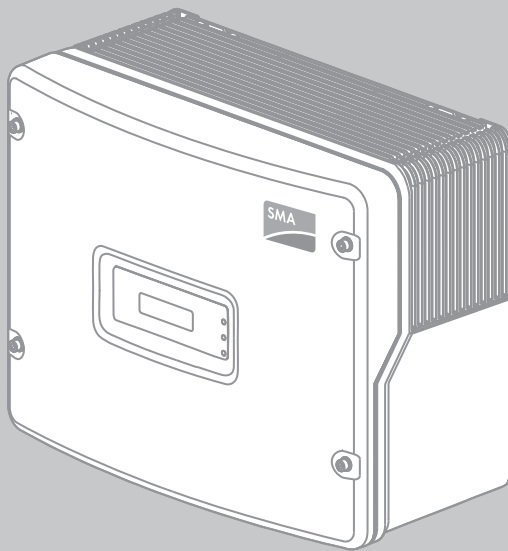




PV Inverter  
**SUNNY BOY 3300/3800**  
Installation Manual





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# 1 Information on this Manual

## 1.1 Validity

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

- Sunny Boy 3300 (SB 3300-11) from firmware version 3.02/3.02.
- Sunny Boy 3800 (SB 3800-11) from firmware version 3.05/3.05.

Keep this manual in a convenient place for future reference.

## 1.2 Target Group

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






## 1.3 Additional Information

You will find further information on special topics such as designing a miniature circuit-breaker or the description of the operating parameters in the download area at [www.SMA.de/en](http://www.SMA.de/en).

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

## 1.4 Symbols Used

The following types of safety precautions and general information appear in this document:

	<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 which, if not avoided, can result in property damage.
	<b>Information</b> Information provides tips that are valuable for the optimum operation of your product.

This symbol indicates the result of an action.

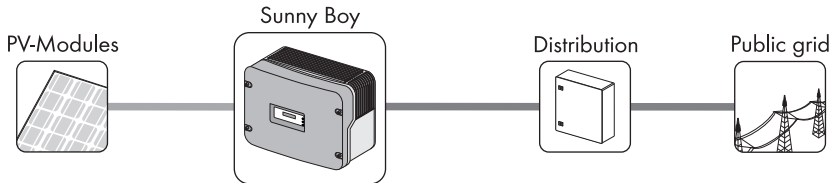


## 2 Safety

### 2.1 Intended Use

The Sunny Boy is a PV inverter which converts the DC current of the PV array to AC current and feeds it into the power distribution grid.

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



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

When designing the PV plant, ensure that the values comply with the permitted operating range of all components at all times. The free design program "Sunny Design" ([www.SMA.de/en/SunnyDesign](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. 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 component parts not expressly recommended or sold by SMA Solar Technology AG shall void any warranty claims and the operation permission.

## 2.2 Safety Precautions



### **DANGER!**

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

- All work on the inverter may only be carried out by an electrically qualified person.
- Physically or mentally challenged persons may only perform activities on the inverter following proper instruction and under supervision.
- Children must not play with the inverter. Children must not have access to an inverter in operation.



### **WARNING!**

**Risk of electric shock when pulling out the DC connectors under load**

If you disconnect the DC connectors from the inverter under load, an electric arc may occur, leading to electric shock and burns.

- If the inverter is not equipped with an Electronic Solar Switch and the regulations valid at the installation site require an external DC switch-disconnector, install an external DC switch-disconnector.
- Switch off the DC connector, the AC miniature circuit-breaker and disconnect the inverter on the DC side before pulling out the DC connectors.



### **CAUTION!**

**Risk of burns due to hot enclosure parts**

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



### **NOTICE!**

**Dust and water intrusion can damage the inverter.**

If the inverter is equipped with an Electronic Solar Switch, it will only provide IP21 degree of protection once the Electronic Solar Switch has been pulled out. The inverter is therefore no longer protected against water and dust intrusion. In order to maintain the degree of protection IP65 also during temporary decommissioning, proceed as follows:

- Unlock and disconnect all DC connectors.
- Open all DC connectors and remove the cables.
- Close all DC inputs with the corresponding DC connectors and the supplied sealing plugs.
- Firmly connect the Electronic Solar Switch again.

**NOTICE!****Damage to the inverter due to moisture and dust intrusion**

If the Electronic Solar Switch is not plugged in or incorrectly plugged in during operation, moisture and dust can penetrate the inverter.

If the Electronic Solar Switch is not correctly plugged in, this can cause contacts to wear in the Electronic Solar Switch or the Electronic Solar Switch might fall down. This can result in yield loss and damage to the Electronic Solar Switch.

Always plug in the Electronic Solar Switch as described in the following:

- Do not tighten the screw in the Electronic Solar Switch.
- Firmly plug in the Electronic Solar Switch until it is flush with the enclosure.
- Ensure that the maximum distance between the Electronic Solar Switch and the enclosure is 1 mm.





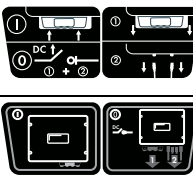

**PV array grounding**

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

## 2.3 Explanation of Symbols

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

### 2.3.1 Symbols on the Inverter











Symbol	Explanation
	Operation display. Indicates the operating state of the inverter.
	Ground fault or varistor defective. Read section 9.3 "Red LED is Glowing Continuously" (page 56).
	Fault or disturbance. Read section 9 "Troubleshooting" (page 50).
	You can operate the display by tapping the enclosure lid: <ul style="list-style-type: none"> <li>• Tapping once: the backlight switches on or the display scrolls to the next display message.</li> <li>• Tapping twice in quick succession*: The inverter shows the display messages from the startup phase again (see section 6.2 "Display Messages During the Startup Phase" (page 40)).</li> </ul>
	DC switch-disconnector Electronic Solar Switch (ESS)** <ul style="list-style-type: none"> <li>• ❶ When the Electronic Solar Switch is plugged in, the DC electric circuit is closed.</li> <li>• ❷ In order to interrupt the DC electric circuit and disconnect the inverter safely under load, first pull out the Electronic Solar Switch ❶ and then remove all DC connectors ❷ as described in section 7.2 "Opening the Inverter" (page 41).</li> </ul>
	QR-Code®*** for SMA bonus program You will find information on the SMA bonus program at <a href="http://www.SMA-Bonus.com">www.SMA-Bonus.com</a> .

\* This function is valid from firmware version 4.00

\*\* optional

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

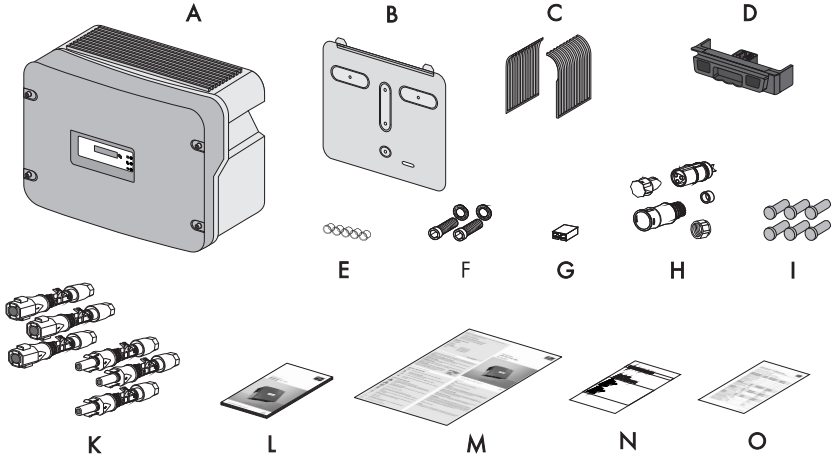
## 2.3.2 Symbols on the Type Label

Symbol	Explanation
	Beware of hazardous voltage. The inverter operates at high voltages. All work on the inverter may only be carried out by an electrically qualified person.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Observe all documentation that accompanies the inverter.
	The inverter must not be disposed of together with the household waste. For more information on disposal, see section 10.4 "Disposing of the Inverter" (page 63).
	CE marking. The inverter complies with the requirements of the applicable EC guidelines.
	The inverter has a transformer.
	Direct current (DC)
	Alternating current (AC)
	Degree of protection IP65 The inverter is protected against dust intrusion 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 Certification.

# 3 Unpacking

## 3.1 Scope of Delivery

Check the delivery for completeness and for visible external damage, such as cracks in the enclosure or in the display. Contact your specialty retailer 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>	2	Ventilation grids (right/left)
<b>D</b>	1	DC load disconnection unit Electronic Solar Switch (ESS)*
<b>E</b>	5	Filler plugs
<b>F</b>	2	Cheese-head screws and M6 conical spring washers
<b>G</b>	1	Jumper
<b>H</b>	1	AC coupling socket: socket unit, protective cap for socket unit, threaded sleeve, sealing ring, pressure screw
<b>I</b>	6	Sealing plugs
<b>K</b>	6 (4)	DC connectors (3 × positive, 3 × negative)**
<b>L</b>	1	Installation manual
<b>M</b>	1	User manual
<b>N</b>	1	Document set
<b>O</b>	1	Supplementary sheet with default settings

\* optional

\*\* For inverters without ESS: 2 × positive, 2 × negative

## 3.2 Identifying the Inverter

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

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

## 4 Mounting

### 4.1 Safety

**DANGER!**

**Danger to life due to fire or explosion.**

Despite careful construction, electrical devices can cause fires.

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

**CAUTION!**

**Risk of burns due to hot enclosure parts**

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

**CAUTION!**

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

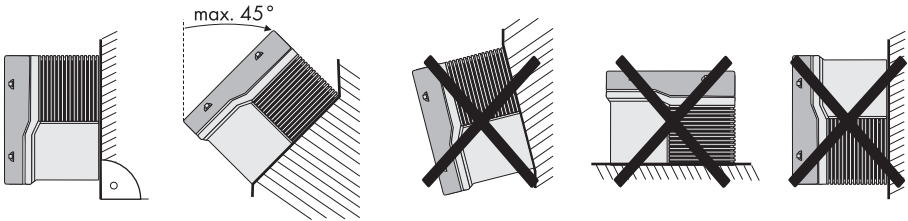
- Take the inverter's weight of approx. 38 kg into account for mounting.

### 4.2 Selecting the Mounting Location

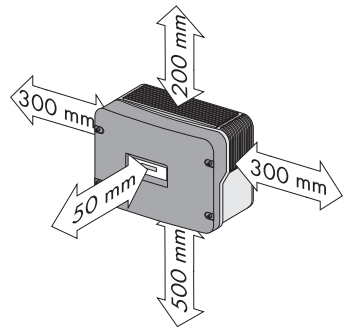
**Consider the following requirements when selecting the mounting location:**

- The mounting method and location must be suitable for the inverter's weight and dimensions (see section 11 "Technical Data" (page 64)).
- Mount on a solid surface.
- The mounting location must at all times be clear and safely accessible without the use of additional aids such as scaffolding or lifting platforms. Non-fulfillment of these criteria may restrict servicing.





- Mount vertically or tilted backwards at a maximum angle of 45°.
- The connection area must point downward.
- Never mount the device with a forward tilt.
- Never mount the device with a sideways tilt.
- Do not mount horizontally.
- Install at eye level in order to allow operation states to be read at all times.
- The inverter must be easy to remove from the mounting location at any time.
- The ambient temperature should be below 40°C to ensure optimum operation.
- Do not expose the inverter to direct solar irradiation as this can cause excessive heating and thus power reduction.
- In living areas, do not mount the unit on plasterboard walls or similar to avoid audible vibrations. 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, if applicable, sufficient space for removing the Electronic Solar Switch if included.



**Multiple inverters installed in areas with high ambient temperatures**

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

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

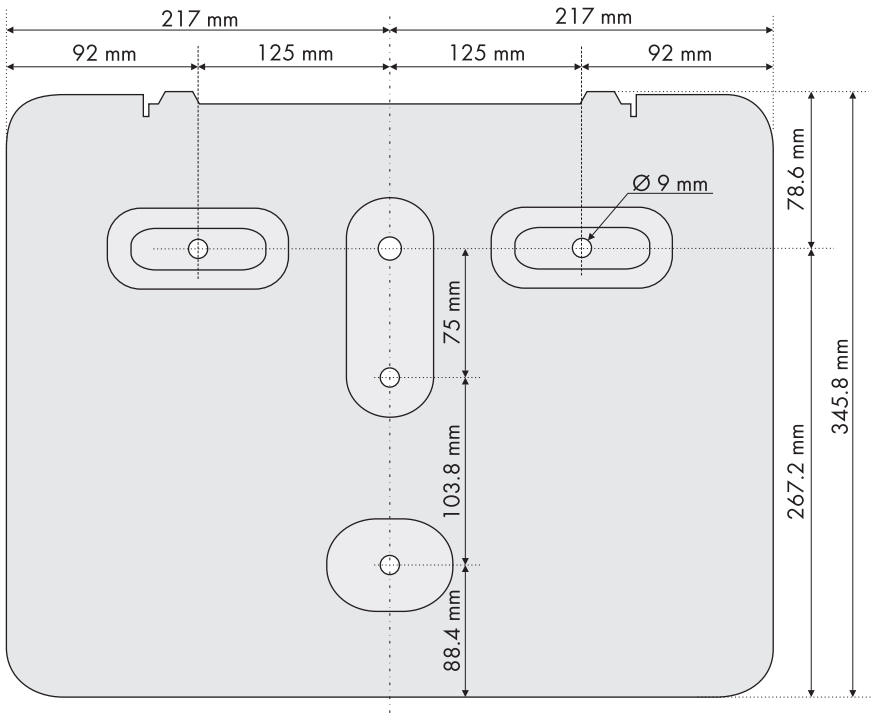


#### CAUTION!

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

- Note that the inverter weighs approx. 38 kg.

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

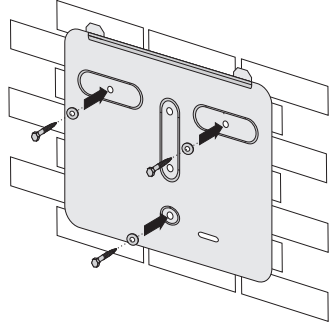


#### Mounting material

When mounting the wall mounting bracket, use fastening material suitable for the mounting surface.

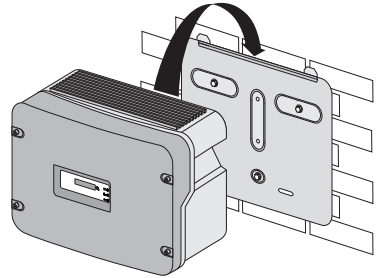
- Fill in holes that are not required in the wall mounting bracket using the filler plugs. Plug the filler plugs into the wall mounting bracket from the side that will later be facing the wall.

3. Attach the wall mounting bracket to the wall using appropriate screws and washers.



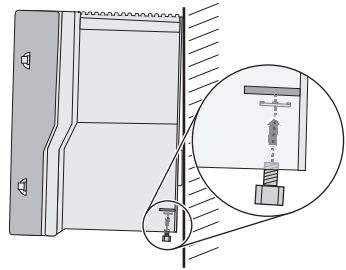
4. Hang the inverter in the wall mounting bracket. In doing so, lead the anchorage brackets through the cut-outs on in the inverter.

- Both brackets of the wall mounting bracket extrude out of the cut-outs on the inverter.



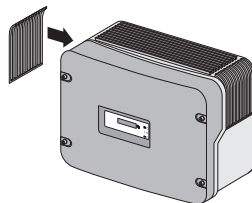
5. If a second protective conductor is required, ground the inverter and secure against being pulled out (5.3.3 "Connecting Additional Grounding" (page 28)).
6. If a second protective conductor is not required, secure the inverter against being pulled out:

- Plug the cheese-head screw with conical spring washer through the metal shackle on the underside of the enclosure. The teeth of the conical spring washer must be facing the metal shackle.
- Tighten the cheese-head screw to a torque of 6 Nm.




7. Check to ensure that the inverter is securely in place. The wall mounting bracket is designed in such way that the inverter tilts backward slightly on a perfectly vertical wall.

8. Attach the ventilation grids. These are labelled with "links/left" or "rechts/right".



## 5 Electrical Connection

### 5.1 Safety



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

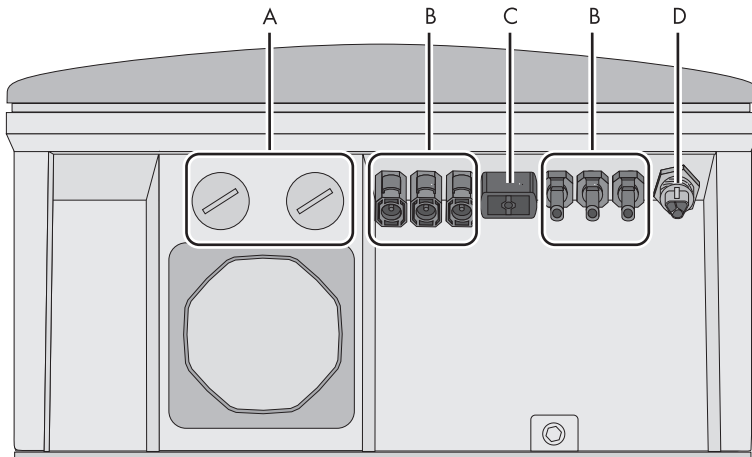
Internal component parts of the inverter can be irreparably damaged by static electric discharge.

- Before you touch a component inside the inverter, ground yourself by touching a grounded object.

### 5.2 Overview of the Connection Area

#### 5.2.1 Exterior View

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



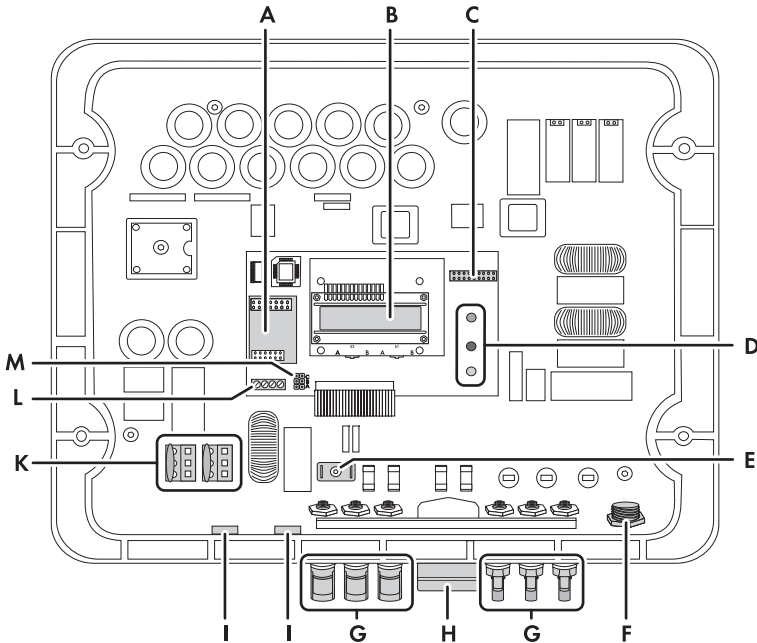
Object	Description
<b>A</b>	Enclosure openings for communication (with filler-plugs)
<b>B</b>	DC connectors for connecting the PV strings*
<b>C</b>	Jack for connecting the DC switch-disconnector Electronic Solar Switch (ESS)**
<b>D</b>	AC socket for grid connection

\*If you have ordered the inverter without ESS, the inverter is fitted with 2 negative and 2 positive DC connectors.

\*\* optional

### 5.2.2 Interior View

The following figure shows the various components and connection areas of the open inverter.



Object	Description
A	Slot for communication
B	Display
C	Jumper slot for fan test
D	Operating status LEDs
E	Flat male tab for grounding the cable shield with cable-bound communication
F	AC socket for grid connection
G	DC connectors for connecting the PV strings*
H	Jack for the Electronic Solar Switch (ESS)**
I	Enclosure opening with filler-plug for communication.
K	Varistors
L	Communication connection
M	Jumper slot for communication

\*If you have ordered the inverter without ESS, the inverter is fitted with 2 negative and 2 positive DC connectors.

\*\* optional

### 5.3 Connection to the Power Distribution Grid (AC)

#### 5.3.1 Conditions for the AC Connection



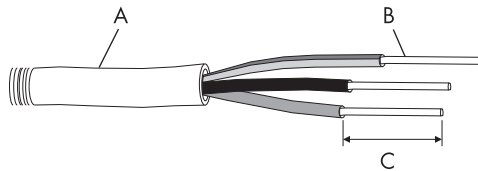
**Connection requirements of the grid operator**

Always observe the connection requirements of your grid operator.

#### Cable Design

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

#### Cable Requirements



Position	Designation	Value
<b>A</b>	External diameter	6 mm ... 14 mm
<b>B</b>	Conductor cross-section	4 mm <sup>2</sup>
<b>C</b>	Length of insulation to be stripped off	8 mm

## Load Disconnection Unit

You must install a **separate** miniature circuit-breaker for each inverter in order to ensure that the inverter can be securely disconnected under load. The maximum permissible fuse protection can be found in section 11 "Technical Data" (page 64).

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



### DANGER!

**Danger to life due to fire.**

When more than 1 inverter is connected in parallel to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. It can result in a cable fire or destruction of the inverter.

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

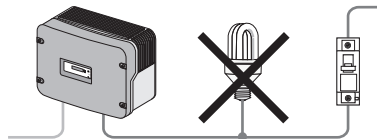


### DANGER!

**Danger to life due to fire.**

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

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



### NOTICE!

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

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

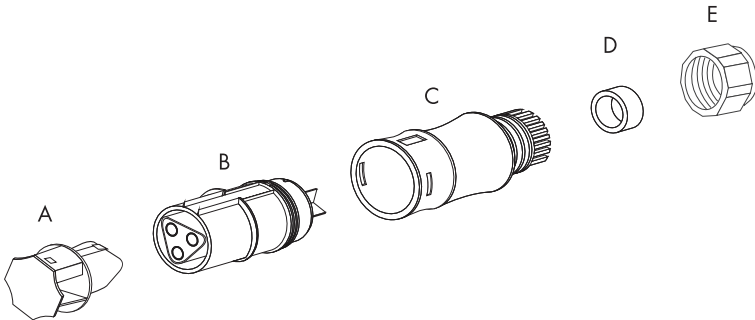
When disconnecting under load using a screw type fuse, the inverter can be damaged.

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



## 5.3.2 Connecting the Inverter to the Power Distribution Grid (AC)

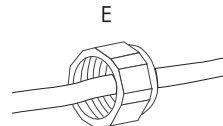
### Overview of the AC Connection Socket



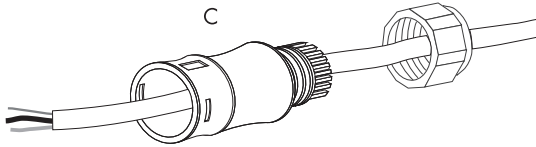
Object	Description
<b>A</b>	Protective cap for socket element
<b>B</b>	Jack element
<b>C</b>	Threaded sleeve with sealing ring for cable diameters of 10 mm to 14 mm
<b>D</b>	Sealing ring for cable diameters of 6 mm to 10 mm
<b>E</b>	Pressure screw

### Procedure

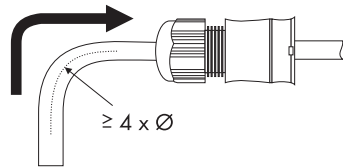
- Check the line voltage and compare with " $V_{AC\ nom}$ " on the type label.  
The exact operating range of the inverter is specified in the operating parameters. The corresponding document can be found in the download area at [www.SMA.de/en](http://www.SMA.de/en), in the "Technical Description" category of the respective inverter.
- Disconnect the miniature 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.
- Pass the pressure screw (E) over the AC cable.



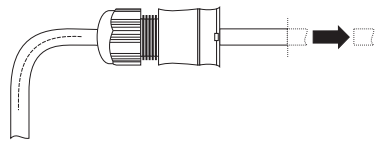
5. Pass the threaded sleeve (C) with the sealing ring over the AC cable.



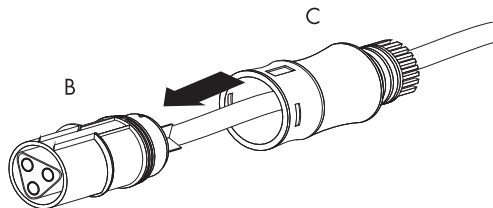
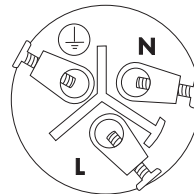
6. Bend the AC cable. The bending radius must be at least four times the cable diameter.



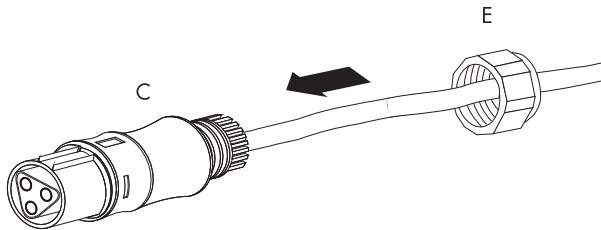
7. Shorten the cable.
8. Shorten phase L and neutral conductor N 4 to 5 mm.



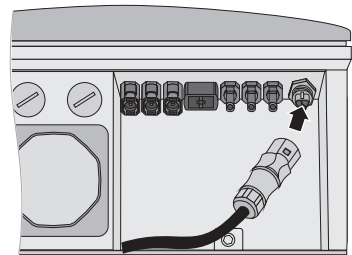
9. Insert the PE protective conductor (green-yellow) into the screw terminal with the earth sign on the socket element and tighten the screw. The PE protective conductor must be longer than the insulated conductors of N and L.
10. Insert the neutral conductor N (blue) into the screw terminal N on the jack element and tighten the screw.
11. Insert phase L (brown or black) into screw terminal L on the jack element and tighten the screw.
12. Make sure the insulated conductors are securely connected.
13. Push the threaded sleeve (C) onto the jack element (B) until it audibly snaps into place.



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



- The AC connection socket has been screwed together.
15. Close the socket element with the protective cap provided, if the inverter has not yet been connected.
16. Insert the AC connection socket into the AC socket on the inverter. Remove the protective cap beforehand, if required.



- The AC cable is connected to the inverter.

**DANGER!**

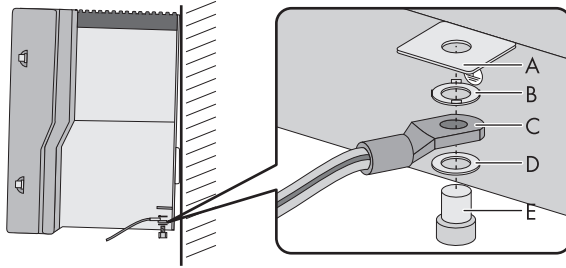
**Danger to life due to high voltages in the inverter.**

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

### 5.3.3 Connecting Additional Grounding

If a second protective conductor, additional grounding or equipotential bonding is required, you can additionally ground the inverter on the enclosure.

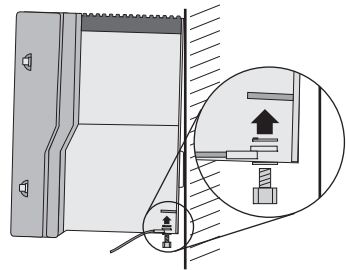
#### Overview of the Additional Grounding



Object	Description
A	Metal shackle on the bottom of the inverter enclosure
B	Conical spring washer (included in the scope of delivery)
C	Terminal lug (M6) with protective conductor
D	Washer
E	M6x12 cheese-head screw (included in the scope of delivery)

#### Procedure

1. Disconnect the inverter from the AC and DC side as described in section 7.2 "Opening the Inverter" (page 41).
2. Align washer, terminal lug with protective conductor and conical spring washer on cheese-head screw. The teeth of the conical spring washer must be facing the metal shackle.
3. Plug the cheese-head screw into the metal shackle and tighten to a torque of 6 Nm.



4. Check that the contact between the protective conductor and the enclosure is in accordance with the regulations valid for the country of installation.

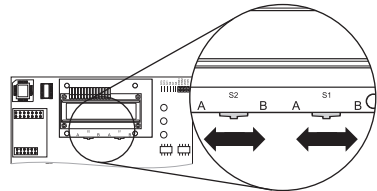
## 5.4 Setting the Display Language

You can set the language of the display using the switches at the bottom of the display assembly inside the inverter.

### Procedure

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 41).
2. Set the switches to the required language, as shown below. The following switch settings apply:

Language	Switch S2	Switch S1
German	B	B
English	B	A
French	A	B
Spanish	A	A



3. Close the inverter as described in section 7.3 "Closing the Inverter" (page 43).
- The display language is set.

## 5.5 Connecting the PV Array (DC)

### 5.5.1 Conditions for the DC Connection



#### Use of Y adapters for parallel connection of strings

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

- The DC electric circuit must not be interrupted by adapters.
- Observe the procedure for disconnecting the inverter as described in section 7.2 "Opening the Inverter" (page 41).
- Requirements for the PV modules of the connected strings:
  - Same type
  - Same quantity
  - Identical alignment
  - Identical tilt
- The connecting cables of the PV modules must be equipped with connectors. The DC connectors for the DC connection are included in the delivery.
- If the inverter is not equipped with an Electronic Solar Switch and the regulations valid at the installation site require an external DC switch-disconnector, install an external DC switch-disconnector.
- The following limiting values at the DC input of the inverter must not be exceeded:

Maximum input voltage	Maximum input current
500 V (DC)	20 A (DC)

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

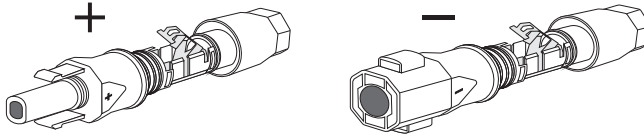
The maximum possible input current per string is limited by the connectors used. If the connectors are overloaded, an electric arc may occur and there is a risk of fire.

- Ensure that the input current for each string does not exceed the maximum through-fault current of the connectors used.

### 5.5.2 Assembling the DC Connectors

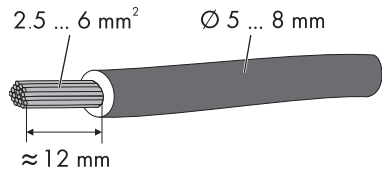
For connection to the inverter, all connection cables of the PV modules must be equipped with the DC connectors provided.

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



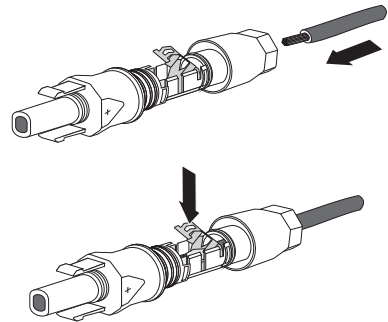
#### Cable requirements:

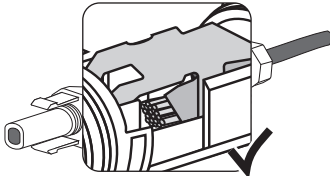
- Use a PV1-F cable.

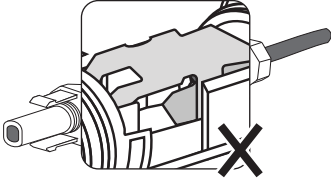
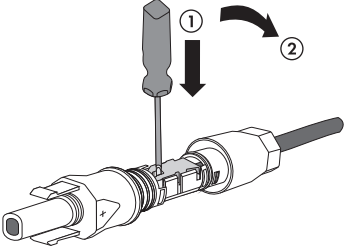


#### Procedure

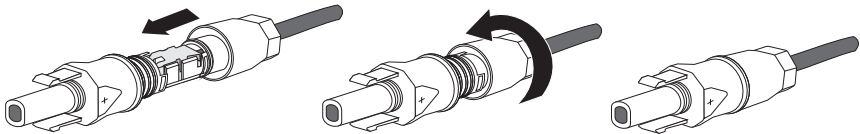
1. Lead the stripped cable all the way into the DC connector.
2. Press the clamping bracket down.
  - The clamping bracket snaps audibly into place.
3. Ensure that the cable is correctly positioned:



Result	Measure
<p><input checked="" type="checkbox"/> If the stranded wire is visible in the chamber of the clamping bracket, the cable is correctly positioned.</p> 	<ul style="list-style-type: none"> <li>• Proceed to step 4.</li> </ul>

Result	Measure
<p>☑ If the stranded wire is <b>not</b> visible in the chamber, the cable is not correctly positioned.</p> 	<ul style="list-style-type: none"> <li>Loosen the clamping bracket. To do so, insert a screwdriver into the clamping bracket and lever the clamping bracket out (blade width 3.5 mm).</li> </ul>  <ul style="list-style-type: none"> <li>Remove the cable and go back to step 1.</li> </ul>

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

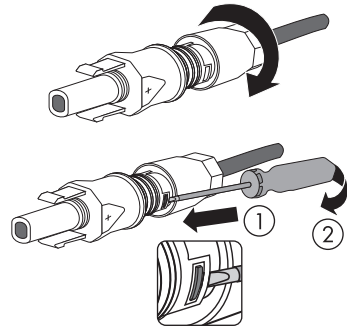


☑ The DC connectors are assembled and can now be connected to the inverter as described in section 5.5 "Connecting the PV Array (DC)" (page 30).

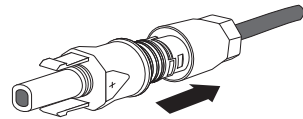


### 5.5.3 Opening the DC Connector

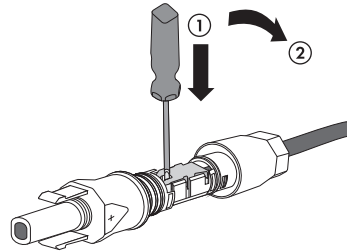
1. Unscrew the screw connection.
2. Unlock the DC connector. To do this insert a screwdriver into the side catch mechanism and lever out (blade width 3.5 mm).



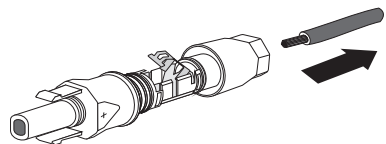
3. Carefully pull the DC connector apart.



4. Loosen the clamping bracket. To do so, insert a screwdriver into the clamping bracket and lever the clamping bracket out (blade width 3.5 mm).



5. Remove the cable.



- The cable is removed from the DC connector.

### 5.5.4 Connecting the PV Array (DC)

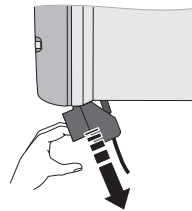
**DANGER!**  
**Danger to life due to high voltage at the inverter**

- Before connecting the PV array, switch off the miniature circuit-breaker and make sure that it cannot be reconnected.

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

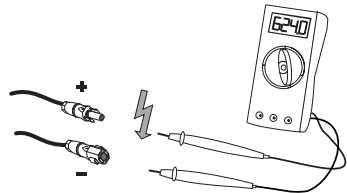
- Only use measuring devices with a DC input voltage range up to at least 1 000 V.

1. Disconnect the miniature circuit-breaker and secure against re-connection.
2. If an Electronic Solar Switch is installed, pull it downwards, slightly towards the wall.



3. Check the connection cables of the PV modules for correct polarity and make sure that the maximum input voltage of the inverter is not exceeded.

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



**NOTICE!**  
**Exceeding the maximum input voltage can destroy the inverter.**

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

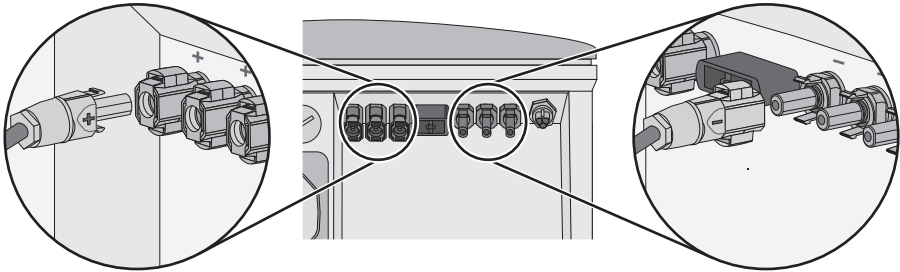
- Do not connect strings with an open-circuit voltage greater than the maximum input voltage of the inverter.
- Check the plant design.

4. Check the strings for ground faults as described in section 9.3.1 "Checking the PV Array for Ground Faults" (page 56).

**NOTICE!****Excessive currents can damage the inverter**

- The maximum current per DC connector may not exceed 16 A.

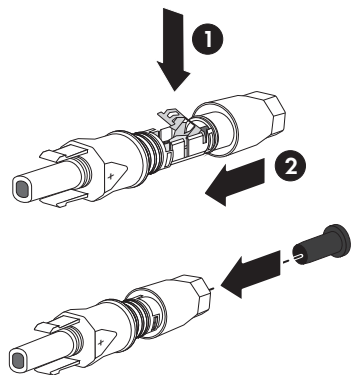
5. Connect the assembled DC connectors to the inverter.
  - ☑ The DC connectors click audibly into position.
 To release the DC connectors, see section 7.2 "Opening the Inverter" (page 41).



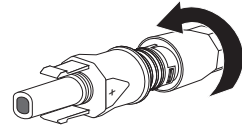
6. In order to seal the inverter, all the DC inputs that are not required have to be closed with DC connectors and sealing plugs:

**Sealing plugs**

- Do **not** plug the sealing plugs **directly** into the DC inputs on the inverter.
- For unused DC connectors, push down the clamping bracket and push it onto the cable gland.
  - Plug the sealing plug into the DC connector.

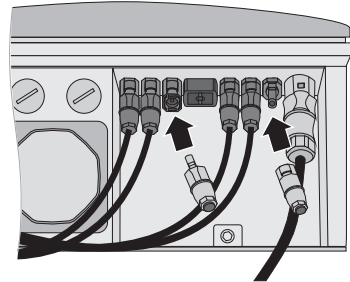


- Tighten the DC connector (torque: 2 Nm).

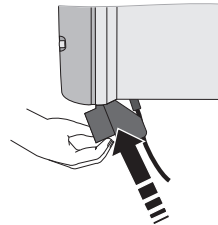


- Insert the DC connectors with sealing plugs into the corresponding DC inputs on the inverter.

☑ The DC connectors click audibly into position.



7. Ensure that all DC connectors are securely in place.
8. If an Electronic Solar Switch is installed, check it for wear, as described in section 8.3 "Checking the Electronic Solar Switch for Wear" (page 49), and reattach it firmly.



**NOTICE!**

**Damage to the inverter due to moisture and dust intrusion**

If the Electronic Solar Switch is not plugged in or incorrectly plugged in during operation, moisture and dust can penetrate the inverter.

If the Electronic Solar Switch is not correctly plugged in, this can cause contacts to wear in the Electronic Solar Switch or the Electronic Solar Switch might fall down. This can result in yield loss and damage to the Electronic Solar Switch.

Always plug in the Electronic Solar Switch as described in the following:

- Do not tighten the screw in the Electronic Solar Switch.
- Firmly plug in the Electronic Solar Switch until it is flush with the enclosure.
- Ensure that the maximum distance between the Electronic Solar Switch and the enclosure is 1 mm.

☑ The PV array is connected.

## 5.6 Communication

The inverter is equipped with a slot for communication interfaces in order to communicate with special data loggers (e.g., Sunny WebBox) or a PC with corresponding software (e.g., Sunny Data Control or Sunny Explorer).

Refer to the respective communication interface manual for a detailed wiring diagram and an installation description for the interface.

The inverter's active power can be limited or the displacement power factor  $\cos \varphi$  can be set externally using the Power Reducer Box from SMA Solar Technology AG. You will find detailed information on active power limitation and on setting the displacement power factor  $\cos \varphi$  in the Technical Description "Operating Parameters" at [www.SMA.de/en](http://www.SMA.de/en).

## 5.7 Setting the Grid and Country Parameters



### Changing grid-relevant and country parameters

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 available in the download area at [www.SMA.de/en](http://www.SMA.de/en), in the "Certificate" category of the respective inverter. Ensure that you discuss the changes to these parameters with your grid operator.

A detailed description of the operating parameters 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.

### 5.7.1 Setting the Installation Country

Using the "Default" parameter, you can set the installation country and/or the grid connection standard valid for the country via a communication product (e.g., Sunny WebBox) or a PC with corresponding software (e.g., Sunny Data Control or Sunny Explorer). This, however, is only required if the inverter was originally ordered for another country. You can see the standard to which the inverter was set upon delivery on the type label and on the included supplementary sheet with the default settings.

### 5.7.2 Setting Stand-alone Grid Operation

To operate the inverter in an off-grid system with Sunny Island, you must set the inverter via the "Default" parameter to stand-alone grid operation ("OFF-Grid").

You have several possibilities to set the inverter to stand-alone grid operation:

- Setting via Sunny WebBox
- or
- Setting via Sunny Data Control or Sunny Explorer



#### DANGER!

**Danger to life due to high voltages in the event of outage of the power distribution grid.**

If you set the inverter to stand-alone grid operation, it does not fulfill any country-specific standards and guidelines. If there is a power distribution grid outage, there is consequently a danger of back-feed.

- **Never** operate the inverter directly on the power distribution grid when set to stand-alone grid operation.

# 6 Commissioning

## 6.1 Commissioning the Inverter

1. Check the following requirements before commissioning:
  - The inverter is securely in place.
  - The AC cables are correctly connected (power distribution grid).
  - All DC cables are completely connected (PV strings).
  - Unused DC inputs are closed using the corresponding DC connectors and sealing plugs.
  - The enclosure lid is securely screwed in place.
  - An external DC switch-disconnector is additionally connected or, if available, the Electronic Solar Switch (ESS) is firmly in place.
  - The miniature circuit-breaker is correctly laid out.

2. Switch on the miniature circuit-breaker.

All 3 LEDs are glowing or flashing: the startup phase is starting.

Green LED is glowing: commissioning was successful.

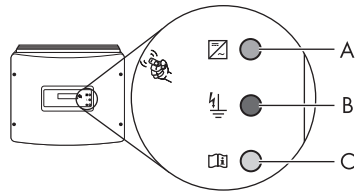
or

Green LED flashes in case of insufficient irradiation: Grid connection conditions have not yet been reached. Wait for sufficient irradiation.

or

The red or yellow LED is glowing or flashing: a disturbance has occurred. Proceed to step 3.

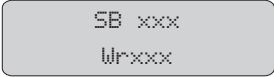
<b>A</b>	Green LED	Operation
<b>B</b>	Red LED	Ground fault or varistor defective
<b>C</b>	Yellow LED	Fault



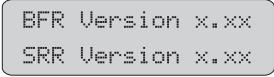
3. Read section 9 "Troubleshooting" (page 50) and if necessary, eliminate the error or fault.

## 6.2 Display Messages During the Startup Phase

- After commissioning, the inverter displays the device type in the startup phase.
- After 5 seconds or when you tap again on the enclosure lid, the firmware version of the internal processors is displayed by the inverter.
- After a further 5 seconds or when you tap again, the configured country standard is displayed by the inverter (example: "VDE-AR-N4105-MP").



SB xxx  
Wrxxx



BFR Version x.xx  
SRR Version x.xx



VDE-AR-N4105-MP




### Showing the display messages again (valid as of firmware version 4.00)


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



## 7 Opening and Closing

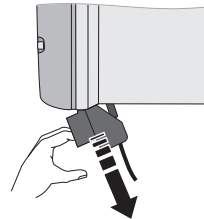
### 7.1 Safety

	<p><b>DANGER!</b> Risk of lethal electric shock.</p>
<p>Before opening the inverter, observe the following:</p> <ul style="list-style-type: none"> <li>• Ensure that no voltage is present on the AC side.</li> <li>• Ensure that neither voltage nor current is present on the DC side.</li> </ul>	

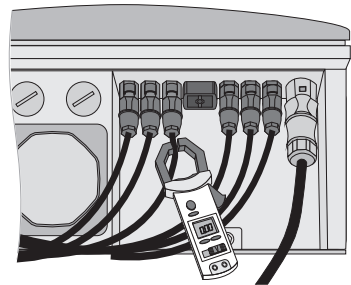
	<p><b>NOTICE!</b> Static discharges can damage the inverter.</p>
<p>The internal component parts of the inverter can be irreparably damaged by electrostatic discharge.</p> <ul style="list-style-type: none"> <li>• Ground yourself before touching a component part.</li> </ul>	

### 7.2 Opening the Inverter

1. Disconnect the miniature circuit-breaker and secure against re-connection.
2. If an external DC switch-disconnector is present, disconnect the external DC switch-disconnector.
3. If an Electronic Solar Switch is installed, pull it downwards, slightly towards the wall.

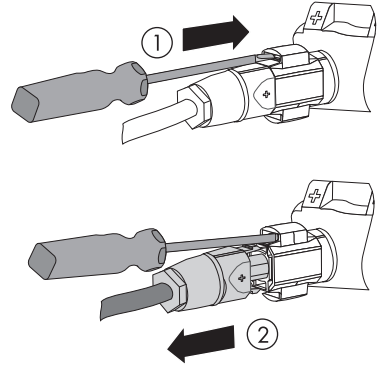


4. Using a current probe, ensure that no current is present at any of the DC cables.
  - If current is present, check the installation.

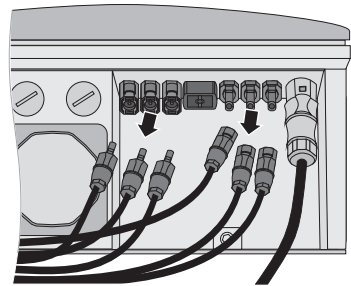


5. Unlock and disconnect all DC connectors. To do this, insert the screwdriver into one of the side slots (blade width: 3.5 mm) and pull the DC connectors straight down.

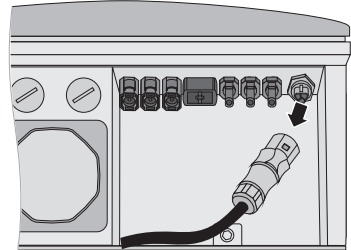
**Do not pull on the cable** while doing this.




- All DC connectors are disconnected from the inverter. The inverter is entirely disconnected from the PV array.



6. Pull out the AC plug.



7. Check whether all LEDs and the display have gone out.

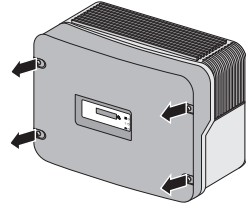


**DANGER!**  
Danger to life due to high voltages in the inverter.

The capacitors in the inverter require 15 minutes to discharge.

- Wait 15 minutes before opening the inverter.

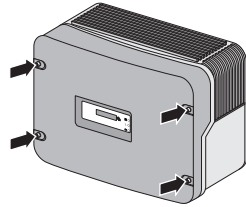
8. Loosen the screws of the enclosure lid.
9. Pull the enclosure lid forward smoothly.



- The inverter is open and no voltage is present.

### 7.3 Closing the Inverter

1. Attach the enclosure lid using the 4 screws and the conical spring washers with the tothing facing toward the enclosure lid. Tighten the screws to a torque of approx. 6 Nm in order to ensure the sealing of the enclosure and the grounding of the enclosure lid.



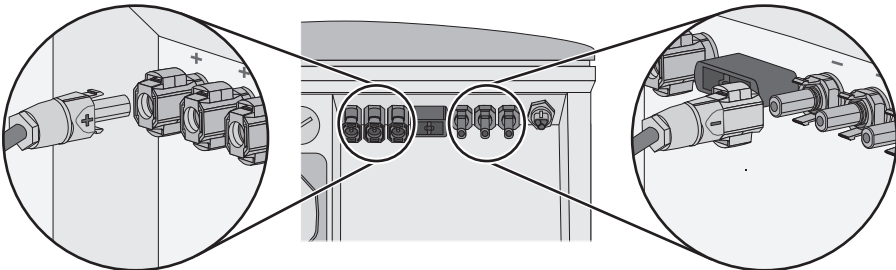
#### DANGER!

Danger to life due to the enclosure lid carrying voltage.

The grounding of the enclosure lid is ensured by the conical spring washers.

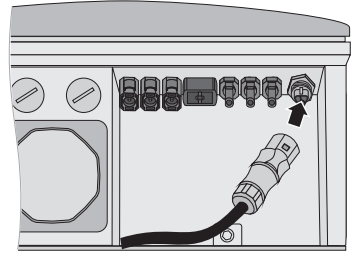
- Attach the conical spring washers for all screws with the tothing facing toward the enclosure lid.

2. Check the DC connectors for correct polarity and connect them.  
To unlock the DC connectors see section 7.2 "Opening the Inverter" (page 41).

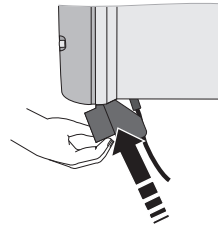



3. Close all the DC inputs that are not needed as described in section 5.5.4 "Connecting the PV Array (DC)" (page 34) to seal the inverter.

4. Connect the AC plug.



5. If an external DC switch-disconnector is present, disconnect the external DC switch-disconnector.
6. If an Electronic Solar Switch is present, check the Electronic Solar Switch for wear as described in section 8.3 "Checking the Electronic Solar Switch for Wear" (page 49) and reattach firmly.





**NOTICE!**

**Damage to the inverter due to moisture and dust intrusion**

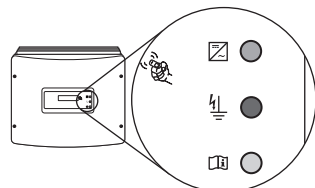
If the Electronic Solar Switch is not plugged in or incorrectly plugged in during operation, moisture and dust can penetrate the inverter.

If the Electronic Solar Switch is not correctly plugged in, this can cause contacts to wear in the Electronic Solar Switch or the Electronic Solar Switch might fall down. This can result in yield loss and damage to the Electronic Solar Switch.

Always plug in the Electronic Solar Switch as described in the following:

- Do not tighten the screw in the Electronic Solar Switch.
- Firmly plug in the Electronic Solar Switch until it is flush with the enclosure.
- Ensure that the maximum distance between the Electronic Solar Switch and the enclosure is 1 mm.

7. Switch on the miniature circuit-breaker.
8. Check whether the inverter's display and LED display indicate a normal operating state (see section 6 "Commissioning" (page 39)).



- The inverter is closed and in operation.

## 8 Maintenance and Cleaning

### 8.1 Cleaning the Inverter

If the inverter is dirty and the visibility of the operating data and operating states of the inverter is only limited, clean the enclosure lid, the display and the LEDs with a damp cloth. Do not use any corrosive substances (e.g., solvents or abrasives) for this.

Also check the inverters and the cables for visible external damage. Repair, if necessary.

### 8.2 Checking the Heat Dissipation

You only need to check the heat dissipation of the inverter if, during an optical inspection, you notice a marked build-up in the fan guard or the inverter is increasingly observed to be in "Derating" operating state. Whether the inverter switches to "Derating" operating state depends on the ambient temperature and cooling efficiency.

#### 8.2.1 Cleaning the Fans

If the fan guard is only covered in loose dust, it can be cleaned with a vacuum cleaner.

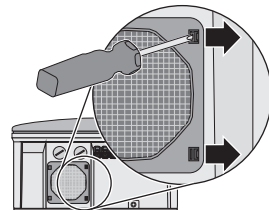
If you do not achieve satisfactory results with a vacuum cleaner, dismantle the fans for cleaning.

Proceed as follows:

1. Disconnect the inverter from both the DC and AC connections as described in section 7.2 "Opening the Inverter" (page 41).
2. Wait for the fan to stop rotating.

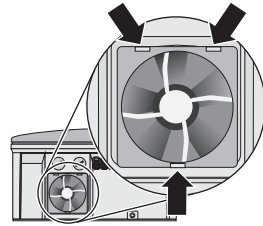
#### Cleaning the Fan Guards

3. Remove the fan guard:
  - Press both latches on the right edge of the fan guard to the right using a screwdriver and loosen from the retainer.
  - Carefully remove the fan guard.
4. Clean the fan guard with a soft brush, a paint brush, a cloth, or compressed air.



## Cleaning the Fans

5. Push the two upper latches backward and the lower latch forward.
6. Remove the fan by pulling it slowly and carefully downward.



7. Unlock and unplug the fan plug inside the inverter.  
The fan cables are long enough that you can lift the fan far enough out to disconnect the internal plugs in the inverter.
8. Remove the fan.
9. Clean the fan with a soft brush, a paint brush, or a damp cloth.



### NOTICE!

**Damage to the fan through use of compressed air.**

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

10. After cleaning, reassemble everything in reverse order.
11. Check the functioning of the fan as described in the following section.

## 8.2.2 Checking the Fans

There are two ways to check whether the fan is working:

- Set the "Fan-Test" parameter to "1" in the installer mode with a communication product.
- or
- Plug the provided jumper into the system control board.

### Setting Parameters

1. Request the installer password from the SMA Service Line (contact: see page 72).
2. Set the "Fan Test" parameter to "1" in the installer mode.
3. Check the air-flow of the fan.

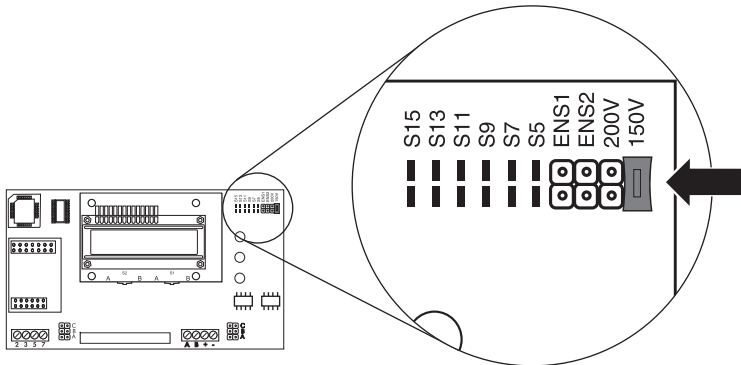
The inverter draws air in from underneath and then blows it out at the top left. Listen for any unusual noise that could indicate incorrect installation or that the fan is defective.

4. After checking the fan, set the "Fan Test" parameter back to "0".
- The fan test is completed.

## Plugging the Jumper

The inverter recognizes the jumper only after the system has been restarted (i.e. all LEDs must have gone out before a restart).

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 41).
2. Plug the provided jumper in the slot on the system control board as shown below.



3. Close the inverter as described in section 7.3 "Closing the Inverter" (page 43).
4. Restart the inverter.
5. Check the air-flow of the fan.

The inverter draws air in from underneath and then blows it out at the top left.

Listen for any unusual noise that could indicate incorrect installation or that the fan is defective.

6. Remove the jumper. Open and close the inverter as described in section 7 "Opening and Closing" (page 41).
- The fan test is completed.

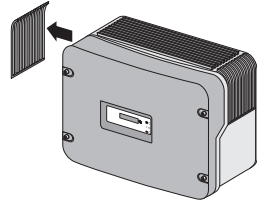
## 8.2.3 Cleaning the Ventilation Grids

There are ventilation grids on each side of the inverter. The inverter takes cooling air in from underneath via the fan and blows it out again through the ventilation grids on the upper left side. For optimal heat dissipation of the inverter, you only have to clean the left ventilation grid.

### Procedure

1. Remove the left ventilation grid.

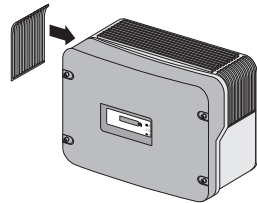
Insert your finger in the space between the ventilation grid and the upper part of the enclosure and remove the ventilation grid to the side.



2. Clean the ventilation grid with a soft brush, a paint brush, or compressed air.

3. Re-attach the ventilation grid to the inverter.

To help you identify the sides, the ventilation grids are marked with "links/left" or "rechts/right" on the inside.



- The ventilation grids are cleaned.



### NOTICE!

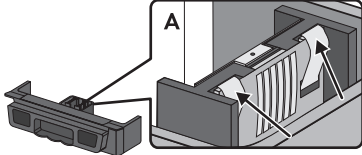
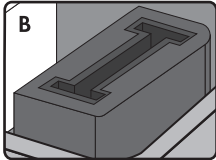
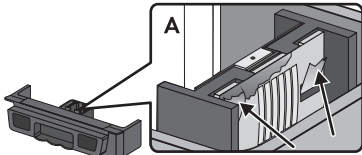
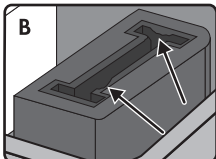
**Risk of damage to the inverter through intrusion of insects.**

- The ventilation grids must not be removed permanently, because otherwise the device is not protected against the entrance of insects.



### 8.3 Checking the Electronic Solar Switch for Wear

Check the Electronic Solar Switch for wear before plugging it in. Depending on the shape of the Electronic Solar Switch, you can estimate the wear on either the metal tongues (shape A) or on the plastic (shape B).

Result	Measure
<p><input checked="" type="checkbox"/> The metal tongues in the Electronic Solar Switch are undamaged and not discolored (A).</p> <p>or</p> <p><input checked="" type="checkbox"/> The plastic in the Electronic Solar Switch is undamaged (B).</p>  	<ol style="list-style-type: none"> <li>1. Insert the handle of the Electronic Solar Switch securely in the jack on the bottom of the enclosure.</li> <li>2. Commission the inverter as described in section 6 "Commissioning" (page 39).</li> </ol>
<p><input checked="" type="checkbox"/> The metal tongues in the Electronic Solar Switch have a brown discoloration or are burned through (A).</p> <p>or</p> <p><input checked="" type="checkbox"/> The plastic in the Electronic Solar Switch shows thermal deformation (B).</p>  	<p>The Electronic Solar Switch can no longer safely disconnect the DC side.</p> <ol style="list-style-type: none"> <li>1. Replace the Electronic Solar Switch handle before attaching it again (order number see section 12 "Accessories" (page 71)).</li> <li>2. Commission the inverter as described in section 6 "Commissioning" (page 39).</li> </ol>

## 9 Troubleshooting

If the inverter displays other blink codes or error messages than those described below, contact the SMA Service Line.

You will also find a description of display messages during operation, status messages and measurement channels in the user manual provided.

Do not perform any repairs that are not described here and take advantage of the 24-hour replacement service (inverter ready for shipping and handed over to a freight-forwarding company within 24 hours) and the SMA Solar Technology AG repair service instead.

### 9.1 Blink Codes

green	red	yellow	Status
flashing	flashing	flashing	OK (startup phase)
is glowing continuously	is not glowing	is not glowing	OK (feed-in operation)
	is glowing continuously	is not glowing	Ground fault or varistor defective
		is glowing continuously	OK (initialization)
is flashing quickly (3 x per second)	is not glowing	is not glowing	OK (stop)
	is glowing continuously	is not glowing	Ground fault or varistor defective
is flashing slowly (1 x per second)	is not glowing	is not glowing	OK (waiting, grid monitoring)
goes out briefly (approx. 1 x per second)	is not glowing	is not glowing	OK (derating)
	is glowing continuously	is not glowing	Ground fault or varistor defective
is not glowing	is not glowing	is not glowing	OK (overnight shutdown or Electronic Solar Switch is not plugged or external DC switch-disconnector is not connected.)
		is glowing/flashing	Fault
	is glowing continuously	is not glowing	Ground fault or varistor defective
		is glowing/flashing	ground fault or varistor defective and fault

## 9.2 Error Messages

When an error occurs, the inverter generates a message which depends on the operating mode and the type of the fault detected.

Message	Description and corrective measure
<b>!PV-Overvoltage!</b> <b>!DISCONNECT DC!</b>	Overvoltage at DC input. Overvoltage can destroy the inverter.
	<p><b>Corrective measures</b></p> <p>Disconnect the inverter from the power distribution grid immediately.</p> <ol style="list-style-type: none"> <li>1. Disconnect the miniature circuit-breaker.</li> <li>2. If installed, disconnect the external DC switch-disconnector.</li> <li>3. If an Electronic Solar Switch is installed, remove it.</li> <li>4. Remove all DC connectors.</li> <li>5. Check the DC voltage: <ul style="list-style-type: none"> <li>- If the DC voltage is above the maximum input voltage, check the plant design or contact the PV array installer.</li> <li>- If the DC voltage is below the maximum input voltage, reconnect the inverter to the PV array as described in section 5.4 "Setting the Display Language" (page 29).</li> </ul> </li> </ol> <p>If the message occurs again, disconnect the inverter again and contact the SMA Service Line (see section 13 "Contact" (page 72)).</p>
<b>ACVtgRPro</b>	<p>The 10-minute average line voltage is no longer within the permissible range. This can be caused by the following:</p> <ul style="list-style-type: none"> <li>• The line voltage at the terminal is too high.</li> <li>• The grid impedance at the terminal is too high.</li> </ul> <p>The inverter disconnects to assure compliance with the power quality of the power distribution grid.</p>
	<p><b>Corrective measures</b></p> <p>Check the line voltage at the terminal of the inverter:</p> <ul style="list-style-type: none"> <li>• If, due to the local grid conditions, the line voltage is 253 V or more, ask the grid operator whether the voltage at the feed-in point can be adjusted, or whether they would agree to an alteration of the limiting value of parameter "ACVtgRPro" for power quality monitoring.</li> <li>• If the line voltage is continuously within the tolerance range and this error message is still displayed, contact the SMA Service Line.</li> </ul>
<b>Bfr-Srr</b>	Internal measurement comparison fault or hardware defect.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this fault occurs frequently, contact the SMA Service Line.</li> </ul>

Message	Description and corrective measure
<p><b>Derating</b></p>	<p>The "Derating" operating state is a normal operating state which may occur occasionally and can have several causes.</p> <p>Once the inverter enters the "Derating" operating state, it will display the "Derating" warning until the next total shutdown of the device (at the end of the day).</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Check the heat dissipation as described in section 8.2 "Checking the Heat Dissipation" (page 45).</li> </ul>
<p><b>dZac-Bfr</b> <b>dZac-Srr</b></p>	<p>Sudden changes in grid impedance exceed the permissible range ("Bfr" or "Srr" are internal messages of no relevance for the user).</p> <p>The inverter disconnects itself from the power distribution grid for safety reasons.</p> <p><b>Corrective measures</b></p> <p>Check the grid impedance and observe how often major deviations occur.</p> <ul style="list-style-type: none"> <li>• If repeated frequency variations occur and this is causing "dZac-Bfr" or "dZac-Srr" disturbances, ask the grid operator to agree to a modification of the operating parameters (dZac-Max).</li> <li>• Discuss any changes to the operating parameter with the SMA Service Line.</li> </ul>
<p><b>EEPROM</b></p>	<p>Transition fault while data is being written or read from EEPROM. The data is not relevant for safe operation.</p> <ul style="list-style-type: none"> <li>• This fault has no effect on the performance of the inverter.</li> </ul>
<p><b>EEPROM dBh</b></p>	<p>EEPROM data is defective, the device has switched off because the loss of data has disabled important functions of the inverter.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Contact the SMA Service Line.</li> </ul>
<p><b>EeRestore</b></p>	<p>One of the duplicate records in the EEPROM is defective and has been reconstructed without loss of data.</p> <ul style="list-style-type: none"> <li>• This error message only serves to inform you and has no effect on the performance of the inverter.</li> </ul>
<p><b>Fac-Bfr</b> <b>Fac-Srr</b> <b>FacFast</b></p>	<p>The power frequency is no longer within the permissible range ("Bfr" or "Srr" is an internal message of no relevance for the user).</p> <p>The inverter disconnects itself from the power distribution grid for safety reasons.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If the power frequency is within the tolerable range and the faults "Fac-Bfr", "Fac-Srr" or "FacFast" are often displayed, contact the SMA Service Line.</li> </ul>

Message	Description and corrective measure
<b>I<sub>max</sub> / overcurrent</b>	Overcurrent on the AC side. This message is displayed if the current in the AC grid is higher than specified.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Check the plant design and grid conditions.</li> </ul>
<b>K1-Close</b> <b>K1-Open</b>	Error during relay test.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault frequently occurs or occurs several times consecutively, contact the SMA Service Line.</li> </ul>
<b>MSD-Fac</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs frequently, contact the SMA Service Line.</li> </ul>
<b>MSD-Vac</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs frequently, contact the SMA Service Line.</li> </ul>
<b>MSD-Timeout</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs frequently, contact the SMA Service Line.</li> </ul>
<b>MSD-Zac</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs frequently, contact the SMA Service Line.</li> </ul>
<b>OFFSET</b>	The "Offset" operating state is a normal operating state that occurs prior to grid monitoring.
	If "Offset" is displayed as an error, there is a fault in the data logging. <b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs frequently, contact the SMA Service Line.</li> </ul>
<b>Riso</b>	The electrical insulation between the PV plant and ground is defective. The resistance between the DC plus and/or DC minus connection and ground is outside the defined limit range.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Check the insulation of the PV plant.</li> <li>• Check the plant for ground faults as described in section 9.3.1 "Checking the PV Array for Ground Faults" (page 56).</li> </ul>
<b>ROM</b>	The inverter's firmware is faulty.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs frequently, contact the SMA Service Line.</li> </ul>

Message	Description and corrective measure
<b>Shutdown</b>	Temporary inverter disturbance.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Contact the SMA Service Line.</li> </ul>
<b>Trafo-Temp-F</b>	Temperatures in the transformer have exceeded the acceptable limit. The inverter stops its feed-in operation until the temperature lies within the permissible range.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this disturbance occurs frequently, check the heat dissipation of the inverter as described in section 8.2 "Checking the Heat Dissipation" (page 45).</li> </ul>
<b>Trafo-Temp-W</b>	Temperatures in the transformer have exceeded the acceptable limit. The inverter stops its feed-in operation until the temperature lies within the permissible range. The "Trafo-Temp-W" disturbance is displayed until final shutdown (at the end of the day).
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Check the heat dissipation of the inverter as described in section 8.2 "Checking the Heat Dissipation" (page 45).</li> </ul>
<b>Vac-Bfr</b> <b>Vac-Srr</b>	The line voltage is no longer within the permissible range ("Bfr" or "Srr" is an internal message of no relevance for the user). This fault can be caused by any of the following conditions: <ul style="list-style-type: none"> <li>• Power distribution grid disconnected (miniature circuit-breaker, fuse)</li> <li>• AC cable is interrupted or</li> <li>• AC cable is highly resistive.</li> </ul> The inverter disconnects itself from the power distribution grid for safety reasons.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Check the line voltage and connection on the inverter.</li> <li>• If the line voltage lies outside the permissible range because of local grid conditions, ask the grid operator if the voltages can be adjusted at the feed-in point or if they agree to changes in the values of the monitored operating limits (operating parameters: Vac-Min and Vac-Max).</li> <li>• If the line voltage lies within the tolerance range, yet "Vac-Bfr" or "Vac-Srr" faults are still displayed, contact the SMA Service Line.</li> </ul>

Message	Description and corrective measure
<b>Vpv-Max</b>	Overvoltage at DC input. The inverter may be damaged.
	<p><b>Corrective measures</b></p> <p>Disconnect the inverter from the power distribution grid immediately.</p> <ol style="list-style-type: none"> <li>1. Disconnect the miniature circuit-breaker.</li> <li>2. If installed, disconnect the external DC switch-disconnector.</li> <li>3. If an Electronic Solar Switch is installed, remove it.</li> <li>4. Remove all DC connectors.</li> <li>5. Check the DC voltage: <ul style="list-style-type: none"> <li>- If the DC voltage is above the maximum input voltage, check the plant design or contact the PV array installer.</li> <li>- If the DC voltage is below the maximum input voltage, reconnect the inverter to the PV array as described in section 5.4 "Setting the Display Language" (page 29).</li> </ul> </li> </ol> <p>If the message occurs again, disconnect the inverter again and contact the SMA Service Line (see section 13 "Contact" (page 72)).</p>
<b>Watchdog Watchdog Srr</b>	Internal program run fault.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this fault occurs frequently, contact the SMA Service Line.</li> </ul>
<b>Zac-Bfr Zac-Srr</b>	<p>The grid impedance is no longer within the permissible range ("Bfr" or "Srr" is an internal message of no relevance for the user). The inverter disconnects itself from the power distribution grid for safety reasons. The impedance is calculated from both the grid impedance and the impedance of the grid connection cable (AC cable) of the inverter.</p>
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Check the grid impedance and grid connection on the inverter.</li> <li>• Use an AC cable with an adequate cross-section (= low impedance) as described in section 5.3 "Connection to the Power Distribution Grid (AC)" (page 23). If required, check and re-tighten the screws on the AC plugs.</li> <li>• If this fault recurs, contact the SMA Service Line.</li> </ul>

### 9.3 Red LED is Glowing Continuously

If the red status display LED is permanently glowing during operation, there is a ground fault in the PV array or at least one of the varistors for overvoltage protection is defective.

#### Procedure

1. Check for ground faults in the PV array as described in section 9.3.1 "Checking the PV Array for Ground Faults" (page 56).
2. If the red LED continues to glow, check the varistors as described in section 9.3.2 "Checking the Function of the Varistors" (page 58).

#### 9.3.1 Checking the PV Array for Ground Faults

1. Disconnect the inverter from both the DC and AC sides as described in section 7.2 "Opening the Inverter" (page 41).

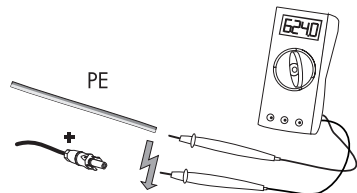
**! DANGER!**  
Risk of lethal electric shock.

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

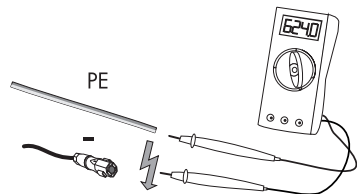
**! NOTICE!**  
Excessive voltages can destroy the measuring device.

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

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

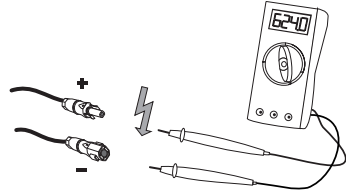


3. Measure the voltages between the negative pole of each string and the ground potential (PE).





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



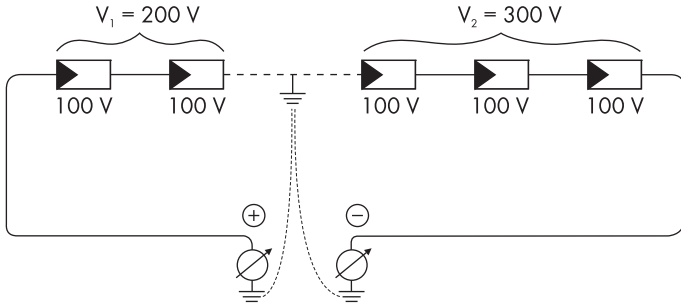
- A ground fault exists if the measured voltages are stable and the sum of the voltages from the positive pole to the ground potential and from the negative pole to the ground potential of a string is approximately equal to the voltage between the positive and negative poles.

Result	Measure
<input checked="" type="checkbox"/> You have found <b>a ground fault</b> .	<ul style="list-style-type: none"> <li>• The installer of the PV array must remedy the ground fault in the affected string. You can determine the location of the ground fault as described below.</li> <li>• Do <b>not</b> reconnect the faulty string.</li> <li>• Commission the inverter as described in section 6.1 "Commissioning the Inverter" (page 39).</li> </ul>
<input checked="" type="checkbox"/> You have found <b>no ground fault</b> .	<p>It is likely that one of the thermally monitored varistors is defective.</p> <ul style="list-style-type: none"> <li>• Check the varistors as described in section 9.3.2 "Checking the Function of the Varistors" (page 58).</li> </ul>

### Location of the ground fault

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

Example:



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

- The ground fault check is finished.

### 9.3.2 Checking the Function of the Varistors

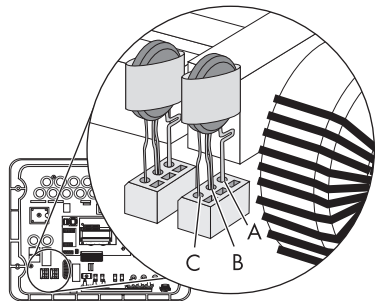
Varistors are wear parts. Their functional efficiency diminishes with age or repeated strain as a result of overvoltage. It is therefore possible that one of the thermally monitored varistors has lost its protective function.



#### Position of varistors

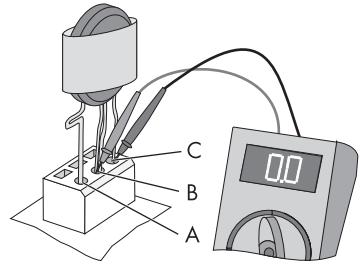
You can determine the position of the varistors using the illustration below. Observe the following assignment of the terminals:

- 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. Open the inverter as described in section 7.2 "Opening the Inverter" (page 41).
2. Use a multimeter to ensure that all of the varistors in installed state have a conducting connection between the connectors B and C.



Result	Measure
<input checked="" type="checkbox"/> There is <b>a conducting</b> connection.	There is probably a different error in the inverter. <ul style="list-style-type: none"> <li>• Close the inverter as described in section 7.3 "Closing the Inverter" (page 43).</li> <li>• Contact the SMA Service Line (see section 13 "Contact" (page 72)).</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 that affect all varistors similarly (temperature, age, induced overvoltage). SMA Solar Technology AG recommends replacing all varistors. <p>The varistors are specially manufactured for use in inverters and are not commercially available. You must order replacement varistors directly from SMA Solar Technology AG (see section 12 "Accessories" (page 71)).</p> <ul style="list-style-type: none"> <li>• To replace the varistors, proceed to step 3.</li> </ul>



**NOTICE!**

**Destruction of the inverter due to overvoltage**

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

- Provide for replacement varistors immediately and replace the defective varistors.
- Do **not** operate inverters with faulty varistors or no varistors at all in plants with a high risk of overvoltage.

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

The terminals will loosen.

If you do not receive an insertion tool for operating the terminals with your replacement varistors, contact SMA Solar Technology AG.

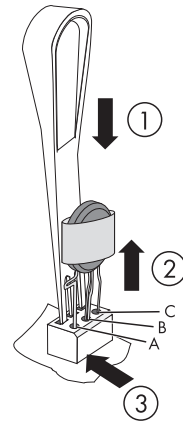
As an alternative, the individual terminal contacts can be operated using a screwdriver with a blade width of 3.5 mm.

4. Remove the varistor (2).
5. Insert the new varistor (3).

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

6. Close the inverter as described in section 7.3 "Closing the Inverter" (page 43).

The check and replacement of the varistors is completed.



# 10 Decommissioning

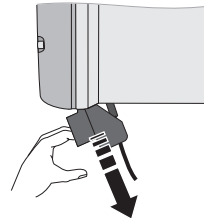
## 10.1 Disassembling the Inverter



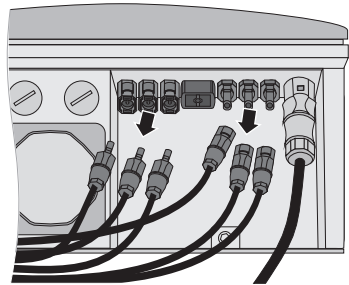
**DANGER!**  
Danger to life due to high voltages in the inverter.

- Disconnect the miniature circuit-breaker and secure against re-connection.

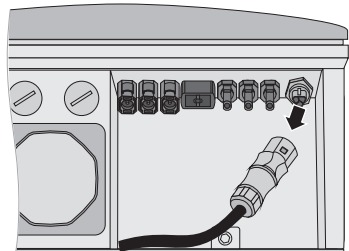
1. If an external DC switch-disconnector is available, disconnect it.
2. If an Electronic Solar Switch is installed, pull it downwards, slightly towards the wall.



3. Release and remove all DC connectors (see section 7.2 "Opening the Inverter" (page 41)).



4. Remove the AC plug from the inverter.



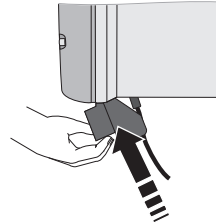
5. Close the AC plug with the protective cap.
6. Close all DC inputs with the corresponding DC connectors and sealing plugs.

**CAUTION!****Risk of burns due to hot enclosure parts**

The inverter's enclosure can become hot during operation.

- Wait until the enclosure has cooled down.

7. If a communication cable is available:
  - Open the inverter as described in section 7.2 "Opening the Inverter" (page 41).
  - Remove the communication cable from the inverter.
  - Close the inverter as described in section 7.3 "Closing the Inverter" (page 43).
8. If present, plug in the Electronic Solar Switch.

**NOTICE!****Damage to the inverter due to moisture and dust intrusion**

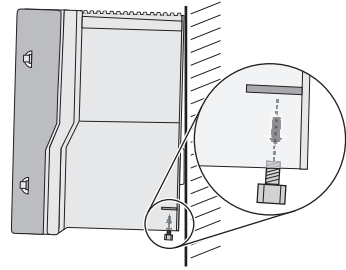
If the Electronic Solar Switch is not plugged in or incorrectly plugged in during operation, moisture and dust can penetrate the inverter.

If the Electronic Solar Switch is not correctly plugged in, this can cause contacts to wear in the Electronic Solar Switch or the Electronic Solar Switch might fall down. This can result in yield loss and damage to the Electronic Solar Switch.

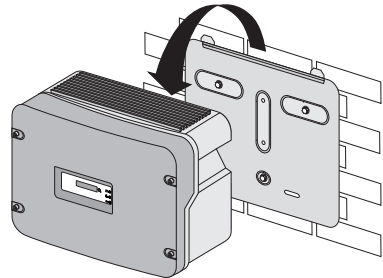
Always plug in the Electronic Solar Switch as described in the following:

- Do not tighten the screw in the Electronic Solar Switch.
- Firmly plug in the Electronic Solar Switch until it is flush with the enclosure.
- Ensure that the maximum distance between the Electronic Solar Switch and the enclosure is 1 mm.

9. Remove the safety screw.



10. Lift the inverter off the wall mounting bracket.



- The inverter is disassembled.

## 10.2 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 and made to support both the weight and the size of the inverter.

## 10.3 Storing the Inverter

Store the inverter in a dry place where ambient temperatures are always between  $-25^{\circ}\text{C}$  and  $+60^{\circ}\text{C}$ .

## 10.4 Disposing of the Inverter

Dispose of the inverter at the end of its electrical endurance in accordance with the disposal regulations for waste electrical and electronic equipment which apply at the installation site at that time. Alternatively, send it back to SMA Solar Technology AG with shipping paid by sender, and with the information "ZUR ENTSORGUNG" ("for disposal") (see section 13 "Contact" (page 72)).

# 11 Technical Data

## 11.1 DC/AC

### 11.1.1 Sunny Boy 3300

#### DC Input

Maximum DC power at $\cos \varphi = 1$	3 820 W
Maximum input voltage*	500 V
MPP voltage range	200 V ...400 V
Rated input voltage	200 V
Minimum input voltage	200 V
Start input voltage	250 V
Maximum input current	20 A
Maximum input current per string	16 A
Number of independent MPP inputs	1
Strings per MPP input with ESS	3
Strings per MPP input	2

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



## AC Output

Rated power at 230 V, 50 Hz	3 300 W
Maximum apparent AC power	3 600 W
Rated grid voltage	230 V
AC nominal voltage	220 V / 230 V / 240 V
AC voltage range*	180 V ... 265 V
Nominal AC current at 220 V	15 A
Nominal AC current at 230 V	14.3 A
Nominal AC current at 240 V	13.8 A
Maximum output current	18 A
Total harmonic factor of the output current with total harmonic factor of the AC voltage < 2%, and AC power > 50% rated power	< 3%
Rated power frequency	50 Hz
AC grid frequency	50 Hz/60 Hz
Operating range at AC power frequency 50 Hz	+/- 4.5 Hz
Operating range at AC power frequency 60 Hz	+/- 4.5 Hz
Displacement power factor, adjustable	0.8 overexcited ... 0.8 underexcited
Feed-in phases	1
Connection phases	1
Overvoltage category according to IEC 60664-1	III

## Efficiency

Maximum efficiency, $\eta_{\max}$	95.2%
European weighted efficiency, $\eta_{EU}$	94.4%

## 11.1.2 Sunny Boy 3800

### DC Input

Maximum DC power at $\cos \varphi = 1$	4 040 W
Maximum input voltage*	500 V
MPP voltage range	200 V ... 400 V
Rated input voltage	200 V
Minimum input voltage	200 V
Start input voltage	250 V
Maximum input current	20 A
Maximum input current per string	16 A
Number of independent MPP inputs	1
Strings per MPP input with ESS	3
Strings per MPP input	2

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

## AC Output

Rated power at 230 V, 50 Hz	3 800 W
Maximum apparent AC power	3 800 W
Rated grid voltage	230 V
AC nominal voltage	220 V / 230 V / 240 V
AC voltage range	180 V ... 265 V
Nominal AC current at 220 V	17.3 A
Nominal AC current at 230 V	16.5 A
Nominal AC current at 240 V	15.8 A
Maximum output current	18 A
Total harmonic factor of the output current with total harmonic factor of the AC voltage < 2%, and AC power > 50% rated power	< 3%
Rated power frequency	50 Hz
AC grid frequency	50 Hz / 60 Hz
Operating range at AC power frequency 50 Hz	+/- 4.5 Hz
Operating range at AC power frequency 60 Hz	+/- 4.5 Hz
Displacement power factor, adjustable	0.8 overexcited ... 0.8 underexcited
Feed-in phases	1
Connection phases	1
Oversvoltage category according to IEC 60664-1	III

## Efficiency

Maximum efficiency, $\eta_{\max}$	95.6%
European weighted efficiency, $\eta_{EU}$	94.7%

## 11.2 General Data

Width x height x depth	450 mm x 350 mm x 236 mm
Width x height x depth with Electronic Solar Switch	450 mm x 352 mm x 236 mm
Weight	38 kg
Length x width x height of packaging	580 mm x 470 mm x 390 mm
Transport weight	43.7 kg
Climatic category according to IEC 60721-2-1	4K4H
Operating temperature range	- 25 °C ... +60 °C
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above MSL	2 000 m
Noise emission (typical)	≤ 40 dB(A)
Power loss in night operation	< 0.1 W
Topology	LF transformer
Cooling concept	OptiCool
Fan connection	designed for safe disconnection in accordance with DIN EN 50178:1998-04
Electronics degree of protection according to IEC 60529	IP65
Protection class according to IEC 62103	I

### 11.2.1 Protective Devices

DC reverse-polarity protection	Short-circuit diode
Input-side disconnection device *	Electronic Solar Switch, DC plug-in system SUNCLIX
DC overvoltage protection	Thermally monitored varistors
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 2.1
Maximum permissible fuse protection	25 A
Ground fault monitoring	Insulation monitoring: $R_{iso} > 1 \text{ M } \Omega$

\* optional

## 11.2.2 Country Standards

Country standard as at 11/2011	SB 3300-11	SB 3800-11
VDE0126-1-1	✓	✓
VDE-AR-N4105	✓	✓
AS 4777	✓	✓
C10/11	✓	✓
VDE0126-1-1 / UTE C15-712-1	✓	✓
PPC	✓	✓
DK5940	✓	✓
EN 50438*	✓	✓
RD 1663/2000	✓	✓
RD 661/2007	✓	✓
G83/1-1	✓	✓

\*EN 50438: Does not apply to all national standard deviations.

## 11.2.3 Climatic Conditions

### According to 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

### According to IEC 60721-3-4, Transport Type E, Class 2K3

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

## 11.2.4 Features

DC connection	SUNCLIX DC connector
AC connection	AC connector
Display	LC text display
RS485, galvanically isolated	optional

### 11.2.5 Electronic Solar Switch (optional)

Electrical endurance in the event of a short circuit, with a nominal current of 30 A	at least 50 switching processes
Maximum switching current	30 A
Maximum switching voltage	800 V
Maximum PV power	10 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP21

### 11.2.6 Torque

Enclosure lid screws	6.0 Nm
Additional grounding screws	6.0 Nm
Cheese-head screws for securing the enclosure to the wall mounting bracket	6.0 Nm
SUNCLIX swivel nut	2 Nm
RS485 communication connection	1.5 Nm

### 11.2.7 Distribution Systems

IT system	suitable
TN-C system	suitable
TN-S system	suitable
TN-C-S system	suitable
TT system	suitable
Split-phase	tsuitable

## 12 Accessories

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

<b>Designation</b>	<b>Brief Description</b>	<b>SMA order number</b>
Ventilation grid	Ventilation grid set "right and left" as spare part	45-7202
Electronic Solar Switch	ESS handle spare part	ESS-HANDLE:02 Also enter the inverter's serial number.
Replacement varistors	Set of thermally monitored varistors (2 pcs.) incl. insertion tool	SB-TV4
Insertion tool for the replacement of varistors	insertion tool for varistors	SB-TVWZ
Positive grounding set	retrofit kit for the positive connection to ground of the DC input	ESHV-P-NR
Negative grounding set	retrofit kit for the negative connection to ground of the DC input	ESHV-N-NR
RS485 retrofit kit	RS485 interface	485PB-NR
<i>Bluetooth</i> upgrade kit	<i>Bluetooth</i> interface	BTPBINV-NR
SUNCLIX DC connector	field plug for conductor cross-sections of 2.5 mm <sup>2</sup> ... 6 mm <sup>2</sup>	SUNCLIX-FC6-SET

## 13 Contact

If you have technical problems concerning our products, contact the SMA Service Line.

We require the following information in order to provide you with the necessary assistance:

- Inverter type
- Inverter serial number
- Type and number of PV modules connected
- Blink code or display message of the inverter
- Optional equipment, e.g. communication products

### **SMA Solar Technology AG**

Sonnenallee 1

34266 Niestetal, Germany

[www.SMA.de](http://www.SMA.de)

### **SMA Service Line**

Inverters: +49 561 9522 1499

Communication: +49 561 9522 2499

Fax: +49 561 9522 4699

E-Mail: [ServiceLine@SMA.de](mailto:ServiceLine@SMA.de)







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The current warranty conditions come enclosed with your device. These are also available online at [www.SMA-Solar.com](http://www.SMA-Solar.com) and can be downloaded and are available on paper from the usual sales channels if required.

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### SMA Solar Technology AG

Sonnenallee 1  
34266 Niestetal  
Germany

Tel. +49 561 9522-0  
Fax +49 561 9522-100  
[www.SMA.de](http://www.SMA.de)  
E-Mail: [info@SMA.de](mailto:info@SMA.de)

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**www.SMA-Solar.com**

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[www.SMA.de](http://www.SMA.de)

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