



PV Inverters

SUNNY BOY 2500 / 3000

Installation Guide




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1 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!
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate 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 Foreword



The Sunny Boy is equipped with the SMA grid guard. This is a type of automatic disconnection device. This means that the Sunny Boy complies with the VDEW (Verband der Elektrizitätswirtschaft – German Electricity Industry Association) regulations for the connection and parallel operation of power-generating systems to the low-voltage grid of the energy supply company and with DIN VDE 0126-1-1, which forms part of these regulations.

Refer to the operating manual for detailed information on troubleshooting and operating the Sunny Boy as well as the various communication options.

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.

If you require further information, please call the Sunny Boy Hotline:

(0561) 95 22 - 499

2.1 Target group



WARNING!

The Sunny Boy may only be installed by trained specialists. The installer must be approved by the local energy supplier. Read this installation guide carefully. Ensure compliance with all prescribed safety regulations, the technical connection requirements of the local energy supplier and any other applicable provisions.

This installation guide is exclusively intended for qualified electricians and is intended to assist with the speedy and correct installation and commissioning of the SMA Sunny Boy 2500 and Sunny Boy 3000 inverter.

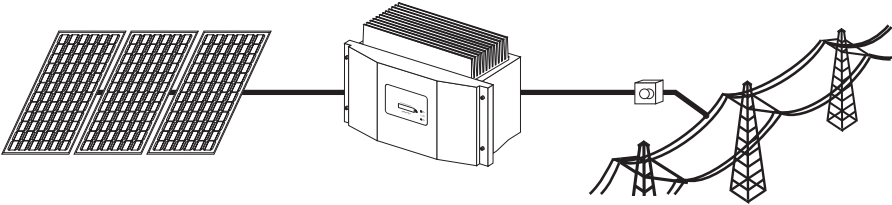
2.2 Additional Information

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

2.3 Appropriate usage

The Sunny Boy is a PV inverter, which converts the DC current of a PV generator 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.

When planning 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/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).

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 operating license.

2.4 Purpose of Documentation

The Sunny Boy 2500 and Sunny Boy 3000 are identical in construction and only differ in their technical data. This documentation uses the terms Sunny Boy or inverter when referring to both device types. The device will be specified with its full name if the information only refers to that particular device.

2.5 Safety instructions



DANGER!

Danger to life due to high voltages in the Sunny Boy!

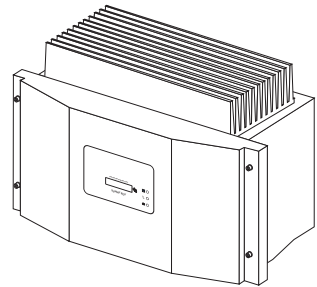
- All work on the Sunny Boy must be carried out by a qualified electrician. High voltages are present in the device.
- Work is to be carried out on the Sunny Boy only once the AC and DC voltages have been disconnected from the Sunny Boy, and once it has been ensured that the capacitors have been discharged.
- The Sunny Boy must be disconnected from the grid and precautions must be taken to prevent the grid being accidentally reconnected. In addition, the connections to the PV generator must be disconnected.
- After isolating the AC and DC voltage, you must wait approximately 15 minutes for the capacitors in the Sunny Boy to discharge. Only then is it safe to open the unit by removing the cover and make sure that no voltage is present in the device.



WARNING!

High efficiency!

Check the system design using the Sunny Design tool (www.SMA.de/SunnyDesign) or by calling the Sunny Boy Service Line. Overvoltages lead to the destruction of the Sunny Boy.



WARNING!

Electrostatic charge!

When working on the Sunny Boy and handling its assemblies, remember to observe all ESD safety regulations. Electronic components are susceptible to electrostatic charge. Discharge any electrostatic charge by touching the grounded housing before handling any electronic component.

**WARNING!****Risk of injury due to the heavy weight of the Sunny Boy!**

The Sunny Boy weighs approximately 32 kg. Min. two people must carry the unit or a suitable transport trolley must be used. Safety boots must be worn.

**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!**

- If the Electronic Solar Switch has been pulled out, the Sunny Boy only has a protection rating of IP21. Thus it is no longer protected against water seepage and foreign objects.

**Grounding the PV generator!**

Comply with the local requirements for grounding the modules and the PV generator. SMA Solar Technology recommends connecting and grounding the generator frame and other electricity conducting surfaces in such a way that there is continuous conduction and grounding in order to achieve maximum protection for systems and persons.

3 Overview of devices

3.1 Identification

You can identify the Sunny Boy with the aid of the type label (see figure below). The type label is found on the right-hand side of the housing (when viewed from the front). It contains information regarding the device type, serial number, device-specific key data, the CE mark and contact information for SMA Solar Technology.

The following is an example of a Sunny Boy 3000 type label.

SMA Solar Technology AG
www.SMA.de

SUNNY BOY
Photovoltaic string inverter • Made in Germany

Model: **SB 3000** Serial No.: **2000165874**

 	$V_{DC,max}$	600 V
	$V_{DC,MPP}$	268-480 V
	$I_{DC,max}$	12 A
 	$V_{AC,nom}$	230 V
	$f_{AC,nom}$	50/60 Hz
	$P_{AC,nom}$	2750 W
	$I_{AC,nom}$	12 A
	$\cos \varphi$	1

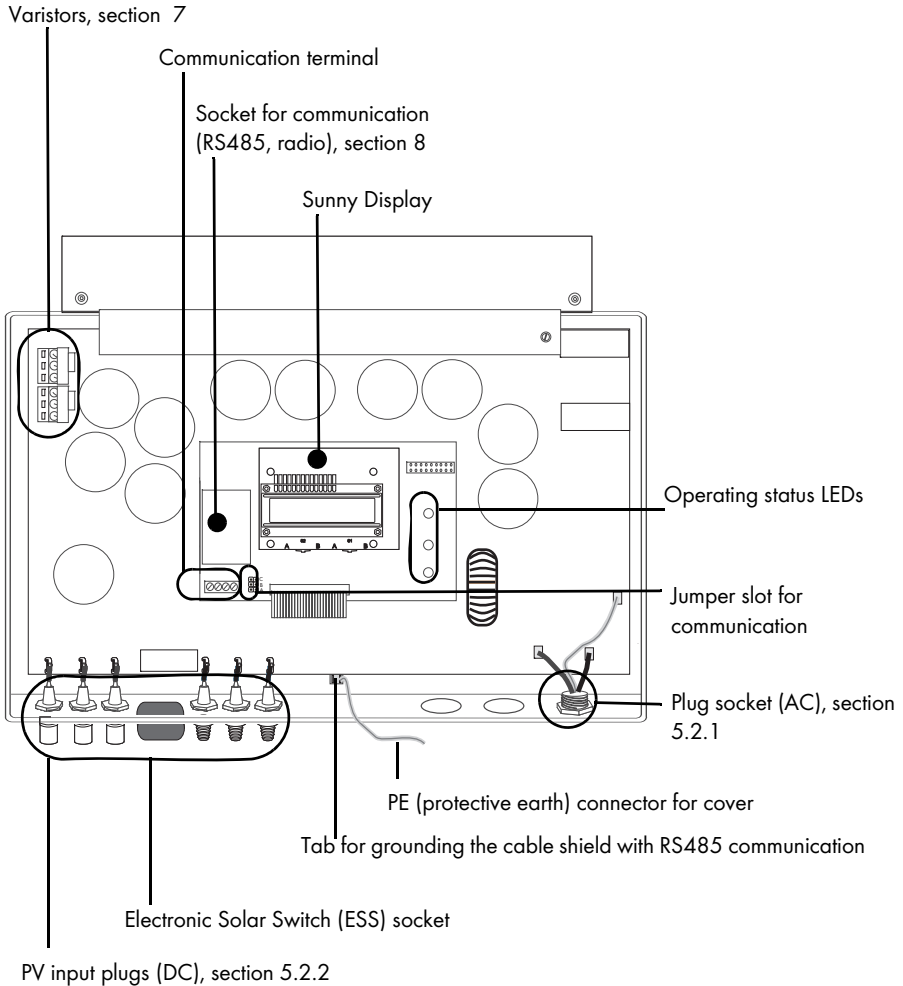
VDE 0126-1-1 (2.06)

outdoor

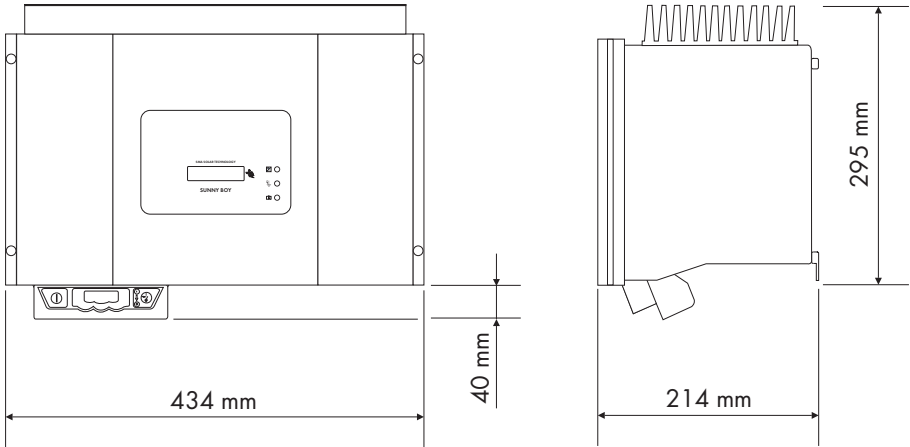
2000165874

3.2 Unit Description

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



3.3 Dimensions



3.4 Electronic Solar Switch (ESS)

3.4.1 Design

The Sunny Boy is equipped with the integrated electronic DC load-disconnecting switch ESS. This reliably prevents the arcing that usually occurs when disconnecting the inverter from the PV generator, which can cause personal injury and may damage the inverter connections. To access the DC input plugs in order to safely disconnect the PV generator from the inverter, you only need to pull on a grip handle on the underside of the inverter.

Disconnecting the inverter thus becomes a three-step process:

1. Disconnecting the AC side
2. Pulling off the Electronic Solar Switch handle
3. Disconnecting the DC plug connectors



DANGER!

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

- Safe disconnection from the PV generator is only guaranteed after removal of the Electronic Solar Switch, **and** of all DC plug connectors.

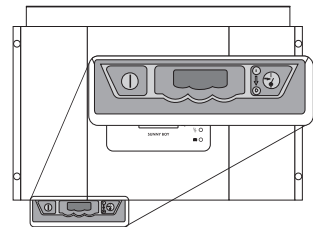
Design

The Electronic Solar Switch consists of a handle on the underside of the inverter and an assembly inside the inverter.

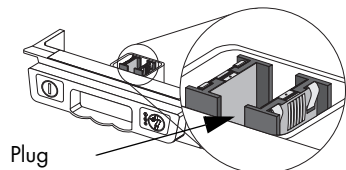
A handle is mounted on the underside of the inverter which covers the PV generators connectors.'

A plug is inside the handle. The Electronic Solar Switch connector is only visible once the handle has been pulled.

The connector is fitted in the handle as a floating connector, so that the handle does not catch when being pulled from the inverter.



Electronic Solar Switch handle



Plug

NOTICE!

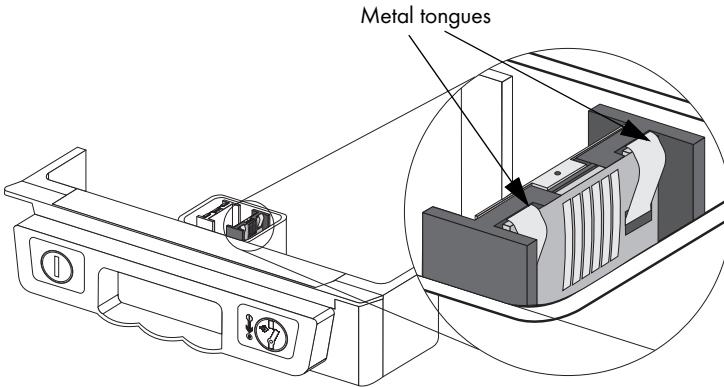
The Electronic Solar Switch can be damaged if it is inserted incorrectly!

- Do not tighten the connector screws. Otherwise, safe disconnection cannot be guaranteed.'

3.4.2 Inspection

Check the Electronic Solar Switch for wear before you attach it.

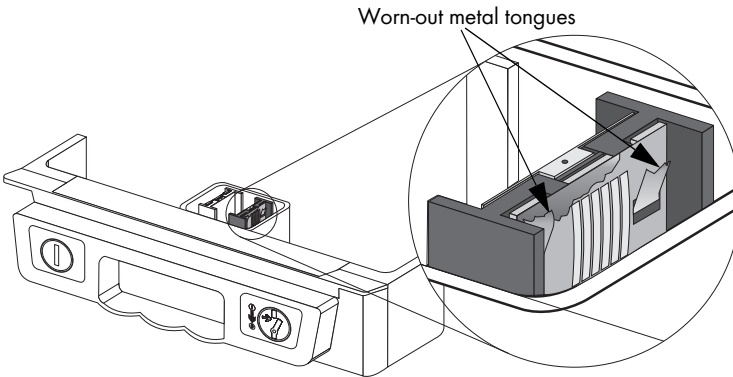
To do this, check the metal tongues on the inside of the plug for brown discoloration.



If at least one of the metal tongues is brown or fully burned off (see figure below), the Electronic Solar Switch can no longer be guaranteed to function correctly.

You must replace the handle of the Electronic Solar Switch before you can reactivate the Sunny Boy.

Replacements for damaged Electronic Solar Switch handles are available from your dealer.

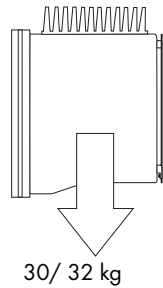


4 Installation Requirements

Check that all of the requirements listed below are met before installing and commissioning the Sunny Boy.

4.1 Installation Location Requirements

The Windy Boy 2500 weighs 30 kg, the Windy Boy 3000 weighs 32 kg. Take this weight into account when choosing the installation location and method of installation.

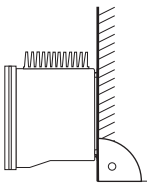


The ambient temperature should be below + 40 °C at all times to guarantee optimal operation.

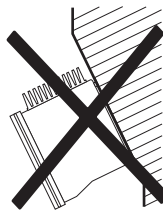
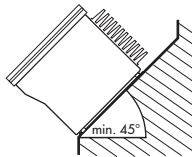
The Sunny Boy is designed for outdoor installation and should be installed in a place where it is not exposed to direct sunlight. An increased ambient temperature can reduce the yield of the PV system. Installing the unit in badly ventilated, warm indoor locations may also reduce yield.

The Sunny Boy is designed to be mounted on a vertical wall. However, if absolutely necessary, the Sunny Boy can be installed tilted back at a maximum angle of 45°. Vertical installation is preferable for an optimum energy yield and maximum operational comfort.

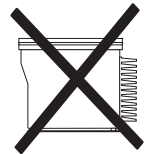
Never install the Sunny Boy horizontally or with a forward tilt.



Install the inverter vertically or tilting backward.



Never install the inverter horizontally or so that it tilts forward.



When choosing the installation location, be sure to observe the following:

WARNING!
Dangerous Voltage!

Unintentionally pulling out the DC plug connectors under load can damage the plugs and could result in personal injury! Install the Sunny Boy in such a way that it is not possible (e.g. for children) to unplug the DC plug connector unintentionally.

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

The temperature of the individual components in the housing, especially the heatsinks, can exceed 60 °C.

- Do not touch the housing of the Sunny Boy during operation.
- Mount the Sunny Boy in such a way that it cannot be touched inadvertently during operation.

DANGER!
Danger to life due to fire or explosion!

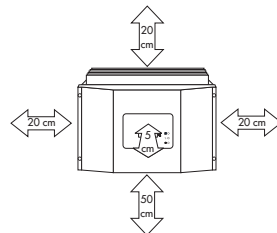
Despite careful construction, a fire can occur with electrical devices.

Do not install the Sunny Boy

- on flammable construction materials,
- in areas where highly flammable materials are stored,
- in potentially explosive environments!

When choosing the installation location, ensure there is enough space for heat to dissipate and enough space for pulling the Electronic Solar Switch handle! Under normal conditions, the following recommended values for the space to be kept clear around the Sunny Boy should be followed:

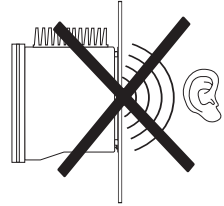
Direction	Minimum Clearances
Sides	20 cm
Top	20 cm
Underneath	50 cm
Front	5 cm



In a living area, the unit should not be mounted on plasterboard walls or alike as otherwise audible vibrations are likely to result.

We recommend securing the unit to a solid surface.

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



4.2 PV Generator Requirements

The Sunny Boy is designed to be connected to up to three strings (PV modules wired in series) having a homogenous structure (modules of the same type, identical orientation and tilt).

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.

The unit has six 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. A pre-assembled set for connecting the free cable ends from a string is available as an optional accessory. The SMA order codes for the various connectors are as follows:

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

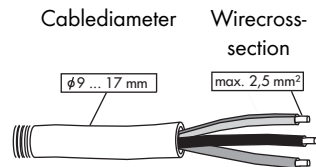
Limit values for DC input	
Max. voltage	600 V (DC)
Max. input current	12 A (DC)

4.3 Low Voltage Grid (AC)

The Sunny Boy must have a three-conductor connection to the grid (live (L), neutral (N), protective earth (PE)).

The grid connection terminals on the AC connection socket included in the accessories kit can take wires with a cross-section of up to 2,5 mm². The accessories kit also contains a PG13.5 AC connection socket for connecting cables with a cross-section between 9 mm² and 13.5 mm², while the PG16 connection socket is used for cables with a cross-section up to a maximum of 17 mm².

For detailed instructions, see sections „Connecting the AC Output with PG13.5“ (25) and „Connecting the AC Output with PG16“ (27).



DANGER!
Risk of lethal burns!

We recommend using a 16 A line circuit breaker to protect the power circuit. No loads should be connected to this power circuit.

Rating for a line circuit breaker

Detailed Information and examples concerning the rating of a line circuit breaker can be found in the Technical Information "line circuit breaker" in the download area of SMA Solar Technology at www.SMA.de.

For optimum operation of the inverters, the grid impedance of the AC cable must not exceed 1 Ohm. This is necessary, amongst other things, for the correct operation of the impedance monitoring. In addition, we recommend dimensioning the cable cross-section so that output losses do not exceed 1 % at nominal power. Output losses depending on the cable length and cross-section are shown in the table below. Multi-wire cables with copper forward and return conductors are used.

Line losses

The maximum cable lengths for the different cable cross-sections are as follows:

	Sunny Boy 2500		Sunny Boy 3000
Cable Cross-Section	1,5 mm ²	2,5 mm ²	2,5 mm ²
Max. length	9 m	15,5 m	12,5 m

Do not use cables where losses will exceed 1.0 % !

The Sunny Boy is designed for operation on 220 - 240 V grids at a grid frequency of 50 / 60 Hz. When connecting an inverter to the public grid, follow the connection requirements of the local grid operator.

	Limit values for AC output
Voltage range (complying with DIN VDE 0126-1-1)	198 V ... 253 / 260 V ^{a)}
Frequency range (complying with DIN VDE 0126-1-1)	47.55 Hz ... 50.2 Hz
Voltage range (extended operating range)	180 V ... 265 V
Frequency range (extended operating range)	45.5 Hz ... 54.5 Hz 55.5 Hz ... 64.5 Hz

- a) The Sunny Boy can feed into the public grid at a maximum output voltage of 260 V for brief periods. However, DIN VDE 0126-1-1 stipulates that the average voltage over 10 minutes must not exceed 253 V. That means, if the grid voltage is constantly 254 V (e.g.), the inverter disconnects itself from the grid. In this case, contact the local grid operator for assistance.

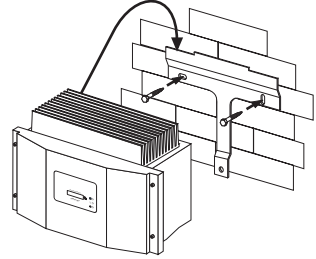
DIN VDE 0126-1-1 only applies in Germany. All other preset country values of your inverter can be found in the download area at www.SMA.de under Technical Description "Operating parameters".

5 Installation

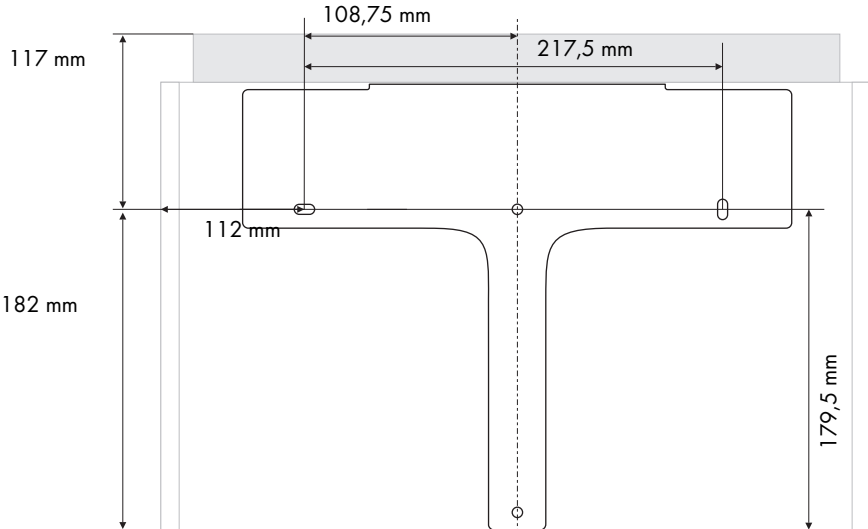
5.1 Mounting

To make the job easier, we recommend you use the supplied wall bracket to mount the Sunny Boy. For vertical installation and installation on solid concrete or block walls, for example, you can fit the bracket using 6 mm x 50 mm hexagon bolts to DIN 571 standard, stainless steel type, and with wall anchors type SX 8.

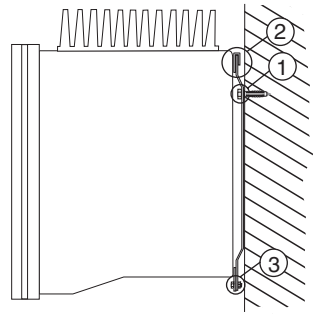
When selecting the mounting materials, be sure to take into account the weight of the Sunny Boy (Sunny Boy 2500 30 kg; Sunny Boy 3000 32 kg).



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). To mark the positions to drill the 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. Secure the Sunny Boy in position 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.



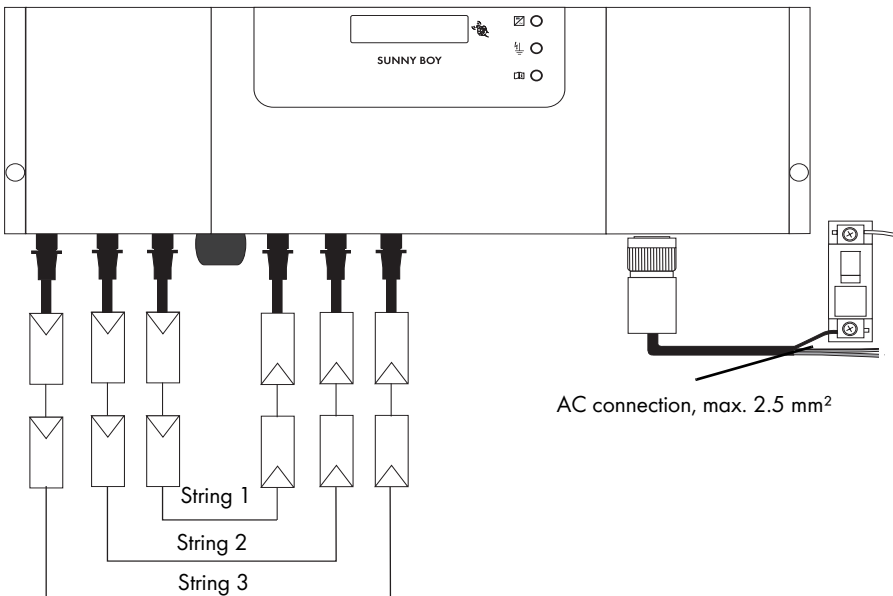
5.2 Electrical Installation



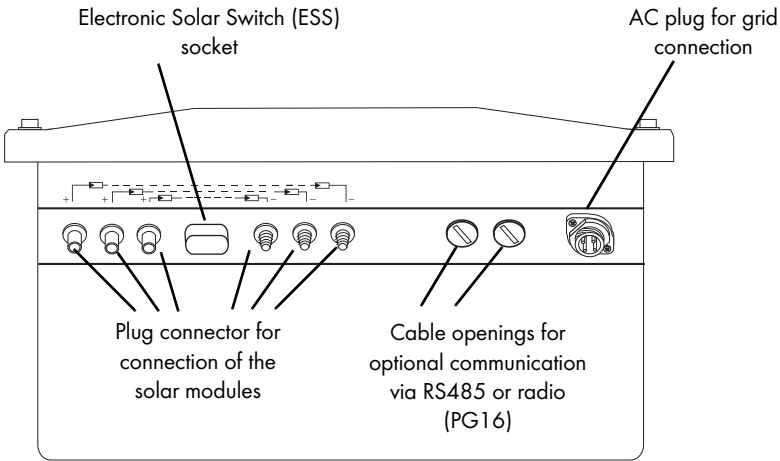
WARNING!

Make sure to check the polarity of the strings before connecting them.

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



View from below



5.2.1 Connecting the AC output

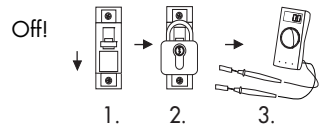
DANGER!
Danger to life due to high voltages in the Sunny Boy!

- Before you connect the power line to the AC connection socket, make sure that no voltage is present at the cable.

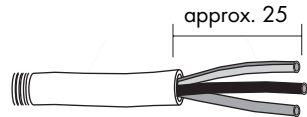
A round plug connector system is used, which allows various cable diameters to be used in the cable outlet. For this reason, the accessories kit includes a PG13.5 pressure screw and a PG16 pressure screw. Check which screw fitting is the right one for your AC cable.

To connect up the AC output, follow these steps:

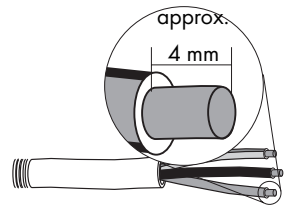
1. Check the grid voltage. If this is higher than 253 V, the Sunny Boy will not be fully operational. In this case, contact the local grid operator for assistance.
2. Isolate the grid connection (switch the line circuit breaker to its "Off" position), make sure it cannot be switched back on, and test to make sure no voltage is present.



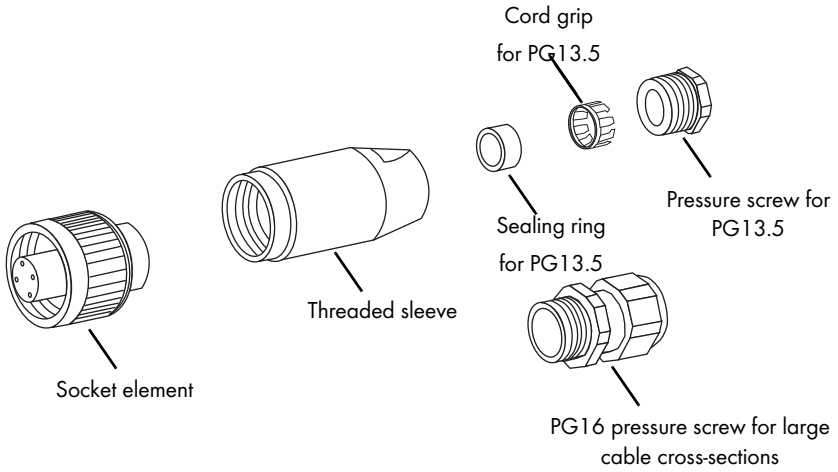
3. Peel off approximately 30 mm of the cable jacket. Shorten L and N by 5 mm.



4. Strip approximately 4 mm of the cables insulation.'



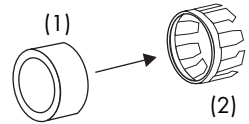
- Now take the AC connection socket parts from the accessories kit and connect up the cable, with shielding and insulation stripped, as described on the following pages.



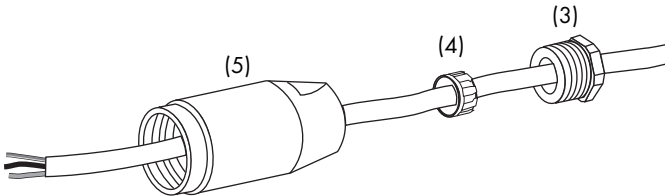
Connecting the AC Output with PG13.5

To connect a cable with a maximum cross-section of 13.5 mm², proceed as follows.

1. Press the sealing ring (1) into the cord grip (2).

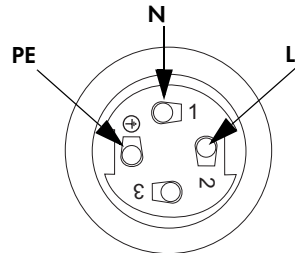


2. Now slide the pressure screw (3) over the cable first of all, followed by the cord grip with the sealing ring (4) in it. Now slide the threaded sleeve (5) over the cable.

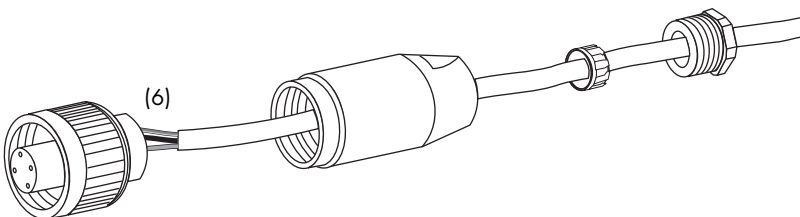


3. Now connect the individual conductors to the socket element in sequence.

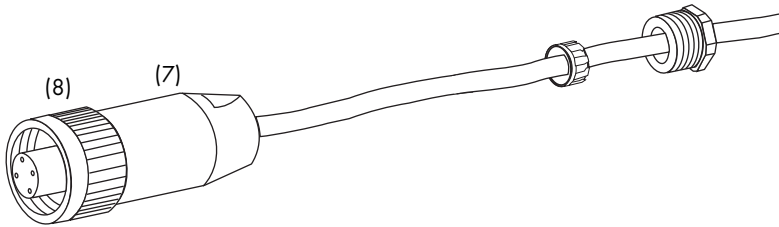
- Protective earth PE (green/yellow) to the screw terminal with the earth sign.
- Neutral conductor N (blue) to screw terminal 1.
- Live L (brown or black) to screw terminal 2.
- Terminal 3 remains unused.



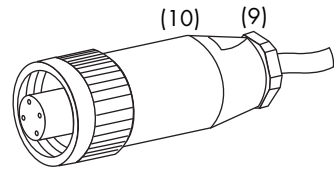
4. Make sure the wires (6) are securely connected.



5. Now screw the threaded sleeve (7) onto the socket element (8) and tighten it.



6. Now screw the pressure screw (9) into the threaded sleeve (10) and tighten it. The cord grip with the sealing ring is pressed into the threaded sleeve and can no longer be seen.



The AC connection socket is now fully assembled.

If you are not going to connect up the Sunny Boy immediately, close the socket element using the cap supplied in the accessories kit.

If the Sunny Boy is already installed, you can now connect up the fully assembled AC connection socket to the flange plug on the Sunny Boy. To do this, remove the protective cap from the flange plug on the Sunny Boy. Firmly tighten the threaded ring on the AC connection socket to the flange plug to seal the connection and secure it.



DANGER!

Danger to life due to high voltages in the Sunny Boy!

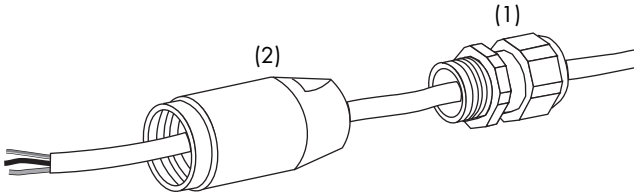
Do not switch the line circuit breaker on yet!

- The Sunny Boy may only be connected to the AC grid once the PV strings are connected and the device is securely closed.

Connecting the AC Output with PG16

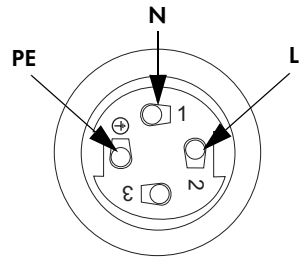
To connect a cable with a cross-section between 13.5 mm² and 16 mm², proceed as follows.

1. First of all, slide the pressure screw with the PG16 screw fitting (1) onto the cable. Now slide the threaded sleeve (2) over the cable.

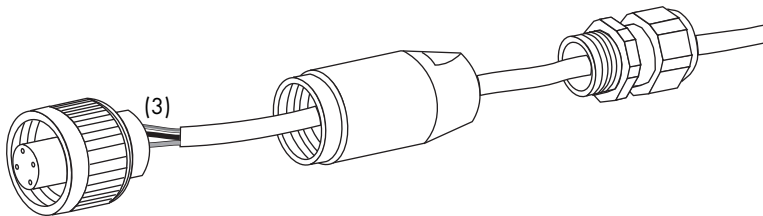


2. Now connect the individual wires to the socket element in sequence.

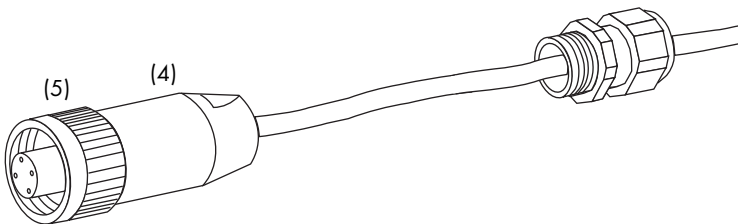
- Protective earth PE (green/yellow) to the screw terminal with the earth sign.
- Neutral conductor N (blue) to screw terminal 1.
- Live L (brown or black) to screw terminal 2.
- Terminal 3 remains unused.



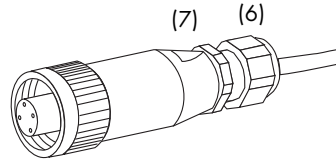
3. Make sure the wires (3) are securely connected.



4. Now screw the threaded sleeve (4) onto the socket element (5) and tighten it.



5. Now screw the pressure screw (6) into the threaded sleeve (7) and tighten it.
6. Firmly tighten the screw fitting to provide sealing and provide strain relief. €€€ check with TM



The AC connection socket is now fully assembled.

If you are not going to connect up the Sunny Boy immediately, close the socket element using the cap supplied in the accessories kit.

If the Sunny Boy is already installed, you can now connect up the fully assembled AC connection socket to the flange plug on the Sunny Boy. To do this, remove the protective cap from the flange plug on the Sunny Boy. Firmly tighten the threaded ring on the AC connection socket to the flange plug to seal the connection and secure it.



DANGER!

Danger to life due to high voltages in the Sunny Boy!

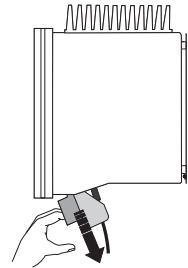
Do not switch the line circuit breaker on yet!

- The Sunny Boy may only be connected to the AC grid once the PV strings are connected and the device is securely closed.

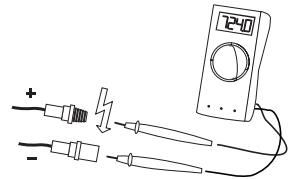
5.2.2 PV String (DC) Connection

To connect up the input, follow these steps:

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



2. Make sure the PV generator connectors have the right polarity and do not exceed the maximum string voltage of 600 V (DC). See also section 4.2 „PV Generator Requirements“ (17).



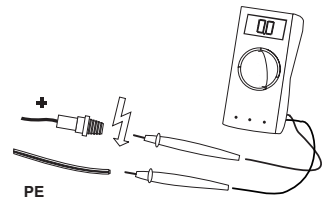
WARNING!

The Sunny Boy could be irreparably damaged by overvoltage!

If the voltage of the solar modules exceeds the maximum input voltage of the Sunny Boy, it could be irreparably damaged by 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.

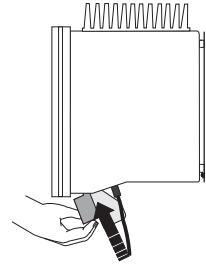
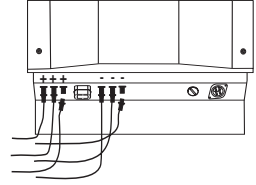
3. Taking one DC plug connector at a time, measure the direct current voltage between one DC plug connector of a string and ground potential.
4. If the measured voltages are constant and their total is roughly the same as the open circuit voltage of the string, then there is a ground fault in this string. Its approximate location can be deduced from the relationships between the voltages.



WARNING!

Do not connect strings to the Sunny Boy that contain a ground fault until you have fixed the ground fault in the PV generator!

5. Repeat points 3 and 4 for each string.
6. Connect up the faultless PV generator strings to the inverter.
7. Close the unused DC input sockets with the caps included in the delivery.
8. Reinsert the handle of the Electronic Solar Switch in the socket on the underside of the Sunny Boy.



NOTICE!

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

- The handle must be firmly attached to the socket of the Electronic Solar Switch and rest against the housing.
- Check that the handle is positioned correctly before recommissioning the inverter.

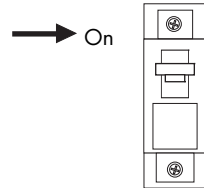
5.3 Commissioning

You can commission the Sunny Boy when:

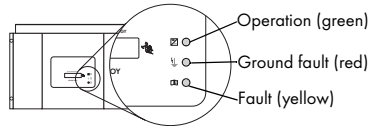
- the housing cover is securely screwed on
- the Electronic Solar Switch is securely attached
- the AC (grid) cable is connected correctly.
- the DC cables (PV strings) are fully connected and the unused DC plug connectors on the bottom of the housing are closed using the protective caps.

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.



NOTICE!

Excessive DC input voltage can destroy the Sunny Boy!

- Disconnect the grid voltage and the PV generator if after a short time the bottom yellow LED flashes four times at intervals of one second and the display shows the message on the right.

!PV-Overvoltage!
!DISCONNECT DC!

Check the string voltages again to make sure they are within the limits stated in section 4.2 „PV Generator Requirements“ (17). 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 Service Line (see section 10 „Contact“ (49)).

Green	Red	Yellow	Status
Glowes continuously	is not glowing	is not glowing	OK (feeding operation)
	glows continuously	is not glowing	fault
		glows continuously	OK (initialization)
Flashes quickly (3 x per second)	is not glowing	is not glowing	OK (stop)
	glows continuously	is not glowing	fault
Blinks slowly (1 x per second)	is not glowing	is not glowing	OK maintenance, grid monitoring
	glows continuously	is not glowing	fault
Briefly goes out (approx. 1x per second)	is not glowing	is not glowing	OK (derating)
	glows continuously	is not glowing	fault
Is not glowing	is not glowing	is not glowing	OK (night shutdown)
		glowing/blinking	fault
	glows continuously	is not glowing	fault
		glowing/blinking	fault

For a detailed description of the failure messages and their causes, see the user manual.

6 Opening and Closing the Sunny Boy

6.1 Safety instructions



If you need to open the device for whatever reason, pay attention to section 2.5 „Safety instructions“ (8).



DANGER!

Danger to life due to high voltages in the Sunny Boy!

- Before working on the Sunny Boy with the cover removed, the AC and DC voltages must therefore be disconnected from the Sunny Boy and the capacitors must be discharged (wait for 15 minutes after isolating the AC and DC voltages).

NOTICE!

Electrostatic discharges can damage the Sunny Boy!

Electronic components are susceptible to electrostatic charge.

- Discharge any electrostatic charge by touching the grounded housing while handling any electronic component.

6.2 Opening the Sunny Boy



Follow the sequence described below and all safety instructions in section 6.1 „Safety instructions“ (33)!



DANGER!

Danger to life due to high voltages in the Sunny Boy!

Before you open the Sunny Boy:

- Switch off the line circuit breaker and secure it to prevent it being reactivated.

1. Pull the handle of the Electronic Solar Switch off the Sunny Boy.
Be sure to pull the handle downwards and slightly towards the wall. There is a contact in the middle that automatically starts the switching process when the handle is pulled.
2. Directly after pulling off the Electronic Solar Switch, pull out the DC plug connectors from the Sunny Boy.



DANGER!

Danger to life due to high voltages in the Sunny Boy!

- Wait 15 minutes for the capacitors inside the Sunny Boy to discharge!

3. Remove the four screws from the housing cover and pull the cover forward smoothly.
4. Remove the PE connection from the cover.
5. Loosen the locking on the PE connectors on the cover when you remove them.

6.3 Closing the Sunny Boy



Follow the sequence described below and all safety instructions in section 6.1 „Safety instructions“ (33)!

1. Reconnect the protective earth (PE) to the housing cover.
2. Secure the housing cover of the Sunny Boy by evenly tightening the four screws.
3. Connect the PV generator by reconnecting the DC plug connectors of the Sunny Boy with those of the strings.
4. Check the Electronic Solar Switch for wear, as described in section 3.4.2 „Inspection“ (13).
5. Reinsert the handle of the Electronic Solar Switch in the socket on the underside of the Sunny Boy.

NOTICE!

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

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

- The handle must be firmly attached to the socket of the Electronic Solar Switch and rest against the housing.
- Check that the handle is positioned correctly before recommissioning the inverter.

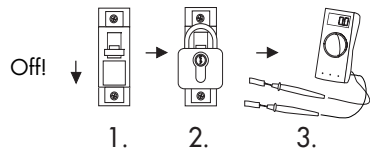
6. Switch the line circuit breaker to the "On" position.
7. Check whether the LED display on the Sunny Boy indicates that the device is functioning correctly.

7 Replacing the Varistors

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.

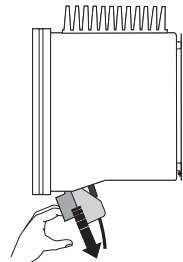
If the red LED on the status display shines continuously during operation, you should first of all make sure that there is no ground fault in the PV generator.

1. Disconnect the Sunny Boy from the low voltage grid (switch the line circuit breaker to its "off" position or pull out the AC plug). Make sure the grid cannot be inadvertently reconnected.

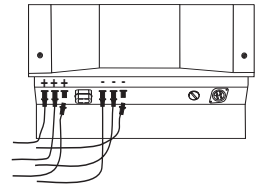


You must make sure that no voltage is present at the AC output before opening the Sunny Boy.

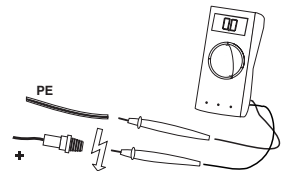
2. Pull the handle of the Electronic Solar Switch off the Sunny Boy.



3. Disconnect the DC plug connectors for all strings.



4. Taking one DC plug connector at a time, measure the voltages between one DC plug connector of a string and ground potential.



**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.
- Do not touch PE.
- Wait until no voltage can be measured.
- Do not connect strings with ground faults to the Sunny Boy.

5. If the measured voltages are constant and their total is roughly the same as the open circuit voltage of the string, then there is a ground fault in this string. Its approximate location can be deduced from the relationships between the voltages.

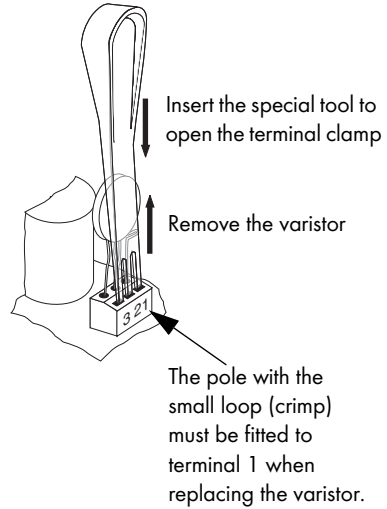
Repeat step 4 for each string.

If you found a ground fault, it is probably not necessary to replace the varistors. Instead, make sure the ground fault is fixed. Generally the PV generators installer should be hired for this job. In this case continue as described under point 9, but with the following steps: 1. Disconnect the faulty string! 2. Protect it with DC plug against accidental touch contact (e.g. by fitting the protective cap or using sufficient high-voltage insulating tape).'

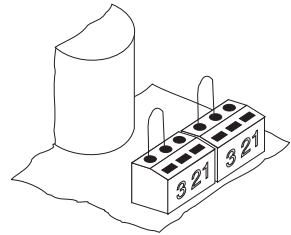
If you did not find any ground fault in the PV generators, it is likely that one of the thermally monitored varistors has lost its protective function. These components are wearing parts. Their functioning diminishes with age or following repeated responses as a result of overvoltages. You can now check these varistors in the following way, paying attention to the safety instructions in section 2.5 „Safety instructions“ (8):

6. Remove the screws securing the cover and remove the cover from the Sunny Boy. Disconnect the PE connection from the cover. Make sure that no voltage is present.
7. Use a continuity tester to check all the varistors and see if there is a conducting connection between connectors 2 and 3. If there is no connection, then that varistor is not working. The positions of the varistors in the Sunny Boy can be seen in the figure in section 3.2 „Unit Description“ (11).

8. Replace the varistor concerned with a new one as shown in the illustration to the right. Ensure the varistor is installed the right way round! If you do not receive a special tool for operating the terminal clamps together with your replacement varistors, please 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, not just the one that is obviously defective. 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 (SMA order code: "SB-TV4").



If no replacement varistors are available on site, the Sunny Boy can be temporarily run without them. To do this, remove the varistors you identified as being faulty as described above and in their place, bridge the terminals 2 and 3 with a length of wire.



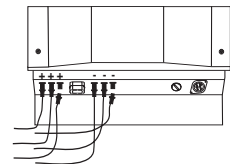
NOTICE!

The Sunny Boy could be irreparably damaged by overvoltage!

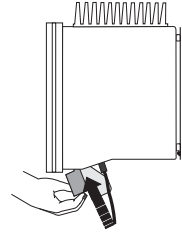
If varistors are missing, the Sunny Boy is no longer protected against overvoltages.

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

9. Reconnect the PE connection on the cover and close the Sunny Boy.
10. Connect up the faultless PV generator strings to the inverter.
11. Close the unused DC input sockets with the caps included in the delivery.



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



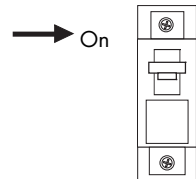
NOTICE!

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

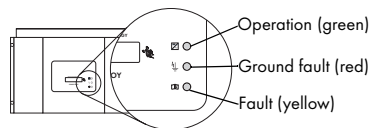
The Electronic Solar Switch can be damaged if it has not been attached properly.

- The handle must be firmly attached to the socket of the Electronic Solar Switch and rest against the housing.
- Check that the handle is positioned correctly before recommissioning the inverter.

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



14. Now check whether the LED display on the Sunny Boy indicates that the device is functioning correctly.



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 Service Line to discuss what to do next.

8 The communication interface

The communication interface is used for communication with special data acquisition devices or a PC with corresponding software.

See the communication interface documentation for a detailed wiring diagram.

This section describes how to install the communication module in the Sunny Boy.

Installation procedure

The letters in brackets refer to the figure on the next page.

1. Open the Sunny Boy as described in Section 6.2 .



WARNING!

Electrostatic discharges can damage the communication interface!

- Do not touch componentsconnectionsandplugcontacts.'
- Ground yourself before removing the communication interface from the packaging by touching the PE or a non-coated part of the housing.

2. Thread the cable through one of the cable feed-throughs (A) on the Sunny Boy. Use the right-hand housing feed-through for the Radio Piggy-Back.



WARNING!

Danger to life through high voltage if there is a fault with the communication cable.

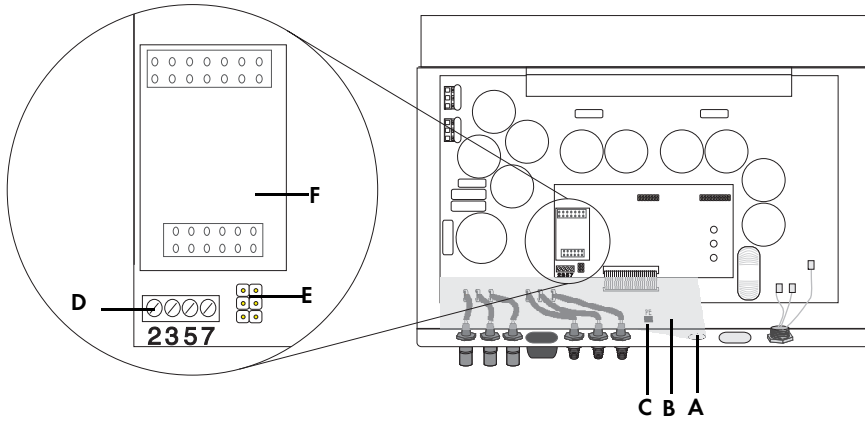
- Pull the silicone tube over the cable.

The silicon tube must completely cover the communication cable inside the housing.

3. If the connection plan of the communication device indicates it as necessary:
 - ground the communication cable at the tab (C) or
 - use the provided cable shield on its screwing device (F) for the communication interface.
4. Install the communication cable (B) as described in the following figure.
5. Connect the communication wires to the screw terminal strip (D) as described in the connection plan of the communication device.
6. Connect the jumpers (E) if the connection plan of the communication device indicates this as necessary.

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

7. Plug the communication interface to the left of the interface port (F).
8. Close the Sunny Boy as described in section 6.3 .



A	Housing feed-through in the base of the Sunny Boy
B	Cable route (gray surface)
C	Tab for grounding the cable shield
D	Screw terminals for connection of the communication wires
E	Jumper slot
F	Interface port

9 Technical data

9.1 Sunny Boy 2500

9.1.1 PV Generator Connection Data

Description	Unit	Setting
Max. input voltage	$U_{DC\ max}$	600 V ^{a)}
Input voltage, MPP range	U_{PV}	224 V ... 480 V
Max. input current	$I_{PV\ max}$	12 A
Max. input power	P_{DC}	2700 W
Recommended total generator power		3000 Wp (for Central Europe)
All-pole disconnection unit on the DC input side		Electronic Solar Switch (ESS) DC plug connector
Overvoltage protection		thermally monitored varistors
Voltage ripple	U_{pp}	< 10 % of the input voltage
Insulation protection		ground fault monitoring ($R_{iso} > 1\ M\Omega$)
Operating internal consumption		< 7 W (standby)
Reverse polarity protection		via short-circuit diode
a) The maximum open circuit voltage, which can occur at a cell temperature of -10 °C, may not exceed the maximum input voltage.		

9.1.2 Grid Connection Data

Description	Unit	Setting
Nominal output power	P_{ACnom}	2300 W
Peak output power	$P_{AC, max}$	2500 W
Nominal output current	$I_{AC, nom}$	10 A
Max. output current	$I_{AC, max}$	12.5 A
Max. fuse protection		20 A
Harmonic distortion of output current (at $K_{Ugrid} < 2\%$, $P_{AC} > 0.5 P_{ACnom}$)	K_{IAC}	< 3 %
Short-circuit proofing		grid-side via current regulation
Operating range, grid voltage	U_{AC}	180 ... 265 V AC
Operating range, grid frequency	f_{AC}	47,55 ... 50.2 Hz
All-pole disconnection unit on grid side		Automatic disconnection device (SMA grid guard 2), double implementation
Power factor (at nominal output power)	cos phi	1
Overvoltage category		III
Test voltage (DC)		1.95 kV (1 s routine testing / 5 s type testing)
Test surge voltage		4 kV (serial interface: 6 kV)
Operating consumption in night mode		0.25 W

9.2 Sunny Boy 3000

9.2.1 PV Generator Connection Data

Description	Unit	Setting
Max. input voltage	$U_{DC \max}$	600 V ^{a)}
Input voltage, MPP range	U_{PV}	268 V ... 480 V
Max. input current	$I_{PV \max}$	12 A
Max. input power	P_{DC}	3200 W
Recommended total generator power		3600 Wp (for Central Europe)
All-pole disconnection unit on the DC input side		Electronic Solar Switch (ESS) DC plug connector
Overvoltage protection		thermally monitored varistors
Voltage ripple	U_{pp}	< 10 % of the input voltage
Insulation protection		ground fault monitoring (Riso > 1 MOhm)
Operating internal consumption		< 7 W (standby)
Reverse polarity protection		via short-circuit diode
a) The maximum open circuit voltage, which can occur at a cell temperature of -10 °C, may not exceed the maximum input voltage.		

9.2.2 Grid Connection Data

Description	Unit	Setting
Nominal output power	P_{ACnom}	2750 W
Peak output power	$P_{AC, max}$	3000 W
Nominal output current	$I_{AC, nom}$	12 A
Max. output current	$I_{AC, max}$	15 A
Max. fuse protection		20 A
Harmonic distortion of output current (at $K_{U_{grid}} < 2\%$, $P_{AC} > 0.5 P_{ACnom}$)	K_{IAC}	< 3 %
Short-circuit proofing		grid-side via current regulation
Operating range, grid voltage	U_{AC}	180 ... 265 V AC
Operating range, grid frequency	f_{AC}	47,55 ... 50.2 Hz
All-pole disconnection unit on grid side		automatic disconnection device (SMA grid guard 2), double implementation
Power factor (at nominal output power)	cos phi	1
Overvoltage category		III
Test voltage (DC)		1.95 kV (1 s routine testing / 5 s type testing)
Test surge voltage		4 kV (serial interface: 6 kV)
Operating consumption in night mode		0.25 W

9.3 Device Description

For a detailed description of the device, see the user manual.

General data	
EC Declaration of Conformity	You can download the EC Declaration of Conformity in the download area at www.SMA.de under Certificate.
Protection rating in accordance with DIN EN 60529	IP65
Dimensions (W x H x D)	approx. 434 mm x 295 mm x 214 mm
Weight	Sunny Boy 2500: approx. 30 kg Sunny Boy 3000: approx. 32 kg

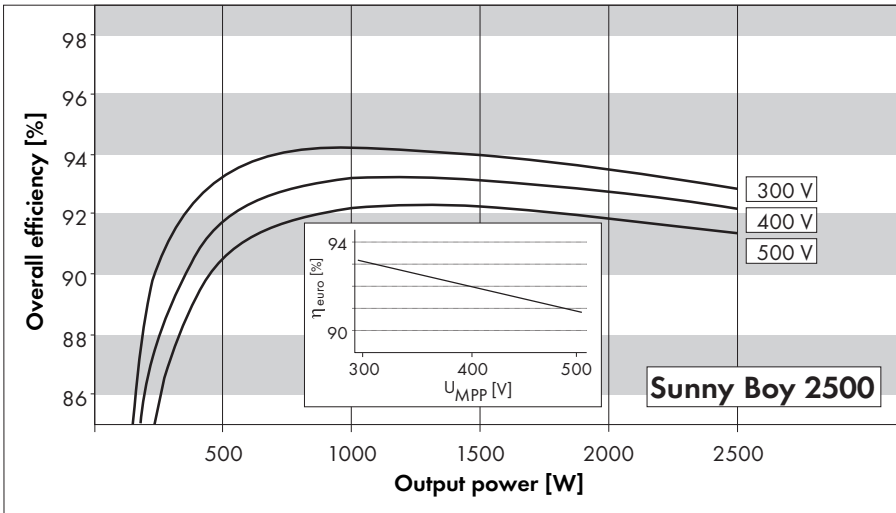
Communication Interface	
Data transmission via separate data cable	optional, RS485, galvanically isolated
Wireless data transmission	optional

Electronic Solar Switch (ESS)	
Electrical service life (in case 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 when unplugged	IP21

9.3.1 Efficiency of the Sunny Boy 2500

Efficiency		
Max. efficiency	η_{max}	94,1 %
CEC rebate efficiency	η_{euro}	93,2 %

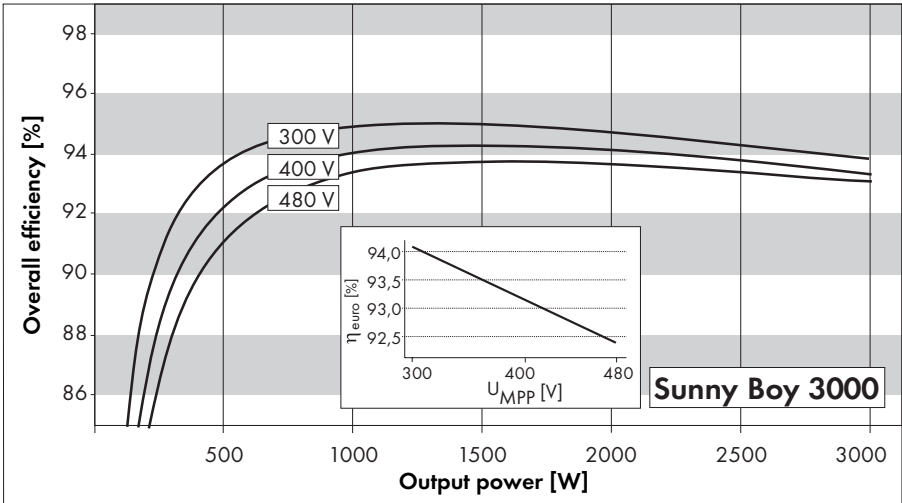
The efficiency of the Sunny Boy 2500 depends mainly on the input voltage of the connected PV strings. The lower the input voltage, the higher the efficiency.



9.3.2 Efficiency of the Sunny Boy 3000

Efficiency		
Max. efficiency	η_{max}	95 %
CEC rebate efficiency	η_{euro}	93,6 %

The efficiency of the Sunny Boy 3000 depends mainly on the input voltage of the connected PV strings. The lower the input voltage, the higher the efficiency.



10 Contact

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

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

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- 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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