



PV inverter

# SUNNY MINI CENTRAL 7000HV

Installation Manual





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# 1 Information on this Manual

## 1.1 Validity

This manual describes the mounting, installation, commissioning, maintenance and troubleshooting procedures for the following SMA inverters:

- Sunny Mini Central 7000HV (SMC 7000HV-11).

Keep this manual in a convenient place for future reference.

## 1.2 Target Group

This manual is for electrically skilled persons. The tasks described in this manual may only be performed by electrically skilled persons.

## 1.3 Additional Information

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

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

## 1.4 Symbols Used

The following types of safety precautions and general information appear in this document as described below.

 <b>DANGER!</b>
<p>"DANGER" indicates a hazardous situation which, if not avoided, will result in death or serious injury!</p>

 <b>WARNING!</b>
<p>"WARNING" indicates a hazardous situation which, if not avoided, could result in death or serious injury!</p>

 <b>CAUTION!</b>
<p>"CAUTION" indicates a hazardous situation which, if not avoided, could result in minor or moderate injury!</p>

 <b>NOTICE!</b>
<p>"NOTICE" indicates a situation that can result in property damage if not avoided!</p>

 <b>Information</b>	<p>Information provides tips that are valuable for the optimal installation and operation of your product.</p>
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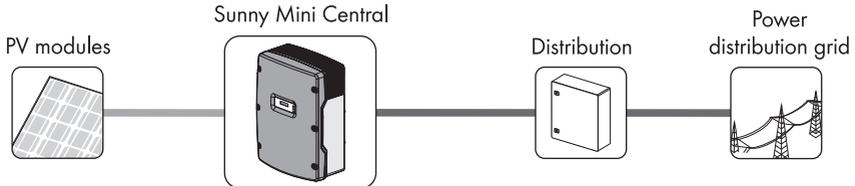
- This symbol indicates the result of an action.

## 2 Security

### 2.1 Intended Use

The Sunny Mini Central is a PV inverter, which converts the direct current of the PV array to grid-compliant alternating current and feeds it into the power distribution grid.

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



The Sunny Mini Central is suitable for indoor and outdoor use.

The Sunny Mini Central may only be operated with PV arrays (PV modules and cabling) of protection class II. The PV modules used have to be suitable for use with the Sunny Mini Central and must be released by the module manufacturer.

Alternative uses, modifications to the Sunny Mini Central or the installation of components not expressly recommended or sold by SMA Solar Technology AG are not permitted.

Persons with limited physical or mental abilities may only work with the Sunny Mini Central following proper instruction and under constant supervision. Children are forbidden to play with the Sunny Mini Central. Keep the Sunny Mini Central away from children.

Only use the Sunny Mini Central in accordance with the information provided in the enclosed documentation. Any other use can result in personal injury or property damage.

- 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.

The enclosed documentation is a part of this product. Read and follow the documentation for the proper and optimum use of the Sunny Mini Central. Keep this documentation in a convenient place for future reference.

## 2.2 Safety Instructions

### Electric Shock

High voltages that can result in electrical shocks are present in the conductive component parts of the inverter.

- Disconnect the inverter from voltage sources as described in this manual before performing any work on it (see section 7.2 "Opening the Inverter" (page 56)).

### Burn Hazard

Some parts of the Sunny Island enclosure can become hot during operation.

- Only touch the enclosure lid of the inverter during operation.

### Environmental Influences

When closed and with the Electronic Solar Switch attached, the inverter complies with the IP65 degree of protection. The inverter is thus protected against the penetration of dust and water. The penetration of dust and water can damage the inverter.

- If the Electronic Solar Switch is not attached, the inverter must be protected against dust and water.
- Securely attach the Electronic Solar Switch again after any work on the inverter.

### Electrostatic discharge

Touching electronic components can cause damage to or destroy the inverter through electrostatic discharge.

- Ground yourself before touching any component parts.

## 2.3 Explanation of Symbols

This section gives an explanation of all the symbols found on the inverter and on the type label.

### 2.3.1 Symbols on the Inverter

Symbol	Explanation
	Operation display. Indicates the operating state of the inverter.
	Ground fault or varistor defective. Read section 9.3 "Red LED is Glowing Continuously" (page 73).
	Fault or disturbance. Read section 9 "Troubleshooting" (page 66).
	You can operate the display by tapping. <ul style="list-style-type: none"> <li>• Tapping once: the background light switches on or the display scrolls one message further.</li> <li>• 2 taps in quick succession*: The inverter shows the display messages from the startup phase again (see section 6.2 "Display Messages During the Startup Phase" (page 50)).</li> </ul>
	DC load disconnection unit Electronic Solar Switch (ESS) <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 connectors ❷, as described in section 7.2 "Opening the Inverter" (page 56).</li> </ul>
	
	QR-Code <sup>®**</sup> for SMA bonus program You will find information on the SMA bonus program at <a href="http://www.SMA-Bonus.com">www.SMA-Bonus.com</a> .

\* This function is valid from firmware version 2.10.

\*\* QR-Code is a registered trademark of DENSO WAVE INCORPORATED.

### 2.3.2 Symbols on the Type Label

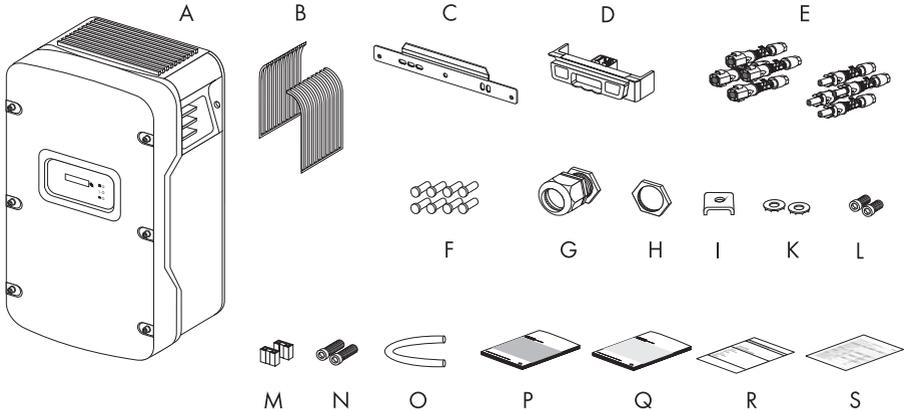
Symbol	Explanation
	Beware of dangerous electrical voltage. The inverter operates at high voltages. All work on the inverter may only be carried out by electrically skilled persons.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Observe all documentation that accompanies the inverter.
	The inverter must not be disposed of together with the household waste. For more information on disposal, see section 10.4 "Disposing of the Inverter" (page 79).
	CE mark. The inverter complies with the requirements of the applicable EC guidelines.
	The inverter has a transformer.
	Direct current (DC)
	Alternating current (AC)
	Degree of protection IP65. The inverter is protected against penetration by dust particles and water jets from any angle.
	RAL quality mark for solar products. The inverter complies with the requirements of the German Institute for Quality Assurance and Labeling.
 N23114	In compliance with Australian mark

Symbol	Explanation
	Chinese mark of conformity
	In compliance with Korean mark

## 3 Unpacking

### 3.1 Scope of Delivery

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



Position	Quantity	Description
<b>A</b>	1	Sunny Mini Central
<b>B</b>	1	Ventilation grids (right/left)
<b>C</b>	1	Wall mounting bracket
<b>D</b>	1	DC load disconnection unit Electronic Solar Switch (ESS)
<b>E</b>	8	DC plug connectors (4 x positive, 4 x negative)
<b>F</b>	8	Sealing plugs for DC connectors
<b>G</b>	1	Cable gland 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	Conical spring washers: 1 x for cover screws (replacement), 1 x for ground terminal
<b>L</b>	2	Cylinder head screws (M6 x 16): 1 x for enclosure lid (replacement), 1 x for ground terminal
<b>M</b>	2	Jumper (1 x for fan test, 1 x for the SMA Power Balancer wiring)
<b>N</b>	2	Cylinder head screws (M6 x 8) for securing the inverter to the wall mounting bracket
<b>O</b>	1	Silicone tube for insulating the SMA Power Balancer connection cable
<b>P</b>	1	Installation manual

Position	Quantity	Description
Q	1	User manual
R	1	Set of documents with explanations and certificates
S	1	Supplementary sheet with inverter factory settings

## 3.2 Identifying the Inverter

You can identify the inverter using the type label. The type label is on the right-hand 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 Mounting

### 4.1 Security

**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.

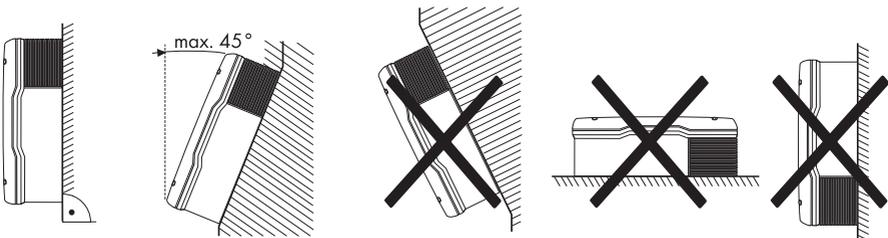
**CAUTION!**  
**Risk of injury due to the heavy weight of the inverter!**

- Take the inverter's weight of approx. 65 kg into account for mounting.

### 4.2 Selecting the Mounting Location

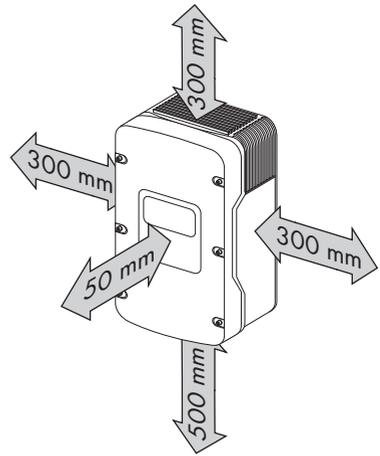
Consider the following requirements when selecting the mounting location:

- The mounting method and location must be suitable for the inverter's weight and dimensions (see section 11 "Technical Data" (page 80)).
- Mount on a solid surface.
- The mounting location must at all times be clear and safely accessible without the use of additional aids such as scaffolding or lifting platforms. Non-fulfillment of these criteria may restrict servicing.



- Mount vertically or tilted backwards by max. 45°.

- The connection area must point downward.
- Never mount the device with a forward tilt.
- Never install the device with a sideways tilt.
- Do not mount horizontally.
- Mount at eye level to allow operating states to be read at all times.
- The ambient temperature should be below 40 °C to ensure optimum operation.
- Do not expose the inverter to direct sunlight as this can cause excessive heating and thus power reduction.
- In living areas, do not mount the unit on plasterboard walls or similar to avoid audible vibrations. When in use, the inverter emits noises 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 ensure sufficient heat dissipation and sufficient space for removing the Electronic Solar Switch.



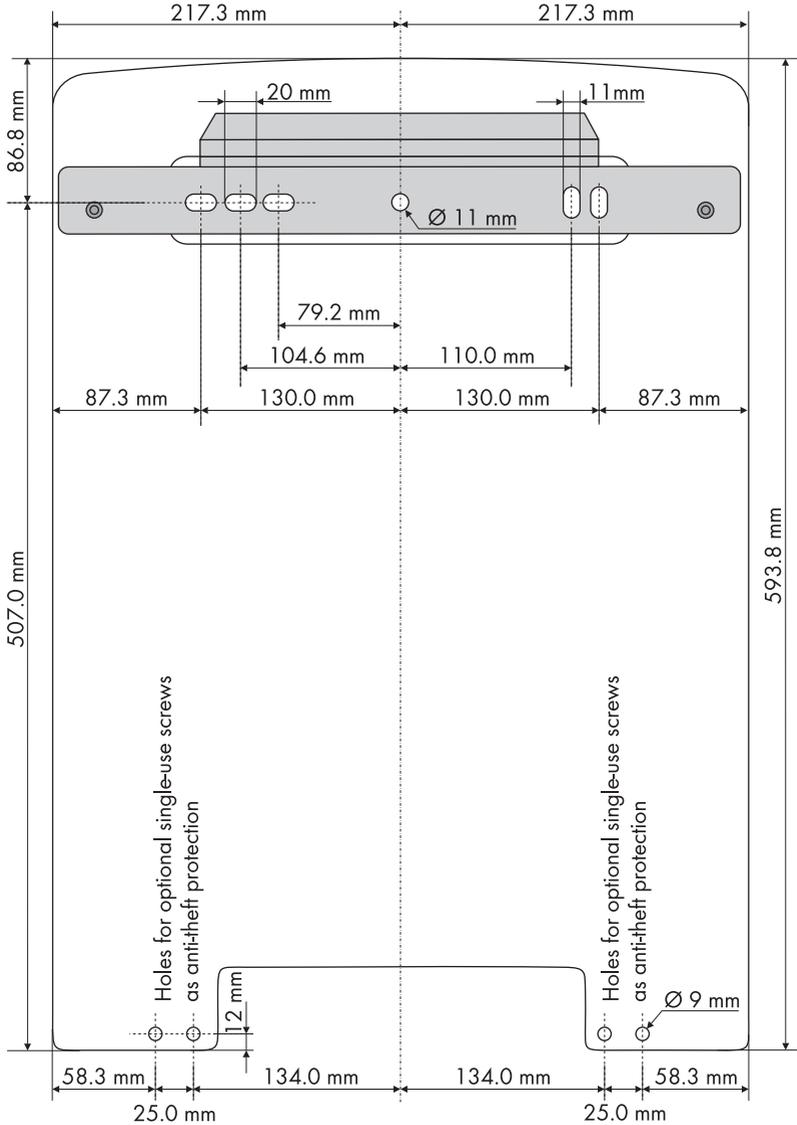
### Multiple inverters installed in areas with high ambient temperatures

There must be sufficient clearance between the individual inverters to ensure that the cooling air of the adjacent inverter is not taken in.

If necessary, increase the clearance spaces and make sure there is enough fresh air supply 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.

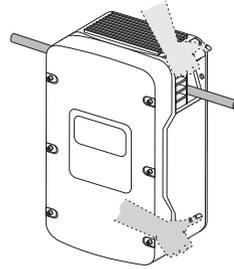


**CAUTION!**

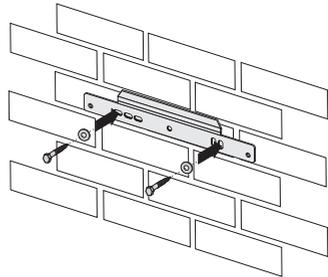
**Risk of injury due to the heavy weight of the inverter!**

The inverter weighs 65 kg.

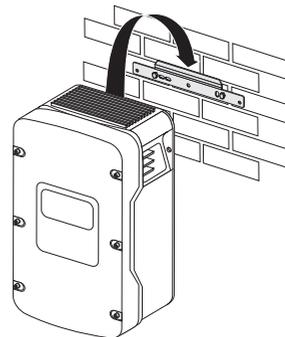
- Attach the wall mounting bracket with the corresponding mounting material (depending on the surface).
- Use the side handles (above and below) or a steel rod (maximum diameter of 30 mm) for transport and mounting. The rod must be pushed through the enclosure openings.



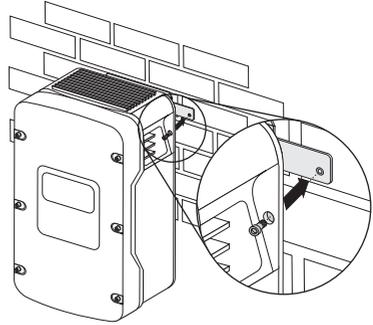
2. Secure the wall mounting bracket to the wall using appropriate screws and washers.



3. Hang the inverter onto the wall mounting bracket using the opening for this purpose in the rear of the enclosure.

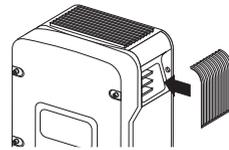


4. Screw the inverter onto the wall mounting bracket on both sides using the screws (M6x8) provided. For this purpose, only tighten the screws by hand.



5. Make sure that the inverter is securely seated.
6. Close the recessed grips with the fan grills provided. To help you identify the sides, the ventilation grids are marked "rechts/right" and "links/left" on the inside.

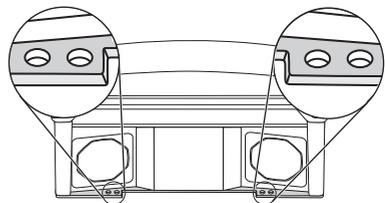
The ventilation grids prevent dirt and insects from entering the device and, if necessary, can be reordered from SMA Solar Technology AG (see section 13 "Contact" (page 85)).



**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!**

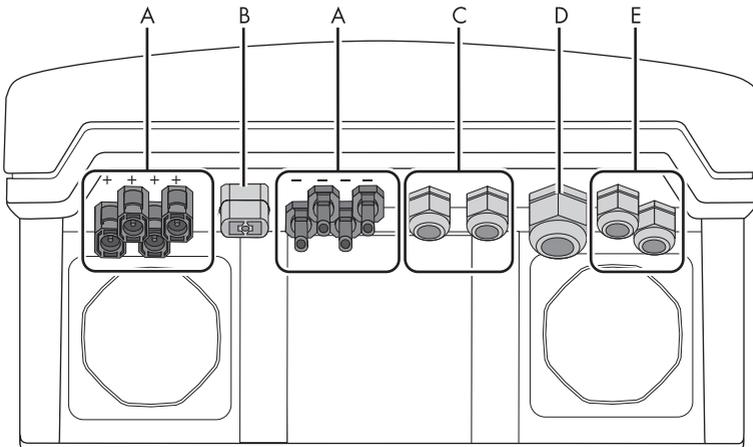
Internal component parts of the inverter can be irreparably damaged by static discharge.

- Ground yourself before touching a component.

### 5.1 Overview of the Connection Area

#### 5.1.1 Exterior View

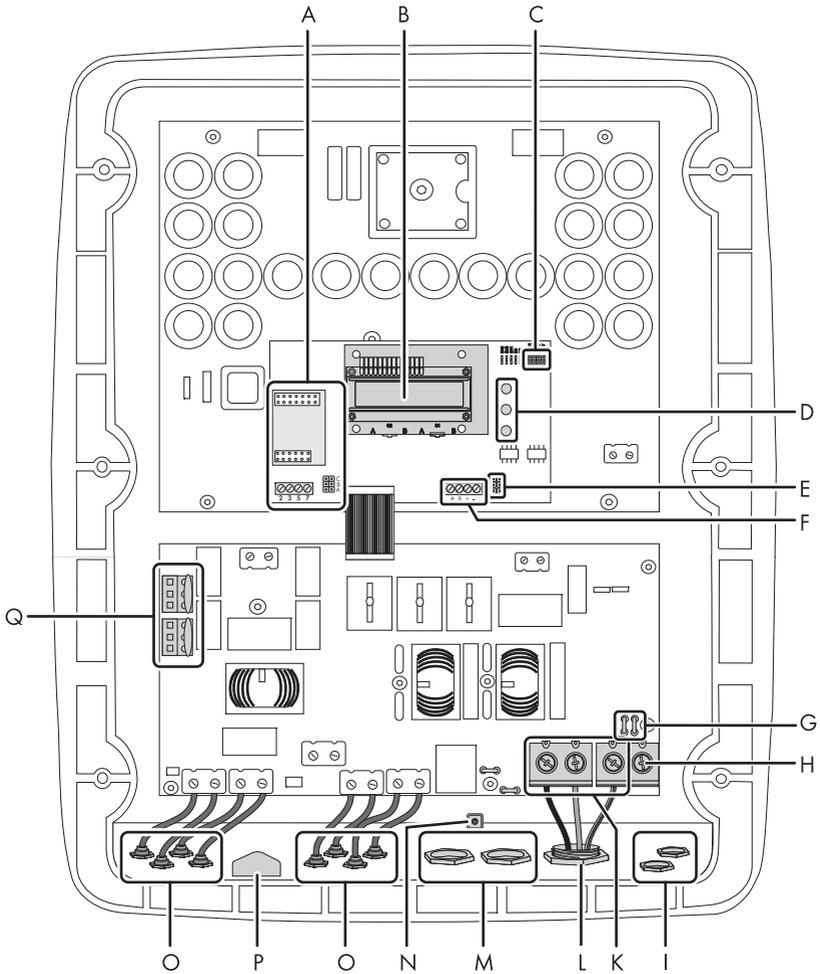
The following figure shows the assignment of the individual connection areas on the bottom of the inverter.



Position	Description
A	DC connectors for connecting the strings
B	Socket for connecting the Electronic Solar Switch (ESS)
C	Cable glands for optional communication via RS485 or radio (PG16)
D	Cable gland for grid connection (AC) (12 mm ... 25 mm)
E	Cable glands for SMA Power Balancer

### 5.1.2 Interior view

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



<b>Position</b>	<b>Description</b>
<b>A</b>	Connection area and slots for communication
<b>B</b>	Display
<b>C</b>	Jumper slot for the fan test
<b>D</b>	LEDs for displaying the operating states
<b>E</b>	Jumper slot for SMA Power Balancer
<b>F</b>	Connections terminals for SMA Power Balancer
<b>G</b>	Flat connector for grounding the cable shield when connecting the SMA Power Balancer
<b>H</b>	Additional connection terminal for grounding
<b>I</b>	Cable glands for the SMA Power Balancer
<b>K</b>	Connection terminals for mains cable (AC)
<b>L</b>	Cable gland for grid cable (AC)
<b>M</b>	Cable glands for communication
<b>N</b>	Screwing device for shield clamp for communication cable
<b>O</b>	DC plug connector
<b>P</b>	Connection socket for Electronic Solar Switch (ESS)
<b>Q</b>	Varistors

## 5.2 Connection to the Power Distribution Grid (AC)

### 5.2.1 Conditions for the AC Connection



#### Connection requirements of the distribution grid operator

Always observe the connection requirements of your distribution grid operator!

#### Cable design

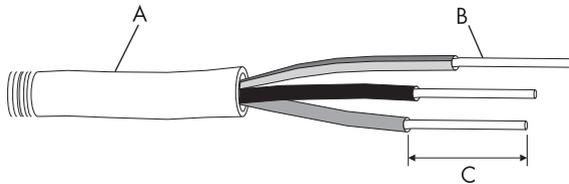
Use "Sunny Design" version 2.0 or higher for the dimensioning of the conductor cross-sectional areas (see "Sunny Design" design program at [www.SMA.de/en](http://www.SMA.de/en)).



#### 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.

#### Cable Requirements



Position	Description	Value
A	External diameter	12 mm ... 25 mm
B	Conductor cross-section	10 mm <sup>2</sup> ... 16 mm <sup>2</sup>
C	Length of insulation to be stripped off	approx. 16 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 maximum permissible rating can be found in section 11 "Technical Data" (page 80).

Detailed information and examples for the rating of a miniature 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 is connected to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. It can result in a cable fire or destruction of the inverter.

- Never connect several inverters to a single miniature circuit-breaker.
- Observe the maximum permissible fuse protection of the inverter when selecting the miniature circuit-breaker.

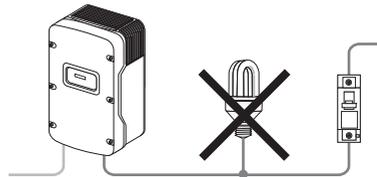


### DANGER!

#### Danger to life due to fire!

When a generator (inverter) and a load are connected to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. The currents from the inverter and the grid can accumulate to over-currents that are not detected by the miniature circuit-breaker.

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



### NOTICE!

#### Damage to the inverter by using screw type fuses as a load disconnection unit!

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

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

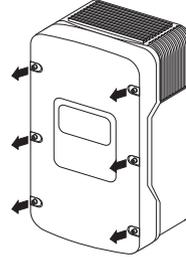
- Use only a switch-disconnector or a miniature circuit-breaker as a load disconnection unit.

## 5.2.2 Connecting the Inverter to the Power Distribution Grid (AC)

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

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

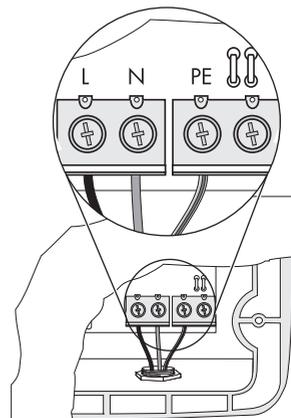
2. Disconnect the miniature circuit-breaker and secure against re-connection.
3. Remove all lid screws and detach the enclosure lid.



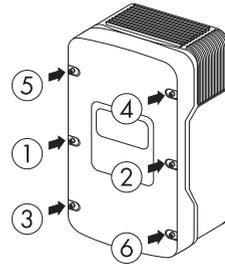
4. Remove the adhesive tape from the AC cable gland (see "D" on Page 21).
5. Insert the AC cable gland from the outside into the enclosure opening and tighten it from the inside with the counter nut.
6. Unscrew the cable gland's lock nut and pass it over the cable.
7. Route the cable through the cable gland to the AC terminal.
8. Connect L, N and the protective conductor (PE) to the connecting terminal plate using a screwdriver in accordance with the label.

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

L and N must not be swapped!



9. Tighten the lock nut firmly to the cable gland.
10. Close the cable gland tightly on the enclosure opening.
11. Tighten the enclosure lid with all screws and the corresponding conical spring washers in the sequence depicted on the right (torque: 6 Nm). The tothing of the conical spring washers must point toward the enclosure lid.  
The scope of delivery of the inverter includes another spare screw and conical spring washer.

**DANGER!**

**Danger to life due to enclosure lid carrying voltage!**

The grounding of the enclosure lid is ensured by the conical spring washers.

- Fasten the conical spring washers for all 6 screws with the tothing facing toward the enclosure lid.

**DANGER!**

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

- Do not switch on the miniature circuit-breaker until the PV array has been connected and the inverter is securely closed.

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

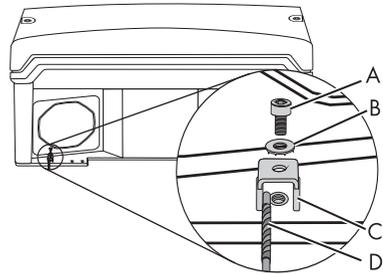
## 5.2.3 Additional Grounding of the Enclosure

If the installation requires, you can use the ground terminal to connect a second protective conductor or as equipotential bonding.

### 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 conical spring washer (B).

The tothing of the conical spring washer must face toward the clamping clip.



- The inverter's enclosure is additionally grounded.

### 5.3 Setting the Display Language

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

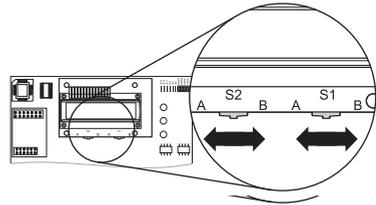
When selecting the display language, different switching settings apply to inverters that are set to the Italian national standard DK 5940. You can see the standard to which the inverter was set upon delivery from the type label and the supplementary document provided with the factory settings. For more information on setting the grid and national parameters, see section 5.7 "Setting the Grid and Country Parameters" (page 47).

#### Procedure

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 56).
2. Set the switches to the required language, as shown below.

The following switch settings, except for DK 5940, apply to all national standards:

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



The following switch settings apply to inverters that are set to the Italian national standard DK 5940:

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

3. Close the inverter as described in section 7.3 "Closing the Inverter" (page 59).
- The display language is set.

## 5.4 Connecting the PV Array (DC)

### 5.4.1 Conditions for the DC Connection



#### Using Y adapters for parallel connection of strings

Y adapters may not be visible within close proximity of the inverter or freely accessible.

- The DC circuit may not be interrupted by Y adapters.
- 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 of the PV modules must be equipped with plug connectors. The DC connectors for the DC terminal are included in the delivery.
- The following limit values at the DC input of the inverter must not be exceeded:

Maximum input voltage	Maximum input current
800 V (DC)	23.0 A (DC)

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

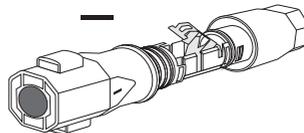
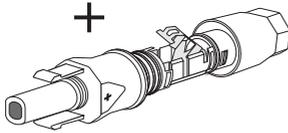
The maximum possible input current per string is limited by the plug connectors used. If the plug connectors are overloaded, an electric arc may occur and there is a risk of fire.

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

### 5.4.2 Assembling the DC Plug Connectors

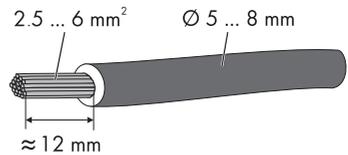
In order to be connected to the inverter, all connection cables of the PV modules must be equipped with the DC plug connectors provided.

To assemble the DC plug connectors, proceed as follows. Ensure the connectors have the correct polarity. The DC plug connectors have the symbols "+" and "-".



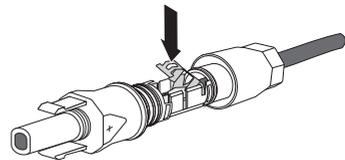
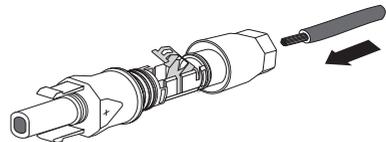
#### Cable requirements:

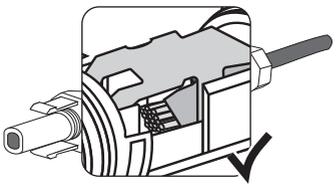
- Use a PV1-F cable.

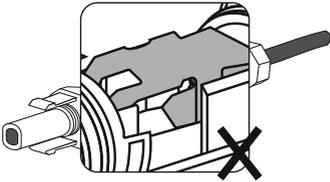
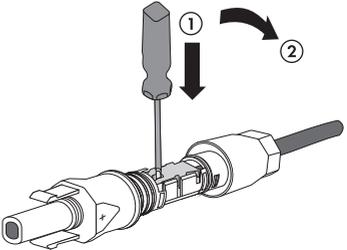


#### Procedure

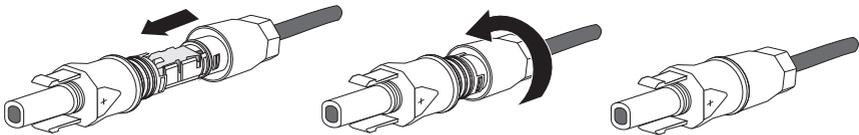
1. Lead the stripped cable all the way into the DC connector.
2. Press the clamping clip down.
  - ☑ The clamping clip snaps audibly into place.
3. Ensure the cable is correctly in place:



Result	Measure
<p>☑ If the stranded wire is visible in the chamber of the clamping clip, the cable is correctly positioned.</p> 	<ul style="list-style-type: none"> <li>• Proceed to step 4.</li> </ul>

Result	Measure
<p><input checked="" type="checkbox"/> If the stranded wires are <b>not</b> visible, the cable is not correctly positioned.</p> 	<ul style="list-style-type: none"> <li>Loosen the clamping clip. To do so, insert a 3.5 mm screwdriver into the terminal clamp and lever it out.</li> </ul>  <ul style="list-style-type: none"> <li>Remove the cable and go back to step 1.</li> </ul>

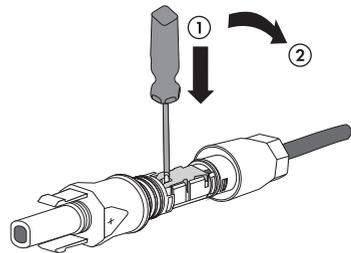
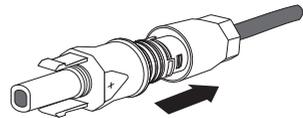
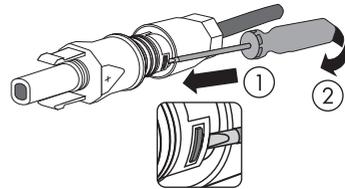
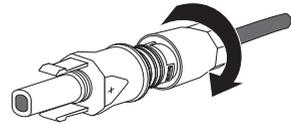
4. Push the cable gland towards the thread and tighten it (torque: 2 Nm).



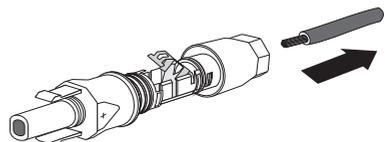
The DC connectors are now assembled and can be connected to the inverters, as described in section 5.4.4 "Connecting the PV Array (DC)" (page 34).

### 5.4.3 Opening the DC Connector

1. Unscrew the screw connection.
2. Unlocking the DC connector: Insert a 3.5 mm screwdriver into the snap slot on the side and lever it out.
3. Carefully pull the DC connector apart.
4. Loosen the clamping clip. To do so, insert a 3.5 mm screwdriver into the terminal clamp and lever it out.



5. Remove the cable.



- The cable is now removed from the DC connector.

### 5.4.4 Connecting the PV Array (DC)

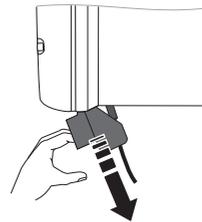
**DANGER!**  
 Danger to life due to high voltages in the inverter!

- Before connecting the PV array, ensure that the miniature circuit-breaker is switched off.

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

- Only use measuring devices with a DC input voltage range up to at least 1 000 V.

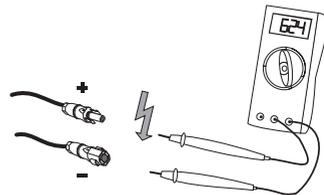
1. Disconnect the miniature circuit-breaker and secure against re-connection.
2. Pull the Electronic Solar Switch downward, slightly towards the wall.



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

At an ambient temperature above 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 ambient temperatures.



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

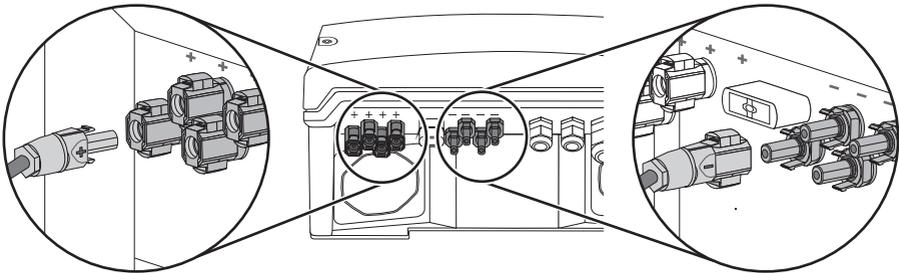
If the voltage of the PV modules exceeds the maximum input voltage of the inverter, it can be destroyed by overvoltage.

This will void all warranty claims.

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

4. Check the strings for ground faults as described in section 9.3.1 "Checking the PV Array for Ground Faults" (page 74).
5. Check the assembled DC plug connectors for correct polarity and connect them to the inverter.
  - ☑ The DC connectors click audibly into position.

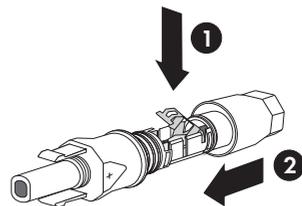
To unlock the DC connectors, see section 7.2 "Opening the Inverter" (page 56).



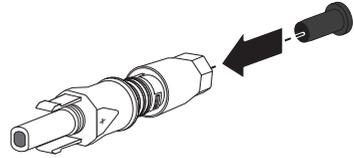
6. In order to seal the inverter, all the DC inputs that are not required have to be closed with DC plug connectors and sealing plugs:

**Sealing plugs**

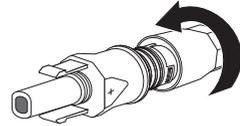
- Do **not** insert the sealing plugs **directly** into the DC inputs of the inverter.
- For unused DC connectors, push down the terminal clamp and push it onto the cable gland.



- Insert the sealing plug into the DC connector.

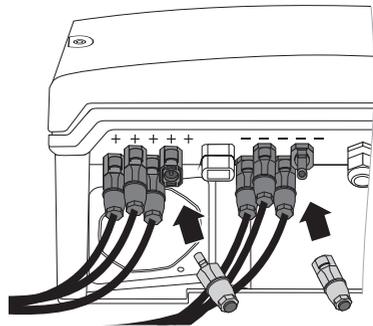


- Tighten the DC plug connector (torque: 2 Nm).

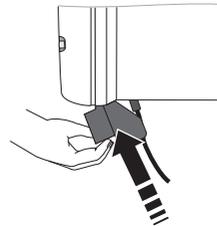


- Insert the DC connectors with sealing plugs into the corresponding DC inputs on the inverter.

☑ The DC connectors click audibly into position.



7. Ensure that all DC plug connectors are securely in place.
8. Check the Electronic Solar Switch for wear, as described in section 8.3 "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 it is not correctly connected, the Electronic Solar Switch can be damaged by high voltages.

- Plug the handle firmly onto the socket of the Electronic Solar Switch.
- Ensure that the Electronic Solar Switch is securely seated.

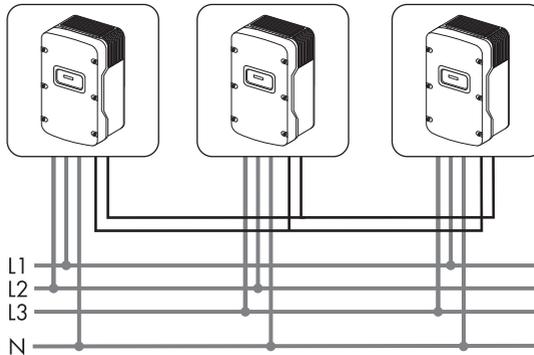
- The PV array is now connected.

You can now commission the inverter as described in section 6 "Commissioning" (page 49).  
The following connection options are optional.

## 5.5 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 3 Sunny Mini Central inverters 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 Centrals are to react if there is a device disturbance 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 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.

### 5.5.1 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 product. 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 available in the download area at [www.SMA.de/en](http://www.SMA.de/en), in the "Certificate" category of the respective inverter.

The configuration options are described below.

## Configuration Options

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



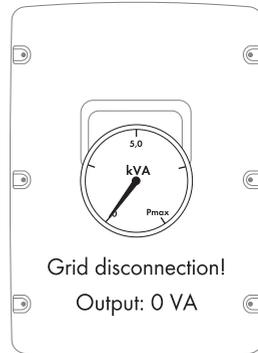
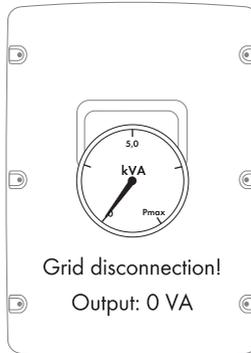
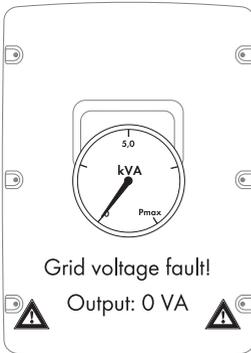
### Local connection requirements

Select the respective setting and always observe the local connection requirements and provisions of your distribution grid operator!

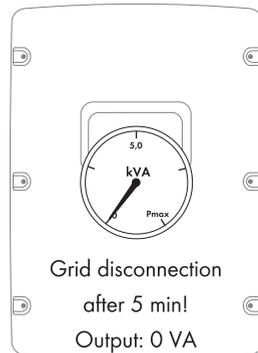
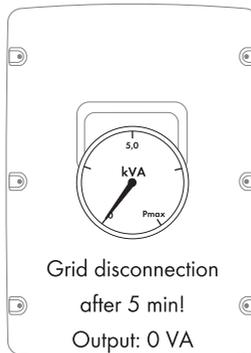
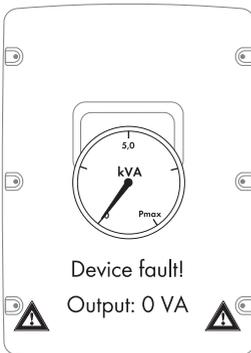
- **FaultGuard**

This operating mode allows for the implementation of a three-phase grid voltage monitoring, which also reacts to device disturbances.

- If one of the 3 inverters indicates a **grid voltage fault** and stops feeding in, the other two inverters also disconnect from the power distribution grid immediately.



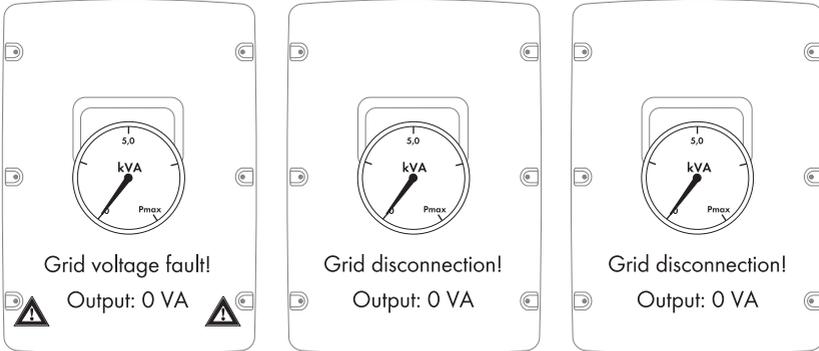
- If one of the 3 inverters indicates a **device fault** and stops feeding in, the other two inverters also disconnect from the power distribution grid 5 minutes later.



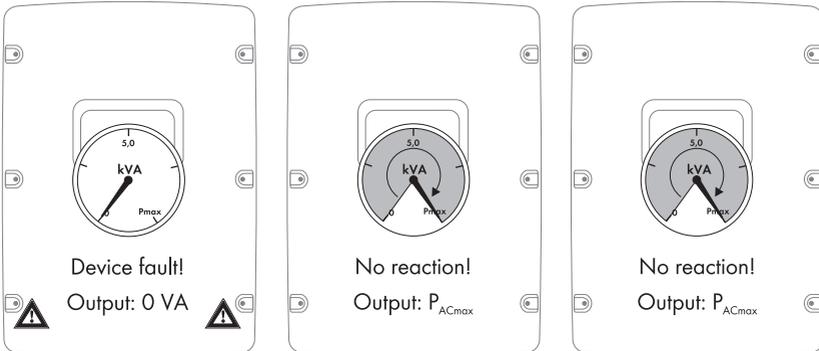
- **PhaseGuard**

This operating mode allows for the implementation of a three-phase grid voltage monitoring.

- If one of the 3 inverters indicates a **grid voltage fault** and stops feeding in, the other two inverters also disconnect from the power distribution grid automatically.



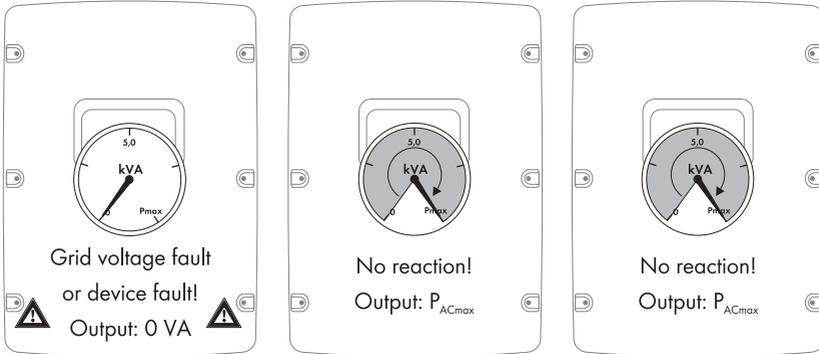
- If one of the three inverters indicates a **device fault** and stops feeding in, the other two inverters are not affected and continue to feed in at full power.



- **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 power distribution grid and the other two inverters continue to run at an undiminished power level.



- **PowerGuard**

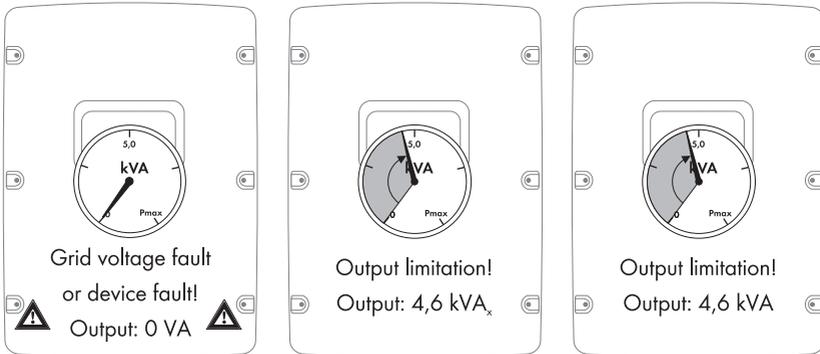
This setting can be selected if the entire PV plant only consists of three Sunny Mini Central inverters and in the event of a malfunction, the unbalanced load should be limited to 4.6 kVA over a 10-minute average.



**Deviating unbalanced load limit for Italy**

The unbalanced load for inverters set to the Italian national standard DK 5940 is limited to 6 kVA over a 10-minute average.

If one of the 3 inverters indicates a **grid voltage fault** or **device fault** and stops feeding in, the other two inverters automatically limit their power to 4.6 kVA over a 10 minute average.



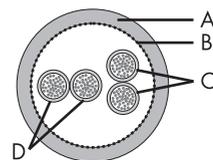
## 5.5.2 Cabling

### Cable Requirements

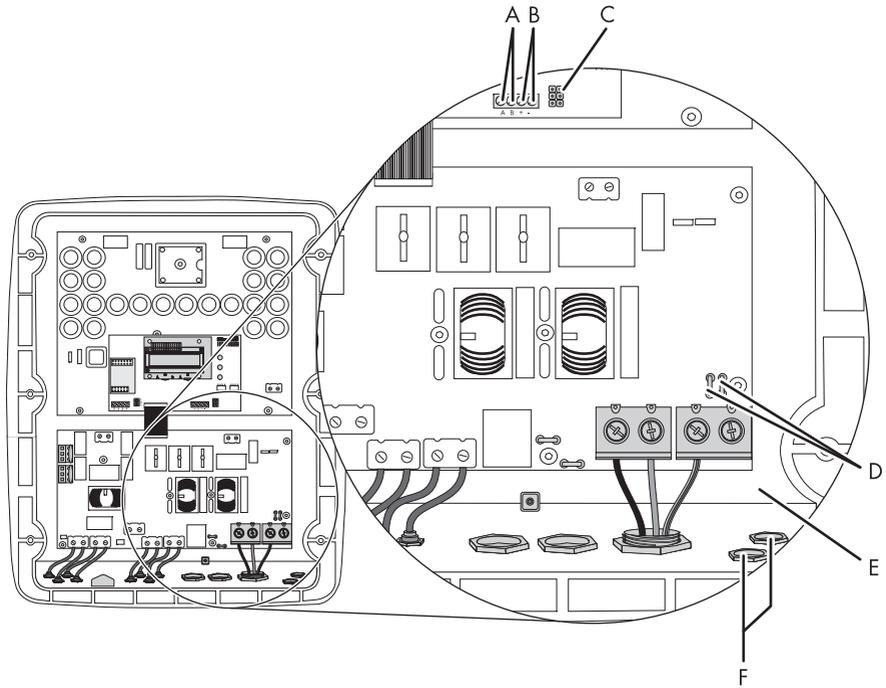
For cabling the SMA Power Balancer, use a "LiYCY" cable, structured as shown here:

- Indoor: LiYCY 2 x 2 x 0.25
- Outdoor: Li-2YCYv 2 x 2 x 0.25

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



## Overview of the Connection Area



Position	Description
A	Screw terminals for the wire bridge
B	Screw terminals for connecting the cables
C	Jumper slot
D	Flat male tab for grounding the cable shield
E	Silicone tube/cable route
F	Cable glands

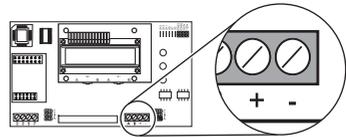
**Procedure**

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 56).
2. Insert the cable into each inverter.  
Use one of the two cable glands (F) on the bottom right hand side.

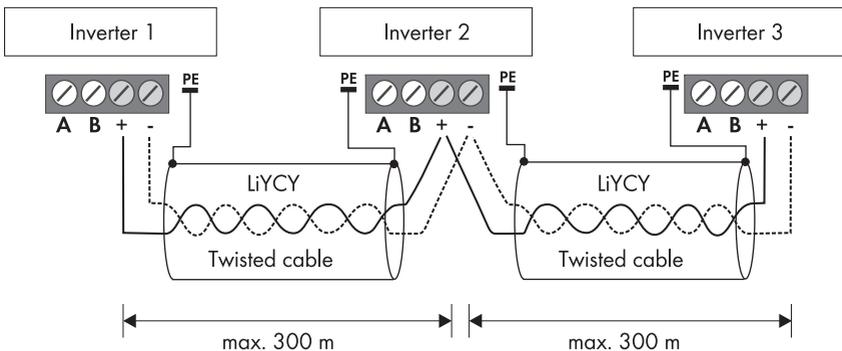
**DANGER!**  
 Danger to life through high voltage if there is a fault with the SMA Power Balancer cable!

- Sheath the positive and negative cable conductors in each inverter using the enclosed silicone tube.
- Cut the silicone tube to the required length.
- The silicone tube must completely cover the cable inside the inverter enclosure.

3. Draw the cable along the cable route (E) as far as the terminal block (B).
4. Ground the shield in each inverter at the PE terminal (D).
5. Sheath the positive and negative cable conductors in each inverter with wire sleeves.
6. Connect the positive and negative pole to the corresponding screw terminals.



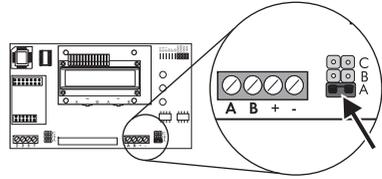
7. In order to connect the three inverters together, connect the positive and negative conductors from the two other inverters to the terminal block of the middle inverter.



The cable length between two inverters may not exceed 300 m.

8. **Only** in the **middle** inverter (the one with 2 insulated conductors for each terminal), insert one of the provided jumpers into the lowest of the three slots as depicted on the right.

Do **not** plug the jumpers in the bottom slot of the two other inverters.



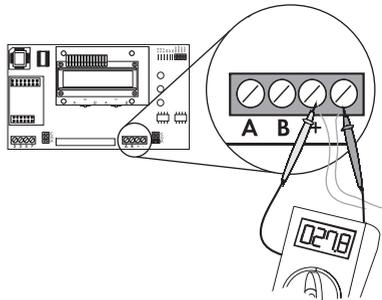
**or**

Bridge the "A" and "B" screw terminals on the **middle** inverter with a wire bridge.

Do **not** bridge the "A" and "B" screw terminals in the two other inverters.

9. Measure the resistance between the terminal block's positive and negative poles in the **middle** inverter.

- If the resistance is approximately 27.8 k  $\Omega$  ( $\pm 370 \Omega$ ), the SMA Power Balancer has been connected correctly. Otherwise, check the cabling.



10. Close all inverters as described in section 7.3 "Closing the Inverter" (page 59).



**Connection with one Sunny Mini Central 9000TL, 10000TL or 11000TL**

In order to be able to connect the SMA Power Balancer to a Sunny Mini Central 9000TL, 10000TL or 11000TL, the Sunny Mini Central 7000HV must be equipped with a special plug (Order No. PBL-SMC-10-NR). Three inverters are then connected together with a special connection cable.

You can order the plug and the connection cable from SMA Solar Technology AG or your dealer. Section 12 "Accessories" (page 84) contains a list of the order numbers.

### 5.5.3 Testing the Functioning

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

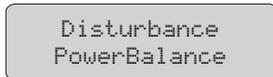
1. Select the "PhaseGuard" setting of the "PowerBalancer" parameter for all three inverters.
2. Check whether all inverters in the group are feeding the power distribution grid normally.

- Green LED glows continually, or adjacent display message: Proceed to step 3.



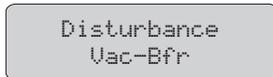
or

- If all inverters in this group show the display message pictured on the right: Check the installation of the SMA Power Balancer and contact the SMA Serviceline, if necessary.

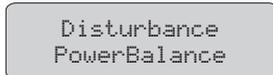


3. Switch off the miniature circuit-breaker for one of the three inverters.

- The inverter with a deactivated miniature circuit-breaker then indicates a grid voltage fault with the adjacent display message ("Bfr" and "Srr" are irrelevant).



- The other two inverters then also disconnect themselves from the power distribution grid with the display message shown 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 miniature circuit-breaker again.

- The functionality test has been completed.

## 5.6 Communication

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

Refer to the respective communication interface manual for a detailed wiring schematics and an installation description for the interface.

The inverter's active power can be limited or its displacement power factor can be set externally using the Power Reducer Box from SMA Solar Technology AG. Detailed information on the Power Reducer Box is available in its Technical Description at [www.SMA.de/en](http://www.SMA.de/en).

## 5.7 Setting the Grid and Country Parameters



### Changing grid-relevant parameters 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 available in the download area at [www.SMA.de/en](http://www.SMA.de/en), in the "Certificate" category of the respective inverter.

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

A detailed description of the operation parameters 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.

### 5.7.1 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 product (e.g., Sunny WebBox) or a PC with appropriate software (e.g. Sunny Explorer). This, however, is only required if the inverter was originally ordered for another country. You can see the standard according to which the inverter was set upon delivery on the type label and the enclosed data sheet with the factory settings.

## 5.7.2 Setting Stand-alone Grid Operation

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

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

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



### DANGER!

**Danger to life due to high voltages in the event of outage of the power distribution grid!**

If you set the inverter to stand-alone grid operation, it does not fulfill any country-specific standards and guidelines. Therefore, in the event of outage of the power distribution grid, there is a danger of back feed.

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

## 5.7.3 Additional Country Parameters



### Requirement for the setting

Set the installation country as described in section 5.7.1 "Setting the Installation Country" (page 47) before setting the country parameter described here.

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

The Sunny Mini Central inverters of type SMC 7000HV-1 1 have an additional default country parameter "MvtgDirective". This expands the deactivation limits of the inverter for voltage and frequency to a maximum/minimum. This country setting may only be selected if the PV plant or inverter is operated with external three-phase decoupling protection which will automatically disconnect the Sunny Mini Central from the power distribution grid 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 of type SMC 7000HV-1 1 may only be operated with an external three-phase decoupling protection device which complies with the country-specific requirements.

Without such external decoupling protection, the Sunny Mini Central will not disconnect from the power distribution grid when the standard requirement is exceeded.

- Install external three-phase decoupling protection.

# 6 Commissioning

## 6.1 Commissioning the Inverter

1. Check the following requirements before commissioning:
  - The inverter is securely in place
  - The AC cable is correctly connected (power distribution grid)
  - All DC cables connected (strings)
  - Unused DC inputs are closed using the corresponding DC connectors and sealing plugs
  - The enclosure lid is securely screwed in place
  - The Electronic Solar Switch is securely plugged
  - The miniature circuit-breaker is correctly laid out
2. Switch on the miniature circuit-breaker.
  - All 3 LEDs are glowing or blinking: The startup phase is starting.
  - Green LED glows: commissioning has been successful.

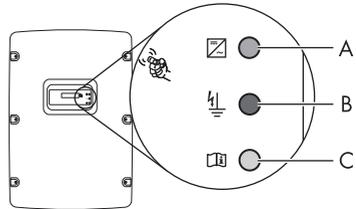
**or**

  - Green LED flashes in case of insufficient irradiation: grid connection conditions have not yet been reached. Wait for sufficient irradiation.

**or**

  - The red or yellow LED is glowing or flashing: a disturbance has occurred. Proceed to step 3.

<b>A</b>	Green LED	Operation
<b>B</b>	Red LED	Ground fault or varistor defective
<b>C</b>	Yellow LED	Fault



**Self test in accordance with DK 5940, Ed. 2.2 for initial commissioning (applies to Italy only)**

The Italian DK 5940 standard prescribes that an inverter can only operate on the power distribution grid after the disconnection times for overvoltage, undervoltage, minimum frequency and maximum frequency have been checked.

Start the self-test as described in section 6.3 "Self-Test in Accordance with DK 5940, Ed. 2.2 (Applies to Italy Only)" (page 51). The test takes approx. 8 minutes.

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

## 6.2 Display Messages During the Startup Phase

- After commissioning, the inverter displays the device type in the startup phase.
- After 5 seconds or when you tap again on the enclosure lid, the firmware version of the internal processors is displayed by the inverter.
- After a further 5 seconds or when you tap again, the configured country standard is displayed by the inverter (example: "GER/VDE0126-1-1").

```
Sunny Mini Central
Wrxx
```

```
BFR Version x.xx
SRR Version x.xx
```

```
GER/VDE0126-1-1
```



### Show display messages again (valid from firmware version 2.10)

If you want to view the display messages of the startup phase again while in normal operation, double tap the enclosure lid.

## 6.3 Self-Test in Accordance with DK 5940, Ed. 2.2 (Applies to Italy Only)

### 6.3.1 Starting the Self-Test by Tapping

You can start testing the disconnection times by tapping on the enclosure cover. A prerequisite here is that the country configuration of the inverter has been set to Italy (IT/DK5940) or "trimmed".

Proceed as follows for checking the disconnection times:

1. Connect the PV array with the inverter (see section 5.4 "Connecting the PV Array (DC)" (page 30)). The inverter can only initialize if the PV array produces enough power. It is therefore not possible to test the disconnection times at night.
2. Connect the inverter with the power distribution grid and commission the inverter (see section 5.2 "Connection to the Power Distribution Grid (AC)" (page 24) and 6.1 "Commissioning the Inverter" (page 49)).  
 The inverter is now in the startup phase, i.e. all 3 LEDs are glowing at the same time.
3. Start the self-test **immediately** after all 3 LEDs have gone out by tapping on the display of the inverter.
4. The question of whether you would like to start the test sequence appears in the display. Tap on the display again within 30 seconds to confirm the question.



Avvio Autotest  
?

Once you have started the test sequence, the inverter checks the disconnection times for overvoltage, undervoltage, maximum frequency and minimum frequency one after the other. During the tests, the inverter shows the values in the display which are described in section 6.3.2 "Completion of the Self-Test" (page 52).

### 6.3.2 Completion of the Self-Test

Note the values which are displayed during the self-test. These values must be entered into a test report. The test results of the individual tests are displayed 3 times, one after the other. The respective display message is displayed for 10 seconds.

The self-test changes the upper and lower disconnection thresholds for each protective function on a linear basis with a modification of 0.05 Hz/s and 0.05 Vn/s for the frequency and voltage monitoring. As soon as the actual measured value is outside the permitted range (altered disconnection threshold), the inverter disconnects itself from the power distribution grid. In this way, the inverter determines the reaction time and checks itself.

#### Overvoltage test

The inverter begins with the overvoltage test. During the test sequence, the voltage limit applied is shown in the display of the inverter.

```
Autotest
Uac max: 262,00V
```

The voltage limit is reduced successively until the shut-down threshold is reached and the inverter disconnects from the power distribution grid.

Once the inverter has disconnected from the power distribution grid, the display successively shows the following values one after the other:

- Disconnection value,
- Calibration value,
- Reaction time,
- Current grid voltage.

```
Valore di soglia
con: 229,95V
```

```
Val. taratura
262,00V
```

```
Tempo intervento
0,08s
```

```
Tensione di rete
Val.eff.: 230,00V
```

## Undervoltage Test

After the overvoltage test, the inverter performs the undervoltage test. During the test sequence, the current calibration value of the voltage limit applied is shown in the display of the inverter.

```

Autotest
Uac min:      188,00V
  
```

The voltage limit is increased successively until the shut-down threshold is reached and the inverter disconnects from the power distribution grid.

Once the inverter has disconnected from the power distribution grid, the display successively shows the following values one after the other:

- Disconnection value,
- Calibration value,
- Reaction time,
- Current grid voltage.

```

Valore di soglia
con:          229,95V
  
```

```

Val. taratura
              188,00V
  
```

```

Tempo intervento
              0,18s
  
```

```

Tensione di rete
Val.eff.:    230,00V
  
```

## Maximum frequency

In a third step, the inverter tests the maximum frequency. During the test sequence, the frequency limit applied is shown in the display of the inverter.

```
Autotest
Fac max: 50,30Hz
```

The frequency limit is reduced successively until the shut-down threshold is reached and the inverter disconnects from the power distribution grid.

Once the inverter has disconnected from the power distribution grid, the display successively shows the following values one after the other:

- Disconnection value,

```
Valore di soglia
con: 49,95Hz
```

- Calibration value,

```
Val. taratura
50,29Hz
```

- Reaction time,

```
Tempo intervento
0,08s
```

- Current grid frequency.

```
Frequenza rete
Val.eff.: 50,00Hz
```

## Minimum frequency

In the last step, the inverter tests the minimum frequency. During the test sequence, the frequency limit applied is shown in the display of the inverter.

```
Autotest
Fac min:      49,70Hz
```

The frequency limit is increased successively until the shut-down threshold is reached and the inverter disconnects from the power distribution grid.

Once the inverter has disconnected from the power distribution grid, the display successively shows the following values one after the other:

- Disconnection value,

```
Valore di soglia
con:          50,05Hz
```

- Calibration value,

```
Val. taratura
              49,71Hz
```

- Reaction time,

```
Tempo intervento
              0,08s
```

- Current grid frequency.

```
Frequenza rete
Val.eff.:    50,00Hz
```

When the inverter has carried out the 4 tests, it switches to "MPP Operation (MPP)" mode. The original calibration values are then reset and the inverter automatically connects to the power distribution grid. If you would like to carry out the test again, you must disconnect the inverter, i.e. disconnect it on the AC and DC sides and then later re-activate it. You can then restart the self-test as described in section 6.3.1 "Starting the Self-Test by Tapping" (page 51). The inverter starts again the test sequence, as described in section 6.3.2 "Completion of the Self-Test" (page 52).

## 7 Opening and Closing

### 7.1 Security



#### **DANGER!**

**Risk of lethal electric shock!**

Before opening the inverter, observe the following:

- Ensure that no voltage is present on the AC side.
- Ensure that neither voltage nor current is present on the DC side.



#### **NOTICE!**

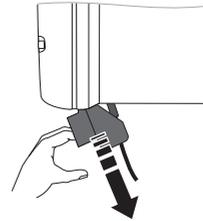
**Electrostatic discharges can damage the inverter!**

The internal component parts of the inverter can be irreparably damaged by electrostatic discharge.

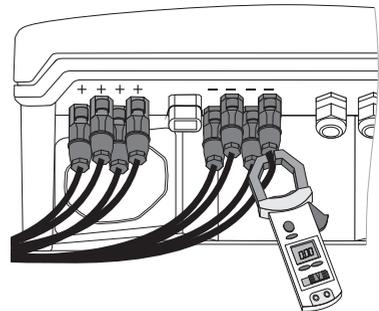
- Ground yourself before touching a component.

### 7.2 Opening the Inverter

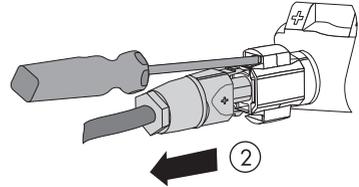
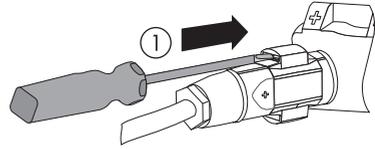
1. Disconnect the miniature circuit-breaker and secure against re-connection.
2. Pull the Electronic Solar Switch downward, slightly towards the wall.



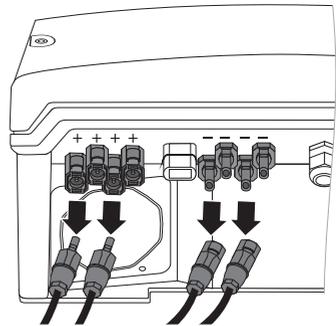
3. Using a current probe, ensure that no current is present at all DC cables.
  - If current is present, check the installation.



4. Unlock and disconnect all DC connectors using a 3.5 mm screwdriver:
  - Insert a screwdriver into one of the side slots (1).
  - Disconnect DC plug connectors (2).



- ☑ All DC plug connectors are disconnected from the inverter. The inverter is entirely disconnected from the PV array.



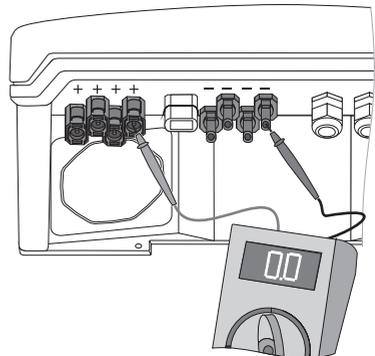


**DANGER!**  
Danger to life due to high voltages in the inverter!

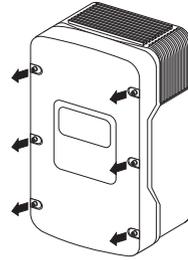
The capacitors in the inverter require 5 minutes to discharge.

- Wait 5 minutes before opening the inverter.

5. Ensure that no voltage is present at the DC plugs on the inverter.
  - ☑ If voltage is present, check the installation.

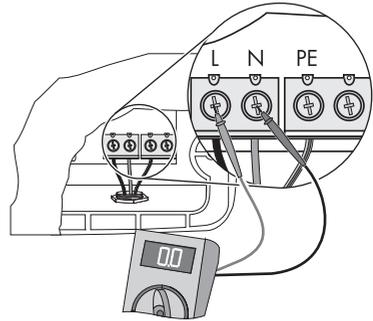


6. Remove all 6 lid screws and pull the enclosure lid forwards to remove it.



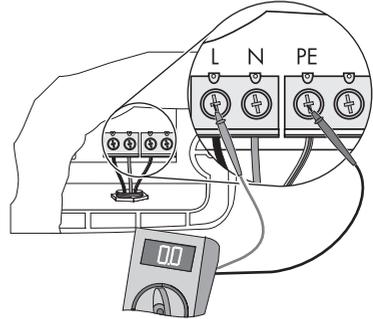
7. Verify the absence of voltage L with respect to N at the AC terminal with an appropriate meter.

If voltage is present, check the installation.



8. Verify the absence of voltage L with respect to PE at the AC terminal with an appropriate meter.

If voltage is present, check the installation.

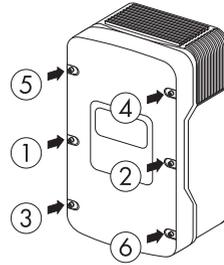


The inverter is free of voltage.

## 7.3 Closing the Inverter

1. Tighten the enclosure lid with all screws and the corresponding conical spring washers in the sequence depicted on the right (torque: 6 Nm). The tothing of the conical spring washers must point toward the enclosure lid.

The scope of delivery of the inverter includes another spare screw and conical spring washer.



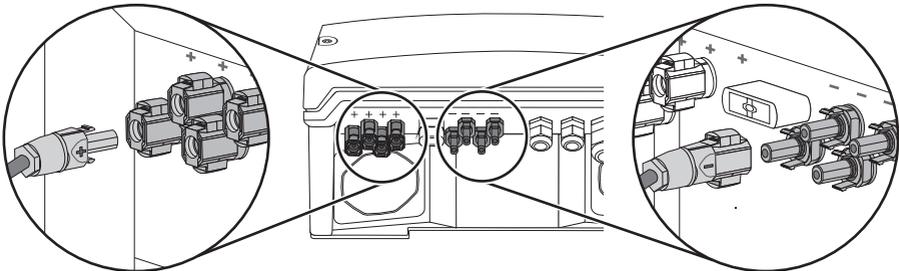
### DANGER!

**Danger to life due to enclosure lid carrying voltage!**

The grounding of the enclosure lid is ensured by the conical spring washers.

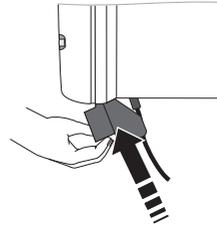
- Fasten the conical spring washers for all 6 screws with the tothing facing toward the enclosure lid.

2. Check the assembled DC plug connectors for correct polarity and connect them to the inverter.
  - ☑ The DC connectors click audibly into position.
 To unlock the DC connectors, see section 7.2 "Opening the Inverter" (page 56).



3. Close all the DC inputs that are not needed as described in section 5.4.4 "Connecting the PV Array (DC)" (page 34) to seal the inverter.
4. Ensure that all DC plug connectors are securely in place.

5. Check the Electronic Solar Switch for wear, as described in section 8.3 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.

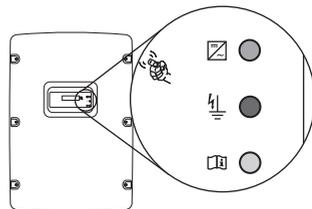
**NOTICE!**

**Damage to Electronic Solar Switch!**

If it is not correctly connected, the Electronic Solar Switch can be damaged by high voltages.

- Plug the handle firmly onto the socket of the Electronic Solar Switch.
- Ensure that the Electronic Solar Switch is securely seated.

6. Switch on the miniature circuit-breaker.
7. Check whether the display field indicates a normal operating state (see section 6 "Commissioning" (page 49)).



- The inverter is now closed and in operation.

## 8 Maintenance and Cleaning

### 8.1 Cleaning the Inverter

If the display field is dirty and you find it difficult to read the operating data and operating states of the inverter, clean the display field with a damp cloth. Do not use any corrosive substances (e.g. solvents, abrasives) for cleaning.

### 8.2 Checking Heat Dissipation

#### 8.2.1 Cleaning the fans

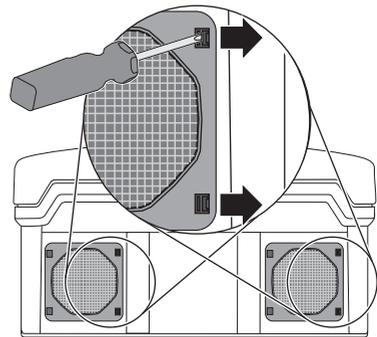
If the fan screens are only soiled with loose dust, they can be cleaned using a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, dismantle the fans for cleaning.

##### 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 ventilation grid

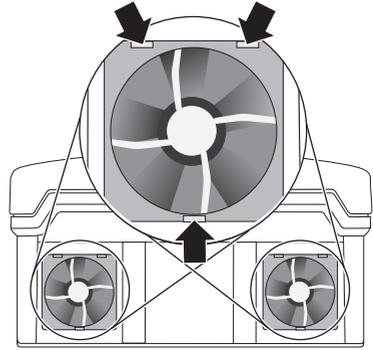
3. Remove the ventilation grids:
  - Press the two latches on the right edge of the fan screen to the right using a screwdriver and loosen it from the bracket.
  - Carefully remove the ventilation grid.



4. Clean the ventilation grid with a soft brush, a paint brush, a cloth or compressed air.

## Cleaning the fans

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



6. Remove the fan by pulling it slowly and carefully downward.
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 pressurized air!

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

10. After cleaning, reassemble everything in reverse order.
  - The fans are cleaned.
11. Check the functioning of the fans as described in the following section.

## 8.2.2 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 with a communication product.
- or**
- Plug the provided jumper into the sequential control system board.

### Setting Parameters

1. Request the installer password from the SMA Serviceline (contact: see Page 85).
2. Set the "Fan-Test" parameter to "1" in the installer mode.
3. Check the fans' air flow.

The inverter takes cooling 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.

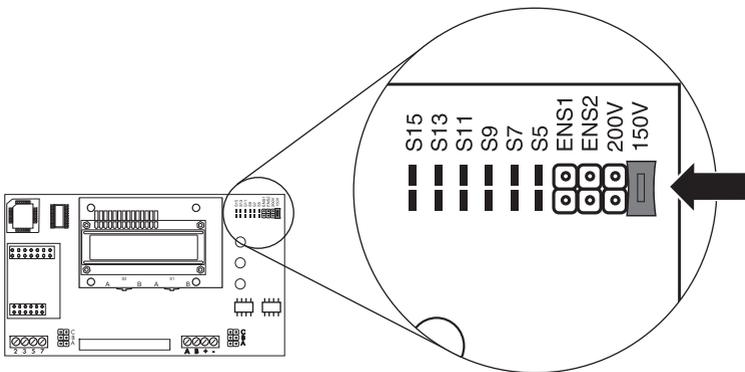
4. After checking the fans, set the "Fan-Test" parameter back to "0".

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 sequential control system 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 takes cooling 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.

## 8.2.3 Cleaning the Ventilation Grids

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

### Procedure

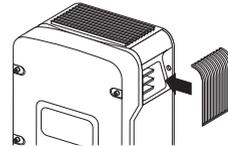
1. Remove the ventilation grids.

Insert your finger above in the space between the ventilation grid and the enclosure and remove the ventilation grid to the side.



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

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



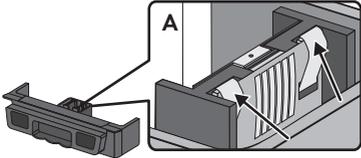
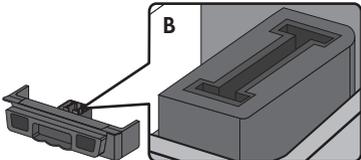
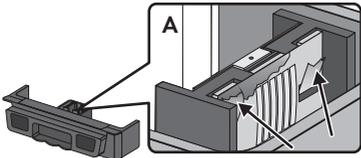
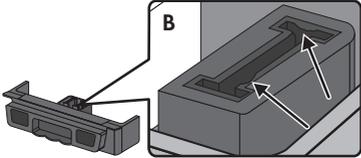
### NOTICE!

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

- The ventilation grids must not be removed permanently, because otherwise the device is not protected against insects entering.

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

Check the Electronic Solar Switch for wear before plugging it in. Depending on the shape of the Electronic Solar Switch, you can estimate the wear on either the metal tongues (A) or on the plastic (B).

Result	Measure
<p><input checked="" type="checkbox"/> The metal tongues in the Electronic Solar Switch are undamaged and not discolored (A).</p>  <p>or</p> <p><input checked="" type="checkbox"/> The plastic in the Electronic Solar Switch is undamaged (B).</p> 	<ol style="list-style-type: none"> <li>1. Securely attach the Electronic Solar Switch handle.</li> <li>2. Recommission the inverter as described in section 6 "Commissioning" (page 49).</li> </ol>
<p><input checked="" type="checkbox"/> The metal tongues in the Electronic Solar Switch have a brown discoloration or are burned through (A).</p>  <p>or</p> <p><input checked="" type="checkbox"/> The plastic in the Electronic Solar Switch shows thermal deformation (B).</p> 	<p>The Electronic Solar Switch can no longer reliably disconnect the DC supply.</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 84).</li> <li>2. Recommission the inverter as described in section 6 "Commissioning" (page 49).</li> </ol>

## 9 Troubleshooting

If the inverter displays other blink codes or fault messages than those described below, contact the SMA Serviceline.

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

Do not perform any repairs that are not described here and take advantage of the 24-hour replacement service (inverter ready for shipping and handed over to a freight-forwarding company within 24 hours) and the SMA Solar Technology AG repair service instead.

### 9.1 Blink Codes

Green	Red	Yellow	Status
Flashes	Flashes	Flashes	OK (startup phase)
is glowing continuously	is not glowing	is not glowing	OK (feed-in operation)
	is glowing continuously	is not glowing	Ground fault or varistor defective
		is glowing continuously	OK (startup phase)
is flashing quickly (3 x per second)	is not glowing	is not glowing	OK (stop)
	is glowing continuously	is not glowing	Ground fault or varistor defective
is flashing slowly (1 x per second)	is not glowing	is not glowing	OK (waiting, grid monitoring)
goes out briefly (approx. 1 x per second)	is glowing continuously	is not glowing	Ground fault or varistor defective
	is not glowing	is not glowing	OK (derating)
is not glowing	is not glowing	is not glowing	OK (nighttime deactivation or Electronic Solar Switch not connected)
		is glowing/flashing	Fault
	is glowing continuously	is not glowing	Ground fault or varistor defective
		is glowing/flashing	Ground fault or varistor defective and disturbance

## 9.2 Fault 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>Disconnect the inverter from the power distribution grid immediately!</p> <ol style="list-style-type: none"> <li>1. Turn off the miniature circuit-breaker.</li> <li>2. Remove the Electronic Solar Switch.</li> <li>3. Remove all DC connectors.</li> <li>4. Check DC voltage: <ul style="list-style-type: none"> <li>- If the DC voltage is above the maximum input voltage, check the plant design or contact the PV array installer.</li> <li>- If the DC voltage is under the maximum input voltage, reconnect the PV array to the inverter as described in section 5.4 "Connecting the PV Array (DC)" (page 30).</li> </ul> </li> </ol> <p>If the message occurs again, disconnect the inverter again and contact the SMA Serviceline (see section 13 "Contact" (page 85)).</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 public 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 distribution grid operator whether the voltage at the feed-in point can be adjusted, or whether they would agree to an alteration of the limit value "ACVtgRPro" parameter for power quality monitoring.</li> <li>• If the grid voltage is continually within the tolerance range and this fault message is still displayed, contact the SMA Serviceline.</li> </ul>
<b>Bfr-Srr</b>	<p>Internal measurement comparison fault or hardware defect.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this disturbance occurs frequently, contact the SMA Serviceline.</li> </ul>

Message	Description and corrective measure
<b>Derating</b>	<p>The "Derating" operating state is a normal operating condition which may occur occasionally and can have several causes.</p> <p>Once the inverter enters the "Derating" state, it will display the "Derating" warning until the next total shutdown of the device (at the end of the day).</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Check heat dissipation as described in section 8.2 "Checking Heat Dissipation" (page 61).</li> </ul>
<b>dZac-Bfr</b> <b>dZac-Srr</b>	<p>Sudden changes in grid impedance exceed the permissible range ("Bfr" or "Srr" are internal messages of no relevance for the user). The inverter disconnects itself from the public grid for safety reasons.</p> <p><b>Corrective measures</b></p> <p>Check the grid impedance and observe how often major deviations occur.</p> <p>If repeated frequency variations occur and this is causing "dZac-Bfr" or "dZac-Srr" errors, ask the distribution grid operator if he would agree to modify the operation parameters (dZac-Max).</p> <p>Discuss any changes to this operation parameter with the SMA Serviceline.</p>
<b>EEPROM</b>	<p>Transition disturbance while data is being written or read from EEPROM. The data is not relevant for safe operation.</p> <ul style="list-style-type: none"> <li>• The disturbance has no effect on the performance of the inverter.</li> </ul>
<b>EEPROM dBh</b>	<p>EEPROM data is defective, the inverter has switched itself off because the loss of data has disabled important functions of the inverter.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Contact the SMA Serviceline.</li> </ul>
<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>• This fault 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). The inverter disconnects itself from the public grid for safety reasons.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Check the grid connection and contact the distribution grid operator if necessary.</li> <li>• If the power frequency is within the tolerable range, but "Fac-Bfr," "Fac-Srr" or "FacFast" disturbances are still displayed, contact the SMA Serviceline.</li> </ul>

<b>Message</b>	<b>Description and corrective measure</b>
<b>I<sub>max</sub>/overcurrent</b>	Overcurrent on the AC side. This message is displayed if the current on the AC grid is larger than specified.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Check the system design and grid conditions.</li> </ul>
<b>K1-Close</b> <b>K1-Open</b>	Fault during relay test.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault frequently occurs or occurs several times consecutively, 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 disturbance occurs frequently, 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 disturbance occurs frequently, 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 disturbance occurs frequently, contact the SMA Serviceline.</li> </ul>
<b>MSD-Zac</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this disturbance occurs frequently, contact the SMA Serviceline.</li> </ul>
<b>Offset</b>	The "Offset" operating state is a normal operating condition that occurs prior to grid monitoring.
	If "Offset" is displayed as a fault, then there is a disturbance in the data logging. <b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this disturbance occurs frequently, 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 equipped with the SMA Power Balancer for preventing unbalanced loads. The operation 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", refer to section 5.5 "Connection of the SMA Power Balancer" (page 38).</li> </ul>

<b>Message</b>	<b>Description and corrective measure</b>
<b>Riso</b>	The electrical insulation between the PV plant and ground is faulty. The resistance between the DC plus and/or DC minus connection and ground is outside the defined limit range.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Check the insulation of the PV plant.</li> <li>• Check the PV plant for ground faults as described in section 9.3.1 "Checking the PV Array for Ground Faults" (page 74).</li> </ul>
<b>ROM</b>	The inverter's firmware is faulty.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this disturbance occurs frequently, contact the SMA Serviceline.</li> </ul>
<b>Shutdown</b>	Temporary inverter disturbance.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Contact the SMA Serviceline.</li> </ul>
<b>STM Timeout</b>	Internal program run disturbance.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this disturbance occurs frequently, contact the SMA Serviceline.</li> </ul>
<b>Trafo-Temp-F</b>	Temperatures in the transformer have exceeded the acceptable limit. The inverter stops feeding the grid until the temperature lies within the acceptable range.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this problem occurs frequently, check the heat dissipation of the inverter, as described in section 8.2 "Checking Heat Dissipation" (page 61).</li> </ul>
<b>Trafo-Temp-W</b>	If the transformer reaches an inadmissibly high temperature, the inverter stops feeding the grid until the transformer has reached an admissible temperature and the plant can begin feeding the grid again. The "Trafo-Temp-W" warning is displayed until the device is completely switched off.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Check the heat dissipation of the inverter, as described in section 8.2 "Checking Heat Dissipation" (page 61).</li> </ul>

Message	Description and corrective measure
<b>Vac-Bfr</b> <b>Vac-Srr</b>	<p>The grid voltage is no longer within the permissible range ("Bfr" or "Srr" is an internal message that has no meaning for the user). This fault can be caused by any of the following conditions:</p> <ul style="list-style-type: none"> <li>• Power distribution grid disconnected (miniature circuit-breaker, fuse),</li> <li>• AC cable is broken or</li> <li>• AC cable is highly resistive.</li> </ul> <p>The inverter disconnects itself from the public grid for safety reasons.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Check the grid voltage and connection on the inverter.</li> <li>• If the grid voltage lies outside the acceptable range because of local grid conditions, ask the distribution grid 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 (operation parameters: Vac-Min and Vac-Max).</li> <li>• If the grid voltage lies within the tolerance range, yet "Vac-Bfr" or "Vac-Srr" faults are still displayed, contact the SMA Serviceline.</li> </ul>
<b>Vpv-Max</b>	<p>Overvoltage at DC input. The inverter could be damaged.</p> <p><b>Corrective measures</b></p> <p>Disconnect the inverter from the power distribution grid immediately:</p> <ol style="list-style-type: none"> <li>1. Turn off the miniature circuit-breaker.</li> <li>2. Remove the Electronic Solar Switch.</li> <li>3. Remove all DC connectors.</li> <li>4. Check DC voltage: <ul style="list-style-type: none"> <li>- If the DC voltage is above the maximum input voltage, check the plant design or contact the PV array installer.</li> <li>- If the DC voltage is under the maximum input voltage, reconnect the PV array to the inverter as described in section 5.4 "Connecting the PV Array (DC)" (page 30).</li> </ul> </li> </ol> <p>If the message occurs again, disconnect the inverter again and contact the SMA Serviceline (see section 13 "Contact" (page 85)).</p>
<b>Watchdog</b>	<p>Internal program run disturbance.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this disturbance occurs frequently, contact the SMA Serviceline.</li> </ul>

Message	Description and corrective measure
<p><b>Zac-Bfr</b> <b>Zac-Srr</b></p>	<p>The grid impedance has left the permissible range. The suffixes "Bfr" and "Srr" are not relevant.</p> <p>The inverter disconnects itself from the public grid for safety reasons. The impedance is calculated from both the grid impedance and the impedance of the AC cable of the inverter.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Check the grid impedance and grid connection on the inverter.</li> <li>• Use an AC cable with an adequate cross-sectional area (= low impedance) as described in section 5.2 "Connection to the Power Distribution Grid (AC)" (page 24). If required, re-tighten the screws on the AC terminals.</li> <li>• If this fault recurs, contact the SMA Serviceline.</li> </ul>

## 9.3 Red LED is Glowing Continuously

If the red status display LED lights up continuously during operation, there is a ground fault in the PV array or at minimum one varistor for overvoltage protection is faulty.

### Procedure

1. Check for ground faults in the PV array as described in section 9.3.1 "Checking the PV Array for Ground Faults" (page 74).
2. If the red LED continues to glow, check the varistors as described in section 9.3.2 "Checking the Function of the Varistors" (page 76).

### 9.3.1 Checking the PV Array for Ground Faults

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



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

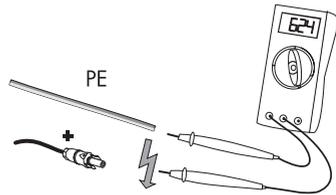
- Only touch the cables of the PV array on their insulation.
- Do not connect strings with ground faults to the inverter.



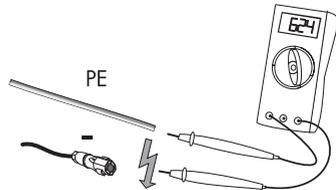
**NOTICE!**  
Excessive voltages can destroy the measuring device.

- Only use measuring devices with a DC input voltage range up to at least 1 000 V.

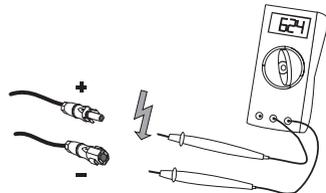
2. Measure the voltages between the plus pole of each string and the ground potential (PE).



3. Measure the voltages between the minus pole of each string and the ground potential (PE).



4. Measure the voltages between the positive and negative poles of each string.



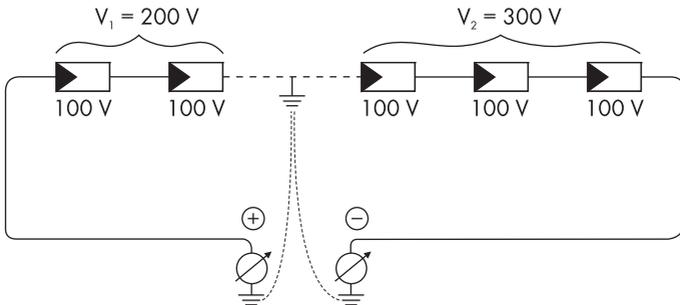
- A ground fault exists if the measured voltages are stable and the sum of the voltages from the positive pole to the ground potential and from the negative pole to the ground potential of a string is approximately equal to the voltage between the positive and negative poles.

Result	Measure
<input checked="" type="checkbox"/> You have found <b>a ground fault</b> .	<ul style="list-style-type: none"> <li>The installer of the PV array must remedy the ground fault in the affected string. You can determine the location of the ground fault as described below.</li> <li>Do <b>not</b> reconnect the faulty string.</li> <li>Close the inverter and commission it as described in section 7.3 "Closing the Inverter" (page 59).</li> </ul>
<input checked="" type="checkbox"/> You have found <b>no ground fault</b> .	<p>It is likely that one of the thermally monitored varistors is defective.</p> <ul style="list-style-type: none"> <li>Check the varistors as described in section 9.3.2 "Checking the Function of the Varistors" (page 76).</li> </ul>

**Location of the ground fault**

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

Example:



In this case, the ground fault is between the second and third PV modules.

- The ground fault check is finished.

### 9.3.2 Checking the Function of the Varistors

Varistors are wear parts. Their functional efficiency diminishes with age or repeated strain as a result of overvoltage. It is therefore possible that one of the thermally monitored varistors has lost its protective function.

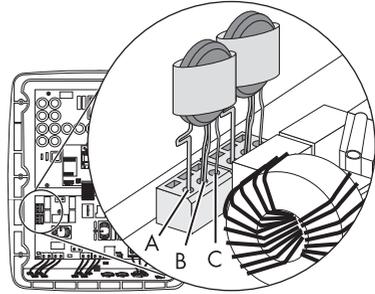


#### Position of varistors

You can determine the position of the varistors using the illustration below.

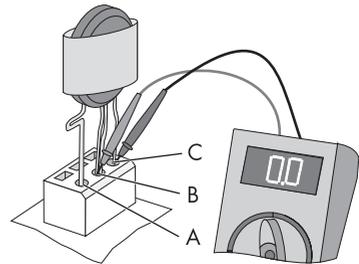
Observe the following assignment of the terminals:

- 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 in the following manner:

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 56).
2. Use a multimeter to ensure that all of the varistors in the installed state have a conducting connection between connectors B and C.



Result	Measure
<input checked="" type="checkbox"/> There is a <b>conducting</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 85)).</li> </ul>

Result	Measure
<p><input checked="" type="checkbox"/> There is <b>no conducting</b> connection.</p>	<p>The respective varistor is defective and must be replaced. Varistor failure is generally due to influences that affect all varistors similarly (temperature, age, induced overvoltage). SMA Solar Technology AG recommends that you replace both varistors.</p> <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 84)).</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 PV 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 terminals with your replacement varistors, contact SMA Solar Technology AG. As an alternative, the individual terminal contacts can be operated using a 3.5 mm wide screwdriver.

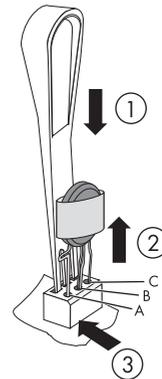
4. Remove varistor (2).

5. Insert new varistor (3).

The pole with the small loop (crimp) must be fitted to terminal 1 when replacing the varistor.

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

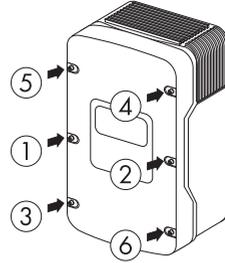
The check and replacement of the varistors is completed.



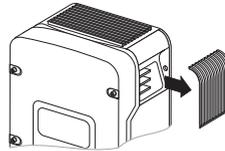
## 10 Decommissioning

### 10.1 Disassembling the Inverter

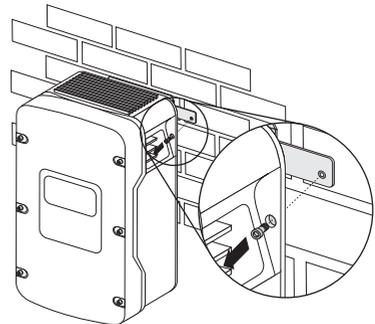
1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 56).
2. Remove all cables from the inverter.
3. Tighten the enclosure lid with all screws and the corresponding conical spring washers in the sequence depicted on the right (torque: 6 Nm). The toothings of the conical spring washers must point toward the enclosure lid.



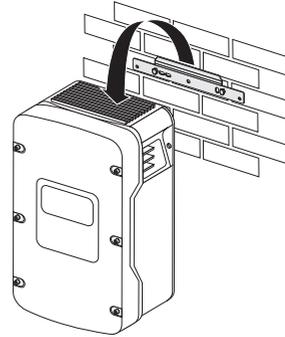
4. Remove the ventilation grids on both sides.



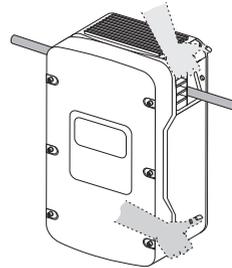
5. Remove the two screws on the left and right side of the inverter that attach it to the wall bracket.
6. Disconnect the theft protection, if applicable.



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 disassembled.

## 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  $-25^{\circ}\text{C}$  and  $+60^{\circ}\text{C}$ .

## 10.4 Disposing of the Inverter

Dispose of the inverter at the end of its service life in accordance with the locally applicable disposal regulations for electronic waste. Alternatively, send it back to SMA Solar Technology AG with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("FOR DISPOSAL") (contact see page 85).

# 11 Technical Data

## DC Input

Maximum DC power at $\cos \varphi = 1$	7 500 W
Maximum input voltage *	800 V
MPP voltage range	335 V ... 560 V
Rated input voltage	340 V
Minimum input voltage	290 V
Start input voltage	400 V
Maximum input current	23 A
Maximum input current per string	23 A
Number of independent MPP inputs	1
Strings per MPP input	4

\* The maximum open-circuit voltage, which can occur at a cell temperature of  $-10^{\circ}\text{C}$ , must not exceed the maximum input voltage.

## AC output

Rated power at 230 V, 50 Hz	6 650 W
Maximum apparent AC power	7 000 VA
Rated grid voltage	230 V
Nominal AC voltage	220 V / 230 V / 240 V
AC voltage range	180 V ... 265 V
AC nominal current at 220 V	30.2 A
AC nominal current at 230 V	28.9 A
AC nominal current at 240 V	27.7 A
Maximum output current	31 A
Total harmonic factor of output current at AC THF < 2%, AC power > 0.5 rated power	$\leq 3\%$
Rated power frequency	50 Hz
AC power frequency	50 Hz / 60 Hz
Operating range at AC power frequency 50 Hz	44 Hz ... 55 Hz
Operating range at AC power frequency 60 Hz	54 Hz ... 65 Hz
Displacement power factor, adjustable	0.8 <sub>overexcited</sub> ... 0.8 <sub>underexcited</sub>
Feed-in phases	1
Connection phases	1
Oversvoltage category as per IEC 60644-1	III

## Protective devices

DC reverse-polarity protection	Short circuit diode
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	thermally monitored varistors
AC short-circuit current capability	Current control
Grid Monitoring	SMA Grid Guard 2.1
Maximum permissible fuse protection	50 A
Ground fault monitoring	Insulation monitoring: $R_{iso} > 1 \text{ M } \Omega$
Galvanic isolation	Available

## General Data

Width x Height x Depth with Electronic Solar Switch	468 mm x 653 mm x 242 mm
Weight	65 kg
Length x width x height of packaging	396 mm x 803 mm x 596 mm
Transport weight	68 kg
Climatic category according to IEC 60721-2-1	4K4H
Operation temperature range	-25 °C ... +60 °C
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above mean sea level	2 000 m
Noise emission (typical)	≤ 41 dB(A)
Power loss in night operation	0.25 W
Topology	LF transformer
Cooling concept	OptiCool: temperature-controlled fan
Fan connection	designed for safe disconnection in accordance with DIN EN 50178:1998-04
Degree of protection for electrics according to IEC 60529	IP65
Protection class (according to IEC 62103)	I

Country standards, as of 07/2011*	VDE 0126-1-1 VDE-AR-N-4105 AS4777 C10/11 PPDS GBT19939-2005 CGC GF001-2009 UTE C15-712-1 PPC DK 5940 EN 50438 RD 1663/2000 RD 661/2007 IEC 61727 PEA G83/1-1 G 59/2
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\*EN 50438: Does not apply to all national standard deviations.

VDE-AR-N-4105-HP: Valid from firmware version 2.10. Setting in accordance with VDE-AR-N-4105 (Germany) for PV plants > 13.8 kVA.

**Climatic conditions in accordance with IEC 60721-3-4, installation type C, class 4K4H**

Extended temperature range	- 25°C ... +60°C
Extended humidity range	0% ... 100%
Extended air pressure range	79.5 kPa ... 106 kPa

**Climatic conditions in accordance with IEC 60721-3-4, transport type E, class 2K3**

Temperature range	- 25°C ... +70°C
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**Features**

DC connection	SUNCLIX DC connector
AC connection	Spring terminal
Display	LC text display
Bluetooth® Wireless Technology	optional
RS485, galvanically isolated	optional

## Electronic Solar Switch

Electrical endurance 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	12 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP21

## Torque

Enclosure lid screws	6.0 Nm
Additional ground terminal	6.0 Nm
Cylinder head screw for attaching the enclosure to the wall mounting bracket	6.0 Nm
SUNCLIX lock nut	2.0 Nm
Screw terminal AC connection	2.5 Nm
RS485 communication connection	1.5 Nm
Connection of the SMA Power Balancer	1.5 Nm

## Grid forms

IT grid	Suitable
TN-C grid	Suitable
TN-S grid	Suitable
TN-C-S grid	Suitable
TT grid, if $U_{N\_PE} < 30$ V	Suitable
Split Phase	Suitable

## Efficiency

Maximum efficiency, $\eta_{max}$	96.2%
European weighted efficiency, $\eta_{EU}$	95.5%

## 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.

<b>Description</b>	<b>Brief Description</b>	<b>SMA order number</b>
Ventilation grid	Ventilation grid set "rechts/links" (right/left) as replacement part	45-7202
Electronic Solar Switch	ESS handle replacement part	ESS-HANDLE:04 Also enter the inverter's serial number.
Power Balancer plug	Upgrade kit to retrofit a Sunny Mini Central equipped with an SMA Power Balancer to the SMA Power Balancer connector system	PBL-SMC-10-NR
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
<i>Bluetooth</i> upgrade kit	<i>Bluetooth</i> communication interface	BTPBINV-NR
Power Reducer Box	Power Reducer Box	POWERREDUCERBOX
Replacement varistors	Set of thermally monitored varistors (2 pc.) incl. insertion tool	MSWR-TV7
Insertion tool for the replacement of varistors	Insertion tool for varistors sets	SB-TVWZ
Positive grounding set	Upgrade kit for the positive connection to ground of the DC input	ESHV-P-NR
Negative grounding set	Upgrade kit for the negative connection to ground of the DC input	ESHV-N-NR
SUNCLIX DC plug connector	Field connector for conductor cross-sectional areas 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 need the following information in order to provide you with the necessary assistance:

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

### **SMA Solar Technology AG**

Sonnenallee 1  
34266 Niestetal, Germany  
[www.SMA.de](http://www.SMA.de)

### **SMA Serviceline**

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Communication:   +49 561 9522 2499  
Fax:                 +49 561 9522 4699  
E-Mail:             Serviceline@SMA.de



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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

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- 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](http://www.SMA.de) and can be downloaded or are available on paper from the usual sales channels if required.

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