



PV Inverter

## **SUNNY MINI CENTRAL**

9000TL / 10000TL / 11000TL

9000TL / 10000TL / 11000TL with Reactive Power Control

**Installation Guide**





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# 1 Notes on this Manual

## 1.1 Validity

This installation guide describes the assembly, installation, commissioning and maintenance of the following SMA inverters:

- Sunny Mini Central 9000TL (SMC 9000TL-10)
- Sunny Mini Central 10000TL (SMC 10000TL-10)
- Sunny Mini Central 11000TL (SMC 11000TL-10)
- Sunny Mini Central 9000TL with Reactive Power Control (SMC 9000TLRP-10)
- Sunny Mini Central 10000TL with Reactive Power Control (SMC 10000TLRP-10)
- Sunny Mini Central 11000TL with Reactive Power Control (SMC 11000TLRP-10)

Store this manual where it can be accessed at all times.

## 1.2 Target Group

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

## 1.3 Additional Information

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

Refer to the user manual for detailed information on operating the inverter.

## 1.4 Symbols Used

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

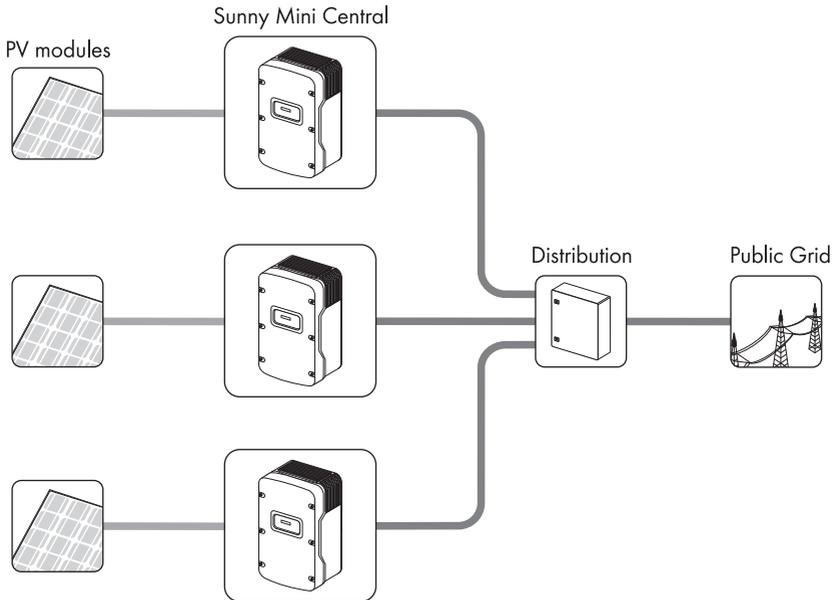
	<b>DANGER!</b>
DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.	
	<b>WARNING!</b>
WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.	
	<b>CAUTION!</b>
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.	
	<b>NOTICE!</b>
NOTICE indicates a situation that can result in property damage if not avoided.	
	<b>Information</b>
Information provides tips that are valuable for the optimal installation and operation of your product.	
<input checked="" type="checkbox"/>	This symbol indicates the result of an action.

## 2 Safety

### 2.1 Appropriate Usage

The Sunny Mini Central is a PV inverter, which converts the DC current of the PV generator to AC current and feeds it into the public grid.

#### Operating Principle of a PV System with Sunny Mini Central



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



#### Capacitive Discharge Currents

PV modules with large capacities relative to ground, such as thin-film modules with cells on a metallic substrate, are only to be implemented if their coupling capacity does not exceed 1400 nF.

During grid feeding, a discharge current flows from the cells to ground. The amount of current depends on the manner in which the modules are installed (e.g. foil on metal roof) and on the weather (rain, snow). This "normal" discharge current may not exceed 50 mA due to the fact that the inverter would otherwise automatically disconnect from the grid as a protective measure. For further information on this subject, see the technical information "Capacitive Discharge Currents" in the download area at [www.SMA.de/en](http://www.SMA.de/en).

When designing the PV system, ensure that the values comply with the permitted operating range of all components at all times. The free design program "Sunny Design" ([www.SMA.de/en/SunnyDesign](http://www.SMA.de/en/SunnyDesign)) will assist you. The manufacturer of the PV modules must have approved the modules for use with this Sunny Mini Central. You must also ensure that all measures recommended by the module manufacturer for long-term maintenance of the module properties are taken (see also Technical Information "Module Technology", in the download area of [www.SMA.de/en](http://www.SMA.de/en)).

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

## Certified Countries

The Sunny Mini Central 9000TL / 10000TL / 11000TL (with according configuration) fulfill the requirements specified in the following standards and directives (dated: February/2010):

- VDE 0126-1-1 (02.2006)
- DK 5940 Ed. 2.2 (02.2006) (only for SMC 9000TL-10/IT / 10000TL-10/IT / 110000TL-10/IT)
- RD 1663/2000 (2000) <sup>a)</sup>
- PPC (06.2006) (only for SMC 9000TL-10 / 10000TL-10 / 11000TL-10)
- PPDS
- C10/C11 (08.2003) <sup>b)</sup>
- AS4777 (2005)
- IEC-utility Meeting 216
- RD 1663/661 (only for SMC 9000TLRP-10 / 10000TLRP-10 / 11000TLRP-10)
- MEA (on request)
- PEA (on request)
- Kepco guide (02.2006) (on request)

a) In the event of restrictions in certain regions, contact the SMA Serviceline.

b) Only possible when the phase voltage is 220 V.

SMA Solar Technology AG can preset special grid parameters for other countries / installation locations according to customer request, after evaluation by SMA Solar Technology AG. You can later make modifications yourself by changing software parameters with respective communication products (e.g. Sunny Data Control or Sunny Explorer) (see section 5.8 "Setting the Grid and Country Parameters" (page 48)). To change grid-relevant parameters, you need a personal access code - the so-called SMA Grid Guard Code. The application form for the personal access code is located in the download area at [www.SMA.de/en](http://www.SMA.de/en), in the "Data sheet" category for each inverter.

## 2.2 Safety Instructions



### DANGER!

**Danger to life due to high voltages in the inverter!**

- All work on the inverter must be carried out by qualified personnel only.
- The appliance is not to be used by children or persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.
- Children should be supervised to ensure that they do not play with the appliance.



### DANGER!

**Danger of burn injuries due to hot enclosure parts!**

- Do not touch enclosure during operation.
- Only touch the lid during operation.



### NOTICE!

**Dust and water in the inverter can damage the device!**

Once the Electronic Solar Switch has been pulled out, the inverter only provides protection rating IP21. The inverter is then no longer protected against water and foreign objects. In order to keep the protection rating IP65 during temporary decommissioning, proceed as follows:

- Unlock and disconnect all DC connectors.
- Open all DC connectors and remove the wires.
- Close all DC inputs with the corresponding DC connectors and the supplied blank plug.
- Securely attach the Electronic Solar Switch again.



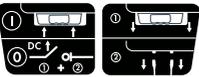
### Grounding the PV Generator

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

## 2.3 Explanation of Symbols

This chapter contains an explanation of all symbols found on the inverter and type label.

### 2.3.1 Symbols on the Inverter

Symbol	Explanation
	Operation display. Indicates the operation condition of the inverter.
	Ground fault, varistor defective or string fuse defective Read section 9 "Troubleshooting" (page 66).
	Disturbance or fault Read section 9 "Troubleshooting" (page 66).
	Tap to switch on the display light and switch to the next display message.
	Electronic Solar Switch (ESS) DC load disconnection unit <ul style="list-style-type: none"> <li>❶ When the Electronic Solar Switch is plugged in, the DC circuit is closed.</li> <li>❷ To interrupt the DC circuit and disconnect the inverter securely under load, you have to first pull out the Electronic Solar Switch ❶ and then remove all DC plug connectors ❷, as described in section 7.2 "Opening the Inverter" (page 56).</li> </ul>

### 2.3.2 Symbols on the Type Label

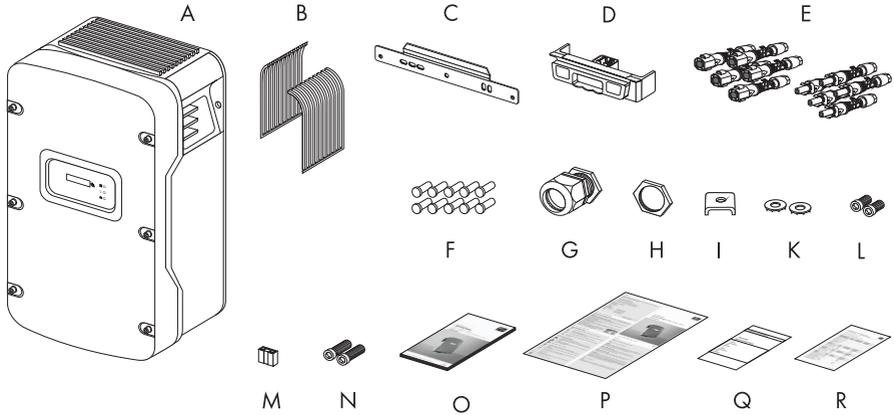
Symbol	Explanation
	Beware of dangerous electrical voltage. The inverter operates at high voltages. All work on the inverter must be carried out by qualified personnel only.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Observe all documentation that accompanies the inverter.

Symbol	Explanation
	<p>The inverter must not be disposed of with the household waste. For more information on disposal, see section 10.4 "Disposing of the Inverter" (page 81).</p>
	<p>CE mark. The inverter complies with the requirements of the applicable EC guidelines.</p>
	<p>The inverter is transformerless.</p>
	<p>Direct Current (DC)</p>
	<p>Alternating current (AC)</p>
	<p>Protection rating IP65. The inverter is protected against penetration by dust particles and water jets from any angle.</p>
	<p>RAL quality mark for solar products. The inverter complies with the requirements of the German Institute for Quality Assurance and Labeling.</p>

## 3 Unpacking

### 3.1 Packing List

Check the delivery for completeness and any visible external damage. Contact your dealer if anything is damaged or missing.



Object	Number	Description
<b>A</b>	1	Sunny Mini Central
<b>B</b>	1	Air grills (right / left)
<b>C</b>	1	Wall mounting bracket
<b>D</b>	1	Electronic Solar Switch (ESS) DC load disconnection unit
<b>E</b>	10	DC plug connectors (5 x positive / 5 x negative)
<b>F</b>	10	Blank plugs for DC plug connectors
<b>G</b>	1	Cable screw connection for AC connection
<b>H</b>	1	Counter nut for cable gland at AC connection
<b>I</b>	1	Clamping clip for additional grounding
<b>K</b>	2	Tooth lock washers: 1 x for cover screws (replacement), 1 x for ground connection cable terminal
<b>L</b>	2	Cylinder head screws (M6x16): 1 x for lid (replacement), 1 x for ground connection cable terminal
<b>M</b>	1	Jumper for fan test
<b>N</b>	2	Cylinder head screws (M6 x 8) for securing the Sunny Mini Central to the wall mounting bracket
<b>O</b>	1	Installation guide
<b>P</b>	1	User manual
<b>Q</b>	1	Set of documents with explanations and certificates
<b>R</b>	1	Supplementary sheet with inverter factory settings

## 3.2 Identifying the Inverter

You can identify the inverter by the type plate. The type label is on the right side of the enclosure.

The serial number (Serial No.) and the type (Type / Model) of the inverter, as well as device-specific characteristics, are specified on the type label.

## 4 Installing the Device

### 4.1 Safety



#### **DANGER!**

**Danger to life due to fire or explosion!**

Despite careful construction, electrical devices can cause fires.

- Do not mount the inverter on flammable construction materials.
- Do not mount the inverter in areas where highly flammable materials are stored.
- Do not mount the inverter in areas with a risk of explosion.



#### **CAUTION!**

**Danger of burn injuries due to hot enclosure parts!**

- Mount the inverter in such a way that it cannot be touched inadvertently.



#### **CAUTION!**

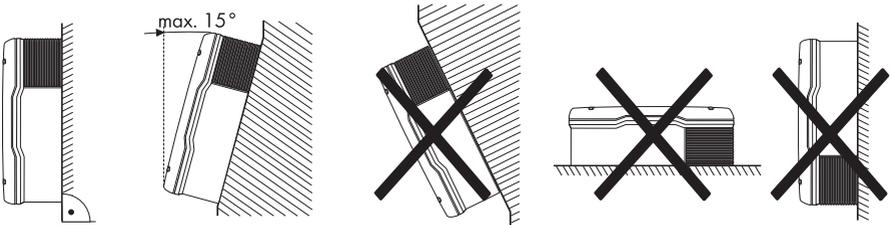
**Risk of injury due to the heavy weight of the inverter!**

- Take the inverter's weight of approx. 35 kg into account for mounting.

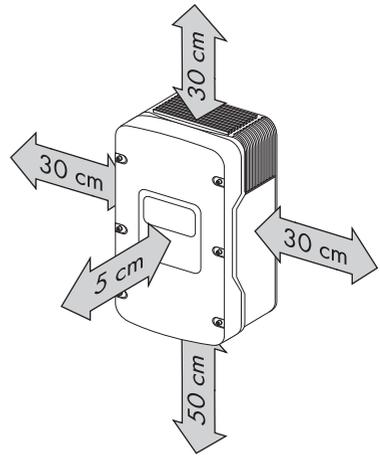
### 4.2 Selecting the Mounting Location

Consider the following requirements when selecting where to install:

- The installation method and mounting location must be suitable for the inverter's weight and dimensions (see section 1.1 "Technical Data" (page 82)).
- Mount on a solid surface.
- The mounting location must at all times be clear and have safe access without the use of additional aids such as scaffolding or lifting platforms. Any possible service actions are otherwise limited.



- Vertical installation or tilted backwards by max. 15°.
- The connection area must point downwards.
- Never install the device with a forward tilt.
- Do not install horizontally.
- Install at eye level to allow operating status to be read at all times.
- The ambient temperature should be below 40 °C to ensure optimal operation.
- Do not expose the inverter to direct sunlight to avoid a power reduction due to excessive heating.
- In living areas, do not mount the unit on plasterboard walls or similar in order to avoid audible vibrations. The inverter can make noises when in use which may be perceived as a nuisance in a living area.
- Observe the minimum clearances to walls, other inverters, or objects as shown in the diagram in order to guarantee sufficient heat dissipation and to have enough space for removing the Electronic Solar Switch.



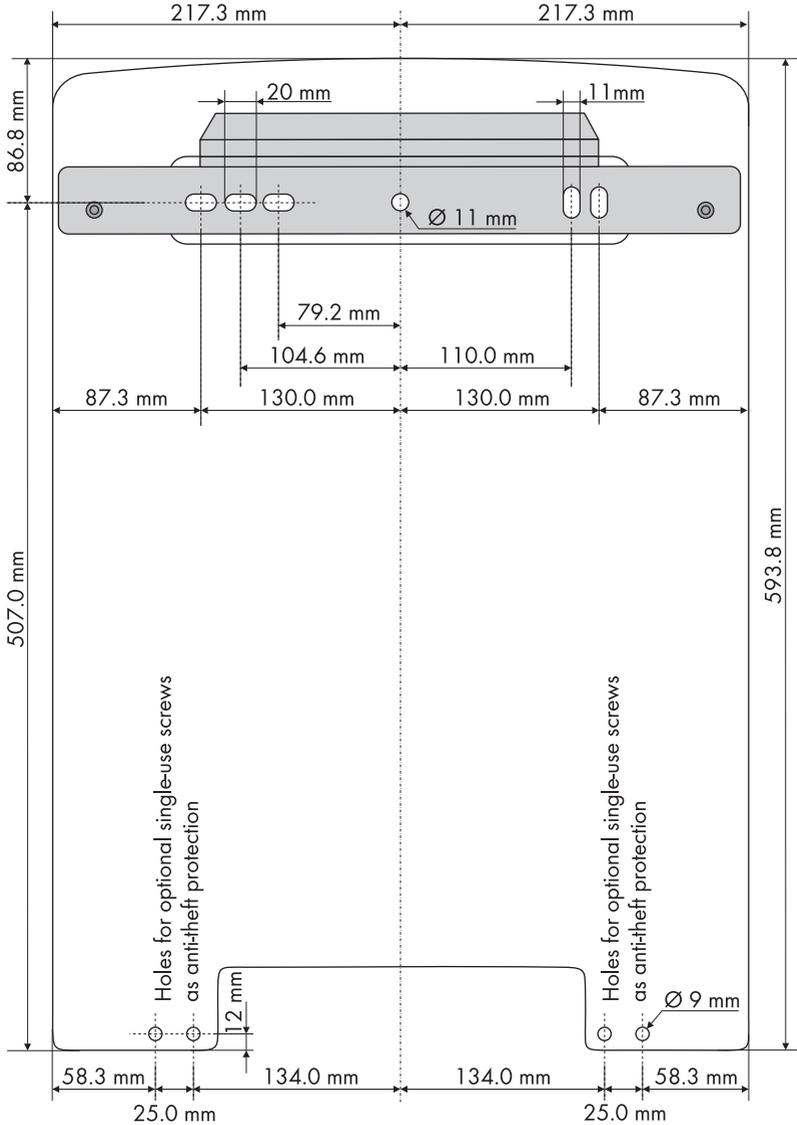
### Multiple inverters installed in areas with high ambient temperatures

There must be sufficient clearance between the individual inverters to ensure the cooling air from the adjacent inverter flows freely.

If necessary, increase the clearances and make sure there is enough ventilation to ensure sufficient cooling of the inverters.

### 4.3 Mounting the Inverter with the Wall Mounting Bracket

1. Mark the position of the drill holes using the wall mounting bracket and drill the holes. Use at least 2 of the 6 holes, with one hole on the right and one on the left.

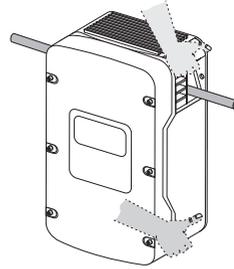


**CAUTION!**

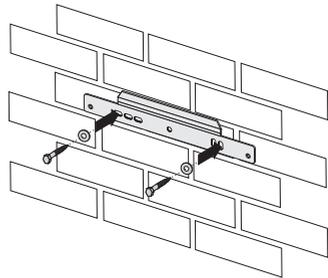
**Risk of injury due to the heavy weight of the inverter!**

The inverter weighs approx. 35 kg.

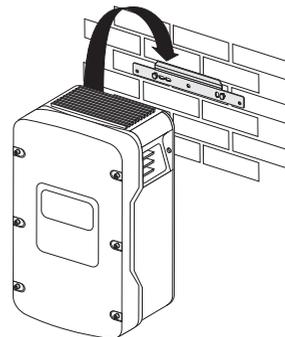
- Attach the wall mounting bracket with the corresponding mounting material (depending on the surface).
- Use the side handles (above and below) or a steel rod (maximum diameter of 30 mm) for transport and mounting. The rod must be pushed through the enclosure openings.



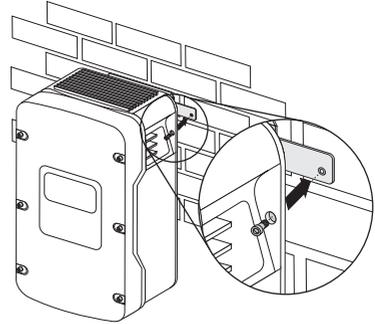
2. Secure the wall mounting bracket to the wall using appropriate screws and washers.



3. Using the mounting hole, attach the inverter to the rear panel of the enclosure in the wall mounting bracket.

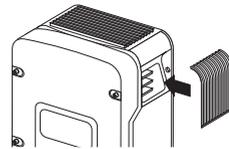


4. Screw the inverter to the wall mounting bracket on both sides using the screws (M6x8) provided.  
Only tighten the screws hand-tight.



5. Check to ensure the inverter is firmly fastened.
6. Close the recessed grips with the fan grills provided. The air grills are marked "rechts/right" and "links/left" on the interior for proper assignment.

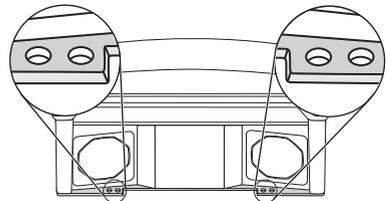
The air grills prevent dirt and insects from entering the device and, if necessary, can be reordered from SMA Solar Technology AG (see section 12 "Accessories" (page 88)).



**Optional Theft Protection**

To protect the inverter against theft, the rear panel can be secured to the wall at the bottom using 2 single-use bolts.

The other two holes are spares.



## 5 Electrical Connection



**NOTICE!**

**Electrostatic discharges can damage the inverter!**

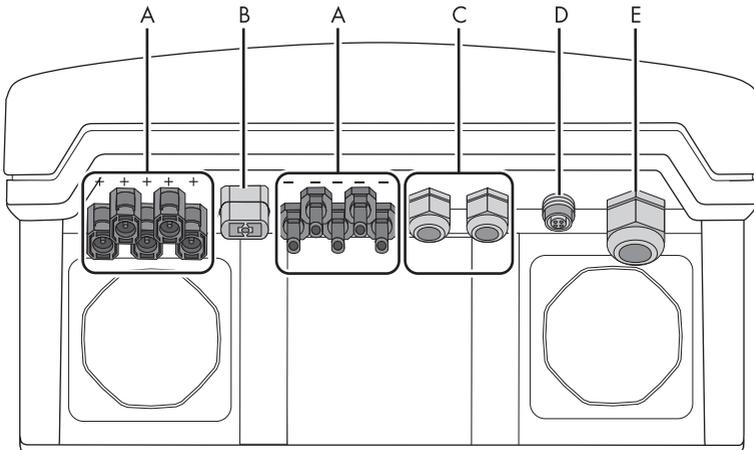
Internal components of the inverter can be irreparably damaged by static discharge.

- Ground yourself before touching a component.

### 5.1 Overview of the Connection Area

#### 5.1.1 Exterior View

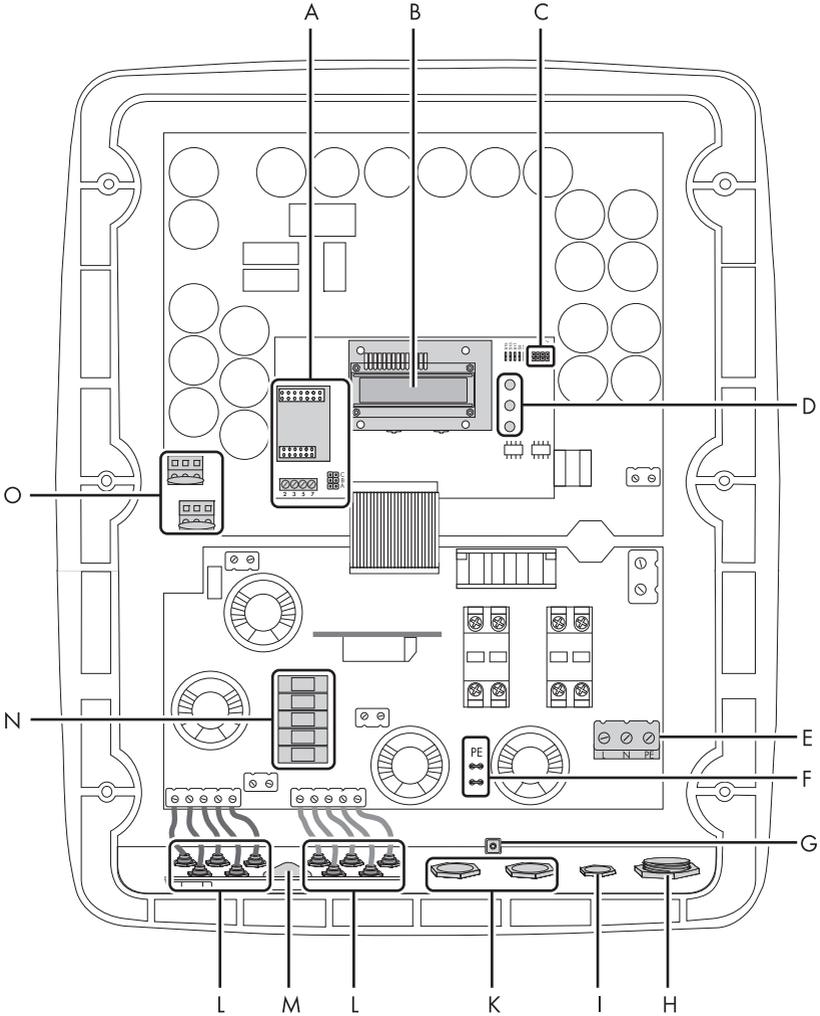
The following figure shows the assignment of the individual connection areas on the bottom of the inverter.



Object	Description
<b>A</b>	DC connector for connecting the PV strings
<b>B</b>	Socket for connecting the Electronic Solar Switch (ESS) DC load disconnection unit
<b>C</b>	Enclosure openings for optional communication via RS485 or radio (PG16)
<b>D</b>	Connection of the SMA Power Balancer
<b>E</b>	Enclosure opening for connecting to grid (AC) (18 mm ... 32 mm)

### 5.1.2 Interior View

The following illustration shows the various components and connection areas of the open inverter.



Object	Description
<b>A</b>	Connection area and sockets for communication (Page 48)
<b>B</b>	Display
<b>C</b>	Jumper slot for fan test (Page 62)
<b>D</b>	LEDs for displaying the operating modes (Page 56)

<b>Object</b>	<b>Description</b>
<b>E</b>	Connection terminals for mains cable (AC) (Page 24)
<b>F</b>	Male connector for grounding the cable shield for communication (Page 48)
<b>G</b>	Screwing device for shield clamp for communication cable (Page 48)
<b>H</b>	Enclosure opening for mains cable (AC) (Page 24)
<b>I</b>	Connection socket for SMA Power Balancer (Page 39)
<b>K</b>	Enclosure openings for communication (Page 48)
<b>L</b>	DC connector (Page 32)
<b>M</b>	Connection socket for Electronic Solar Switch (ESS) DC load disconnection unit (Page 32)
<b>N</b>	Slot for string fuses (Page 30)
<b>O</b>	Varistors (Page 75)

## 5.2 Connection to the Public Grid (AC)

### 5.2.1 Conditions for the AC Connection



#### Connection requirements of the utility operator

Always observe the connection requirements of your utility operator!

#### Dimensioning of the Cables

The conductor cross-section should be dimensioned in a way that output losses do not exceed 1 % at nominal power. Use "Sunny Design" ([www.SMA.de/en](http://www.SMA.de/en)) for this.

The maximum cable lengths relative to the conductor cross-section are shown in the following table.

Conductor cross-section	Maximum wire length		
	SMC 9000TL-10 / SMC 9000TLRP-10	SMC 10000TL-10 / SMC 10000TLRP-10	SMC 11000TL-10 / SMC 11000TLRP-10
16.0 mm <sup>2</sup>	27 m	24 m	22 m
25,0 mm <sup>2</sup> <sup>a)</sup>	43 m	38 m	35 m
<sup>a)</sup> Only use flexible cables!			



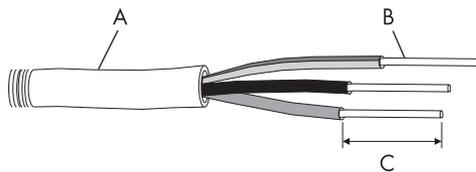
#### Cut line losses in half

If three inverters with symmetrical feeding are combined to form a three-phase system, the neutral conductor is not subjected to any load, and the line losses are halved. Thus, the maximum possible cable length is doubled.

The conductor cross-sectional area required in individual cases depends on the following factors:

- ambient temperature,
- routing method,
- UV resistance.

#### Cable Requirements



Position	Description	Value
A	External diameter	18 mm ... 32 mm
B	Conductor cross-section	Max. 25 mm <sup>2</sup>
C	Strip insulation	Approx. 18 mm

## Load Disconnection Unit

You must install a **separate** line circuit breaker for each inverter in order to ensure that the inverter can be securely disconnected under load. The maximal permissible rating is located in section 11 "Technical Data" (page 82).

Detailed information and examples for the rating of a line circuit breaker can be found in the Technical Information "Line Circuit Breaker" in the SMA Solar Technology AG download area at [www.SMA.de/en](http://www.SMA.de/en).



### DANGER!

#### Danger to life due to fire!

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

- Never connect several inverters to the same line circuit breaker.
- Comply with the maximum permissible fuse protection of the inverter when selecting the line circuit breaker.

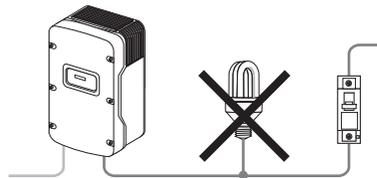


### DANGER!

#### Danger to life due to fire!

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

- Never connect consumers between the inverter and the line circuit breaker without protection.
- Always protect consumers separately.



### NOTICE!

#### Damage to the inverter by using screw type fuse elements as load disconnection unit!

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

When disconnecting under load using a screw type fuse element, the inverter can be damaged.

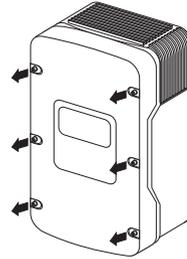
- Use only a load disconnecting switch or a line circuit breaker as load disconnecting unit.

## 5.2.2 Connecting the Inverter to the Public Grid (AC)

1. Check the grid voltage and compare with " $V_{AC\ nom}$ " on the type label.

The exact operating range of the inverter is specified in the operating parameters. The corresponding document is located in the download area at [www.SMA.de/en](http://www.SMA.de/en), in the "Technical Description" category of the respective inverter.

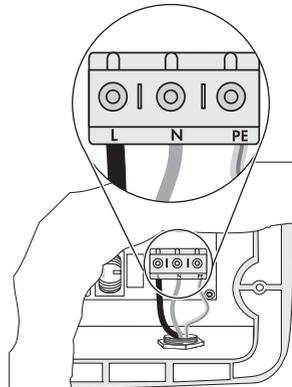
2. Disconnect the line circuit breaker and secure against re-connection.
3. Loosen all cover screws and remove the cover.



4. Remove tape on the AC enclosure opening (see "E" on Page 21).
5. Insert the AC screw clamp into the enclosure opening from the outside and tighten it with the counter nut from the inside.
6. Pull the cable through.
7. Connect L, N and the protective conductor (PE) to the terminal blocks using a screwdriver in accordance with the label.

To do this, the PE wire must be 5 mm longer than the L and N wires.

L and N must not be swapped.

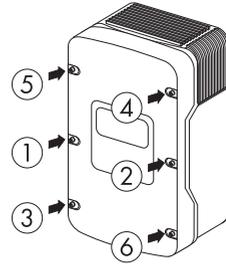


8. Securely close the clamp at the enclosure opening.

9. Secure the lid with all screws and the corresponding tooth lock washers.

Tighten the screws with 6 Nm torque in the order shown on the right hand side. The tothing of the tooth lock washers must face toward the lid.

The inverter packing list includes another spare screw and tooth lock washer.



**DANGER!**

**Danger to life due to live lid!**

The grounding of the enclosure lid is ensured by the tooth lock washers.

- Fasten the tooth lock washers for all 6 screws with the tothing facing toward the lid.



**DANGER!**

**Danger to life due to high voltages in the inverter!**

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

- The inverter is now connected to the public grid (AC).

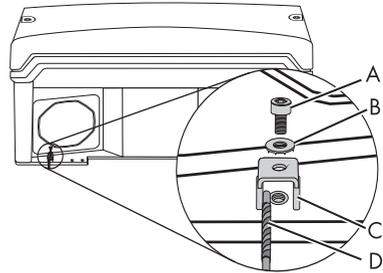
### 5.2.3 Additional Grounding of the Housing

If a second protective conductor connection is required in the country of installation, you can also ground the inverter using a second protective conductor on the connection terminal on the enclosure.

#### Procedure

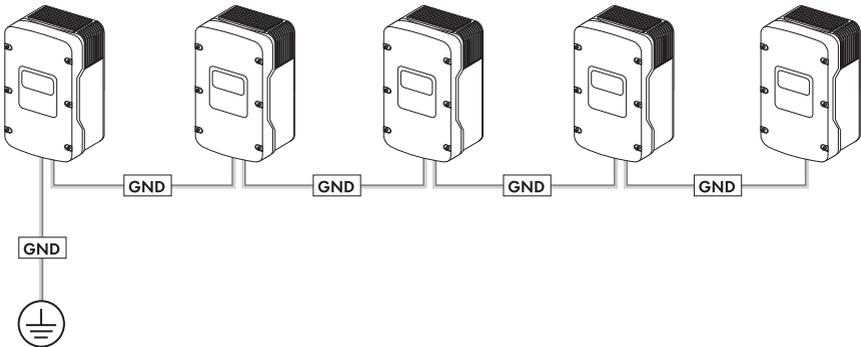
1. Insert the stripped grounding cable (D) under the clamping clip (C) (max. cross-section 16 mm<sup>2</sup>).
2. Screw the clamping clip tight with screw (A) and tooth lock washer (B).

The tothing of the tooth lock washer must face toward the clamping clip.



- The inverter's enclosure is additionally grounded.

You can ground multiple inverters as shown in the diagram below:



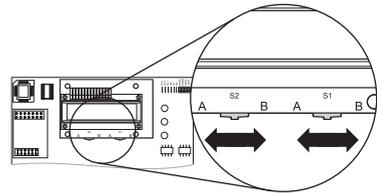
## 5.3 Setting the Display Language

You can set the language of the display using the switches on the underside of the display assembly inside the inverter.

### Procedure

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 56).
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 inverter as described in section 7.3 "Closing the Inverter" (page 59).
- The display language is now set.

## 5.4 Installing the String Fuses

The Sunny Mini Central can be equipped with special string fuses to protect the PV modules from reverse currents. Whether string fuses must be used depends on the PV modules used and the number of strings directly connected to the Sunny Mini Central. If necessary, consult the module manufacturer.

The Sunny Mini Central is equipped with factory-installed jumpers. The inputs are thus unprotected. If necessary, the jumpers can be replaced with special string fuses (thermal fuses). At the moment, SMA Solar Technology AG offers the following add-on kits:

- 5 x 8 A
- 5 x 10 A
- 5 x 12 A
- 5 x 16 A
- 5 x 20 A

Section 12 "Accessories" (page 88) contains a list of the SMA order numbers. Additional types are available upon request.



### NOTICE!

**The Sunny Mini Central can be damaged if the string fuses burn out!**

When using commercially available fuses, it cannot be ensured that they will function correctly and in case of a fault, the string fuses may burn out.

- Only use add-on kits provided by SMA Solar Technology AG.

If installed, the string fuses in the Sunny Mini Central will be monitored automatically. In the case of a burnt-out fuse, the error message "Check DC fuse" appears in the display. However, the Sunny Mini Central continues to feed electricity.

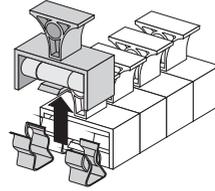


### Equip all slots with a string fuse

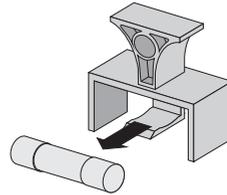
To ensure that the fuse monitoring function is working properly, all 5 slots must be equipped with the appropriate fuses at all times. This also applies if fewer strings are connected.

### Mounting String Fuses

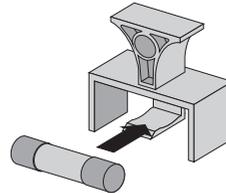
1. Open the Sunny Mini Central as described in section 7.2 "Opening the Inverter" (page 56).
2. Remove all fuse extractors (for slot see section 5.1.2 "Interior View" (page 22)).



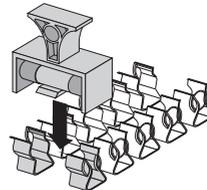
3. Remove jumpers from the fuse extractors.



4. Insert the string fuses in the fuse extractors.



5. Insert the fuse extractors in the slots.



6. Close the Sunny Mini Central as described in section 7.3 "Closing the Inverter" (page 59).

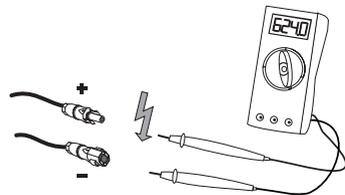


**WARNING!**

**Danger of burn injuries due to electric arc in the Sunny Mini Central!**

If a string is connected with the poles reversed it can cause an electric arc via the string fuse.

- Check every string separately for correct polarity before connecting the DC connector.



## 5.5 Connection of the PV Generator (DC)

### 5.5.1 Conditions for the DC Connection



#### Use of Adaptors

Adaptors (branch connectors) are not to be visible or freely accessible in the immediate surroundings of the inverter.

- The DC current flow may not be interrupted via adaptors.
- Observe the procedure for disconnecting the inverter as described in section 7.2 "Opening the Inverter" (page 56).
- Requirements for the PV modules of the connected strings:
  - Same type
  - Same number
  - Identical alignment
  - Identical tilt
- The connecting cables from the PV modules must be fitted with plug connectors. You will find the necessary DC plug connector for DC connection in the delivery.
- The following limit values at the DC input of the inverter may not be exceeded:

Inverter	Maximum input voltage	Maximum input current
SMC 9000TL-10 / SMC 9000TLRP-10	700 V (DC)	28.0 A (DC)
SMC 10000TL-10 / SMC 10000TLRP-10	700 V (DC)	31.0 A (DC)
SMC 11000TL-10 / SMC 11000TLRP-10	700 V (DC)	34.0 A (DC)



#### DANGER!

Risk of lethal electric shock or fire!

The maximum possible input current per string is limited by the plug connectors used. If the plug connector is overloaded, an electric arc may occur and there is a fire risk.

- Ensure that the input current for each string does not exceed the maximum flow current of the plug connectors used.



#### The residual current breaker

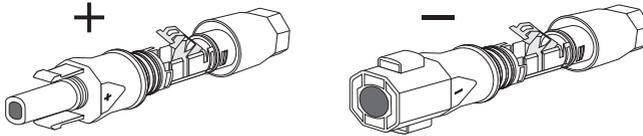
The inverter is equipped with an integrated universal current sensitive residual-current monitoring unit. The inverter can automatically differ between real fault currents and "normal" capacitive leakage currents.

If an external RCD or residual current breaker is strictly required, you must use a switch that triggers at a failure current of 100 mA or higher.

### 5.5.2 Assembling the DC Plug Connector

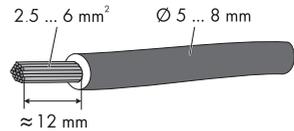
In order to connect to the inverter, all connecting cables of the PV modules must be equipped with the DC plug connectors provided.

To assemble the DC plug connectors, proceed as detailed below. Ensure the plug connectors have the correct polarity. The DC plug connectors are marked with "+" and "-".



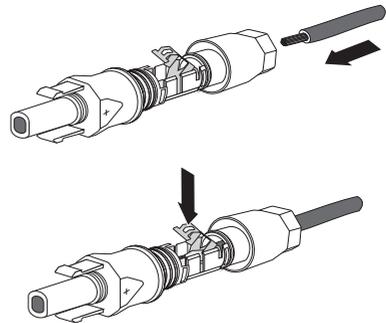
#### Cable requirements:

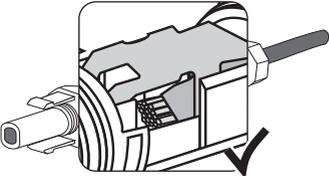
- Use a PV1-F cable.

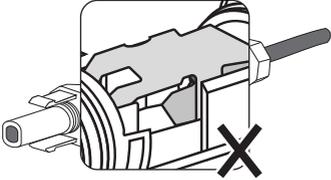
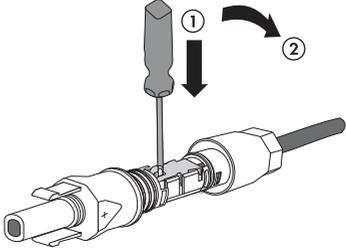


#### Procedure

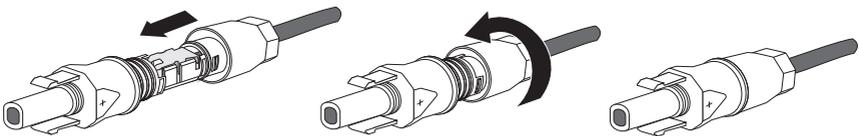
1. Insert the stripped cable into the plug connector as far as it will go.
2. Press the clamping bracket down until it audibly snaps into place.
3. Ensure the cable is correctly in place.



Result	Action
<p>☑ If the conductors are visible in the hollow cavity of the clamping clip, the cable is in the correct position.</p> 	<ul style="list-style-type: none"> <li>• Proceed to step 4.</li> </ul>

Result	Action
<p>☑ If the conductor is <b>not</b> visible in the hollow cavity of the clamp, the cable is not in the correct position.</p> 	<ul style="list-style-type: none"> <li>Loosen the clamping clip with the help of a screwdriver.</li> </ul>  <ul style="list-style-type: none"> <li>Remove cable and start again from step 1.</li> </ul>

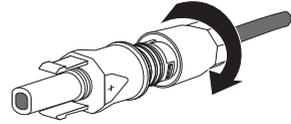
4. Push the threaded joint to the thread and screw into place.



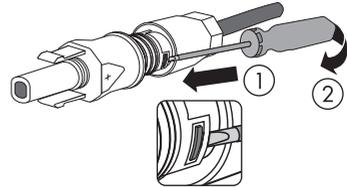
☑ The DC plug connectors are now assembled and can be connected to the inverters, as described in section 5.5.4 "Connecting the PV Generator (DC)" (page 36).

### 5.5.3 Opening the DC Plug Connector

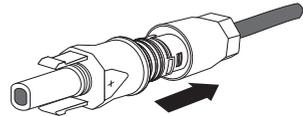
1. Screw the threaded joint off.



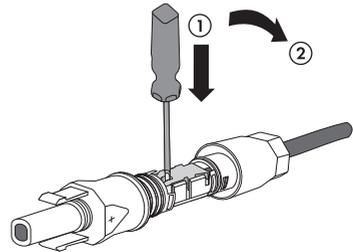
2. To release the plug connector, slot a screw driver into the side catch mechanism and lever out.



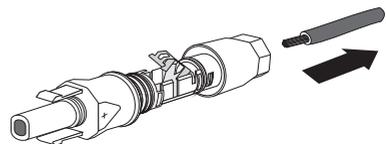
3. Carefully pull the DC plug connector apart.



4. Loosen the clamping clip with the help of a screwdriver.



5. Remove the cable.



- The cable is now removed from the DC plug connector.

### 5.5.4 Connecting the PV Generator (DC)

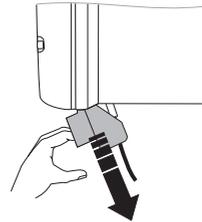
**DANGER!**  
 Danger to life due to high voltages in the inverter!

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

**NOTICE!**  
 Excessive voltages can destroy the measuring device!

- Only use measuring devices with a DC input voltage range of at least 1000 V.

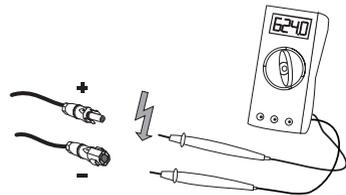
1. Disconnect the line circuit breaker and secure against re-connection.
2. Pull the Electronic Solar Switch downwards, slightly towards the wall.



3. Check the connection cables of the PV modules for correct polarity and that the maximum input voltage of the inverter is not exceeded.

At an ambient temperature higher than 10 °C, the open circuit voltage of the PV modules must not be more than 90 % of the maximum inverter input voltage.

Otherwise, check the system design and the PV module connection. If this is not done, the maximum inverter input voltage can be exceeded at low temperatures.





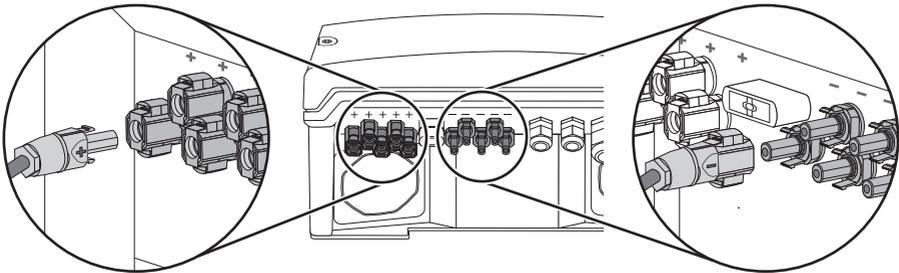
**NOTICE!**

**Destruction of the inverter due to overvoltage!**

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

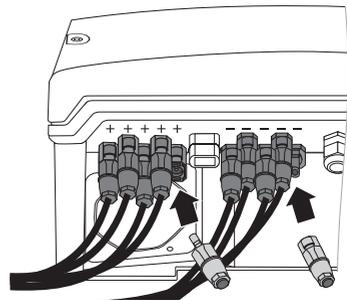
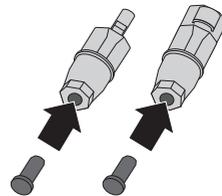
- Do not connect strings with an open circuit voltage greater than the maximum input voltage of the inverter.
- Check the system design.

4. Check the strings for ground faults, as described in section 9.3 "The Red LED Glows Continuously (Ground Fault)" (page 74).
5. Check the DC plug connector for correct polarity and connect it. To release the plug connectors see section 7.2 "Opening the Inverter" (page 56).

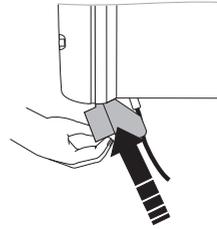


6. To create the sealing on the inverter, all the DC inputs have to be closed as follows:

- Insert the blank plugs provided into the unnecessary DC plug connectors. Do **not** insert the sealing plugs into the DC inputs on the inverter.
- Insert the DC plug connectors with sealing plugs into the corresponding DC inputs on the inverter.



7. Check the Electronic Solar Switch for wear, as described in section 8.2 "Checking the Electronic Solar Switch (ESS) for Wear" (page 65) and attach it firmly.

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

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

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

**NOTICE!****Damage to Electronic Solar Switch!**

If not plugged correctly, the Electronic Solar Switch can be damaged by high voltages.

- Connect the holder firmly on to the socket of the Electronic Solar Switch.
- Make sure that the device is securely in place.

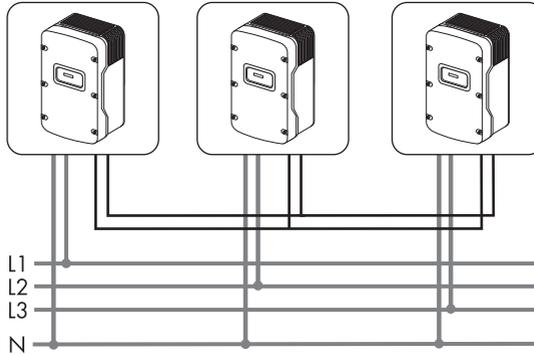
- The PV generator is now connected.

You can now commission the inverter as described in section 6 "Commissioning" (page 55). The following connection options are optional.

## 5.6 Connection of the SMA Power Balancer

The Sunny Mini Central is equipped with the SMA Power Balancer as standard. This enables a circuit connection of three Sunny Mini Central to a three-phase feed-in system.

Each of the 3 Sunny Mini Central devices in a group must be connected to a different phase conductor of the low-voltage grid (L1, L2 and L3)!



By activating this circuit, you can stipulate how the other two Sunny Mini Central devices are to react if there is a device fault with the third Sunny Mini Central or there is a grid voltage fault in its phase.



### Three-phase grid connection

For further information on this subject, see the technical information "Three-phase grid connection with Sunny Mini Central" in the download area at [www.SMA.de/en](http://www.SMA.de/en).

The connections for the SMA Power Balancer are galvanically isolated from the rest of the Sunny Mini Central circuit.



### Cable for the connection of the SMA Power Balancer connector system

The cable for the connection is not provided as standard, but rather must be ordered separately from SMA Solar Technology AG (see section 12 "Accessories" (page 88)).

### 5.6.1 Configuration

The SMA Power Balancer is deactivated at the factory using the "PowerBalancer" parameter (parameter setting = off) and can only be activated and configured using a communication device. To change the "PowerBalancer" parameter, you need a personal access code - the so-called SMA Grid Guard Code. The application form for the personal access code is located in the download area at [www.SMA.de/en](http://www.SMA.de/en), in the "Data sheet" category for each inverter.

The configuration options are detailed below.

## Configuration Options

There are 4 different configuration options for the "PowerBalancer" parameter.



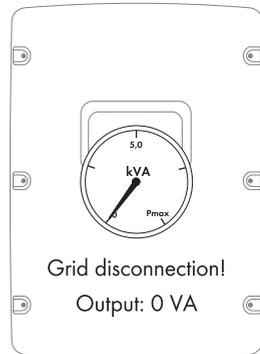
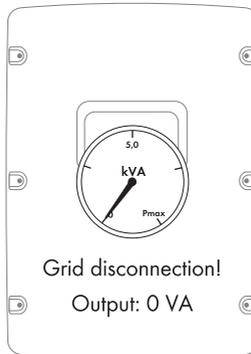
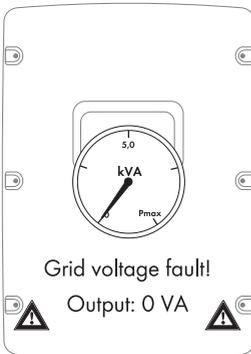
### Local connection requirements

Select the respective setting and always observe the local connection requirements and provisions of your utility operator.

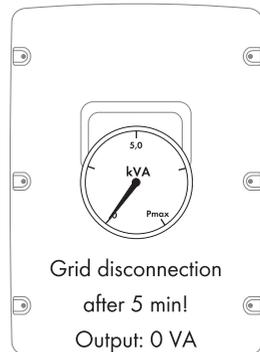
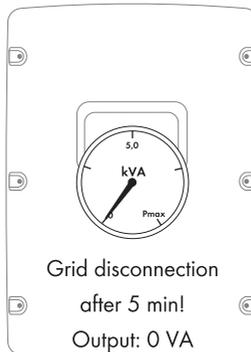
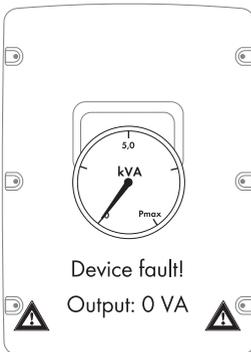
- **FaultGuard**

This operating mode allows to implement a three-phase grid voltage monitoring that also reacts to device failures.

- If one of the three inverters indicates a **grid voltage fault** and stops feeding in, the other two inverters also disconnect from the grid immediately.



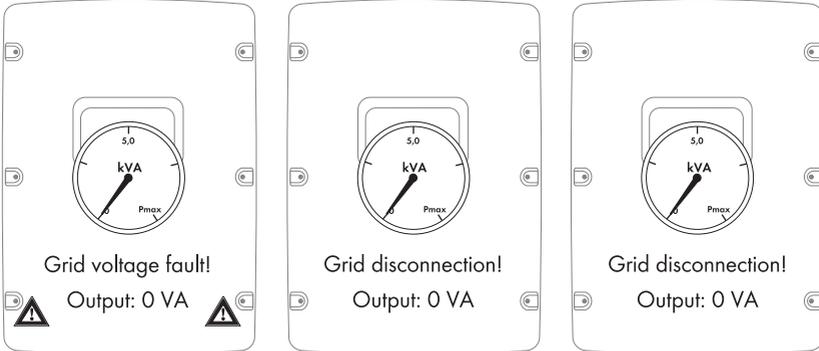
- If one of the three inverters indicates a **device fault** and stops feeding in, the other two inverters also disconnect from the grid 5 minutes later.



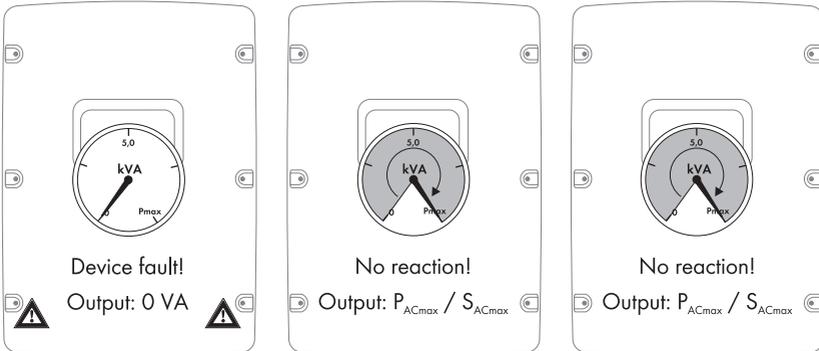
- **PhaseGuard**

This operating mode allows to implement a three-phase grid voltage monitoring.

- If one of the three inverters indicates a **grid voltage fault** and stops feeding in, the other two inverters also disconnect from the grid automatically.



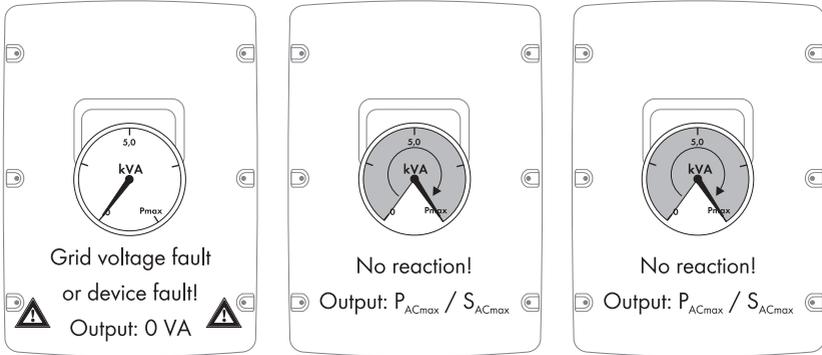
- If one of the three inverters indicates a **device fault** and stops feeding in, the other two inverters are not affected and continue to feed in at full power.



- **Off**

The SMA Power Balancer is deactivated (factory setting).

- In the event of a **device fault** or **grid voltage fault** at an inverter, only this inverter is disconnected from the grid and the other two inverters continue to run at an undiminished power level.



- **PowerGuard**

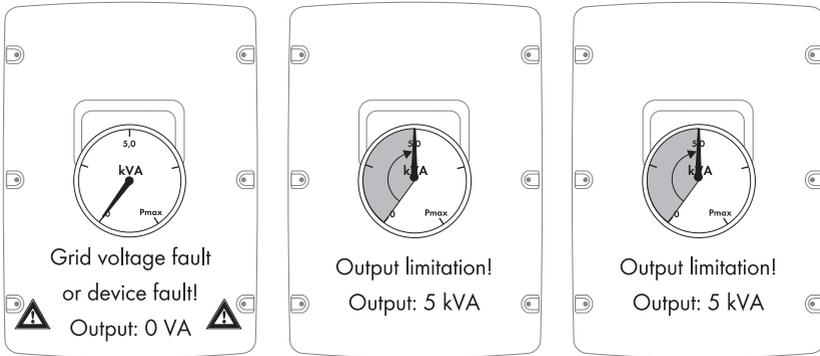
This setting can be selected, if the entire PV plant consists of three 3 Sunny Mini Central inverters only and in case of a failure the unbalanced load shall be limited to 5 kVA over a 10-minute average.



**Unbalanced load limitation in case of SMC 9000TL-10/IT / 10000TL-10/IT / 11000TL-10/IT (applies exclusively to Italy)**

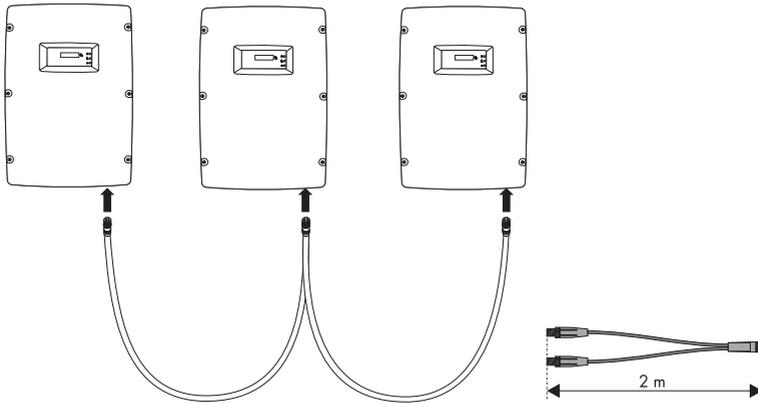
In the case of the Sunny Mini Central 9000TL-IT / 10000TL-IT / 11000TL-IT, the unbalanced load is limited to 6 kVA.

- If one of the three inverters indicates a **grid voltage fault** or **device fault** and stops feeding in, the other two inverters automatically limit their power to 5 kVA over a 10 minute average.



### 5.6.2 Cabling

A group of 3 Sunny Mini Central units is cabled according to the following diagram:

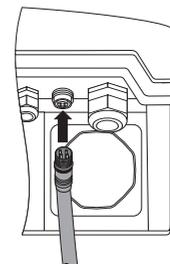
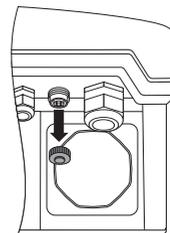


#### Connecting Sunny Mini Central units without an SMA Power Balancer connector system

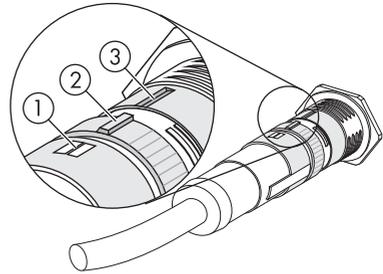
When connecting Sunny Mini Centrals with an SMA Power Balancer but without the SMA Power Balancer connector system, you require a special upgrade kit (order number: PBL-SMC-10-NR) for these Sunny Mini Centrals.

#### Cabling Procedure

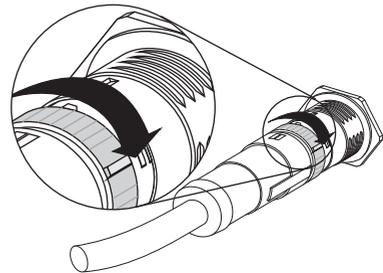
1. Twist off the lid of the threaded joint on the bottom side of the Sunny Mini Central.
2. Plug the SMA Power Balancer cable into the socket.



The markers (1 to 3) must form a line, as illustrated on the right.



3. Tighten the cable screw connection half a turn.



- The cable is now securely connected. The SMA Power Balancer can now be activated via a communication device.

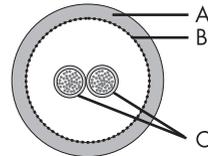
### Extending the Cable

If you must bridge large spans between 2 Sunny Mini Centrals, you can extend the SMA Power Balancer cable.

Use an "LiYCY" cable for this with the illustrated layout:

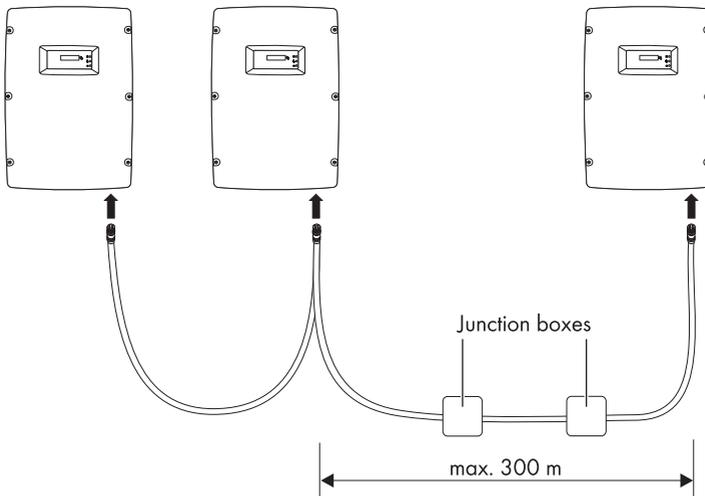
- Indoors: Li-2YCY 1 x 2 x 0.25 mm<sup>2</sup>
- Outdoors: Li-2YCYv 1 x 2 x 0.25 mm<sup>2</sup>

Object	Description
A	Flexible insulation
B	Shielding
C	Twisted pair (1 x 2 x 0.25 mm <sup>2</sup> )



Proceed as follows:

1. Cut the SMA Power Balancer cable in the middle.
2. Connect the wires and shield inside a junction box (outdoors) with an extension cable 1:1 (max. cable length 300 m).



3. Connect the SMA Power Balancer cable to the Sunny Mini Central as described in section "Cabling Procedure" (page 44).

### 5.6.3 Testing the Functioning

To test whether the SMA Power Balancer operates correctly, proceed as follows.

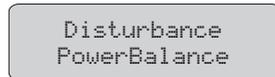
1. Select the "PhaseGuard" setting of the "PowerBalancer" parameter for all three inverters.
2. Check whether all inverters in the group are feeding the grid normally.

- If the green LED lights up steadily or if the display message pictured opposite appears, proceed with point 3.

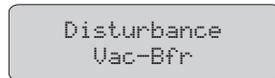


or

- If all inverters in this group show the display message pictured to the opposite: check the installation of the SMA Power Balancer and contact SMA Solar Technology AG, if necessary.

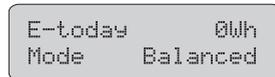


3. Switch off the line circuit breaker for one of the three inverters.
  - The inverter with a deactivated line circuit breaker then indicates a grid voltage fault with the display message shown opposite ("Bfr" and "Srr" are irrelevant).
  - The other two inverters then also disconnect themselves from the grid with the display message shown to the opposite.



Both inverters subsequently switch to "Balanced" mode.

- If the inverters react as described above, the functionality test has been completed successfully. Otherwise, check the configuration.



4. If applicable, reset the "PowerBalancer" parameter to the desired setting in all inverters.
5. Switch on the line circuit breaker again.
- The functionality test has been completed.

## 5.7 Communication

The inverter is equipped with a slot for communication interfaces in order to communicate with special data acquisition devices (e.g. Sunny WebBox) or a PC with corresponding software (e.g. Sunny Data Control or Sunny Explorer).

See the respective communication interface manual for a detailed wiring diagram and an installation description for the interface.

Using the Power Reducer Box from SMA Solar Technology AG, it is possible to set a limit for the active power for all inverters. Also, the reactive power specification can be controlled in Sunny Mini Central units with Reactive Power Control. For detailed information on the Power Reducer Box, see its technical description and the technical information on "Grid safety management" in the download area under [www.SMA.de/en](http://www.SMA.de/en).

## 5.8 Setting the Grid and Country Parameters



### Changing Grid-Relevant and Country Parameters

To change grid-relevant parameters, you need a personal access code - the so-called SMA Grid Guard Code. The application form for the personal access code is located in the download area at [www.SMA.de/en](http://www.SMA.de/en), in the "Data sheet" category for each inverter.

Ensure that you discuss the changes to these parameters with your utility operator.

A detailed description of the operating parameter for the inverter is available in the download area at [www.SMA.de/en](http://www.SMA.de/en) in the category "Technical Description" of the respective inverter.

### 5.8.1 Setting the Installation Country

Using the "Default" parameter you can set the installation country and/or the grid connection standard valid for the country via a communication device (e.g. Sunny WebBox) or a PC with appropriate software (e.g. Sunny Data Control or Sunny Explorer). This, however, is only required if the inverter was originally ordered for another country. You can see the standard to which the inverter was set upon delivery from the type label and the supplementary document provided with the factory settings.

## 5.8.2 Setting Off-Grid Operation

To operate the inverter in an off-grid system with Sunny Island, you must set the inverter via the "Default" parameter to off-grid ("OFF-Grid") operation.

You have several possibilities to set the inverter to off-grid operation:

- Setting via Sunny WebBox
- or
- Setting via Sunny Data Control or Sunny Explorer.



### DANGER!

**Danger to life due to high voltages in the event of outage of the public grid.**

If you set the inverter to off-grid operation, it does not fulfill any country-specific standards and regulations. Therefore, if there is an outage of the public grid, there is a danger of back feed.

- **Never** operate the inverter directly on the public grid when set to off-grid operation.

## 5.8.3 Additional Country Parameter



### Requirements for the setting

Set the installation country as described in section 5.8.1 "Setting the Installation Country" (page 48) before setting the country parameter described here.

The deactivation criteria (voltage, frequency) are specified via country parameters for all Sunny Mini Central inverters.

Type SMC 9000TLRP-10 / 100000TLRP-10 / 110000TLRP-10 Sunny Mini Centrals have an additional default country parameter "MVtgDirective". This parameter expands the deactivation limits of the inverter for voltage and frequency to a maximum / minimum. This country setting may only be selected if the plant or inverter is operated with an external three-phase decoupling protection, which disconnects the Sunny Mini Central from the grid automatically if non-permissible voltage and frequency values occur. Device protection is still guaranteed.



### DANGER!

**Risk of lethal electric shock if external decoupling protection is missing!**

If the country setting is "MVtgDirective", the Sunny Mini Central with Reactive Power Control may only be operated with an external three-phase decoupling protection device which complies with the country-specific requirements.

Without this external decoupling protection, the Sunny Mini Central does not disconnect from the grid when the standard requirements are exceeded.

- Install external three-phase decoupling protection.

## 5.9 Reactive Power and Grid Management

Sunny Mini Central units 9000TL / 10000TL / 11000TL with Reactive Power Control are reactive power-compatible inverters and can feed in reactive power by entering a shift factor ( $\cos \varphi$ ). These inverters are also equipped with advanced grid management functions for output control, which can be activated and configured in accordance with the requirements of the utility operator.

The configuration parameters are protected by the SMA Grid Guard Code password. However, they can only be accessed at the installer level. To set all parameters you need a personal SMA Grid Guard Code and the installer password. The application form for the SMA Grid Guard Code is located in the download area at [www.SMA.de/en](http://www.SMA.de/en), in the "Data sheet" category for each inverter. The installer password can be obtained from the SMA Serviceline upon request. Confirm the changes to these parameters with your utility operator.

With the procedures described below, you can select different settings in which additional configuration parameters can be set.

### 5.9.1 Setting the Displacement Power Factor $\cos \varphi$

The "Q-VArMod" parameter allows you to select the reactive power process for the Sunny Mini Centrals with Reactive Power Control. 3 settings can be selected.

The displacement power factor ( $\cos \varphi$ ) can be specified by setting a software parameter for the corresponding device (Mode 1) or transmitted to multiple devices via the Sunny WebBox in combination with the Power Reducer Box (Mode 2).

The factory setting for the displacement power factor is  $\cos \varphi = 1$  (Mode 1).

#### Procedures and Configuration Parameters



##### Default settings

In the table below, default settings are marked with \*.

Procedure	Setting	Description
Q-VArMod	PFCnst*	Mode 1: Constant displacement power factor $\cos \varphi$ .
	PFCtlCom	Mode 2: Displacement power factor is transferred by communication via Power Reducer Box.
	Off	The process is deactivated.

#### Configuration Options for "PFCnst"

Setting	Parameters	Description	Value range	Default
PFCnst	PF-PF	Displacement power factor specification $\cos \varphi$ (Mode 1).	0.8 ... 1	1
	PF-PFExt	Type of excitation of the displacement power factor $\cos \varphi$ (Mode 1).	Underexcited, overexcited	Underexcited

## 5.9.2 Frequency-dependent Active Power Limitation P(f)

Activating this function enables active power limitation P depending on the grid frequency  $f_{AC}$ . The process used complies with the Medium Voltage Regulation valid in Germany. However, the settings can also be adjusted to the requirements of other countries or utility operators by means of software parameters.

The "P-WCtlHzMod" parameter allows you to select the frequency-dependent active power limitation P(f). 2 settings can be selected.

This process is deactivated on delivery.

### Procedures and Configuration Parameters



#### Default settings

In the table below, default settings are marked with \*.

Procedure	Setting	Description
P-WCtlHzMod	Off*	The process is deactivated.
	On	The active power is throttled in accordance with the characteristic curve.

### Configuration Options for "On"

Setting	Parameters	Description	Value range	Default
On	P-HzStr	Start frequency (nominal frequency + setting) for active power limitation.	0 ... 5 Hz	0.20 Hz
	P-WGra	Steepness of the active power limitation (gradient).	10 ... 100 %/Hz	40 %/Hz
	P-HzStop	Frequency (nominal frequency + setting) for resetting the active power limitation.	0 ... 5 Hz	0.05 Hz

### 5.9.3 Grid Safety Management via External Active Power Limitation

The "P-WMod" parameter allows you to select the active power process. 3 settings can be selected. The maximum possible AC active power can be set externally for Sunny Mini Central inverters via communication (WebBox with Power Reducer Box) (e.g. via a ripple control signal). This process is activated for all devices on delivery. The active power is restricted via the Power Reducer Box (Mode 1). A fixed limitation of the active power of an individual inverter can also be set, however external specification via the Power Reducer Box is then no longer possible.

#### Procedures and Configuration Parameters



#### Default settings

In the table below, default settings are marked with \*.

Procedure	Setting	Description
P-WMod	Off	The process is deactivated.
	WCnst	Limitation of the maximum active power of the inverter (Mode 2).
	WCtlCom*	Limitation of the maximum active power via communication with a Power Reducer Box (Mode 1).

#### Configuration Options for "WCnst"

Setting	Parameters	Description	Value range	Default
WCnst	P-W	Limitation of the maximum active power.	0 ... 11110	11000

## 5.9.4 Soft Start

Sunny Mini Central units with Reactive Power Control are equipped with a soft start function. After reactivation, for example after a voltage fault or frequency fault, the soft start function increases the output of active power gradually (gradient function). The capacity increases by 10 % of the nominal power per minute.

This process is deactivated on delivery.



### Default settings

In the table below, default settings are marked with \*.

Procedure	Setting	Description
WGrReconEna	0*	Soft start is deactivated.
	1	Soft start is activated.

## 5.9.5 Phase Assignment

The "Phase" parameter allows the Sunny Mini Central units to be assigned to phase L1, L2 or L3. This function allows a communication command to be sent only to the inverters with the specific phase setting when using the Power Reducer Box.



### Default settings

In the table below, default settings are marked with \*.

Parameters	Setting	Description
Phase	----- *	This setting means that no active setting was selected. The inverter reacts as in setting "L1".
	L1	The inverter is assigned to phase L1.
	L2	The inverter is assigned to phase L2.
	L3	The inverter is assigned to phase L3.

## 5.9.6 Limited Dynamic Grid Support

From firmware version 2.00/2.00, the Sunny Mini Central units with Reactive Power Control feature the function for limited the dynamic grid support. Using this function, the inverter can begin feeding again immediately following the end of a short-term interruption to the voltage. The inverter also disconnects from the mains through the internal decoupling protection with the set country parameter and/or through the external three-phase decoupling protection.

This function has 4 adjustable parameters.



### Default settings

In the table below, default settings are marked with \*.

Parameters	Description	Unit	Value range
<b>DGS-PWMVolNom</b>	Cut-off voltage in percent relative to $V_{Ref} + V_{RefOfs}$ . When the AC voltage drops below the value set here, the inverter will stop feeding.	%	40 ... 100
			70*
<b>DGS-HystVolNom</b>	Hysteresis in percent. When the AC voltage exceeds the value set, the inverter starts feeding again.	%	0 ... 60
			5*
<b>VRef</b>	Phase voltage at the output side of the transformer.	V	215 ... 245
			230*
<b>VRefOfs</b>	Adjustable voltage offset (e.g. through output losses).	V	-20 ... +20
			0*

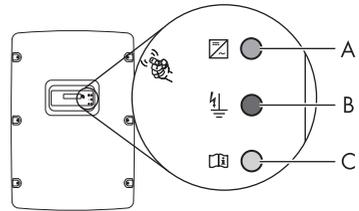
## 6 Commissioning

1. Check the following requirements before commissioning:
  - The inverter is firmly fastened.
  - Correct connection of the AC cable (grid)
  - Full connection of the DC cables (PV strings)
  - Unnecessary DC inputs are closed with the corresponding DC plug connectors and blank plugs
  - The enclosure lid is securely screwed in place
  - Electronic Solar Switch is securely plugged
  - The line circuit breaker is laid out correctly
2. Switch on the line circuit breaker.
  - The green LED is glowing or blinking if there is enough radiation: commissioning has been successful.

or

- The red or yellow LED is glowing or blinking: there is an error. Proceed to step 3.

<b>A</b>	Green LED	In operation
<b>B</b>	Red LED	Ground fault, varistor defective or string fuse defective
<b>C</b>	Yellow LED	Fault



3. Read section 9 "Troubleshooting" (page 66) and if necessary eliminate the fault or disturbance.

## 7 Opening and Closing

### 7.1 Safety



**DANGER!**  
Risk of lethal electric shock!

Observe the following before opening the inverter:

- Ensure the AC side is not live.
- Ensure the DC side is not live.



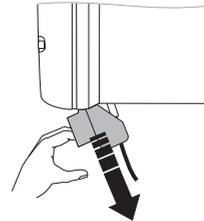
**NOTICE!**  
Electrostatic discharges can damage the inverter.

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

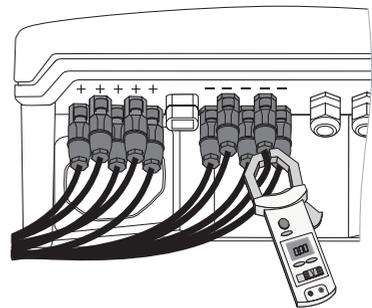
- Ground yourself before touching a component.

### 7.2 Opening the Inverter

1. Disconnect the line circuit breaker and secure against re-connection.
2. Pull the Electronic Solar Switch downwards, slightly towards the wall.

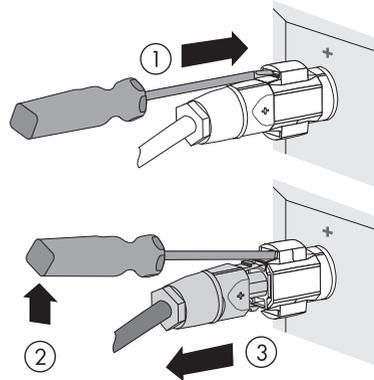


3. Ensure there is no current at any DC cables using a clip-on ammeter.
  - If there is a current present, check the installation.



4. Unlock all DC plug connectors using a screwdriver:

- insert a screwdriver into one of the slits on the sides (1).
- Lever the screwdriver upwards (2) and pull out the plug connector (3).



**DANGER!**  
 Danger to life due to high voltages in the inverter!

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

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

**DANGER!**  
 Danger to life due to high voltages in the inverter!

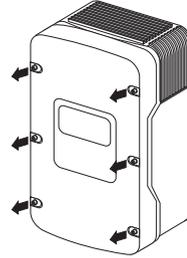
The capacitors in the inverter require 5 minutes to discharge.

- Wait 5 minutes before opening the inverter.

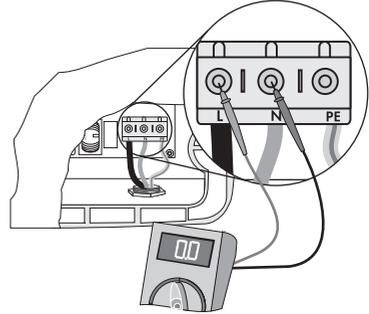
5. Ensure that there is no voltage at the DC plugs at the inverter.

- ☑ If there is a voltage present, check the installation.

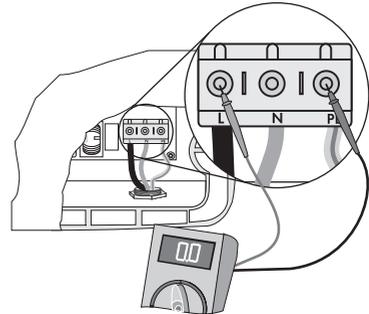
6. Loosen all 6 lid screws and pull the lid forwards to remove it.



7. Verify the absence of voltage L with respect to N at the AC clamp with an appropriate meter.  
 If there is a voltage present, check the installation.



8. Verify the absence of voltage L with respect to ground at the AC clamp with an appropriate meter.  
 If there is a voltage present, check the installation.



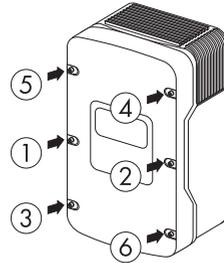
- The inverter is now open and is not live.

## 7.3 Closing the Inverter

1. Secure the lid with the 6 screws and the corresponding tooth lock washers.

Tighten the screws with 6 Nm torque in the order shown on the right hand side. The tothing of the tooth lock washers must face toward the lid.

The inverter packing list includes another spare screw and tooth lock washer.



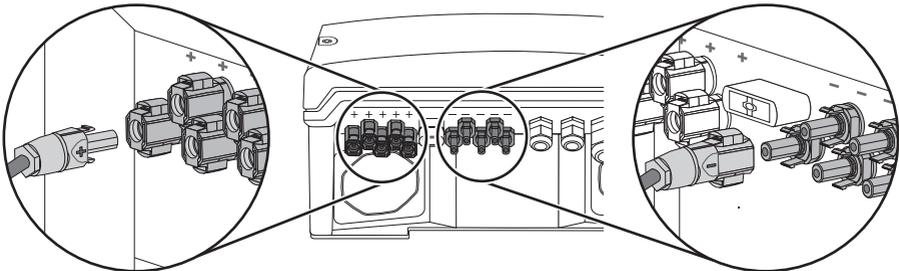
### DANGER!

Danger to life due to live enclosure lid!

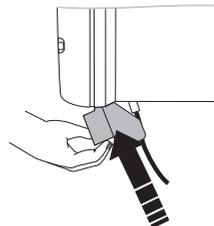
The grounding of the enclosure lid is ensured by the tooth lock washers.

- Fasten the tooth lock washers for all 6 screws with the tothing facing toward the lid.

2. Check the DC plug connector for correct polarity and connect it.  
To release the plug connectors see section 7.2 "Opening the Inverter" (page 56).



3. Close all unnecessary DC inputs as described in section 5.5.4 "Connecting the PV Generator (DC)" (page 36) to seal the inverter.
4. Check the Electronic Solar Switch for wear as described in section 8.2 and firmly attach.



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

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

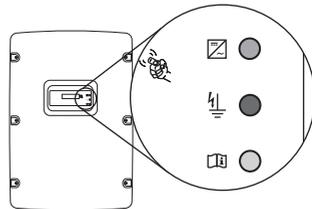
- Do **not** tighten the connector screw in the Electronic Solar Switch handle.

**NOTICE!****Damage to Electronic Solar Switch!**

If not plugged correctly, the Electronic Solar Switch can be damaged by high voltages.

- Connect the holder firmly on to the socket of the Electronic Solar Switch.
- Make sure that the device is securely in place.

5. Switch on the line circuit breaker.
6. Check whether the display and the LEDs indicate normal operating mode (see section 6 "Commissioning" (page 55)).



- The inverter is now closed and in operation.

## 8 Maintenance and Cleaning

### 8.1 Checking Heat Dissipation

#### 8.1.1 Cleaning the fan

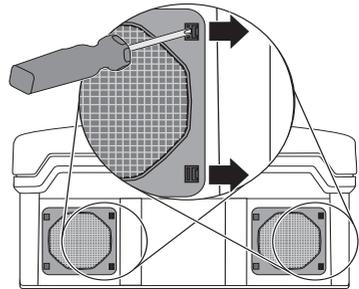
If the fan guards are only soiled with loose dust, they can be cleaned using a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, dismantle the fans for cleaning.

##### Procedure

1. Disconnect the inverter from both the DC and AC connections as described in section 7.2 "Opening the Inverter" (page 56).
2. Wait for the fans to stop rotating.

##### Cleaning the Fan Grills

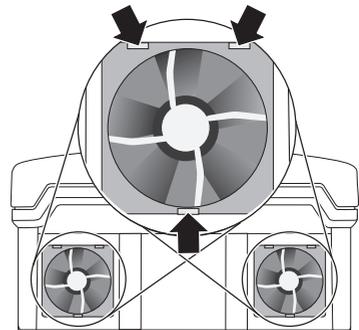
3. To remove the fan grills:
  - Press both latches on the right of the fan grill to the right using a screwdriver and loosen from the bracket.
  - Carefully remove the fan grill.



4. Clean the fan grill with a soft brush, a paint brush, a cloth or compressed air.

##### Cleaning the fan

5. Press the front latches backward and the rear latch forward.



6. Remove the fan by pulling it slowly and carefully downwards.
7. Unlock and remove the plug.  
The fan cables are long enough that you can lift the fans far enough out to disconnect the internal plug in the inverter.
8. Remove the fan.
9. Clean the fan with a soft brush, a paint brush, or a damp cloth.

**NOTICE!****Damage to the fan due to the use of compressed air.**

- Do not use compressed air to clean the fan. This can damage the fan.

10. After cleaning, assemble everything in reverse order.
11. Check the function of the fans as described in the following section.

### 8.1.2 Checking the Fans

You can check that the fans are working in 2 ways:

- Set the "Fan Test" parameter to "1" in the installer mode (using Sunny Data Control, Sunny Explorer or Sunny WebBox).
- or**
- Plug the provided jumper into the system control board.

#### Setting Parameters

1. Request the installer password on the SMA Serviceline (contact: see Page 90).
2. Set the "Fan Test" parameter to "1" in the installer mode.
3. Check the fans' air flow.

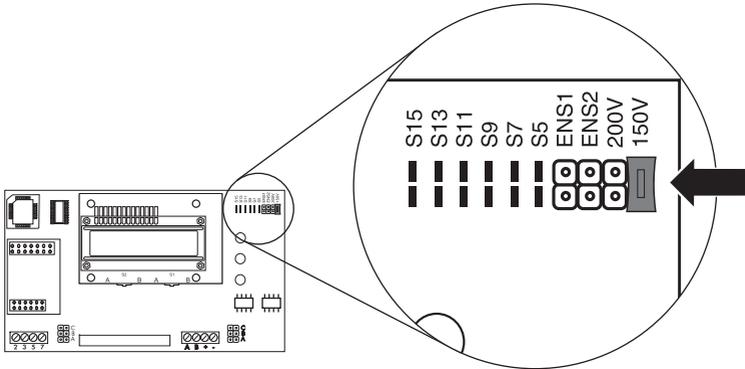
The inverter sucks air in from underneath and then blows it back out on the upper sides. Listen for any unusual noise, which could indicate incorrect installation or that the fans are faulty.

4. After checking the fans, set the "Fan Test" parameter back to 0.
- The test of the fans has been completed.

## Plugging the Jumper

The inverter recognizes the jumper only after the system has been restarted (i.e. all LEDs must have gone out before a restart).

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 56).
2. Plug the provided jumper in the slot on the system control board as shown below.



3. Close the inverter as described in section 7.3 "Closing the Inverter" (page 59).
  4. Check the fans' air flow.
 

The inverter sucks air in from underneath and then blows it back out on the upper sides. Listen for any unusual noise, which could indicate incorrect installation or that the fans are faulty.
  5. After checking the fans, remove the jumper. Open and close the inverter as described in section 7 "Opening and Closing" (page 56).
- The test of the fans has been completed.

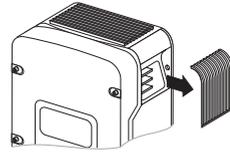
### 8.1.3 Cleaning the Air Grills

The inverter sucks air in from underneath via the fan and blows it out again through the air grills on the upper sides. Clean the air grills if they are dirty.

#### Procedure

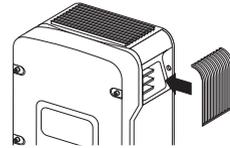
1. Remove the air grills.

Insert your finger above in the space between the air grills and the enclosure and remove the air grills to the side.



2. Clean the air grills with a soft brush, a paint brush, or compressed air.
3. Re-attach the air grills to the inverter.

The air grills must be attached according to the inside inscription ("links/left" and "rechts/right").



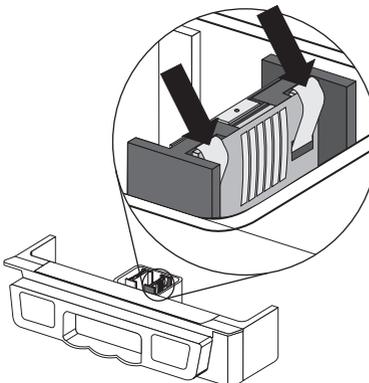
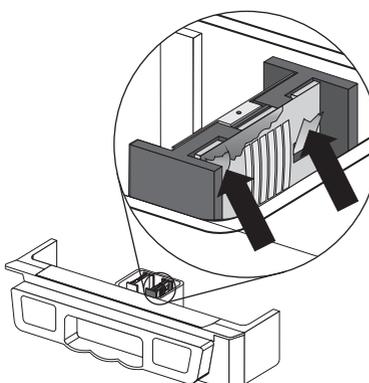
#### NOTICE!

**The inverter can be damaged if insects enter!**

- The air grills must not be removed permanently, because otherwise the device is not protected against the entrance of insects.

## 8.2 Checking the Electronic Solar Switch (ESS) for Wear

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

Result	Action
<p><input checked="" type="checkbox"/> The metal tongues inside the connector are not damaged or discolored.</p> 	<ol style="list-style-type: none"> <li>1. Securely attach the Electronic Solar Switch handle.</li> <li>2. Commission the inverter as described in section 6 "Commissioning" (page 55).</li> </ol>
<p><input checked="" type="checkbox"/> The metal tongues inside the connector have a brown discoloration or are burned through.</p> 	<p>The Electronic Solar Switch can no longer reliably disconnect the DC side.</p> <ol style="list-style-type: none"> <li>1. Replace the Electronic Solar Switch handle before attaching it again (for the order number see section 12 "Accessories" (page 88).</li> <li>2. Commission the inverter as described in section 6 "Commissioning" (page 55).</li> </ol>

## 9 Troubleshooting

If the inverter displays other blink codes or error messages as detailed below, contact the SMA Serviceline.

In the user manual provided, you will also find a description of the display messages during operation, the status messages and measuring channels.

Do not try to carry out repairs other than those described here. Instead, use the SMA Solar Technology AG 24-hour replacement service (the inverter will be ready for dispatch within 24 hours and sent to a forwarding agency) and repair service.

### 9.1 LED Codes

Green	Red	Yellow	Status
Glowes continuously	Is not glowing	Is not glowing	OK (feeding operation)
	Glowes continuously	Is not glowing	Fault
		Glowes continuously	OK (initialization)
Flashes quickly (3 x per second)	Is not glowing	Is not glowing	OK (stop)
	Glowes continuously	Is not glowing	Fault
Flashes slowly (1 x per second)	Is not glowing	Is not glowing	OK (waiting, grid monitoring)
Briefly goes out (Approx. 1x per second)	Glowes continuously	Is not glowing	Fault
	Is not glowing	Is not glowing	OK (derating)
Is not glowing	Is not glowing	Is not glowing	OK (nighttime deactivation)
		Glowing/blinking	Fault
	Glowes continuously	Is not glowing	Fault
		Glowing/blinking	Fault
Not relevant	Blinks	Not relevant	Warning (see section 9.4 )

## 9.2 Error Messages

When a disturbance occurs, the inverter generates a message, which depends on the operating mode and the type of the detected disturbance.

Message	Description and corrective measure
<b>!!PV-Overvoltage!!</b> <b>!DISCONNECT DC!</b>	Overvoltage at DC input. Overvoltage can destroy the inverter.
	<p><b>Corrective measures</b></p> <p>Immediately disconnect the inverter from the grid.</p> <ol style="list-style-type: none"> <li>1. Turn off the line circuit breaker.</li> <li>2. Remove the Electronic Solar Switch.</li> <li>3. Disconnect all the DC plug connectors.</li> <li>4. Check DC voltage: <ul style="list-style-type: none"> <li>- If the DC voltage exceeds the maximum input voltage, check the plant design or contact the person who installed the PV generator.</li> <li>- If the DC voltage is under the maximum input voltage, reconnect the inverter to the PV generator as described in section 5.5.4 "Connecting the PV Generator (DC)" (page 36).</li> </ul> </li> </ol> <p>If the message occurs again, disconnect the inverter again and contact the SMA Serviceline (see section 13 "Contact" (page 90)).</p>
<b>ACVtgRPro</b>	<p>The 10-minute-average grid voltage is no longer within the permissible range. This can be caused by either of the following:</p> <ul style="list-style-type: none"> <li>• The grid voltage at the connection point is too high.</li> <li>• The grid impedance at the connection point is too high.</li> </ul> <p>The inverter disconnects to assure compliance with the voltage quality of the grid.</p>
	<p><b>Corrective measures</b></p> <p>Check the grid voltage at the connection point of the inverter:</p> <ul style="list-style-type: none"> <li>• If, due to the local grid conditions, the grid voltage is 253 V or more, ask the utility operator whether the voltage at the feed-in point can be adjusted, or whether they agree to an alteration of the threshold value of the ACVtgRPro parameter to monitor the voltage quality.</li> <li>• If the grid voltage is continually within the acceptable range, and this error is still displayed, contact the SMA Serviceline.</li> </ul>
<b>CAN</b>	Internal communication fault.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>

Message	Description and corrective measure
Check L-N-PE	L and N are swapped at the AC connection or PE is not connected.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Check the AC connection</li> </ul>
Check Varistor	At least one of the varistors is defective.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Check the function of the varistors as described in section 9.4.1 "Checking the Function of the Varistors (&lt;Check Varistor&gt;)" (page 75).</li> </ul>
DC fuse	At least one string fuse is defective.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Check and if necessary replace the string fuses, as described in section 9.4.2 "Replacing the String Fuses (&lt;DC fuse&gt;)" (page 78).</li> </ul>
Derating	The "Derating" operating mode is a normal operating mode which may occur occasionally and can have several causes.
	<p>Once the inverter enters the "Derating" mode, it will display the "Derating" warning until the next total shutdown of the device (at the end of the day).</p> <b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Check heat dissipation, as described in Section 8.1 "Checking Heat Dissipation" (page 61).</li> </ul>
dl-Bfr dl-Srr	The inverter has detected a drastic change in the differential current. The integrated differential current monitoring system plays an important part in ensuring personal safety.
	<p>A drastic change in the differential current can be caused by a sudden grounding fault, failure current or an actual fault in the device. The inverter disconnects from the grid.</p> <b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If the message "Fault current-Bfr" or "Fault current-Srr" appears for no obvious reason, verify whether the plant insulation might have a ground fault, as described in section 9.3 "The Red LED Glows Continuously (Ground Fault)" (page 74).</li> </ul>
EEPROM	Transition disturbance during reading or writing of EEPROM data. The data is not relevant for safe operation.
	<ul style="list-style-type: none"> <li>• The disturbance has no effect on the performance of the inverter.</li> </ul>
EEPROM dBh	EEPROM data is defective, the inverter has switched itself off because the loss of data has disabled important functions of the inverter.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Contact the SMA Serviceline.</li> </ul>

Message	Description and corrective measure
<b>EeRestore</b>	<p>One of the duplicate data sets in the EEPROM is defective and has been reconstructed without loss of data.</p> <ul style="list-style-type: none"> <li>The error message only serves to inform you and has no effect on the performance of the inverter.</li> </ul>
<b>Fac-Bfr</b> <b>Fac-Srr</b> <b>FacFast</b>	<p>The grid frequency is no longer within the permissible range ("Bfr" / "Srr" / "Fast" is an internal message that has no meaning for the user). For safety reasons, the inverter disconnects itself from the grid.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>Check the grid connection and contact the utility operator if necessary.</li> <li>If the grid frequency is within the tolerance range, yet "Fac-Bfr," "Fac-Srr" or "FacFast" faults are still being displayed, please contact the SMA Serviceline.</li> </ul>
<b>Fault Curr Meas</b> <b>Fault Curr Meas-Srr</b>	<p>Deviation in the differential current measurement / differential current</p> <p>If this fault message is displayed repeatedly, it means that inverter operation is permanently disabled.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>Contact the SMA Serviceline.</li> </ul>
<b>HW-Signal</b>	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>Contact the SMA Serviceline.</li> </ul> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>If this fault occurs often, contact the SMA Serviceline.</li> </ul>
<b>Iac-DC_Offs-Srr</b>	<p>A grid disturbance has occurred.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>Check the grid conditions.</li> <li>Contact the SMA Serviceline if this problem occurs often or several times in succession.</li> </ul>
<b>IGBTs</b>	<p>The internal hardware monitoring system has detected a fault in the power electronics.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>Contact the SMA Serviceline.</li> </ul>
<b>Imax</b>	<p>Overcurrent on the AC side. This message is displayed if the current in the AC grid is greater than specified.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>Check the system design and grid conditions.</li> </ul>

Message	Description and corrective measure
<b>MSD-dI</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>
<b>MSD-Fac</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>
<b>MSD-Vac</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>
<b>MSD-Timeout</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>
<b>offset</b>	Fault in the acquisition of measurement data.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>
<b>PowerBalance</b>	The Sunny Mini Central is part of a three-phase system with two further Sunny Mini Centrals. This is equipped with the SMA Power Balancer for preventing asymmetric loads. The operating parameter "PowerBalancer" is set to "PhaseGuard" or "FaultGuard".
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• For more detailed descriptions of the operation modes "PhaseGuard" and "FaultGuard", please refer to section 5.6 "Connection of the SMA Power Balancer" (page 39).</li> </ul>
<b>REL_INV_CLOSE</b> <b>REL_GRID_CLOSE</b>	A grid relay does not close. The inverter checks the relays connecting it to the grid before feeding power into the grid. If the grid relays do not function properly, the inverter does not connect to the grid for safety reasons.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Contact the SMA Serviceline.</li> </ul>

Message	Description and corrective measure
REL_INV_OPEN REL_GRID_OPEN	<p>A grid relay does not open. The inverter checks the relays connecting it to the grid before feeding power into the grid. If the grid relays do not function properly, the inverter does not connect to the grid for safety reasons.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this fault message is displayed repeatedly, it means that inverter operation is permanently disabled. If the inverter is equipped with a communication interface, try to rectify the fault using a communication product.</li> <li>• Should this be unsuccessful, contact the SMA Serviceline.</li> </ul>
Riso	<p>The electrical insulation between the PV system and ground is faulty. The resistance between the DC plus and/or DC minus connection and ground is outside the defined limit range.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Check the plant insulation.</li> <li>• Check the plant for ground faults as described in section 9.3 "The Red LED Glows Continuously (Ground Fault)" (page 74).</li> </ul>
Riso-Sense	<p>The insulation measurement has failed.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>
ROM	<p>The inverter's firmware is faulty.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>
SD-DI-Wandler	<p>The inverter has detected an insulation fault on the DC side.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Check the plant insulation.</li> <li>• Check the plant for ground faults as described in section 9.3 "The Red LED Glows Continuously (Ground Fault)" (page 74).</li> </ul>
SD-Imax	<p>The inverter has detected an overcurrent on the AC side. It disconnects from the grid for safety reasons and then attempts to reconnect to the grid.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>
SD-WR-Bruecke	<p>The inverter has detected a fault in the power electronics. It disconnects from the grid and then attempts to reconnect to the grid.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this fault continues to occur, contact the SMA Serviceline.</li> </ul>

Message	Description and corrective measure
<b>Shutdown</b>	Temporary inverter fault.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Contact the SMA Serviceline.</li> </ul>
<b>STM Timeout</b>	Internal program run fault.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>
<b>Vac-Bfr</b> <b>Vac-Srr</b>	The grid voltage on line 2 is no longer within the permissible range ("Bfr" or "Srr" is an internal message that has no meaning for the user). This code can be caused by any of the following conditions: <ul style="list-style-type: none"> <li>• Grid disconnected (line circuit breaker, fuse),</li> <li>• AC cable is broken or</li> <li>• AC cable is highly resistive.</li> </ul> For safety reasons, the inverter disconnects itself from the grid.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Check the grid current and grid connection on the inverter.</li> <li>• If the grid voltage lies outside the acceptable range because of local grid conditions, ask the utility operator if the voltages can be adjusted at the feed-in point or if they agree to changes in the values of the monitored operational limits (operating parameters: Vac-Min and Vac-Max).</li> <li>• If the grid frequency is within the tolerable range, yet "Vac-Bfr," or "Vac-Srr" faults are still being displayed, please contact the SMA Serviceline.</li> </ul>

Message	Description and corrective measure
<b>VpvMax</b> <b>Vpv-Max</b>	<p>Overvoltage at DC input. The inverter may be damaged.</p> <p><b>Corrective measures</b></p> <p>Immediately disconnect the inverter from the grid!</p> <ol style="list-style-type: none"> <li>1. Turn off the line circuit breaker.</li> <li>2. Remove the Electronic Solar Switch.</li> <li>3. Disconnect all the DC plug connectors.</li> <li>4. Check DC voltage: <ul style="list-style-type: none"> <li>- If the DC voltage exceeds the maximum input voltage, check the plant design or contact the person who installed the PV generator.</li> <li>- If the DC voltage is under the maximum input voltage, reconnect the inverter to the PV generator as described in section 5.5.4 "Connecting the PV Generator (DC)" (page 36).</li> </ul> </li> </ol> <p>If the message occurs again, disconnect the inverter again and contact the SMA Serviceline (see section 13 "Contact" (page 90)).</p>
<b>UZWK-Max</b> <b>UzwkMax</b>	<p>The internal hardware monitor has detected an overvoltage condition in the intermediate circuit of the inverter.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>
<b>Watchdog</b> <b>Watchdog-Srr</b>	<p>Internal program run fault.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this fault occurs often, contact the SMA Serviceline.</li> </ul>

### 9.3 The Red LED Glows Continuously (Ground Fault)

The inverter has detected a ground fault in the PV generator.

Proceed as follows to find it:

1. Disconnect the inverter from both the DC and AC connections as described in section 7.2 "Opening the Inverter" (page 56).



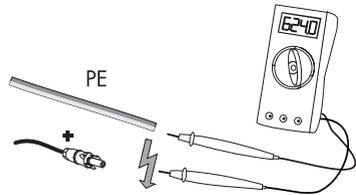
**NOTICE!**

**Excessive voltages can destroy the measuring device!**

- Only use measuring devices with a DC input voltage range up to at least 1000 V.

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

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





**DANGER!**

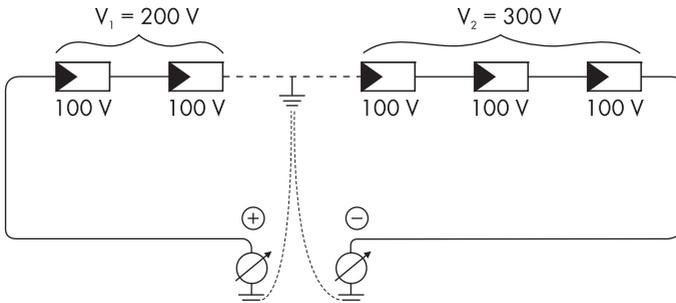
**Risk of lethal electric shock!**

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

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

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

Example:



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

3. Repeat step 2 for each string.
4. The installer of the PV generator must remedy the ground fault in the affected string before you may reconnect the string to the inverter.
5. Restart the inverter as described in section 7.3 "Closing the Inverter" (page 59), but **without** reconnecting the faulty string.

## 9.4 The Red LED is Flashing

A flashing red LED can have different causes and depends on the corresponding fault indication on the display:

- <Check Varistor> display message: At least one of the varistors is defective (see section 9.4.1 "Checking the Function of the Varistors (<Check Varistor>)" (page 75)).
- <DC fuse> display message: At least one of the string fuses is defective (see section 9.4.2 "Replacing the String Fuses (<DC fuse>)" (page 78)).

### 9.4.1 Checking the Function of the Varistors (<Check Varistor>)

Varistors are wearing parts. Their functional efficiency 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.

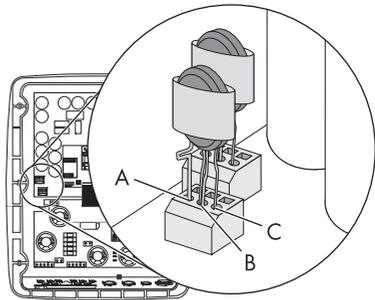


#### Position of Varistors

You can determine the position of the varistors with the help of the illustration below.

Observe the following allocation of the terminals:

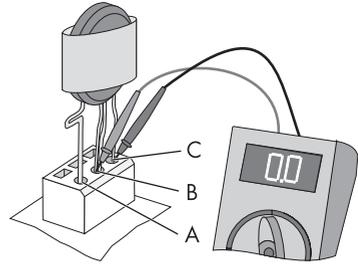
- Terminal A: outer terminal (varistor connection **with loop** [crimp])
- Terminal B: middle terminal
- Terminal C: outer terminal (varistor connection **without loop** [crimp])



You can check the varistors as follows:

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 56).

- With the aid of a multimeter, determine for both varistors in the installed state whether a conductive connection exists between connectors B and C.



Result	Action
<input checked="" type="checkbox"/> There is a <b>conductive</b> connection:	There is probably a different fault in the inverter. <ul style="list-style-type: none"> <li>Close the inverter as described in section 7.3 "Closing the Inverter" (page 59).</li> <li>Contact the SMA Serviceline (see section 13 "Contact" (page 90)).</li> </ul>
<input checked="" type="checkbox"/> There is <b>no conductive</b> connection:	The respective varistor is not working and must be replaced. Varistor failure is generally due to influences which affect all varistors similarly (temperature, age, induced overvoltage). SMA Solar Technology AG recommends that you replace both varistors. <p>The varistors are specially manufactured for use in the inverter and are not commercially available. You must order replacement varistors directly from SMA Solar Technology AG (see section 12 "Accessories" (page 88)).</p> <ul style="list-style-type: none"> <li>To replace the varistors, proceed to step 3.</li> </ul>



**NOTICE!**

**Destruction of the inverter due to overvoltage.**

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

- Do **not** operate the inverter without varistors in plants with a high risk of overvoltages.
- Replacement varistors should be obtained as soon as possible.

3. Insert an insertion tool into the openings of the terminal contacts (1).

☑ This releases the terminals.

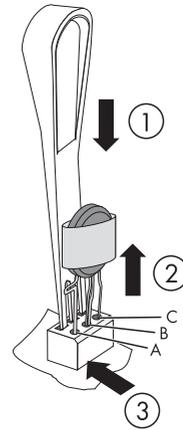
If you do not receive an insertion tool for operating the terminal clamps with your replacement varistors, please contact SMA Solar Technology AG. As an alternative, the terminal contacts can be operated using a 3.5 mm wide screwdriver.

4. Remove the varistor (2).
5. Insert new varistor (3).

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

6. Close the inverter as described in section 7.3 "Closing the Inverter" (page 59).

☑ The check and replacement of the varistors is completed.

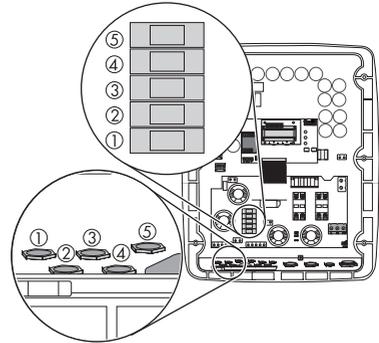


### 9.4.2 Replacing the String Fuses (<DC fuse>)

At least one string fuse is defective. You can detect which fuse is defective using a circuit indicator.

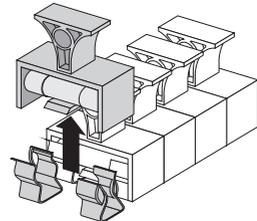
To do so, proceed as follows:

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 56).
2. Observe the illustrated assignment to the strings.



3. All fuse extractors must be consecutively removed with the string fuses.

Note the string assignment.



4. Check the conductivity using the circuit indicator.  
A non-conductive fuse indicates a fault in the affected string.
5. Have the installer of the PV generator check the affected string and order the upgrade kit for the defective string fuse from SMA Solar Technology AG (see section 12 "Accessories" (page 88)).



**NOTICE!**

**The inverter can be damaged if the string fuses burn out!**

When using commercially available fuses, it cannot be ensured that they will function correctly and in case of a fault, the fuses may burn out.

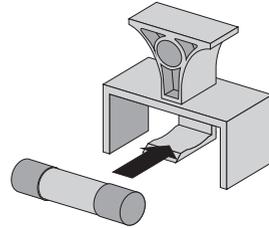
- Only use add-on kits provided by SMA Solar Technology AG.



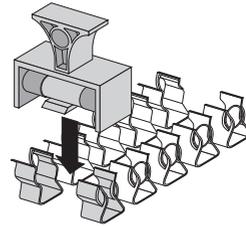
**Equip all slots with a string fuse**

To ensure that the fuse monitoring function is working properly, all 5 slots must be equipped with the appropriate fuses at all times. This also applies if fewer strings are connected!

6. Insert the string fuse from the add-on kit in the fuse extractor provided.



7. Insert the fuse extractors in the slots.

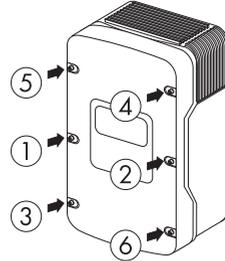


8. Close the inverter as described in section 7.3 "Closing the Inverter" (page 59).
- The defective string fuses have been replaced.

## 10 Decommissioning

### 10.1 Dismantling the Inverter

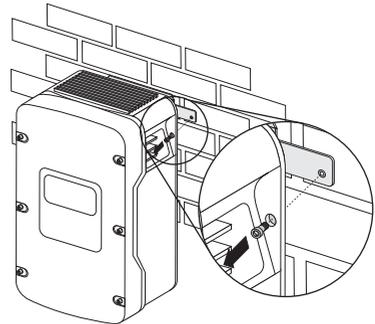
1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 56).
2. Remove all cables from the inverter.
3. Close the inverter with the 6 screws and the corresponding tooth lock washers.



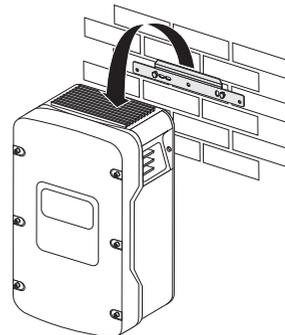
4. Remove the air grills from both sides.



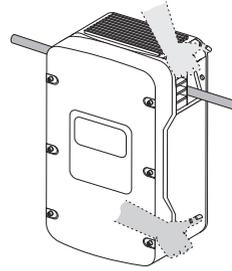
5. Remove the two screws on the left and right side of the inverter that attach it to the wall bracket.
6. Disconnect the anti-theft protection, if applicable.



7. Remove the inverter upwards from the wall mounting bracket.



8. Use the side handles (above and below) or a steel rod (maximum diameter 30 mm) to transport the inverter. The rod must be pushed through the enclosure openings.



- The inverter is dismantled.

## 10.2 Packing the Inverter

If possible, always pack the inverter in its original packaging. If it is no longer available, you can also use an equivalent carton. The carton must be completely closeable, have a handle system and be made to support both the weight and size of the inverter.

## 10.3 Storing the Inverter

Store the inverter in a dry place where ambient temperatures are always between  $-25\text{ }^{\circ}\text{C}$  and  $+60\text{ }^{\circ}\text{C}$ .

## 10.4 Disposing of the Inverter

Dispose of the inverter at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation location at that time. Alternatively, send it back to SMA Solar Technology AG with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("for disposal") (contact see section Page 90)

# 11 Technical Data

## 11.1 Sunny Mini Central 9000TL / 10000TL / 11000TL

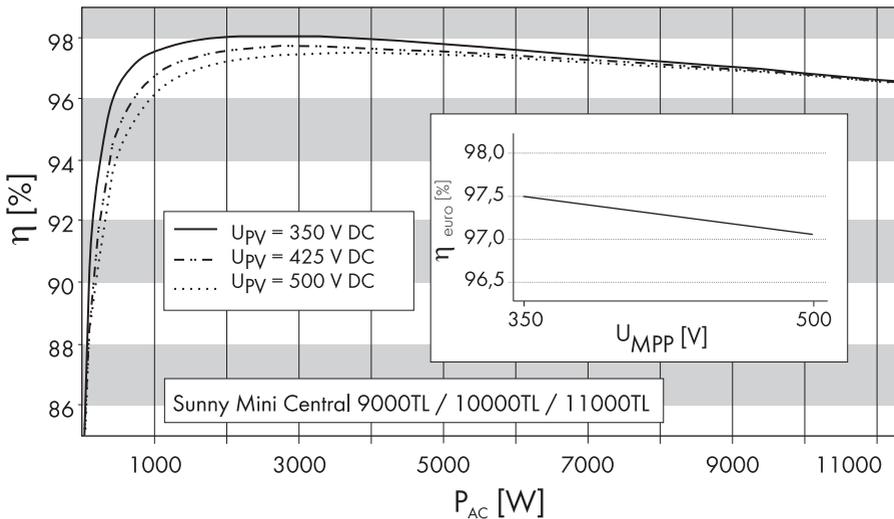
		SMC 9000TL-10	SMC 10000TL-10	SMC 11000TL-10
<b>PV generator connection data</b>				
Max. PV input voltage	$U_{PV0}$	700 V <sup>a)</sup> (Based on -10 °C cell temperature)		
Input voltage, MPP range	$U_{PV}$	333 V ... 500 V DC		
PV start voltage, adjustable	$U_{PV\ Start}$	400 V	400 V	400 V
Max. input current	$I_{PVM\ max}$	28 A	31 A	34 A
Max. input power	$P_{DC}$	9300 W	10350 W	11400 W
Voltage ripple	$U_{pp}$	< 10 % of the input voltage		
Internal consumption during operation		< 8 W		
a) The maximum open circuit voltage, which can occur at a cell temperature of -10 °C, may not exceed the maximum input voltage.				

<b>Grid connection data</b>				
AC nominal power	$P_{ACNom}$	9000 W	10000 W	11000 W
Max. AC power	$P_{ACMax}$	9000 W	10000 W	11000 W
Nominal AC current	$I_{ACNom}$	40 A	44 A	48 A
Max. AC current	$I_{ACMax}$	40 A	44 A	48 A
Max. fuse protection		80 A		
Harmonic distortion of output current (at $K_{Ugrid} < 2\%$ , $P_{AC} > 0.5 P_{ACNom}$ )	$K_{IAC}$	< 4 %		
Nominal operating voltage	$U_{ACnom}$	220 V / 230 V / 240 V		
Voltage range (extended operating range)	$U_{AC}$	180 V ... 260 V		
Nominal operating frequency	$f_{ACnom}$	50 Hz / 60 Hz		
Frequency range (extended operating range)	$f_{AC}$	50 Hz: 45.5 Hz ... 54.5 Hz 60 Hz: 55.5 Hz ... 64.5 Hz		
Power factor (at nominal output power)	$\cos \varphi$	1		
Overvoltage category		III		
Test voltage (50 Hz)		2.15 kV		
Test surge voltage		4 kV (serial interface: 6 kV)		
Internal consumption in night mode		0.15 W		

		SMC 9000TL-10	SMC 10000TL-10	SMC 11000TL-10
<b>General data</b>				
EC Declaration of Conformity	Enclosed documentation package Download area <a href="http://www.SMA.de/en">www.SMA.de/en</a>			
Dimensions (W x H x D)	468 mm x 613 mm x 242 mm (approx.)			
Weight	approx. 35 kg			
Protection rating in accordance with DIN EN 60529	IP65			
Climatic conditions according to DIN EN 50178:1998-04:				
Location of type C:	Class 4K4H Extended temperature range: -25 °C to +60 °C Extended humidity range: 0 ... 100 % Extended air pressure range: 70 kPa to 106 kPa			
Transport of type E:	class 2K3 Temperature range: - 25 °C ... +70 °C			
Operation temperature range	- 25 °C ... +60 °C			
Max. operating altitude	3000 m above mean sea level			
Topology	Transformerless			
Fan connection	Designed for safe disconnection in accordance with DIN EN 50178:1998-04			
Protection class	I			
Noise emission (typical)	≤ 42 dB(A)	≤ 45 dB(A)	≤ 46 dB(A)	
<b>Protective function DC side</b>				
All-pole disconnection unit on the DC input side	Electronic Solar Switch, DC plug system SUNCLIX			
Overvoltage protection	Thermally monitored varistors			
Personnel protection	Insulation monitoring ( $R_{iso} > 1 \text{ M } \Omega$ )			
Pole confusion protection	Via short-circuit diode			
<b>Protective function AC side</b>				
Short circuit proof	Current control			

		SMC 9000TL-10	SMC 10000TL-10	SMC 11000TL-10
All-pole disconnection unit grid side		Automatic disconnection device (SMA Grid Guard 2.1)		
<b>Communication interfaces</b>				
RS485 (galvanically isolated)		optional		
Radio		optional		
Bluetooth® Wireless Technology		optional		
<b>Electronic Solar Switch (ESS)</b>				
Electrical service life (in the event of a short circuit, with a nominal current of 35 A)		Min. 50 switching processes		
Maximum switching current		35 A		
Maximum switching voltage		800 V		
Maximum PV power		Approx. 12 kW		
Protection rating when plugged		IP65		
Protection rating when unplugged		IP21		
<b>Efficiency</b>				
Max. efficiency	$\eta_{max}$	98 %		
European efficiency	$\eta_{euro}$	97.6 %	97.5 %	97.5 %

**Efficiency curve**



## 11.2 Sunny Mini Central 9000TL / 10000TL / 11000TL with Reactive Power Control

		SMC 9000TLRP-10	SMC 10000TLRP-10	SMC 11000TLRP-10
<b>PV generator connection data</b>				
Max. PV input voltage	$U_{PV0}$	700 V <sup>a)</sup> (Based on -10 °C cell temperature)		
Input voltage, MPP range	$U_{PV}$	333 V ... 500 V DC		
PV start voltage, adjustable	$U_{PV\ Start}$	400 V	400 V	400 V
Max. input current	$I_{PVM\ max}$	28 A	31 A	34 A
Max. input power (at $\cos \varphi = 1$ )	$P_{DC}$	9300 W	10350 W	11400 W
Voltage ripple	$U_{pp}$	< 10 % of the input voltage		
Internal consumption during operation		< 8 W		

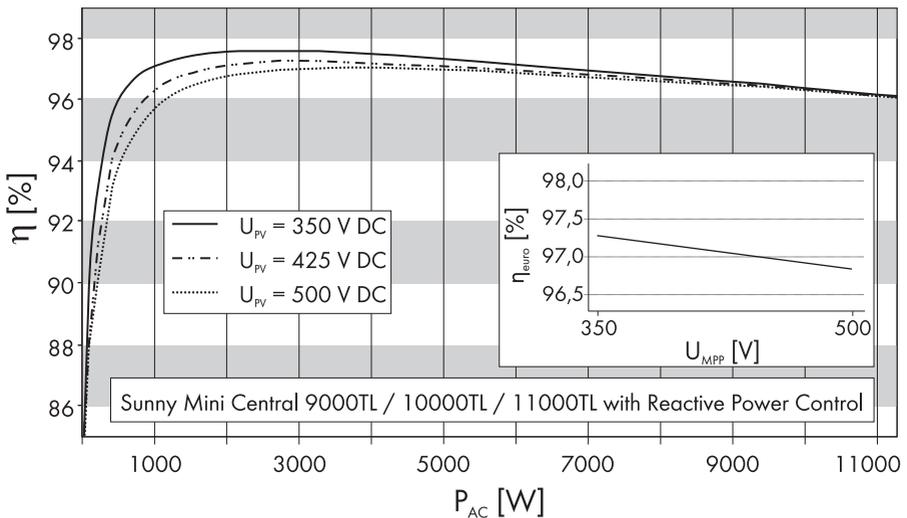
<sup>a)</sup> The maximum open circuit voltage, which can occur at a cell temperature of -10 °C, may not exceed the maximum input voltage.

<b>Grid connection data</b>				
AC nominal power	$S_{ACNom}$	9000 VA	10000 VA	11000 VA
Max. AC power	$S_{ACMax}$	9000 VA	10000 VA	11000 VA
Nominal AC current	$I_{ACNom}$	40 A	44 A	48 A
Max. AC current	$I_{ACMax}$	40 A	44 A	48 A
Max. fuse protection		80 A		
Harmonic distortion of output current (at $K_{Ugrid} < 2\%$ , $P_{AC} > 0.5 P_{ACNom}$ )	$K_{IAC}$	< 4 %		
Nominal operating voltage	$U_{ACNom}$	220 V / 230 V / 240 V		
Voltage range (extended operating range)	$U_{AC}$	180 V ... 260 V		
Nominal operating frequency	$f_{ACNom}$	50 Hz / 60 Hz		
Frequency range (extended operating range)	$f_{AC}$	50 Hz: 45.5 Hz ... 54.5 Hz 60 Hz: 55.5 Hz ... 64.5 Hz		
Displacement power factor, configurable	$\cos \varphi$	0.8 <sub>overexcited</sub> ... 0.8 <sub>underexcited</sub>		
Overvoltage category		III		
Test voltage (50 Hz)		2.15 kV		
Test surge voltage		4 kV (serial interface: 6 kV)		
Internal consumption in night mode		0.15 W		

		SMC 9000TLRP-10	SMC 10000TLRP-10	SMC 11000TLRP-10
<b>General data</b>				
EC Declaration of Conformity		Enclosed documentation package Download area <a href="http://www.SMA.de/en">www.SMA.de/en</a>		
Dimensions (W x H x D)		468 mm x 613 mm x 242 mm (approx.)		
Weight		approx. 35 kg		
Protection rating in accordance with DIN EN 60529		IP65		
Climatic conditions according to DIN EN 50178:1998-04:				
Location of type C:		Class 4K4H Extended temperature range: -25 °C to +60 °C Extended humidity range: 0 ... 100 % Extended air pressure range: 70 kPa to 106 kPa		
Transport of type E:		class 2K3 Temperature range: - 25 °C ... +70 °C		
Operation temperature range		- 25 °C ... +60 °C		
Max. operating altitude		3000 m above mean sea level		
Topology		Transformerless		
Fan connection		Designed for safe disconnection in accordance with DIN EN 50178:1998-04		
Protection class		I		
Noise emission (typical)		≤ 42 dB(A)	≤ 45 dB(A)	≤ 46 dB(A)
<b>Protective function DC side</b>				
All-pole disconnection unit on the DC input side		Electronic Solar Switch, DC plug system SUNCLIX		
Overvoltage protection		Thermally monitored varistors		
Personnel protection		Insulation monitoring ( $R_{iso} > 1 \text{ M } \Omega$ )		
Pole confusion protection		Via short-circuit diode		

		SMC 9000TLRP-10	SMC 10000TLRP-10	SMC 11000TLRP-10
<b>Protective function AC side</b>				
Short circuit proof	Current control			
All-pole disconnection unit grid side	Automatic disconnection device (SMA Grid Guard 2.1)			
<b>Communication interfaces</b>				
RS485 (galvanically isolated)	optional			
Bluetooth	optional			
<b>Electronic Solar Switch (ESS)</b>				
Electrical service life (in the event of a short circuit, with a nominal current of 35 A)	min. 50 switching processes			
Maximum switching current	35 A			
Maximum switching voltage	800 V			
Maximum PV power	Approx. 12 kW			
Protection rating when plugged	IP65			
Protection rating when unplugged	IP21			
<b>Efficiency</b>				
Max. efficiency	$\eta_{\max}$	97.7 %		
European efficiency	$\eta_{\text{euro}}$	97.3 %		

**Efficiency curve**



## 12 Accessories

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

Description	Brief description	SMA order number	
		SMC 9000TL-10	SMC 9000TLRP-10
		SMC 10000TL-10	SMC 10000TLRP-10
		SMC 11000TL-10	SMC 11000TLRP-10
8 A string fuses	Add-on kit with 5 8 A fuses (incl. fuse protector)	FUSEKIT 8A-NR	
10 A string fuses	Add-on kit with 5 10 A fuses (incl. fuse protector)	FUSEKIT 10A-NR	
12 A string fuses	Add-on kit with 5 12 A fuses (incl. fuse protector)	FUSEKIT 12A-NR	
16 A string fuses	Add-on kit with 5 16 A fuses (incl. fuse protector)	FUSEKIT 16A-NR	
20 A string fuses	Add-on kit with 5 20 A fuses (incl. fuse protector)	FUSEKIT 20A-NR	
SMA Power Balancer Y cable	Connecting cable (2 x 2 m) for SMA Power Balancer connector system	PBL-YCABLE-10	
RS485 upgrade kit	RS485 interface	485PB-SMC-NR	
Radio upgrade kit	Radio Piggy-Back for upgrading a Sunny Mini Central for communication with Sunny Beam, including antenna, coaxial cable, and PG threaded joint (metal)	BEAMPB-NR	-
Bluetooth upgrade kit	Bluetooth communication interface	On request	
Power Reducer Box	Power Reducer Box	POWERREDUCERBOX	
Replacement varistors	Set of thermally monitored varistors (2 pcs.) including insertion tool	MSWR-TV 7	
Insertion tool for replacing the varistors	Installation tool for varistors	SB-TVWZ	

Description	Brief description	SMA order number	
		SMC 9000TL-10	SMC 9000TLRP-10
		SMC 10000TL-10	SMC 10000TLRP-10
		SMC 11000TL-10	SMC 11000TLRP-10
Electronic Solar Switch	ESS handle replacement part	ESS-HANDLE:04	
Air grills	Air grill set "right and left" as spare part	45-7202	
SUNCLIX DC plug connector	Field connector for conductor cross sections 2.5 mm <sup>2</sup> ... 6 mm <sup>2</sup>	SUNCLIX-FC6-SET	

## 13 Contact

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

- Inverter type
- Inverter serial number
- Type and number of the PV modules connected
- Optional equipment, e.g. communication devices
- Blink code or display message of the inverter

### **SMA Solar Technology AG**

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[www.SMA.de](http://www.SMA.de)

### **SMA Serviceline**

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- Operating the product whilst ignoring relevant, statutory safety regulations in the deployment location
- Ignoring safety warnings and instructions contained in all documents relevant to the product
- Operating the product under incorrect safety or protection conditions
- Altering the product or supplied software without authority
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- In case of unforeseen calamity or force majeure

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