Sunny Mini Central
SMC 5000A / 6000A
Inverter for three-phase grid feeding PV plants

Table of Contents

1 Notes on this manual

1.1 Validity

These installation instructions cover correct installation and commissioning of type Sunny Mini Central SMC 5000A and SMC 6000A SMA inverters.

1.2 Target group

Only trained electricians approved by the responsible power supply company may install and commission the inverters. The instructions are based on the assumption that you, the installer, are familiar with electrical installations and know the corresponding rules and regulations.

1.3 Explanation of the symbols used:

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.

This symbol indicates a fact that is important for optimum operation of the product. Read these sections carefully to ensure optimum operation of your product.

This symbol identifies an example.

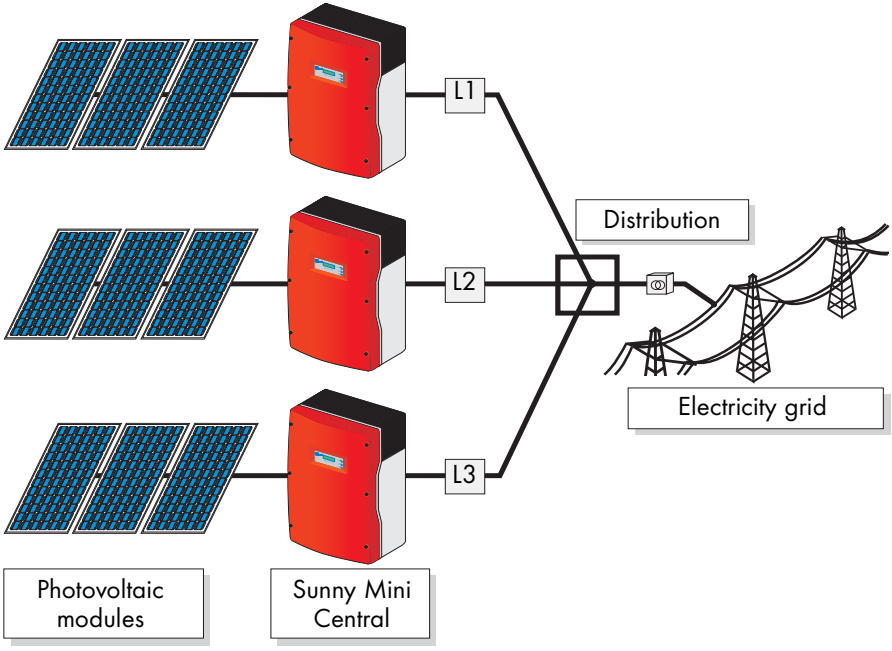
2 The Sunny Mini Central

2.1 Appropriate usage

The Sunny Mini Central is a photovoltaic inverter and serves to feed solar energy from solar modules converted using photovoltaics into a low voltage grid with a rated voltage of 220 to 240 V and 50 Hz or 60 Hz.

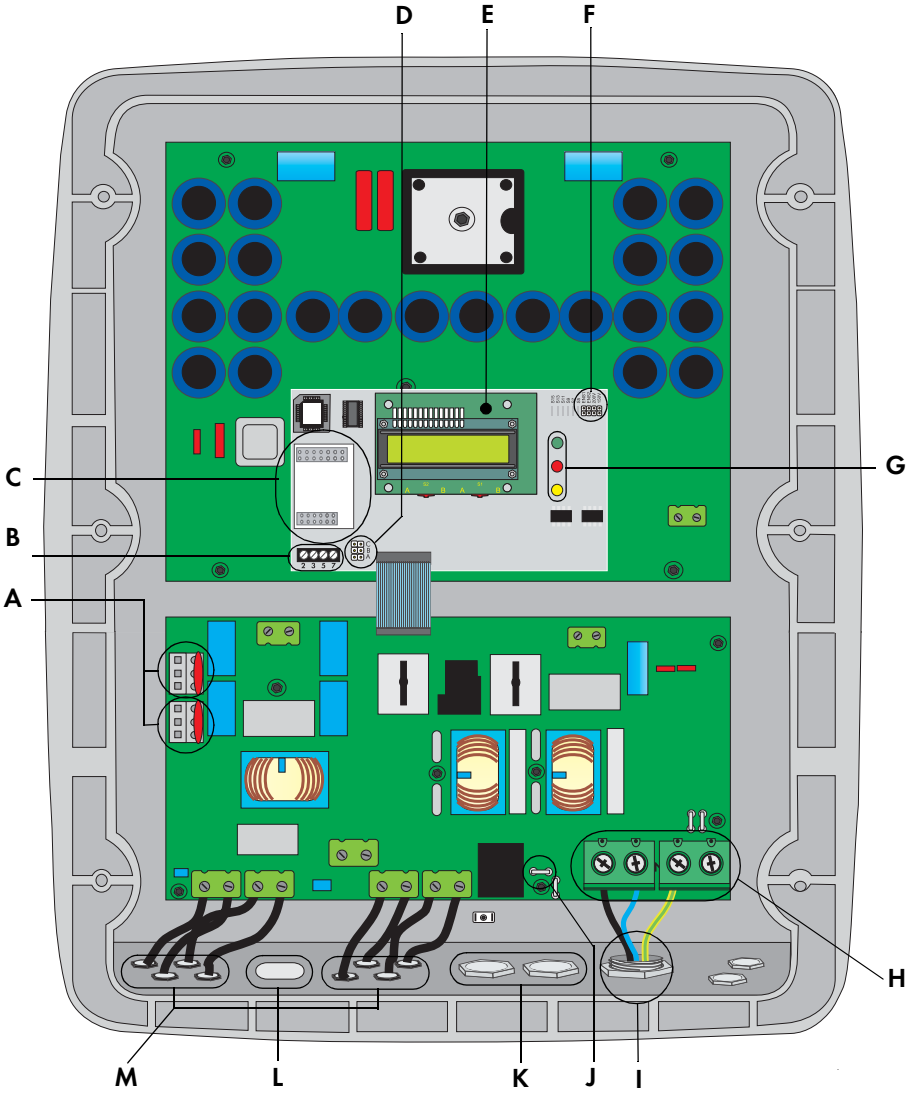
Do not use the Sunny Mini Central for purposes other than those described here. Alternative uses, modifications to the inverter as well as installing components not recommended or sold by SMA void the warranty and operating permission.

Principle of a solar system with a Sunny Mini Central SMC 5000A or SMC 6000A



2.2 Overview of the device

The following diagram gives a schematic overview of the various components and connection points inside the SunnySunny Mini Central Mini Central SMC 5000A and SMC 6000A with the cover removed:



A Varistors (page 70)

B Connection terminals for communication (page 51)

C Socket for communications Piggy-Back (RS232, RS485, Radio) (page 51)

D Jumper for communication (page 51)

E Sunny Display (page 56)

F Jumper for fan testing (page 75)

G Operating status LEDs (page 59)

H Connection terminals for mains cable (AC) (page 39)

I Cable duct for mains cable (AC) (page 39)

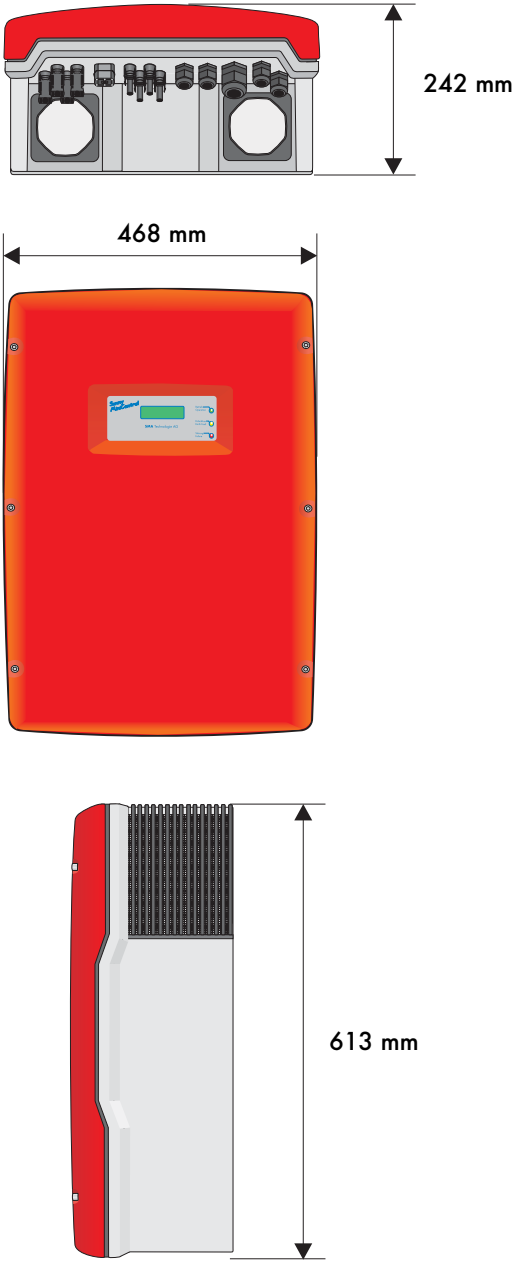
J Flat connection for grounding the cable shield for RS232 and RS485 communications (page 51)

K Cable feed-throughs for communication (page 51)

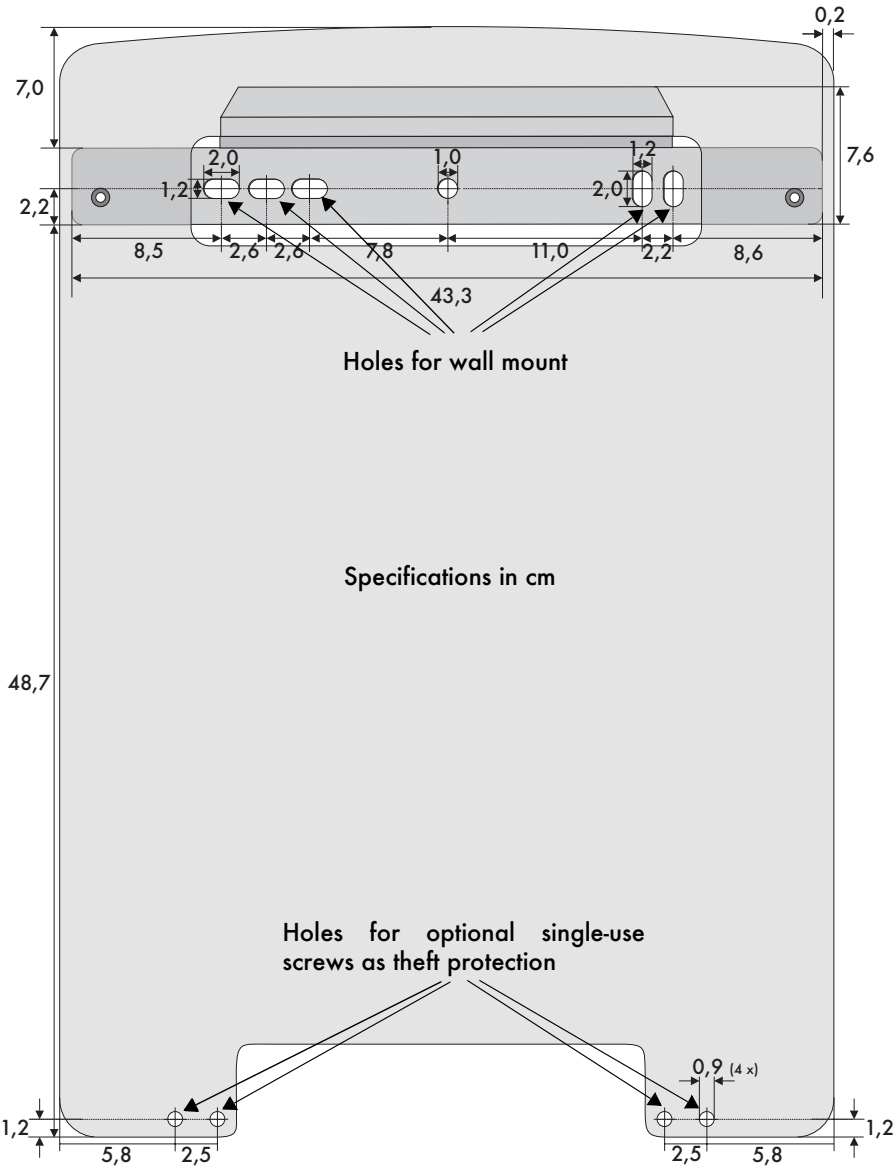
L Connection plug for ESS (page 17)

M PV input plugs (DC) (page 32)

2.3 Dimensions



Wall mounting bracket and rear panel

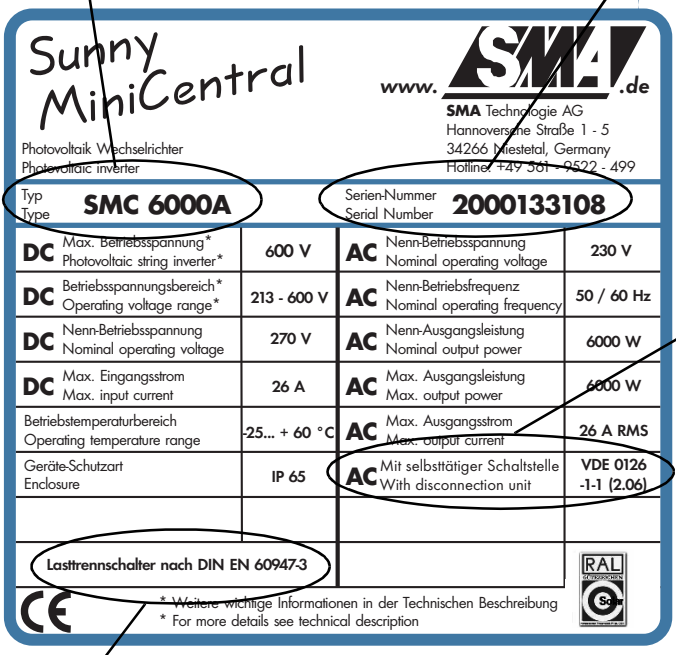


2.4 Identification

Type plate

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

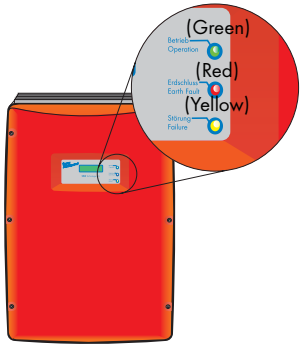
The following is an example of a Sunny Mini Central SMC 6000A type plate.



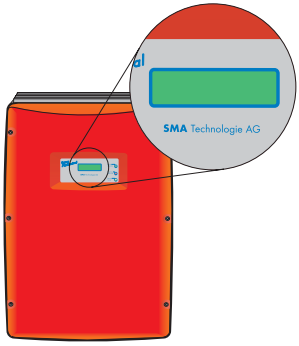
2.5 Special features:

2.5.1 LEDs

The Sunny Mini Central is fitted with an operating status indicator, the three LEDs on the cover at the front, as standard. The are green, yellow and red and can indicate the operating status of the Sunny Mini Central via various blink codes. A detailed explanation of the different blink codes can be found in the operating manual of the Sunny Mini Central.



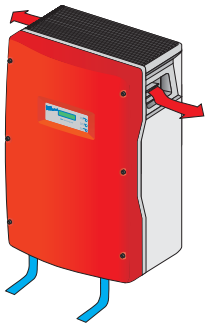
2.5.2 Sunny Display



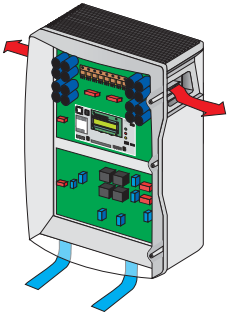
The Sunny Mini Central is equipped with a display in the lid of the case as standard. The illumination of the Sunny Display is activated by tapping on the lid of the case. Tapping again switches the Sunny Display to the next message. The display continues after 5 seconds if it is not tapped. It shows a series of messages one after the other, which describe the yield values and the operating status. A detailed explanation of the different messages can be found in the operating manual of the Sunny Mini Central. After two minutes, the illumination of the Sunny Display switches itself off automatically. The Sunny Display can be set to the languages German, English, French and Spanish (see chapter 7.1.1 „Setting the language of the Sunny Display" (Page 58)).

2.5.3 OptiCool

The Sunny Mini Central comes equipped with the patented OptiCool dual-chamber cooling system. At the same time, the inverter's enclosure is integrated into the temperature management and now serves not only to incorporate and protect the internal components but also as a cool air and heat distributor.

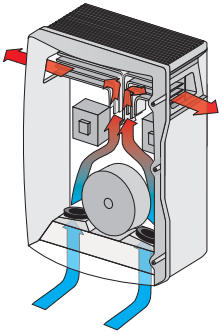


As the central component of passive heat abstraction, the heat sink is integrated into the enclosure, thus dividing it into two chambers.



The front chamber containing the electronic components is especially sealed and thus protected against infiltration by water, dust or dirt. In addition, the heat sink, functioning as a partition wall, provides enough space for the installation of the heat-producing components.

The rear housing chamber contains the components which develop high amounts of heat, depending on their function, such as chokes, which are especially enclosed and are, thus, unsusceptible to external influences.

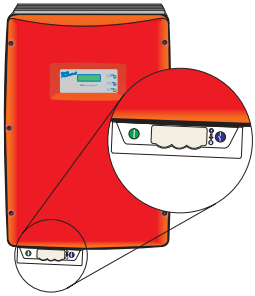


Two active cooling units are affixed to the underside of the second chamber which have been specially designed for this purpose. According to the temperature of the power conductor and the inductive components, they switch themselves on automatically and vary the speed as necessary for an even heat balance within the device.

The air current provided by the fan is particularly well channeled via a current tunnel and expels the waste heat both from the heat sink and the other components in this area.

OptiCool makes for low component temperatures throughout the inverter. This leads to high levels of reliability and excellent performance behaviour even with high ambient temperatures which both impact considerably on the economic viability of the inverter and, therefore, the PV system as a whole.

2.5.4 Electronic Solar Switch (ESS)



The Sunny Mini Central can be equipped with the "ESS" integrated electronic DC circuit breaker, which fulfills all requirements for the installation standard for photovoltaic systems (VDE 0100-7-712) valid from June 2006. To access the DC input plugs in order to disconnect the PV generator from the inverter, you only need to pull on a grip handle on the base of the inverter, which immediately interrupts the current flow on the DC side. At the same time, this activates an electronic switch inside the device. This switch reliably prevents the arcing that usually occurs when separating the inverter from the PV generator. But the inverter is **not** de-energized yet! In order isolate the PV generator completely, the DC input plugs have also to be removed. When closed, the ESS does **not** cause line losses. You can find further information on the ESS in the enclosed instruction manual of the ESS, if the Sunny Mini Central is equipped with one. The ESS is only available ex works and cannot be retrofitted.

3 Safety instructions

3.1 Handling of the Sunny Mini Central

The Sunny Mini Central has a weight of approx. 63 kg. Min. two people must carry the unit or a suitable transport trolley must be used. Steel-capped shoes must be worn.

Follow the instructions in the pictograms, signs and labels on the inverter and ensure that they are legible at all times.

Do not install the Sunny Mini Central

- **on inflammable materials,**
- **in areas where there are easily inflammable substances,**
- **in potentially explosive areas!**

Check the system design using the "Sunny Design" design program (www.SMA.de) or by calling the Sunny Boy Hotline before installing the Sunny Mini Central. Overvoltages may lead to the destruction of the Sunny Mini Central.

Open and close the Sunny Mini Central as described in Chapter 9 „Opening and closing of the Sunny Mini Central" (Page 63) only and follow the safety instructions there.

Work on the Sunny Mini Central with the cover removed must be carried out by a qualified electrician! High contact voltages are present in the device. Before working on the Sunny Mini Central with the cover removed, the AC and DC voltages must be disconnected from the Sunny Mini Central and the capacitors must be discharged (wait for 20 minutes after isolating the AC and DC voltage).

When working on the Sunny Mini Central 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.

The temperature of individual parts of the case and of components inside the Sunny Mini Central can reach over 60°C. Touching could result in burns!

Avoid contact with the PV modules when they are running, as a minimal displacement current could flow and cause a secondary accident due to shock. Therefore, maintenance work may only be performed on the solar generator when it is disconnected. This can be done by activating the Electronic Solar Switch (ESS) for example. Disconnecting the inverter from the mains grid is not sufficient.

General safety rules for working on photovoltaic systems:

1. **Disconnecting the device**

   Before you start to work on the unit, disconnect all wires which could carry voltage to the area you are working on!

2. **Ensure that the device cannot be reconnected.**

   Prevent the device being reconnected by marking it, blocking or locking it!

3. **Ensure that the unit is voltage free.**

   Use a voltage tester to ensure that the unit is voltage free. Ensure that all poles of the unit are free of voltage.

3.2 Responsibility of the installer

Each person carrying out work on electrical devices is responsible for the safety of the persons involved and for the safety of the devices.

Be sure to always observe the standards and regulations applicable at the installation site.

This installation guide, the operating instructions and the operating instructions of installed components must be kept in the immediate vicinity of the inverter, and must be available to installation, operating, maintenance and cleaning staff at all times.

The inverter may only be used when it is technically perfect and safe to operate. All safety features must be accessible at any time and their correct operation must be tested regularly.

Read this installation guide carefully and be sure to observe all prescribed safety regulations when installing and commissioning the system, as well as the technical connection requirements of the local energy supplier and all applicable national provisions of the country in which the system is installed.

The information regarding operational safety refers to the regulations of the European Union valid at the time the inverter is produced. The installer is obliged to make sure that the mentioned safety measures comply with the regulations valid at the time and to observe new regulations when installing the inverter. Outside the European Union, the laws on occupational safety applicable in the deployment location of the device and the respective national requirements must be adhered to.

In addition to the work safety measures in this installation guide, the general safety and accident prevention regulations which apply where the inverter is installed and the valid environmental protection regulations must be observed and followed.

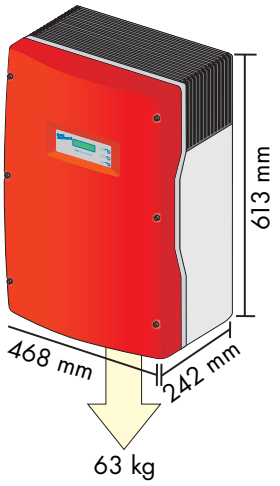
Follow all instructions in this installation guide completely and without restrictions.

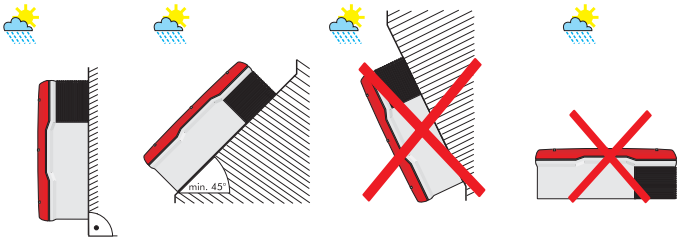
4 Mounting the unit

4.1 Required tools and materials

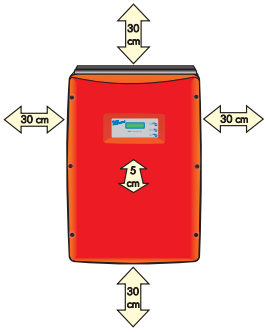
Number	Tools/Material	Purpose
1	Drill	Drilling the holes for the wall bracket
2 - 4	Dowels with a diameter of 10 mm (for attaching to a concrete or stone wall, for example)	Insert in the holes in the wall for the wall mount
2 - 4	8 mm x 60 mm hexagon bolts to DIN 571 standard, stainless steel type (for attaching to a concrete or stone wall, for example)	Attaching the wall bracket to the wall
1	Appropriate wrench	Attaching the wall bracket to the wall
1	Allen key (5 mm)	Attaching the Sunny Mini Central to the wall bracket
1	Steel bar with max. diameter of 30 mm	Poss. for carrying the Sunny Mini Central (slide through the rear housing opening)
Optional for anti-theft protection:		
2 - 4	Dowels with a diameter of 10 mm (for attachment to a concrete or stone wall, for example)	Insert in the holes in the wall for the anti-theft screws (if desired)
2 - 4	Corresponding single-use screw systems (8 mm)	Anti-theft protection of the Sunny Mini Central (if desired)
1	suitable screwdriver	Secure the single-use screws to the anti-theft protection (if desired)

4.2 Selecting an installation site

No.	Checkpoint	Control
Location		
1	The installation location and attachment type is suitable for the weight of approx. 63 kg and the dimensions of 468 mm x 613 mm x 242 mm (width x height x depth) of the Sunny Mini Central. 	
2	The Sunny Mini Central is accessible at any time (e.g. not mounted on roofs that are difficult to access).	
3	The Sunny Mini Central can be removed from the installation location easily (by two people), in spite of its weight of 63 kg.	
4	**The Sunny Mini Central is not mounted** • **on inflammable materials,** • **in areas where there are easily inflammable substances,** • **in potentially explosive areas.**	
5	The Sunny Mini Central is not exposed to direct sunlight, in order to avoid yield losses of the PV system.	
6	The ambient temperature is always between -25 °C and +60°C.	

No.	Checkpoint	Control
7	**The Sunny Mini Central is installed in such a way that it is not possible (e. g. for children) to unintentionally unplug the DC plug connectors.** **Unintentionally pulling out the DC plug connector under load can damage the plug and result in bodily injury or death!**	
Position		
8	The Sunny Mini Central is mounted vertically on a wall, or if it is absolutely necessary, tilted back to an angle of max. 45°. 	
9	The Sunny Mini Central is installed so that it is not slanting forward.	
10	The Sunny Mini Central is not installed horizontally.	
11	The Sunny Mini Central should ideally be installed at eye level to allow operating conditions to be read at all times.	
Foundation		
12	The Sunny Mini Central is mounted on a solid surface.	
13	 In domestic installations, the Sunny Mini Central should not be mounted on plasterboard walls or similar as otherwise audible vibrations are likely to result. The Sunny Mini Central makes noises when in use which can, in the domestic setting, be seen as a nuisance.	

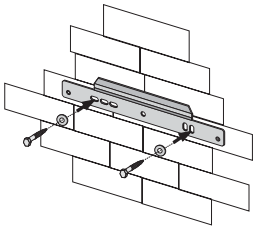
<table>
<tr><th>No.</th><th>Checkpoint</th><th>Control</th></tr>
<tr><td colspan="3">Safety clearances</td></tr>
<tr><td>14</td><td>The following minimum clearances to walls, other devices or objects must be observed to guarantee sufficient heat dissipation.

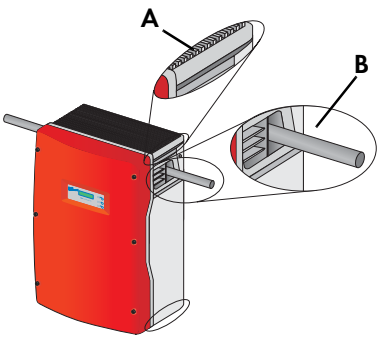
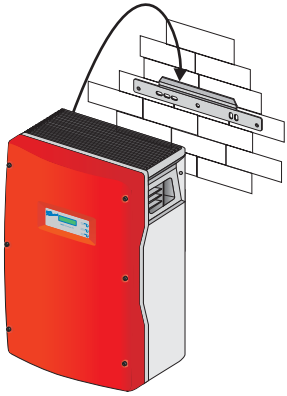
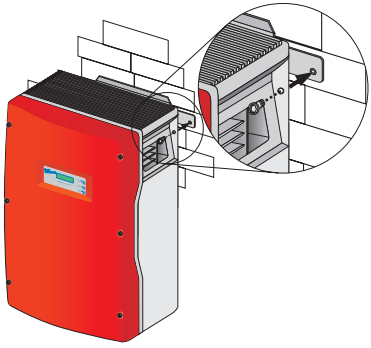
<table>
<tr><th>Direction</th><th>Minimum clearance</th></tr>
<tr><td>sides</td><td>30 cm</td></tr>
<tr><td>top</td><td>30 cm</td></tr>
<tr><td>underside</td><td>30 cm</td></tr>
<tr><td>front</td><td>5 cm</td></tr>
</table>

</td><td></td></tr>
<tr><td>15</td><td>If serveral Sunny Mini Central units are installed in areas where high ambient temperatures are to be expected, the individual Sunny Mini Central units must be far enough apart to ensure that the individual Sunny Mini Central units do not intake the cooling air of the neighbouring unit.
If necessary, increase the clearances and ensure that the device is sufficiently ventilated.</td><td></td></tr>
<tr><td>16</td><td> 
The Sunny Mini Central must be mounted in a manner that the inverter cannot be touched accidentally!
The temperature of individual parts of the case and of components inside the Sunny Mini Central can reach over 60°C. Touching could result in burns!</td><td></td></tr>
</table>

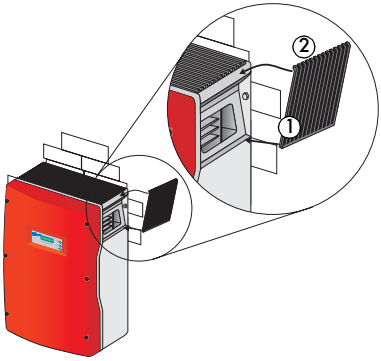
4.3 Mounting the Sunny Mini Central

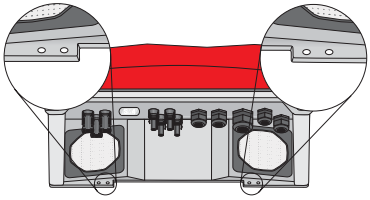
Only use the original wall bracket for installation.

When mounting the device, be sure to take into account the weight of the Sunny Mini Central of 63 kg.

Step	Instructions	
Installing the wall mount		
1	For mounting the wall bracket, use two to four of the six holes in the middle.	
2	Mark the positions of the drill holes by using the wall bracket as a drilling template (see page 13 for a sample)	
3	Drill the holes, insert the dowels and secure the wall bracket with screws using corresponding washers.	
	Recommended bolts:	8 mm x 60 mm hexagon bolts to DIN 571 standard, stainless steel type
	Recommended dowels:	SX10

Step	Instructions
Mounting the Sunny Mini Central	
4	When transporting and installing the Sunny Mini Central, use the ergonomic handles at the top and bottom at the sides of the Sunny Mini Central (A), or the housing opening, by inserting a steel bar (B), for example, (diameter max. 30 mm). 
4	Hook the Sunny Mini Central using the mounting holes on the rear face into the wall bracket. 
5	Fix the Sunny Mini Central to the wall bracket using the two enclosed M6 x 8 mm bolts an both sides of the Sunny Mini Central. Fasten the bolts so that they are hand-tight. 
6	Make sure the Sunny Mini Central is positioned securely on the bracket.

Step	Instructions
7	Close the recessed handles with the handle covers provided in the accessories kit. They are required to adequately prevent insects entering the unit. Should the handle covers break, new ones can be ordered from SMA (page 103). 

Step	Instructions
Optional anti-theft protection	
8	To protect the Sunny Mini Central against theft, the rear face can be secured to the wall at the bottom using 2 so-called single-use bolts. The other two holes are spare, in case you take down the Sunny Mini Central and then mount it again, and the screw stumps from the first single-use bolts still stick out of the wall.  The exact position of the holes can be seen in the illustration of the rear panel in chapter 2.3 „Dimensions" (Page 12).
The inverter can then only be taken down by cutting the single-use bolts with an angle grinder!	

5 Electrical Connection

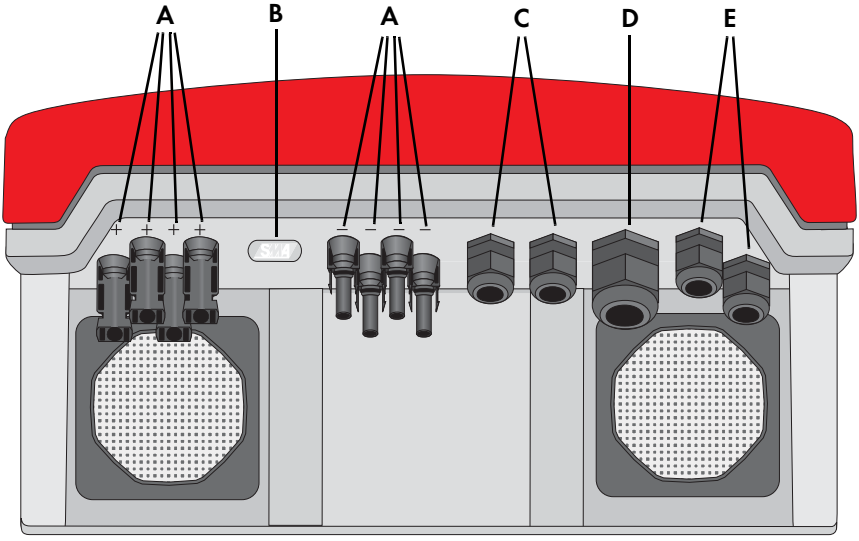
5.1 Required tools and materials

Number	Tools/Material	Purpose
2-8	DC plug connector	for the connecting cables of the solar modules for connection to the Sunny Mini Central
1	Multimeter with DC input voltage range up to at least 600 V	Check the connecting wires of the solar modules for correct polarity and ensure that the maximum input voltage of the Sunny Mini Central is not exceeded
1	Cable with external diameter between 11 and 25 mm	AC connecting cable
1	Stripping pliers	Stripping the AC cable
1	Flathead screwdriver 1 x 6 mm or Phillips screwdriver PZ2 Pozidrive	Using the screw clamps for the AC connection
1	Allen key (5mm)	Opening and closing the housing cover
1	Line circuit breakers (See page 47 for layout)	Power circuit fuse

5.2 Connection procedure

When connecting the unit to the power supply, follow the sequence described here only!

The following illustration shows the assignment of the individual housing ducts on the base of the Sunny Mini Central.



A Plug connectors for connecting the PV strings

B Optional plug connector for connecting the ESS (Electronic Solar Switch)

C Cable feed-throughs for optional communication via RS232, RS485 or radio (PG16)

D Cable feed-through for grid connection (AC) (11 mm - 25 mm)

E Not used

5.3 Connection of the DC input

5.3.1 Prerequisites:

For connecting the DC input, the following conditions must be satisfied:

1. The connected strings must consist of modules of the same type and number and should have an identical orientation and tilt.
2. The connecting wires of the solar modules must be equipped with plug connectors to allow the eight DC plug connectors of the Sunny Mini Central to be connected to it.

   A pre-assembled set for connecting the free cable ends from a string is available as an optional accessory from SMA:

Connection set	**Order code**	**Max. current per connector**
Multi-contact 3mm	SWR-MC	21.0 A
Multi-contact 4 mm	MC-SET	30.0 A
Tyco	TYCO-SET	30.0 A

3. Make sure that the following limit values at the DC input of the Sunny Mini Central are not exceeded:

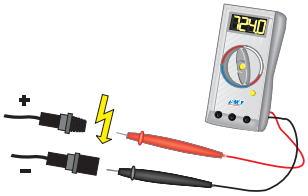
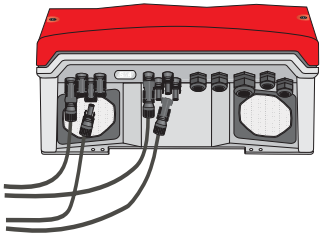
Device	**maximum input voltage**	**maximum input current**
SMC 5000A	600 V (DC)	26.0 A (DC)
SMC 6000A	600 V (DC)	26.0 A (DC)

4. Check the system desing and the string size using the design program "Sunny Design" which is available to download free at www.SMA.de.

5.3.2 Connection of the PV strings

The inverter has to be disconnected from the grid, before connecting the PV strings.

To connect up the PV strings, follow these steps:

Step	Instructions
1	Make sure the connecting cables of the solar modules have the right polarity and do not exceed the maximum input voltage of the Sunny Mini Central (see section5.3.1 „Prerequisites:" (Page 32)). 
	Warning! Dangerously high voltages may be present. Danger of death! Make sure that you only use measuring devices with a DC input voltage range up to at least 600 V!
2	Taking one DC plug connector at a time, measure the direct current voltage between one DC plug connector of a string and earth potential. If the measured voltages are constant and their total is roughly the same as the open circuit voltage of the string, then there is a ground fault in this string. Its approximate location can be deduced from the relationships between the voltages.
3	**Attention! Do not connect strings to the Sunny Mini Central that contain a ground fault until you have fixed the ground fault in these strings!**
4	Repeat step 2 for each string.
5	Connect up the faultless PV generator strings as indicated on the right. 
6	Close the unused DC input sockets with the caps included in the delivery.

5.3.3 Reverse Current

Advice on generator configuration for PV systems using the Sunny Mini Central

In contrast to the "Sunny Boy" string inverters, in the PV generator of a system using the "Sunny Mini Central", three and more strings are usually connected in parallel. 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 can cause wrongly directed module current, leading to a solar module being subjected to so-called reverse current, which may be several times more than the normal maximum current (short circuit current) of the solar 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 (open circuit voltage UPV 0) 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 UPV 0, 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!

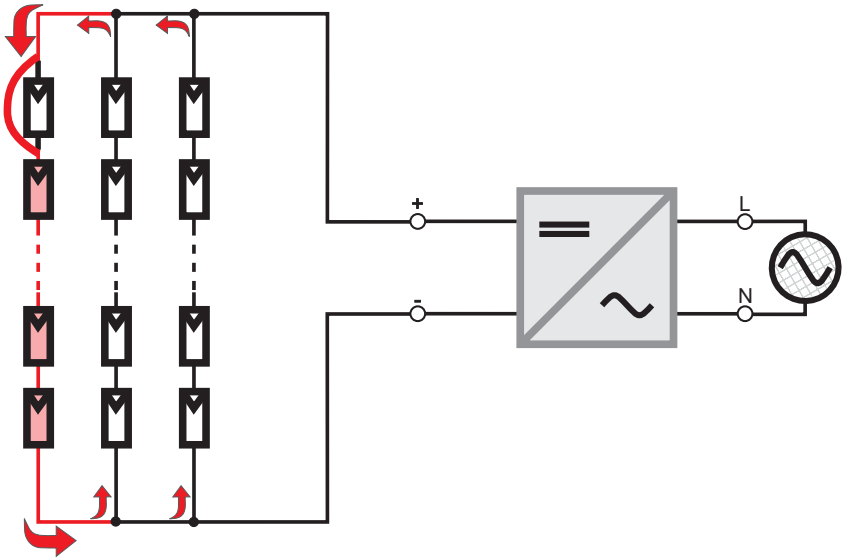
Reverse current can only occur due to a fault in the solar generator (e.g. short circuit in one or more modules) that causes the open circuit terminal voltage of a module string to be significantly lower than the open circuit terminal voltage of other parallel strings. In the worst case, the voltage on the faulty string may lie within the MPP voltage (UMPP) 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.

Reverse current into the faulty string =
Total current of the remaining strings



How can reverse current in the modules be prevented?

First we must explain that bypass diodes which are the current state-of-the-art in module construction do not influence the reverse current in the module, but only reduce the effect of any shadowing which may occur.

In order to prevent or to limit the reverse current into the modules, the following standard methods can be applied:

1. String technology

All components in a string (modules, wire diameter, plug connectors) must be designed as reverse current for the remaining generator short-circuit current. In case of parallel connection of max. two strings, this is always the case, since the resulting reverse current of a (defect) string can reach no higher value than the value of the short circuit current of the (intact) string.

2. String diodes

The so-called string diodes connected in series with the individual strings prevent any reverse current in the corresponding string. Disadvantage: The diode is always connected in series to the corresponding generator string, the string current flows through it and leads to correspondingly high continuous losses. Moreover, the failure of the diode may cause the loss of the safety function or lead to the failure of the entire string.

3. String fuses

String fuses connected in series to the individual strings can limit the reverse current in the corresponding string to the permitted maximum. The losses at the string fuses are considerably lower than in string diodes. Failure of a string fuse can be detected by monitoring the fuse or by intelligent fault monitoring of the solar generator.

Only the first option is viable for low-cost systems.

Design notes

The following must be checked or ensured above all:

Step	Verification
1	Do all the strings have the same number of series-connected modules?
2	How high is the maximum reverse current in a defective string at nominal conditions? Example: generator with 4 strings of modules with 5 A short circuit current The maximum reverse current is 3 x 5 A = 15 A.
3	Are the modules suitable for such a reverse current?
4	If not: Have appropriate measures been taken in order to avoid these currents (e.g. string fuse in each string)?
5	Are the plug connectors of the modules and the inverter suitable for such a reverse current?
6	Is the string wiring suitable for such a reverse current?

5.4 Connecting the AC output

5.4.1 Prerequisites:

For connecting the AC output, the following conditions must be satisfied:

1. Connection requirements

When connecting the inverter to the public grid, follow the connection requirements of the local grid operator.

The Sunny Mini Central is designed for operation on 220 V - 240 V grids. Additionally, it is equipped with an automatic grid frequency identifier and can thus be connected to a 50 or 60 Hz system without further parameterization.

The following limit values for the AC output apply:

	Limit values for AC output
Voltage range (default setting per DIN VDE 0126-1-1)	198 V ... 253 / 260 V[a]
Voltage range (adjustable operating range)	180 V ... 265 V
Frequency range (default setting per DIN VDE 0126-1-1)	47.5 Hz ... 50.2 Hz
Frequency range (adjustable operating range)	50 Hz 45.5 Hz ... 54.5 Hz 60 Hz: 55.5 Hz ... 64.5 Hz

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

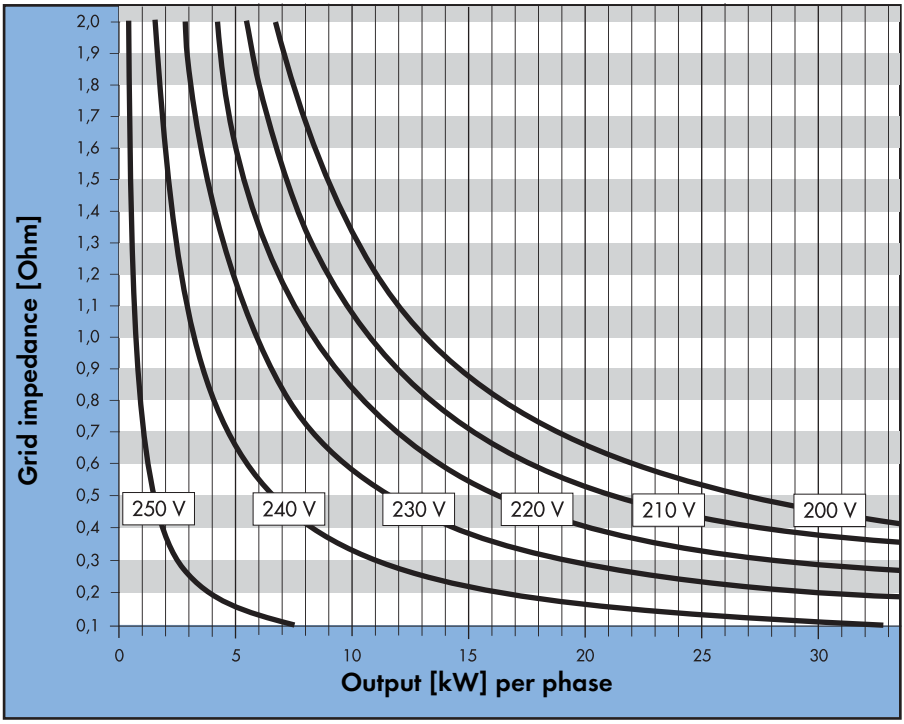
DIN VDE 0126-1-1 only applies in Germany. See section 13.4.3 „Country-specific parameter settings" (Page 94) for all other preset country values of your inverter.

2. Grid impedance

Due to a high grid impedance, a high line resistance and / or a high voltage at the feed-in point, a high AC voltage may result at the connection point of the Sunny Mini Central . In Germany, the 10-minute average of the output voltage (Uac) of the Sunny Mini Central is limited to 253 V according to DIN VDE 0126-1-1. If the Sunny Mini Central records that the 10-minute average exceeds this voltage limit, or if the 260 V limit is exceeded, it switches off immediately and displays a grid error message. If surge voltage protection is not required in the relevant grid area

(outside Germany), it is deactivated by means of presetting the LdVtgC parameter (see chapter 13.4 „Sunny Mini Central operating parameters" (Page 87). In this case, only the disconnection parameter Uac-Max applies.

The following diagram shows the power output the inverter can feed into the grid per phase without leading to a switch-off because of a too high AC voltage.



The following variables are needed to get en estimate of it.

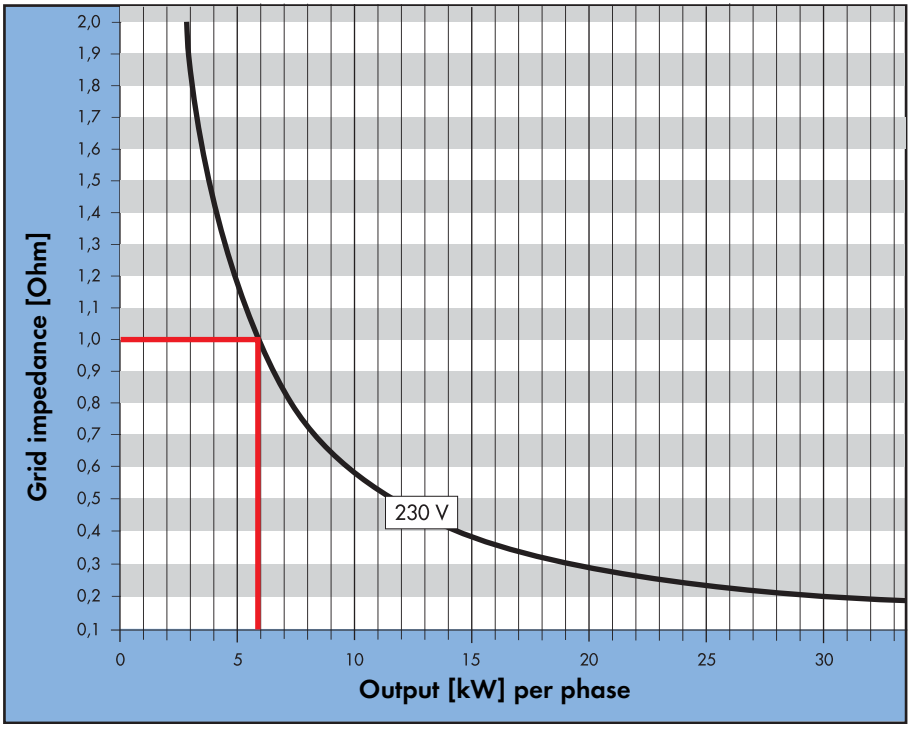
- Grid voltage without mains feeding
- Grid impedance at the terminal of the Sunny Mini Central

The diagram shows the respective curves for a grid voltage without mains supply. A maximum possible feed-in power per phase (X axis) is obtained for the respective curves depending on the grid impedance (Y axis).

The maximal feeding power per phase is approximately twice as high with a three phase connection and with a symmetric feeding power.

Example:

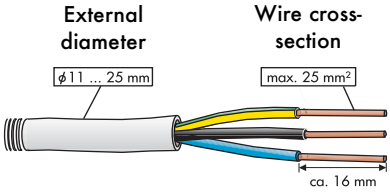
- The grid voltage without mains supply is 230 V.
- The grid impedance at the terminal is 1.0 Ohms.



The power read on the X axis is approx. 5.8 kW per phase.

Consequently, only one Sunny Mini Central may be installed per phase in this example. A higher output per phase, without causing a switch-off because of AC overvoltage, requires better connection conditions for the Sunny Mini Central (e.g. a cable with a larger cross-section).

3. Cable connection



The connection terminals in the Sunny Mini Central are suitable for wire cross-sections of up to 25 mm².

The external diameter of the cable must therefore be between 11mm and 25mm. If you use a cable with a cross-section smaller than 14mm (11mm minimum), the rubber bushing in the screw fitting must be replaced by the one included with the inverter at delivery.

Strip approx. 16 mm of the insulation from the conductors of the cable. The connection is made with three wires (L, N, PE).

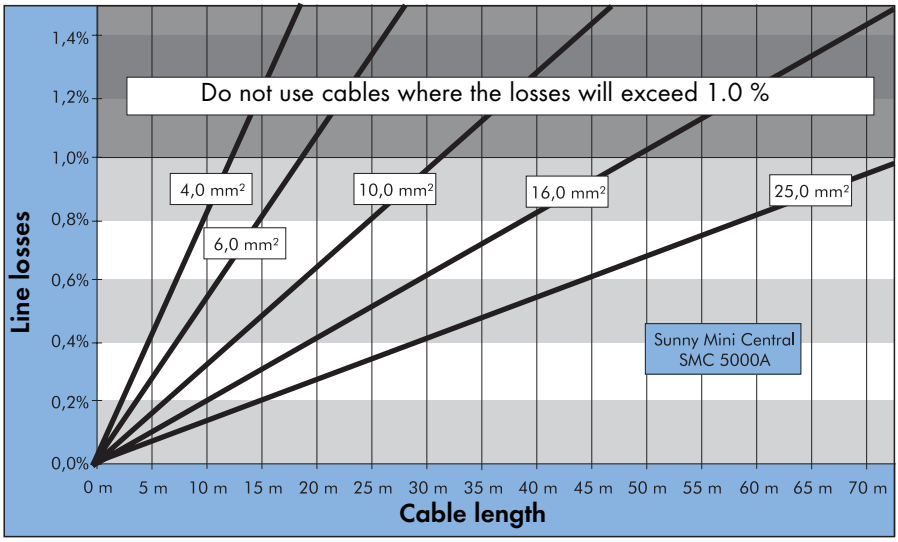
4. Wire design

Do not use cables where the losses will exceed 1.0 %.

For optimum operation of the inverter, the grid impedance of the AC cable must not exceed 1 Ohm. This is necessary, amongst other things, for the correct operation of impedance observation. The conductor cross-section should be dimensioned 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 graphs below. Multi-wire cables with copper forward and return conductors are used.

Use the following diagrams to check your wire design:

Line losses of the Sunny Mini Central SMC 5000A

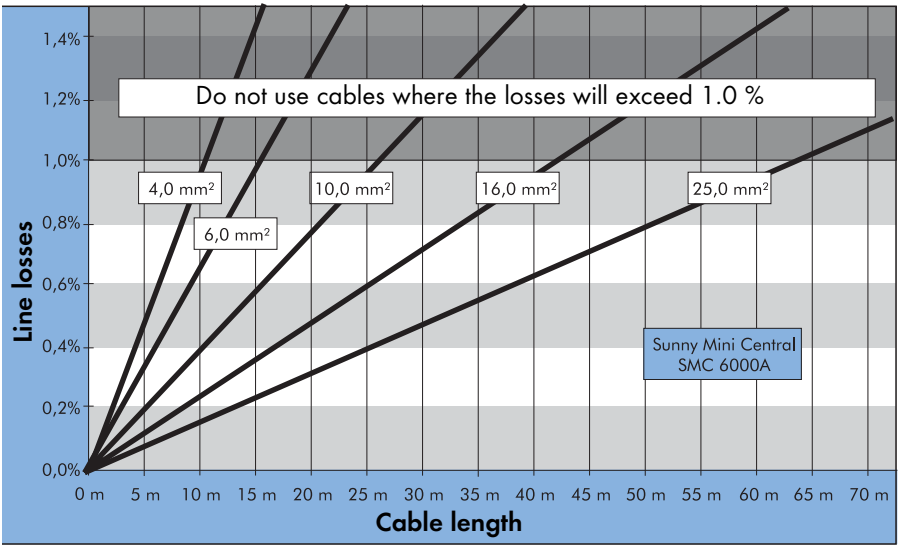


The following maximum cable lengths are possible for the different cable cross-sections:

Cable cross-section	4.0 mm²	6.0 mm²	10.0 mm²	16.0 mm²	25.0 mm²
Max. cable length	12.4 m	18.6 m	31.1 m	49.7 m	77.7 m

The neutral conductor has no load in three phase connections with symmetric feeding power and the cable losses are reduced by 50 %. The maximum cable length is therefore twice as long.

Line losses of the Sunny Mini Central SMC 6000A



The following maximum cable lengths are possible for the different cable cross-sections:

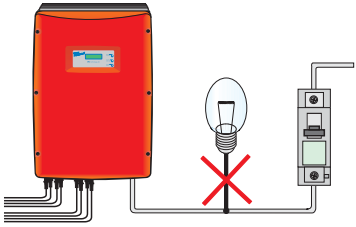
Cable cross-section	4.0 mm²	6.0 mm²	10.0 mm²	16.0 mm²	25.0 mm²
Max. cable length	10.3 m	15.5 m	25.9 m	41.4 m	64.8 m

The neutral conductor has no load in three phase connections with symmetric feeding power and the cable losses are reduced by 50 %. The maximum cable length is therefore twice as long.

5. Line circuit breaker:

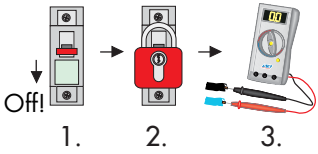
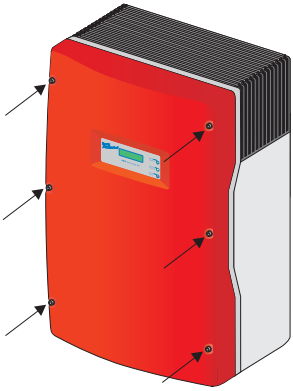
The selection of the correct line circuit beraker depends on various factors. For detailed information for the rating of a line circuit breaker, please refer to chapter 5.4.3 „The line circuit breaker" (Page 47).

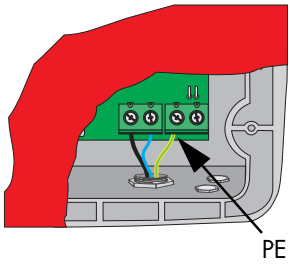
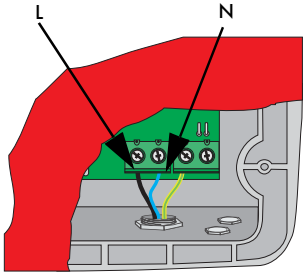
No loads may be connected to this power circuit.



5.4.2 Connecting the AC output

To connect up the AC output, follow these steps:

Step	Instructions
1	Check the grid voltage. For Germany, the following applies: If the grid voltage is constantly higher than 253 V, the Sunny Mini Central will not be fully operational. In this case, contact the local grid operator for assistance. The inverter can temporarily feed power into the grid with a maximum output voltage of 260 V. However, the 10-minute average must not exceed 253 V.en, der 10-Minuten-Mittelwert darf jedoch 253 V nicht überschreiten.
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	Make sure that the PV generator is not connected to the inverter.
4	Remove the screws that secure the housing cover of the Sunny Mini Central. Put the screws and the washers to one side so that they do not get lost. Pull the cover forward to remove it. 

Step	Instructions
5	Connect the earth wire (PE) of the mains cable to the right terminal of the terminal block (see figure on the right). The PE cable must be 5 mm longer as the L and N cables!  PE conductor connection
6	Connect the mains cable as shown in the figure. Use the supplied cable feed-through. **"L" and "N" must not be swapped!**  „L" and „N" connection
7	Secure the housing cover by evenly tightening the two middle screws first. Then tighten the four remaining screws as well and do not forget to also re-attach the washers. The indentations of the washers must face toward the housing cover. The screws must be tightened with approximately 6 Nm torque in order to guarantee both the sealing of the enclosure and the grounding of the cover. **Attention! The teeth of the lock washers ensure the grounding of the cover. Make sure that the teeth of all six washers face toward the housing cover!**

5.4.3 The line circuit breaker

Factors that determine the selection

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 ampacity).
- 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)
- Adequate separation between the circuit breakers to avoid excessive heating
- Selectivity
- Protection class of the connected load (VDE 0100, part 410, protection against electric shock)

When installing the fuses, please always take the information in the manufacturer's data sheets into account, e.g. in terms of installation distance and heat impact.

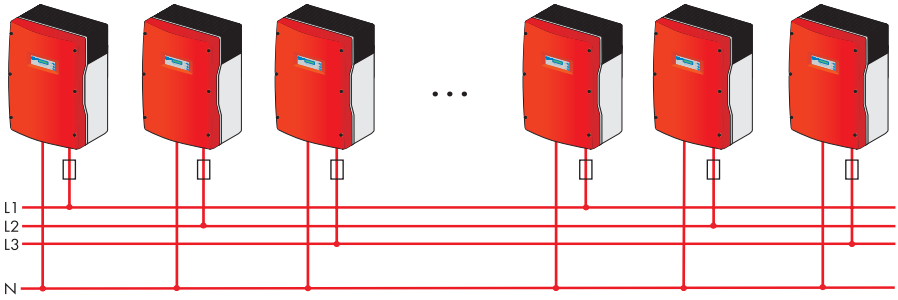
Besides that, observe the following standards in all cases:

- *DIN VDE 0298-4 (Cable routing and current-carrying capacity)*
- *DIN VDE 0100; part 430 (Protective measures; protection of cables and cords against overcurrent)*
- *DIN VDE 0100; part 410 (Protective measures; protection against electric shock)*
- *as well as country-specific standards applicable at the installation site.*

Rating of the circuit breakers

Example for the thermal rating of 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 Mini Central inverters and with three inverters per phase.



Required technical data of the Sunny Mini Central SMC 5000A / SMC 6000A

- Maximum output current = 26 A / 26 A
- Maximum permissible fuse protection for the Sunny Mini Central = 40 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 (6 mm²) is ideally routed and can take a nominal current of 32.2 A.

Selecting a line circuit breaker:

- The maximum possible nominal current for the cable used and the maximum possible fuse protection for the Sunny Mini Central limit the maximum possible nominal current for the line circuit breaker.
- In our example, 32 A is possible (SMC 6000A)
- Additionally, check the thermal suitability of the line circuit breakers.

Example for the thermal selection of a 32 A line circuit breaker with B sensitivity with no gap between the circuit breakers:

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. 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:

Ibn = 32 A x 0.9 x 0.77 x 1.07 = 23.7 A

Summary:

The selected line circuit breaker cannot be used in our example case since the maximum current-carrying capacity for fault-free operation is lower than the maximum output current of the inverter used. **It will trip under rated operating conditions!**

Solution 1:

Use a 35 A line circuit breaker. As a result, the maximum current-carrying capacity would be 26 A (Ibn = 35 A x 0.9 x 0.77 x 1.07 = 26 A) and the line circuit breaker will **not** trip under rated operating conditions.

However, you should consider the underlying conditions once again. In this case, you cannot use the previously selected 6 mm² cable.

Solution 2:

Increase the distance between the line circuit breakers to 8 mm. This would mean that the reduction factor is 0.98 instead of 0.77. As a result, the maximum current-carrying capacity would be 30 A (Ibn = 32 A x 0.9 x 0.77 x 1.07 = 30 A) and the line circuit breaker will **not** trip under rated operating conditions.

Recommendation by SMA: Solution 2:

---

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.

As well as the thermal rating of the circuit breakers, of course the applicable DIN VDE standards also need to be taken into account. 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.

6 The communications interface

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, 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 cable shield needs to be connected to the PE

The next pages will describe the following:

- the housing feed-throughs for the communications interface
- the permitted cable route in the Sunny Mini Central
- 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

With the Sunny Mini Central SMC 5000A and SMC 6000A , communication via Powerline is not possible.

6.1 Connecting RS232, RS485, Sunny Beam

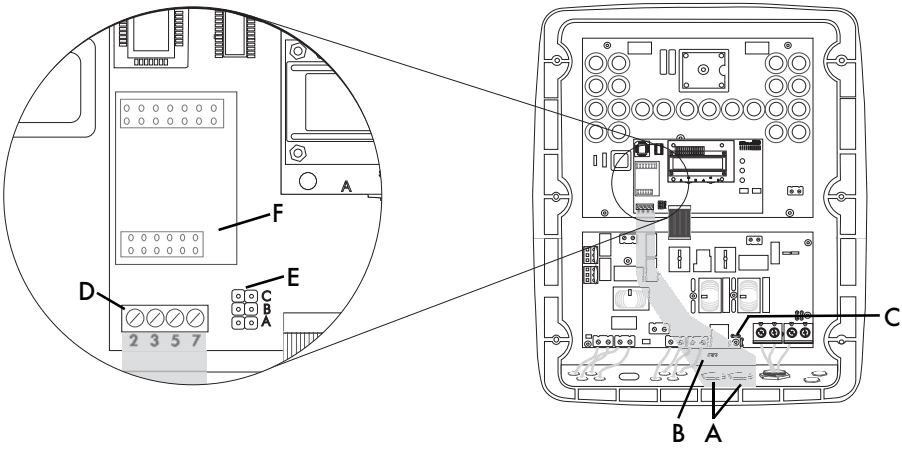
When opening the Sunny Mini Central, follow all the safety instructions as described in chapter 9 .

Electrostatic discharges are an acute danger to the Sunny Mini Central and to the communications interface. Ground yourself by touching PE or an uncoated part of the enclosure before removing the communications interface from the packaging, and before touching any components within the Sunny Mini Central.

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

Step	Instructions
1	Open the inverter as described in section 9.
2	Guide the PG screw fitting over the communication cable.
3	Thread the cable through the cable feed-through (A) on the Sunny Mini Central.
4	Screw the PG screw fitting onto the Sunny Mini Central.
5	Sheathe the cable inside the Sunny Mini Central using the silicone tube provided. The silicone tube is imperative for safety reasons. Without this silicone tube, the interface is not to be operated.
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 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.

Step	Instructions
10	Plug the communications interface to the left of the board (F).
11	Close the Sunny Mini Central as described in section 9.



A Enclosure feed-throughs in the base of the Sunny Mini Central

B Cable route (gray surface)

C PE connector

D Screw terminals for connection of the communication wires

E Jumper slot

F Interface port

6.1.1 Jumper functions

	Jumper A	Jumper B	Jumper C
RS232	-	-	-
RS485	Termination	Bias 1	Bias 2
Sunny Beam	-	-	-

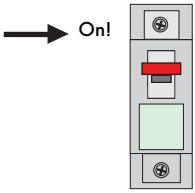
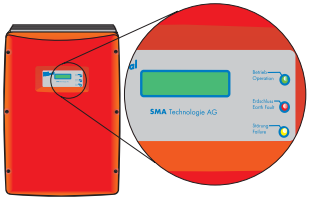
A detailed description of the jumper functions can be found in the communication device manual.

7 Commissoning of the Sunny Mini Central

You can start up the Sunny Mini Central when

- the housing's cover is securely screwed shut
- the DC cables (PV strings) are fully connected and the unused DC plug connectors on the bottom of the housing are closed using the protective caps
- the AC (mains) cable is connected correctly and
- the line circuit breaker is laid out correctly.

How to start up the inverter

Step	Instructions
1	First of all, switch the line circuit breaker to the "on" position. 
2	Now look at the LED or the display to check whether the Sunny Mini Central is in a fault-free operating status. If this is the case, commissioning was successfully completed. If the Sunny Mini Central shows other messages or blink codes than those described below, see the operating manual of the Sunny Mini Central for their precise meaning and possible solutions 

7.1 Display

After a normal grid connection of the Sunny Mini Central, it takes approx. one minute until the following display messages are shown alternately. For this, the DC and AC connections must be wired correctly and the circuit breaker must be switched on. The display messages shown before that only have the purpose of indicating the initialization of the Sunny Mini Central and the process of controlling whether the power supply requirements are fulfilled.

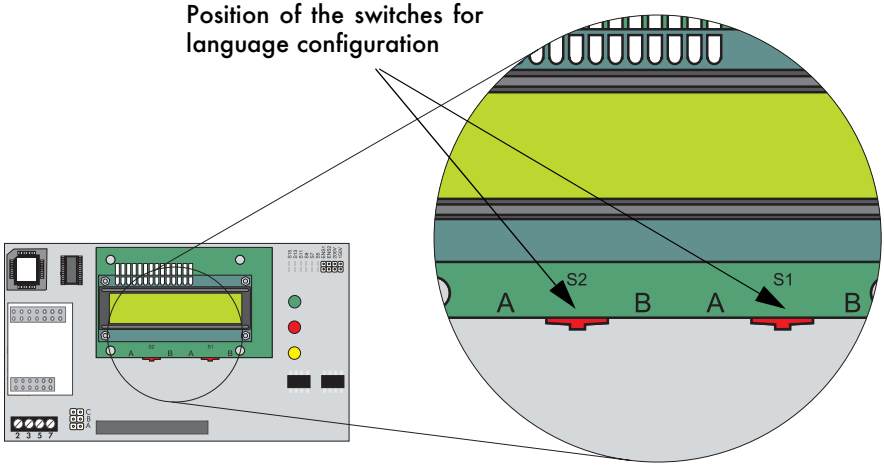
Display	Description
Feeding Operation	
E-today 0 Wh Mode MPP	The energy generated today and the current operating mode are displayed first.
Pac 903W Vpv 260V	The current feed-in output and the solar generator voltage are displayed after 5 seconds or when you tap the housing cover.
E-Total 0 Wh h-Total 0h	After a further 5 seconds, or when you tap again, the total energy produced and the time the converter has been connected to the grid are displayed. Then the cycle begins again.
In Case of Failures	
E-today 0 Wh Mode Disturbance	In case of a failure, the message "Disturbance" will be indicated in the status bar.
Disturbance Vac-Bfr	The exact error message follows. For example, if the "Disturbance" message shown here is displayed immediately after connection, it may be due to the fact that the AC wire is not correctly connected or the circuit breaker is not switched on.
at: 261V present: 245 V	If a measured value is responsible for the fault condition, then the value measured at the time of the fault is displayed. If another measurement is possible, the current value is displayed in the second line.
Please refer to the operating manual of the Sunny Mini Central to read the exact explanation of the error and status messages!	

Display	Description
PV Overvoltage	
!PV-Overvoltage! !DISCONNECT DC !	**If the message shown on the left side appears, the AC and DC cables must be disconnected from the Sunny Mini Central again immediately. There is a risk of damage to the Sunny Mini Central resulting from excessive DC input voltage!**  1. Check the DC input voltage again to make sure it is within the limits stated in section 5.3.1 „Prerequisites:" (Page 32). If the string voltages are too high, contact the planner / installation engineer of the PV generator for assistance. 2. If despite checking the DC input voltages the display message occurs again when the PV generator is connected to the Sunny Mini Central, disconnect the PV generator from the Sunny Mini Central again and contact SMA (see section 15 „Contact" (Page 103)).

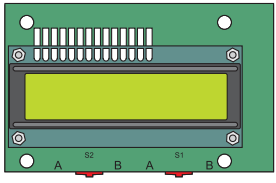
7.1.1 Setting the language of the Sunny Display

You can set the language of the Sunny Display using the switches on the underside of the display components inside the Sunny Mini Central . Proceed as follows:

1. Open the Sunny Mini Central as described in chapter 9.2 „Opening of the Sunny Mini Central" (Page 64).
2. Set the switches for the required language, as shown below.



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

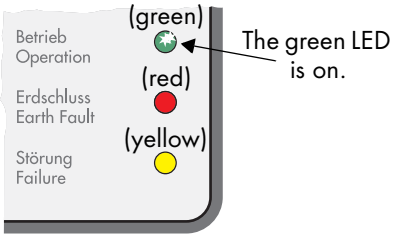


3. Close the Sunny Mini Central as described in chapter 9.3 „Closing of the Sunny Mini Central" (Page 65).

7.2 LEDs

After a normal grid connection of the Sunny Mini Central, it takes approx. one minute until the green LED is continuously on. For this, the DC and AC inputs must be correctly connected and the circuit breaker must be activated. The blink codes shown before that only have the purpose of indicating the initialization of the Sunny Mini Central and the process of controlling whether the power supply requirements are fulfilled.

Working mode



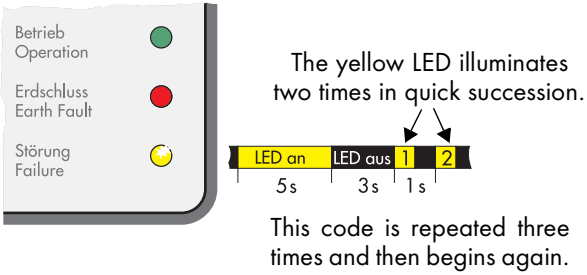
The Sunny Mini Central is in the normal working mode.

The green LED is continuously on.

In case of failures

In case the Sunny Mini Central detects an error, this is indicated through a blink code of the yellow and red LEDs.

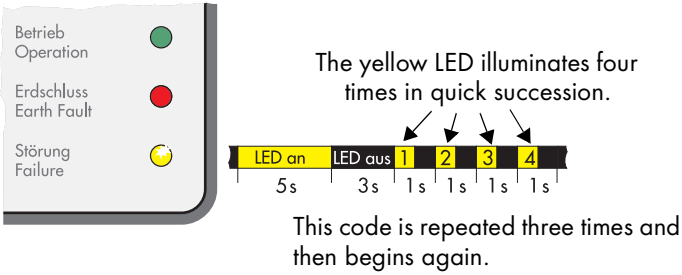
For example, if the yellow LED lights for 5 seconds immediately after connection, then goes out for 3 seconds and then flashes briefly twice, there is a grid fault. In this case, that may be due to the fact that the AC cable has not yet been cabled correctly or that the line circuit breaker has not been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



Please refer to the operating manual of the Sunny Mini Central to read the exact explanation of the blink codes.

PV overvoltage

If the blink code shown below appears, the AC and DC cables must be disconnected from the Sunny Mini Central again immediately. There is a risk of damage to the Sunny Mini Central resulting from excessive DC input voltage.



1. Check the DC input voltage again to make sure it is within the limits stated in chapter 5.3.1 „Prerequisites:" (Page 32). If the string voltages are too high, the PV generator's planner / installer should be called upon for assistance.
2. If despite checking the DC input voltage the blink code occurs again when the PV generator is connected to the Sunny Mini Central , disconnect the PV generator from the Sunny Mini Central again and contact SMA (see chapter 15 „Contact" (Page 103)).

8 Hand-over to the operator

After installing the Sunny Mini Central successfully, hand the system over to the operator.. To do so, please use the following check list

No.	Checkpoint	Control
What the operator should know:		
1	Operating principles of the PV system	
2	Switching the PV system on and off	
3	Meaning of the LEDs and display messages	
4	Maintenance and cleaning (handle covers, LEDs, display,...)	
5	Handling of additional communication components	
6	Contact partner in case of a failure	
7	Keep the documents to hand close to the Sunny Mini Central	
The following documents are handed out to the operator:		
1	Operating manual of the Sunny Mini Central	
2	Installation manual of the Sunny Mini Central	
3	Declaration of conformity of the Sunny Mini Central	
4	If necessary, all manuals for additional components (interfaces, data logger, etc.)	
5	Data sheet for the solar modules used	
6	Diagram of the layout of the solar modules and their wiring	
7	Current circuit diagram of the unit	
8	The complete registration and commissioning documents of the local energy supply company	

9 Opening and closing of the Sunny Mini Central

9.1 Safety instructions

Inappropriate opening or closing of the Sunny Mini Central may cause serious injury to persons or material damage. The Sunny Mini Central may therefore only be opened and closed by trained electricians in compliance with the safety regulations.

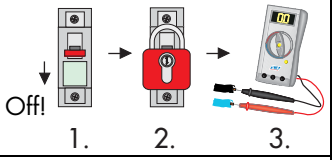
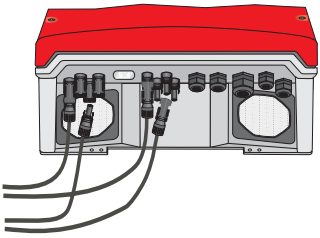
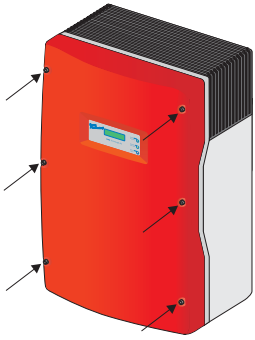
Be sure to observe the safety instructions given in chapter 3 „Safety instructions" (Page 19), especially the general safety rules for working on electrical systems.

The temperature of individual parts of the case and of components inside the Sunny Mini Central can reach over 60°C. Touching could result in burns!

Work on the Sunny Mini Central with the cover removed must be carried out by a qualified electrician! High contact voltages are present in the device. Before working on the Sunny Mini Central with the cover removed, the AC and DC voltages must be disconnected from the Sunny Mini Central and the capacitors must be discharged (wait for 30 minutes after disconnecting the AC and DC voltage).

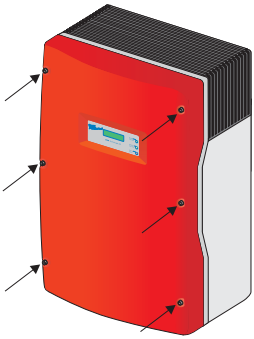
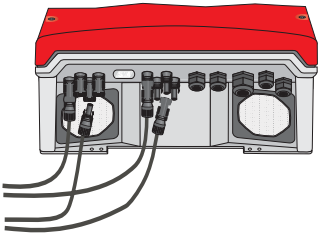
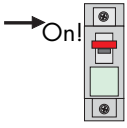
9.2 Opening of the Sunny Mini Central

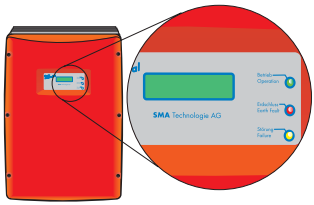
Follow the sequence described below and all safety instructions in Chapter 9.1 „Safety instructions" (Page 63)!

Step	Instructions	
1	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.	
2	Disconnect the PV generator from the Sunny Mini Central by disconnecting the DC plug connectors for all strings.	
3	**Wait for 30 minutes for the capacitors inside the Sunny Mini Central to discharge!**	
4	Remove the six screws from the housing cover and pull the cover forward smoothly. Put the cover, the screws and the washers to one side so that they do not get lost.	

9.3 Closing of the Sunny Mini Central

Follow the sequence described below and all safety instructions in Chapter 9.1 „Safety instructions" (Page 63)!

Step	Instructions	
1	Secure the housing cover by evenly tightening the two middle screws with the corresponding washers first. The indentations of the washers must face toward the housing cover. The screws must be tightened with approximately 6 Nm torque in order to guarantee both the sealing of the housing and the grounding of the cover. Then tighten the four remaining screws as well. If you should lose a screw or washer, the Sunny Mini Central accessories kit contains a spare screw and spare washer.	
	Attention! The teeth of the lock washers ensure the grounding of the cover. Make sure that the teeth of all six washers face toward the housing cover!	
2	Connect the PV generator by connecting the DC plug connectors of the Sunny Mini Central with the ones of the strings. Close the unused DC input sockets with the caps included in the delivery.	
3	Switch the line circuit breaker to the "on" position.	

Step	Instructions
4	Check whether the display or the LEDs on the Sunny Mini Central indicate that the device is functioning correctly (see section 7 „Commissoning of the Sunny Mini Central" (Page 55)). 

10 Troubleshooting / Problem solving

The Sunny Mini Central is a complex high-technology device. As a result, the possibilities for fixing faults on site are limited to just a few items. Should the Sunny Mini Central display other blink codes or display messages than those described in chapter 7 „Commissoning of the Sunny Mini Central" (Page 55), please refer to the operating manual of the Sunny Mini Central to find the exact explanation 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 Mini Central is made ready for shipping within 24 hours and then given to a shipping company) and the repair service of **SMA** Technologie AG.

Inappropriate problem solving may cause serious injury to persons or material damage. Faults must therefore be corrected by a trained electrician.

10.1 Overview

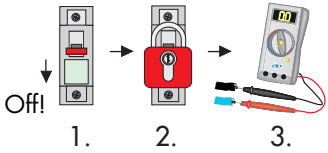
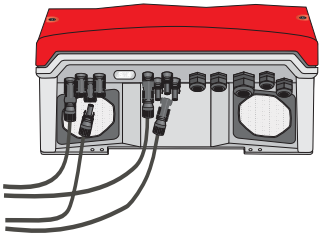
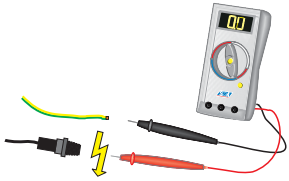
Green	Red	Yellow	Status
illuminates continuously	is not illuminated	is not illuminated	OK (working mode)
	illuminates continuously	is not illuminated	Failure
		illuminates continuously	OK (initialization)
flashes quickly (3x per second)	is not illuminated	is not illuminated	OK (stop)
	illuminates continuously	is not illuminated	Failure
flashes slowly (1x per second)	is not illuminated	is not illuminated	OK (waiting, grid monitoring)
briefly goes out (approx. 1 x per second)	illuminates continuously	is not illuminated	Failure
	is not illuminated	is not illuminated	OK (derating)
	illuminates continuously	is not illuminated	Failure
is not illuminated	is not illuminated	is not illuminated	OK (night shutdown)
		illuminating/flashing	Failure
	illuminates continuously	is not illuminated	Failure
		illuminating/flashing	Failure

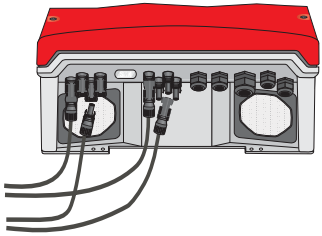
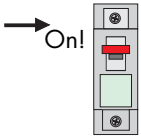
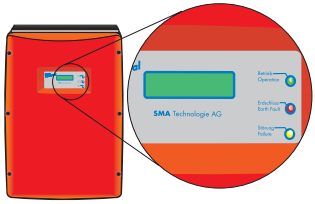
10.2 The Red LED Illuminates Continuously

10.2.1 Ground Fault Testing

If the red LED on the Sunny Mini Central glows contiuously, it should be checked whether there is a ground fault in the PV generator.

Follow the safety instructions in chapter 9.1 „Safety instructions" (Page 63) and proceed as follows:

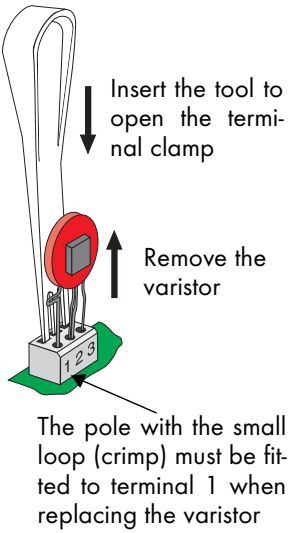
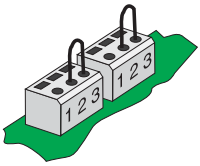
Step	Instructions
1	Disconnect the Sunny Mini Central from the AC grid (switch the line circuit breaker to its "off" position), make sure it cannot be inadvertently reconnected and test to make sure no voltage is present. 
2	Disconnect the DC plug connectors for all strings. 
3	Taking one DC plug connector at a time, measure the voltages between one DC plug connector of a string and earth potential. Pay attention to all safety instructions! 
	Warning! Dangerously high voltages may be present. Danger of death! Make sure that you only use measuring devices with a DC input voltage range up to at least 600 V.
4	If the measured voltages are constant and their total is roughly the same as the open circuit voltage of the string, then there is a ground fault in this string. Its approximate location can be deduced from the relationships between the voltages.

<table>
<tr><th>Step</th><th colspan="2">Instructions</th></tr>
<tr><td>5</td><td colspan="2">Repeat points 3 and 4 for each string.</td></tr>
<tr><td></td><td>Event</td><td>Measure</td></tr>
<tr><td></td><td>You have found a ground fault.</td><td>Restart the Sunny Mini Central as described from step 7 onwards, but without reconnecting the faulty string. The PV generator's installation engineer has to fix the ground fault before you can reconnect this string.</td></tr>
<tr><td></td><td>You have found no ground fault.</td><td>It is likely that one of the thermally monitored varistors is defective. In this case, proceed as described in section 10.2.2 „:Checking the varistors” (Page 70).</td></tr>
<tr><td></td><td colspan="2"></td></tr>
<tr><td>6</td><td colspan="2">Reconnect the PV generator by reconnecting the DC plug connectors of the Sunny Mini Central with the ones of the strings. Close the unused DC input sockets with the caps included in the delivery.
  </td></tr>
<tr><td>7</td><td colspan="2">Switch the line circuit breaker to the "on" position.
  </td></tr>
<tr><td>8</td><td colspan="2">Check whether the display or the LEDs on the Sunny Mini Central indicate that the device is functioning correctly (see section 7 „Commissoning of the Sunny Mini Central” (Page 55)).
  </td></tr>
</table>

10.2.2 :Checking the varistors

Varistors are wearing parts. Their functioning diminishes with age or following repeated responses as a result of overvoltages. It is therefore possible that one of the thermally monitored varistors has lost its protective function. You can now check these varistors in the following way, paying attention to the safety instructions in chapter 9.1 „Safety instructions" (Page 63):

<table>
<tr><th>Step</th><th colspan="2">Instructions</th></tr>
<tr><td>1</td><td colspan="2">Open the Sunny Mini Central as described in section 9.2 „Opening of the Sunny Mini Central" (Page 64).</td></tr>
<tr><td>2</td><td colspan="2">Use a continuity tester to check all the varistors and see if there is a conducting connection between connectors 2 and 3. The positions of the varistors in the Sunny Mini Central can be seen in the diagram in section 2.2 „Overview of the device" (Page 10).</td></tr>
<tr><td></td><td>Event</td><td>Measure</td></tr>
<tr><td></td><td>There is a conducting connection.</td><td>It is likely that there is a different fault in the Sunny Mini Central which has activated the blink code.
Close the Sunny Mini Central again as described in chapter 9.3 „Closing of the Sunny Mini Central" (Page 65) and contact the SMA hotline to discuss further steps.</td></tr>
<tr><td></td><td>There is no conducting connection.</td><td>The respective varistor is not working and must be replaced.
The varistors are specially manufactured for use in the Sunny Mini Central and are not commercially available. They must be ordered directly from SMA Technologie AG (SMA order code: MSWR-TV6).
To replace the part, proceed to step 4.</td></tr>
</table>

Step	Instructions
3	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), you should replace both varistors, not just the one that is obviously defective. 
	*If no replacement varistors are locally available, the Sunny Mini Central can **temporarily** run without them. To do this, remove the varistors you identified as being faulty as described above and in their place, bridge the terminals 2 and 3 with a length of wire.* 
	Attention! An input modified in this way 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 Mini Central must not be operated without varistors.
4	Close the Sunny Mini Central as described in section 9.3 „Closing of the Sunny Mini Central" (Page 65).

11 Maintenance and cleaning

The Sunny Mini Central has been constructed for low maintenance. To guarantee safe operation, it is usually adequate to observe the following principles:

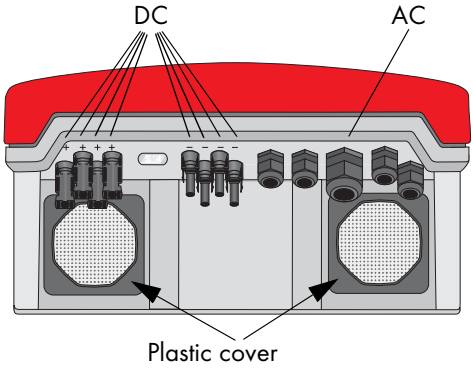
- Check the Sunny Mini Central visually for damage approximately every two months.
- Check regularly whether the display and the LEDs indicate that the device is functioning correctly. If necessary, correct faults using the explanation of the blink codes and display messages contained in the operating manual of theSunny Mini Central.
- This information can also be obtained by using one of the communications options.
- Check the heat dissipation as described in chapter 11.1 „Checking heat dissipation" (Page 73), if, during a visual inspection, you notice a marked build-up in the fan guard or the inverter is increasingly observed to be in derating mode (see explanation of the blink codes and display messages in the operating manual of the Sunny Mini Central).
- If necessary, clean the LEDs and the display with a damp cloth. Solvents, abrasives or corrosive liquids must not be used!

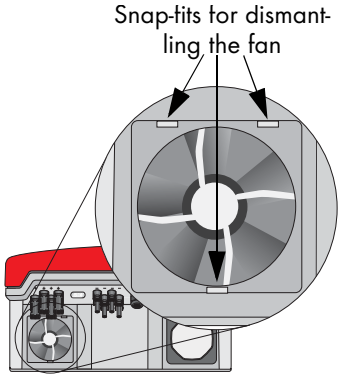
11.1 Checking heat dissipation

11.1.1 Cleaning the fans

If the fan guards are only covered in loose dust, they can be cleaned with a vacuum-cleaner. If you do not achieve satisfactory results with a vacuum-cleaner, you can dismantle the fans for the sake of cleaning.

The Sunny Mini Central is fitted with two fans on its underside. In order to clean the fans, proceed as follows:



Step	Instructions
1	Disconnect the Sunny Mini Central from both the DC and AC connections, paying attention to the safety instructions in section 3 „Safety instructions" (Page 19).
2	Wait for the fans to stop rotating.
3	Push the four latches at the sides at the top and bottom of the black plastic cover to one side and remove it carefully with the fan grates mounted behind. Clean the fan guards with a soft brush, a paint brush, a cloth or compressed air. If the fans are very dirty, you can clean them following the procedure laid out from step 4 onwards.
4	The fans are attached to the housing via three snap fits. Press the two front snap fits back and the rear snap fit forwards. 
5	Remove the fans by pulling them downwards slowly and carefully. The fan cables are long enough that you can lift the fans far enough out to disconnect the internal plug in the Sunny Mini Central. To do so, unlock the corresponding plugs and remove them. You can now take out the fans and clean them.
6	Clean the fans with a soft brush, a paint brush or a cloth and water. Under no circumstances should you use compressed air to clean the fans as this can cause them damage.
7	After cleaning, replace everything in reverse order. Subsequently check that the fans are functional as laid out in the next section.

11.1.2 Checking the fans

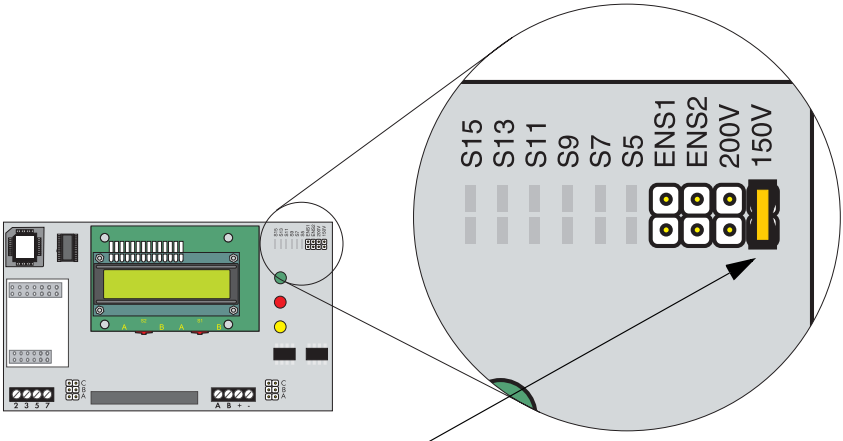
If necessary, there are two different ways to check the fans are functional:

- Set the "Fan Test" parameter to "1" in the installer mode (using Sunny Data, Sunny Data Control, the Sunny Boy Control data logger or the Sunny WebBox).
- Place the jumper on the controller board (the jumper required to check the fans is included in the Sunny Mini Central accessories kit).

Check the fans as follows:

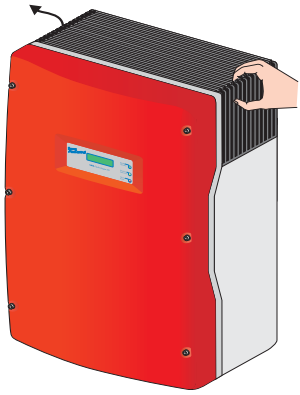
Step	Instructions
Setting the Parameter	
1	Ask for the Installer Password from the SMA Hotline (for contact information see page 103).
2	Set the „Fan Test" parameter in the installer mode to „1" (using Sunny Data, Sunny Data Control, the Sunny Boy Control data logger or the Sunny Web-Box).
3	Check the fans' air-flow. The Sunny Mini Central sucks air in from underneath and then blows it back out on the upper sides. Look out for any unusual noise which could indicate incorrect installation or that the fans are faulty.
4	Set the „Fan Test" parameter back to „0" when you have finished checking the fans.

Step	Instructions
Setting the Jumper	
1	Open the Sunny Mini Central as described in section 9.2 „Opening of the Sunny Mini Central" (Page 64).
2	Place the jumper on the controller board socket, as laid out below.
3	Close the Sunny Mini Central as described in section 9.3 „Closing of the Sunny Mini Central" (Page 65).
4	The Sunny Mini Central recognizes the jumper only once the system has been restarted (i.e. all LEDs must have gone out before a restart).
5	Once you have put the jumper in position, you must restart the Sunny Mini Central. Check the fans' air-flow. The Sunny Mini Central sucks air in from underneath and then blows it back out on the upper sides. Look out for any unusual noise which could indicate incorrect installation or that the fans are faulty.
6	Once you have checked the fans, you must set the Fan-Test parameter back to 0 and remove the jumper following the instructions laid out in section 9 „Opening and closing of the Sunny Mini Central" (Page 63).



11.1.3 Cleaning the handle covers

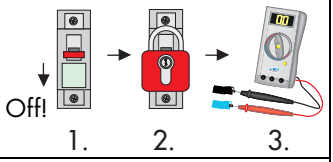
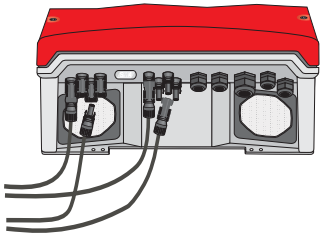
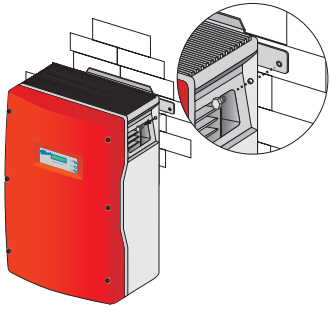
There are handle covers on either side of the Sunny Mini Central. The Sunny Mini Central sucks air in from underneath via the fan and blows it out again on the upper sides. For optimum hat dissipation within the device, you have to clean both handle covers. Proceed as follows when cleaning the handle covers:

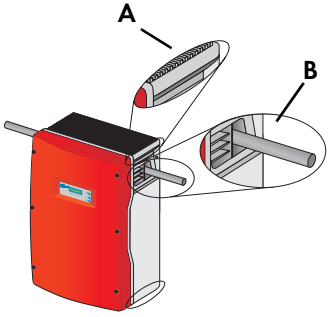
Step	Instructions
1	The handle covers of the Sunny Mini Central are to be found on the sides of the housing. Place your fingers in the space between the top of the housing and the handle covers and gently pull the handle covers out of their bracket. 
2	Clean the handle covers with a soft brush, a paint brush or compressed air.
3	Insert the handle covers back into the Sunny Mini Central. The handle covers can only be inserted on the right or left side of the Sunny Mini Central respectively. "links/left" or "rechts/right" is printed on the inside of the handle covers to help you identify the sides.
4	*The handle covers must not be removed permanently, because otherwise the device is not protected against the entrance of insects! Should the handle covers break, new ones can be ordered from SMA (contact: see page 103).*

12 Decomissioning

12.1 Disassembly

You must follow the sequence described below and all safety instructions in chapter 3 and 9.1!

Step	Instructions
1	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. 
2	Disconnect the PV generator from the Sunny Mini Central by disconnecting the DC plug connectors for all strings. 
3	Open the Sunny Mini Central as described in section 9.2 „Opening of the Sunny Mini Central" (Page 64).
4	Disconnect the AC cable.
5	Close the Sunny Mini Central with the six screws and the corresponding washers.
6	Remove the two screws on the left and right side of the Sunny Mini Central that attach it to the wall bracket. 

Step	Instructions
7	If necessary, use an angle grinder to remove the single-use screws for anti-theft protection.
8	Remove the Sunny Mini Central upwards, keeping it in vertical position.
	Remember that the Sunny Mini Central weighs 63 kg!
9	When transporting the Sunny Mini Central, use the ergonomic handles at the top and bottom at the sides of the Sunny Mini Central (A) or the housing opening by sliding a steel bar (B) through it, for example (diameter maximum 30 mm). 

12.2 Packaging

If possible, please pack the Sunny Mini Central in the original packaging. If this is no longer availagle, a similar box can be used which can withstand the weight of the Sunny Mini Central (63 kg) has a handle system and can be closed fully.

12.3 Storage

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

12.4 Disposal

Dispose the Sunny Mini Central according to the currently applicable disposal regulations for electronic waste at the installation site. It is also possible to send the Sunny Mini Central to SMA for disposal. Shipping costs paid by sender. Mark the Sunny Mini Central as "ZUR ENTSORGUNG" (FOR DISPOSAL"). Contact details are on page page 103.

13 Technical data

13.1 Sunny Mini Central SMC 5000A

Description	Short descr.	Setting
PV generator connection data		
Max. input open circuit voltage	$U_{PV\ 0}$	600 V (based on -10 °C cell temperature)
Input voltage, MPP range	U_{PV}	213 V ... 600 V @ UACmin (246 V ... 600 V DC @ 230 V AC)
Max. input current	$I_{PV\ max}$	26 A
Max. input power	P_{DC}	5750 W
All-pole isolator on the DC input side		DC plug connector
Surge voltage protection		Thermally monitored varistors
Voltage ripple	U_{pp}	< 10% of the input voltage
Personal protection		Insulation monitoring (Riso > 1 MW)
Operating consumption		< 7 W
Reverse polarity protection		Short circuit diode

Description	Short descr.	Setting
Grid connection data		
Nominal output power	P_{ACnom}	5000 W
Peak output power	P_{ACmax}	5500 W
Nominal output current	I_{ACnom}	21.7 A
Max. output current:	I_{ACnom}	26 A
Harmonic distortion of output current (at KUgrid < 2 %, PAC > 0.5 PACnom)	K_{IAC}	< 4 %
Short-circuit strength		Current control
Nominal operational voltage	U_{ACnom}	230 V
Operating range, grid voltage (in the area of application of DIN VDE 0126-1-1)	U_{AC}	198 ... 253 V / 260 V[a]
Voltage range extended operating range)	U_{AC}	180 V ... 265 V
Nominal operating frecuency	f_{ACnom}	50 Hz / 60 Hz
Operating range, grid frequency (in the area of application of IN VDE 0126-1-1)	f_{AC}	47.5 Hz ... 50.2 Hz
Frequency range (extended operating range)	f_{AC}	50 Hz: 45.5 Hz ... 54.5 Hz 60 Hz: 55.5 Hz ... 64.5 Hz
All-pole isolation on grid side		Independent disconnection device (SMA grid guard 2)
Power factor	cos phi	1
Overvoltage category		III
Test voltage (50Hz)		2 kV
Test surge voltage		4 kV (serial interface: 6 kV)
Own consumption in night mode		0.25 W

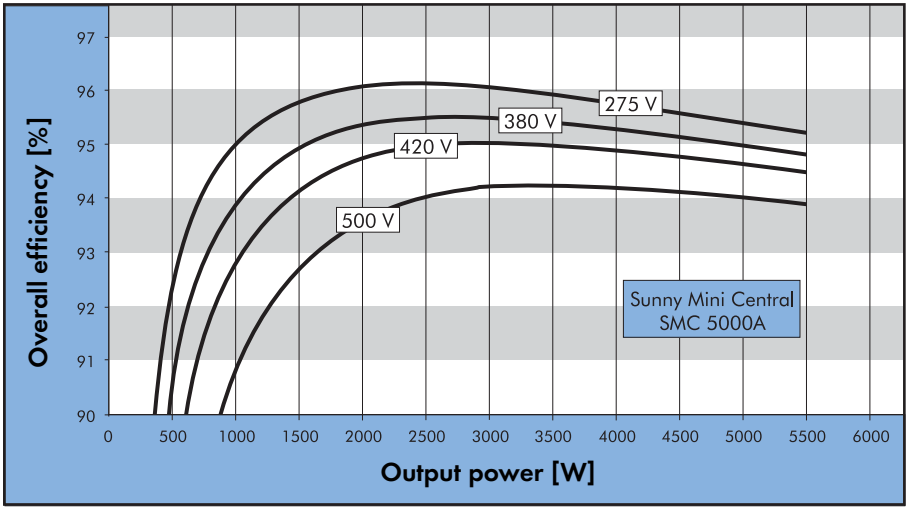
Description	Short descr.	Setting
Efficiency		
Max. efficiency	ηmax	96,1 %
European standard efficiency	ηeuro	95,2 %
Weight		
Weight		62 kg (approx.)

a) The Sunny Mini Central can temporarily feed power into the grid with a maximum output voltage of 260 V. According to DIN VDE 0126-1-1, however, the 10-minute average must not exceed a voltage of 253 V. That means, if the grid voltage is constantly 254 V (e.g.), the inverter disconnects itself from the grid. In this case, contact the local grid operator for assistance.

DIN VDE 0126-1-1 only applies in Germany. See chapter 13.4.3 „Country-specific parameter settings" (Page 94) for all other preset country values of your inverter.

Efficiency curve of the SMC 5000A

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



13.2 Sunny Mini Central SMC 6000A

Description	Short descr.	Setting
PV generator connection data		
Max. input open circuit voltage	$U_{PV\ 0}$	600 V (based on -10 °C cell temperature)
Input voltage, MPP range	U_{PV}	213 V ... 600 V @ UACmin (246 V ... 600 V DC @ 230 V AC)
Max. input current	$I_{PV\ max}$	26 A
Max. input power	P_{DC}	6300 W
All-pole isolator on the DC input side		DC plug connector
Surge voltage protection		Thermally monitored varistors
Voltage ripple	U_{pp}	< 10% of the input voltage
Personal protection		Insulation monitoring (Riso > 1 MW)
Operating consumption		< 7 W
Reverse polarity protection		Short circuit diode

Description	Short descr.	Setting
Grid connection data		
Nominal output power	P_{ACnom}	6000 W
Peak output power	P_{ACmax}	6000 W
Nominal output current	I_{ACnom}	26 A
Max. output current:	I_{ACnom}	26 A
Harmonic distortion of output current (at KUgrid < 2 %, PAC > 0.5 PACnom)	K_{IAC}	< 4 %
Short-circuit strength		Current control
Operating range, grid voltage (in the area of application of DIN VDE 0126-1-1)	U_{AC}	198 ... 253 V / 260 Va
Voltage range (extended operating range)	U_{AC}	180 V ... 265 V
Nominal operating frequency	f_{ACnom}	50 Hz / 60 Hz
Operating range, grid frequency (in the area of application of DIN VDE 0126-1-1)	f_{AC}	47.5 Hz ... 50.2 Hz
Frequency range (extended operating range)	f_{AC}	50 Hz: 45.5 Hz ... 54.5 Hz 60 Hz: 55.5 Hz ... 64.5 Hz
All-pole isolation on grid side		Independent disconnection device (SMA grid guard 2)
Power factor	cos phi	1
Overvoltage category		III
Test voltage (50Hz)		2 kV
Test surge voltage		4 kV (serial interface: 6 kV)
Own consumption in night mode		0.25 W

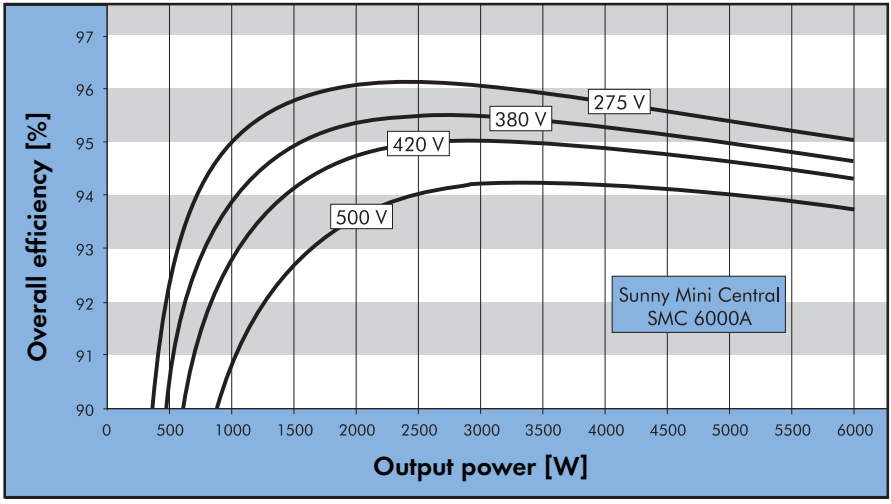
Description	Short descr.	Setting
Efficiency		
Max. efficiency	ηmax	96,1 %
European standard efficiency	ηeuro	95,2 %
Weight		
Weight		63 kg (approx.)

a) The Sunny Mini Central can temporarily feed power into the grid with a maximum output voltage of 260 V. According to DIN VDE 0126-1-1, however, the 10-minute average must not exceed a voltage of 253 V. That means, if the grid voltage is constantly 254 V (e.g.), the inverter disconnects itself from the grid. In this case, contact the local grid operator for assistance.

DIN VDE 0126-1-1 only applies in Germany. See Chapter 13.4.3 „Country-specific parameter settings" (Page 94) for all other preset country values of your inverter.

Efficiency of the SMC 6000A

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



13.3 General data

General data	
Protection type to DIN EN 60529	IP65
Dimensions (w x h x d)	468 mm x 613 mm x 242 mm (approx.)
External interfaces	
Data transmission over separate data cable	Optional, RS232 / RS485, electrically separated
Wireless data transmission	Optional

13.4 Sunny Mini Central operating parameters

Unauthorised changes to the operating parameters may result in:

- **Injury or accidents as a result of changing the internal safety routines in the Sunny Mini Central.**
- **Voiding the Sunny Mini Central's operating approval certificate.**
- **Voiding the guarantee of the Sunny Mini Central.**

Never change the parameters of your Sunny Mini Central without express authorization by the local energy supply company and instructions from SMA.

13.4.1 Explanation of the operating parameters

Name	Explanation
ACVtgRPro	Surge voltage protection (only relevant for Germany). The Sunny Mini Central can feed into the public grid in Germany 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 10-minute average exceeds the threshold value of 253 V, the Sunny Mini Central disconnects itself from the grid. Once the 10-minute average returns to a value of less than 253 V, the Sunny Mini Central returns to "Working" 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.
AntiIsland-Ampl	Amplification of the AntiIsland process (deactivated for GER by setting AntiIsland-Ampl = 0)

Name	Explanation
AntiIsland-Freq	Repetition rate of the AntiIsland process (deactivated for GER by setting AntiIsland-Ampl = 0)
Control	Current regulation switching. If the operating parameter "Control" is set to "Auto", the inverter automatically chooses the optimal type of current regulation. If the operating parameter "Control" is set to "Grid", the inverter regulates on the grid side. If set to "Bridge", the inverter regulates on the bridge side. This setting can be a corrective measure in the event of difficult grid characteristics. Discuss the alteration of this parameter with the SMA hotline.
Default	Used for setting the country specific information. • *GER/ENS:* Country-specific parameter settings for Germany in accordance with DIN VDE 0126 (4.99) • *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 • *AUS/AS4777*: Country-specific parameter settings for Australia • *IT/DK5950:* Country-specific parameter settings for Italy • *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, "trimmed" is shown in the display. • *Off_Grid:* Setting for inverters which are operated in a stand-alone grid. More detailed information can be found in the Sunny Island manual.
dFac-Max	Maximum "Mains frequency change" before the mains monitoring system disconnects the device from the mains supply.
dZac-Max	Maximum "Mains impedance change" before the mains monitoring system disconnects the device from the mains supply.
E_Total	Total energy yield for the inverter. This change may be necessary when you exchange your Sunny Mini Central and want to use the data from the old device.
Fac-delta-	Maximum frequency, above (Fac-delta+) and below (Fac-delta-) the mains frequency, before the mains monitoring system disconnects the device from the mains supply.
Fac-delta+	

Name	Explanation
Fac-Limit delta	For setting the frequency-dependent output derating in the operating mode "Off Grid". Further information on this topic can be found in the Sunny Island instruction manual.
Fac-Pderating	Frequency-dependent output limitation
Fac-start delta	For setting the frequency-dependent output derating in the operating mode "Off Grid". Further information on this topic can be found in the Sunny Island instruction manual.
Fac-Tavg	Averaging time of grid frequency gaging
Fan-Test	When you set the "Fan test" parameter to "1" you can check whether the fan is functioning.
Hardware-BFS	Hardware version of the operation control unit (BFR)
h_Total	Total hours of operation for the inverter. This change may be necessary when you exchange your Sunny Mini Central and want to use the data from the old device.
I-NiTest	Setting the impulse for impedance monitoring. This parameter only functions when the Sunny Mini Central is deactivated (disconnected on the AC side) or in "Stop" mode.
Inst.-Code	Parameters for grid monitoring can only be changed after entering the SMA grid guard password.
KI-Wind-Reg	Control factors in Turbine mode. Further information on this topic can be found in the Windy Boy instruction manuals
KP-Wind-Reg	
LdVtgC	Compensation for the voltage drop in the cabling. With this parameter, the voltage drop between the inverter and the grid connection point is taken into account. The 10-minute average voltage 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 parameter Uac-Max applies.
Memory 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.

Name	Explanation
Operating Mode	Operating mode of the Sunny Mini Central: • *MPP:* Maximum Power Point • Turbine Mode: Operating mode for Sunny Mini Central on a wind energy plant • *UKonst*: Constant voltage mode (Desired voltage is defined in "Usoll-Konst") • *IKonst:* Operating mode for test purposes • *Stop:* Disconnection from mains network, no operation • *Off Grid:* Operating mode for Sunny Mini Central in a stand-alone grid.
Plimit	Upper limit for AC output power
Pmax	Output limitation of the inverter
P-Wind-Mid P-Wind-Ramp	Parameters for adjusting the inverter in Turbine mode. Further information on this topic can be found in the Windy Boy instruction manuals
Ripple-Ctl-Frq Ripple-Ctl-Lev Ripple-Ctl-Rcvr	The Ripple-Ctl-Frq, Ripple-Ctl-Lev, Ripple-Ctl-Rcvr paramters are intended to handle ripple control signals with Sunny Mini Centrals. These parameters are not available for all Sunny Mini Centrals. These parameters may only be changed after prior agreement with SMA Technologie AG.
SMA-SN	Serial number of the Sunny Mini Central
Software-BFR	Firmware version of the operation control unit (BFR)
Software-SRR	Firmware version of the current control unit (SRR)
Speicher/ Storage	• *Permanent:* Modified parameters are stored in the EEPROM and can be used even when the Sunny Mini Central has been restarted. • *Volatil:* Prevents the parameters from being stored in the EEPROM, the parameters are only stored until the next restart.
T-Max-Fan	Temperature for the maximum fan speed.
T-Start	The period the Sunny Mini Central waits after the Upv-Start value has been reached.
T-Start-Fan	The fan starts to run at minimum speed at this temperature.
T-Stop	The period the Sunny Mini Central waits before disconnecting from the mains supply when Upv drops below the grid peak voltage.

Name	Explanation
T-Stop-Fan	If after a temperature increase the inverter cools down to below this threshold value, the fan switches itself off again.
Uac-Max	Lower (Uac-Min) and upper (Uac-Max) limits of the allowable AC voltage (Self contained power system recognition), before the mains supply monitoring system disconnects the device from the mains supply.
Uac-Min	
Uac-Tavg	Averaging time of grid frequency measuring
UDC WindMax	Parameters for adjusting the inverter in Turbine mode. Further information on this topic can be found in the Windy Boy instruction manuals
UDC WindMid	
UDC WindStart	
Upv-Start	The DC voltage required before the Sunny Mini Central begins feeding power into the mains supply.
Usoll-Konst	PV desired voltage for constant operational voltage. These parameters are only important when the "Betriebsart" parameter is set to U-konst.

13.4.2 Parameter settings for Germany

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

Name	Unit	Value range	Factory setting	
			SMC 5000A	SMC 6000A
ACVtgRPro	V	230 ... 300	253	253
AntiIsland-Ampl *	grd	0 ... 10	0	0
AntiIsland-Freq *	mHz	0.1 ... 2000	500	500
Control		Auto, Grid, Bridge	Auto	Auto
Default *		GER/VDE0126-1-1, GB/G83, AUS/AS4777, USA/UL1741, IT/DK5950, Off_Grid, SP/RD1663, Other, trimmed	GER/VDE0126-1-1	GER/VDE0126-1-1
dFac-MAX *	Hz/s	0,1 ... 4,0	4	4
dZac-MAX *	mOhm	0.35 ... 20000	685	670
E_Total	kWh	0 ... 200000	0	0
Fac-delta- *	Hz	0.1 ... 4,5	2.45	2.45
Fac-delta+ *	Hz	0.1 ... 4,5	0.19	0.19
Fac-Limit delta	Hz	0 ... 5	2	2
Fac-start delta	Hz	0 ... 5	1	1
Fan test		0 ... 1	0	0
h_Total	h	0 ... 200000	0	0
Inst.-Code				
I-NiTest *	mA	0 ... 25000	16000	16000
Memory function			no function	no function

Name	Unit	Value range	Factory setting	
			SMC 5000A	SMC 6000A
Operating Mode		MPP, Ikonst, Stop, Turbine Mode, U-konst, Off_grid	MPP	MPP
Pmax	W	0 ... 6050	5500	6000
P-Wind-Mid	W	0 ... 6000	2000	2000
P-Wind-Ramp	W/s	10 ... 2000	1000	1000
Ripple-Ctl-Frq	Hz	105 ... 1605	1605	1605
Ripple-Ctl-Lev	%	0.5 ... 8	8	8
Ripple-Ctl-Rcvr		disable,enable, auto	disable	disable
Riso-Min	kOhm	0 ... 10000	1000	1000
Speicher / Storage		Permanent, volatile	Permanent	Permanent
T-Max-Fan	grdC	0 ... 110	90	90
T-Start *	s	5 ... 1600	10	10
T-Start-Fan	grdC	0 ... 110	70	70
T-Stop	s	1 ... 3600	2	2
T-Stop-Fan	grdC	0 ... 110	50	50
Uac-Max *	V	230 ... 300	260	260
Uac-Min *	V	160 ... 230	198	198
UDC WindMax	V	1 ... 600	450	540
UDC WindMid	V	1 ... 600	315	450
UDC WindStart	V	1 ... 600	200	250
Upv-Start	V	250 ... 600	300	300
Usoll-Konst	V	250 ... 600	600	600

*Parameters designated with * are safety-related grid monitoring parameters. To change the SMA grid guard parameters, you must enter you personal SMA grid guard password (Inst.-Code). Please call the SMA Hotline to obtain your personal SMA grid guard password.*

13.4.3 Country-specific parameter settings

The settings made for the Sunny Mini Central ex works are on the type plate (see section „Type plate" (Page 14).

Sunny Mini Central SMC 5000A

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 section 13.4.2.

Name	Unit	Country settings				
		Germany	Australia	Great Britain	Italy	Spain
ACVtgRPro	V	253	253	253	253	253
Default		GER/ VDE0126-1-1	AUS/ AS4777	GB/ G83	IT/ DK5950	SP/ RD1663
dFac-Max	Hz/s	4	0.25	0.2	0.20	2
dZac-Max	mOhm	685	20000	350	350	350
Fac-delta-	Hz	2.45	0.19	0.5	0.29	0.98
Fac-delta+	Hz	0.19	0.19	0.5	0.29	0.98
I-Ni-Test	mA	16000	8000	0	0	0
LDVtgC	V	0	50	50	50	50
T-Start	s	10	45	180	10	10
Uac-Min	V	198	205	209	198	199
Uac-Max	V	260	265	261	262	250

Sunny Mini Central SMC 6000A

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 section 13.4.2.

Name	Unit	Country settings				
		Germany	Australia	Great Britain	Italy	Spain
ACVtgRPro	V	253	253	253	253	253
Default		GER/ VDE0126-1-1	AUS/ AS4777	GB/ G83	IT/ DK5950	SP/ RD1663
dFac-Max	Hz/s	4	0.25	0.2	0.20	2
dZac-Max	mOhm	670	20000	350	350	350
Fac-delta-	Hz	2.45	0.19	0.5	0.29	0.98
Fac-delta+	Hz	0.19	0.19	0.5	0.29	0.98
I-Ni-Test	mA	16000	8000	0	0	0
LDVtgC	V	0	50	50	50	50
T-Start	s	10	45	180	10	10
Uac-Min	V	198	205	209	198	199
Uac-Max	V	260	265	261	262	250

13.4.4 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:

Name	Unit	Factory setting	
		SMC 5000A	SMC 6000A
Fac-Pderating			
Fac-Tavg	ms	160	160
Hardware-BFS			
Plimit	W	5500	6000
SMA-SN			
Software-BFR			
Software-SRR			
Uac-Tavg	ms	80	80

13.5 Explanations and certificates

13.5.1 CE declaration of conformity

CE Declaration of Conformity

Sunny Central

for utility interactive inverters

Product: **Sunny Mini Central**
Type: **SMC 5000, SMC 5000A, SMC 6000, SMC 6000A, SMC 6000TL, SMC 7000TL, SMC 8000TL**

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 low voltage 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
	DIN EN 61000-3-11:2001-04
Utility Interference:	DIN EN 61000-3-12: 2004-06 (Draft)
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
- 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 as in case of incorrect connection or inproper usage

without explicit written confirmation by SMA.

Niestetal, 13.03.2006

SMA Technologie AG

i. V. Frank Greizer

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

SMC-CE-11:BE1106

SMA Technologie AG
Hannoversche Straße 1-5
34266 Niestetal
Tel. +49 561 9522 – 0
Fax +49 561 9522 – 100
www.SMA.de
info@SMA.de

CE SMA

13.5.2 SMA grid guard certificate

The Sunny Mini Central is equipped with the "SMA grid guard 2" independent disconnection device and it is covered by the industrial trade association "SMA grid guard" import certificate.

Fachausschuss Elektrotechnik
der Berufsgenossenschaftlichen Zentrale
für Sicherheit und Gesundheit – BGZ
des Hauptverbandes der gewerblichen Berufsgenossenschaften

BG
Federführung:
Berufsgenossenschaft
der Feinmechanik
und Elektrotechnik

Fachausschuss Elektrotechnik, Postfach 51 05 80, 50941 Köln

SMA Technologie AG
Hannoversche Straße 1-5
34266 Niestetal

Ihre Zeichen/Nachricht vom	Unser Zeichen (Bitte stets angeben)	Bearbeiter	☎ (02 21) 37 78-	Datum
	UB.010.17	Pl/Ow	6312	25.01.2006

Unbedenklichkeitsbescheinigung

Erzeugnis:	Selbsttätig wirkende Schaltstelle (ENS)
Typ:	SMA grid guard Version 2
Bestimmungsgemäße Verwendung:	Selbsttätig wirkende, dem VNB unzugängliche Schaltstelle als Sicherheitsschnittstelle zwischen einer Eigenerzeugungsanlage und dem Niederspannungsnetz. Gleichwertiger Ersatz für eine jederzeit dem VNB zugängliche Schaltstelle mit Trennfunktion.
Prüfgrundlage:	
DIN V VDE V 0126-1-1 (2006-02)	"Selbsttätige Schaltstelle zwischen einer netzparallelen Erzeugungsanlage und dem öffentlichen Niederspannungsnetz"

Das Sicherheitskonzept des o.g. Erzeugnisses, entspricht den zum Zeitpunkt der Ausstellung dieser Bescheinigung geltenden sicherheitstechnischen Anforderungen für die aufgeführte bestimmungsgemäße Verwendung.

Die Unbedenklichkeitsbescheinigung wird spätestens

31.12.2010

ungültig.

- Mehlem -
Leiter der Prüf- und
Zertifizierungsstelle

Hausadresse: Gustav-Heinemann-Ufer 130 50968 Köln Tel. (02 21) 37 78-63 01 Fax (02 21) 37 78-63 22

14 Glossary

AC

Abbreviation for "Alternating Current"

Central inverter

An inverter concept in which all PV modules are connected to each other (in series and/ or parallel) and which uses a single inverter for feeding energy into the mains supply network.

DC

Abbreviation for "Direct Current"

Derating

English for "reduction": a controlled reduction in performance, usually dependent on component temperatures. Compared with the normal process of completely shutting down the device, the effect on the external power network is smaller with derating.

Grid impedance

The grid impedance is a characteristic grid specification, which is determined by the grid's infrastructure, as well as by the number of power suppliers and power consumers. If supply to the grid section drops out due to a grid shutdown on the part of the adjacent supplier (medium voltage transformer), the grid impedance changes abruptly. In order to detect this occurrence, and to prevent an unwanted stand-alone grid, SMA grid guard measures the grid impedance and disconnects the inverter from the grid in the event of a jump in impedance.

Inverter

A device for converting the direct current (DC) from the PV generator into alternating current (AC), which is used by most normal household devices and especially for feeding energy into an existing mains supply network. Inverters for PV-systems usually contain one or more MPP-trackers.

Mains coupled system

A PV system that is connected to the mains supply grid of an external energy supplier.

Maximum Power Point "MPP"

The operational point (current / voltage) of the PV generator at which the highest possible performance under the prevailing conditions is achieved. The actual MPP changes constantly depending (e.g.) on the level of solar irradiation and the cell temperature.

MPP tracker

The operational point (current / voltage) of the PV generator at which the highest possible performance under the prevailing conditions is achieved. The actual MPP changes constantly depending (e.g.) on the level of solar irradiation and the cell temperature

Multi-string inverter

An inverter that combines the advantages of several string inverters (separate MPP control of individual strings) and a central inverter (lower performance specific costs).

PV

Abbreviation for "Photovoltaic", describes the conversion of solar energy into electrical energy.

PV generator

Technical device for the conversion of light energy into electrical energy. This normally also describes all installed and electrically connected solar modules in a PV system.

PV-module

See "Solar module"

PV system

Describes the complete collection of components needed for the acquisition and utilization of solar energy. As well as the PV generator, this also includes the Sunny Boy or Sunny Mini Central, for example, in the case of grid-coupled systems.

SMA grid guard

Part of an "independent disconnection device for electrical power units". This is a mandatory safety device that prevents power from a solar energy system being fed into a deactivated grid. In the Sunny Boy / Sunny Mini Central, this function is assumed by the "SMA grid guard".

Solar cell

An electronic component that generates electrical energy when irradiated with sunlight. Since the voltage produced by a solar cell is very small (ca. 0.5 V), several solar cells are combined to form a solar module. The most common material presently used for solar cells is Silicon, which is manufactured in different forms (monocrystalline, polycrystalline, amorphous) In addition to different mechanical variations, that are usually designed to increase the level of efficiency, completely new materials are currently being tested (Cadmium Telluride, Cadmium Indium Sulphide, Titanium Dioxide and many others.)

Solar energy

"Sun energy", i.e. energy from sunlight (solar radiation).

Solar module

A collection of solar cells in an enclosure that protects the sensitive cells from mechanical stresses and allows easy installation.

Stand-alone grid system

An energy generation system that is completely independent of any external power sources.

String

Describes a group of solar modules electrically connected in series.

String inverter

An inverter concept that avoids the disadvantages of the central inverter concept. The PV generator is split into individual strings, each of which feeds the grid by means of its own string inverter installed close to the generator. This greatly simplifies installation, and the yield losses caused by manufacturing deviations or variations in shadowing of the solar modules are greatly reduced.

Varistor

In the Sunny Boy and Sunny Mini Central, the varistors serve to guard against atmospheric overvoltages, e.g. nearby lightning strikes. They divert overvoltages in order to protect the electronics in the Sunny Boy or Sunny Mini Central. During operation, varistors are subject to a certain degree of ageing. Varistors which have already been operating for a considerable period of time, or have already needed to divert overvoltages, become highly resistive. Thermally monitored varistors detect increased temperature (which suggests such "ageing"). If one of the varistors is no longer functional, the inverter triggers a fault message.

15 Contact

If you have any questions or technical problems concerning the Sunny Mini Central, please contact our hotline. Please have the following information available when you contact SMA:

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

Address:

SMA Technologie AG
Hannoversche Strasse 1 - 5
34266 Niestetal
Germany

Tel.:+49 (561) 95 22 - 499
Fax:+49 (561) 95 22 - 4699
hotline@SMA.de
www.SMA.de

The information contained in this document is the property of **SMA** Technologie AG. Publishing its content, either partially or in full, requires the written permision of **SMA** Technologie AG. Any internal company copying of the document for the purposes of evaluating the product or its correct implementation is allowed and does not require permission.

Exclusion of liability

The general terms and conditions of delivery of **SMA** Technologie AG shall apply.

The content of these documents is continually checked and amended, where necessary. However, discrepancies cannot be excluded. No guarantee is made for the completeness of these documents. The latest version is available on the Internet at www.SMA.de or from the usual sales channels.

Guarantee or liability claims for damages of any kind are exlcuded if they are caused by one or more of the following:

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

Software licensing

The use of supplied software produced by **SMA** Technologie AG is subject to the following conditions:

This software may be copied for internal company purposes and may be installed on any number of computers. Supplied source codes may be changed or adapted for internal company purposes on your own responsibility. Drivers may also be transferred to other operating systems. Source codes may only be published with the written permission of **SMA** Technologie AG. Sub-licensing of software is not permissible.

Limitation of liability: **SMA** Technologie AG rejects any liability for direct or indirect damages arising from the use of software developed by **SMA** Technologie AG. This also applies to the provision or non-provision of support activities.

Supplied software not developed by **SMA** Technologie AG is subject to the respective licensing and liability agreements of the manufacturer.

Trademarks

All trademarks are recognized even if these are not marked separately. Missing designations do not mean that a product or brand is not a registered trademark.

SMA Technologie AG

Hannoversche Straße 1-5

34266 Niestetal

Germany

Tel. +49 561 9522-0

Fax +49 561 9522-100

www.SMA.de

E-mail: info@SMA.de

Sales
Solar Technology

www.SMA.de

SMA Technologie AG
Hannoversche Strasse 1–5
34266 Niestetal, Germany
Tel.: +49 561 9522 4000
Fax: +49 561 9522 4040
E-mail: info@SMA.de
Freecall: +800 SUNNYBOY
Freecall: +800 78669269



SMA America, Inc.
Grass Valley, California, USA
E-mail: info@SMA-America.com

SMA Solar Technology China
Beijing, P.R. China
E-mail: info@SMA-China.com

SMA Technology Korea Co., Ltd.
Seoul, Korea
E-mail: info@SMA-Korea.com

SMA Ibérica Tecnología Solar, S.L.
Barcelona, Spain
E-mail: info@SMA-Iberica.com

SMA Italia S.r.l.
Milan, Italy
E-mail: info@SMA-Italia.com

Innovation in Systems Technology
for the Success of Photovoltaics