Sunny Boy SB 1100LV
Inverter for Photovoltaic Plants
Inhaltsverzeichnis

1  Explanation of the symbols used: ................. 5
2  Foreword ........................................... 7
  2.1  Target group ................................... 7
3  Safety instructions ................................. 9
4  Overview ........................................... 11
  4.1  Unit description ................................. 11
  4.2  External dimensions ............................ 12
5  Installation requirements ......................... 13
  5.1  Installation site requirements .................. 13
  5.2  PV generator requirements ..................... 15
  5.3  Low voltage grid (AC) ......................... 15
6  Installation ......................................... 19
  6.1  Mounting the unit ................................ 19
  6.2  Electrical installation ......................... 20
    6.2.1  Connecting the AC output .................. 21
    6.2.2  PV string (DC) connection ................. 26
  6.3  Reverse current ................................ 27
  6.4  Commissioning ................................ 30
7  Opening and closing the Sunny Boy ............... 33
  7.1  Opening the Sunny Boy ......................... 33
  7.2  Closing the Sunny Boy .......................... 33
8  Technical data .................................... 35
  8.1  PV generator connection data .................. 35
  8.2  Grid connection data ........................... 36
  8.3  Device description ............................... 37
  8.4  Operating parameters ........................... 38
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.4.1</td>
<td>Explanation of the operating parameters</td>
<td>38</td>
</tr>
<tr>
<td>8.4.2</td>
<td>Parameter settings for Germany</td>
<td>41</td>
</tr>
<tr>
<td>8.4.3</td>
<td>Country-specific parameter settings</td>
<td>42</td>
</tr>
<tr>
<td>8.4.4</td>
<td>Non-modifiable parameters</td>
<td>43</td>
</tr>
<tr>
<td>9</td>
<td>Certificates</td>
<td>45</td>
</tr>
<tr>
<td>9.1</td>
<td>CE declaration of conformity</td>
<td>45</td>
</tr>
<tr>
<td>9.2</td>
<td>SMA grid guard certificate</td>
<td>46</td>
</tr>
<tr>
<td>10</td>
<td>Replacing the varistors</td>
<td>47</td>
</tr>
<tr>
<td>11</td>
<td>Rating for a line circuit breaker</td>
<td>51</td>
</tr>
<tr>
<td>12</td>
<td>The communications interface</td>
<td>55</td>
</tr>
<tr>
<td>12.1</td>
<td>Connection of the interface</td>
<td>56</td>
</tr>
<tr>
<td>12.1.1</td>
<td>Jumper functions</td>
<td>57</td>
</tr>
<tr>
<td>13</td>
<td>Contact</td>
<td>59</td>
</tr>
</tbody>
</table>
1 Explanation of the symbols used:

To ensure optimum use of these instructions, please note the following explanation of symbols used.

This symbol identifies an example.

This symbol identifies a notice where failure to follow the advice will make the procedure or operation more difficult.

This symbol indicates a fact that when not observed could result in damage to components or danger to persons. Please read these sections especially carefully.
Explanation of the symbols used:

SMA Technologie AG
2 Foreword

The Sunny Boy SB 1100LV contains the SMA grid guard 2. This is a type of independent disconnection device. It ensures that the Sunny Boy SB 1100LV complies with the VDEW (Verband der Elektrizitätswirtschaft – German Electricity Industry Association) regulations for the connection and parallel operation of electrical power units to the low-voltage grid of the electricity supply company and with DIN VDE 0126-1-1, which forms a part of these regulations.

For detailed information on troubleshooting and on how to use the Sunny Boy and the various communications options, please see the operating instructions.

"Sunny Design" helps you design the system and check string size taking the relevant inverter into consideration. Further information on Sunny Design is available at www.SMA.de.

If you require further information, please call the Sunny Boy hotline on the following number:

(0561) 95 22 - 499

2.1 Target group

Attention!

The Sunny Boy may only be installed by trained specialists. Installers must be approved by the local energy supplier. Please carefully read this installation manual. All prescribed safety regulations, the technical connection requirements of the local energy supplier and all applicable provisions must be adhered to.

This installation manual is intended solely for qualified electricians. Its aim is to help install and set up SMA Sunny Boy SB 1100LV inverters quickly and correctly.
3 Safety instructions

Caution! Overvoltage
Check the system design using the "Sunny Design" design tool (www.SMA.de) or by calling the Sunny Boy Hotline. Overvoltages may lead to the destruction of the Sunny Boy SB 1100LV.

Warning! High voltage!
Work on the Sunny Boy with the cover removed must be carried out by a qualified electrician. High voltages are present in the device. Before working on the Sunny Boy with the cover removed, the AC and DC voltages must be disconnected from the Sunny Boy and the capacitors must be discharged.

The Sunny Boy must be disconnected from the mains grid and precautions must be taken to prevent the grid being reconnected. In addition, the connections to the PV generator must be disconnected.

After isolating the AC and DC voltage, you must wait approx. 30 minutes for the capacitors in the Sunny Boy to discharge. Only then is it safe to open the unit by removing the cover. You must also make sure that no voltage is present in the device.

Caution! Electrostatic charge!
When working on the Sunny Boy SB 1100LV and handling the components, remember to observe all ESD safety regulations. Electronic components are susceptible to electrostatic charge. Discharge any electrostatic charge by touching the grounded enclosure before handling any electronic component.
4 Overview

4.1 Unit description

The following diagram gives a schematic overview of the various components and connection points inside the Sunny Boy SB 1100LV with the cover removed:

- Varistors, page 47
- Socket for communication (RS232, RS485, NLM Piggy-Back, Radio), page 59
- Sunny Display
- PV input terminal (DC), page 26
- PE (protective earth) connecting cable for cover
- Communication connector
- Flat connection for grounding the cable shield for RS232 and RS485 communications
- Operating status LEDs
- Jumper for communication
- Connection plug (AC), page 21
4.2 External dimensions

- Height: 214 mm
- Width: 434 mm
- Depth: 295 mm
5 Installation requirements

Please check that all of the conditions listed below are met before installing and setting up the Sunny Boy.

5.1 Installation site requirements

The Sunny Boy SB 1100LV weighs approx. 29 kg. Please take this weight into account when choosing the installation site and method of installation.

The Sunny Boy SB 1100LV 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.

The Sunny Boy is designed to be mounted on a vertical wall. If absolutely necessary, however, the Sunny Boy can be installed tilted back at a maximum angle of 45°. For an optimum energy yield and the most convenient operation, vertical installation at eye-level is preferable. If installing the unit outdoors, make sure that it is not slanting forward. The rear panel is designed such that the Sunny Boy SB 1100LV is tilting slightly backward on a perfectly vertical wall.

We advise against installing the unit in a horizontal position outdoors.

The ambient temperature must not be outside the -25 °C to +60 °C range.

Never install the inverter horizontally or so that it tilts forward.
When choosing the installation site, be sure to note the following:

**Warning! Risk of burns!**
The temperature of individual parts of the case and components within the Sunny Boy can reach more than 60 °C. Touching could result in burns!

**Do not install the Sunny Boy on flammable construction materials, in areas where highly inflammable materials are stored or in potentially explosive environments!**

When choosing the installation site, ensure there is enough space for heat to dissipate. Under normal conditions, the following guidelines should be applied for the space to be kept clear around the Sunny Boy SB 1100LV:

<table>
<thead>
<tr>
<th>Minimum clearance</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sides</td>
<td>20 cm</td>
</tr>
<tr>
<td>Top</td>
<td>20 cm</td>
</tr>
<tr>
<td>Underneath</td>
<td>20 cm</td>
</tr>
<tr>
<td>Front</td>
<td>5 cm</td>
</tr>
</tbody>
</table>

In domestic installations, the unit should not be mounted on plasterboard walls or similar as otherwise audible vibrations are likely to result. We recommend securing the unit to a solid surface. The Sunny Boy makes noises when in use which can, in the domestic setting, be seen as a nuisance.
5.2 PV generator requirements

The Sunny Boy SB 1100LV is internally designed to be connected directly to up to two strings (PV modules wired in series) having a homogenous structure (modules of the same type, identical orientation and tilt).

For connecting the PV generators, the unit has two DC terminal blocks, which each have connections for two strings. If you want to connect more than two strings to the Sunny Boy SB 1100LV, you must use a DC distribution box.

The DC side must be equipped with a DC circuit breaker compliant to DIN VDE 0100-712 to allow the PV generator to be disconnected from the Sunny Boy.

The Sunny Boy SB 1100LV operates with high currents on the DC side. If there is a fault in a string, the current of this string is routed via another string as reverse current. This can irreparably damage the PV generators. See chapter 6.3 "Reverse current" (Page 27) for more information.

"Sunny Design" helps you design the system and check string size taking the relevant inverter into consideration. Further information on "Sunny Design" is available at www.SMA.de.

<table>
<thead>
<tr>
<th>Limit values for DC input</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. voltage</td>
<td>60 V (DC)</td>
</tr>
<tr>
<td>Max. input current</td>
<td>62 A (DC)</td>
</tr>
</tbody>
</table>

5.3 Low voltage grid (AC)

The Sunny Boy must have a three-conductor connection to the mains 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 cable diameter between 9 mm and 13.5 mm, while the PG16 connection socket is used for cables with cable diameters from 13.5 mm up to a maximum of 17 mm. For detailed instructions, see chapters "Connecting the AC output with PG13.5" (Page 22) and "Connecting the AC plug with PG16" (Page 24).
Attention!

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 in a photovoltaic electrical power unit operated in parallel with the low-voltage grid

Various factors should be taken into account when selecting line circuit breakers. These include, for example:

- The type of cable used (conductor material and insulation)
- Ambient temperatures affect the cables (higher temperatures result in a reduced maximum current load)
- Method of routing the cable (reduces the ampacity of the conductor)
- Bundling cables together (reduces the ampacity of the conductor)
- Loop impedance \( Z \) (in the event of a body contact this limits the current that can flow and therefore determines the response behavior of the circuit breaker)
- Sufficient distance between the circuit breakers so as to avoid undue heating (heat can trigger the circuit breakers early).
- Selectivity
- Protection class of the connected load (VDE 0100, part 410, Protection against electric shock)

Please pay attention to chapter 11 “Rating for a line circuit breaker” (Page 51).

The following standards should be followed in all cases:

- DIN VDE 0298-4 (Cable routing and current-carrying capacity)
- DIN VDE 0100; part 430 (Protective measures; protection of cable and cords against overcurrent)
- DIN VDE 0100; part 410 (Protective measures; protection against electric shock)
AC cable system impedance should not exceed 1 ohm. This is necessary, amongst other things, for the correct operation of impedance observation. In addition, we recommend dimensioning the conductor cross-section so that line losses do not exceed 1% at the nominal power. Line losses depending on the cable length and cross-section are shown in the graph below. Multi-wire cables with copper forward and return conductors are used.

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

<table>
<thead>
<tr>
<th>Conductor cross-section</th>
<th>1.5 mm²</th>
<th>2.5 mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. length</td>
<td>21 m</td>
<td>35 m</td>
</tr>
</tbody>
</table>
The Sunny Boy SB 1100LV is designed for operation on 220 - 240 V grids with a grid frequency of 50 Hz. When connecting an inverter to the public grid, please adhere to the local connection requirements of your grid operator.

<table>
<thead>
<tr>
<th></th>
<th>Limit values for AC output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage range</td>
<td>198 V ... 253 / 260 V ^a</td>
</tr>
<tr>
<td>(complying with DIN VDE 0126-1-1)</td>
<td></td>
</tr>
<tr>
<td>Frequency range</td>
<td>47.55 Hz ... 50.2 Hz</td>
</tr>
<tr>
<td>(complying with DIN VDE 0126-1-1)</td>
<td></td>
</tr>
<tr>
<td>Voltage range</td>
<td>180 V ... 265 V</td>
</tr>
<tr>
<td>(extended operating range)</td>
<td></td>
</tr>
<tr>
<td>Frequency range</td>
<td>45.5 Hz ... 54.5 Hz</td>
</tr>
<tr>
<td>(extended operating range)</td>
<td></td>
</tr>
</tbody>
</table>

^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. I.e., if the grid voltage remains constant at 254 V, the inverter is automatically disconnected from the grid. In this case, contact the local grid operator for assistance.

DIN VDE 0126-1-1 only applies in Germany. See chapter 8.4.3 “Country-specific parameter settings” (Page 42) for the country-specific preset default values of your inverter.
6 Installation

6.1 Mounting the unit

To make the job easier, we recommend you use the supplied wall bracket to mount the Sunny Boy SB 1100LV. For vertical installation on solid concrete or block walls, for example, you can fit the bracket using 8 mm x 50 mm hexagon bolts to DIN 571 standard, stainless steel type, and with wall plugs type SX8.

When selecting the mounting materials, be sure to take into account the weight of the Sunny Boy SB 1100LV (29 kg).

1. Fit the wall bracket [1]. To mark the positions to drill the holes, you can use the wall bracket as a drilling template.

2. Now hook the Sunny Boy SB 1100LV onto the wall bracket [2] at its upper mounting plate so that it cannot be moved sideways.

3. Fix the Sunny Boy SB 1100LV onto its bracket by screwing the supplied M6x10 bolt into the central threaded hole at the bottom of the bracket [3].

4. Make sure the Sunny Boy SB 1100LV is positioned securely on the bracket.
6.2 Electrical installation

Attention!
Make sure to check the polarity of the strings before connecting them!

The complete wiring for a Sunny Boy SB 1100LV is shown schematically in the following diagram:

* Circuit breaker according to DIN VDE 0100-712
6.2.1 Connecting the AC output

Warning! Voltage!
Before you connect the mains cable to the AC connection socket, make sure that no voltage is present in 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 constantly higher than 253 V, the Sunny Boy SB 1100LV will not be fully operational. In this case, contact the local grid operator for assistance. The inverter can feed into the grid at an output voltage of 260 V for brief periods. However, the average output over a 10 minute period may not exceed 253 V.

2. Isolate the grid connection (switch the line circuit breaker to its "off" position), make sure it cannot be switched back on, and test to make sure no voltage is present.

3. 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:

- Socket element
- Threaded sleeve
- Sealing ring for PG13.5
- Cord grip for PG13.5
- Pressure screw for PG13.5
- PG16 pressure screw for large cable diameters
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 into the cord grip.

2. Now slide the pressure screw over the cable first of all, followed by the cord grip with the sealing ring in it. Now slide the threaded sleeve 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. Make sure that the PE earth wire is longer than the N and L connected wires.
   - 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 are securely connected.
5. Now screw the threaded sleeve onto the socket element and tighten it.

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

The AC connecting socket is now fully assembled.
If you are not going to connect up the Sunny Boy immediately, close off 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 connecting socket to the flange plug to seal the connection and secure it.

Attention!
Do not switch the line circuit breaker on yet! The Sunny Boy SB 1100LV may only be connected to the AC grid once the PV strings are connected and the device is securely closed.
Connecting the AC plug 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 onto the cable. Now slide the threaded sleeve over the cable.

2. Now connect the individual conductors to the socket element in sequence.
   - Protective earth PE (green/yellow) to the screw terminal with the earth sign. Make sure that the PE earth wire is longer than the N and L connected wires.
   - 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 are securely connected.

4. Now screw the threaded sleeve onto the socket element and tighten it.
5. Now screw the pressure screw into the threaded sleeve and tighten it.
6. Firmly tighten the screw fitting against the seal and strain relief.

The AC connecting socket is now fully assembled.
If you are not going to connect up the Sunny Boy immediately, close off 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 connecting socket to the flange plug to seal the connection and secure it.

Attention!
Do not switch the line circuit breaker on yet! The Sunny Boy SB 1100LV may only be connected to the AC grid once the PV strings are connected and the device is securely closed.
6.2.2 PV string (DC) connection

To connect up the input, follow these steps:

1. Make sure the PV generator connectors have the right polarity and do not exceed the maximum string voltage of 60 V (DC). See also chapter 5.2 "PV generator requirements" (Page 15).

**Warning!**

Dangerous high voltages may be present. Danger of death!

2. Taking one DC plug connector at a time, measure the direct current voltage between one DC connection of a string and earth potential.

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

**Attention!**

Do not connect strings to the Sunny Boy SB 1100LV that contain a ground fault until you have fixed the earth fault in the PV generator.

4. Repeat points 2 and 3 for each string.

5. Open the Sunny Boy as described in chapter 7.1 "Opening the Sunny Boy" (Page 33).
6.3 Reverse current

Advice on generator configuration for PV systems using the Sunny Boy SB 1100LV

The Sunny Boy SB 1100LV operates with very high input currents. This does not sound particularly spectacular but it has practical consequences because, in such large generators, certain faults which are totally uncritical in string systems must be allowed for. Short circuits cause wrongly directed module current, which can lead to a PV module being subjected to so-called reverse current, which may be several times more than the normal maximum current (short circuit current) of the PV module.

How does reverse current occur?

In principle, reverse current can only occur when modules are connected in parallel and the open circuit terminal voltage (Voc) of the individual parallel strings is different. In normal operation, this is adequately avoided when the strings are of the same length. Since shadowing of the modules has no significant effect on Voc, even in this situation no significant reverse current occurs.

Under fault-free operation of a correctly laid out PV generator, no excessive reverse current can occur!

Reverse current can only occur due to a fault in the solar generator (e.g. short circuit in one or more modules) that causes the open circuit terminal voltage of a module string to be significantly lower than the open circuit terminal voltage of other parallel strings. In the worst case, the voltage on the faulty string may lie within the MPP voltage (VMPP) of the remaining generator elements. The internal diode structure of the solar cells...
causes reverse current to flow through the faulty generator string that, depending on the amount of current, may lead to excessive heating or destruction of the modules in this string.

Among other symptoms, the following faults may lead to reduction of the open circuit terminal voltage of a generator string and subsequent reverse current in parallel-connected systems:

• Short circuit in one or more modules,
• Short circuit in one or more cells in a module,
• Double ground fault in a module and/or the cabling.

Despite the fact that these faults are very unlikely, and extremely rare in practice, preventative measures must still be taken. After all, these types of faults carry a high potential for damage and danger, since all modules in the affected string may be damaged and the local heating may also cause secondary damage.

Current in the faulty string = Total current of the remaining strings
How to avoid reverse current in the modules?

First, we must know that today’s state-of-the-art bypass diodes for module construction do not affect reverse current in the module, but only reduce the effects of any shading which may occur.

The following standard methods of preventing or reducing reverse current to the modules exist.

1. **String technology**

All components in a string (modules, cable cross-section, plug connectors) must be designed for the remaining generator short-circuit current as reverse current. This is always the case if no more than two strings are connected in parallel, as the resulting reverse current of a (defective) string cannot exceed the value of the short-circuit current of the (intact) string.

2. **String diodes**

String diodes connected in series to the individual strings prevent any form of reverse current in the corresponding string. Disadvantage: The diode is permanently connected in series to the corresponding generator string, which means that the current of the string in question always flows through it, leading to correspondingly high permanent losses. If the diode fails, the protective function may be lost or the entire string may fail.

3. **String fuses**

The string fuses connected in series to the individual strings allow the reverse current in the corresponding string to be limited to a permitted maximum value. The losses at the string fuses are significantly lower than at the string diodes. The failure of a string fuse can be detected by monitoring the fuse or via “intelligent” fault monitoring of the solar generator.

For cost-effective solutions, only the first option is suitable. The PV input terminals are approved for 62 A per connection. The system planner must ensure that this value is not exceeded.
Design instructions
The following must be tested/ensured in particular:
1. Do all strings have the same number of modules connected in series?
2. How high is the maximum reverse current in a defective string at nominal conditions?
   Example: Generator with 4 strings of modules at 5 A short-circuit current.
   The maximum reverse current is $3 \times 5 \text{ A} = 15 \text{ A}$.
3. Are the modules suited for this reverse current?
4. Are the plug connectors of the modules and the inverters suited for this reverse current?
5. Is the string wiring suited for this reverse current?

6.4 Commissioning
You can start up the Sunny Boy SB 1100LV when
• the lid is securely screwed shut,
• the AC (mains) cable is connected correctly,
• the DC cables (PV strings) are fully connected.

How to start up the inverter
1. First of all, switch the line circuit breaker and the DC circuit breaker to the "on" position.

2. Look at the LED display and consult the table on the following page to check whether the Sunny Boy SB 1100LV is in a fault-free and expedient operating mode. Once the inverter is in a fault-free operating status, start-up has successfully completed.

Attention!
If the bottom yellow LED flashes four times at intervals of one second, the grid voltage and the PV generator must be disconnected from the Sunny Boy SB 1100LV immediately! There is a risk of damage to the inverter resulting from excessive DC input voltage.
Check the string voltages again to make sure they are within the limits stated in chapter 5.2 "PV generator requirements" (Page 15). If the string voltages are too high, the PV generator's planner/installer should be called upon for assistance.

If despite checking the string voltages the LED signal occurs again when the PV generator is connected to the Sunny Boy SB 1100LV, disconnect the PV generator from the Sunny Boy again and contact SMA Technologie AG (see chapter 13 "Contact" (Page 59)).

<table>
<thead>
<tr>
<th>Green</th>
<th>Red</th>
<th>Yellow</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illuminates continuously</td>
<td>Is not illuminated</td>
<td>Is not illuminated</td>
<td>OK (working mode)</td>
</tr>
<tr>
<td></td>
<td>Illuminates continuously</td>
<td>Is not illuminated</td>
<td>Fault</td>
</tr>
<tr>
<td></td>
<td>Illuminates continuously</td>
<td>Illuminates continuously</td>
<td>OK (initialization)</td>
</tr>
<tr>
<td>Flashes quickly (3x per second)</td>
<td>Is not illuminated</td>
<td>Is not illuminated</td>
<td>OK (stop)</td>
</tr>
<tr>
<td></td>
<td>Illuminates continuously</td>
<td>Is not illuminated</td>
<td>Fault</td>
</tr>
<tr>
<td>Flashes slowly (1x per second)</td>
<td>Is not illuminated</td>
<td>Is not illuminated</td>
<td>OK (waiting, grid monitoring)</td>
</tr>
<tr>
<td></td>
<td>Illuminates continuously</td>
<td>Is not illuminated</td>
<td>Fault</td>
</tr>
<tr>
<td>Briefly goes out (approx. 1x per second)</td>
<td>Is not illuminated</td>
<td>Is not illuminated</td>
<td>OK (derating)</td>
</tr>
<tr>
<td></td>
<td>Illuminates continuously</td>
<td>Is not illuminated</td>
<td>Fault</td>
</tr>
<tr>
<td>Is not illuminated</td>
<td>Is not illuminated</td>
<td>Is not illuminated</td>
<td>OK (night shutdown)</td>
</tr>
<tr>
<td></td>
<td>Illuminating/flashing</td>
<td>Is not illuminated</td>
<td>Fault</td>
</tr>
<tr>
<td></td>
<td>Illuminating/flashing</td>
<td>Is not illuminated</td>
<td>Fault</td>
</tr>
</tbody>
</table>

For a detailed description of the fault messages and their causes, see the operating instructions.
7 Opening and closing the Sunny Boy

**Attention!**
If you need to open the device for whatever reason, please pay attention to chapter 3 "Safety instructions" (Page 9).

### 7.1 Opening the Sunny Boy

**Attention!**
Follow the sequence below under all circumstances.

1. Switch the line circuit breaker to the "off" position.
2. Switch the DC circuit breaker to the "off" position.
3. Wait 30 minutes!
4. Remove the four screws from the lid and pull the lid forward smoothly. Remove the PE connection from the lid. Loosen the locking on the PE connectors on the lid when you remove them.

### 7.2 Closing the Sunny Boy

**Attention!**
Follow the sequence below under all circumstances.

1. Reconnect the earth wire (PE) to the lid. Now secure the lid to the Sunny Boy SB 1100LV by tightening the four screws evenly.
2. Switch the DC circuit breaker to the "on" position.
3. Switch the line circuit breaker to the "on" position.
4. Now check whether the LED display on the Sunny Boy SB 1100LV indicates that the device is functioning correctly.
# 8 Technical data

## 8.1 PV generator connection data

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. input open circuit voltage</td>
<td>$U_{PV0}$</td>
<td>60 V (based on -10°C cell temperature)</td>
</tr>
<tr>
<td>Input voltage, MPP range</td>
<td>$U_{PV}$</td>
<td>21 V ... 60 V</td>
</tr>
<tr>
<td>Max. input current</td>
<td>$I_{PV \text{ max}}$</td>
<td>62 A</td>
</tr>
<tr>
<td>Max. input power</td>
<td>$P_{DC}$</td>
<td>1240 W</td>
</tr>
<tr>
<td>Recommended total generator power</td>
<td></td>
<td>1380 Wp (for central Europe)</td>
</tr>
<tr>
<td>Connection of the DC input side</td>
<td></td>
<td>DC screw terminal</td>
</tr>
<tr>
<td>Surge voltage protection</td>
<td></td>
<td>Thermally monitored varistors</td>
</tr>
<tr>
<td>Voltage ripple</td>
<td>$U_{ss}$</td>
<td>&lt; 10% of the input voltage</td>
</tr>
<tr>
<td>Insulation protection</td>
<td></td>
<td>Ground fault monitoring ($R_{iso} &gt; 1 , \Omega$)</td>
</tr>
<tr>
<td>Operating consumption</td>
<td></td>
<td>&lt; 4 W (standby)</td>
</tr>
<tr>
<td>Reverse polarity protection</td>
<td></td>
<td>via short circuit diode</td>
</tr>
</tbody>
</table>
8.2 Grid connection data

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal output power</td>
<td>$P_{ACnom}$</td>
<td>1000 W</td>
</tr>
<tr>
<td>Continuous output power (at 45 °C)</td>
<td></td>
<td>1000 W</td>
</tr>
<tr>
<td>Peak output power</td>
<td>$P_{ACmax}$</td>
<td>1100 W</td>
</tr>
<tr>
<td>Nominal output current</td>
<td>$I_{ACnom}$</td>
<td>4.4 A</td>
</tr>
<tr>
<td>Harmonic distortion of output current (at $K_{Ugrid} &lt; 2 %$)</td>
<td>$K_{IAC}$</td>
<td>&lt; 4 %</td>
</tr>
<tr>
<td>Short-circuit strength</td>
<td></td>
<td>Grid-side via current regulation</td>
</tr>
<tr>
<td>Operating range, grid voltage</td>
<td>$U_{AC}$</td>
<td>180 ... 265 V AC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Germany: 198 ... 253 / 260 V AC</td>
</tr>
<tr>
<td>Operating range, grid frequency</td>
<td>$f_{AC}$</td>
<td>45.5 ... 54.5 Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Germany: 47.55 ... 50.2 Hz</td>
</tr>
<tr>
<td>All-pole isolator grid side</td>
<td></td>
<td>Independent disconnection device (&quot;SMA grid guard 2&quot;), double implementation</td>
</tr>
<tr>
<td>Phase shift angle (based on the current's fundamental frequency)</td>
<td>$\cos \phi$</td>
<td>1</td>
</tr>
<tr>
<td>Overvoltage category</td>
<td></td>
<td>III</td>
</tr>
<tr>
<td>Test voltage (DC)</td>
<td></td>
<td>1.6 kV (1 s routine testing / 5 s type testing)</td>
</tr>
<tr>
<td>Test surge voltage</td>
<td></td>
<td>4 kV (serial interface: 6 kV)</td>
</tr>
<tr>
<td>Own consumption in night mode</td>
<td></td>
<td>0.1 W</td>
</tr>
</tbody>
</table>

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. I.e., if the grid voltage remains constant at 254 V, the inverter is automatically disconnected from the grid. In this case, contact the local grid operator for assistance. DIN VDE 0126-1-1 only applies in Germany. See chapter 8.4.3 "Country-specific parameter settings" (Page 42) for the country-specific preset default values of your inverter.
8.3 Device description

For a detailed description of the devices, see the operating instructions.

<table>
<thead>
<tr>
<th>General data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection category per DIN EN 60529</td>
</tr>
<tr>
<td>Dimensions (w x h x d)</td>
</tr>
<tr>
<td>Weight</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data transmission over mains power line</td>
</tr>
<tr>
<td>Data transmission over separate data cable</td>
</tr>
<tr>
<td>Wireless data transmission</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. efficiency ( \eta_{\text{max}} )</td>
</tr>
<tr>
<td>European standard efficiency ( \eta_{\text{euro}} )</td>
</tr>
</tbody>
</table>

The efficiency of the Sunny Boy SB 1100LV depends mainly on the input voltage of the connected PV strings. The lower the input voltage, the higher the efficiency.

![Graph showing efficiency vs. output power](image_url)
8.4 Operating parameters

Warning!

Unauthorized changes to the operating parameters may result in:

- injury or accidents as a result of changing the internal safety routines in the Sunny Boy,
- voiding the Sunny Boy's operating approval certificate,
- voiding the Sunny Boy's guarantee.

Never change the parameters of your Sunny Boy without express authorization and instructions.

8.4.1 Explanation of the operating parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACVtgRPro</td>
<td>Surge voltage protection [only relevant for Germany]. Sunny Boys can feed into the public grid with up to 260 V AC. However, DIN VDE 0126-1-1 stipulates that the average AC voltage over 10 minutes must not exceed 253 V. If the average over 10 minutes exceeds the threshold value of 253 V, the inverter disconnects itself from the grid. Once the average over 10 minutes returns to a value of less than 253 V, the inverter returns to &quot;Working&quot; mode. If surge voltage protection is not required in the relevant grid area (outside Germany), it can be deactivated by means of presetting the LDVtgC parameter. In this event, only the fast cut-off via the Uac-Max parameter intervenes.</td>
</tr>
<tr>
<td>AntiIsland-Ampl</td>
<td>Amplification of the AntiIsland process [deactivated for GER by setting AntiIsland-Ampl = 0]</td>
</tr>
<tr>
<td>AntiIsland-Freq</td>
<td>Repetition rate of the AntiIsland process [deactivated for GER by setting AntiIsland-Ampl = 0]</td>
</tr>
<tr>
<td>Default</td>
<td>Used for setting the country-specific information. GER/VDE0126-1-1: country-specific parameter settings for Germany in accordance with DIN VDE 0126-1-1. SP/RD1663: country-specific parameter settings for Spain. GB/G83: country-specific parameter settings for Great Britain. Other: here, parameter settings can be defined for countries for which no predefined setting exists. Trimmed: if country-specific parameters have been changed, &quot;trimmed&quot; is shown in the display.</td>
</tr>
<tr>
<td>Name</td>
<td>Explanation</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>dFac-Max</td>
<td>Maximum &quot;grid frequency change&quot; before the grid monitoring system disconnects the device from the grid.</td>
</tr>
<tr>
<td>dZac-Max</td>
<td>Maximum &quot;grid impedance change&quot; before the grid monitoring system disconnects the device from the grid.</td>
</tr>
<tr>
<td>E_Total</td>
<td>Total energy yield for the inverter. This change may be necessary when you exchange the Sunny Boy and want to use the data from the old device.</td>
</tr>
<tr>
<td>Fac-delta-</td>
<td>Maximum frequency, above (Fac-delta+) and below (Fac-delta-) the mains frequency, before the mains monitoring system disconnects the device from the mains supply.</td>
</tr>
<tr>
<td>Fac-delta+</td>
<td>Frequency-dependent output limitation</td>
</tr>
<tr>
<td>Fac-Tavg</td>
<td>Averaging time of grid frequency gaging</td>
</tr>
<tr>
<td>h_Total</td>
<td>Total hours of operation for the inverter. This change may be necessary when you exchange the Sunny Boy and want to use the data from the old device.</td>
</tr>
<tr>
<td>I-Ni-Test</td>
<td>Setting the impulse for impedance monitoring. This parameter only functions when the Sunny Boy is deactivated (disconnected on the AC side) or in &quot;Stopp&quot; mode.</td>
</tr>
<tr>
<td>Inst.-Code</td>
<td>Parameters for self contained power system recognition can only be changed after entering the &quot;SMA grid guard&quot; password.</td>
</tr>
<tr>
<td>LDVtgC</td>
<td>Compensation for the voltage drop in the cabling.</td>
</tr>
</tbody>
</table>

With this parameter, the voltage drop between the inverter and the grid connection point is taken into account. The average voltage over 10 minutes at the inverter connection must not exceed the sum of ACVtgRPro plus LDVtgC. The parameter LDVtgC is preset to 0 V for Germany. In grid areas in which the additional surge voltage protection (see parameter ACVtgRPro) is not required, the parameter LDVtgC is preset to 50 V. Thus, the surge voltage protection is deactivated for these grid areas (253 V + 50 V = 303 V) and only the fast cut-off via the Uac-Max parameter intervenes.
## Technical data

<table>
<thead>
<tr>
<th>Name</th>
<th>Explanation</th>
</tr>
</thead>
</table>
| Operating mode   | Operating mode of the Sunny Boy:  
MPP: Maximum Power Point  
UKonst: Constant voltage mode (desired voltage is defined in "Usoll-Konst")  
IKonst: Operating mode for test purposes  
Stopp: Disconnection from mains network, no operation  
Turbine Mode: Operating mode for wind energy systems.  
Off Grid: Operating mode for Sunny Boys in a stand-alone grid. |
| Plimit           | Upper limit for AC output power                                                                                                             |
| SMA-SN           | Serial number of the Sunny Boy                                                                                                             |
| Software-BFR     | Firmware version of the operation control unit (BFR)                                                                                       |
| Software-SRR     | Firmware version of the current control unit (SRR)                                                                                         |
| Storage function | Default parameter: Returns all parameter values to the factory setting.  
Reset Betriebsdaten: Returns all user level parameter values to the factory setting.  
Reset Fehler: Resets a permanent fault. |
| Speicher/Storage | Permanent: Modified parameters are stored in the EEPROM and can be used even when the Sunny Boy has been restarted.  
Volatile: Prevents the parameters from being stored in the EEPROM, the parameters are only stored until the next restart. |
| T-Start           | The period the Sunny Boy waits after the Upv-Start value has been reached.                                                                   |
| T-Stop            | The period the Sunny Boy waits before disconnecting from the mains supply when Pac drops below the set value.                                  |
| Uac-Min           | Lower (Uac-Min) and upper (Uac-Max) limits of the allowable AC voltage (self contained power system recognition), before the grid monitoring system disconnects the device from the grid. |
| Uac-Max           |                                                                                                                                               |
| Uac-Tavg          | Averaging time of grid frequency gaging                                                                                                |
| Upv-Start         | The DC voltage required before the Sunny Boy begins feeding power into the mains supply.                                                    |
| Usoll-Konst       | PV desired voltage for constant operational voltage. These parameters are only important when the "Operating mode" parameter is set to U-konst. |
### 8.4.2 Parameter settings for Germany

Grayed out parameters are only displayed in installer mode. The table below contains the parameters that are applicable in Germany.

<table>
<thead>
<tr>
<th>Name</th>
<th>Unit</th>
<th>Value range</th>
<th>Factory setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACVtgRPro V</td>
<td>V</td>
<td>230 ... 300</td>
<td>253</td>
</tr>
<tr>
<td>AntiIsland-Ampl * grd</td>
<td>0 ... 10</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>AntiIsland-Freq * mHz</td>
<td>0 ... 2000</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Default *</td>
<td></td>
<td>GER/VDE0126-1-1, GB/G83, SP/RD1663, Off_Grid, Other, trimmed</td>
<td></td>
</tr>
<tr>
<td>dFac-Max *</td>
<td>Hz/s</td>
<td>0.1 ... 4.0</td>
<td>0.25</td>
</tr>
<tr>
<td>dZac-Max *</td>
<td>mOhm</td>
<td>0 ... 20000</td>
<td>750</td>
</tr>
<tr>
<td>E_Total kWh</td>
<td></td>
<td>0 ... 200000</td>
<td></td>
</tr>
<tr>
<td>Fac-delta- *</td>
<td>Hz</td>
<td>0.1 ... 4.5</td>
<td>2.45</td>
</tr>
<tr>
<td>Fac-delta+ *</td>
<td>Hz</td>
<td>0.1 ... 4.5</td>
<td>0.19</td>
</tr>
<tr>
<td>h_Total h</td>
<td></td>
<td>0 ... 200000</td>
<td></td>
</tr>
<tr>
<td>I-NiTest * mA</td>
<td></td>
<td>0 ... 7500</td>
<td>6000</td>
</tr>
<tr>
<td>Operating mode MPP, UKonst, Stopp, Turbine Mode, Off Grid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage function Default Parameter, Reset Operating Data, Reset Fault</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speicher/Storage Permanent, volatile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-Start * s</td>
<td></td>
<td>5 ... 300</td>
<td>10</td>
</tr>
<tr>
<td>T-Stop s</td>
<td></td>
<td>1 ... 3600</td>
<td>2</td>
</tr>
<tr>
<td>Uac-Min * V</td>
<td></td>
<td>160 ... 230</td>
<td>198</td>
</tr>
<tr>
<td>Uac-Max * V</td>
<td></td>
<td>230 ... 300</td>
<td>260</td>
</tr>
<tr>
<td>Upv-Start V</td>
<td></td>
<td>20 ... 60</td>
<td>25</td>
</tr>
<tr>
<td>Usoll-Konst V</td>
<td></td>
<td>26 ... 63</td>
<td>63</td>
</tr>
</tbody>
</table>
8.4.3 Country-specific parameter settings

The parameters listed below represent country-specific settings and are only displayed in installer mode. All other parameters are international and can be viewed in the table in chapter 8.4.2.

<table>
<thead>
<tr>
<th>Name</th>
<th>Unit</th>
<th>Germany</th>
<th>Great Britain</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default</td>
<td></td>
<td>GER/VDE0126-1-1</td>
<td>GB/G83</td>
<td>SP/RD1663</td>
</tr>
<tr>
<td>dFac-Max</td>
<td>Hz/s</td>
<td>0.25</td>
<td>0.2</td>
<td>2</td>
</tr>
<tr>
<td>dZac-Max</td>
<td>mOhm</td>
<td>750</td>
<td>350</td>
<td>350</td>
</tr>
<tr>
<td>Fac-delta-</td>
<td>Hz</td>
<td>2.45</td>
<td>0.5</td>
<td>0.98</td>
</tr>
<tr>
<td>Fac-delta+</td>
<td>Hz</td>
<td>0.19</td>
<td>0.5</td>
<td>0.98</td>
</tr>
<tr>
<td>l-Ni-Test</td>
<td>mA</td>
<td>6000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>T-Start</td>
<td>s</td>
<td>10</td>
<td>180</td>
<td>10</td>
</tr>
<tr>
<td>Uac-Min</td>
<td>V</td>
<td>198</td>
<td>209</td>
<td>199</td>
</tr>
<tr>
<td>Uac-Max</td>
<td>V</td>
<td>260</td>
<td>261</td>
<td>250</td>
</tr>
</tbody>
</table>
8.4.4 Non-modifiable parameters

Grayed out parameters are only displayed in installer mode. The following parameters are displayed in the parameter list but cannot be changed:

<table>
<thead>
<tr>
<th>Name</th>
<th>Unit</th>
<th>Factory setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fac-Pderating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fac-Tavg</td>
<td>ms</td>
<td>160</td>
</tr>
<tr>
<td>Plimit</td>
<td>W</td>
<td>1100</td>
</tr>
<tr>
<td>SMA-SN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software-BFR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software-SRR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uac-Tavg</td>
<td>ms</td>
<td>80</td>
</tr>
</tbody>
</table>
9 Certificates

9.1 CE declaration of conformity

CE Declaration of Conformity
for utility interactive inverters

Product: Sunny Boy
Type: SB 700, SB 1100, SB 1100LV, SB 1700, SB 2100TL,
SB 2500, SB 2800i, SB 3000, SB 3300TL, SB 3300TL HC

We declare that the above specified devices are compliant with the regulations of the European Community, in terms of the design and the version fabricated by SMA. This especially applies for the EMC Regulation defined in 89/336/EWG and the LV- regulation defined in 73/23/EWG.

The devices are compliant with the following standards:

EMC:
Emission: DIN EN 61000-6-3: 2002-08
DIN EN 61000-6-4: 2002-08
DIN EN 55022: 2003-09, Class B
Utility Interference: DIN EN 61000-3-3: 2002-05
DIN EN 61000-3-2: 2001-12
Immunity: DIN EN 61000-6-1: 2002-08
DIN EN 61000-6-2: 2002-08
Safety: DIN EN 50178: 1998-04
Semiconductor-Converter: DIN EN 60146-1-1: 1994-03

The above mentioned devices are therefore marked with a CE sign.

Note:
This declaration of conformity becomes invalid in case without explicit written confirmation by SMA, where
- the product is modified, complemented or changed;
- and/or components, other than those belonging to the SMA accessories, are installed in the product;
- as well in case of incorrect connection or improper usage.

Niestetal, 13.03.2006
SMA Technologie AG

i.V. Frank Greizer
(Head of Development Department Solar Technology)

SMA Technologie AG
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www.SMA.de
iV@SMA.de
9.2 SMA grid guard certificate

The Sunny Boy SB 1100LV is equipped with the "SMA grid guard 2" independent disconnection device and it is covered by the industrial trade association "SMA grid guard 2" certificate.
10 Replacing the varistors

The Sunny Boy SB 1100LV is a complex high-technology device. As a result, the possibilities for fixing faults on site are limited to just a few items. Please don’t try to carry out repairs other than those described here. Use the SMA Technologie AG 24-hour exchange service and repair service instead.

If the red LED on the status display glows 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 SB 1100LV from the low voltage grid [switch the line circuit breaker to its “off” position]. Make sure the grid cannot be inadvertently reconnected and that no voltage is present.

2. Switch off the DC circuit breaker.

3. Open the Sunny Boy SB 1100LV as described in chapter 7.1. Taking one DC plug connector at a time, measure the voltages between one DC plug connector of a string and earth potential. Pay attention to the safety instructions!

   Warning!
   Dangerous high voltages may be present. Danger of death!

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

5. Repeat points 3 and 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 generator’s installation engineer should be hired for this job. In this case continue as described under point 10, but without reconnecting the faulty string. Instead of reconnecting the string, protect its DC plug against accidental touch contact (e.g. by fitting the protective caps or using sufficient high-voltage insulating tape).

   If you did not find any ground fault in the PV generator, 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
Replacing the varistors

6. Using a continuity tester, check all the varistors to see if there is a conducting connection between connectors 2 and 3. If there is not, then that varistor is not working. The positions of the varistors in the Sunny Boy SB 1100LV can be seen in the diagram in chapter 4.1 "Unit description" (Page 11).

7. Replace the varistor concerned with a new one as shown in the drawing 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 with your replacement varistors, please contact SMA. 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 SB 1100LV and are not commercially available. They must be ordered directly from SMA Technologie AG (SMA order code: "SB-TV3").

Attention!
If no spare varistors are available on site, the Sunny Boy SB 1100LV can once again feed into the grid. The input is no longer protected against overvoltages! Replacement varistors should be obtained as soon as possible. In systems with a high risk of overvoltages, the Sunny Boy SB 1100LV should not be operated with defective varistors!

8. Connect up the faultless PV generator strings to the inverter.
9. Reconnect the PE connection on the lid and close the Sunny Boy SB 1100LV.
10. Switch on the DC circuit breaker.
11. Switch the line circuit breaker to the "on" position.
12. Now check whether the LED display on the Sunny Boy SB 1100LV 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 hotline to discuss what to do next.
11 Rating for a line circuit breaker

Example for the thermal rating for a line circuit breaker in a photovoltaic electrical power unit operated in parallel with the low-voltage grid.

We assume a PV system with 9 Sunny Boy SB 1100LV inverters, with three inverters per phase.

Required technical information for the inverters used

- Maximum output current = 5 A
- Maximum permissible fuse protection for the inverter = 16 A

The choice of cable together with the way it is routed, ambient temperatures and other underlying conditions limit the maximum fuse protection for the cable.

- In our example we assume that the chosen cable (2.5 mm²) is ideally routed and can take a nominal current of 11 A.

Selecting a line circuit breaker:

- The maximum possible nominal current for the cable used and the maximum possible fuse protection for the inverter now limit the maximum possible nominal current for the line circuit breaker.
- In our example, 10 A is possible.

However, the thermal suitability of the line circuit breaker still needs to be checked.
When selecting line circuit breakers, a number of load factors need to be taken into account. These can be found in the respective data sheets.

Example for the thermal selection of a 10 A line circuit breaker with B sensitivity with no gap between the circuit breakers:

For example, one manufacturer's circuit breaker may be designed for an ambient temperature of 50 °C.

Load factors according to data sheet specifications:

- Reduction through permanent load >1h = 0.9 \(^a\)
- Reduction when 9 circuit breakers are arranged side-by-side without gaps = 0.77 \(^b\)
- Increase in nominal current as a result of ambient temperatures of 40 °C in the circuit breaker panel = 1.07 \(^c\)

Result:
The nominal load current for the line circuit breaker is calculated as:
\[ I_{bn} = 10 \text{ A} \times 0.9 \times 0.77 \times 1.07 = 7.4 \text{ A} \]

---

\(^a\) Permanent loads of longer than 1 hour are possible in photovoltaics.
\(^b\) When only one circuit breaker is used, this factor = 1
\(^c\) Because the circuit breakers are rated for 50 °C
Summary:
The selected line circuit breaker can be used in our example case since the maximum current-carrying capacity for fault-free operation is higher than the maximum output current of the inverter used. It will not trigger under rated operating conditions!

If the calculated current-carrying capacity of the circuit breaker had been lower than the maximum output current from the inverter, the following solution might have been used:

By spacing the circuit breakers at an interval of 8 mm, the reduction factor would be 0.98 instead of 0.77. As a result, the maximum current-carrying capacity would be 9.4 A.

In addition to the thermal rating of the circuit breakers, the boundary conditions as laid out in section "Rating for a line circuit breaker in a photovoltaic electrical power unit operated in parallel with the low-voltage grid" (Page 16) and the applicable DIN VDE standards also need to be taken into account, of course. The main ones that apply here are:

- DIN VDE 0100; part 410
- DIN VDE 0100; part 430
- DIN VDE 0298; part 4

In special applications the relevant standards must be followed.
Rating for a line circuit breaker

SMA Technologie AG
12 The communications interface

Attention!
Installation or replacement of the communications interface is only to be carried out by a trained electrician.

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

The detailed wiring diagram for the individual communications interfaces can be found in the communication device manual. This wiring diagram includes:

- Specifications of the necessary cable type
- Which of the inverter’s connections are used
- Whether jumpers need to be mounted, and if so, which jumpers
- Whether the PE needs to be connected to the cable shield

The next pages will describe the following:

- The enclosure feed-throughs for the communications interface
- The permitted cable route in the Sunny Boy
- The location of the PE connector
- The location of the screw terminals for connection of communication wires
- The location of the jumper slots
- The location of the interface port
12.1 Connection of the interface

Attention!

When opening the Sunny Boy, follow all the safety instructions as described in section 3.

Electrostatic discharges are an acute danger to the Sunny Boy and to the communications interface. Ground yourself by touching PE before removing the communications interface from the packaging, and before touching any components within the Sunny Boy.

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

1. Open the inverter as described in section 7.1.
2. Guide the PG screw fitting over the communication cable.
3. Thread the cable through the cable feed-throughs (A) on the Sunny Boy.
4. Screw the PG screw fitting onto the Sunny Boy.
5. Sheathe the cable inside the Sunny Boy using the silicon tube provided. The silicon tube is imperative for safety reasons. The interface may not be commissioned without this silicon tube (with the exception of the Sunny Beam Piggy-Back).
6. Lay the cable in area (B) as shown in the figure to the right.
7. Ground the cable shield at the PE connector (C) if the terminal connection diagram of the communication device indicates this as necessary.
8. Connect the communication wires to the screw terminal strip (D) as described in the terminal connection diagram of the communication device. Note down the connector color coding for the respective pin numbers. Connecting the receiver incorrectly can cause the devices to be damaged.
   - Pin 2 color: _________________
   - Pin 3 color: _________________
   - Pin 5 color: _________________
   - Pin 7 color: _________________
9. Connect the jumpers [E] if the terminal connection diagram of the communication device indicates this as necessary. The table shown to the right provides an overview of the jumper functions.
10. Plug the communications interface into the board (F).
11. Close the Sunny Boy as described in chapter 7.2.
12.1.1 Jumper functions

<table>
<thead>
<tr>
<th></th>
<th>Jumper A</th>
<th>Jumper B</th>
<th>Jumper C</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS232</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>RS485</td>
<td>Termination</td>
<td>Bias 1</td>
<td>Bias 2</td>
</tr>
<tr>
<td>NLM</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sunny Beam</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

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

If you have any questions or technical problems concerning the Sunny Boy SB 1100LV, please contact our hotline. Have the following information available when you contact SMA:

- 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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- 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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