



PV Inverter

SUNNY BOY 3300TL HC

Installation Guide



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1 Notes on this Manual

This manual describes the mounting, installation, commissioning and servicing of the SMA inverters of the type Sunny Boy 3300TL HC (SB 3300TL HC). Store this manual where it will be accessible at all times.

1.1 Validity

This manual is valid for the Sunny Boy 3300TL HC.

1.2 Target group

This manual is intended for the electrician.

1.3 Additional Information

You will find further information on special topics such as designing a line circuit breaker or the description of the operating parameters in the download area at www.SMA.de/en.

Refer to the user manual for detailed information on troubleshooting and operating the Sunny Boy.

1.4 Symbols Used

The following types of safety instructions and general information appear in this document as described below:

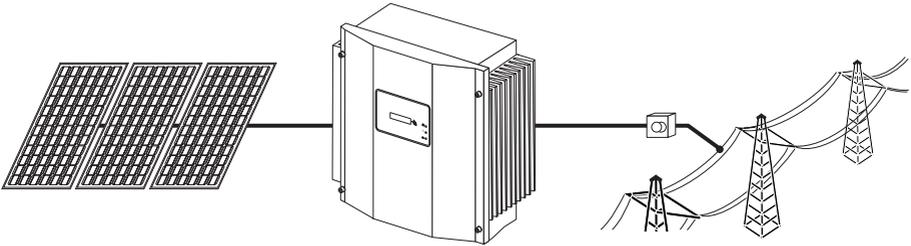
	DANGER!
DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.	
	WARNING!
WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.	
	CAUTION!
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.	
	NOTICE!
NOTICE indicates a situation that can result in property damage if not avoided.	
	Information
Information provides tips that are valuable for the optimal installation and operation of your product.	

2 Safety

2.1 Appropriate Usage

The Sunny Boy is a PV inverter that converts the DC current of solar cells to AC current and feeds it into the public grid.

Principle of a PV system with this Sunny Boy



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

PV modules with large capacities relative to ground, such as thin-film modules with cells on a metallic substrate, are only to be implemented if their coupling capacity is below 50 nF/kWp.

During grid feeding, a leakage current whose magnitude depends on the manner in which the modules are installed and on the weather (rain, snow) flows from the cells to ground. This operational leakage current is not to exceed a value of 50 mA.

When designing the PV system, ensure that the values comply with the permitted operating range of all components at all times. The free design program "Sunny Design" (www.SMA.de/en/SunnyDesign) will assist you. The manufacturer of the PV modules must have approved the modules for use with this Sunny Boy unit. 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).

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

2.2 Safety Instructions



DANGER!

Danger to life due to high voltages.

- All work on the Sunny Boy must only be carried out by a qualified personnel.



CAUTION!

Danger of burn injuries due to hot housing parts!

- Do not touch the housing of the Sunny Boy during operation.



NOTICE!

Foreign objects or water entering the Sunny Boy can damage the device!

Once the Electronic Solar Switch has been pulled out, the Sunny Boy only provides protection degree IP21. The Sunny Boy is then no longer protected against water and contamination with dirt!

In order that the protection level IP65 is also provided during a temporary decommissioning, proceed as follows:

- Unplug all DC plug connectors and seal them with the protecting caps provided.
- Attach the Electronic Solar Switch again.



Grounding the PV generator

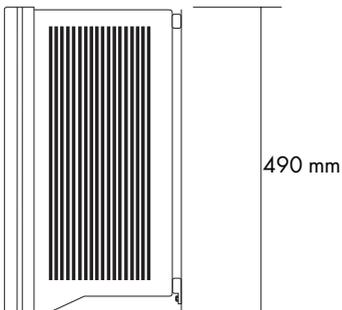
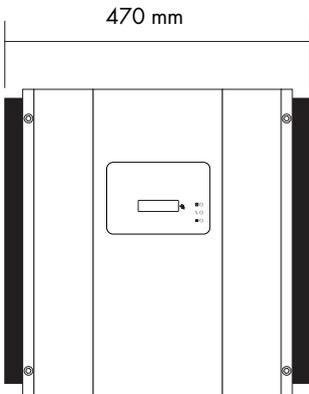
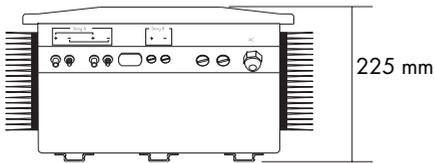
Comply with the local requirements for grounding the modules and the PV generator. SMA recommends to electrically bond the module frames, the racks and all metal surfaces and ground these in order to have optimal protection of the system and personnel.

3 Overview

3.1 Identifying the Sunny Boy

You can identify the Sunny Boy using the type label. The type label can be found on the right side of the housing and contains information about the serial number, the device type as well as technical data.

3.2 External dimensions



4 Mounting

4.1 Selecting the Mounting Location

 <p>DANGER! Danger to life due to fire or explosion!</p>
<p>Despite careful construction, a fire can occur with electrical devices.</p> <ul style="list-style-type: none"> • Do not mount the Sunny Boy on flammable construction materials. • Do not mount the Sunny Boy near highly flammable materials. • Do not install the Sunny Boy in potentially explosive areas!

 <p>CAUTION! Danger of burn injuries due to hot housing parts!</p>
<p>The temperature of individual parts of the housing, in particular the temperature of the heatsink and the components inside the Sunny Boy can reach more than 60 °C. Touching could result in burns!</p>

Weight

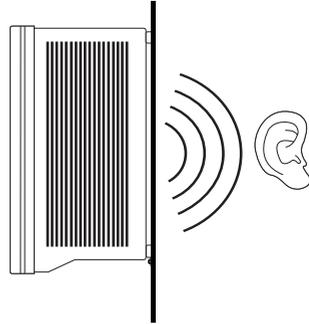
 <p>CAUTION! Risk of injury due to the heavy weight of the Sunny Boy!</p>
<p>The Sunny Boy weighs more than 28 kg.</p> <ul style="list-style-type: none"> • Consider the weight of the Sunny Boy when choosing the location and method of installation.

Ambient Conditions

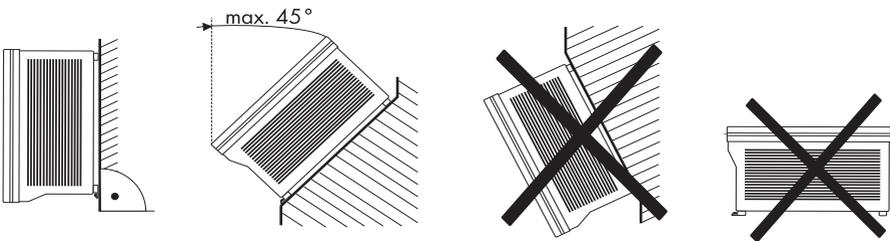
- The mounting location and mounting method must be suitable for the weight and dimensions.
- Mount on a solid surface.
- The installation location must be accessible at all times (do not mount in inaccessible places).
- The Sunny Boy must be easy to remove from the mounting location at any time.
- The Sunny Boy must not be in operation in ambient temperatures outside the range of -25 °C and +60 °C. For optimal operation, the ambient temperature should not exceed +40 °C.
- Do not expose the Sunny Boy to direct sunlight, so as to avoid power reduction due to excessive heating.

- In a living area, do not mount the unit on plasterboard walls (or similar) in order to avoid audible vibrations.

The Sunny Boy can make noises when in use which can be regarded as a nuisance when installed in a living area.



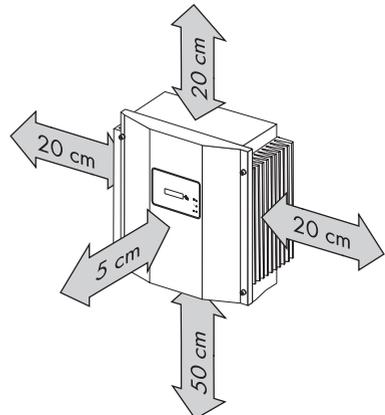
- Vertical installation or tilted backwards by max. 45°.
- Install at eye level to allow operating modes to be read at all times.
- Never install the device with a forward tilt.
- Do not install horizontally.



Safety Clearances

Observe the following safety clearances to walls, other devices or other objects in order to guarantee sufficient heat dissipation and enough space for removing the Electronic Solar Switch:

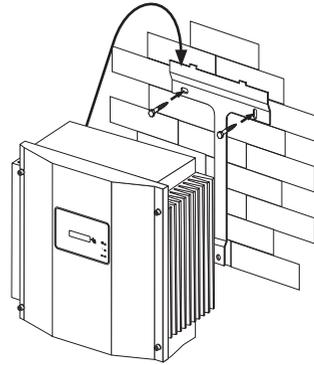
Direction	Minimum Clearance
Sides	20 cm
Top	20 cm
Bottom	50 cm
Front	5 cm



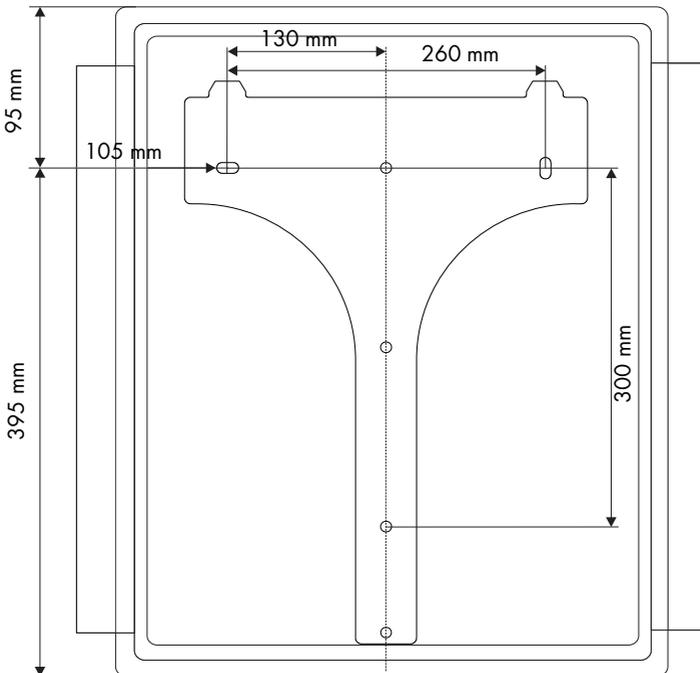
4.2 Mounting the Sunny Boy

To make the job easier, we recommend you use the supplied wall bracket to mount the Sunny Boy. For vertical installation on solid concrete or block walls, for example, you can fit the bracket using 8 mm x 50 mm hexagon bolts to DIN 571 standard, stainless steel type, and with wall plugs type SX10.

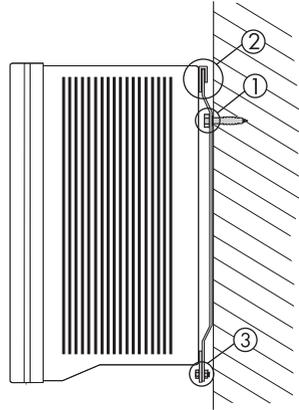
When selecting the mounting materials, be sure to take into account the weight of the Sunny Boy (28 kg).



If you do not want to use the supplied wall bracket as a template, observe the dimensions shown in the illustration below. The procedure for mounting the inverter using the wall bracket is described on the following pages.



1. Mount the wall bracket (1). In order to mark the positions for the drill holes, you can use the wall bracket as a drilling template.
2. Now hang the Sunny Boy onto the wall bracket (2) using its upper mounting plate so that it cannot be moved sideways.
3. Fix the Sunny Boy onto its bracket by screwing the supplied M6x10 bolt into the central threaded hole at the bottom of the bracket (3).
4. Make sure that the Sunny Boy is positioned securely on the bracket.



5 Electrical Connection

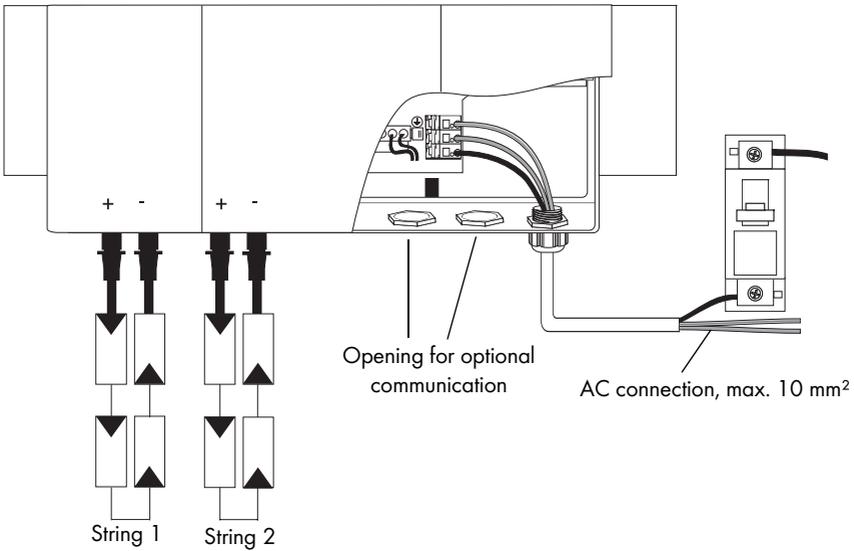
5.1 Overview Connection Area

 **NOTICE!**
Electrostatic discharges can damage the Sunny Boy!

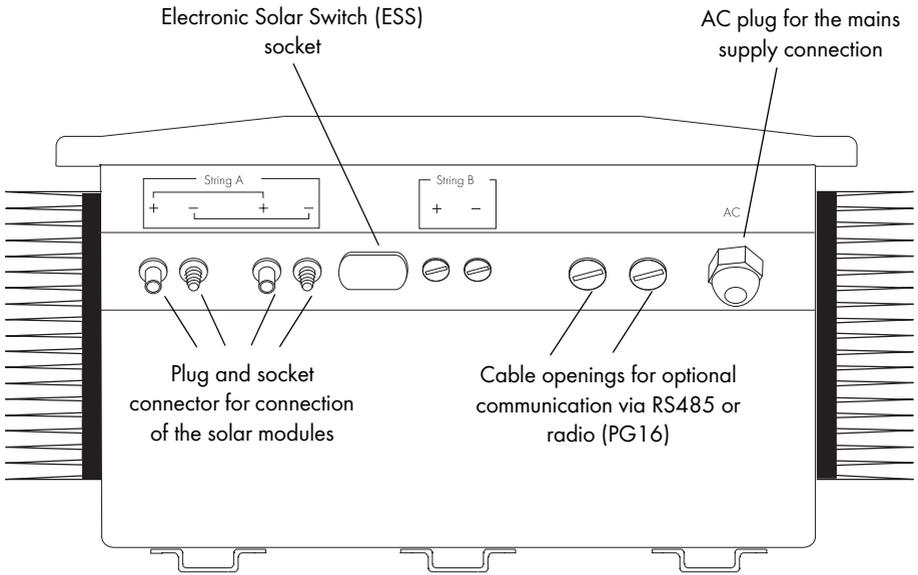
Internal components of the Sunny Boy can be irreparably damaged by electrostatic discharge.

- Ground yourself before you touch a component.

The complete wiring for a Sunny Boy is shown schematically in the following figure:

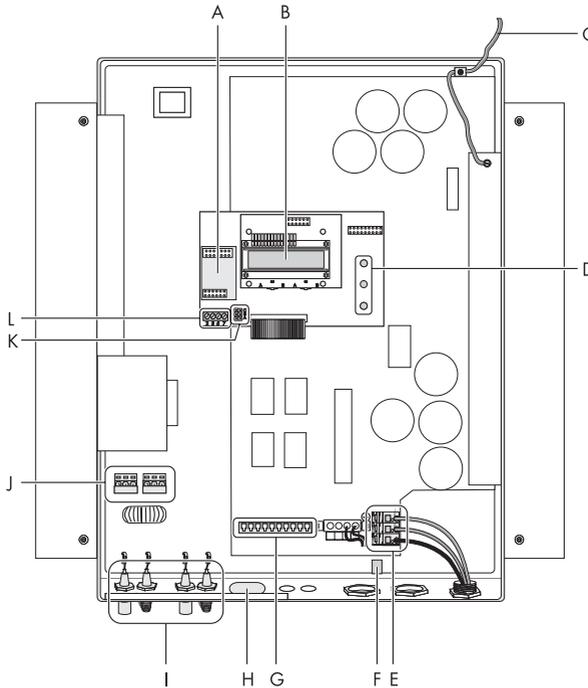


5.1.1 View from Below



5.1.2 View from Inside

The following diagram gives a schematic overview of the various components and connection points inside the Sunny Boy with the cover removed:



Object	Description
A	Socket for communication (RS485, radio), section 5.5 "The Communications Interface" (page 23)
B	Sunny Display
C	PE (protective earth) connecting cable for cover
D	Operating status LEDs
E	Connection terminals (AC), chapter 5.2.1 "Connection of the AC Output" (page 18)
F	Tab for grounding the cable shield with RS485 communication
G	Socket for the PLC power module (required for mains grid communication)
H	Electronic Solar Switch (ESS) socket
I	PV input plugs (DC), section 5.3.1 "PV string (DC) connection" (page 20)
J	Varistors, section 9.1 "The red LED is continuously lit" (page 32)
K	Jumper slot for communication
L	Communication connector

5.2 Low Voltage Grid (AC)

Load Disconnection Unit

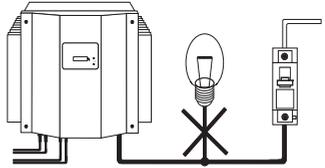
The maximal permissible rating is located in the technical data (page 36).



DANGER!
Danger to life due to fire!

When a generator (Sunny Boy) and a consumer are connected to the same line circuit breaker, the protective function of the line circuit breaker is no longer guaranteed. The current from the Sunny Boy and the grid can add up to overcurrent which is not detected by the line circuit breaker.

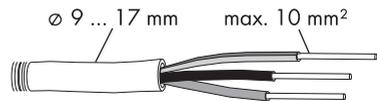
- Never connect loads between the Sunny Boy and the line circuit breaker without protection.
- Always install separate fuses for loads.



The relevant technical regulations and the special instructions of the local grid operator must be followed.

The connection terminals of the Sunny Boy are suitable for wire cross-sections of up to 10 mm². The external diameter of the cable must be between 9mm and 17mm.

The connection is made with three wires (L, N, PE).



 Examples for the rating of a line circuit breaker can be found in the Technical Information "line circuit breaker" in the download area of www.SMA.de/en.

The Sunny Boy is equipped with an integrated universal current sensitive leakage-current monitoring unit. The Sunny Boy can automatically differ between real fault currents and "normal" capacitive leakage currents.

The Sunny Boy does not generate any extraordinary leakage currents in normal operation. In certain operating states (e.g. during self-test of the protective equipment), leakage currents may occur which can trigger a "normal" 30 mA RCD or FI circuit breaker.

 **A 30 mA RCD or FI circuit breaker must not be installed.**

In the event that an RCD or FI circuit breaker is necessary or mandatory, you must use a circuit breaker with a tripping characteristic of 100 mA or more.

5.2.1 Connection of the AC Output

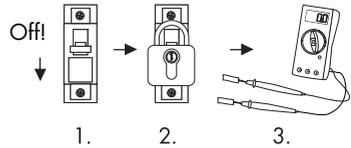


Connection requirements of the grid operator

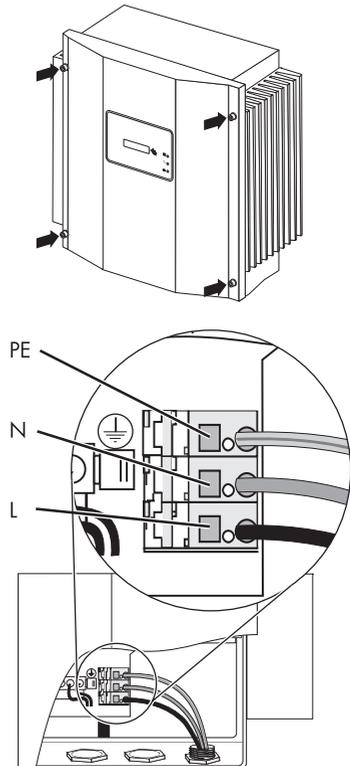
Always observe the connection requirements of your grid operator!

To connect the AC cable, proceed as follows:

1. Check the grid voltage. Complying with DIN VDE 0126-1-1, the Sunny Boy will not be fully operational if the grid voltage is constantly higher than 253 V. In this case, contact the local grid operator for assistance. The inverter can temporarily feed power into the grid with a maximum output voltage of 260 V. However, the 10-minute average must not exceed 253 V.
2. Isolate the grid connection (switch the line circuit breaker to its "Off" position), make sure it cannot be switched back on, and test to make sure no voltage is present.
3. Remove the screws that secure the enclosure of the Sunny Boy and carefully remove the cover. Remove the PE connection from the cover.



4. Connect the mains cable as shown in the figure. Use the supplied cable opening.
"L" and "N" must not be swapped.
5. Connect the protective earth (PE) of the power line to the upper screw terminal with the earth sign.
6. Reconnect the PE connection to the housing cover with these.
7. Fix the housing cover of the Sunny Boy and tighten the four screws evenly.





Correct operation of your Sunny Boy requires, among other things, the connection of the PE conductor to the equipotential bonding of the building. Please check the prescribed PE connection from the Sunny Boy case to protective earth when commissioning the device!

DANGER!
Danger to life due to high voltages.

- Do not switch the line circuit breaker on yet! The Sunny Boy may only be connected to the AC grid once the PV strings are connected and the device is securely closed.

5.3 PV Generator Requirements

The Sunny Boy is designed to be connected to up to two strings having a homogenous structure (modules of the same type, identical orientation, tilt and number).

Sunny Design will assist you in the system design and checking of the string size for a given type of inverter. Further information on Sunny Design is available at www.SMA.de/en.

The unit has four DC plug connectors (two for each string) for connecting the PV generators. The connecting cables from the PV generators must also be fitted with this type of plug connector. The SMA order codes for the various connectors are as follows [see also section 12 "Accessories" (page 39)]:

- Multi-Contact 3 mm: "SWR-MC"
- Multi-Contact 4 mm: "MC-SET"
- Tyco: "TYCO-SET"

Limit values for DC input	
Max. voltage	750 V (DC)
Max. input current	11 A (DC)

5.3.1 PV string (DC) connection

DANGER!
Danger to life due to high voltages on the Sunny Boy!

- Before connecting the PV generator, ensure that the line circuit breaker is switched off.

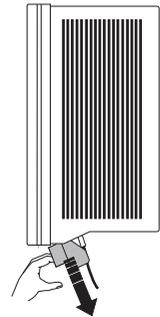
Use of Adaptors

Adaptors (branch connectors) are not to be visible or freely accessible in the immediate surrounding of the Sunny Boy, in order that the DC circuit is not disrupted as a result.

- Always disconnect the current flow first via the Electronic Solar Switch.

Procedure for DC connection

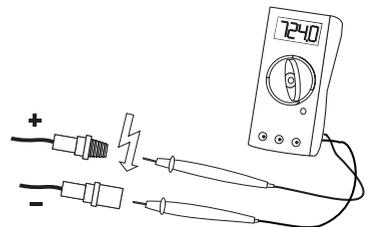
1. Remove the Electronic Solar Switch on the underside of the Sunny Boy.



NOTICE!
Excessive voltages can destroy the measuring device!

- Only use measuring devices with a DC input voltage range up to at least 800 V.

2. Check that the PV generator connectors have the right polarity and do not exceed the maximum string voltage of 750 V (DC). See also section 5.1 "Overview Connection Area" (page 14).





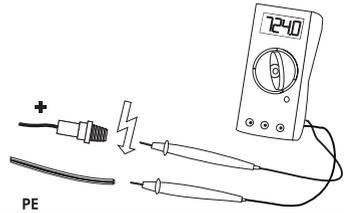
NOTICE!

Exceeding the maximum input voltage can destroy the Sunny Boy!

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

- Do not connect strings to the Sunny Boy with open circuit voltage greater than the maximum input voltage of the Sunny Boy.
- Check the system design.

3. Check the strings for ground faults, as described in section 9.1.1 "Checking the PV Generator for Ground Fault" (page 32).

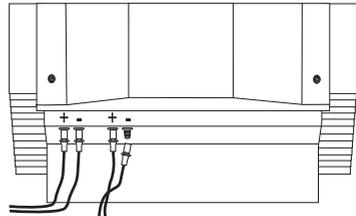


DANGER!

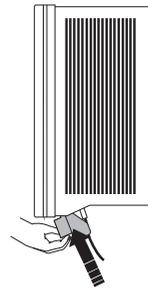
Risk of lethal electric shock!

- Do not connect any strings in which you have detected a ground fault!
- Firstly, clear the ground fault in the PV generator.

4. Connect up the faultless PV generator strings to the inverter.
5. Close the unused DC input sockets with the caps included in the delivery.



6. Reinsert the Electronic Solar Switch in the socket on the underside of the Sunny Boy.



 **NOTICE!**
Manipulating the connector in the handle can damage the Electronic Solar Switch!

The connector within the handle must remain movable in order to ensure proper contact. Tightening the screw voids all warranty claims and creates a fire risk.

- Do **not** tighten the connector screw in the Electronic Solar Switch handle.

 **NOTICE!**
The Electronic Solar Switch can be damaged if it is inserted incorrectly!

The Electronic Solar Switch can be damaged by high voltage if it has not been attached properly.

- Press the handle firmly into place on the socket of the Electronic Solar Switch until it audibly locks into place.
- Check that the handle is securely in place.

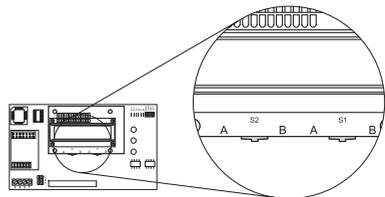
5.4 Setting the Display Language

The display language of the display is set with the switches underneath the display assemblies inside the Sunny Boy.

You can change the language setting of the display as follows:

1. Open the Sunny Boy as described in section 7.1 "Opening the Sunny Boy" (page 29).
2. Set the switch combination of the required language. See Table.

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



3. Close the Sunny Boy as described in section 7.2 "Closing the Sunny Boy" (page 30).

5.5 The Communications Interface

The communication interface is used to communicate with SMA communication devices (e.g. Sunny Boy Control, Sunny WebBox) or a PC with appropriate software (e.g. Sunny Data Control). Depending on the selected communication interface, up to 2500 inverters can be interconnected. Detailed information on this topic can be found in the communication device manual, the software or on the Internet at www.SMA.de/en.

For the installation of the communication interfaces there are the following possibilities:

- RS485, Funk Piggy-Back (see section 5.5.1 "Connection RS485, Radio Piggy-Back" (page 24))

The detailed wiring diagram for each communication interface can be found in the communication device manual. This wiring diagram includes the following information:

- Details on the required cable type
- Which of the inverter's connections are used
- Whether jumpers need to be mounted, and if so, which jumpers
- Whether the PE needs to be connected to the cable shield

The next pages will describe the following:

- The housing feed-throughs for the communication interface
- The permitted cable route in the Sunny Boy
- The location of the PE connector
- The location of the screw terminals for connecting the communication wires
- The location of the jumper slots
- The location of the interface port
- The location of the interface port for the PLC power module and the Powerline modem

5.5.1 Connection RS485, Radio Piggy-Back

This section describes the installation of the Piggy-Backs for the different Sunny Boy communication systems: RS485 interface and Radio Piggy-Back. You can take the relevant SMA order numbers from the section 12 "Accessories" (page 39).



NOTICE!

Electrostatic discharges can damage the Sunny Boy and the communication interface!

Electrostatic discharges are an acute danger to the Sunny Boy and to the communication interface.

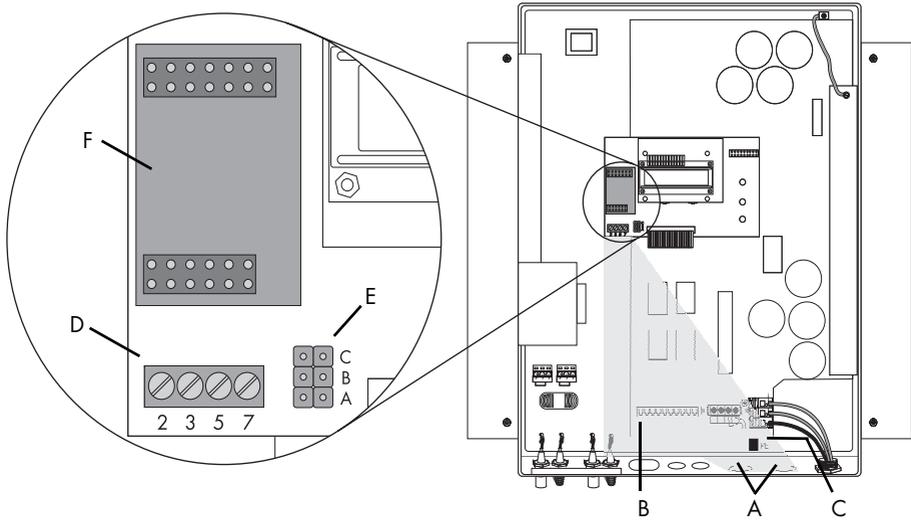
- Ground yourself by touching PE before removing the communication interface from the packaging, and before touching any components within the Sunny Boy.



Read the communication device manual before beginning installation work. Further wiring details can be found there.

1. Open the Sunny Boy as described in section 7.1 "Opening the Sunny Boy" (page 29).
2. Guide the PG screw fitting over the communication cable.
3. Thread the cable through one of the cable openings (A) on the Sunny Boy. Use one or two cable openings, depending on the type of cable used. Use the right-hand housing feed-through for the Radio Piggy-Back.
4. Screw the PG screw fitting onto the Sunny Boy.
5. Sheathe the cable inside the Sunny Boy using the silicone tube provided. The silicone tube is imperative for safety reasons. The interface may not be commissioned without this silicone tube (with the exception of the Radio Piggy-Back).
6. Lay the cable in area (B) as shown in the figure to the right.
7. Ground the cable shield at the PE connector (C) if the connection plan of the communication device indicates this as necessary.
8. Connect the communication wires to the screw terminal strip (D) as described in the connection plan of the communication device. Note down the connector color coding for the respective pin numbers. Connecting the receiver incorrectly can damage the devices.
 - Pin 2 color: _____
 - Pin 3 color: _____
 - Pin 5 color: _____
 - Pin 7 color: _____
9. Connect the jumpers (E) if the connection plan of the communication device indicates this as necessary. The table in section 5.5.2 "Jumper Functions" (page 25) provides an overview of the jumper functions.

10. Plug the communication interface to the left of the board (F).
11. Close the Sunny Boy as described in section 7.2 "Closing the Sunny Boy" (page 30).



- A Enclosure openings in the base of the Sunny Boy.
- B Cable route (gray surface)
- C PE connector
- D Screw terminals for connection of the communication wires
- E Jumper slots
- F Interface port

5.5.2 Jumper Functions

	Jumper A	Jumper B	Jumper C
RS485	Termination	Bias 1	Bias 2
Radio Piggy-Back	-	-	-

A detailed description of the jumper functions can be found in the communication device documentation.

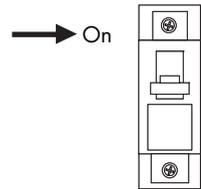
6 Commissioning

Check the following requirements before commissioning:

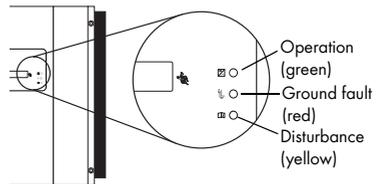
- The cover is securely screwed on.
- The AC (power) cable is connected correctly.
- The DC cables (PV-Strings) are fully connected.
- The unused DC plug connectors on the underside of the housing are sealed with protecting caps.
- The Electronic Solar Switch (ESS) is correctly attached.
- The line circuit breaker is correctly rated.

Commissioning Procedure

1. Switch the line circuit breaker to the "On" position.



2. Now look at the LED display and consult the table on the following page to check whether the Sunny Boy is in a fault-free and expedient operating mode. If this is the case, commissioning was successfully completed.



6.1 Display Message

Feeding Operation

After fault-free grid connection of the Sunny Boy, it takes approximately one minute until the following display messages are shown alternately. The display messages shown before only have the purpose of indicating the initialization of the Sunny Boy and the process of controlling whether the power supply requirements are fulfilled.

- Initially, the energy generated on the respective day and the current operating mode are displayed.
- After 5 seconds or by tapping on the enclosure lid, the current feed-in output and the output voltage are displayed.
- After a further 5 seconds, or when you tap again, the current input voltage and the input power are displayed.
- After a further 5 seconds, or when you tap again, the total energy produced and the time the Sunny Boy has been connected to the grid are displayed.
- Then the cycle begins again.

```
E-today    0Wh
Mode       MPP
```

```
Pac        903W
Vac        230V
```

```
Upv       520V
Ppv       1325W
```

```
E-total    0Wh
h-total    0h
```

Disturbance

- In case of a failure, the message "Disturbance" will be indicated in the status bar.
- The exact failure message follows.
- For example, if the grid fault message shown here is displayed immediately after connection, it may be due to the fact that the AC wire is not correctly connected or the circuit breaker is not switched on yet.
- If the disturbance was caused by a measured value that does not correspond to the standard, the value measured at the time of the disturbance is displayed. If another measurement is possible, the present value is displayed in the second line.

```
E-today    0Wh
Mode Disturbance
```

```
Disturbance
Vac-Bfr
```

```
at:        261W
Present:   245W
```

PV Overvoltage



NOTICE!

Excessive DC input voltage can destroy the Sunny Boy!

If the bottom yellow LED flashes four times at intervals of one second, the grid voltage and the PV generator must be immediately disconnected from the Sunny Boy! There is a danger of damage to the inverter resulting from excessive DC input voltage!

!PV-Overvoltage!
!DISCONNECT DC!

Check the string voltages again to make sure they are within the limits stated in section 5.1 "Overview Connection Area" (page 14). If the input voltage is too high, contact the planner / installer of the PV generator for assistance.

If despite checking the string voltages the LED signal occurs again when the PV generator is connected to the Sunny Boy, disconnect the PV generator from the Sunny Boy again and contact SMA Solar Technology (see section 13 "Contact" (page 40)).

6.2 Blink Codes

Green	Red	Yellow	Status
Glows continuously	Is not glowing	Is not glowing	OK (feeding operation)
	Glows continuously	Is not glowing	Disturbance
		Glows continuously	OK (initialization)
Flashes quickly (3 x per second)	Is not glowing	Is not glowing	OK (Stop)
	Glows continuously	Is not glowing	Disturbance
Flashes slowly (1 x per second)	Is not glowing	Is not glowing	OK (waiting, grid monitoring)
	Glows continuously	Is not glowing	Disturbance
Briefly goes out (approx. 1x per second)	Is not glowing	Is not glowing	OK (derating)
	Glows continuously	Is not glowing	Disturbance
Is not glowing	Is not glowing	Is not glowing	OK (night shutdown)
		glowing/blinking	Disturbance
	Glows continuously	Is not glowing	Disturbance
		glowing/blinking	Disturbance



You will find a detailed description of the failure messages and their causes as well as the meaning of the blink codes in the the Sunny Boy user manual included in delivery.

7 Sunny Boy Opening and Closing



NOTICE!

Electrostatic discharges can damage the Sunny Boy!

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

- Ground yourself before you touch a component.

7.1 Opening the Sunny Boy

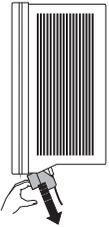


DANGER!

Danger to life due to high voltages.

- Before opening the Sunny Boy, switch the line circuit breaker off and make sure that it cannot be switched back on.

1. Remove the Electronic Solar Switch.



2. Disconnect the PV generator from the Sunny Boy.



DANGER!

Danger to life due to unsafe disconnection from the PV generator!

A secure separation from the PV generator is only guaranteed after pulling off the Electronic Solar Switch **and** all DC connectors.

- Remove all DC plug connectors to completely disconnect the PV generator from the Sunny Boy.

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



DANGER!

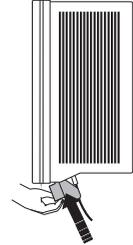
Danger to life due to high voltages.

- Wait 15 minutes for the capacitors to discharge.

4. Remove the four screws from the housing cover and pull the cover forward smoothly. Remove the PE connection from the cover by loosening the locking device of the PE connection on the cover.
5. Verify the absence of voltage with respect to ground at the AC clamp with an appropriate meter. If there is a voltage present, check the installation!

7.2 Closing the Sunny Boy

1. Reconnect the protective earth (PE) to the housing cover.
2. Now secure the lid to the Sunny Boy by tightening the four screws evenly. The screws must be tightened with approximately 4 Nm torque in order to guarantee the sealing of the housing.
3. Connect the PV generator. Ensure the assignment of the strings is correct.
4. Check the Electronic Solar Switch for wear, as described in section 8.2 "Check the Electronic Solar Switch for wear" (page 31).
5. Reinsert the Electronic Solar Switch in the socket on the underside of the Sunny Boy.



NOTICE!

Manipulating the connector in the handle can damage the Electronic Solar Switch!

The connector within the handle must remain movable in order to ensure proper contact. Tightening the screw voids all warranty claims and creates a fire risk.

- Do **not** tighten the connector screw in the Electronic Solar Switch handle.



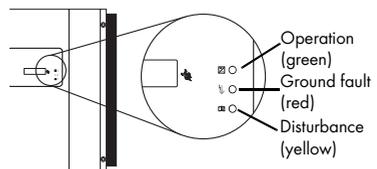
NOTICE!

The Electronic Solar Switch can be damaged if it is inserted incorrectly!

The Electronic Solar Switch can be damaged by high voltage if it has not been attached properly.

- Press the handle firmly into place on the socket of the Electronic Solar Switch until it audibly locks into place.
- Check that the handle is securely in place.

6. Switch the line circuit breaker to the "On" position.
7. Now check whether the LED display on the Sunny Boy indicates that the device is functioning correctly.



8 Maintenance and Cleaning

Check the correct operation of the Sunny Boy at regular intervals.

Impurities such as dust or airborne blossoms can cause heat concentration that can lead to yield losses. Also check the Sunny Boy and the cables for visible external damage. Undertake repairs if necessary.

8.1 Cleaning the Cooling Fins

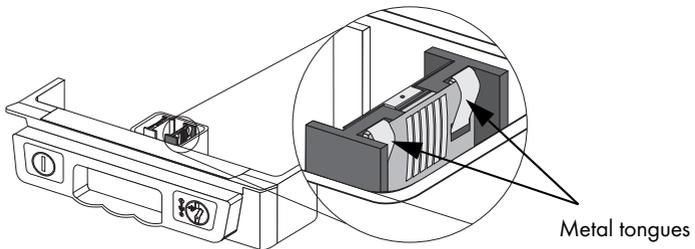
The heat dissipation of the product can be restricted by unclean cooling fins.

- Clean the cooling fins with a suitable, soft brush.

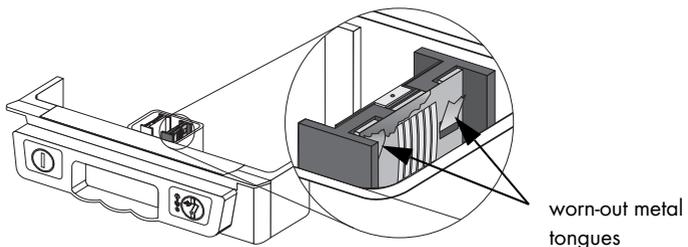
8.2 Check the Electronic Solar Switch for wear

To check the Electronic Solar Switch for wear, proceed as follows:

1. Remove the Electronic Solar Switch.
2. Check whether metal tongues inside the connector have a brown discoloration or are burned off.



- If all metal tongues are in acceptable condition (as illustrated above), the Electronic Solar Switch can continue to be used.
- If at least one of the metal tongues has a brown discoloration or is completely burned off (as illustrated below), proper functioning of the Electronic Solar Switch is no longer guaranteed.



3. Replace the defective Electronic Solar Switch, before you re-commission the Sunny Boy. You can purchase replacements from SMA Solar Technology (see section 12 "Accessories" (page 39)).

9 Troubleshooting

The Sunny Boy is a complex high-technology device. As a result, the possibilities for fixing faults on site are limited to just a few items. Do not attempt to carry out repairs other than those described here. Use the SMA Solar Technology 24-hour replacement service and repair service instead.

9.1 The red LED is continuously lit

If the red LED of the status display is continuously on during operation, there is either a ground fault in the PV generator or at least one of the varistors for the overvoltage protection is defective.

9.1.1 Checking the PV Generator for Ground Fault

1. Disconnect the Sunny Boy from both the DC and AC connections, as described in section 7.1 "Opening the Sunny Boy" (page 29).
2. Measure the voltages between the plus and minus pole of a string against the ground potential. If voltage is found, there is a ground fault in the corresponding string.

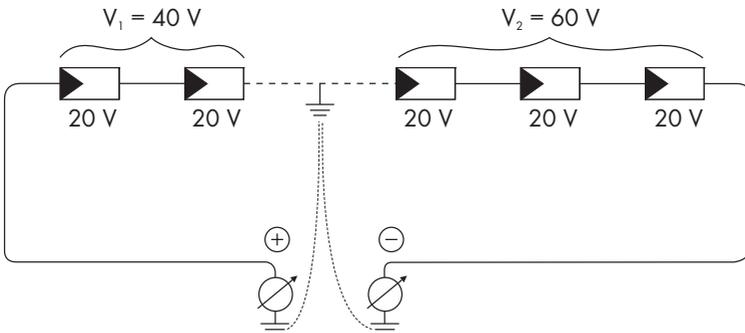
DANGER!
Risk of lethal electric shock!

In case of a ground fault, the PV generator may carry high voltages.

- Do not touch the frame of the PV generator.
- Wait until no voltage can be measured.
- Do not connect strings with ground faults to the Sunny Boy.

The approximate position of the ground fault can be determined from the ratio of the measured voltages between plus against ground potential and minus against ground potential.

Example:



The ground fault is between the second and third module in this case.

3. Repeat step 2 for each string.
4. The table illustrated below shows the various results and corresponding measures.

Result	Measure
You have found a ground fault .	<ul style="list-style-type: none"> • The installer of the PV generator must remedy the ground fault in the affected string before you may reconnect the string to the Sunny Boy. • Do not reconnect the faulty string. • Close the Sunny Boy and operate as described in section 7.2 "Closing the Sunny Boy" (page 30).
You have found no ground fault .	<p>It is likely that one of the thermally monitored varistors is defective.</p> <ul style="list-style-type: none"> • Check the varistors as described in section 9.1.2 "Checking the Function of the Varistors" (page 33).

9.1.2 Checking the Function of the Varistors

Varistors are wearing parts. Their functioning becomes restricted through aging or due to repeated responses as a result of overvoltages. It is therefore possible that one of the thermally monitored varistors has lost its protective functioning, and thus the red LED is permanently lit.

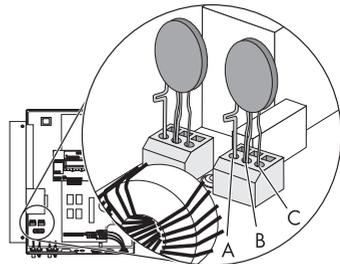


Position of varistors

The position of the varistors are to be determined with the help of the diagram below.

Observe the following allocation of the terminals:

- Terminal A: outer terminal
(varistor connection **with crimp**)
- Terminal B: middle terminal
- Terminal C: outer terminal
(varistor connection **without crimp**)

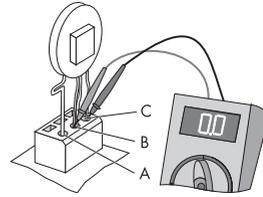


You can check the functioning of the varistors in the following manner:

1. Open the Sunny Boy as described in section 7.1 "Opening the Sunny Boy" (page 29).

- Determine with the aid of a multimeter for both varistors in the installed state whether a conductive connection exists between connectors B and C

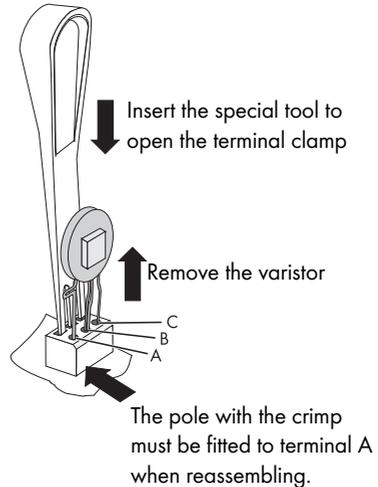
If there is **no conducting connection**, then that varistor is not working.



- Replace both varistors, as illustrated in the adjacent drawing, with new ones.

Ensure the varistor is installed the right way round! If you do not receive a special tool for operating the terminal clamps with your replacement varistors, contact SMA Solar Technology. As an alternative, the terminal contacts can be operated using a suitable screwdriver.

Since the failure of one varistor is generally due to factors that affect all varistors in a similar way (temperature, age, inductive overvoltages), it is highly recommended that you replace both varistors. The varistors are specially manufactured for use in the Sunny Boy and are not commercially available. They must be ordered directly from SMA Solar Technology (see section 12 "Accessories" (page 39)).



NOTICE!

The Sunny Boy could be irreparably damaged by overvoltage!

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

- Replacement varistors should be obtained as soon as possible.
- The Sunny Boy must not be operated **without varistors** in systems with a high risk of overvoltages.

- Close the Sunny Boy as described in section 7.2 "Closing the Sunny Boy" (page 30).

If no ground fault and no defective varistor were found, there is probably a fault in the Sunny Boy. In this case, contact the SMA Serviceline to discuss what to do next.

10 Decommissioning

10.1 Disassembly

1. Open the Sunny Boy as described in section 7.1 "Opening the Sunny Boy" (page 29).
2. Remove all cables from the Sunny Boy.
3. Close the Sunny Boy: fasten the housing cover to the Sunny Boy with the 4 screws.
4. Loosen the cylinder head screw between the Sunny Boy and wall mounting bracket.
5. Dismantle the Sunny Boy by lifting it out of the wall mounting bracket.

10.2 Packaging

If possible, always package the Sunny Boy in the original packaging. If this is no longer available, you can also use an equivalent box that fulfills the following requirements:

- Suitable for loads up to 28 kg
- With handle system
- Completely closable

10.3 Storage

Store the Sunny Boy in a dry place where ambient temperatures are always between -25 °C and +60 °C.

10.4 Disposal

Dispose of the Sunny Boy at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation site at that time. Alternatively, send it back to SMA Solar Technology with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("for disposal").

11 Technical Data

PV generator connection data		Setting
Max. input voltage	$U_{DC\ max}$	750 V ^{a)}
Input voltage, MPP range	U_{pv}	125 V ... 600 V
Max. input current	$I_{PV\ max}$	11 A
Max. input power	P_{DC}	3440 W
Voltage ripple	U_{pp}	< 10 % of the input voltage
Internal consumption during operation		< 10 W (standby)
a) The maximum open circuit voltage, which can occur at a cell temperature of -10 °C, must not exceed the maximum input voltage.		

Grid Connection Data		Setting
Nominal output power	P_{ACnom}	3000 W
Max. output power	P_{ACmax}	3300 W
Nominal output current	I_{ACnom}	13 A
Max. output current	$I_{AC\ max}$	16 A
Max. fuse protection		32 A
Harmonic distortion of output current (at $T_{HD} < 2\%$, $P_{AC} > 0.5 P_{ACNom}$)	K_{IAC}	< 4 %
Nominal AC voltage	U_{ACnom}	220 V / 230 V / 240 V
Voltage range (extended operating range)	U_{AC}	180 ... 260 V AC
AC- Grid frequency	f_{ACnom}	50 Hz
Frequency range (extended operating range)	f_{AC}	45.5 ... 52.5 Hz
Power factor (at nominal output power)	cos Phi	1
Overvoltage category		III
Test voltage (50 Hz)		1.65 kV
Test surge voltage		4 kV (serial interface: 6 kV)
Internal consumption in night mode		0.25 W

General Data	
EC Declaration of Conformity	You will find the EC Declaration of Conformity in the accompanying document set or in the download area of www.SMA.de/en under Certificate.
Protection category per DIN EN 60529	IP65
Dimensions (W x H x D)	approx. 470 mm x 490 mm x 225 mm
Weight	approx. 28 kg
Protection class	I
Topology	Transformerless
Climatic conditions according to DIN EN 50178:1998-04	
Location of type C:	Class 4K4H Extended temperature range: -25 °C ... +60 °C Extended humidity range: 0 ... 100 % Extended air pressure range: 70 kPa ... 106 kPa
Transport of type E:	Class 2K3 Temperature range: -25 °C ... +70 °C
Operating temperature range	-25 °C ... +60 °C
Max. operating altitude	2000 m above sea level NN
Noise emission (typical)	≤ 29 dB (A)

Protective function DC side	
All-pole isolator on the DC input side	Electronic Solar Switch, DC plug connectors
Overvoltage protection	Thermally monitored varistors
Personal protection	Ground fault monitoring (Riso > 1 MOhm)
Pole Confusion Protection	via short-circuit diode

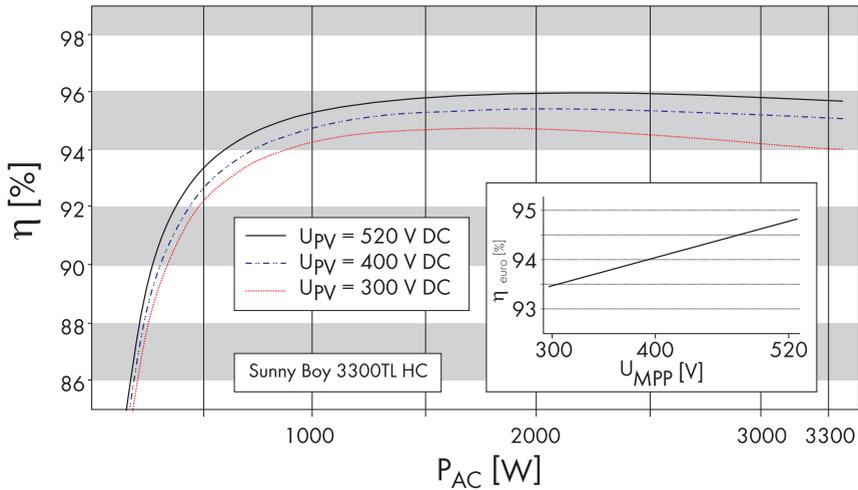
Protective function AC side	
Short Circuit Proof	Grid-side via current regulation
All-pole disconnection unit on grid side	Automatic disconnection device (grid guard 2.1), double design

Communication Interfaces	
RS485 (galvanically isolated)	optional
Radio	optional

Electronic Solar Switch	
Electrical lifetime (in the event of a short circuit, with a nominal current of 30 A)	min. 50 switching processes
Maximum switching current	30 A
Maximum switching voltage	800 V
Maximum PV power	Approx. 10 kW
Protection rating when plugged	IP65
Protection rating in unplugged state	IP21

Efficiency		
Max. efficiency	η_{max}	96 %
European standard efficiency	η_{euro}	94.6 %

Efficiency curve



12 Accessories

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

designation	Brief description	SMA order number
Replacement varistors	Set of thermally monitored varistors (2 pcs.) including insertion tool	MSWR-TV7
Electronic Solar Switch	ESS handle replacement part	ESS-HANDLE:03
RS485 upgrade kit	RS485 interface	485PB-MS-NR
Radio upgrade kit	Radio Piggy-Back for upgrading a Sunny Boy for communication with Sunny Beam, including antenna, coaxial cable, and PG cable gland (metal)	BEAMPB-NR
<i>Bluetooth</i> [®] Wireless Technology upgrade kit	<i>Bluetooth</i> Interface	on request
DC- Connection set Multi-Contact 3 mm:	Multi-Contact adapter set 3, max. flow current: 21 A	SWR-MC
DC- Connection set Multi-Contact 4 mm:	Multi-Contact adapter set 4, max. flow current: 30 A	MC-SET
Tyco DC connection set	TYCO adapter set, max. flow current: 30 A	TYCO-SET

13 Contact

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

- Inverter type
- Type and number of modules connected
- Communication
- Series number of the Sunny Boy
- Blink code or display of the Sunny Boy

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- Operating the product in an unintended environment
- Operating the product whilst ignoring relevant, statutory safety regulations in the deployment location
- Ignoring safety warnings and instructions contained in all documents relevant to the product
- Operating the product under incorrect safety or protection conditions
- Altering the product or supplied software without authority
- The product malfunctions due to operating attached or neighboring devices beyond statutory limit values
- In case of unforeseen calamity or force majeure

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