



PV inverter

SUNNY BOY 2100TL

Installation Guide



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1 Notes on this Manual

1.1 Validity

This manual describes the mounting, installation and commissioning of the Sunny Boy 2100TL. Store this manual where it will be accessible at all times.

1.2 Target Group

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

1.3 Additional Information

You will find further information on special subjects such as designing a line circuit breaker or the description of the operating parameters in the download area at www.SMA.de. Refer to the user manual for detailed information on troubleshooting and operating the inverter.

1.4 Symbols Used

The following types of safety warnings 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.

ATTENTION!

ATTENTION indicates a situation that can result in property damage if not avoided!



Information

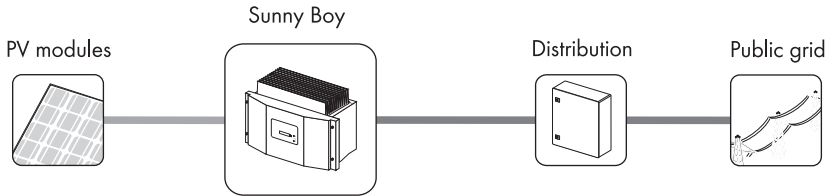
Information provides tips that are valuable for the optimal installation and operation of your product.

2 Safety

2.1 Appropriate Usage

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

Principle of a PV system with a Sunny Boy



The Sunny Boy may only be operated with PV generators (modules and cabling) of protection class II.



Capacitive discharge currents

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 does not exceed 1400 nF.

During grid feeding, a discharge current flows from the cells to ground. The amount of current depends on the manner in which the modules are installed (e.g. foil on metal roof) and on the weather (rain, snow) This "normal" discharge current may not exceed 50 mA due to the fact that the inverter would automatically disconnect from the grid as a protective measure otherwise.

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/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 SMA Solar Technology invalidates the warranty claims and operation permission.

Certified countries

The Sunny Boy 2100TL (with the relevant configuration) fulfills the requirements specified in the following standards and directives (as at 12/2008):

- VDE 0126-1-1 (02.2006)
- RD 1663/2000 (2000)
- E 2750 (11.2004)

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

You can later make modifications yourself by changing software parameters with respective communication products (e.g. Sunny Data Control). A personal password is required for this, which you can obtain from the Serviceline upon request.

2.2 Safety Precautions



DANGER!

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

- All work on the Sunny Boy may only be carried out by a qualified electrician.



CAUTION!

Danger of burn injuries due to hot housing parts!

- Do not touch the housing body during operation.
- Only touch the cover during operation.

ATTENTION!

Dust and water in 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.

Proceed as follows in order to establish protection rating IP65 in the event of temporary decommissioning:

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



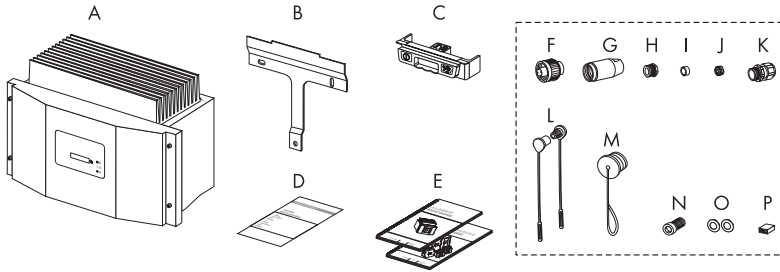
Grounding the PV generator

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

3 Unpacking

3.1 Scope of Delivery

Check the delivery for completeness and for any visible external damage such as cracks in the housing or in the display. Please contact your dealer if something is missing or has been damaged.



Object	Quantity	Description
A	1	Sunny Boy
B	1	Wall mounting bracket
C	1	Electronic Solar Switch (ESS)
D	1	Documentation package
E	2	1x Installation Guide, 1x User Manual
Contents of the accessory bag		
F	1	Socket element
G	1	Threaded sleeve
H	1	Pressure screw PG 13.5
I	1	Sealing ring PG 13.5
J	1	Fastening case PG 13.5
K	1	PG 16 pressure screw for large cable cross-sections
L	2	Caps for DC plug connectors
M	1	Cap for AC connector
N	1	M6 x 12 cylinder head screw
O	2	Plastic washer M5 (as spare for cover)
P	1	Jumper

3.2 Identifying the Sunny Boy

You can identify the Sunny Boy using the type label. The type label is on the right side of the housing. The serial number (serial No.) and the type (Type / Model) of the Sunny Boy are specified on the type label.

4 Mounting the Device

4.1 Selecting the Mounting Location



DANGER!

Danger to life due to fire or explosion!

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

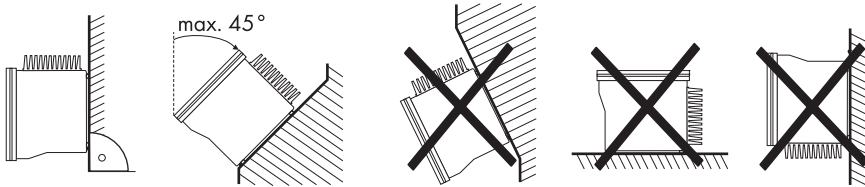
- Do not mount the Sunny Boy on flammable construction materials.
- Do not mount the Sunny Boy near highly flammable materials.
- Do not install the Sunny Boy in potentially explosive areas.



CAUTION!

Danger of burn injuries due to hot housing parts!

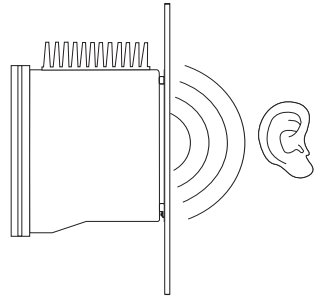
- Mount the Sunny Boy in such a way that it cannot be touched inadvertently!



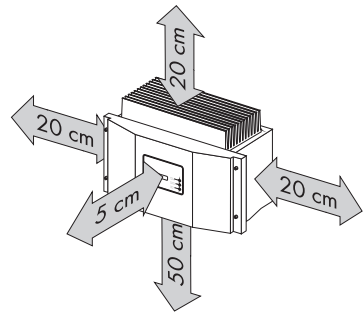
- Vertical installation or tilted backwards to a maximum of 45°. The connectors must face downwards.
 - Never install the device with a forward tilt!
 - Do not install horizontally!
- The installation method and mounting location must be suitable for the weight and dimensions of the Sunny Boy (see section 11 „Technical Data“ (40)).
- Installation on a solid surface.
- The installation location must be accessible at all times.
- The ambient temperature should be below 40 °C to ensure optimal operation.
- 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.



- Observe the minimum clearances to walls, other devices or objects as shown in the diagram in order to guarantee sufficient heat dissipation and to have enough space for removing the Electronic Solar Switch.



4.2 Mounting the Sunny Boy with a Wall Mounting Bracket

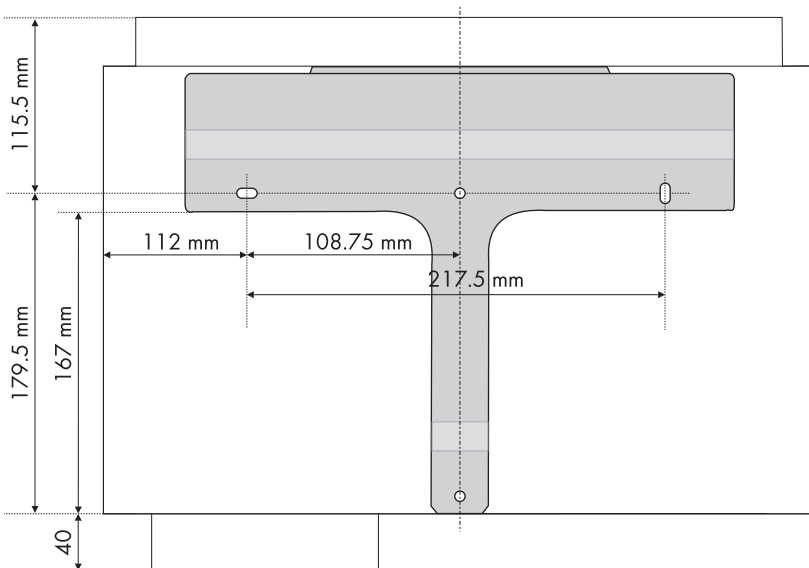


CAUTION!

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

- Take the weight of the Sunny Boy of approx. 16 kg into account.
- When mounting the wall bracket, use fastening material suitable for the mounting surface.

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

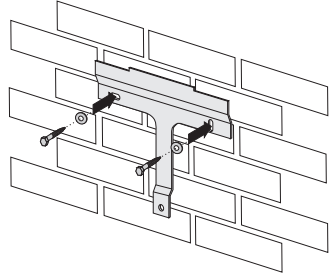


Mounting Material

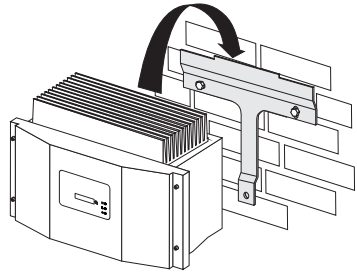
Attach the wall mounting bracket with the corresponding mounting material (depending on the surface).

2. Attach the wall bracket to the wall using suitable screws and washers.

For vertical 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 SX8.

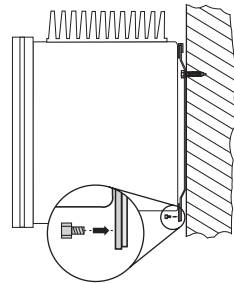


3. Now hang the Sunny Boy onto the wall bracket using the hooks on the rear side so that it cannot be moved sideways.



4. Secure the Sunny Boy in position fastening the supplied M6 x 12 screw.

5. Check that the unit is securely in place.



- The Sunny Boy is now mounted to the wall.

5 Electrical Connection

ATTENTION!

Electrostatic discharges can damage the Sunny Boy!

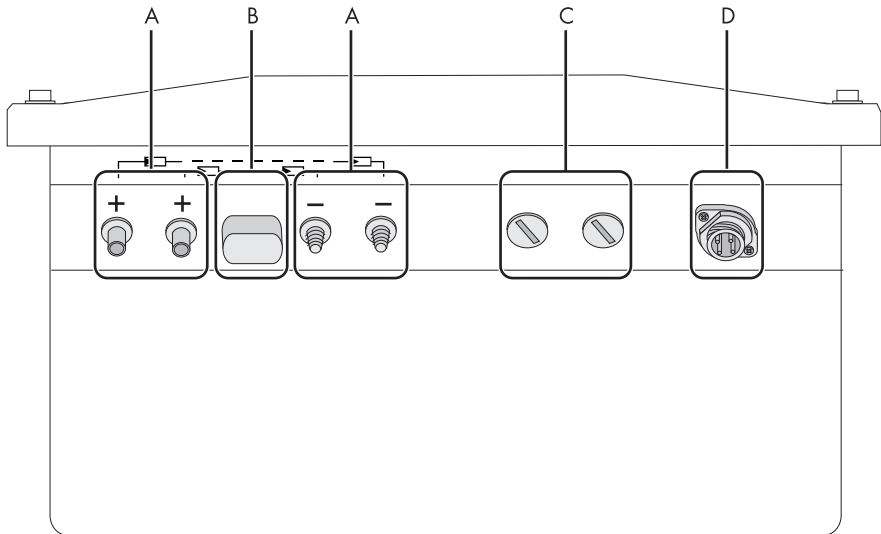
Internal components of the Sunny Boy can be irreparably damaged by static discharge.

- Ground yourself before you touch a component.

5.1 Connection Area Overview

5.1.1 Exterior View

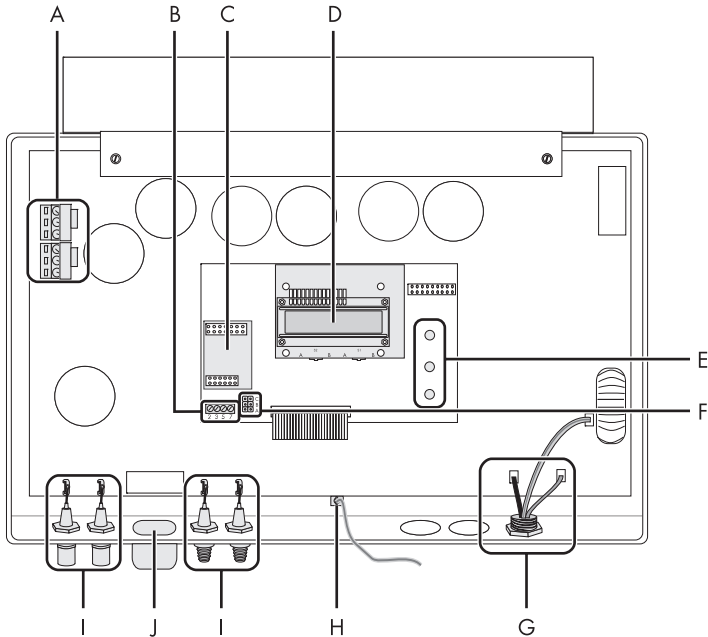
The following figure shows the assignment of the individual housing openings on the base of the inverter.



Object	Description
A	Plug connectors for connecting the PV strings
B	Socket for the connection of the Electronic Solar Switch (ESS) DC load disconnection unit
C	able opening for communication with sealing plugs
D	Plug for AC connection

5.1.2 Interior View

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	Varistors, section 9.1.2
B	Connection terminals for communication
C	Socket for communication (RS485, radio), section 5.4
D	Display
E	Operating status LEDs
F	Jumper slot for communication
G	Plug socket (AC), section 5.2
H	Tab for grounding the cable shield with RS485 communication
I	PV input plugs (DC), section 5.5
J	Electronic Solar Switch (ESS) socket

5.2 Connecting the public utility (AC)



Connection requirements of the grid operator

Always observe the connection requirements of your grid operator!

Cable Design

The cable cross-section should be sized using the "Sunny Design" design program (www.SMA.de) so that output losses do not exceed 1 % at nominal power.

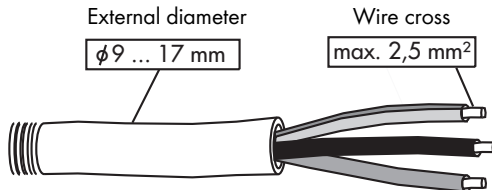
The maximum cable lengths in relation to the cross section are shown in the following table.

Cable cross-section	Max. cable length
1.5 mm ²	11 m
2.5 mm ²	18 m

Depending on the type of cable installation, observe the requirements of the following factors when selecting the cable type / cable cross-section:

- ambient temperature
- the type of cable installation and
- the UV resistance.

Cable requirements



Load disconnection unit

You must install a **separate** fuse for each inverter in order to ensure that the inverter can be securely disconnected under load. The maximal permissible rating is located in the technical data.

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.

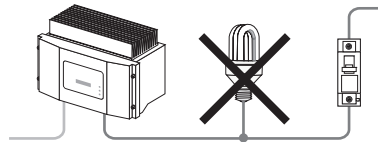
**DANGER!****Danger to life due to fire!**

If more than one Sunny Boy is connected in parallel to the same circuit breaker, the protective function of the circuit breaker is no longer guaranteed. It can result in a cable fire or the destruction of the Sunny Boy.

- never connect more than one Sunny Boy to one circuit breaker.
- Comply with the maximum permissible fuse protection of the Sunny Boy when selecting the circuit breaker.

**WARNING!****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 consumers between the Sunny Boys and the circuit breaker without protection.
- Always install separate fuses for loads.

**Permissible Load Disconnection Unit**

Use only line circuit breakers as load disconnection units!

A screw type fuse element, e.g. D system (Diazed) or DO system (Neozed) is not a load disconnection device, and thus may **not** be used as a load disconnection unit.

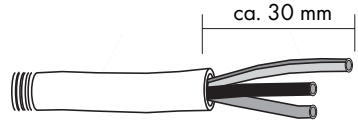
Upon disconnection under load, the screw type fuse element may be destroyed, or its functionality may be inhibited by contact burning. It only acts as cable protection.

Connection Procedure

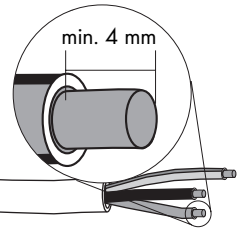
1. Check the grid voltage and compare it with V_{AC} on the type label.

The exact working range of the Sunny Boy is specified in the operation parameters. These can be uploaded via a communication component or can be ordered from SMA Solar Technology.

2. Switch off the line circuit breaker and secure it against reactivation.
3. Strip ca. 30 mm of the cable. Shorten L and N by 5 mm.

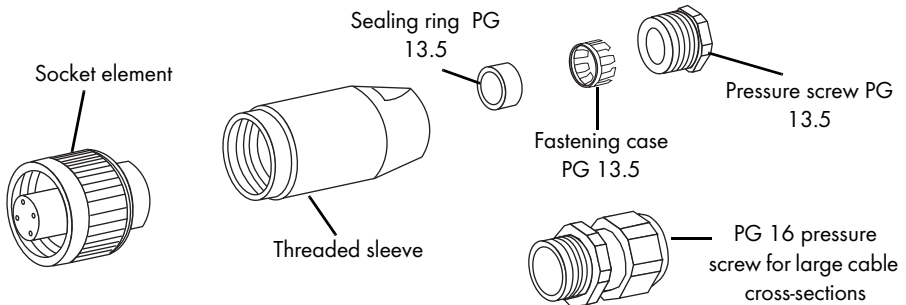


4. Strip a minimum of 4 mm off the wires.

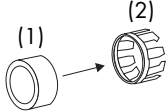
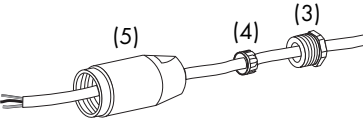
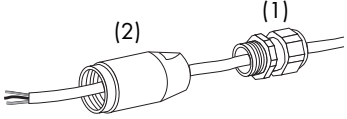


5. Remove the part of the AC connection socket from the accessory bag and connect the stripped and bared cable as described on the following pages.

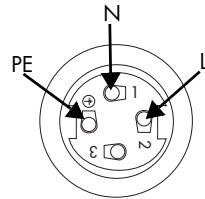
The accessory pack contains an AC connection socket PG 13.5 for connection with a cable diameter of 9 to 13.5 mm and an Ac connection socket PG 16 for connection with a cable diameter size of 13.5 mm to a maximum 17 mm.



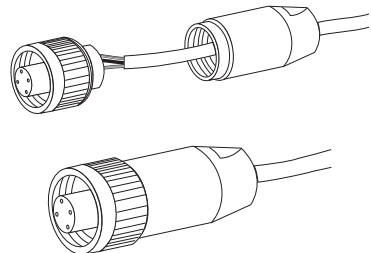
6. Attach the pressure screw or cable screw connection and threaded sleeve.

PG 13.5	PG16
<ul style="list-style-type: none"> Push the sealing ring (1) into the fastening case (2).  <ul style="list-style-type: none"> Push the pressure screw (3) and the fastening case with sealing ring (4) over the cable. Slide the threaded sleeve (5) over the cable. 	<ul style="list-style-type: none"> Slide the cable screw connection (1) over the cable. Slide the threaded sleeve (2) over the cable. 

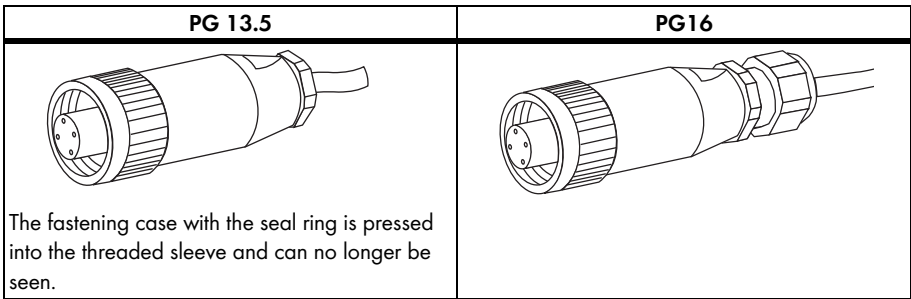
- Plug the protective earth conductor PE (green-yellow) into the screw terminal with the ground symbol on the socket element and tighten the screw.
- Plug the neutral conductor N (blue) into the screw terminal 1 on the socket element and tighten the screw.
- Plug the phase L (brown) into the screw terminal 2 on the socket element and tighten the screw.
- Leave screw terminal 3 free.
- Make sure the wires are securely connected.




12. Turn the threaded sleeve to the socket element.



13. Screw the pressure screw tightly onto the threaded sleeve.



- The connection socket is securely screwed in place. Close the socket element with the protection cap provided, if the Sunny Boy is not to be closed immediately.
14. Plug the AC connection socket into the AC socket on the Sunny Boy. If necessary, remove the protection cap from the AC socket first.
 15. Screw the threaded ring of the AC connection socket firmly onto the AC socket on the Sunny Boy. The threaded ring serves as a seal and cable grip of the AC connection socket.
- The AC cable is connected to the Sunny Boy.



DANGER!

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

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

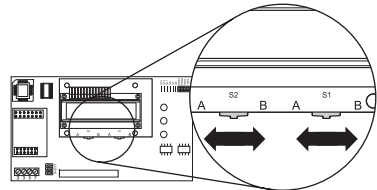
5.3 Setting the Display Language

You can set the language of the display using the switches on the underside of the display assemblies inside the Sunny Boy.

Proceed as follows:

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (31).
2. Set the switches to the required language, as shown below.

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“ (32).

5.4 Communication

The Sunny Boy can be retrofitted with a communication interface (socket see section 5.1.2 „Interior View“ (15)) in order to be that it can communicate with special data acquisition devices (e.g. Sunny WebBox) or a PC with appropriate software (e.g. Sunny Data).

See the communication interface documentation for a detailed wiring diagram and instructions for insertion.

5.5 Connecting a PV Generator (DC)

- Requirements for the modules of the connected strings:
 - same type
 - same number
 - identical alignment
 - identical tilt
- The connecting wires of the PV module must be equipped with plug connectors in order that the DC plug connectors to be connected to the Sunny Boy.

A pre-assembled set for connecting the free cable ends from a string is available as an accessory from SMA Solar Technology (see section 12 „Accessories“ (43)).

- The following limit values at the DC input of the Sunny Boy may not be exceeded:

Maximum input voltage	Maximum input current
600 V (DC)	11.0 A (DC)



Use of Adaptors

Adaptors (branch connectors) are not to be visible or freely accessible in the immediate surrounding of the Sunny Boy.

- The DC current flow may **not** be interrupted as a result.
- Always disconnect the current flow first via the Electronic Solar Switch.

Connection Procedure

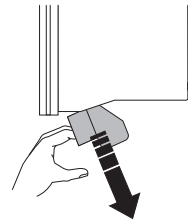


DANGER!

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

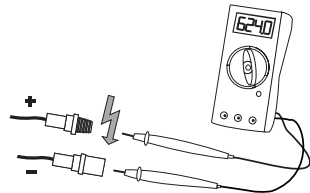
- Before connecting the PV generator, ensure that the line circuit breaker is switched off.

1. Remove the Electronic Solar Switch by pulling it downwards and slightly towards the wall.



2. Check the connection cables of the solar modules for correct polarity and that the maximum input voltage of the Sunny Boy is not exceeded.

Check the system design if the open circuit voltage of the solar modules is less than 10% below the maximum input voltage of the Sunny Boy.



ATTENTION!

The Sunny Boy can be irreparably damaged by overvoltage!

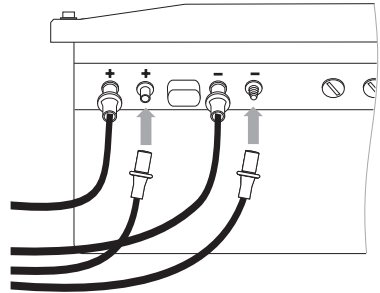
If the voltage of the solar modules exceeds the maximum input voltage of the Sunny Boy, it could be irreparably damaged by overvoltage.

All warranty claims become void.

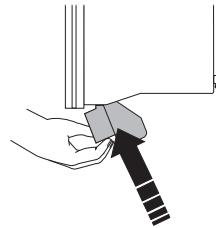
- Do not connect strings to the Sunny Boy with open circuit voltage greater than the maximum input voltage of the Sunny Boy.
- Check the system design.

3. Check the strings for ground faults, as described in section 9.1 „The Red LED is continuously on“ (35).

4. Connect the DC plug connectors.
5. Close unused DC input sockets with the sealing caps included in the packing list.



6. Check the Electronic Solar Switch for wear as described in section 8.1 and insert it until it audibly clicks into place.



ATTENTION!

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

The connector must remain moveable inside the handle 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.

ATTENTION!

Damage to the Electronic Solar Switch!

If inserted incorrectly, the Electronic Solar Switch can be damaged by high voltages.

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

- The PV generator is now connected.



The residual current device

The Sunny Boy is equipped with an integrated all-pole sensitive leakage current monitoring unit. This enables the Sunny Boy to automatically differentiate between real leakage currents and "normal" capacitive leakage currents.

If an external RCD or residual current breaker is mandatory, you must use a circuit breaker which is triggered at a leakage current of 100 mA or more.

You will find detailed information for the use of an RCD in the technical information "Criteria for selecting an RCD" in the download area at www.SMA.de.

5.6 Setting installation country

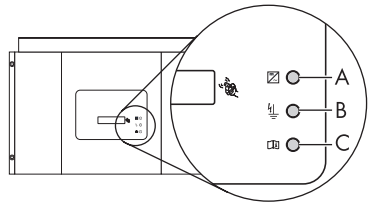
With the "Default" parameter you can set the installation country or the valid grid connection standard for that country via a communication device (e.g. Sunny WebBox) or a PC with appropriate software (e.g. Sunny Data Control). This however is only necessary if the Sunny Boy was originally ordered for another country. You can ascertain to which standard the Sunny Boy was set to for delivery by looking on the type label.

6 Commissioning the Sunny Boy.

1. Check the following requirements:
 - correct connection of the AC (grid) cable
 - Full connection of the DC cables (PV strings)
 - unused DC plug connectors on the underside of the housing are sealed with protecting caps
 - the housing cover is securely screwed in place
 - The Electronic Solar Switch is securely plugged on
 - the line circuit breaker is laid out correctly
2. Switch on the line circuit breaker.

Upon successful commissioning, the green LED lights up or blinks as long as adequate irradiation is available.

A lit / flashing yellow or red LED signalizes a disturbance. Proceed to step 3.



LED	Color	Meaning
A	green	In operation
B	red	ground fault
C	yellow	Disturbance

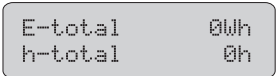
3. Read the operating instructions included. The meaning of the LEDs as well as the error and status reports shown on the display are described in this.

6.1 Display

Feed-in Operation

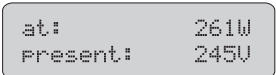
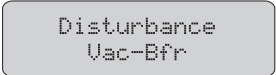
After error-free grid connection of the Sunny Boy, it takes approximately one minute until the following display messages are shown alternately. The display messages shown before only have the purpose of indicating the initialization of the Sunny Boy and the process of controlling whether the power supply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

- The energy already generated today and the current operating mode are displayed first.
- The current feed-in output and the PV voltage are displayed after 5 seconds or when you tap the housing cover.
- 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.



Disturbance

- In the event of a disturbance, the message "Disturbance" will be indicated in the status bar.
- The exact disturbance 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 cable is not correctly connected or the circuit breaker is not switched on yet.
- If a measured value, which is not standard-compliant, is responsible for the disturbance then the value measured at the time of the disturbance is displayed. If a further measurement of the value is possible, the current measured value will be displayed in the second row.



Please refer to the delivered user manual of the Sunny Boy to read the exact explanations for the error and status messages!

PV surge voltage

```
!PV-Overvoltage!  
!DISCONNECT DC!
```

ATTENTION!

Excessive DC voltage can destroy the Sunny Boy!

Immediately disconnect the Sunny Boy!

1. Switch the line circuit breaker off.
2. Remove the Electronic Solar Switch.
3. Disconnect the DC plug connectors.

Check DC voltage!

- Greater than 600 V: Contact the planner / installer of the PV generator for assistance.
- Lower than 600 V: Connect the Sunny Boy to the PV generator again as described in section 5.2 „Connecting the public utility (AC)“ (16). If the message reappears, disconnect the Sunny Boy again and contact SMA (see section 13 „Contact“ (44)).

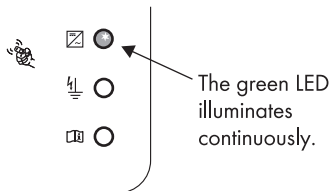
6.2 Blink Codes

Overview

Green	Red	Yellow	Status
Glowes continuously	Is not glowing	Is not glowing	OK (feed-in operation)
	Glowes continuously	Is not glowing	Disturbance
		Glowes continuously	OK (Initialization)
flashes quickly (3 x per second)	Is not glowing	Is not glowing	OK (stop)
	Glowes continuously	Is not glowing	Disturbance
flashes slowly (1 x per second)	Is not glowing	Is not glowing	OK (waiting, Grid monitoring)
briefly goes out (approx. 1 x per second)	Glowes continuously	Is not glowing	Disturbance
	Is not glowing	Is not glowing	OK (derating)
Is not glowing	Is not glowing	Is not glowing	OK (overnight shutdown)
		glowing/flashing	Disturbance
	Glowes continuously	Is not glowing	Disturbance
		glowing/flashing	Disturbance

Feed-in Operation

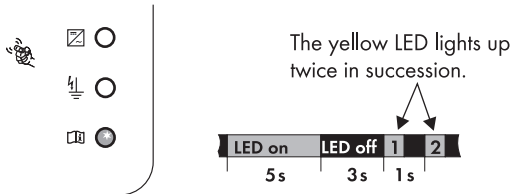
After a fault-free grid connection of the Sunny Boy, it takes approximately one minute until the green LED is continuously on. The blink codes shown before only have the purpose of indicating the initialization of the Sunny Boy and the process of controlling whether the power supply requirements are fulfilled.



Disturbance or fault

If the inverter detects a disturbance or fault, this is indicated through a blink code of the yellow and red LEDs.

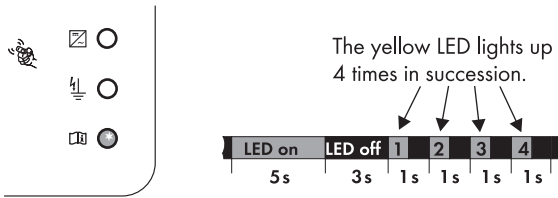
For example, if the yellow LED glows for 5 seconds immediately after connection, then goes out for 3 seconds and then flashes briefly twice, there is a grid fault. In this case, it may be due to the fact that the AC cable has not yet been connected correctly or that the line circuit breaker has not yet been switched on.



Meaning of the Blink codes

For a detailed description of the blink codes, see the operating instructions provided with the Sunny Boy.

PV surge voltage



ATTENTION!

Excessive DC voltage can destroy the Sunny Boy!

Immediately disconnect the Sunny Boy!

1. Switch the line circuit breaker off.
2. Remove the Electronic Solar Switch.
3. Disconnect the DC plug connectors.

Check DC voltage!

- Higher than 600 V:
Contact the planner / installer of the PV generator for assistance.
- Lower than 600 V:
Reconnect the Sunny Boy to the PV generator as described in section 5.2 „Connecting the public utility (AC)” (16).
If the message occurs again, disconnect the Sunny Boy again and contact SMA Solar Technology (see section 13 „Contact” (44)).

7 Opening and Closing

ATTENTION!

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



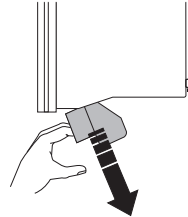
DANGER!

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

Before opening the Sunny Boy:

- Switch off the line circuit breaker and secure it against reactivation.

1. Remove the Electronic Solar Switch by pulling it downwards and slightly towards the wall.

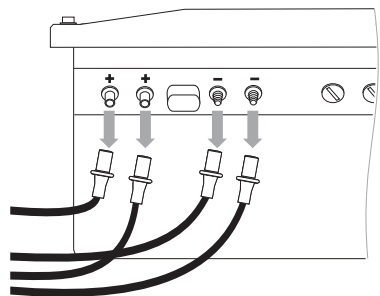


DANGER!

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

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

- Remove the DC plug connector immediately to completely disconnect the PV generator from the Sunny Boy.



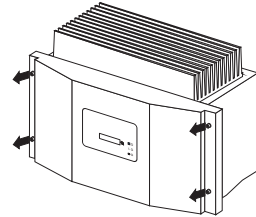
**DANGER!**

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

The capacitors in the Sunny Boy require 15 minutes to discharge.

- Wait 15 minutes before opening the Sunny Boy.

2. Loosen all 4 cover screws and pull the cover forward to remove it.

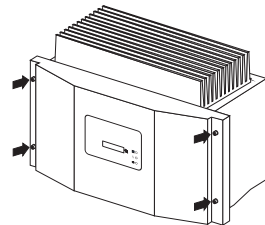


3. Remove the protective earth (PE) connection from the cover by loosening the locking device of the PV connection on the cover.

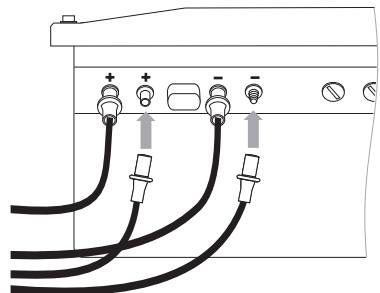
The Sunny Boy is now free of voltage and you may now carry out work on it.

7.2 Closing the Sunny Boy

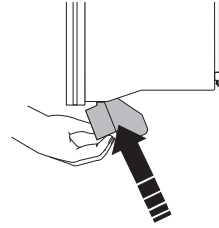
1. Reconnect the protective earth (PE) to the housing cover.
2. Secure the housing cover of the Sunny Boy by evenly tightening the 4 cover screws.



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



4. Check the Electronic Solar Switch for wear as described in section 8.1 and insert it until it audibly clicks into place.



ATTENTION!

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

The connector must remain moveable inside the handle 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.

ATTENTION!

Damage to the Electronic Solar Switch!

If inserted incorrectly, the Electronic Solar Switch can be damaged by high voltages.

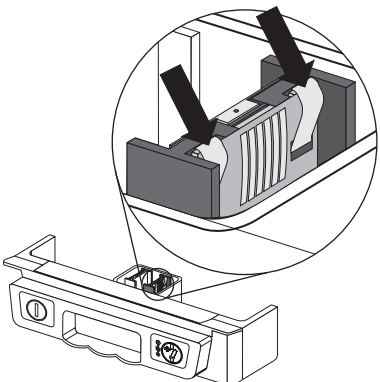
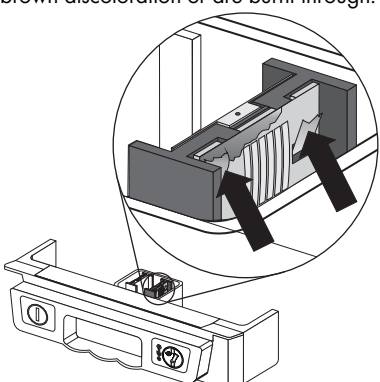
- Press the handle firmly into place on the socket of the Electronic Solar Switch until it audibly locks into place.
- Check that the unit is securely in place.

5. Switch on the line circuit breaker.
6. Check whether the display and the LEDs indicate normal operating mode (see section 6 „Commissioning the Sunny Boy.“ (25)).

8 Maintenance

8.1 Inspection of the Electronic Solar Switch

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

Examination Result	Measure
<p>The metal tongues inside the connector are not damaged and not discolored.</p> 	<ul style="list-style-type: none"> Replace the handle of the Electronic Solar Switch and reactivate the Sunny Boy.
<p>The metal tongues on the inside of the plug show brown discoloration or are burnt through.</p> 	<p>The Electronic Solar Switch can no longer reliably disconnect the DC side.</p> <ul style="list-style-type: none"> Replace the handle of the Electronic Solar Switch before you plug it back on (order number see section 12 „Accessories“ (43)).

9 Troubleshooting

If the Sunny Boy displays other blink codes or display messages than those described in section 6 „Commissioning the Sunny Boy.“ (25), refer to the user manual of the Sunny Boy to find the exact meaning of the display message or the blink code and details on troubleshooting.

Please do not attempt any other repairs than those described here, but instead use the 24-hour replacement service (the Sunny Boy is made ready for shipping within 24 hours and then given to a shipping company) and the SMA Solar Technology AG repair service.

9.1 The Red LED is continuously on

Either a ground fault exists 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“ (31).

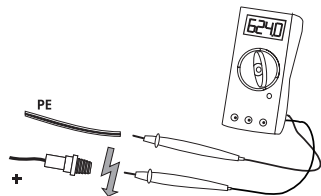
ATTENTION!

Excessive voltages can destroy the measuring device!

- Only use measuring devices with a DC input voltage range up to at least 700 V.

2. Measure the voltages between the plus and minus pole of a string against the ground potential.

If a voltage is found, there is a ground fault in the corresponding string.



DANGER!

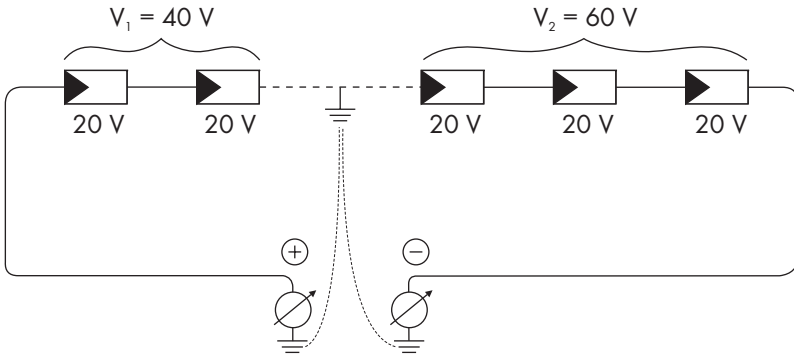
Risk of lethal electric shock!

In the event 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.

For example:



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

3. Repeat step 2 for each string.

Event	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. Restart the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (32), but without reconnecting the faulty string.
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“ (37).

9.1.2 Checking the Function of the Varistors

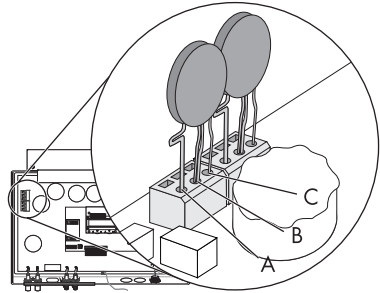
Varistors are wearing parts. Their functioning becomes restricted through aging or due to repeated responses as a result of overvoltage. It is therefore possible that one of the thermally monitored varistors has lost its protective functioning, and thus the red LED is lit.



Position of the varistors

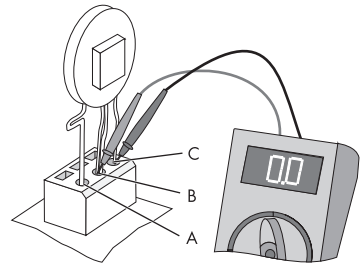
Observe the following allocation of the terminals:

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



Check the varistors as described below:

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (31).
2. With the aid of a Multimeter, determine for both varistors in the installed state whether a conductive connection exists between connectors B and C.



Result	Measure
There is a conducting connection.	There is probably another fault in the Sunny Boy. <ul style="list-style-type: none"> • Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (32). • Contact the SMA Solar Technology Serviceline (see section 13 „Contact“ (44)).

Result	Measure
<p>There is no conducting connection.</p>	<p>The respective varistor is not working and must be replaced.</p> <p>Varistor failure is generally due to influences which affect all varistors similarly (temperature, age, induced overvoltage). It is therefore strongly recommended to replace both varistors.</p> <p>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“ (43)).</p> <ul style="list-style-type: none"> To replace the varistors, proceed to step 3.

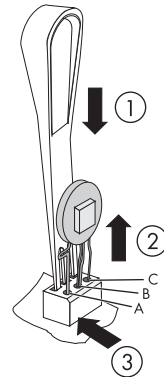
- Insert the extractor tool into the opening of the terminal contacts (1).

The clamps loosen.

If you did not receive an extractor tool together with the replacement varistors for the servicing of the terminals, contact SMA Solar Technology. The terminal contacts can also be provisionally serviced by a screwdriver with a 3.5 mm blade width.

- Remove the varistor (2).
- Insert new varistor.

The pole with the small loop (crimp) must be fitted to terminal A (3) when remounting.



ATTENTION!

The Sunny Boy can be irreparably damaged by overvoltage!

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

- Replacement varistors should be obtained immediately.
- Do not** operate the Sunny Boy without varistors in systems with a high risk of overvoltages.

- Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (32).
- The examination of the varistors is now at an end.

10 Decommissioning

10.1 Disassembling the Sunny Boy

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

- Take the weight of the Sunny Boy of approx. 16 kg into account.

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (31).
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 lower screws, which fix the Sunny Boy to the wall mounting bracket.
5. Remove the Sunny Boy from the wall mounting bracket.

10.2 Packaging the Sunny Boy

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 16 kg
- with handle system
- can be closed fully

10.3 Storing the Sunny Boy

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

10.4 Disposing of the Sunny Boy

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		
Max. input voltage	$U_{PV \max}$	600 V ^{a)} (based on -10 °C cell temperature)
Input voltage, MPP range (nominal power)	U_{PV}	200 V ... 480 V DC
Max. input current	$I_{PV \max}$	11 A
Max. input power	P_{DC}	2200 W
Voltage ripple	U_{ss}	< 10 % of the input voltage
Internal consumption during operation		< 7 W

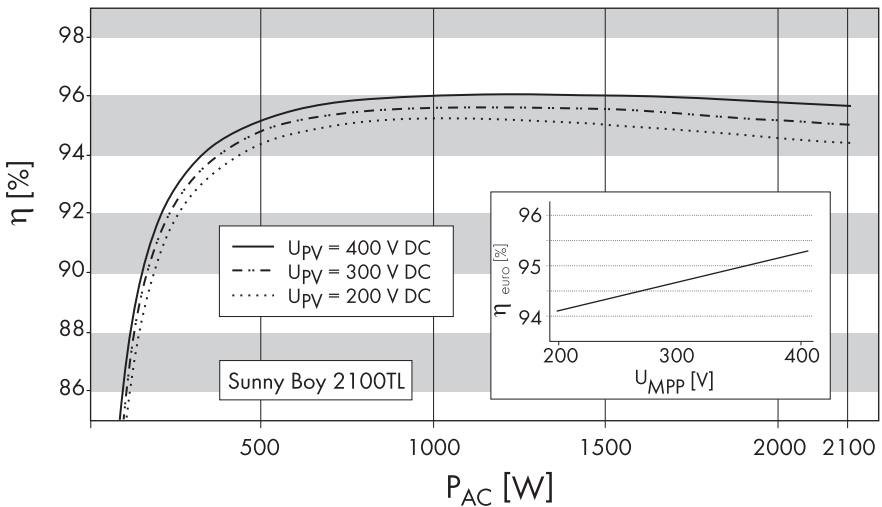
^{a)} The maximum open circuit voltage, which can occur at a cell temperature of -10 °C, may not exceed the maximum input voltage.

Grid Connection Data		
Nominal output power	P_{ACNom}	1950 W
Peak output power	P_{ACmax}	2100 W
Nominal output current	I_{ACNom}	8.5 A
Max. output current	I_{ACMax}	11 A
Max. fuse protection		16 A
Harmonic distortion of output current (with $K_{UGrid} < 2\%$, $P_{AC} > 0.5 P_{ACNom}$)	K_{IAC}	< 3 %
Nominal operating voltage	U_{ACnom}	220 V / 230 V / 240 V
Voltage range (extended operating range)	U_{AC}	180 V ... 260 V
Nominal operating frequency	f_{ACnom}	50 Hz
Frequency range (extended operating range)	f_{AC}	50 Hz: 45.5 Hz ... 54.5 Hz ...
Power factor (at nominal output power)	cos phi	1
Overvoltage category		III
Test voltage (50 Hz)		2.2 kV
Test surge voltage		4 kV (serial interface: 6 kV)
Internal consumption in night mode		0.1 W

General data	
EC Declaration of Conformity	document pack included in delivery, download area at www.SMA.de
Dimensions (w x h x d)	approx. 434 mm x 295 mm x 214 mm
Weight	approx. 16 kg
Protection rating in accordance with DIN EN 60529	IP65
Climatic conditions according to DIN EN 50178:1998-04:	
Location of type C:	Class 4K4H <ul style="list-style-type: none"> Extended temperature range: -25 °C to +60 °C Extended humidity range: 0 ... 100 %, extended air pressure range: 70 kPa to 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
Topology	Transformerless
Protection class	I
Noise emission (typical)	≤ 33 dB (A)
Protective function DC side	
All-pole disconnection unit on the DC input side	Electronic Solar Switch, DC plug connector
overvoltage protection	thermally monitored varistors
Personal protection	Insulation monitoring ($R_{iso} > 1 \text{ MOhm}$)
Reverse polarity protection	via short-circuit diode

Protective function AC side		
Short Circuit Proof		Current regulation
All-pole disconnection unit on grid side		Automatic disconnection device (SMA grid guard 2.1)
Efficiency		
Max. efficiency	η_{max}	96 %
European efficiency	η_{euro}	95.2 %
Communication interfaces		
RS485 (galvanically isolated)		optional
Radio		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 in unplugged state		IP21

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 SB-TVWZ	SB-TV4
Electronic Solar Switch	ESS handle replacement part	ESS-HANDLE:01
RS485 upgrade kit	RS485 interface	485PB-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
DC connection set Multi-Contact 3 mm	Multi-Contact 3 adapter set, max. flow current: 21 A	SWR-MC
DC connection set Multi-Contact 4 mm	Multi-Contact 4 adapter set, 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, contact our Serviceline. We require the following information in order to provide you with the necessary assistance:

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

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- 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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The current guarantee conditions come enclosed with your device. These are also available online at www.SMA.de and can be downloaded or are available on paper from the usual sales channels if required.

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