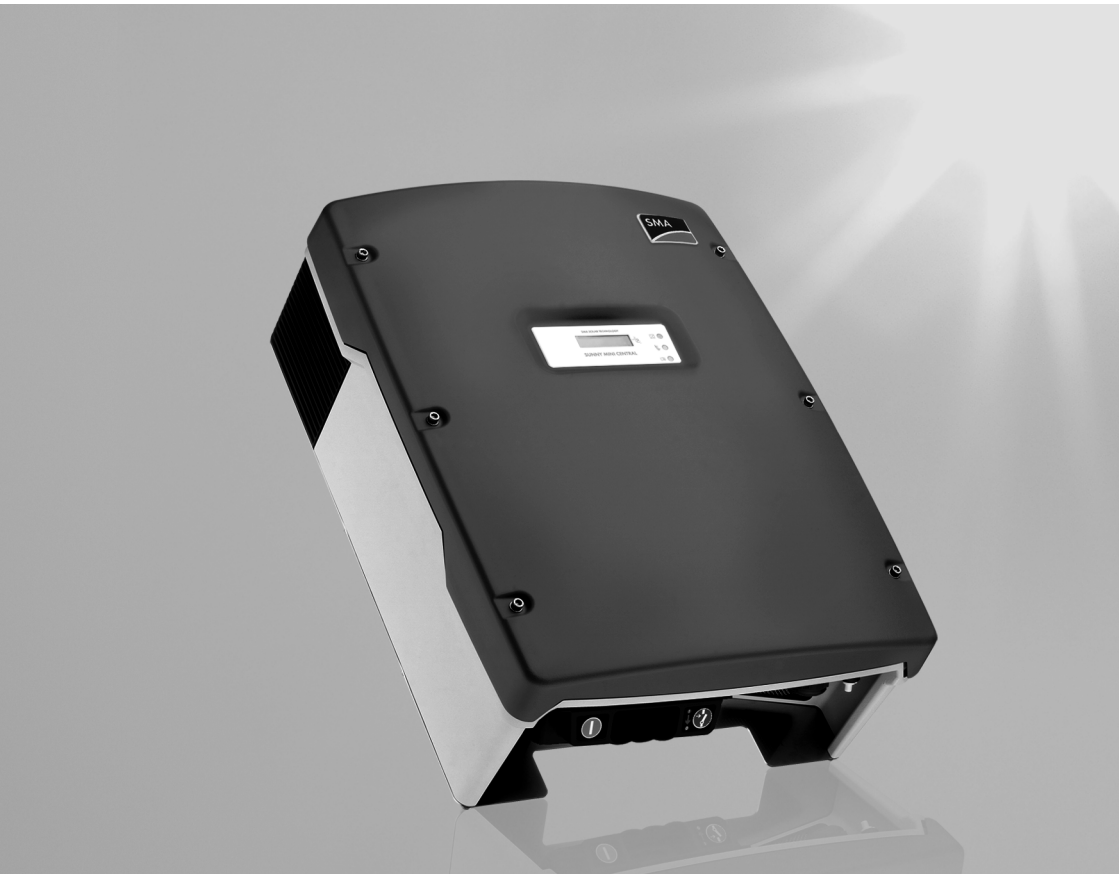
PV Inverter

SUNNY MINI CENTRAL 9000TL / 10000TL / 11000TL

Installation Guide



SMC9-11TL-IEN083620 | IME-SMCTL_9_10_11 | Version 2.0

EN

Table of Contents

1 Notes on this manual

1.1 Area of validity

This installation guide describes the installation and commissioning of SMA Mini Central 9000TL (SMC 9000TL-10), 10000TL (SMC 10000TL-10) and 11000TL (SMC 11000TL-10) type inverters.

1.2 Target group

Only qualified electricians may install and commission Sunny Mini Central units.

1.3 Storage of Manuals

All manuals for the Sunny Mini Central and the installed components must be stored with the system documentation and be accessible at all times.

1.4 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.

1.5 Symbols Used

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

DANGER!

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE!

NOTICE indicates a situation that can result in property damage if not avoided.

Information

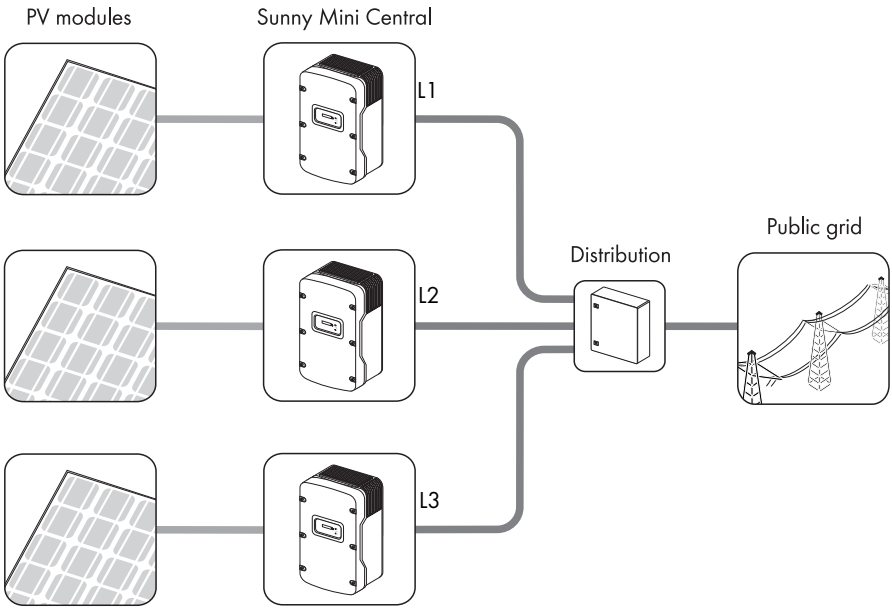
Information provides tips that are valuable for the optimal operation of the product.

2 Security

2.1 Appropriate Usage

The Sunny Mini Central is a PV inverter that converts the DC current of solar cells to AC current and feeds it into the public grid.

Principle of a PV System with the 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.

PV modules with large capacities relative to ground, such as thin-film modules with cells on a metallic substrate, are therefore only to be implemented if their coupling capacitance is below 50 nF/kWp. During grid feeding, a leakage current flows from the cells to the earth. The magnitude of this current depends on the manner in which the modules are installed and, to no small extent, on the weather (rain, snow). This operational leakage current is not to exceed 50 mA.

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

Do not use the Sunny Boy for purposes other than those described here. Alternative uses, modifications to the Sunny Boy or the installation of components not expressly recommended or sold by the manufacturer void the warranty claims and operating license.

2.2 Safety Precautions

DANGER!

Danger to life due to high voltages in the Sunny Mini Central!

All work on the Sunny Mini Central must be carried out by a qualified electrician.

DANGER!

Danger of burn injuries due to hot housing parts!

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

NOTICE!

Dust or water entering the Sunny Mini Central can damage the device!

If the Electronic Solar Switch has been pulled out, the Sunny Mini Central only has a protection rating of IP21.

If the device has been temporarily decommissioned, proceed as follows to restore the IP65 protection rating:

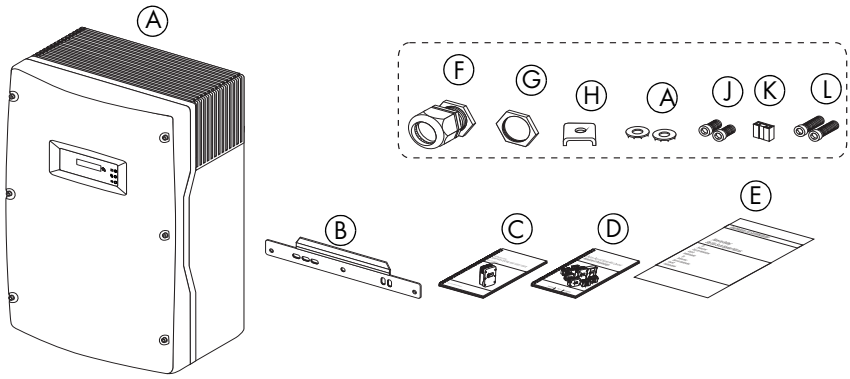
- Unplug all DC plug connectors and seal them with the protecting caps provided.
- Attach the Electronic Solar Switch.

Grounding the PV generator

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

3 Unpacking

3.1 Delivery Scope



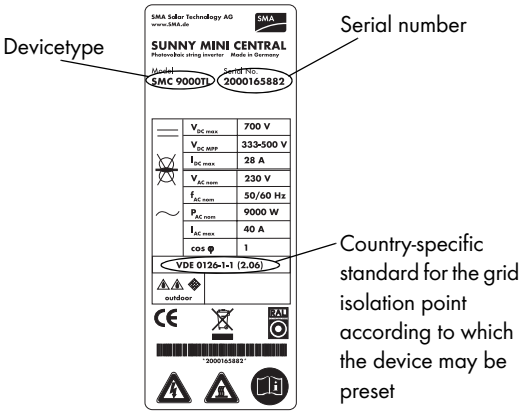
Object	Quantity	Description
A	1	Sunny Mini Central
B	1	wall mounting bracket
C	1	installation guide
D	1	user manual
E	1	set of documents with explanations and certificates
	1	Inverter accessories bag
	1	Communication accessories bag (optional), for packing list see separate communication manual
Contents of inverter accessories bag:		
F	1	cable screw connection for AC connection:
G	1	nut for AC connection cable screw connection
H	1	clamping clip for additional connection to ground
I	2	washers: 1 x for cover screws (replacement), 1 x for ground connection cable terminal
J	2	cylinder head screws (M6 x 16): 1 x for cover (replacement), 1 x for ground connection cable terminal
K	1	jumper for fan test
L	2	cylinder head screws (M6 x 8) for securing the Sunny Mini Central on the wall mounting bracket

3.2 Check for Transport Damage

Check the Sunny Mini Central for visible external damage, such as cracks in the housing or display. Please contact your dealer if you find any damage.

3.3 Identifying the Sunny Mini Central

You can identify the Sunny Mini Central using the type label. The type label is on the right side of the housing.



4 Mounting

4.1 Selection of the Mounting Location

DANGER!

Danger to life due to fire or explosion!

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

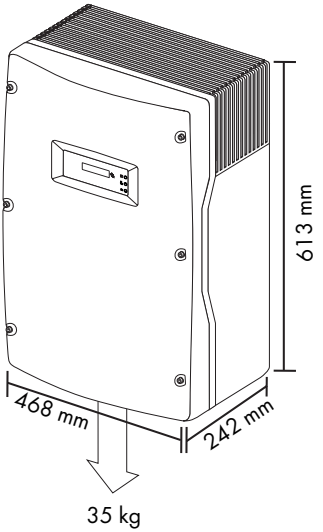
- Do not mount the Sunny Mini Central on flammable construction materials.
- Do not mount the Sunny Mini Central in areas where highly flammable materials are stored.
- Do not mount the Sunny Mini Central in areas where there is a risk of explosion.

CAUTION!

Danger of burn injuries due to hot housing parts!

- Mount the Sunny Mini Central such that it cannot be touched inadvertently.

4.1.1 Dimensions and Weight



4.1.2 Ambient Conditions

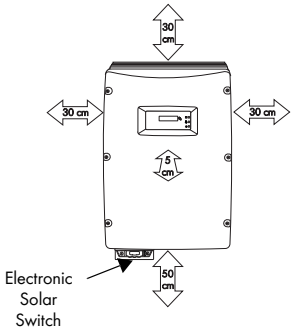
- The mounting location and mounting method must be suitable for the weight and dimensions of the Sunny Mini Central.
- Mounting on a solid surface.
- The mounting location must be accessible at all times.
- The ambient temperature should be below 40 °C at all times to guarantee optimal operation.
- Do not expose the Sunny Mini Central to direct sunlight to avoid a power reduction due to excessive heating.
- In a living area, do not mount the unit on plasterboard etc. walls as otherwise audible vibrations are likely to result.

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

4.1.3 Safety Clearances

Observe the following minimum clearances to walls, other devices or objects to guarantee sufficient heat dissipation and enough space for pulling the Electronic Solar Switch handle.

Direction	Minimum Clearance
Sidewise	30 cm
Above	30 cm
Bottom	50 cm
Front	5 cm

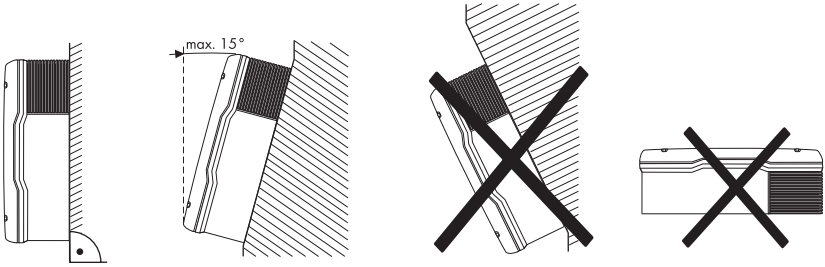


Multiple Sunny Mini Centrals installed in areas with high ambient temperatures

The individual Sunny Mini Central units must be far enough apart to ensure that the individual Sunny Mini Central units do not take in the cooling air of the neighboring unit.

If necessary, increase the clearance and ensure that the supply of cool air is sufficient to cool the Sunny Mini Centrals.

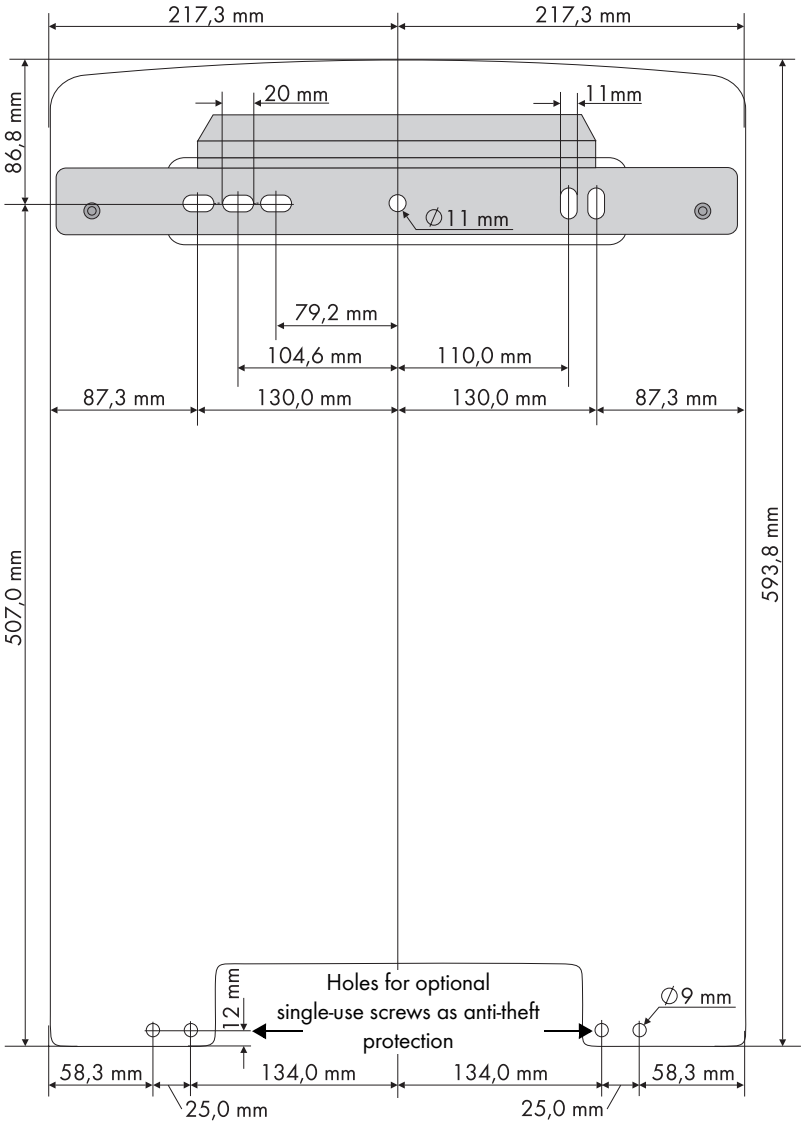
4.1.4 Position



- Vertical installation or tilted backwards by max. 15°.
- Never install the unit with a forward tilt.
- Do not install horizontally.
- Install at eye level to allow operating modes to be read at all times.

4.2 Mounting Instructions

1. Mark the position of the drill holes using the wall mounting bracket and drill the holes. In doing so, use two to four of the six holes in the middle.

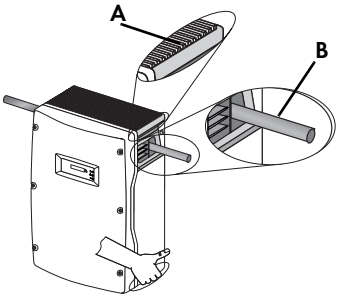


CAUTION!

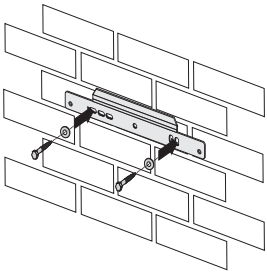
Risk of injury due to the heavy weight of the Sunny Mini Central!

The Sunny Mini Central weighs approximately 35 kg

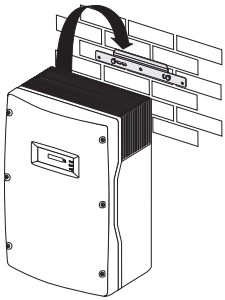
- Attach the wall mounting bracket with the corresponding mounting material (depending on the surface).
- Use the side handles above and below (A) or place a steel rod in the housing opening (B, max. diameter 30 mm) for transport and assembly.



2. Secure the wall mounting bracket using suitable screws and washers.



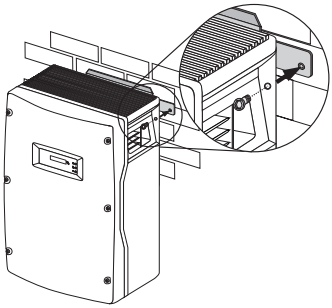
3. Attach the Sunny Mini Central to the wall mounting bracket using the mounting opening in the rear wall of the housing.



4. Screw the Sunny Mini Central onto the wall mounting bracket on both sides using the M6 x 8 mm screws provided.

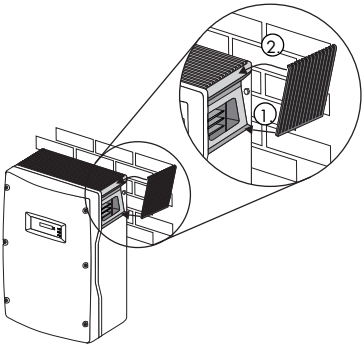
   Only fasten the screws using your hand!

5. Check that the unit is securely in place.



6. Close the recessed grips with the handle covers provided in the accessories kit.

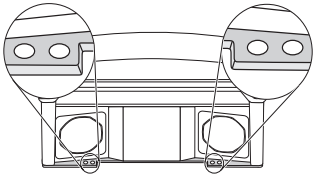
   The handle covers prevent dirt and insects from entering the device and if necessary, can be reordered from SMA Solar Technology (SMA order number: 45-7202, contact: see Page 65).



Optional Anti-theft Protection

To protect the Sunny Mini Central against theft, the rear face can be secured to the wall at the bottom using two single-use bolts.

The other two holes are spares.



5 Electrical Connection

NOTICE!

Electrostatic discharges can damage the Sunny Mini Central!

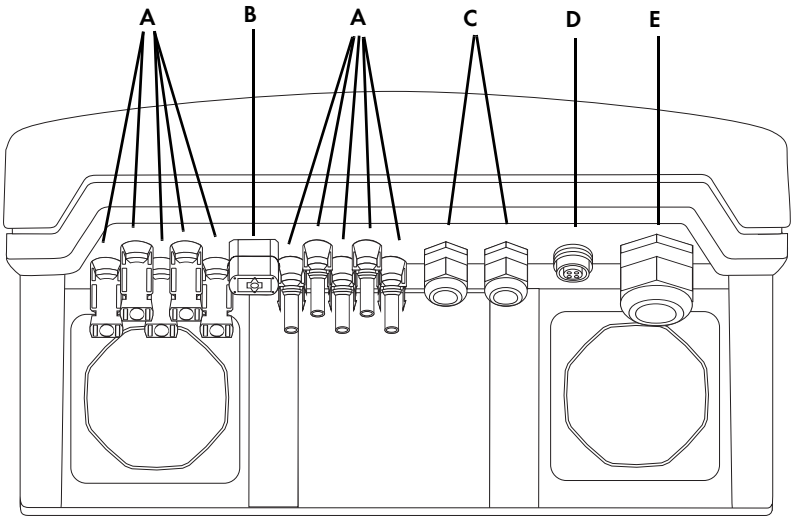
Internal components of the Sunny Mini Central can be irreparably damaged by static discharge.

- Ground yourself before you touch a component.

5.1 Overview of the Connection Area

5.1.1 View from Below

The following figure shows the assignment of the individual housing openings on the base of the Sunny Mini Central.



A Plug connectors for connecting the PV strings

B Socket for the connection of the Electronic Solar Switch (ESS) DC load disconnection unit

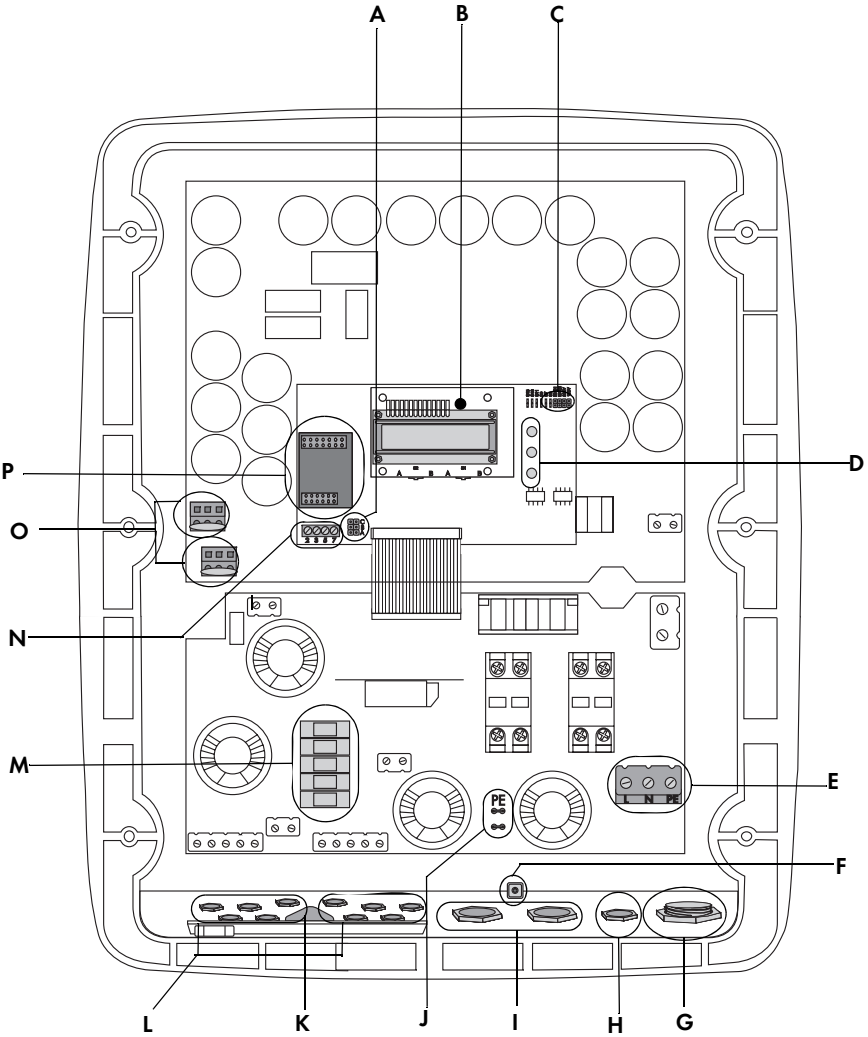
C Cable openings for optional communication via RS232, RS485 or radio (PG16)

D Power Balancer Connection

E Cable opening for grid connection (AC) (18 mm - 32 mm)

5.1.2 View from Inside

The following diagram gives a schematic overview of the various components and connection points inside the Sunny Mini Central with the cover removed.



A Jumper for communication (Page 43)
B Display (Page 45)
C Jumper for fan testing (Page 55)
D Operating status LEDs (Page 48)
E Connection terminals for mains cable (AC) (Page 24)
F Screwing device for shield clamp for communication cable (Page 43)
G Cable opening for mains cable (AC) (Page 24)
H Connection socket for Power Balancer (Page 34)
I Cable openings for communication (Page 43)
J Tab for grounding the cable shield with communication (Page 43)
K Connection socket for "Electronic Solar Switch (ESS)" DC load disconnection unit (Page 30)
L PV input plug (DC) (Page 30)
M Slot for string fuses (Page 28)
N Connection terminal for communication (Page 43)
O Varistors (Page 60)
P Slot for communication interface (Page 43)

5.2 Connection to the Public Grid (AC)

Connection Requirements of the Grid Operator

Always follow the connection requirements of the grid operator!

Cable Design

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

The maximum cable lengths for each cable cross section are shown in the following table.

Cable cross section	Max. Cable Length		
	SMC 9000TL	SMC 10000TL	SMC 11000TL
16,0 mm²	27 m	24 m	22 m
25.0 mm² [a)]	43 m	38 m	35 m
[a)] Only use flexible cables.			

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

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

Cut line losses in half

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

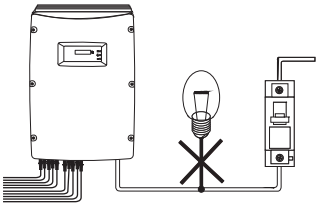
Load Disconnection Unit

The maximal permissible rating is located in the technical data (see Page 62).

DANGER!

Danger to life due to fire!

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



- Never connect loads between the Sunny Mini Centrals and the line circuit breaker without protection.
- Always install separate fuses for loads.

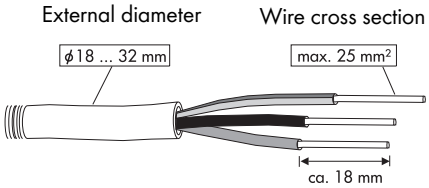
Load disconnection unit

Use only line circuit breakers as load disconnection units!

A screw type fuse element, e.g D system (Diazed) or D0 system (Neozed) is not a load disconnection device, and thus may **not** be used as a load disconnection unit.

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

Cable Requirements



Connection Procedure:

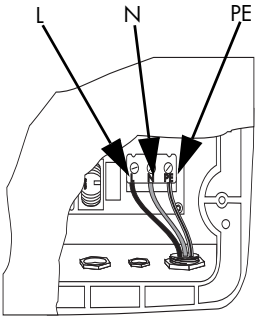
1. Check the grid voltage and compare it with "Vac" on the type label.

   The exact operating range of the Sunny Mini Central is specified in the operating parameters. The operating parameters can be read using a communication component or requested from SMA Solar Technology.
2. Switch off the line circuit breaker and secure it to prevent it from being reactivated.
3. Loosen all six cover screws and remove the cover.
4. Remove the taping of the AC cable opening (see “E” on Page 19).

5. Insert the AC screw clamp into the cable opening from the outside and tighten it along with the nut from the inside.
6. Pull cable through.
7. Connect L, N and the protective earth (PE) to the terminal blocks in accordance with the labels.

   For this, the PE wire must be 5 mm longer than the L and N wires!

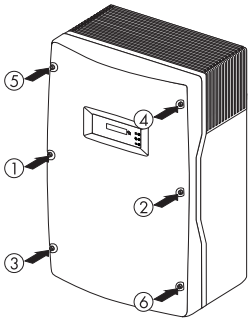
   L and N may not be swapped!
8. Securely close the screw clamp on the cable opening.



9. Secure the cover with six screws and the corresponding washers.

   Tighten the screws in the sequence shown on the right to a torque of 6 Nm. The toothing of the washers must face toward the cover.

   The Sunny Mini Central accessories kit contains a spare screw and spare washer.



DANGER!

Danger to life due to live covers!

The grounding of the housing cover is ensured by the toothed washers.

- Fasten the washers for all six screws with the toothing facing toward the cover.

DANGER!

Danger to life due to high voltages in the Sunny Mini Central!

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

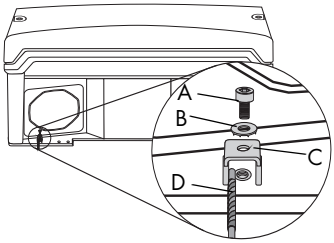
Additional Grounding of the Housing

If a second protective earth connection is required in the installation country (e.g. Switzerland), you can also ground the Sunny Mini Central with an additional protective earth on the connection terminal of the housing.

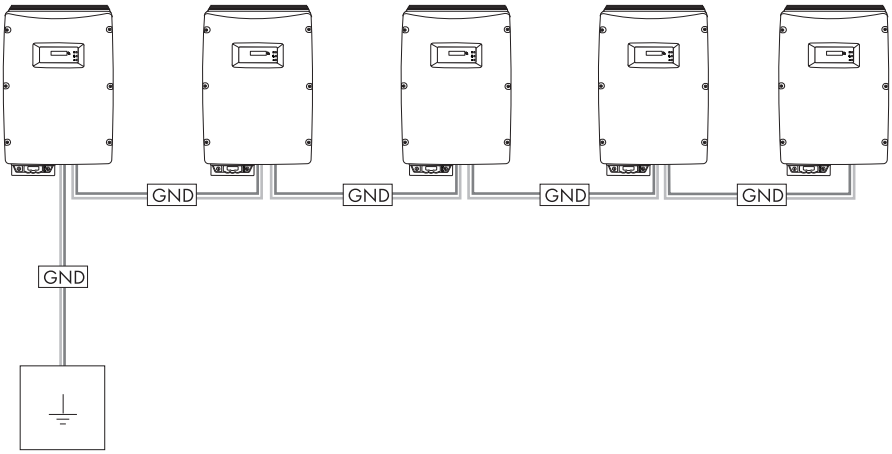
Procedure

1. Insert the stripped grounding cable (D) under the terminal clamp (C) (max. cross section: 16 mm²).
2. Secure the clamping clip with screw (A) and washer (B).

   The toothing of the washer must face toward the clamping clip.



You can ground multiple Sunny Mini Centrals as shown below:



5.3 Installing the String Fuses

The Sunny Mini Central can be equipped with special string fuses to protect the string inputs from reverse currents. Whether string fuses must be used depends on the PV modules used as well as 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). SMA Solar Technology offers at the moment 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

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.

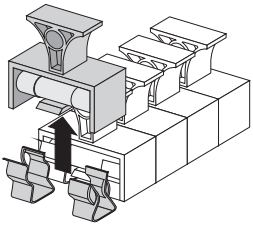
If installed, the string fuses in the Sunny Mini Central will be monitored automatically. If a fuse is burned out, the "Check DC fuse" error message appears in the display. However, the Sunny Mini Central continues to feed power.

Equip all slots with a string fuse

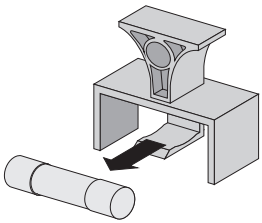
To ensure that the fuse monitoring function is working properly, all five slots must be equipped with the appropriate fuses at all times. This also applies if fewer strings are connected!

Installation Procedure

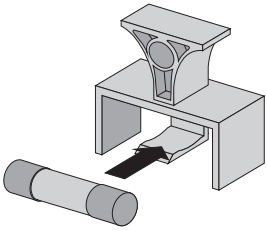
1. Open the Sunny Mini Central as described in section 7.1 „Opening the Sunny Mini Central“ (48).
2. Remove all fuse extractors (slot see section 5.1.2 „View from Inside“ (20)).



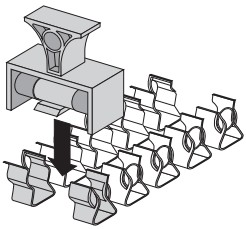
3. Remove jumpers from the fuse extractors.



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 7.2 „Closing the Sunny Mini Central“ (50).

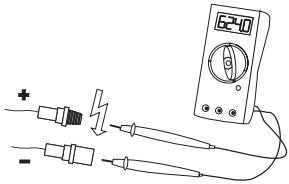


WARNING!

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 plug connector!



5.4 PV Generator (DC) Connection

- Requirements for the modules of the connected strings:
  - same type
  - same number
  - identical alignment
  - identical tilt
- The connecting wires of the PV modules must be equipped with plug connectors to allow the ten DC plug connectors of the Sunny Mini Central to be connected to it.

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

Connection Set	Order Code	Maximum flow current
Multi-Contact 3 mm	SWR-MC	21.0 A
Multi-Contact 4 mm	MC-SET	30.0 A
Tyco	TYCO-SET	30.0 A

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

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

DANGER!

Risk of lethal electric shock or burns!

The maximum possible input current per string is limited by the plug connector 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.

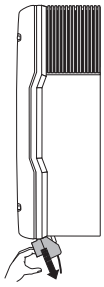
Connection Procedure

DANGER!

Danger to life due to high voltages in the Sunny Mini Central!

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

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



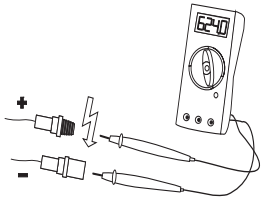
NOTICE!

Excessive voltages can destroy the measuring device!

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

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

   Check the system design if the open circuit voltage of the PV modules is less than 10 % below the maximum input voltage of the Sunny Mini Central!



NOTICE!

The Sunny Mini Central could be irreparably damaged by overvoltage!

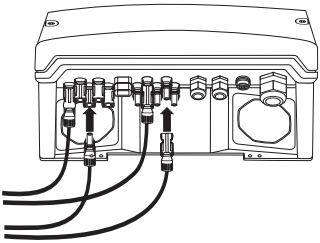
If the voltage of the PV modules exceeds the maximum input voltage of the Sunny Mini Central, it could be irreparably damaged by overvoltage.

All warranty claims become void.

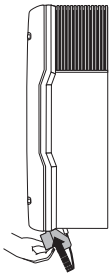
- Do not connect strings to the Sunny Mini Central with open circuit voltage greater than the maximum input voltage of the Sunny Mini Central.
- Check the system design.

3. Check the strings for ground faults, as described in section 9.1 „The Red LED is Continuously Illuminated (Ground Fault)“ (56).

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



6. Check the Electronic Solar Switch for wear as described in section 8.2 and insert it until it audibly clicks into place.



NOTICE!

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

The connector must remain moveable inside the handle to ensure proper contact. Tightening the screws voids all warranty claims and creates a fire risk.

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

NOTICE!

Damage to the Electronic Solar Switch!

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

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

You can now commission the Sunny Mini Central as described in section 6 „Commissioning" (42). The following connection options are optional.

The residual current circuit breaker

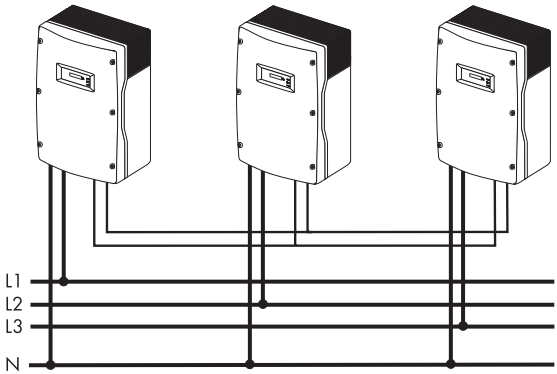
The Sunny Mini Central is equipped with an integrated all-pole sensitive leakage current monitoring unit. This enables the Sunny Mini Central to automatically differentiate between real leakage currents and "normal" capacitative leakage currents.

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

5.5 Power Balancer Connection

The Sunny Mini Central can be equipped with the Power Balancer as standard. This enables a circuit connection of three Sunny Mini Centrals to a three-phase low-voltage grid.

Each of the three Sunny Mini Centrals in a group must be connected to a different grid phase conductor (L1, L2 and L3)!



By activating this circuit, you can stipulate how the other two Sunny Mini Centrals 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.

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

Cable for the connection of the Power Balancer connector system

The cable for the connection is not provided as standard, but rather must be ordered separately from SMA Solar Technology (order number: PBL-YCABLE-10).

5.5.1 Configuration

The Power Balancer is deactivated at the factory using the "PowerBalancer" parameter (parameter setting = off) and can only be activated and configured using an SMA communication component. You will find options available for this in the Sunny Mini Central user manual or on the SMA Solar Technology website www.SMA.de.

Request a personal SMA grid guard password from SMA Solar Technology so that you can modify the "PowerBalancer" parameter (contact: see Page 65).

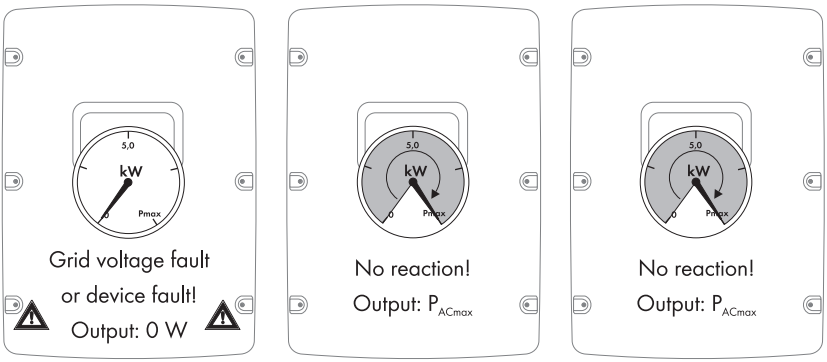
Configuration Options

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

- **Off**

  The Power Balancer is deactivated (factory setting).

  In the event of a device fault or grid voltage fault at a Sunny Mini Central, only this Sunny Mini Central is disconnected from the grid and the other two devices continue to run at an undiminished power level.

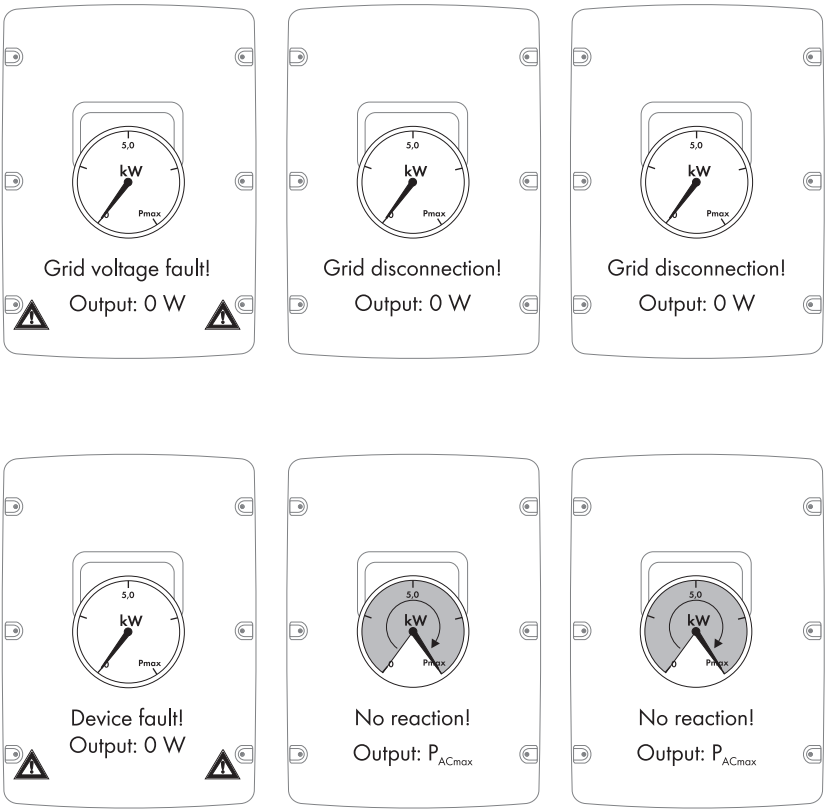


- **PhaseGuard**

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

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

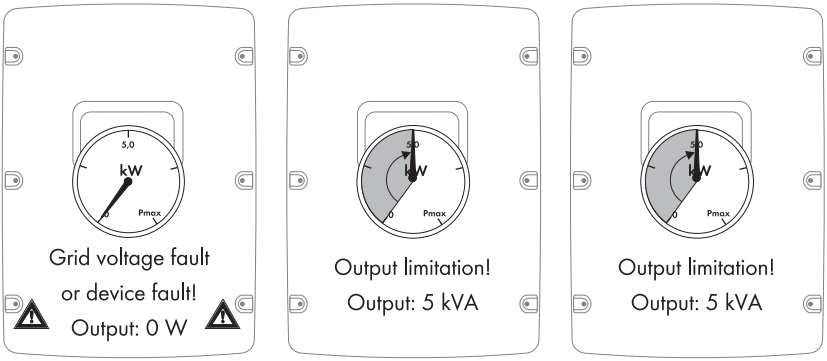
  For systems with a nominal power output > 30 kW, select this setting in order to realize the required three-phase voltage monitoring.



- **PowerGuard**

  If one of the three Sunny Mini Centrals 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.

  Select this setting in order to prevent an unbalanced load of over 5 kVA in a group of three Sunny Mini Centrals.

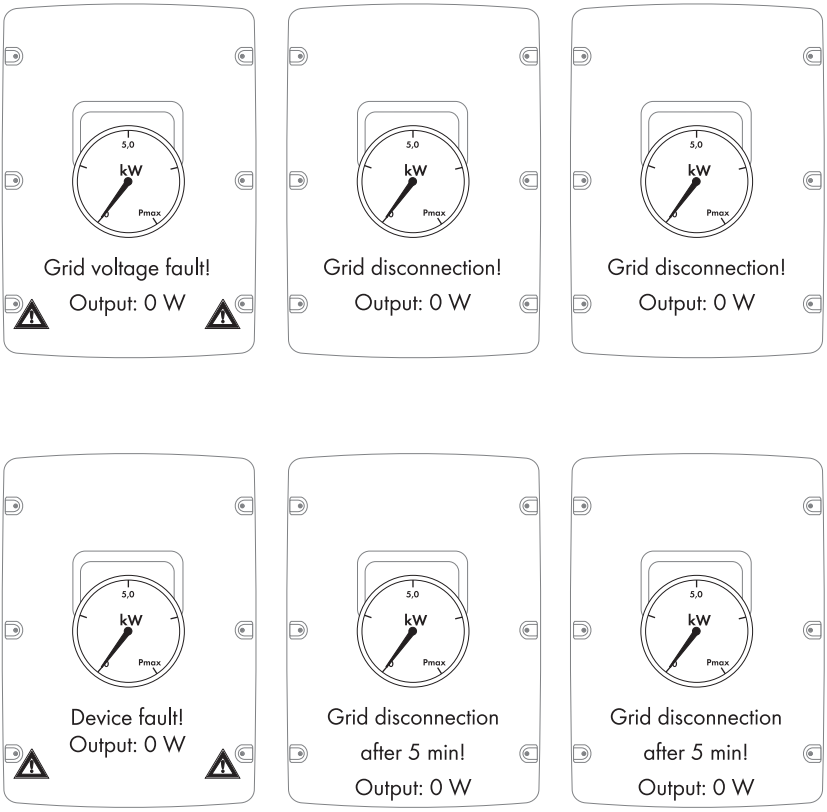


- **FaultGuard**

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

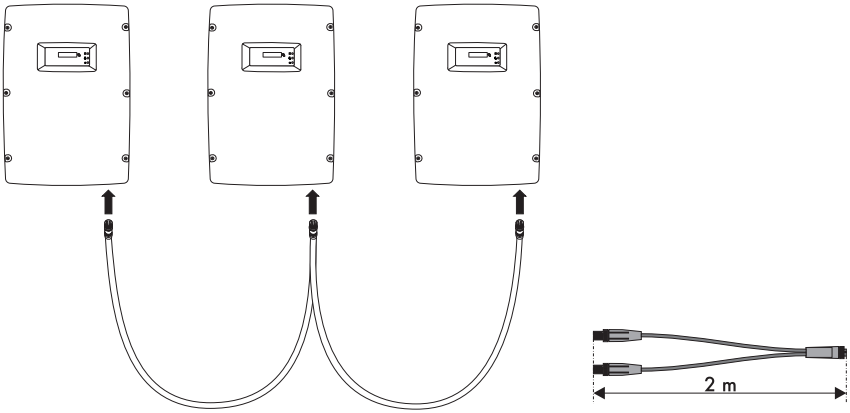
  If one of the three Sunny Mini Centrals indicates a **device fault** and stops feeding in, the other two inverters also disconnect from the grid 5 minutes later.

  Select this setting in order to realize the three-phase voltage monitoring required for systems with a nominal power output > 30 kW, and to prevent an unbalanced load of more than 5 kVA between two phases.



5.5.2 Cabling

The cabling of a group of three Sunny Mini Centrals is carried out according to the following diagram:

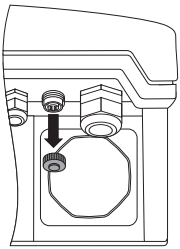


Connecting Sunny Mini Centrals without a Power Balancer connector system

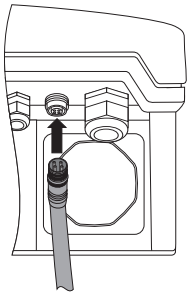
When connecting Sunny Mini Centrals with a Power Balancer but without the Power Balancer connector system, you require for these Sunny Mini Centrals a special add-on kit (order number: PBL-SMC-10-NR).

Cabling Procedure

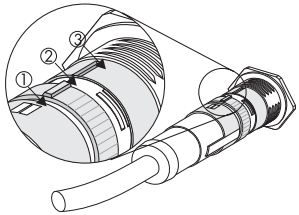
1. Twist off the cover of the threaded joint on the bottom side of the Sunny Mini Central.



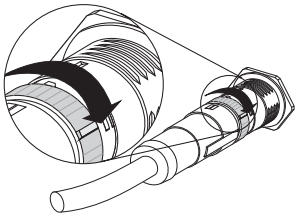
2. Plug the Power Balancer cable on the socket.



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



3. Tighten the cable screw connection with a half turn.

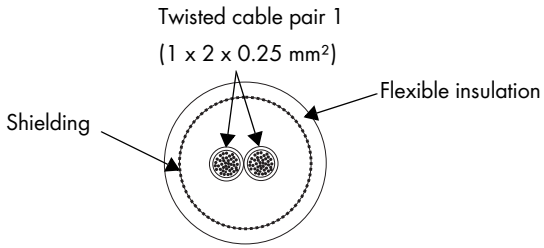


The cable is firmly connected. The Power Balancer can now be activated via a communication device.

Extending the Cable

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

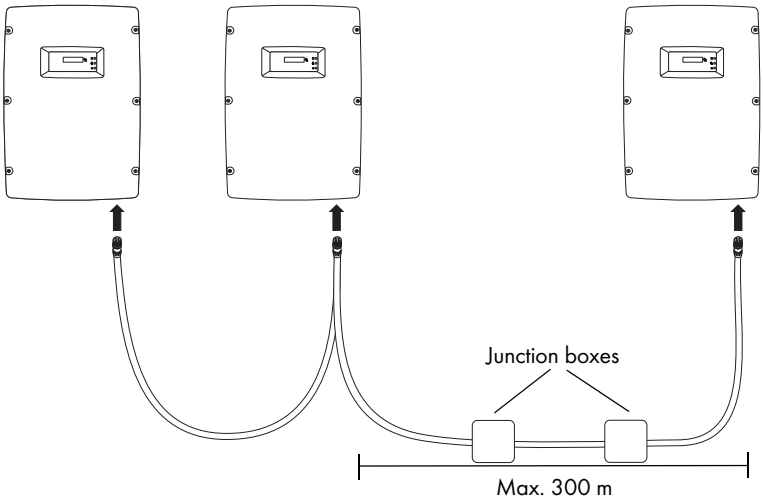
Use an "LiYCY" cable for this with the illustrated layout:



- Indoors: Li-2YCY 1 x 2 x 0.25 mm²
- Outdoors: Li-2YCYv 1 x 2 x 0.25 mm²

Proceed as follows:

1. Cut the 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 Power Balancer cable to the Sunny Mini Central as described in section „Cabling Procedure“ (36).

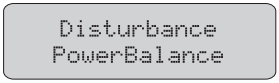
5.5.3 Functionality Test

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

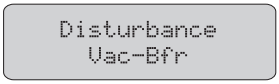
1. Select the “PhaseGuard” setting of the “PowerBalancer” parameter for all three Sunny Mini Centrals.
2. Check whether all Sunny Mini Centrals in the group are feeding the grid normally (green LED glows continually, or display message shown to the right). If this is the case, proceed to step 3.

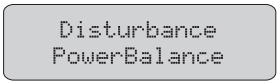
   If all Sunny Mini Centrals in this group show the display message pictured to the right:

   check the installation of the Power Balancer and contact SMA Solar Technology if necessary.
3. Switch off the line circuit breaker for one of the three Sunny Mini Centrals.
4. The Sunny Mini Central with a deactivated line circuit breaker then indicates a grid voltage fault with the display message shown to the right ("Bfr" and "Srr" are irrelevant).

5. The other two Sunny Mini Centrals then also disconnect from the grid and display the message shown to the right. Both devices subsequently switch to "Balanced" mode.

6. If the Sunny Mini Centrals react as described above, the functionality test has been completed successfully. Otherwise, check the configuration.
7. If applicable, reset the "PowerBalancer" parameter to the desired setting in all Sunny Mini Centrals.
8. Switch on the line circuit breaker again.

5.6 Slot for Communication Interfaces

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

See the communication interface documentation for a detailed wiring diagram.

This section describes how to install the communication interface in the Sunny Mini Central.

Installation Procedure

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

1. Open the Sunny Mini Central as described in section 7.1 „Opening the Sunny Mini Central" (48).

NOTICE!

Electrostatic discharges can damage the communication interface!

- Do not touch components connections and plug contacts.
- Ground yourself before removing the communication interface from the packaging by touching the PE or a non-coated part of the housing.

2. Thread the cable through the cable opening (E) on the Sunny Mini Central. Use the right cable opening for radio communication.

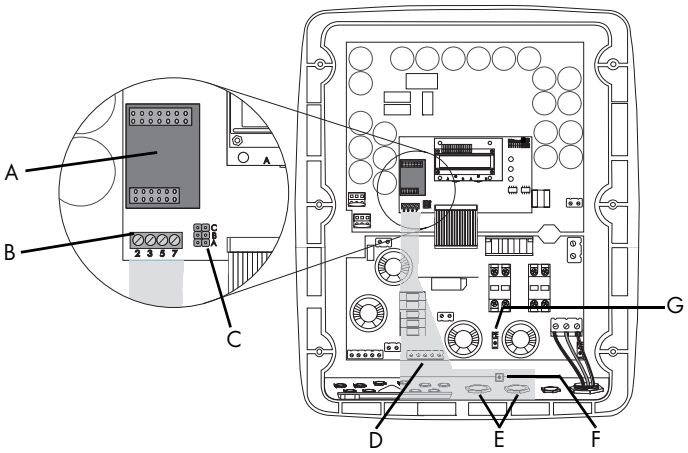
DANGER!

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

- Pull the silicone tube over the cable.

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

3. If the connection diagram of the communication device requires grounding the cable shield of the communication cable:
   - Use the provided shield clamp on its screwing device (F) for the communication interface. The installation and use of the cable shield is described in the communication interface documentation.
   - Or if no shield clamp was provided, ground the cable shield on the tab (G).
4. Install the communication cable (D) as described in the following figure.
5. Connect the communication cables to the screw terminal strip (B) as described in the connection plan of the communication device.
6. Connect the jumpers (C) if the connection plan of the communication device indicates this as necessary.
7. A detailed description of the jumper functions can be found in the communication device documentation.
8. Plug the communication interface to the left of the interface slot (A).
9. Close the Sunny Mini Central as described in section 7.2 .



A Interface slot
B Screw terminals for connection of the communication wires
C Jumper slot
D Cable route (gray surface)
E Cable openings in the base of the Sunny Mini Central
F Screwing device for the shield clamp
G Tab for grounding the cable shield

6 Commissioning

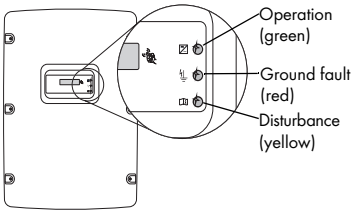
Check the following requirements before commissioning:

- correct connection of the AC (grid) cable
- full connection of the DC cables (PV strings)
- unused DC plug connectors on the underside of the housing are sealed with protective caps
- the housing cover is securely screwed in place
- the Electronic Solar Switch is securely plugged
- the line circuit breaker is laid out correctly

Commissioning Procedure

1. Switch on the line circuit breaker.
2. During the day, an illuminated or blinking green LED signals fault-free operation. If this is the case, commissioning was completed successfully.

   There is no display available for displaying due to a lack of radiation at night.
3. The meaning of the yellow and red LEDs as well as the error and status messages on the display are described in the user manual provided.



6.1 Display

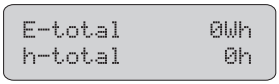
Working Mode

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

1. The energy generated today and the current operating mode are displayed first.

2. The current feed-in output and the PV voltage are displayed after 5 seconds or when you tap the housing cover.

3. After a further 5 seconds, or when you tap again, the total energy produced and the time the Sunny Mini Central has been connected to the grid are displayed.



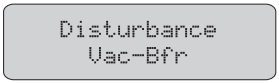
4. Then the cycle begins again.

Disturbance

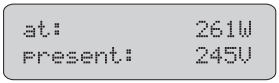
1. In case of a failure, the message "Disturbance" will be indicated in the status bar.

2. The exact failure message follows.

   For example, if the grid fault message shown here is displayed immediately after connection, it may be due to the fact that the AC wire is not correctly connected or the circuit breaker is not switched on yet.



3. If a measured value, which is not standard-compliant, is responsible for the fault, then the value measured at the time of the fault is displayed. If another measurement is possible, the present value is displayed in the second line.



Please refer to the provided operating manual of the Sunny Mini Central to read the exact explanations for the error and status messages!

PV Overvoltage

NOTICE!

Excessive DC voltage can destroy the Sunny Mini Central!

Immediately disconnect the Sunny Mini Central!

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

Check DC voltage!

- Higher than 700 V: Contact the planner / installer of the PV generator for assistance.
- Lower than 700 V: Reconnect the Sunny Mini Central to the PV generator as described in section 5.4 „PV Generator (DC) Connection“ (28).

  If the message occurs again, disconnect the Sunny Mini Central again and contact SMA Solar Technology (see section 12 „Contact“ (65)).

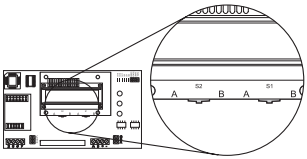
6.1.1 Setting the Display Language

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

Proceed as follows:

1. Open the Sunny Mini Central as described in section 7.1 „Opening the Sunny Mini Central“ (48).
2. Set the switches for the required language, as shown below.

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



3. Close the Sunny Mini Central as described in section 7.2 „Closing the Sunny Mini Central“ (50).

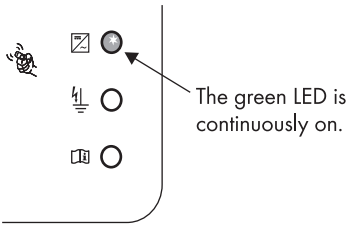
6.2 LED Display

Overview

Green	Red	Yellow	Status
Glows continuously	is not glowing	is not glowing	OK (feeding operation)
	glows continuously	is not glowing	disturbance
		glows continuously	OK (initialization)
Blinks quickly (3 x per second)	is not glowing	is not glowing	OK (stop)
	glows continuously	is not glowing	disturbance
Blinks slowly (1 x per second)	is not glowing	is not glowing	OK (waiting, grid monitoring)
Briefly goes out (approx. 1x per second)	glows continuously	is not glowing	disturbance
	is not glowing	is not glowing	OK (derating)
is not glowing	Is not glowing	is not glowing	OK (night shutdown)
		glowing/blinking	disturbance
	glows continuously	is not glowing	disturbance
		glowing/blinking	disturbance
Not relevant	flashes	not relevant	warning

Working Mode

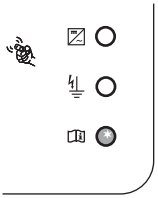
After a fault-free grid connection of the Sunny Mini Central, it takes approximately one minute until the green LED is continuously on. The blink codes shown before only have the purpose of indicating the initialization of the Sunny Mini Central and the process of controlling whether the power supply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

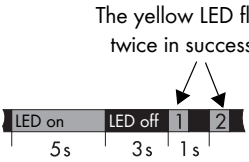


Failure or Fault

If the Sunny Mini Central detects a failure or fault, this is indicated through a blink code of the yellow and, where applicable, the red LEDs.

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

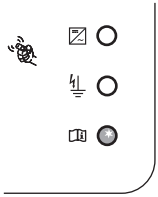


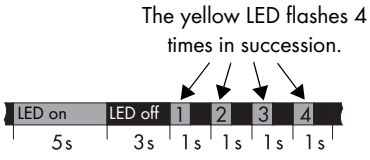


Explanation of the blink codes

For a detailed description of the blink codes, see the provided operating manual of the Sunny Mini Central.

PV Overvoltage





NOTICE!

Excessive DC voltage can destroy the Sunny Mini Central!

Immediately disconnect the Sunny Mini Central!

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

Check DC voltage!

- Higher than 700 V:

  Contact the planner / installer of the PV generator for assistance.

- Lower than 700 V:

  Reconnect the Sunny Mini Central to the PV generator as described in section 5.4 „PV Generator (DC) Connection“ (28).

  If the message occurs again, disconnect the Sunny Mini Central again and contact SMA Solar Technology (see section 12 „Contact“ (65)).

7 Opening and Closing

NOTICE!

Electrostatic discharges can damage the Sunny Mini Central!

Internal components of the Sunny Mini Central can be irreparably damaged by electrostatic discharge.

- Ground yourself before you touch a component.

7.1 Opening the Sunny Mini Central

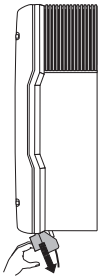
DANGER!

Danger to life due to high voltages in the Sunny Mini Central!

Before opening the Sunny Mini Central:

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

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

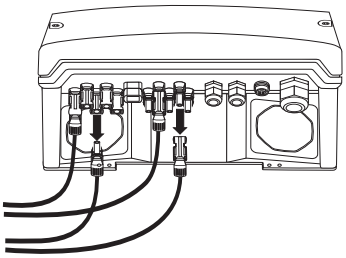


DANGER!

Danger to life due to high voltages in the Sunny Mini Central!

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

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



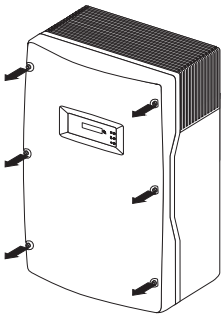
DANGER!

Danger to life due to high voltages in the Sunny Mini Central!

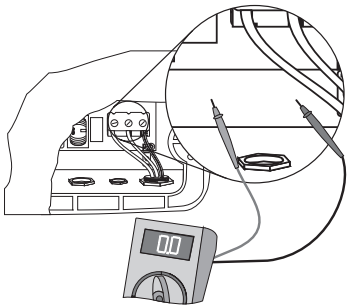
The capacitors in the Sunny Mini Central require five minutes to discharge.

- Wait five minutes before opening the Sunny Mini Central.

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



3. Use a suitable measuring device on the AC terminal to ensure that there is no voltage present at PE. If voltage is found, check the installation!

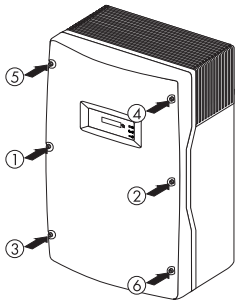


7.2 Closing the Sunny Mini Central

1. Secure the cover with six screws and the corresponding washers.

   Tighten the screws in the sequence shown on the right to a torque of 6 Nm. The toothing of the washers must face toward the cover.

   The Sunny Mini Central accessories kit contains a spare screw and spare washer.



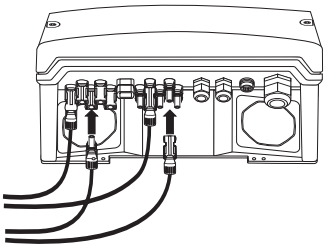
DANGER!

Danger to life due to live covers!

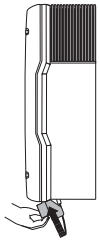
The grounding of the housing cover is ensured by the toothed washers.

- Fasten the washers for all six screws with the toothing facing toward the cover.

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



3. Check the Electronic Solar Switch for wear as described in section 8.2 and insert it until it audibly clicks into place.



NOTICE!

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

The connector must remain moveable inside the handle to ensure proper contact. Tightening the screws voids all warranty claims and creates a fire risk.

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

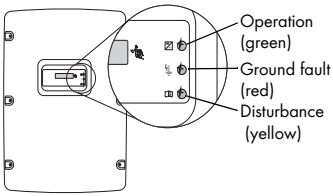
NOTICE!

Damage to the Electronic Solar Switch!

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

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

4. Switch on the line circuit breaker.
5. Check whether the display and the LEDs indicate normal operating mode (see section „“ (41)).



8 Maintenance

8.1 Checking Heat Dissipation

8.1.1 Cleaning the Fans

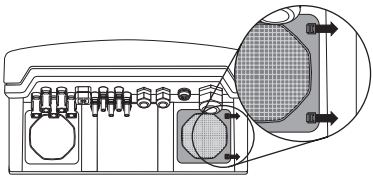
If the fan guards are only covered in loose dust, they can be cleaned with a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, dismantle the fan for cleaning.

To do so, proceed as follows:

1. Disconnect the Sunny Mini Central from both the DC and AC connections, as described in section 7.1 „Opening the Sunny Mini Central“ (48).
2. Wait for the fans to stop rotating.

Cleaning the Fan Guards

3. Push the two latches at the right edge of the black plastic cover to one side and remove it carefully with the fan guards mounted behind.
4. Clean the fan guard with a soft brush, a paint brush, a cloth, or pressurized air.

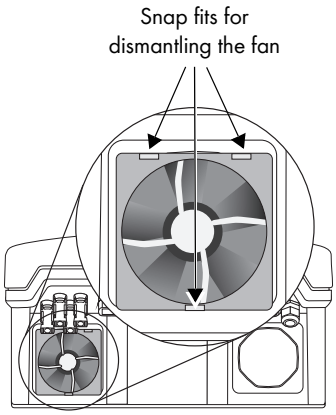


Cleaning the Fan

5. Press the front latches backwards and the rear latches forwards.
6. Remove the fan by pulling it slowly and carefully downwards.
7. Unlock and remove the plugs.

   The fan cables are long enough that you can lift the fan far enough out to disconnect the internal plugs in the Sunny Mini Central.
8. Remove the fan and clean it with a soft brush, a paint brush, or a cloth and water.

   Do not use pressurized air as this can damage the fan.
9. After cleaning, assemble everything in reverse order.



10. Check that the fans are functional as described in the next section.

8.1.2 Checking the Fans

There are two ways to check that the fan is functional:

- Set the "Fan Test" parameter to "1" in the installer mode

  (using Sunny Data, Sunny Data Control, the Sunny Boy Control data logger or Sunny WebBox)
  or
- place the jumper on the controller board (the jumper required to check the fans is included in the Sunny Mini Central accessories kit).

Setting the Parameter

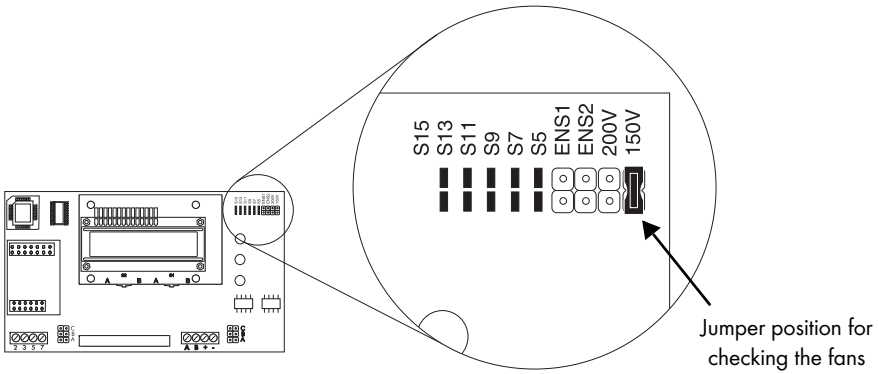
1. Request the installer password on the SMA Service Line (contact: see Page 65).
2. Set the "Fan Test" parameter to "1" in the installer mode.
3. Check the fans air-flow.

   The Sunny Mini Central sucks air in from underneath and then blows it back out on the upper sides. 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.

Setting the Jumper

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

1. Open the Sunny Mini Central as described in section 7.1 „Opening the Sunny Mini Central" (48).
2. Plug the provided jumper in the slot on the system control board as shown below.



3. Close the Sunny Mini Central as described in section 7.2 „Closing the Sunny Mini Central" (50).

4. Check the fans air-flow.

   The Sunny Mini Central 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 Sunny Mini Central as described in section 7 „Opening and Closing“ (48).

8.1.3 Cleaning the Handle Covers

The Sunny Mini Central sucks air in from underneath via the fans and blows it out again at the top on both sides via the handle covers. Clean the handle covers if they are dirty. Proceed as follows:

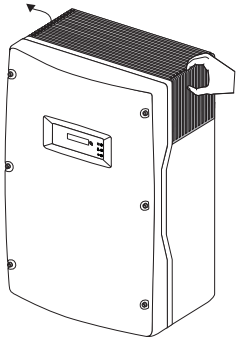
1. Remove the handle covers.

   Insert your finger above in the space between the handle cover and the housing and remove the handle covers to the side.

2. Clean the handle covers with a soft brush, a paint brush, or pressurized air.

3. Fasten the handle covers back onto the Sunny Mini Central.

   The handle covers must be attached according to the inside inscription (“links/left” and “rechts/right”).



NOTICE!

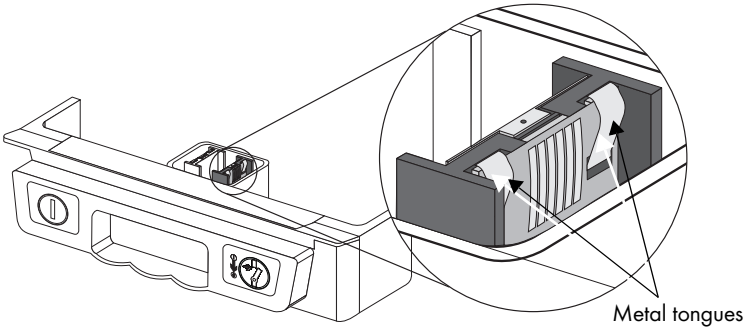
Insects entering the Sunny Mini Central can damage the device!

- The handle covers must not be removed permanently, because otherwise the device is not protected against the entrance of insects!

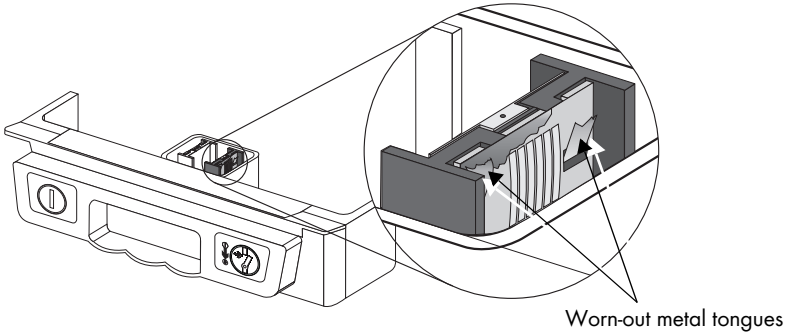
8.2 Inspection of the Electronic Solar Switch (ESS)

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

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



If the metal tongues are brown or completely burned out (see figure below), then the Electronic Solar Switch can no longer reliably disconnect the DC side.



You must replace the handle of the Electronic Solar Switch before you can reactivate the Sunny Mini Central. Replacements for damaged Electronic Solar Switch handles are available from your dealer.

9 Troubleshooting

Should the Sunny Mini Central display other blink codes or display messages than those described in section 5.5.3 „Functionality Test“ (39), please refer to the operating manual of the Sunny Mini Central to find the exact meaning of the display message or the blink code and details on troubleshooting.

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

9.1 The Red LED is Continuously Illuminated (Ground Fault)

The Sunny Mini Central has detected a ground fault in the PV generator.

Proceed as follows to locate it:

1. Disconnect the Sunny Mini Central from both the DC and AC connections, as described in section 7.1 „Opening the Sunny Mini Central“ (48).

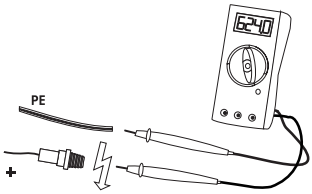
NOTICE!

Excessive voltages can destroy the measuring device!

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

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

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



DANGER!

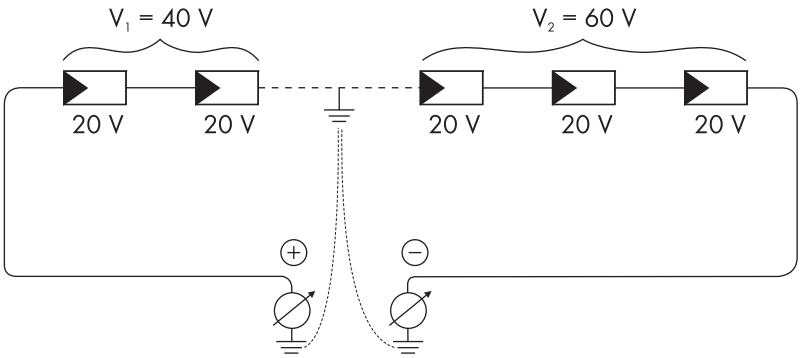
Risk of lethal electric shock!

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

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

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

For example:



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

3. Repeat step 2 for each string.
4. The installer of the PV generator must fix the ground fault in the affected string before the string may be reconnected to the Sunny Mini Central.
5. Restart the Sunny Mini Central as described in section 7.2 „Closing the Sunny Mini Central" (50), but **without** reconnecting the faulty string.

9.2 The Red LED is Flashing

A flashing red LED can have different causes and depends on the corresponding error message on the display:

1. At least one of the varistors is defective (<Check Varistor> display message).
2. At least one of the string fuses is defective (<DC fuse> display message).

9.2.1 Checking 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.

You can check the varistors in the following way:

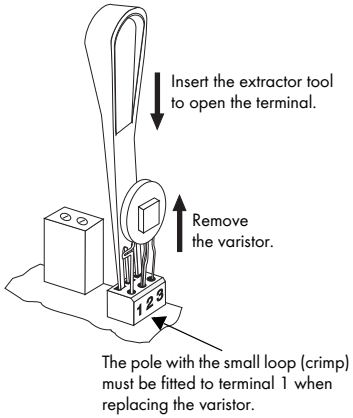
1. Open the Sunny Mini Central as described in section 7.1 „Opening the Sunny Mini Central" (48).
2. Use a multimeter to check both varistors and see if there is a conducting connection between connectors 2 and 3 (position see section 5.1.2 „View from Inside" (20)).

Event	Measure
There is a **conducting** connection:	There is probably another fault in the Sunny Mini Central. • Close the Sunny Mini Central as described in section 7.2 „Closing the Sunny Mini Central“ (50). • Discuss further steps with the SMA Technical Service Line.
There is **no conducting** connection:	The respective varistor is not working and must be replaced. The varistors are specially manufactured for use in the Sunny Mini Central and are not commercially available. They must be ordered directly from SMA Solar Technology . (SMA order code: "MSWR-TV7"). • To replace the part, proceed to step 3.

3. Replace both varistors with new ones as shown in this drawing. Varistor failure is generally due to influences which affect all varistors similarly (temperature, age, induced overvoltage).

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

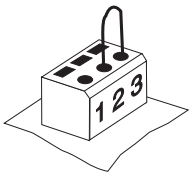
   Ensure the varistors are installed the right way round.



4. Bridge connections 2 and 3 if required.

   If no replacement varistors are available on site, the Sunny Mini Central can be temporarily run without them.

   To do this, remove the varistors as described above and in their place, bridge the terminals 2 and 3 with a wire jumper.



NOTICE!

The Sunny Mini Central could be irreparably damaged by overvoltage!

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

- Do **not** operate Sunny Mini Centrals without varistors in systems with a high risk of overvoltages.
- Replacement varistors should be obtained as soon as possible.

5. Close the Sunny Mini Central as described in section 7.2 „Closing the Sunny Mini Central" (50).

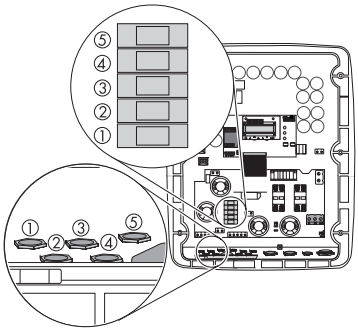
9.2.2 Replacing the String Fuses (<DC fuse>)

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

To do so, proceed as follows:

1. Open the Sunny Mini Central as described in section 7.1 „Opening the Sunny Mini Central" (48).

   The string assignment is displayed in the figure on the right.



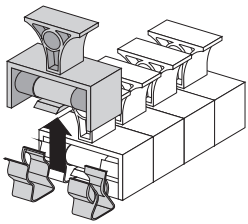
2. All fuse extractors must be consecutively removed with the string fuses.

   Note the string assignment.

3. Check the conductivity using the circuit indicator.

   A non-conductive fuse indicates a fault in the affected string.

4. Have the installer of the PV generator check the affected string and order the add-on kit for the defect string fuse from SMA Solar Technology.



NOTICE!

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

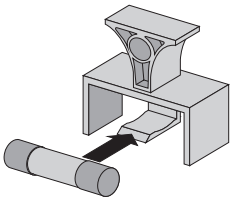
When using commercially available fuses, it cannot be ensured that they will function correctly and in case of a fault, the fuses may burn out.

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

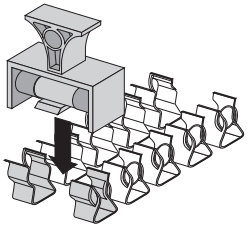
Equip all slots with a string fuse

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

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



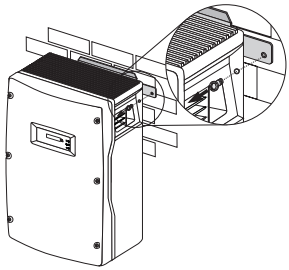
6. Insert the fuse extractors in the slots.
7. Close the Sunny Mini Central as described in section 7.2 „Closing the Sunny Mini Central“ (50).



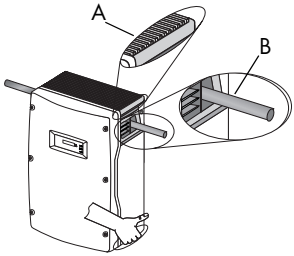
10 Decommissioning

10.1 Disassembly

1. Open the Sunny Mini Central as described in section 7.1 „Opening the Sunny Mini Central“ (48).
2. Remove all cables from the Sunny Mini Central.
3. Close the Sunny Mini Central with the six screws and the corresponding washers.
4. Remove both screws on the left and right side of the Sunny Mini Central that attach it to the wall mounting bracket.
5. Disconnect the anti-theft protection, if applicable.
6. Remove the Sunny Mini Central upwards in a vertical position from the wall mounting bracket.



7. When transporting the Sunny Mini Central, use the ergonomic handles at the top and bottom at the sides of the Sunny Mini Central (A) or the housing opening, for example, by sliding a steel bar through it (B) (diameter max. 30 mm).



10.2 Packaging

If possible, always pack the Sunny Mini Central in the original packaging. If this is no longer available, a similar box can be used which can withstand the weight of the Sunny Mini Central (35 kg), has a handle system and can be closed fully.

10.3 Storage

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

10.4 Disposal

Dispose of the Sunny Mini Central at the end of its service life in accordance with the disposal regulations for electronic scrap which apply at the installation site at that time. Alternatively, send it back to SMA Solar Technology with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("for disposal") (contact: see Page 65).

11 Technical Data

		SMC 9000TL-10	SMC 10000TL-10	SMC 10000TL-10
PV Generator Connection Data				
Max. input voltage	$U_{PV\,0}$	700 V [a] (based on -10 °C cell temperature)		
Input voltage Input voltage, MPP range	U_{PV}	333 V ... 500 V DC		
Max. input current	$I_{PV\,max}$	28 A	31 A	34 A
Max. input power	P_{DC}	9300 W	10350 W	11400 W
Voltage ripple	Upp	< 10 % of the input voltage		
Internal consumption during operation		< 8 W		

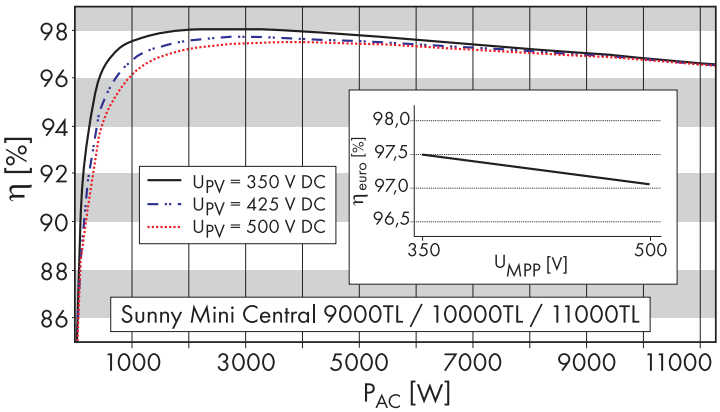
[a] The maximum open circuit voltage, which can occur at a cell temperature of -10 °C, may not exceed the maximum input voltage.

Grid connection data				
Nominal output power	P_{ACnom}	9000 W	10000 W	11000 W
Peak output power	P_{ACmax}	9000 W	10000 W	11000 W
Nominal output current	I_{ACnom}	40 A	44 A	48 A
Max. output 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 operational 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 phi	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 10000TL-10
General data				
EC Declaration of Conformity		enclosed set of documents, download area www.SMA.de		
Dimensions (W x H x D)		approx. 468 mm x 613 mm x 242 mm		
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 air 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		3,000 m above sea level		
Topology		transformerless		
Fan connections		designed for safe disconnection in accordance with DIN EN 50178:1998-04		
Protective function DC side				
All-pole disconnection unit on the DC input side		Electronic Solar Switch, DC plug connector		
Overvoltage protection		thermally monitored varistors		
Personal Protection		insulation monitoring (Riso > 1 MOhm)		
Reverse polarity protection		via short-circuit diode		

		SMC 9000TL-10	SMC 10000TL-10	SMC 10000TL-10
Protective function AC side				
Short-circuit tolerance		Current control		
All-pole disconnection unit on grid side		Automatic disconnection device (SMA grid guard 2.1)		
Efficiency				
Max. efficiency	η_{max}	98 %		
CEC rebate efficiency	η_{euro}	97,6 %	97,5 %	97,5 %
Communication interfaces				
RS232		optional		
RS485 (galvanically isolated)		optional		
Radio		optional		
Electronic Solar Switch (ESS)				
Electrical service life (in case 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		

Efficiency curve



12 Contact

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

- inverter type
- series number of the Sunny Mini Central
- type and number of modules connected
- communication method
- blink code or display of the Sunny Mini Central

SMA Solar Technology AG

Sonnenallee 1

34266 Niestetal, Germany

Tel.:+49 (0)561/ 9522 - 499

Fax:+49 (0)561/ 9522 - 4699

Serviceline@SMA.de

www.SMA.de

Exclusion of liability

The general terms and conditions of delivery of SMA Solar Technology AG shall apply.

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

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

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

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

- SMA Solar Technology AG rejects any liability for direct or indirect damages arising from the use of software developed by SMA Solar Technology AG. This also applies to the provision or non-provision of support activities.
- Supplied software not developed by SMA Solar Technology AG is subject to the respective licensing and liability agreements of the manufacturer.

SMA Factory Warranty

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

Trademarks

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

SMA Solar Technology AG

Sonnenallee 1

34266 Niestetal

Germany

Tel. +49 561 9522-0

Fax +49 561 9522-100

www.SMA.de

E-Mail: info@SMA.de

SMA Solar Technology AG

www.SMA.de

Sonnenallee 1
34266 Niestetal, Germany
Tel.: +49 561 9522 4000
Fax: +49 561 9522 4040
E-Mail: Vertrieb@SMA.de
Freecall: 0800 SUNNYBOY
Freecall: 0800 78669269