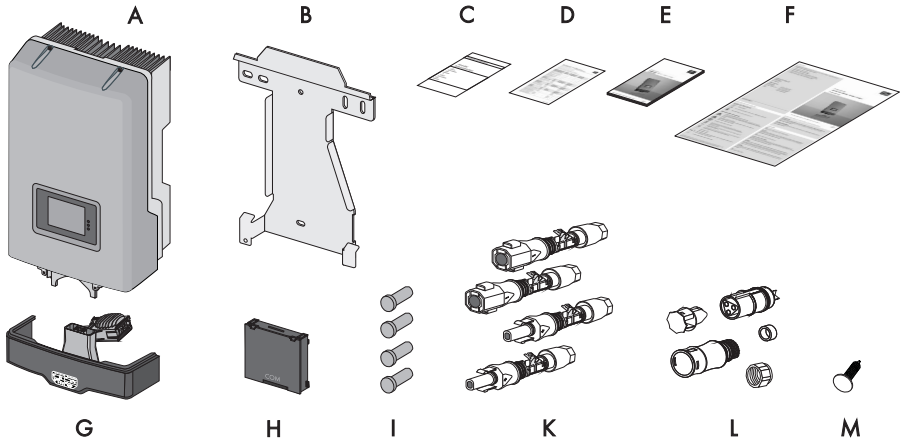
Symbol	Explanation
	Beware of dangerous electrical voltage. The inverter operates at high voltages. All work on the inverter must be carried out by qualified personnel only.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Observe all documentation that accompanies the inverter.
	The inverter must not be disposed of together with the household waste. For more information on disposal, see section 12.5 "Disposing of the Inverter" (page 82).

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

## 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
<b>A</b>	1	Sunny Boy
<b>B</b>	1	Wall mounting bracket
<b>C</b>	1	Document set
<b>D</b>	1	Supplementary sheet with inverter factory settings
<b>E</b>	1	Installation Guide
<b>F</b>	1	User Manual
<b>G</b>	1	DC load disconnection unit Electronic Solar Switch (ESS handle with fan)
<b>H</b>	1	Communication module (Quick Module)
<b>I</b>	4	Sealing plugs for DC plug connectors
<b>K</b>	4	DC connectors (2 x positive / 2 x negative)
<b>L</b>	1	AC coupling socket: socket element, protective cap for AC socket on inverter, threaded sleeve, sealing ring, clamping nut.
<b>M</b>	1	Connection screw 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 the Device

### 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!

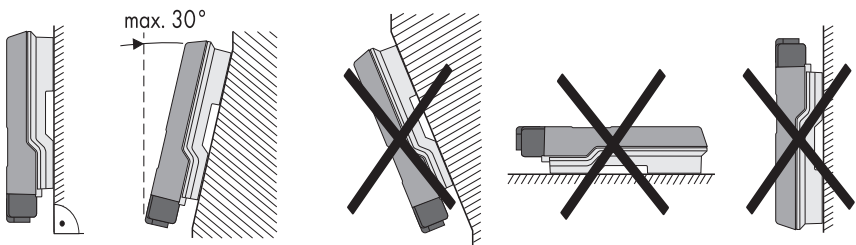
**Risk of injury due to the heavy weight of the inverter.**

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

### 4.2 Selecting the Mounting Location

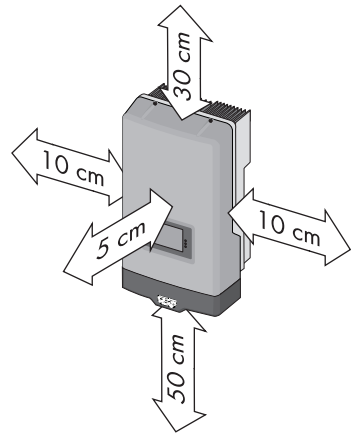
Consider the following points when selecting where to install:

- The mounting method and location must be suitable for the inverter's weight and dimensions (see section 13 "Technical Data" (page 83)).
- Mount on a solid surface.
- The mounting location must at all times be clear and have safe access without the use of additional aids such as scaffolding or lifting platforms. Any possible service actions are otherwise limited.





- Vertical installation or tilted backward by max. 30°.
- The connection area must point downward.
- Never mount the device with a forward tilt.
- Never install the device with a sideways tilt.
- Do not mount horizontally.
- Mount at eye level to allow operating status 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 to avoid a power reduction due to excessive heating.
- In living areas, do not mount the unit on plasterboard walls or similar in order to avoid audible vibrations. The inverter can make noises when in use, 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 the removal of 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.

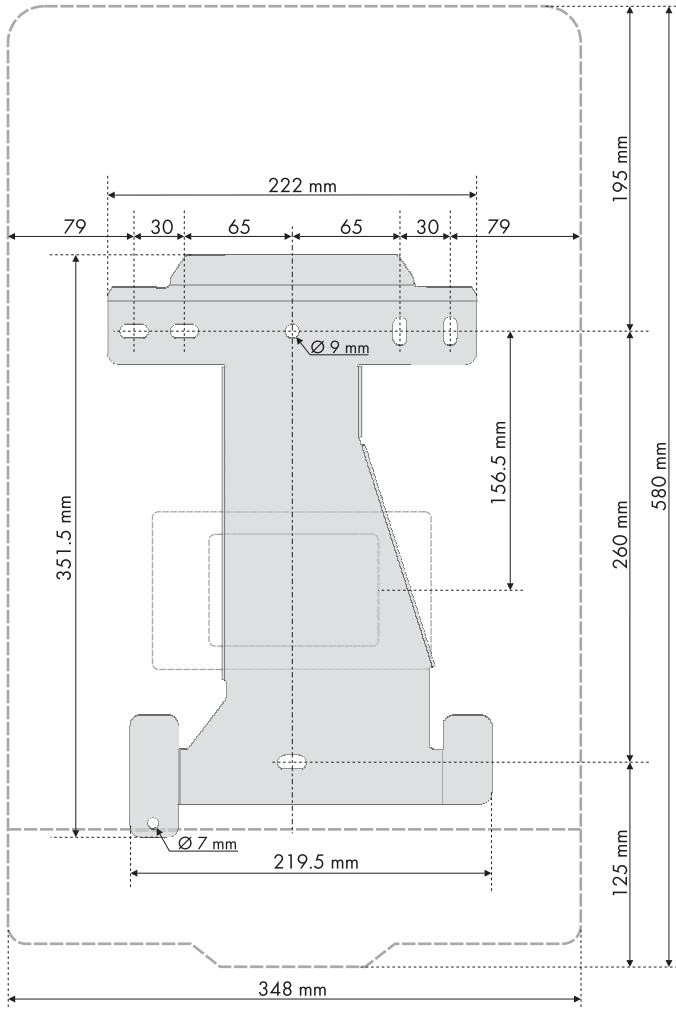
### 4.3 Mounting the Inverter with the Wall Mounting Bracket

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

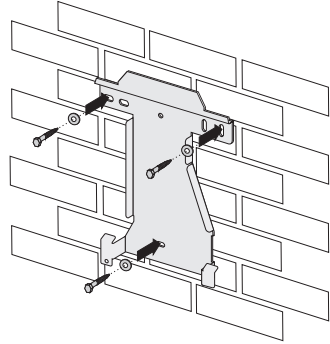


**Number of drill holes used**

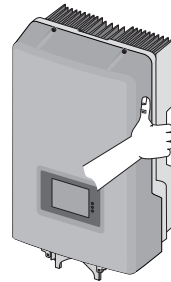
- When mounting onto the wall, use at least 1 upper hole right and left and when necessary the lowest hole in the middle.
- Use the middle upper and lower holes when mounting to a pillar.



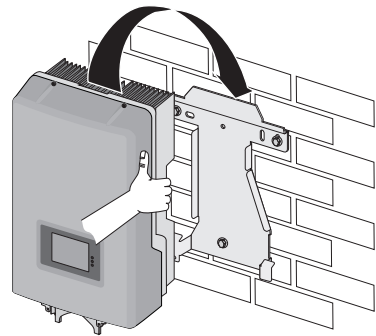
2. Attach the wall mounting bracket to the wall using appropriate screws (diameter min. 6 mm, max. 8 mm) and washers (outer diameter min. 12 mm, max. 24 mm).



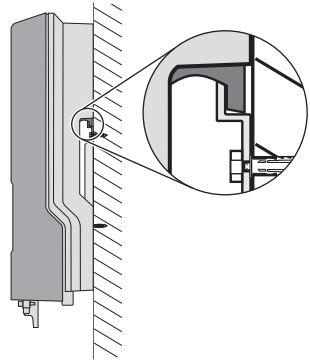
3. Transport the inverter using the handles on the sides.



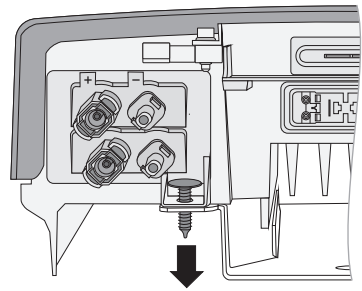
4. Hang the inverter with its mounting slots from above in the wall mounting.



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



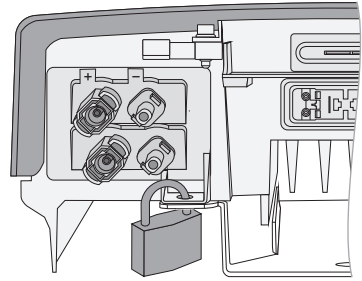
6. Use the connection screws (see position "M" in the scope of delivery on page 14) provided to fix the inverter and prevent it from being lifted out of place.



- The inverter is now securely mounted to the wall.

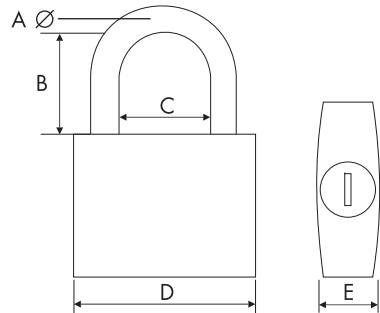
## Optional Theft Protection

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 fitted with a communication module (Quick Module) as standard. In the Quick Module there is a slot for an SD card and 3 rotary switches with the following functions:

- Rotary switches A and B are for setting the country of installation and the display language (see section 5.3 "Configuration of the inverter via the Quick Module" (page 23)).
- Rotary switch C is for the allocation of the NetID for communication via *Bluetooth* (see section 5.3.5 "Communication via Bluetooth" (page 30)).



### 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" (page 92)). You will find detailed descriptions of the functions in the respective manual.



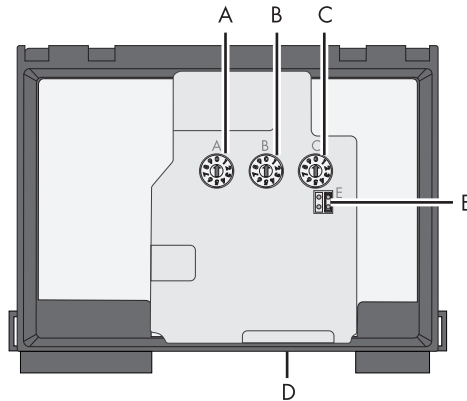
### Configuration of the Quick Module

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

### 5.1 Safety

	<p><b>DANGER!</b> 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 on the AC and DC sides before you accept the settings on the Quick Module.</p> <ul style="list-style-type: none"> <li>• Disconnect the inverter as described in section 8 "Disconnect the Inverter from Voltage Sources" (page 60).</li> </ul>	

## 5.2 Inner View of the Quick Module



Object	Description
A	Rotary switch for setting the country standard (switch A)
B	Rotary switch for setting the display language (switch B)
C	Rotary switch for the configuration of <i>Bluetooth</i> communication (switch C)
D	Slot for SD card
E	Jumper slot for setting the language to English (E)

## 5.3 Configuration of the inverter via the Quick Module

The inverter can be configured for various countries. This is carried out via the two rotary switches in the Quick Module (switch A and switch B) before commissioning or via the configuration of the "CntrySet" or "Set country standard" parameter via an external communication device with *Bluetooth* interface once you have commissioned the inverter.



### 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 power supply line requirements demand a mechanism which prevents the parameters for grid feeding from being able to be changed. Some country data sets are therefore protected and can only be unlocked with a personal access code, the so-called SMA Grid Guard code.

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

It is also possible via a communication device to configure ("CntrySet" or "Set country standard") as well as to manually block or unblock country data sets. To lock, you have to set the so-called SMA Grid Guard code to "54321". This will automatically appear as an input window when changing the first grid-relevant parameter. 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 grid-feed hours. The application form for the personal access code is located in the download area at [www.SMA.de/en](http://www.SMA.de/en), in the "Certificate" category for each inverter. The language is configurable without a password independent of the country data set.



#### Changing of 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 grid-feed hours, but have to be manually locked. To manually lock the parameters, set the SMA Grid Guard code to "54321".



#### Detailed information on parameter settings

Detailed information on how to proceed with respect to setting and changing parameters is available in the respective 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 can not 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. These settings will be overwritten by changes to the rotary switch or via a communication device and can not simply be reconstructed. For devices ordered without any specified country of installation, the standard setting is "VDE0126-1-1" and the language is "german".

Changes will be immediately accepted after switching the line circuit breaker on. If an unprogrammed switch setting is selected, the inverter issues an error message.

Check whether the inverter is set to the installation country.

#### Before commissioning:

- Check that the country setting of the inverter is correct using the supplement provided and comparing this to 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 53)).
- 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 the rotary switch A to "0" in order to keep the country data set.

The operating parameters define which setting is hidden behind which parameter set. 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](http://www.SMA.de/en) in the category "Technical Description" of 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
0	3	Retained	French	Dependent on parameter set	Dependent on parameter set
0	4	Retained	Spanish	Dependent on parameter set	Dependent on parameter set

(A)	(B)	Country data set	Display language	Grid guard protection	Country
0	5	Retained	Italian	Dependent on parameter set	Dependent on parameter set
0	6	Retained	Not programmed**	Dependent on parameter set	Dependent on parameter set
0	7	Retained	Not programmed**	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 <sup>a)</sup>	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-A	Spanish	Yes	Spain
4	8	PPC	Not programmed**	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 programmed**	Yes	
6	6	EN 50438	Not programmed**	Yes	
7	0	EN50438-CZ	Not programmed**	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
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

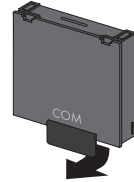
(A)	(B)	Country data set	Display language	Grid guard protection	Country
8	8	UL1741/240 ***	English	No	USA
8	9	UL1741/240 ***	Spanish	No	USA
8	A	UL1741/240 ***	French	No	USA
9	8	UL1741/auto ***	English	No	USA
9	9	UL1741/auto ***	Spanish	No	USA
9	A	UL1741/auto ***	French	No	USA
D	0	Off-Grid 60Hz	English	No	Flexible
D	1	Off-Grid 60Hz	German	No	Flexible
D	2	Off-Grid 60Hz	French	No	Flexible
D	3	Off-Grid 60Hz	Spanish	No	Flexible
D	4	Off-Grid 60Hz	Italian	No	Flexible
D	5	Off-Grid 60Hz	Not programmed**	No	Flexible
D	6	Off-Grid 60Hz	Not programmed**	No	Flexible
E	0	Off-Grid 50Hz	English	No	Flexible
E	1	Off-Grid 50Hz	German	No	Flexible
E	2	Off-Grid 50Hz	French	No	Flexible
E	3	Off-Grid 50Hz	Spanish	No	Flexible
E	4	Off-Grid 50Hz	Italian	No	Flexible
E	5	Off-Grid 50Hz	Not programmed**	No	Flexible
E	6	Off-Grid 50Hz	Not programmed**	No	Flexible
a) Special setting: <i>Bluetooth</i> transmission power reduced (in accordance with French standards) *) In planning **) Currently not programmed. The previously configured display language remains set. ***) This country standard must only be set for Sunny Boy 2000HF-US / 2500HF-US / 3000HF-US.					

Should the inverter not be set to the installation country, you have several options to configure the country standard required.

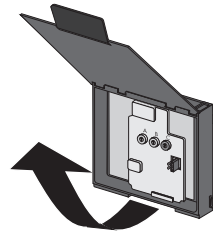
- Setting via 2 rotary switches in Quick Module, as described in section 5.3.4 "Setting the Country Standard and Language using Rotary Switches" (page 29).
- Alternatively you can adjust the setting via the "CntrySet" or "Set country standard" parameters with a communication device (e.g. Sunny Data Control 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 on the AC and DC sides as described in section 8 "Disconnect the Inverter from Voltage Sources" (page 60).
  - Pull the Quick Module out to the first stopper.
2. Flip the lower flap of the Quick Module up.



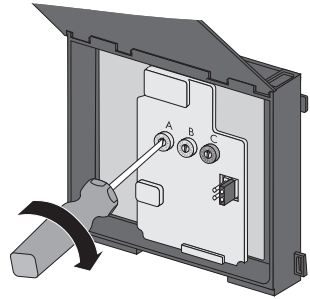
3. Open the lid of the Quick Module, until it locks in place.



- The Quick Module is opened. 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

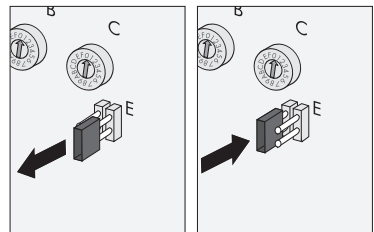
1. Open the Quick Module, as described in section 5.3.3 "Opening the Quick Module" (page 28).
2. Set the arrows on both left rotary switches (A and B) using a screw driver to the desired positions (see table in section 5.3.2 "Checking the Country Standard" (page 25)). The width of the screwdriver should be 2.5 mm.



#### Jumper for English language

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

- To do this, plug 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.

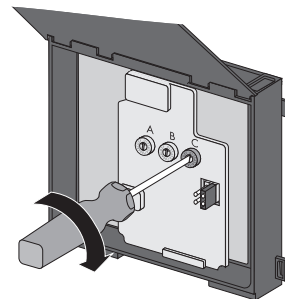
The following configuration settings are possible via a rotary switch (switch C):

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). This, however, is only necessary if neighboring systems are within a radius of 500 m. So that all inverters in your PV system 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 28).
2. Set the arrow on the rotary switch (C) to the required position using a screwdriver. The width of the screwdriver should be 2.5 mm.

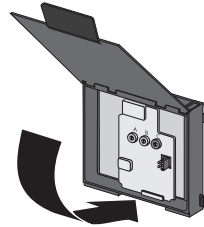


#### Acceptance of settings

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

### 5.3.6 Closing the Quick Module

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



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

## 5.4 Mounting the Quick Module



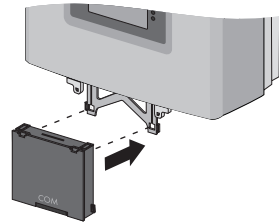
### NOTICE!

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

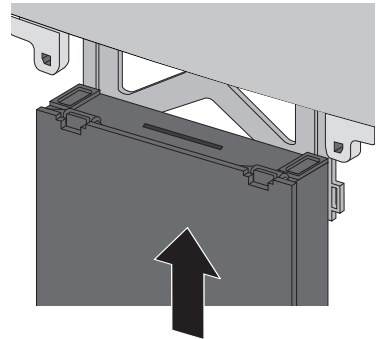
The Quick Module could be damaged when incorrectly installed in the inverter.

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

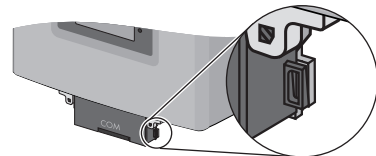
1. Disconnect the inverter on the AC and DC sides as described in section 8 "Disconnect the Inverter from Voltage Sources" (page 60).
2. Put the Quick Module into the designated holes on the bracket.



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



4. 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.



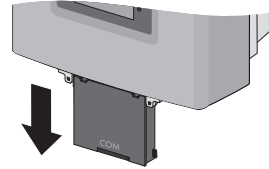
- The Quick Module is mounted.



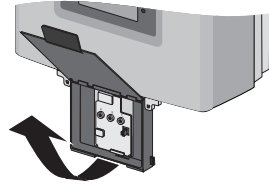
## 5.4.1 Changes via rotary switches after installation of the Quick Module

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:

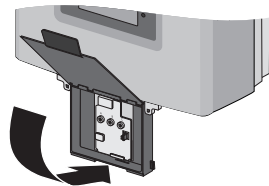
1. Disconnect the inverter on the AC and DC sides as described in section 8 "Disconnect the Inverter from Voltage Sources" (page 60).
2. Pull the Quick Module out to the first stopper.



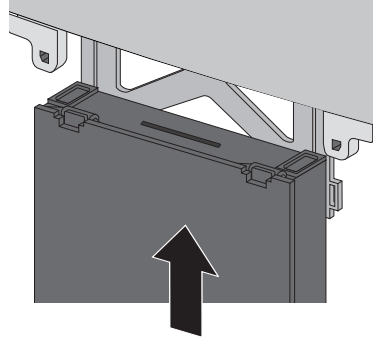
3. Flip the flap up and pen the lid until it locks in place.



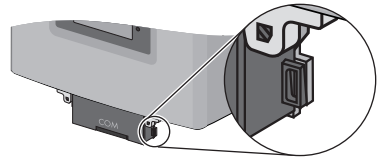
4. See section 5.3.4 "Setting the Country Standard and Language using Rotary Switches" (page 29) for setting the installation country and the display language.
5. See section 5.3.5 "Communication via Bluetooth" (page 30) for assigning the NetID via *Bluetooth*.
6. Close the lid of the Quick Module and flip the flap down again until it locks into place.



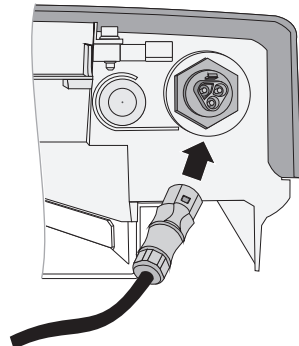
7. Push the Quick Module upwards in the guide slot until it clicks into place.



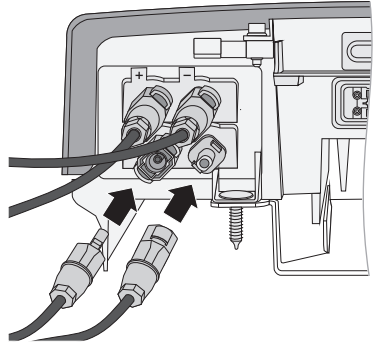
8. Check that the Quick Module is correctly seated. The loops of the Quick Module and the bracket must be positioned flush on top of each other.



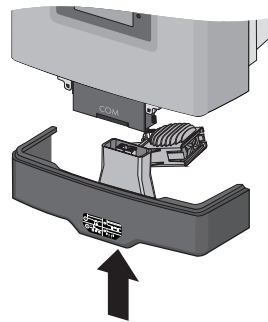
9. Connect the AC plug.



10. Check the DC connector for correct polarity and connect it.



11. Connect the Electronic Solar Switch.



**NOTICE!**

**Damage to Electronic Solar Switch.**

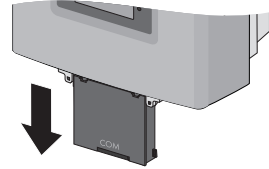
If it is not correctly connected, the Electronic Solar Switch can be damaged.

- Connect the handle firmly on to the socket of the Electronic Solar Switch.
- The holder must close flush with the enclosure.

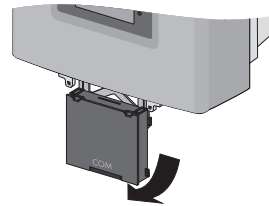
12. If a multi-function relay is connected, switch on the multi-function relay power supply.
13. Switch on the line circuit breaker.
- The changes have been set.

## 5.5 Dismantling the Quick Module

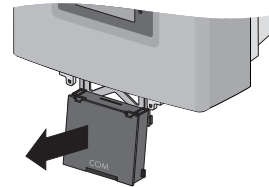
1. Disconnect the inverter on the AC and DC sides as described in section 8 "Disconnect the Inverter from Voltage Sources" (page 60).
2. Pull the Quick Module out over the first stopper to the last stopper.



3. Lift the Quick Module upwards until the guide lugs pass through the openings of the bracket.



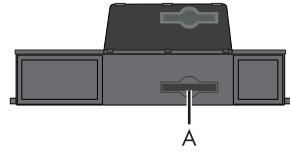
4. Carefully take the Quick Module out of the bracket.



- The Quick Module is disassembled.

## 5.6 Slot for SD card

The Quick Module is fitted with a slot for an SD card. The slot is to be found on the outside of the Quick Module (A).



There are a number of cases which require an SD card to be read in, such as:

- Under consultation with the SMA Serviceline, a firmware update is necessary. SMA Solar Technology AG will send you a file with the firmware update per e-mail. You will find the description of the Firmware update in the download area at [www.SMA.de/en](http://www.SMA.de/en).



### Properties of the SD Card

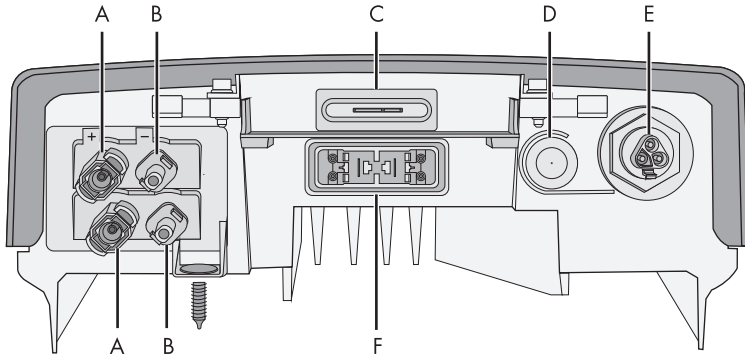
Use an SD card that is FAT16 or FAT32 formatted and has a maximum storage capacity of 2 GB.

Use the SD card exclusively for this inverter. Do not save any multimedia files or other unsuitable files on the SD card.

## 6 Electrical Connection

### 6.1 Overview of the Connection Area

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



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

## 6.2 Connection to the Public Grid (AC)

### 6.2.1 Conditions for the AC Connection



#### Connection requirements of the utility operator

Always observe the connection requirements of your utility operator.

#### Cable Sizing

The grid impedance of the AC cable must not exceed  $1 \Omega$ .

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

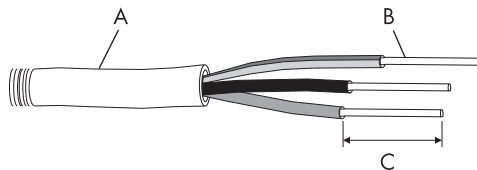
The maximum cable lengths relative to the conductor cross-section are shown in the following table. Do not exceed the maximum cable length.

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

The conductor cross-sectional area required in individual cases depends on the following factors among others:

- Ambient temperature,
- Routing method,
- Conduction losses,
- valid installation requirements of the respective country (installation location).

#### Cable requirements



Position	Description	Value
A	External diameter	6 mm ... 14 mm
B	Conductor cross-section	2.5 mm <sup>2</sup> ... 4 mm <sup>2</sup>
C	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 is located in section 13 "Technical Data" (page 83).

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](http://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 the destruction of the inverter.

- Never connect several inverters to the same line circuit breaker.
- Comply with the maximum permissible fuse protection of the inverter when selecting the line circuit breaker.

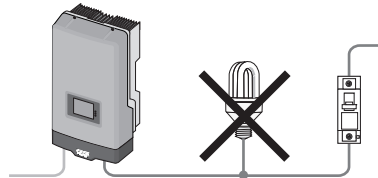


### DANGER!

**Danger to life due to fire.**

When a generator (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 overcurrent, which 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 load disconnection unit. A screw type fuse element is only used as cable protection.

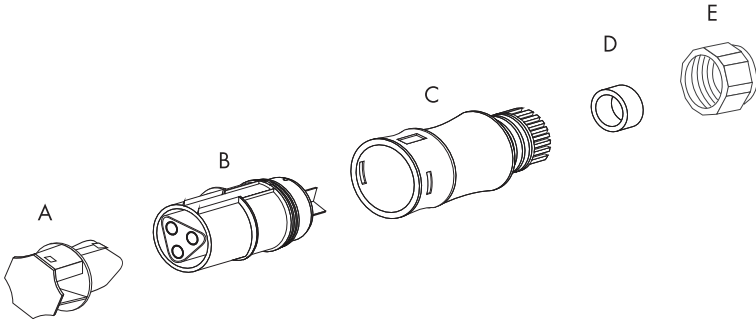
When disconnecting under load using a screw type fuse element, the inverter can be damaged.

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



## 6.2.2 Connecting the Inverter to the Public Grid (AC)

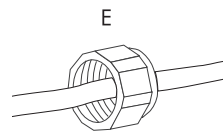
### Overview of the AC Coupling Socket



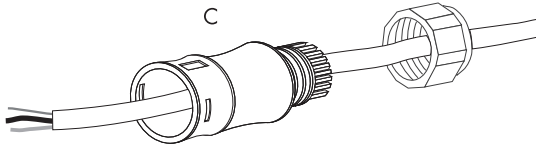
Object	Description
<b>A</b>	Protective cap for AC socket on inverter
<b>B</b>	Socket element
<b>C</b>	Threaded sleeve with sealing ring for cable diameters from 10 mm to 14 mm
<b>D</b>	Sealing ring for cable diameters of 6 mm to 10 mm
<b>E</b>	Clamping nut

### Connecting the Inverter to the Public Grid (AC)

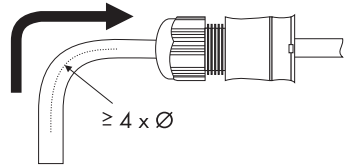
- Check the correct country setting of the inverter using the supplement provided against the factory settings.  
 If the inverter is not set to the desired country standard, then adjust the country standard using the rotary switches in the Quick Module as described in section 5.3.4 "Setting the Country Standard and Language using Rotary Switches" (page 29).
- Check the grid voltage and compare it with the permissible voltage range ( $V_{AC}$ ) (see section 13 "Technical Data" (page 83)).
- Disconnect the line circuit breaker and secure against re-connection.
- If necessary, exchange 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.
- Thread the clamping nut (E) over the AC cable.



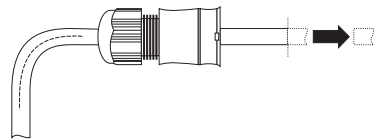
6. Thread the threaded sleeve (C) over the AC cable.



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

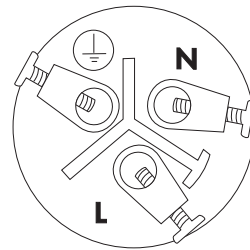


8. Shorten the cable.

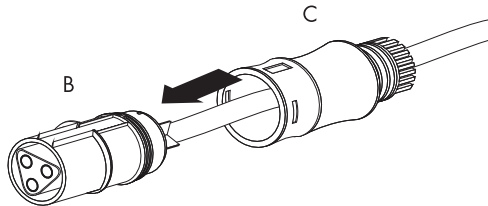


9. Shorten phase L and neutral conductor N 4 mm to 5 mm.  
The PE protective conductor must be longer than the connection wires of N and L.

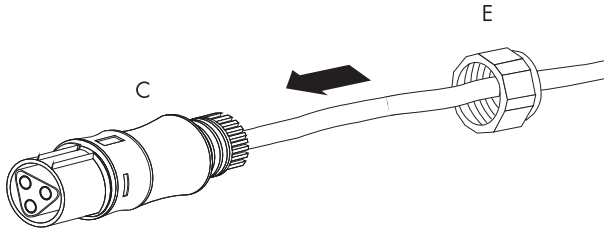
10. Insert the grounding conductor PE (green-yellow) in the screw terminal with the earth sign on the socket element and tighten the screw.
11. Insert the neutral conductor N (blue) in the screw terminal N on the socket element and tighten the screw.
12. Insert phase L (brown or black) into the screw terminal L on the socket element and tighten the screw.



13. Make sure the wires are securely connected.
14. Push the threaded sleeve (C) onto the socket element (B) until it audibly snaps into place.

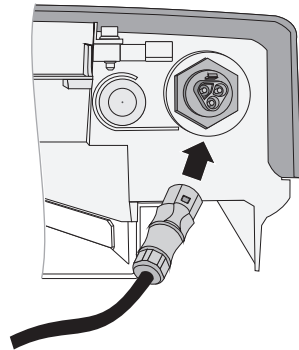


15. Screw the clamping nut (E) tightly onto the threaded sleeve (C). The clamping nut serves to seal and relieve strain.



The AC connection socket has been screwed together.

16. If the AC connection socket is not immediately connected to the inverter, close the AC socket on the inverter with the protective cap provided.
17. Insert the AC connection socket into the AC socket on the inverter audibly snaps into place. Remove the protective cap beforehand as required.



The AC cable is now connected to the inverter.



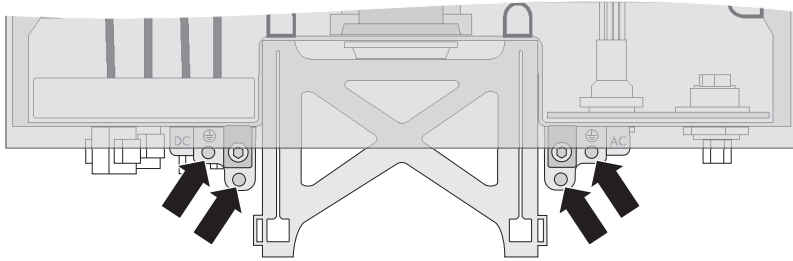
**DANGER!**

Danger to life due to high voltages in the inverter.

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

### 6.2.3 Connecting Additional Grounding

If a second protective conductor connection, additional grounding or a potential equalization is required in the country of installation, you can also ground the inverter on the enclosure (see illustration).



## 6.3 Connection of the PV Generator (DC)

### 6.3.1 Conditions for the DC Connection



#### Use of Adaptors

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

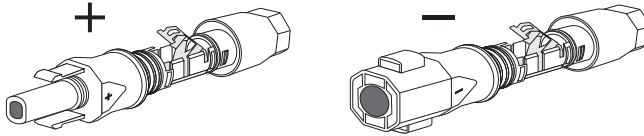
- The DC current flow must not be interrupted via adaptors.
- Observe the procedure for disconnecting the inverter as described in section 8 "Disconnect the Inverter from Voltage Sources" (page 60).
- Requirements for the PV modules of the connected strings:
  - Same type
  - Same number
  - Identical alignment
  - Identical tilt
- The connecting cables from the PV modules must be fitted 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
<b>SB 2000HF-30</b>	700 V	12 A
<b>SB 2500HF-30</b>	700 V	15 A
<b>SB 3000HF-30</b>	700 V	15 A

### 6.3.2 Assembling the DC Plug Connector

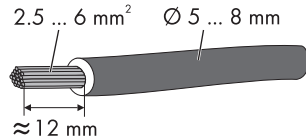
In order to connect to the inverter, all connection cables of the PV modules must be equipped with the DC plug connectors provided.

To assemble the DC plug connectors, proceed as detailed below. Ensure the plug connectors have the correct polarity. The DC plug connectors have the symbols "+" and "−".



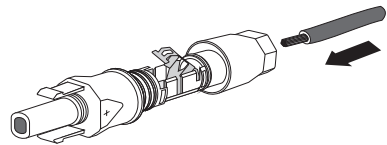
**Cable requirements:**

- Use a PV1-F cable.

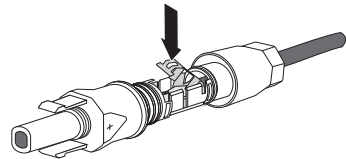


**Procedure:**

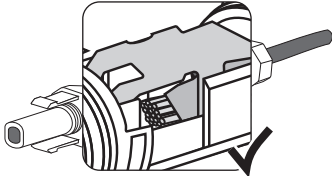
1. Insert stripped cable into the plug up to the limit.

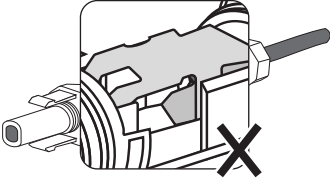
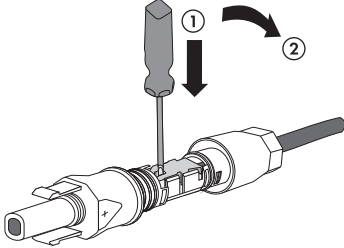


2. Press the clamping clip down until it audibly snaps into place.

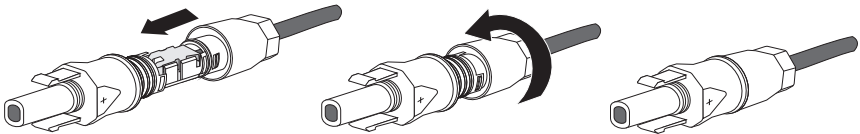


3. Ensure the cable is correctly in place:

Result	Action
<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"> <li>• Proceed to step 4.</li> </ul>

Result	Action
<p>☑ If the conductors are <b>not</b> visible in the hollow cavity, the cable is not in the correct position.</p> 	<ul style="list-style-type: none"> <li>Loosen the clamping clip using a screwdriver. The width of the screwdriver should be 3.5 mm.</li> </ul>  <ul style="list-style-type: none"> <li>Remove cable and start again from step 1.</li> </ul>

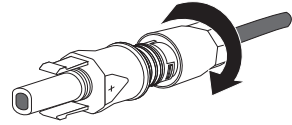
4. Push the threaded joint to the thread and screw into place.



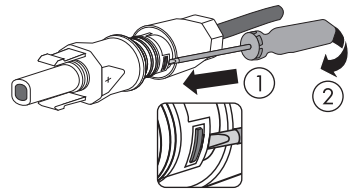
☑ The DC plug connectors are now assembled and can be connected to the inverters, as described in section 6.3.4 "Connecting the PV Generator (DC)" (page 49).

### 6.3.3 Opening the DC Plug Connector

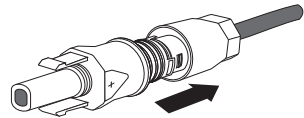
1. Screw the threaded joint off.



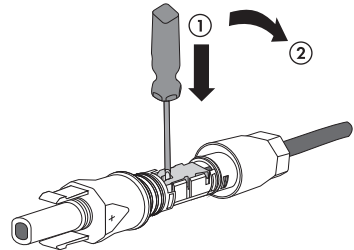
2. To release the plug connector, slot a screwdriver into the side catch mechanism and lever out.



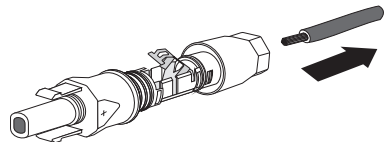
3. Carefully pull the DC plug connector apart.



4. Loosen the clamping clip using a screwdriver. The width of the screwdriver should be 3.5 mm.



5. Remove the cable.



- The cable is now removed from the DC plug connector.



### 6.3.4 Connecting the PV Generator (DC)



#### DANGER!

Danger to life due to high voltages in the inverter.

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



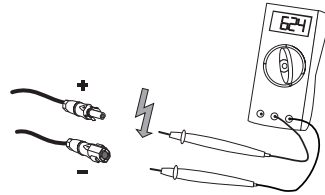
#### NOTICE!

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 secure against re-connection.
2. Check the connection cables of the PV modules for correct polarity and 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 system design and the PV module connection. If this is not done, the maximum inverter input voltage can be exceeded at low ambient temperatures.



#### NOTICE!

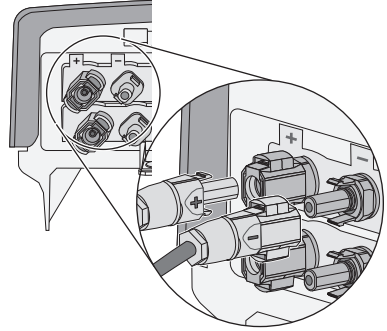
Destruction of the inverter due to overvoltage.

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

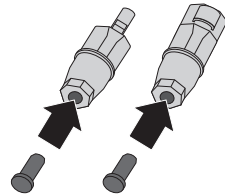
- Do not connect strings with an open circuit voltage greater than the maximum input voltage of the inverter.
- Check the system design.

3. Check the strings for ground faults, as described in section 11.1 "Checking the PV Generator for a Ground Fault" (page 74).

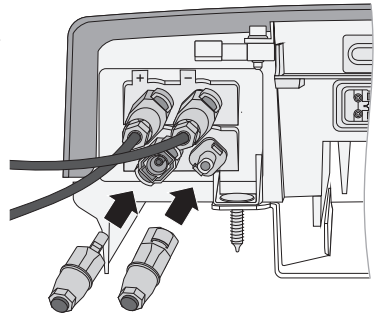
4. Check the DC plug connector for correct polarity and connect it. To release the plug connectors see section 8.2 "Disconnect the Inverter from Voltage Sources" (page 60).



5. 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 plugs into the DC inputs on the inverter.

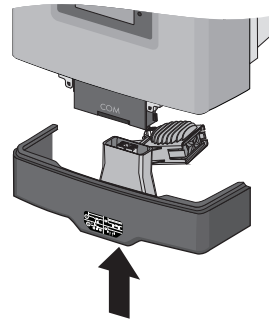


- Insert the DC plug connectors with sealing plugs into the corresponding DC inputs on the inverter.



6. Mount the Quick Module, as described in section 5.4 "Mounting the Quick Module" (page 32).

## 7. Connect the Electronic Solar Switch.

**NOTICE!****Damage to Electronic Solar Switch.**

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

- Connect the handle firmly on to the socket of the Electronic Solar Switch.
- The holder must close flush with the enclosure.

- The PV generator is connected to the inverter. You can now commission the inverter as described in section 7 "Commissioning" (page 52).

## 7 Commissioning

### 7.1 Commissioning the Inverter

1. Check for firm positioning on the wall  
(see section 4 "Mounting the Device" (page 16)).
2. Check for correct country configuration  
(see section 5.3.2 "Checking the Country Standard" (page 25)).
3. Check for correct connection of the AC grid cable  
(see section 6.2 "Connection to the Public Grid (AC)" (page 39)).
4. Check for correct connection of the DC cables (PV strings)  
(see section 6.3 "Connection of the PV Generator (DC)" (page 45)).
5. Close unnecessary DC inputs with the DC plug connectors and sealing plugs  
(see section 6.3.4 "Connecting the PV Generator (DC)" (page 49)).
6. Check whether all enclosure openings are closed.
7. Check whether the enclosure lid is firmly screwed in place.
8. Check for correct connection of the Quick Module.
9. Firmly connect the Electronic Solar Switch.
10. Check for correct design of the line circuit breaker.
11. Switch on the line circuit breaker.
12. If a multi-function relay is connected, switch on the multi-function relay power supply.



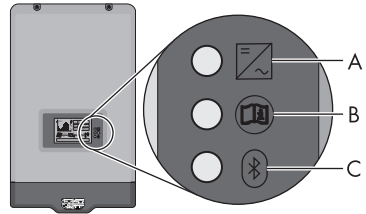
**Self test in accordance with ENEL directive for initial start-up  
(applies to Italy only)**

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 54). The test takes approx. 3 minutes.

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

LED	Color	Meaning
A	Green	Glowing: operation
		Flashing: waiting for sufficient irradiation
B	Red	Failure
C	Blue	Bluetooth Communication is active



- ☑ If the inverter has been commissioned successfully, the green LED should be on 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 "Error Messages" (page 68).

## 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.
 

FW PRCK XXXX HP XXXX
- 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.
 

SN 2120237148 XXXX
- After a further 5 seconds, or when you tap again, the configured standard is displayed (example: "VDE0126-1-1").
 

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

SPRACHE DEUTSCH
- During normal operation, the text line of the display will subsequently be clear. You can refer to the possible event messages in the scrolling lines and their meaning in section 10 "Messages" (page 67).

## 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. Prerequisite here is that the country configuration of the inverter has been set to Italy (Enel-GUIDA) or a reconfiguration based on the Enel-GUIDA country data set has been carried out. In addition, an undisturbed feed-in operation must be possible.



#### Display Language during the Self-Test

Independent 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 52).
  - 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 cover **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 55).

## 7.3.2 Test Sequence

Note the values which are displayed during the test sequence. These values must be entered into a test protocol. 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 actual voltage, the feed-in current and the frequency is displayed above the text rows independent of the test values.

### Overvoltage Test

The inverter begins with 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 achieved 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. TARATURA 276,0 V

- 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.

## 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 Interruption of the Self-Test

If, during the self-test, an unexpected disconnection requirement occurs, the self-test is interrupted. The same applies if the DC voltage is so low that the feed-in can not 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 59).

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 secure against re-connection.
  2. If a multi-function relay is connected, switch off the multi-function relay power supply.
  3. Disconnect the Electronic Solar Switch from the inverter for 5 minutes and then connect it again.
  4. Switch on the 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 54) from point 3.

## 8 Disconnect the Inverter from Voltage Sources

### 8.1 Safety



**NOTICE!**

**Electrostatic discharges can damage the inverter.**

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

- Ground yourself before touching a component.

### 8.2 Disconnect the Inverter from Voltage Sources



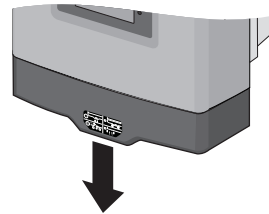
**DANGER!**

**Danger to life due to high voltages in the inverter.**

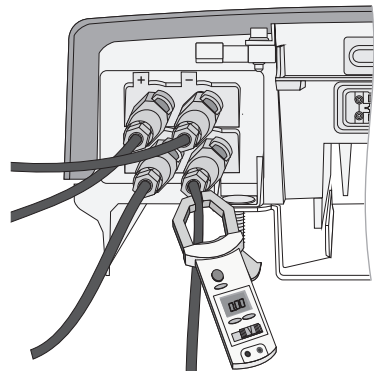
The inverter operates at high voltages.

- Disconnect the inverter on the AC and DC sides as described below.

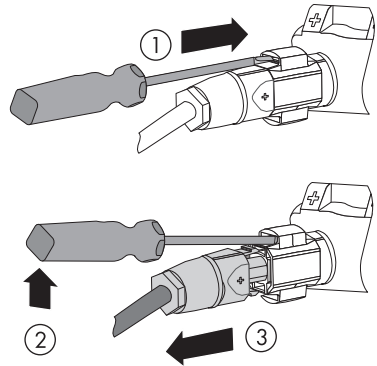
1. Disconnect the line circuit breaker and secure against re-connection.
2. If a multi-function relay is connected, switch off the multi-function relay power supply.
3. Remove the Electronic Solar Switch.



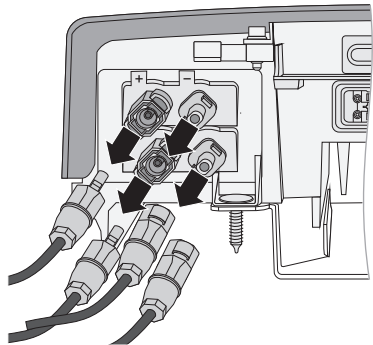
4. Using a current probe, ensure that there is no current to all DC cables.
  - If there is a current present, check the installation.



5. Unlock all DC connectors using a screwdriver. The width of the screwdriver should be 3.5 mm.
- Insert a screwdriver into one of the side slits (1).
  - Lever the screwdriver upward (2) and pull out the plug connector (3).



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

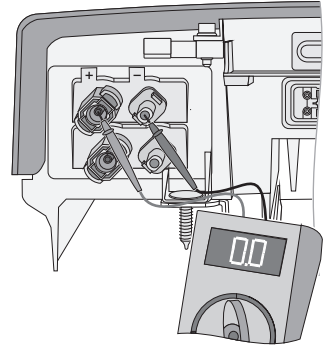
**DANGER!**

**Danger to life due to high voltages in the inverter.**

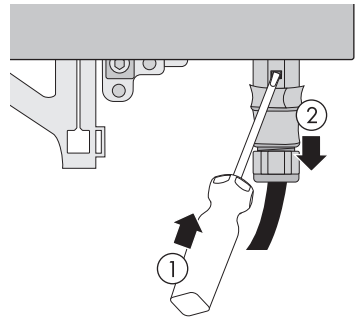
The capacitors in the inverter require 5 minutes to discharge.

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

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



8. Unlock the AC plug using a screwdriver and pull it out.



- The inverter is now free of voltage.

## 9 Maintenance and Cleaning

Impurities such as dust or pollen can cause heat accumulation that can lead to yield losses. Check the inverters and the cables for visible external damage. Contact the SMA Serviceline if the inverter is damaged. 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 too high warming (temperature symbol on the display illuminates), this can be caused by the following:

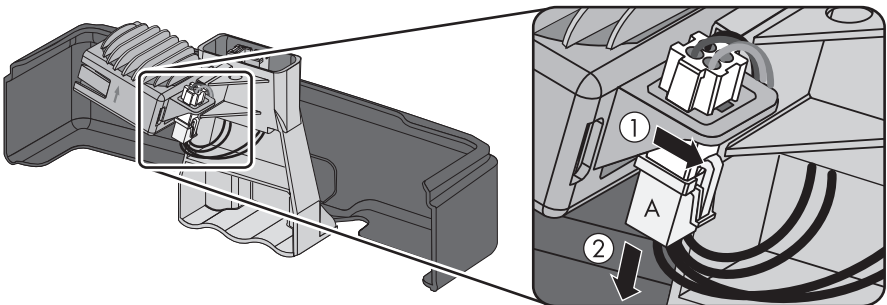
- The cooling fins on the rear side of the enclosure are clogged with dirt.
  - Clean the cooling fins when necessary with a soft brush.
- The fan is clogged.
  - Clean the fan as described in the following.

#### 9.1.1 Cleaning the fan

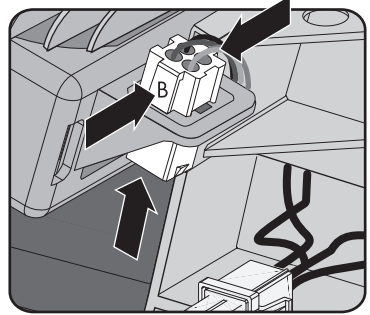
If the fan housing is only soiled with loose dust, they can be cleaned using a vacuum cleaner. If the fan housing is only soiled with loose dust, they can be cleaned using a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, you can dismantle the fan for cleaning.

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

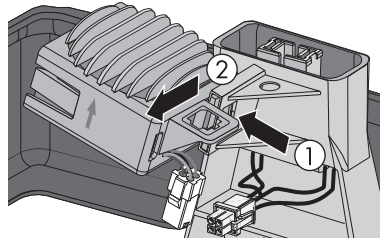
1. Disconnect the inverter as described in section 8 "Disconnect the Inverter from Voltage Sources" (page 60).
2. Unlock (1) and pull out (2) the fan socket (A).



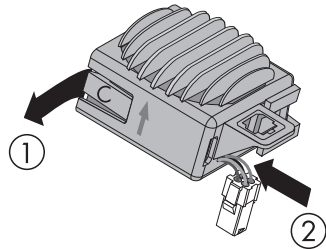
3. Push both latches (B) of the socket, which is fixed to the fan, together and remove the socket from the opening.



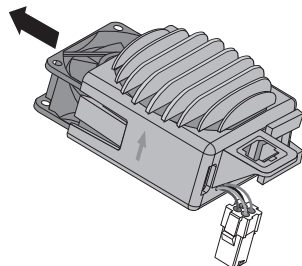
4. **Optional:** Push the latch on the holder of the Electronic Solar Switch downwards (1) and at the same time remove the fan housing with fan (2).



5. Push the latches on the sides of the fan housing (C) outwards (1) and push the fan out of the housing from the rear side (2).



6. Remove the fan with socket from the fan housing.





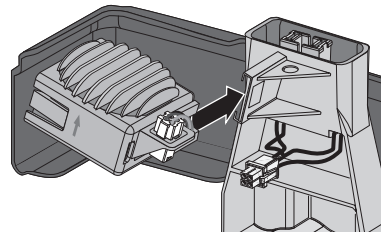
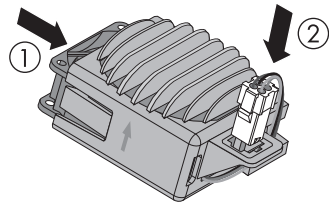
7. Clean the fan with a soft brush, a paint brush, or a damp cloth.

**NOTICE!****Damage to the fan through the use of pressurized air.**

- Do not use pressurized air to clean the fan. This can damage the fan.

8. Clean the fan housing with a soft brush, a paint brush, a cloth or pressurized air.
9. After cleaning, reassemble everything in reverse order.
10. Visual inspection:

- The side of the fan with the arrows must be inserted into the fan housing first during reassembly (1). The arrows on the fan must point to the left and upwards.
- The socket must again be inserted in the opening from above (2).
- The arrow on the fan housing and the fins must be showing upwards during fitting to the Electronic Solar Switch.



- The fan has been cleaned.

11. Re-commission the inverter as described in section 7 "Commissioning" (page 52).

**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 Fans" (page 66).

## 9.1.2 Checking the Fans



### Checking the Fan

To test the fan you will need a special data logging 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. Request the installer password from the SMA Serviceline (contact: see Page 93).
2. Set the "CoolSys.FanTst" or "Fan test" parameter to "On" in the installer mode.
3. Check the air-flow of the fan.

The inverter sucks air in from underneath and then blows it back out on the upper left side. Listen for any unusual noise, which could indicate incorrect installation or that the fan is faulty.

4. After checking the fan, set the "CoolSys.FanTst" or "Fan test" parameter back to "Off".
- You have finished checking the fan.

# 10 Messages

## 10.1 The green LED is glowing or flashing

### Green LED is 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 not sufficient 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 54)).
< Inst.code valid >	The SMA guard grid code entered is valid. The configured country data set is now unblocked and can be changed. If the configured country data set is protected, the unlocking is valid for a maximum of 10 feed-in hours.
< No new update SDcard >	There is no update file relevant for this inverter on the SD card or the available update has already been carried out.
< Grid param. unchanged>	The selected switch setting is not programmed or there is no country data set available on the SD card.
< Parameters set successfully >	A new country data set has been configured.
< SD card is read >	The inverter is currently reading the SD card.
< Set parameter >	The inverter sets the parameters.
< Update completed >	The inverter has successfully completed the update.
< Update Bluetooth >	Successful update of the <i>Bluetooth</i> components.
< Update display >	Successful update of display.
< Update main CPU >	Successful update of inverter component.
< Update communication >	Successful update of communication component.

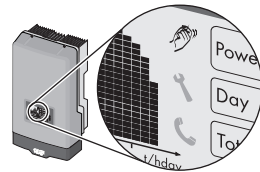
Display	Description
< Update RS485I module >	Successful update of communication interface.
< Upd. language table >	Successful update of language table.
< Update file OK >	The file found is valid.

### 10.3 Error Messages

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, multi-line messages can be switched further. If the error exists over a long period of time, the red LED begins to light 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>&lt; Grid fault &gt;</p> <p>The grid voltage has exceeded the permissible range. This error can have the following causes:</p> <ul style="list-style-type: none"> <li>• The grid voltage at the point of connection of the inverter is too high.</li> <li>• Grid impedance at the terminal of the inverter is too high.</li> </ul> <p>For safety reasons, the inverter disconnects itself from the grid.</p>	<ul style="list-style-type: none"> <li>• Check the grid current and grid connection on the inverter.</li> </ul> <p>If the grid voltage lies outside the acceptable range because of local grid conditions, ask the utility provider if the voltage can be adjusted at the feed-in 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>&lt; Grid fault &gt;</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"> <li>• Grid disconnected</li> <li>• AC cable damaged</li> <li>• The grid voltage at the point of connection of the inverter is too low.</li> </ul> <p>For safety reasons, the inverter disconnects itself from the grid.</p>	<ul style="list-style-type: none"> <li>• Check for tripping of the line circuit breaker.</li> <li>• Check the grid current and grid connection on the inverter.</li> </ul> <p>If the grid voltage lies outside the acceptable range because of local grid conditions, ask the utility provider if the voltage can be adjusted at the feed-in 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>&lt; Grid fault &gt;</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"> <li>• The grid voltage at the point of connection of the inverter is too high.</li> <li>• Grid impedance at the terminal of the inverter is too high.</li> </ul> <p>The inverter disconnects to assure compliance with the voltage quality of the grid.</p>	<ul style="list-style-type: none"> <li>• Check the grid voltage at the point of connection of the inverter:</li> </ul> <p>If due to local grid conditions the grid voltage exceeds the configured limiting value, ask the utility provider whether the voltage can be adjusted at the feed-in 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 acceptable range, and this error is still displayed, contact the SMA Serviceline.</p>
4	<p>&lt; Grid fault &gt;</p> <p>The inverter has left the grid parallel operation and for safety reasons interrupted feeding-in.</p>	<ul style="list-style-type: none"> <li>• Check the power supply line for strong, short-term frequency variations.</li> </ul>
5	<p>&lt; Grid fault &gt;</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"> <li>• If possible, check the grid frequency and observe how often major deviations occur.</li> </ul> <p>If repeated frequency variations occur and as a result this error occurs, ask the utility provider if it would agree to modify the operating parameter.</p> <p>Discuss the proposed parameters with the SMA Serviceline.</p>

Event no.	Display message and cause	Corrective measures
6	<p>&lt; Grid fault &gt;</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"> <li>• Check the grid connection for direct current.</li> <li>• If this is a recurrent phenomenon, check with the utility provider whether it is possible to raise the limiting value of monitoring.</li> </ul>
7	<p>&lt; Frq. not permitted &gt;</p> <p>The grid frequency has left the allowable range. For safety reasons, the inverter disconnects itself from the grid.</p>	<ul style="list-style-type: none"> <li>• If possible, check the grid frequency and observe how often major deviations occur.</li> </ul> <p>If repeated frequency variations occur and as a result this error occurs, ask the utility provider if it would agree to modify the operating parameter.</p> <p>Discuss the proposed parameters with the SMA Serviceline.</p>
8	<p>&lt; Waiting for grid voltage &gt;</p> <p>&lt; Grid failure &gt;</p> <p>    &lt; Check fuse &gt;</p>	<ul style="list-style-type: none"> <li>• Check fuse.</li> <li>• Check AC installation.</li> <li>• Check whether there is a general black-out.</li> </ul>
33	<p>&lt; Unstable operation &gt;</p> <p>The supply at the DC input of the inverter is not sufficient for stable operation. The reason for this could be snow-covered PV modules.</p>	<ul style="list-style-type: none"> <li>• Wait for higher irradiation.</li> <li>• If this event recurs at medium irradiation, check the PV system design and correct the connection of the PV generator.</li> </ul>
34	<p>&lt; DC overvoltage &gt;</p> <p>    &lt; Disconnect generator &gt;</p> <p>The DC input voltage connected to the inverter is too high.</p>	<ul style="list-style-type: none"> <li>• <b>Immediately disconnect the inverter from the PV generator, as described in section 8.2 "Disconnect the Inverter from Voltage Sources" (page 60)! Otherwise, the inverter may be destroyed.</b></li> <li>• 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 generator.</li> </ul>

Event no.	Display message and cause	Corrective measures
35	<p>&lt; Insulation resist. &gt;            &lt; Check generator &gt;</p> <p>The inverter has detected a ground fault in the PV generator. However, the inverter continues feeding into the grid.</p>	<ul style="list-style-type: none"> <li>• Check the strings for ground faults, as described in section 11.1 "Checking the PV Generator for a Ground Fault" (page 74).</li> <li>• The installer of the PV generator must remedy the ground faults before you re-connect the affected string.</li> </ul>
	<p>&lt; Ground fuse fault &gt;            &lt; Check ground fuse &gt;</p> <p>The inverter has detected a ground voltage in the grounding path.</p>	<ul style="list-style-type: none"> <li>• Check the ground fuse as described in the in installation guide of the SMA plug-in Grounding. Check the strings for ground faults, as described in section 11.1 "Checking the PV Generator for a Ground Fault" (page 74).</li> </ul>
38	<p>&lt; DC overcurrent &gt;            &lt; Check generator &gt;</p> <p>An overcurrent condition occurs on the DC side of the inverter and the inverter switches off.</p>	<p>If this event occurs often:</p> <ul style="list-style-type: none"> <li>• Check the layout and the wiring of the PV generator.</li> </ul>
39	<p>&lt; Wait for DC start conditions &gt;            &lt; Start cond. not met &gt;</p> <p>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"> <li>• Wait for higher irradiation.</li> <li>• If this event recurs at medium irradiation, check the PV system design and correct the connection of the PV generator.</li> </ul>
42	<p>&lt; Wrong earthing type; check earthing set &gt;</p> <p>The polarity of the grounding set does not correspond to the polarity set at the inverter.</p>	<ul style="list-style-type: none"> <li>• Check polarity of grounding set.</li> <li>• Remove grounding set.</li> <li>• Turn grounding set 180° and reconnect with correct polarity.</li> </ul>
60 - 64	<p>&lt; Self diagnosis &gt;            &lt; Interference device &gt;</p>	<ul style="list-style-type: none"> <li>• Contact the SMA Serviceline (see section 15 "Contact" (page 93)).</li> </ul>
65	<p>&lt; Self diagnosis &gt;            &lt; Overtemperature &gt;</p> <p>The inverter switches off due to too high temperature</p>	<ul style="list-style-type: none"> <li>• Ensure sufficient ventilation.</li> <li>• Check heat dissipation, as described in section 9.1 "Checking Heat Dissipation" (page 63).</li> </ul>
66	<p>&lt; Self diagnosis &gt;            &lt; Overload &gt;</p>	<ul style="list-style-type: none"> <li>• Contact the SMA Serviceline (see section 15 "Contact" (page 93)).</li> </ul>

Event no.	Display message and cause	Corrective measures
67	<p>&lt; Comm. disturbed &gt;</p> <p>A fault has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid.</p>	<p>If this event occurs often:</p> <ul style="list-style-type: none"> <li>Contact the SMA Serviceline (see section 15 "Contact" (page 93)).</li> </ul>
68	<p>&lt; Self diagnosis &gt;</p> <p>&lt; Input A defective &gt;</p>	<ul style="list-style-type: none"> <li>Contact the SMA Serviceline (see section 15 "Contact" (page 93)).</li> </ul>
70	<p>&lt; Sensor fault fan permanently on &gt;</p>	<ul style="list-style-type: none"> <li>Contact the SMA Serviceline (see section 15 "Contact" (page 93)).</li> </ul>
71	<p>&lt; SD card defective &gt;</p>	<p>Re-format the SD card.</p> <ul style="list-style-type: none"> <li>Re-save the files to the SD card.</li> </ul>
	<p>&lt; Parameter file not found or defective &gt;</p>	<ul style="list-style-type: none"> <li>Copy the parameter file into the card drive:\PARASET directory.</li> </ul>
	<p>&lt; Param. setting failed &gt;</p>	<ul style="list-style-type: none"> <li>Check the parameters for valid values.</li> <li>Ensure change rights via SMA Grid Guard code.</li> </ul>
	<p>&lt; Update file defect. &gt;</p>	<ul style="list-style-type: none"> <li>Re-format the SD card.</li> <li>Re-save the files to the SD card.</li> </ul>
	<p>&lt; No update file found &gt;</p>	<ul style="list-style-type: none"> <li>Copy the update file into the SD card drive:\UPDATE directory.</li> </ul>
72	<p>&lt; Data stor. not poss. &gt;</p> <p>Internal device fault: however, the inverter continues to feed in.</p>	<ul style="list-style-type: none"> <li>If this fault occurs often, contact the SMA Serviceline (see section 15 "Contact" (page 93)).</li> </ul>
73	<p>&lt; Update main CPU failed &gt;</p> <p>Internal device fault.</p>	<ul style="list-style-type: none"> <li>Contact the SMA Serviceline (see section 15 "Contact" (page 93)).</li> </ul>
	<p>&lt; Update RS485I module failed &gt;</p> <p>Internal device fault: however, the inverter continues to feed in.</p>	<ul style="list-style-type: none"> <li>Re-try update.</li> <li>If this fault occurs again, contact the SMA Serviceline (see section 15 "Contact" (page 93)).</li> </ul>
	<p>&lt; Update BT failed &gt;</p> <p>Internal device fault: however, the inverter continues to feed in.</p>	
	<p>&lt; Upd. display failed &gt;</p> <p>Internal device fault: however, the inverter continues to feed in.</p>	
	<p>&lt; Update language table failed &gt;</p> <p>Internal device fault: however, the inverter continues to feed in.</p>	



Event no.	Display message and cause	Corrective measures
74	< Varistor defective >	<ul style="list-style-type: none"> <li>Check the varistors as described in section 11.2 "Checking the Functioning of the Varistors" (page 76).</li> </ul>
75	< Fan fault > < Clean fan >	<ul style="list-style-type: none"> <li>Check heat dissipation as described in section 9.1 "Checking Heat Dissipation" (page 63).</li> </ul>
77	< Self diagnosis > < Interference device >	<ul style="list-style-type: none"> <li>Contact the SMA Serviceline (see section 15 "Contact" (page 93)).</li> </ul>
80	< Derating occurred > The delivered power of the inverter was reduced below nominal power due to a too-high temperature for more than 10 minutes.	<p>If this event occurs often:</p> <ul style="list-style-type: none"> <li>Ensure sufficient ventilation.</li> <li>Check heat dissipation as described in section 9.1 "Checking Heat Dissipation" (page 63).</li> </ul>
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"> <li>Contact the SMA Serviceline (see section 15 "Contact" (page 93)).</li> </ul>
90	< Inst. code invalid > The SMA Grid Guard code entered (personal installer password) is invalid.	<ul style="list-style-type: none"> <li>A valid SMA Grid Guard code has been entered.</li> </ul>
	< Grid param. locked > The actual country data set is locked.	<ul style="list-style-type: none"> <li>Enter the valid SMA Grid Guard code for changing the country data set.</li> </ul>
	< Abort self-test >	<ul style="list-style-type: none"> <li>Contact the SMA Serviceline (see section 15 "Contact" (page 93)).</li> </ul>
	< Changing grid param. not possible > <ul style="list-style-type: none"> <li>The selected rotary switch setting for the country configuration is not programmed.</li> <li>The parameters to be changed are protected.</li> </ul> < Ensure DC supply > The DC supply for the writing procedure is not sufficient.	<ul style="list-style-type: none"> <li>Check setting of the rotary switch (see section 5.3.2 "Checking the Country Standard" (page 25)).</li> <li>Enter the SMA Grid Guard code</li> <li>Ensure sufficient DC voltage is available.</li> </ul>

# 11 Failure Search

## 11.1 Checking the PV Generator 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 generator.

Check the strings for ground faults, as described in the following:

1. Disconnect the inverter on the AC and DC sides as described in section 8.2 "Disconnect the Inverter from Voltage Sources" (page 60).

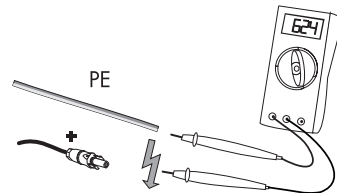
**DANGER!**  
Risk of lethal electric shock.

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

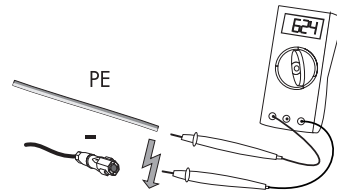
**NOTICE!**  
Excessive voltages can destroy the measuring device.

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

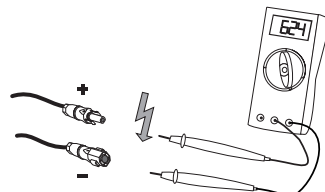
2. Measure the voltages between the positive pole of the strings and the ground potential (PE).



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



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

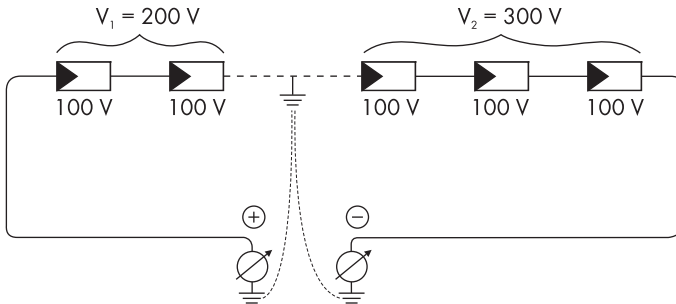


- ☑ If the voltages measured are stable and the total of the voltages from the plus pole against ground potential and the minus pole against ground potential of a string roughly corresponds to the voltage between the plus pole and minus pole, then there is a ground fault.

Result	Action
☑ You have found <b>a</b> ground fault.	<ul style="list-style-type: none"> <li>The installer of the PV generator must remedy the ground fault in the affected string before you may reconnect the string to the inverter.</li> <li>Do <b>not</b> reconnect the faulty string.</li> <li>Re-commission the inverter as described in section 7 "Commissioning" (page 52).</li> </ul>
☑ You have found <b>no</b> ground fault.	<p>It is likely that one of the thermally monitored varistors is defective.</p> <ul style="list-style-type: none"> <li>Check the function of the varistors as described in section 11.2 "Checking the Functioning of the Varistors" (page 76).</li> </ul>

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 module.

- ☑ The ground fault check is finished.

## 11.2 Checking the Functioning 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.



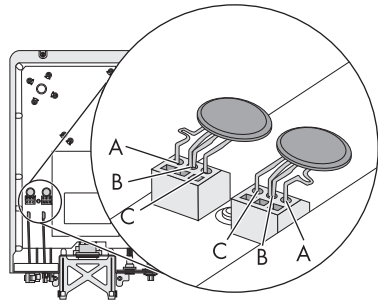
### Position of Varistors

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 on the AC and DC sides as described in section 8 "Disconnect the Inverter from Voltage Sources" (page 60).



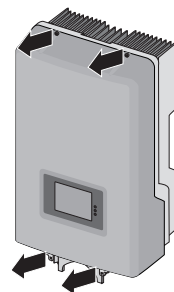
### DANGER!


Danger to life due to high voltages in the inverter.

The capacitors require 5 minutes to discharge.

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


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



 **NOTICE!**  
**Electrostatic discharges can damage the inverter.**

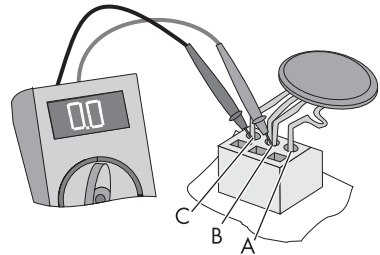
Internal components of the inverter can be irreparably damaged by electrostatic discharge.

- Ground yourself before touching 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 connectors B and C.



Result	Action
<input checked="" type="checkbox"/> There is a <b>conducting</b> connection.	There is probably a different fault in the inverter. <ul style="list-style-type: none"> <li>• Continue with point 9.</li> <li>• Consult the SMA Serviceline for details on further procedure.</li> </ul>
<input checked="" type="checkbox"/> There is <b>no conducting</b> 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 that you replace 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 92)). <ul style="list-style-type: none"> <li>• To replace the varistors, proceed to step 5.</li> </ul>

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

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

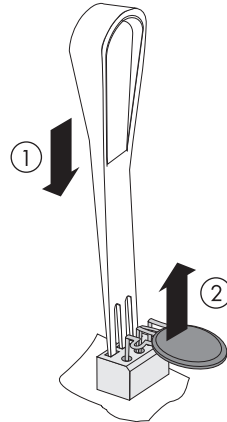
- Do **not** operate the inverter without varistors in plants with a high risk of DC overvoltages.
- Replacement varistors should be obtained as soon as possible.

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

The terminal clamps loosen.

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

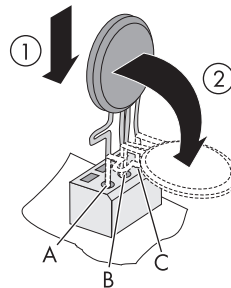
6. Remove the varistor (2).



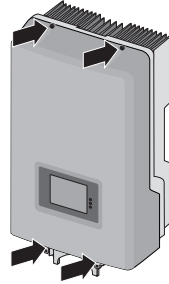
7. Insert new varistor (1).

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 housing cover.
10. Tighten the screws.



11. Re-commission the inverter as described in section 7 "Commissioning" (page 52).
  - The check and replacement of the varistors is completed.

## 12 Decommissioning

### 12.1 Dismantling the Inverter

1. Disconnect the inverter on the AC and DC sides as described in section 8 "Disconnect the Inverter from Voltage Sources" (page 60).

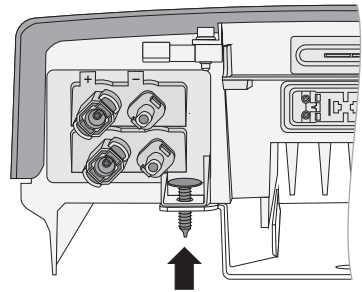


#### CAUTION!

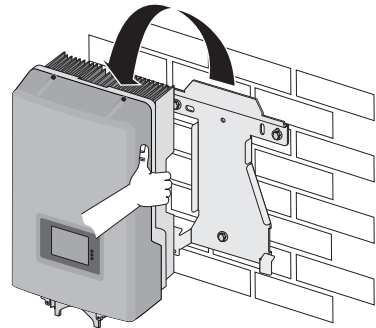
**Danger of burn injuries due to hot enclosure parts.**

- Wait 30 minutes before disassembling until the housing has cooled down.

2. Loosen the connection screw between the enclosure and the wall or loosen the security lock.



3. Remove the inverter from the wall mounting bracket.



- The inverter is dismantled.

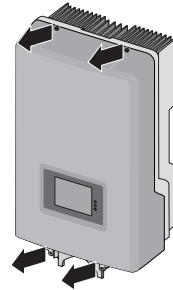


## 12.2 Replacing the Enclosure Lid

In the event of a fault it can be that your inverter must be replaced. In this case you 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. Dismantle the inverter as described in section 12.1 "Dismantling the Inverter" (page 80).
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 cover of the replacement device onto your inverter:

1. Put on the transport cover.
2. Tighten the screws.
  - You can now send your inverter with transport cover to SMA Solar Technology AG.
3. Fix the enclosure lid of your inverter onto the replacement device.
4. Mount (see section 4 "Mounting the Device" (page 16)) and connect the replacement device as described in section 6 "Electrical Connection" (page 38).

## 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  $-25\text{ °C}$  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") (see section Page 93).

## 13 Technical Data

### 13.1 Sunny Boy 2000HF

#### DC Input

Maximum DC power at $\cos \varphi = 1$	2,100 W
Maximum DC voltage *	700 V
MPP voltage range at AC nominal power	175 V ... 560 V
DC nominal voltage	530 V
Minimum DC voltage	175 V
Start voltage, adjustable	220 V
Maximum input current	12.0 A
Maximum input current per string	12.0 A
Number of MPP trackers	1
Strings per MPP tracker	2
Voltage ripple of input voltage	< 10 %

\* 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

AC nominal power at 230 V, 50 Hz	2,000 W
Maximum AC apparent power	2,000 VA
Nominal AC voltage	220 V / 230 V / 240 V
Nominal AC current at 220 V / 230 V / 240 V	9.1 A / 8.7 A / 8.3 A
AC voltage range	180 V ... 280 V
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
Maximum output current	11.4 A
Harmonic distortion of output current at AC THD voltage < 2 % AC power > 0.5 AC nominal power	$\leq 3\%$
Power factor $\cos \varphi$ at nominal AC power	1
Supply phases	1
Connection phases	1
Overvoltage category	III

\*\* depending on country configuration, e.g. 600 V ... 700 V

## 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

Transport type E, class 2K3

Temperature range	- 25 °C ... +70 °C
-------------------	--------------------

## Protective Devices

DC reverse polarity prevention	Short-circuit diode
All-pole DC disconnection unit	Electronic Solar Switch, DC plug system SUNCLIX
DC overvoltage protection	Thermally monitored varistors
Personal protection (Riso > 1 M Ω)	Insulation monitoring
AC short circuit protection	Current control
All-pole AC disconnection unit	Automatic disconnection device SMA Grid Guard 3
Maximum fuse protection	25 A
Galvanic isolation	available

## General data

Width x height x depth with Electronic Solar Switch	348 mm x 580 mm x 145 mm
Weight	17 kg
Width x height x depth of packaging	450 mm x 600 mm x 400 mm
Transport weight	21 kg
Operating temperature range	- 25 °C ... +60 °C
Maximum operating altitude above mean sea level	3,000 m
Noise emission (typical)	No data
Internal consumption in night mode	< 1 W
Topology	HF transformer
Protection rating according to IEC 60529	IP65
Cooling concept	OptiCool: temperature-controlled fan
Protection class	I

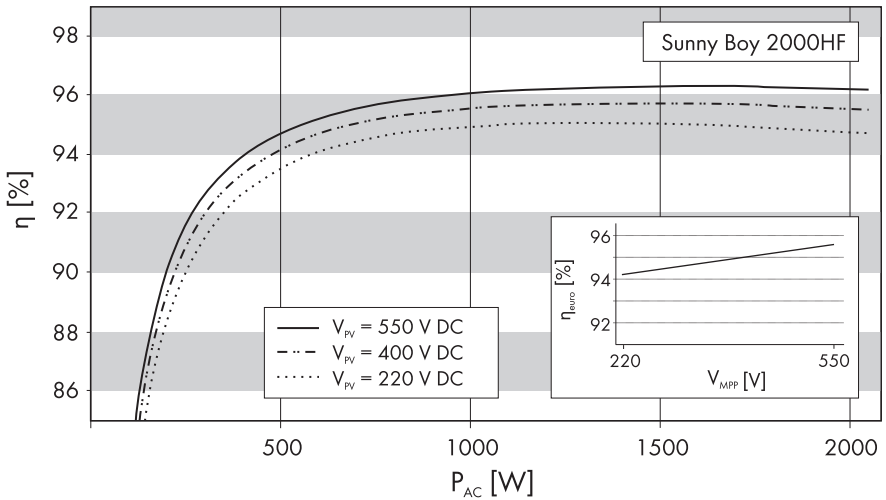
**Features**

DC connection	DC plug system SUNCLIX
AC connection	AC connector
Display	LC graphic display
Bluetooth	Standard
RS485, galvanically isolated	Optional

**Electronic Solar Switch**

Electrical 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

**Efficiency**



Max. efficiency	$\eta_{max}$	96.3 %
European efficiency	$\eta_{EU}$	95.0 %

## 13.2 Sunny Boy 2500HF

### DC Input

Maximum DC power at $\cos \varphi = 1$	2,650 W
Maximum DC voltage *	700 V
MPP voltage range at AC nominal power	175 V ... 560 V
DC nominal voltage	530 V
Minimum DC voltage	175 V
Start voltage, adjustable	220 V
Maximum input current	15.0 A
Maximum input current per string	15.0 A
Number of MPP trackers	1
Strings per MPP tracker	2
Voltage ripple of input voltage	< 10 %

\* The maximum open circuit voltage, which can occur at a cell temperature of  $-10\text{ }^{\circ}\text{C}$ , may not exceed the maximum input voltage.

### AC Output

AC nominal power at 230 V, 50 Hz	2,500 W
Maximum AC apparent power	2,500 VA
Nominal AC voltage	220 V / 230 V / 240 V
Nominal AC current at 220 V / 230 V / 240 V	11.4 A / 10.9 A / 10.4 A
AC voltage range	180 V ... 280 V
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
Maximum output current	14.2 A
Harmonic distortion of output current at AC THD voltage < 2 % AC power > 0.5 AC nominal power	$\leq 3\%$
Power factor $\cos \varphi$ at nominal AC power	1
Supply phases	1
Connection phases	1
Overvoltage category	III

\*\* depending on country configuration, e.g. 600 V ... 700 V

## 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

Transport type E, class 2K3

Temperature range	- 25 °C ... +70 °C
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## Protective Devices

DC reverse polarity prevention	Short-circuit diode
All-pole DC disconnection unit	Electronic Solar Switch, DC plug system SUNCLIX
DC overvoltage protection	Thermally monitored varistors
Personal protection (Riso > 1 M Ω)	Insulation monitoring
AC short circuit protection	Current control
All-pole AC disconnection unit	Automatic disconnection device SMA Grid Guard 3
Maximum fuse protection	25 A
Galvanic isolation	available

## General data

Width x height x depth with Electronic Solar Switch	348 mm x 580 mm x 145 mm
Weight	17 kg
Width x height x depth of packaging	450 mm x 600 mm x 400 mm
Transport weight	21 kg
Operating temperature range	- 25 °C ... +60 °C
Maximum operating altitude above mean sea level	3,000 m
Noise emission (typical)	No data
Internal consumption in night mode	< 1 W
Topology	HF transformer
Protection rating according to IEC 60529	IP65
Cooling concept	OptiCool: temperature-controlled fan
Protection class	I

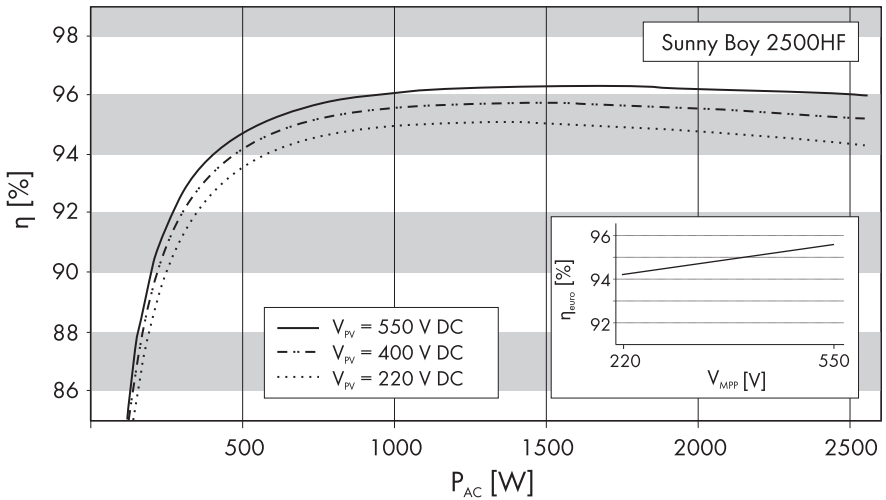
### Features

DC connection	DC plug system SUNCLIX
AC connection	AC connector
Display	LC graphic display
Bluetooth	Standard
RS485, galvanically isolated	Optional

### Electronic Solar Switch

Electrical 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

### Efficiency



Max. efficiency	$\eta_{max}$	96.3 %
European efficiency	$\eta_{EU}$	95.4 %



## 13.3 Sunny Boy 3000HF

### DC Input

Maximum DC power at $\cos \varphi = 1$	3,150 W
Maximum DC voltage *	700 V
MPP voltage range at AC nominal power	210 V ... 560 V
DC nominal voltage	530 V
Minimum DC voltage	175 V
Start voltage, adjustable	220 V
Maximum input current	15.0 A
Maximum input current per string	15 A
Number of MPP trackers	1
Strings per MPP tracker	2
Voltage ripple of input voltage	< 10 %

\* The maximum open circuit voltage, which can occur at a cell temperature of  $-10\text{ }^{\circ}\text{C}$ , may not exceed the maximum input voltage.

### AC Output

AC nominal power at 230 V, 50 Hz	3,000 W
Maximum AC apparent power	3,000 VA
Nominal AC voltage	220 V / 230 V / 240 V
Nominal AC current at 220 V / 230 V / 240 V	13.6 A / 13.0 A / 12.5 A
AC voltage range	180 V ... 280 V
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
Maximum output current	15.0 A
Harmonic distortion of output current at AC THD voltage < 2 % AC power > 0.5 AC nominal power	$\leq 3\%$
Power factor $\cos \varphi$ at nominal AC power	1
Supply phases	1
Connection phases	1
Overvoltage category	III

\*\* depending on country configuration, e.g. 600 V ... 700 V

## 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

Transport type E, class 2K3

Temperature range	- 25 °C ... +70 °C
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## Protective Devices

DC reverse polarity prevention	Short-circuit diode
All-pole DC disconnection unit	Electronic Solar Switch, DC plug system SUNCLIX
DC overvoltage protection	Thermally monitored varistors
Personal protection (Riso > 1 M Ω)	Insulation monitoring
AC short circuit protection	Current control
All-pole AC disconnection unit	Automatic disconnection device SMA Grid Guard 3
Maximum fuse protection	25 A
Galvanic isolation	available

## General data

Width x height x depth with Electronic Solar Switch	348 mm x 580 mm x 145 mm
Weight	17 kg
Width x height x depth of packaging	450 mm x 600 mm x 400 mm
Transport weight	21 kg
Operating temperature range	- 25 °C ... +60 °C
Maximum operating altitude above mean sea level	3,000 m
Noise emission (typical)	No data
Internal consumption in night mode	< 1 W
Topology	HF transformer
Protection rating according to IEC 60529	IP65
Cooling concept	OptiCool: temperature-controlled fan
Protection class	I

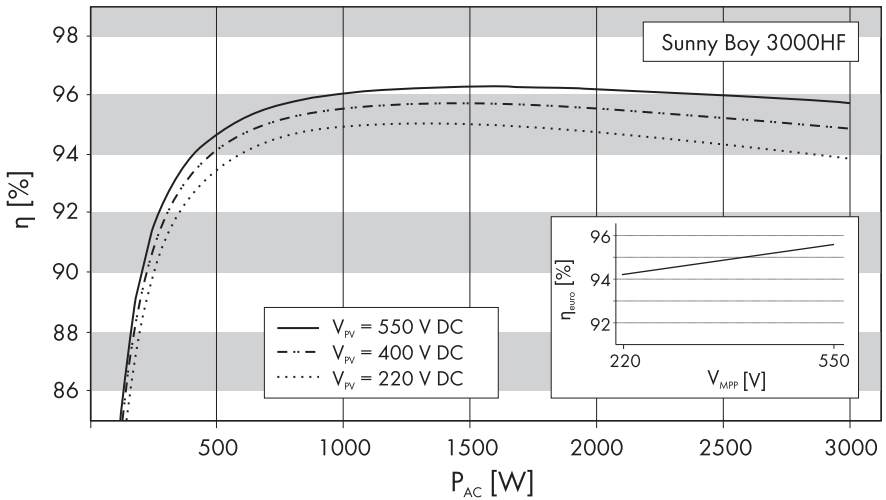
**Features**

DC connection	DC plug system SUNCLIX
AC connection	AC connector
Display	LC graphic display
Bluetooth	Standard
RS485, galvanically isolated	Optional

**Electronic Solar Switch**

Electrical 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

**Efficiency**



Max. efficiency	$\eta_{max}$	96.3 %
European efficiency	$\eta_{EU}$	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.

<b>Description</b>	<b>Brief description</b>	<b>SMA order number</b>
Replacement varistors	Set of thermally monitored varistors (2 pc.)	MSWR-TV 7
ESS handle with fan	ESS handle as spare 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 connector	SUNCLIX field connector for cross-sections from 2.5 to 6 mm <sup>2</sup> , 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
- Inverter serial number
- 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

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