PV Inverters

SUNNY TRIPOWER 8000TL/10000TL/12000TL/15000TL/17000TL

Installation Manual

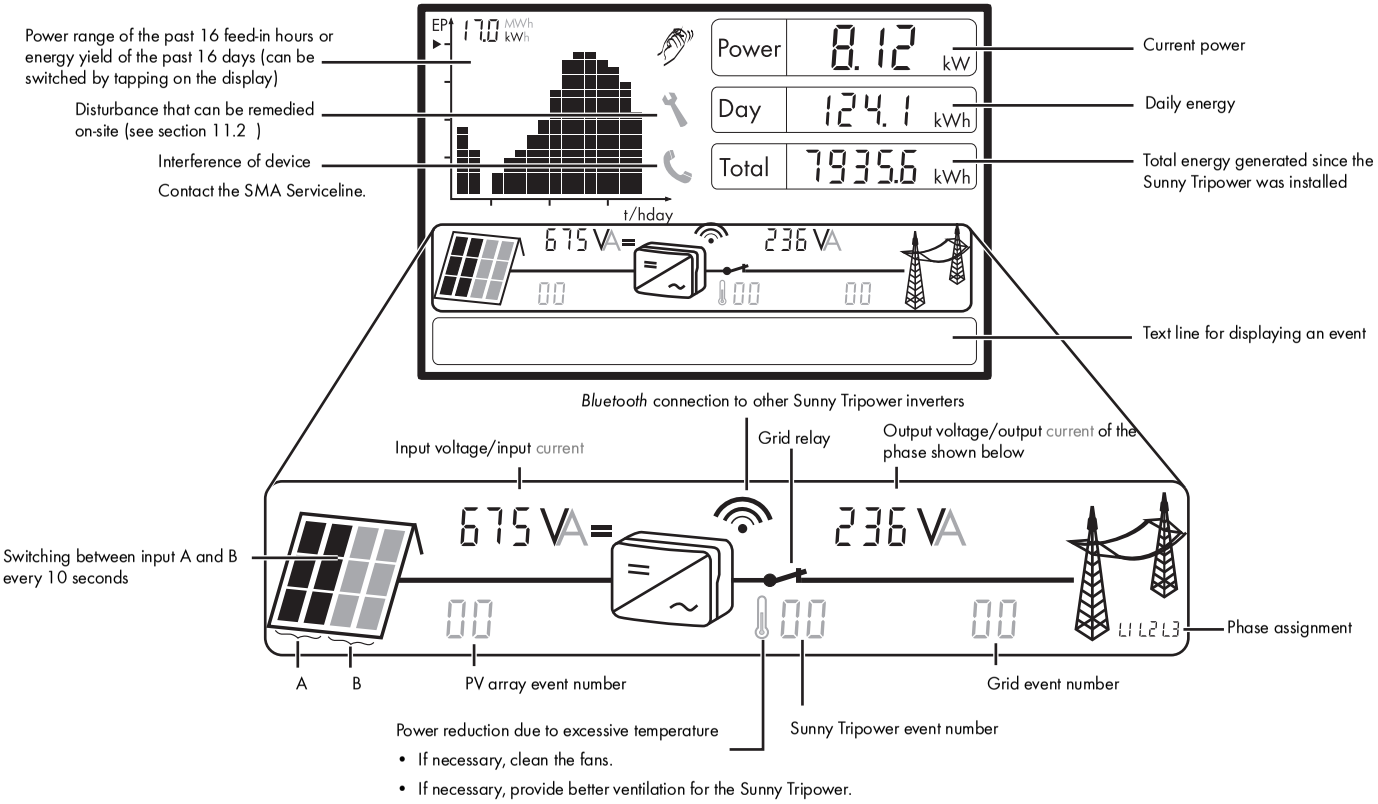
STP8-17TL-IA-IEN112030 | IMEN-STP10-17TL | Version 3.0

EN

Display

Tapping on the lower lid:

- Activating the background illumination
- Switching through the energy values of the past 16 feed-in hours to the daily energy values of the past 16 days
- Switching through the text line



- If necessary, clean the fans.
- If necessary, provide better ventilation for the Sunny Tripower.

Table of Contents

1 Information on this Manual

1.1 Validity

This manual describes the assembly, installation, commissioning, maintenance and failure search procedures for the following SMA inverters:

- Sunny Tripower 8000TL (STP 8000TL-10)
- Sunny Tripower 10000TL (STP 10000TL-10)
- Sunny Tripower 12000TL (STP 12000TL-10)
- Sunny Tripower 15000TL (STP 15000TL-10)
- Sunny Tripower 17000TL (STP 17000TL-10)

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 be performed by electrically skilled persons only.

1.3 Additional Information

You will find further information on special topics such as designing a miniature circuit-breaker or the description of the parameters and measured values at 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 instructions and general information appear in this document:

DANGER!

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

WARNING!

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

CAUTION!

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

NOTICE!

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

Information

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

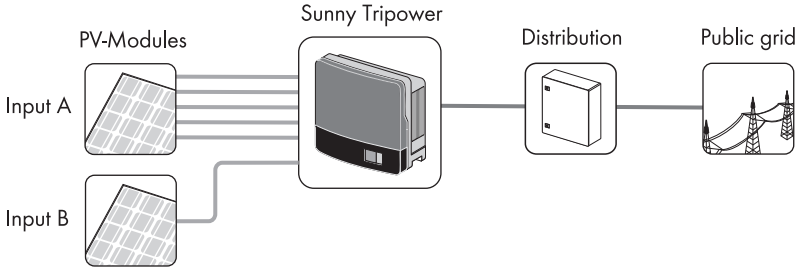
☑ This symbol indicates the result of an action.

2 Safety

2.1 Appropriate Usage

The Sunny Tripower is a PV inverter which converts the direct current of a PV array into alternating current and feeds this into the power distribution grid.

Principle of a PV plant with this Sunny Tripower



String connections Sunny Tripower 8000TL, 10000TL and 12000TL

The Sunny Tripower 8000TL, 10000TL and 12000TL only have 4 string connections at input A.

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

Leakage Currents

PV modules with large capacities relative to ground, such as thin-film PV modules with cells on a metallic substrate, are only to be implemented if their coupling capacity does not exceed 2.55 µF.

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

When designing the PV plant, ensure that the values comply with the permitted operating range of all components at all times. The free design program "Sunny Design" from version 2.0 (www.SMA.de/en/SunnyDesign) will assist you in this. The manufacturer of the PV modules must have approved the PV modules for use with this Sunny Tripower. You must also ensure that all measures recommended by the module manufacturer for long-term maintenance of the module properties are taken (see also Technical Information "Module Technology" at www.SMA.de/en).

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

2.2 Safety Instructions

DANGER!

Danger to life due to high voltages in the inverter

- All work on the inverter may only be carried out by a trained electrically skilled person.
- Persons with limited physical or physical abilities may only perform activities on the inverter after tuition and under supervision.
- Children may not play with the inverter. Children may not have access to an inverter in operation.

CAUTION!

Danger of burn injuries due to hot enclosure parts

During operation, the upper lid of the enclosure and the enclosure body may become hot.

- Only touch the lower enclosure lid during operation.

CAUTION!

Possible damage to health as a result of the effects of irradiation

- Do not stay closer than 20 cm from the inverter for any length of time.

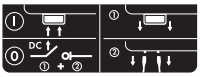
PV array grounding

Comply with the local regulations for grounding the PV modules and the PV array. SMA Solar Technology AG recommends connecting the array frame and other electrically conductive surfaces so that there is continuous conduction and to ground them in order to ensure maximum protection for property and persons.

2.3 Explanation of Symbols

This section gives an explanation of all the symbols shown 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.
	An error has occurred. Read section 11 "Troubleshooting" (page 90) to remedy the error.
	*Bluetooth*® Wireless Technology Shows the status of *Bluetooth* communication.
	DC load disconnection unit Electronic Solar Switch (ESS) • ❶ When the Electronic Solar Switch is plugged in, the DC circuit is closed. • ❶ In order to interrupt the DC circuit and disconnect the inverter securely under load, you must first pull out the Electronic Solar Switch ❶ and then remove all DC plug connectors ❷ , as described in section 8 "Disconnecting the Inverter" (page 70).
	**Danger to life due to high voltages in the inverter** There is residual voltage in the inverter. The inverter needs 10 minutes to electrically discharge. • Wait 10 minutes before you open the upper enclosure lid or the DC lid.
	**NOTICE, danger!** • Observe the connection requirements for second protective conductor in section 6.3.1 "Conditions for the AC Connection" (page 27).
	**QR-Code®* for SMA Bonus program** You will find information on the SMA bonus program at www.SMA-Bonus.com.

* 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 a trained electrically skilled person.
	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 12.5 "Disposing of the Inverter" (page 101).
	CE mark The inverter complies with the requirements of the applicable EC guidelines.
	The inverter is transformerless.
	Direct Current (DC)
	Alternating Current (AC)
	Degree of protection IP54 The inverter is protected against dust deposits in the interior and against splashes of water from all angles.
	RAL quality mark for solar products The inverter complies with the requirements of the German Institute for Quality Assurance and Labeling.
	Device class label The inverter is equipped with a wireless component that complies with the harmonized standards.

Symbol	Explanation
	Certified safety The inverter complies with the requirements of the Europe Equipment and Product Safety Act.
	Australian mark of conformity
	Korean mark of conformity

3 Product Description

The Sunny Tripower is a multi-string inverter which converts the direct current of a PV array into alternating current. To do this, the Sunny Tripower is equipped with 2 separate MPP trackers which can be connected to the different PV modules. Feed-in of the electricity into the power distribution grid is three-phase. Cooling is carried out by the cooling system OptiCool, whereby a fan is integrated on the underside and on the left side of the enclosure.

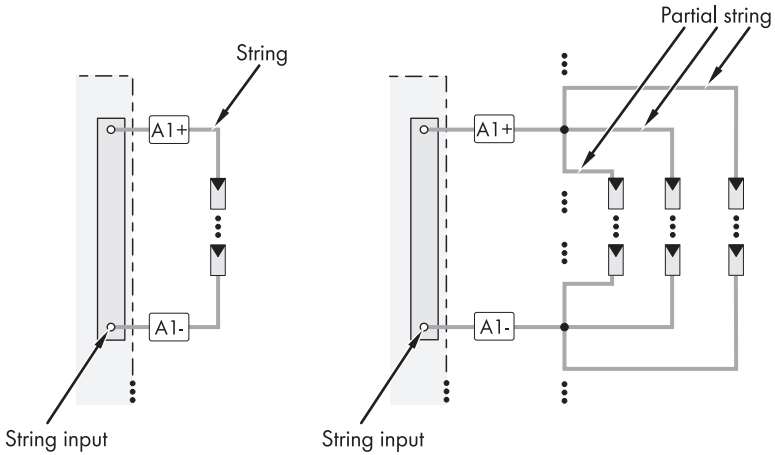
In addition, Sunny Tripower is equipped with the features described below.

3.1 Surge Arrester Type II

Along with the standard integrated, thermally monitored varistors, the Sunny Tripower is equipped with module slots for the additional mounting of surge arresters Type II. The modules are monitored when plugged in. If a module is triggered, a warning is issued via the display or external communication (e.g. Sunny WebBox or Sunny Explorer). This makes it easy to integrate the Sunny Tripower into a lightning protection concept. The necessary modules are available as retrofit kits for input A or input A+B.

3.2 Intelligent String Failure Detection

The Sunny Tripower is equipped with a system that recognizes the total failure of individual strings or partial strings (see following figure). With a PV module current of approx. 1 A, monitoring of up to 6 partial strings per string input is possible. Identical alignment of the connected PV array at input A and B is prerequisite for the reliable functioning of the intelligent string failure detection. For the education phase, the Sunny Tripower needs approximately 14 days of moderate irradiation after successful activation. One advantage of this system is that its auto-adaptive function completely eliminates the necessity of any configuration. In the event of a string failure a warning message is issued on the display or via external communication (e.g. Sunny WebBox or Sunny Explorer). Note that extreme shading and snow covered PV modules lead to warning messages.



3.3 Electronic String Fuse

The Sunny Tripower is equipped with an electronic string fuse. It prevents dangerous reverse currents in the PV array and thus plays a key role in fire prevention. Reverse currents can occur if connections are reverse poled during installation or as a result of module defects during operation. The electronic string fuse recognizes these defects and shorts the PV array. This prevents the occurrence of reverse currents and thus safeguards both the PV plant and the Sunny Tripower. An advantage of this method is that conventional fuses at the DC inputs are not necessary. The electronic solution is entirely maintenance-free and does not require any dimensioning.

In order to use this function optimally, the greatest of attention is necessary during commissioning (see section 6.4 "Connecting the PV Array (DC)" (page 32)). The Sunny Tripower warns of dangerous conditions by beeping and issuing warnings in the display or via external communication. If electrical installation takes place under conditions of insufficient irradiation (PV voltage smaller than 188 V), the Sunny Tripower will not have power supply which means that the protective functions described above will not be active during installation.

3.4 Reactive Power Feed-in and Grid Management

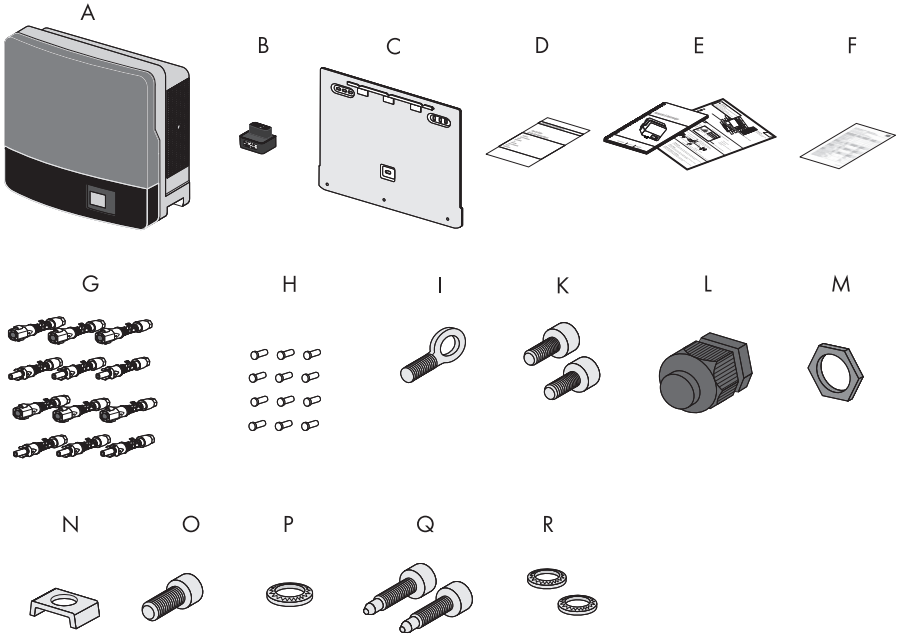
The Sunny Tripower is capable of utilizing reactive power and can feed reactive power into the grid via the setting of a default value for the displacement power factor (cos φ). Additionally this inverter is also equipped with advanced grid management functions, e.g. power limitation and dynamic grid support. These functions can be activated and configured depending on the requirements of the utility operator.

You will find detailed information on the setting parameters of these functions in the Technical Description "Reactive power feeding and grid stability management" in the download area at www.SMA.de/en in the "Technical Description" category of the respective inverter.

4 Unpacking

4.1 Scope of Delivery

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



Object	Quantity	Description
A	1	Sunny Tripower
B	1	Electronic Solar Switch (ESS)
C	1	Rear panel (wall mounting bracket)
D	1	Set of documents with explanations and certificates
E	1	Installation guide, including user manual
F	1	Supplementary sheet with inverter factory settings
—	1	Installation guide for RS485 communication module (optional)
G	10/12	DC plug connectors Sunny Tripower 8000TL/10000TL/12000TL: 10 units (5 x positive, 5 x negative) Sunny Tripower 15000TL/17000TL: 12 units (6 x positive, 6 x negative)

Object	Quantity	Description
H	10/12	Sealing plug Sunny Tripower 8000TL/10000TL/12000TL: 10 units Sunny Tripower 15000TL/17000TL: 12 units
I	1	Eye bolt (M5) for securing the Sunny Tripower to the rear panel
K	2	Cylinder screws (M5x10) for attaching the enclosure to the rear panel
L	1	Cable gland for AC connection
M	1	Counter nut for the AC connection cable gland
N	1	Clamping clip (M6) for additional grounding
O	1	Cylinder head screw (M6) for ground terminal
P	1	Conical spring washer (M6) for ground terminal
Q	2	Cylinder head screws (M5x20) for enclosure lid (replacement)
R	2	Conical spring washer (M5) for enclosure lid screws (replacement)

4.2 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.

5 Mounting

5.1 Safety

DANGER!

Danger to life due to fire or explosion

Despite careful construction, electrical devices can cause fires.

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

CAUTION!

Risk of injury due to the heavy weight of the inverter (approx. 65 kg)

- Take the weight of the inverter into account for transport.
- Select a suitable mounting location and mounting surface.
- When mounting the back panel, use fastening material suitable for the mounting surface.
- Two people are needed to mount the inverter.

CAUTION!

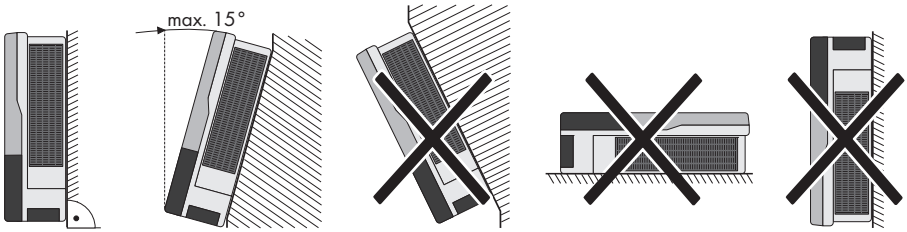
Danger of burn injuries due to hot enclosure parts

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

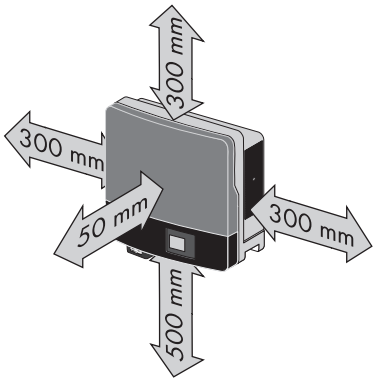
5.2 Selecting the Mounting Location

Consider the following requirements when selecting the installation site:

- The mounting method and location must be suitable for the inverter's weight and dimensions (see section 13 "Technical Data" (page 102)).
- 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. 15°.
- 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.
- Install the inverter at eye level. Given the weight of the device, this will facilitate disassembling if service work is necessary.
- The ambient temperature should be below 40 °C to ensure optimum operation.
- Do not expose the inverter to direct solar irradiation, as this can cause excessive heating and 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.



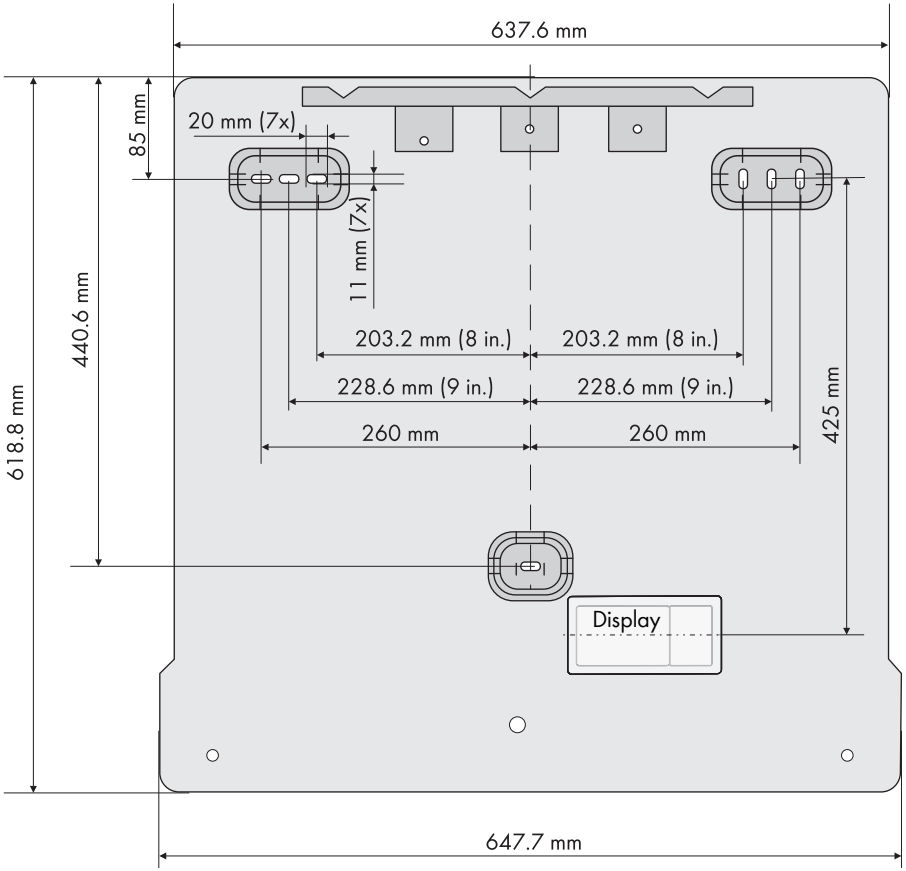
Multiple inverters installed in areas with high ambient temperatures

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.

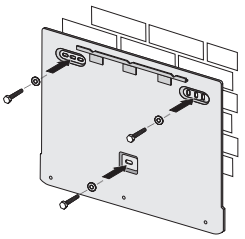
5.3 Mounting the Inverter with Rear Panel

1. Use the rear panel as a drilling template and mark the positions of the drill holes.

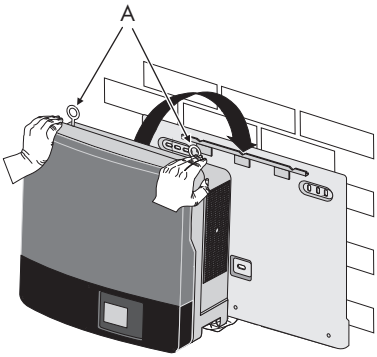


2. Mount the rear panel.

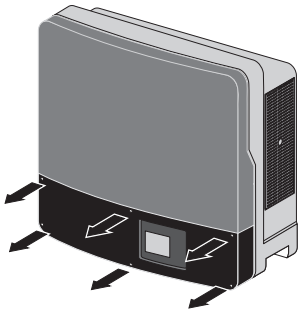
   For this, use 1 upper hole on the right and on the left and the hole in the middle.



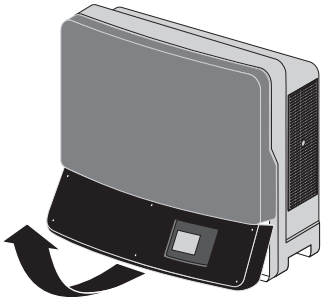
3. Hang the inverter in the rear panel in such a way that the enclosure of the inverter lies flush with the rear panel.
   - For two people to transport the inverter, each person must use the recessed grips underneath and at the same time take a hold of the upper edge of the enclosure lid.
   - When transporting with a crane, you can attach two ring bolts to the top of the inverter (see A: M10, diameter = 10 mm). To do this, remove the filler-plugs and screw in the ring bolts as far as they will go.
4. If necessary, remove the ring bolts after transport and re-attach the filler-plugs.



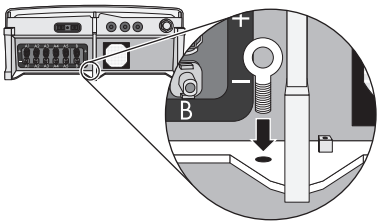
5. Loosen all 6 captive screws of the lower enclosure lid.



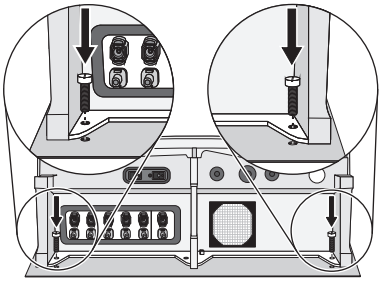
6. Lift and remove the lower enclosure lid from below.



7. Screw the supplied eye bolt into the hole provided in order to secure the enclosure against removal. Only tighten the eye bolt hand-tight here.



8. In order to secure the enclosure to the rear panel, fasten the underside of the enclosure with the two M5x10 cylinder screws supplied (torque: 6.0 Nm).

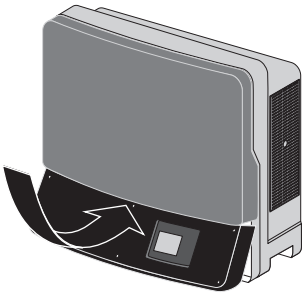


9. Check to ensure that the inverter is securely in place.

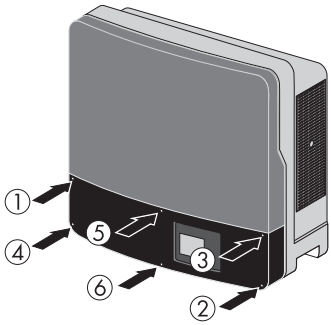
☑ The inverter is now securely mounted to the wall.

If the inverter is not to be connected immediately, re-attach the lower enclosure lid:

– Dock the lower enclosure lid at an angle and attach. In the process, the captive screws must protrude.



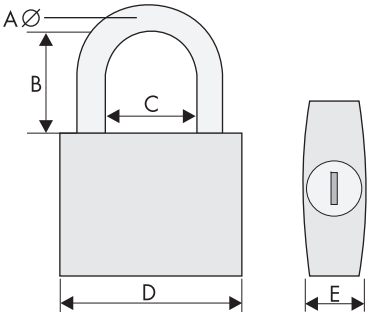
– Pre-screw all 6 screws and then tighten them in the sequence shown on the right (torque: 2.0 Nm).



Optional Theft Protection

To protect the inverter from theft, you can secure it to the rear panel with a padlock.

The padlock must meet the following requirements:

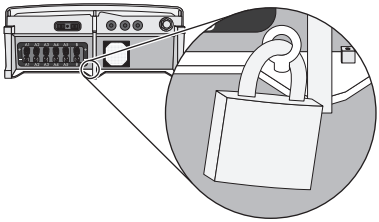


- Size:
  A: 6 mm ... 8 mm diameter
  B: 23 mm ... 29 mm
  C: 23 mm ... 28 mm
  D: 39 mm ... 50 mm
  E: 13 mm ... 18 mm
- Stainless
- Hardened shackle
- Secured lock cylinder

Storage of the key

Store the key carefully for possible service purposes.

1. Put the shackle of the padlock through the eye of the previously mounted eye bolt and close the padlock.



☑ The inverter is protected against theft.

6 Electrical Connection

6.1 Safety

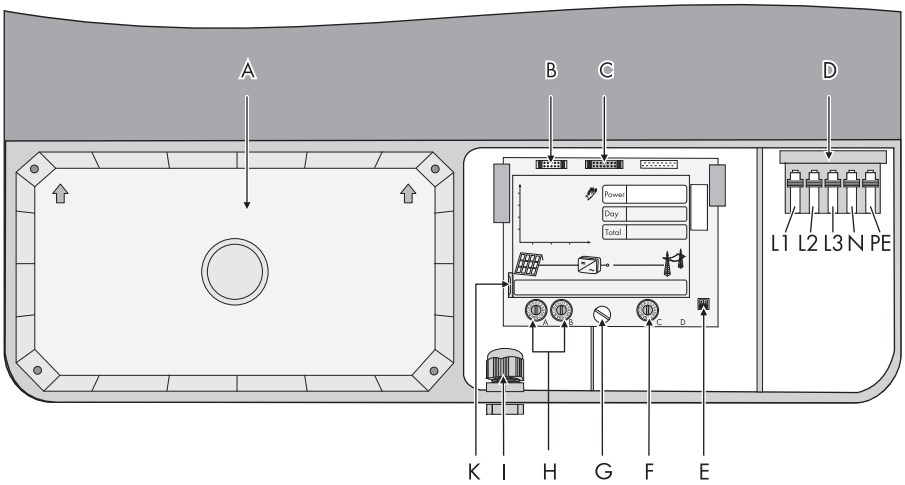
NOTICE!

Electrostatic discharges can damage the inverter

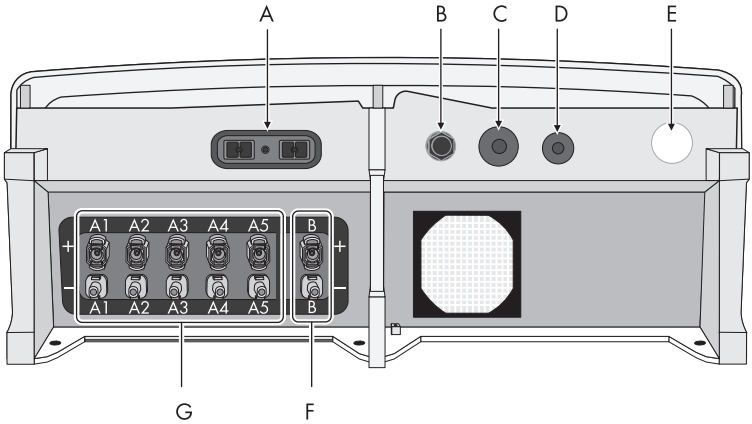
Internal components of the inverter can be irreparably damaged by static discharge.

- Ground yourself before touching a component part.

6.2 Overview of the Connection Area



Object	Description
A	DC lid (slots for surge arresters and varistors are located under this)
B	Plug for connecting the multi-function relay
C	Plug for connecting the RS485 communication module (optional)
D	Terminal for grid connection
E	Jumper for setting the language to English
F	Rotary switch for setting the *Bluetooth* NetID
G	Screw for releasing and raising the display
H	Rotary switches for setting the country standard and display language
I	Cable entry for the multi-function relay (M20, 5 mm ... 13 mm)
K	Slot for SD card (for service purposes only)



Object	Description
A	Electronic Solar Switch (ESS) socket
B	Cable entry for the multi-function relay (M20, 5 mm ... 13 mm)
C	Cable entries for communication via RS485 (M32) (optional)
D	Additional cable entry (M20)
E	Cable entry for grid connection (AC) (M32, 14 mm ... 25 mm)
F	DC plug connectors for connecting the strings (input area B)
G	DC plug connectors for connecting the strings (input area A) (for Sunny Tripower 8000TL/10000TL/12000TL only 4 units)

6.3 Connecting the Power Distribution Grid (AC)

6.3.1 Conditions for the AC Connection

You must comply with the connection requirements of your distribution grid operator.

Residual current device

The inverter is equipped with an integrated all-pole sensitive residual-current monitoring unit. The inverter can automatically differentiate between residual currents and normal capacitive leakage currents.

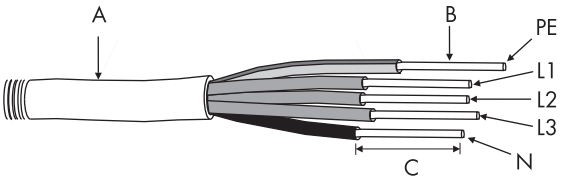
If an external RCD or residual current device is strictly required, you must use a switch that triggers at a residual current of 100 mA or higher.

You will find further information for using an RCD in the Technical Information "Criteria for selecting an RCD" at www.SMA.de/en.

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). The necessary minimum cross-sectional area depends on the cable losses and the output current of the inverter type used.

Cable Requirements



Position	Description	Value
A	Cable diameter	14 mm ... 25 mm
B	Conductor cross-sectional area	1.5 mm² ... 16 mm², with bootlace ferrule maximum 10 mm²
C	Stripped insulation	approx. 12 mm
The PE insulated conductor must be 5 mm longer than the L and N conductors.		

Connection of a second protective conductor

In some installation countries, a second protective conductor is required to prevent a contact current in the event of a malfunction in the original protective conductor.

For installation countries falling within the scope of validity of the IEC standard 62109, the following requirements are applicable:

- Installation of the protective conductor on the AC terminal with a conductor cross-sectional area of at least 10 mm² Cu.

or

- Installation of a second protective conductor on the ground terminal with the same cross-sectional area as the original protective conductor on the AC terminal (see section 6.3.3 "Connecting the Second Protective Conductor" (page 31)).

In each case, observe the applicable regulations in the installation country.

Load Disconnection Unit

You must install a **separate three-phase** miniature circuit-breaker for each inverter in order to be able to safely disconnect the inverter under load. The maximum permissible rating can be found in section 13 "Technical Data" (page 102).

DANGER!
Danger to life due to fire

In the event of the parallel connection of more than one inverter 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.
- Fuse each phase with a separate 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 loads separately.

NOTICE!

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

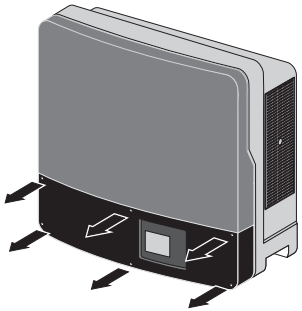
A screw type fuse element, e.g. DIAZED fuse (Diazed) or D0 system (Neozed), is not a switch-disconnector, and may **not** be used as a load disconnection unit. A screw type fuse element serves as cable protection only.

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

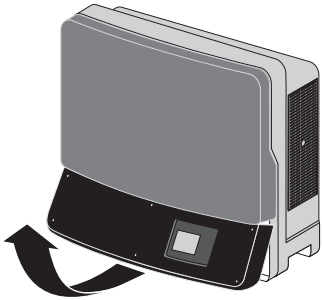
- Use only a switch-disconnector or a miniature circuit-breaker as a load disconnection unit.

6.3.2 AC Connection Procedure

1. Check the grid voltage and compare it with the permissible voltage range (see section 13 "Technical Data" (page 102)).
2. Disconnect the miniature circuit-breaker from all 3 phases and secure against re-connection.
3. Loosen all 6 captive screws of the lower enclosure lid.



4. Lift and remove the lower enclosure lid from below.

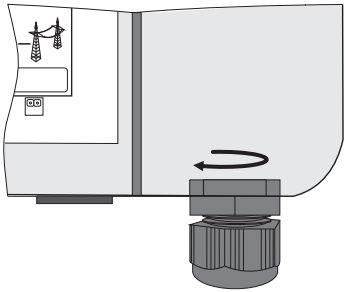


5. Check that the country setting of the inverter is correct by using the supplement provided with the factory settings.

   If the inverter is not set to the desired country standard, then adjust the country standard using the rotary switches as described in section 6.5.3 "Setting the Country Standard and Language using Rotary Switches" (page 51).

6. Remove the adhesive tape from the AC enclosure opening.

7. Insert the AC cable gland from the outside into the cable feed-through and tighten it from the inside with the counter nut.



8. Pull the cable through.

9. Raise the terminals of the AC clamp terminal as far as they will go.

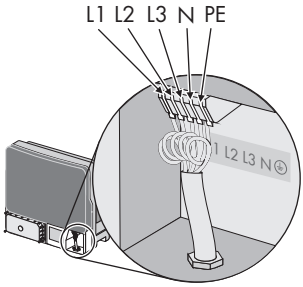
NOTICE!

Risk of fire when connecting 2 conductors

If 2 conductors are connected to one terminal, a poor electrical contact can result in overheating or a risk of fire.

- Connect a maximum of 1 conductor per terminal.

10. Connect L1, L2, L3 N and the protective conductor (PE) to the AC terminal in accordance with the labeling.
    - To do this, the protective conductor must be 5 mm longer than the L and N wires.
    - L and N must not be swapped.
    - The direction of rotation of L1, L2 and L3 is not relevant.



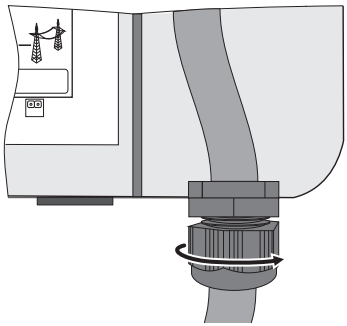
CAUTION!

Danger of crushing when terminals snap shut

The terminals close by snapping down fast and hard.

- Press the terminals down with your thumb, do not grip the entire terminal on all sides.
- Keep fingers away from the terminals.

11. Close all terminals of the AC terminal again until they snap into place.
12. Screw the hexagon cap nut of the screw connection tightly to the cable entry.



DANGER!

Danger to life due to high voltages in the inverter

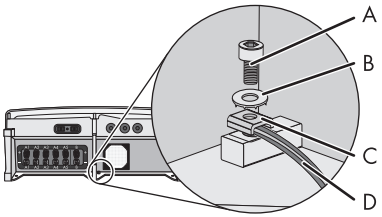
- Do not switch on the line circuit breaker until the PV array has been connected and the inverter is securely closed.

6.3.3 Connecting the Second Protective Conductor

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

Procedure

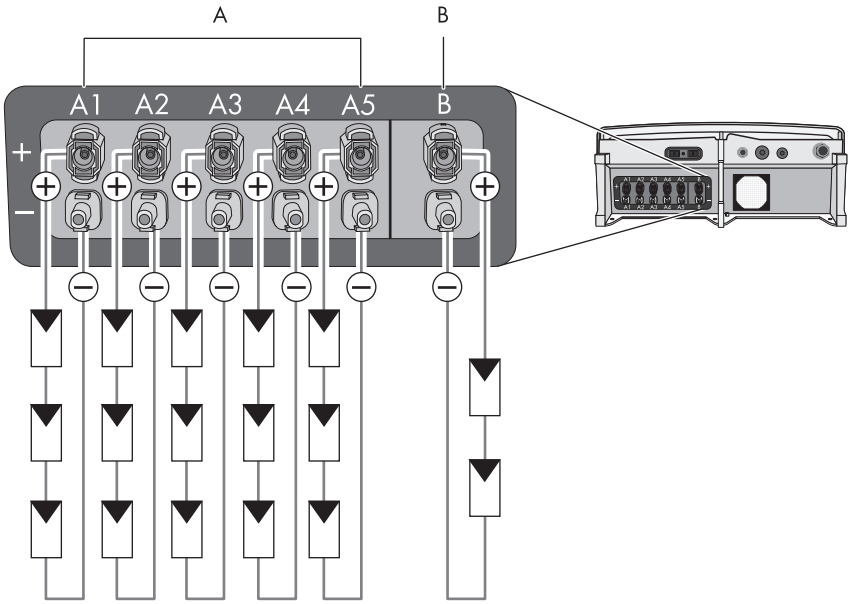
1. Take the clamping clip, cylinder head screw (M6) and conical spring washer (M6) out of the accessory kit.
2. Insert the stripped grounding cable (D) under the clamping clip (C) (cross-sectional area: maximum 16 mm²).
3. Screw the terminal (C) tight with the screw (A). Here, the toothing of the conical spring washer (B) must face toward the clamping clip.



6.4 Connecting the PV Array (DC)

6.4.1 Conditions for the DC Connection

The inverter has 2 input areas, "A" and "B", each with its own MPP tracker.



Up to 4 strings (Sunny Tripower 8000TL/10000TL/12000TL) or 5 strings (Sunny Tripower 15000TL/17000TL) can be connected at input area A. 1 string can be connected at input area B.

- For input area A, the PV modules must meet the following requirements:
  - Same type
  - Same quantity of PV modules connected in series
  - Identical alignment
  - Identical tilt
- For the activation of the intelligent string failure detection the PV modules at input A and B must be identically aligned.
- The connecting cables of the PV modules must be equipped with plug connectors. You will find the necessary DC connectors for DC connection in the delivery.

Use of Y adapters

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 8 "Disconnecting the Inverter" (page 70).

- The following limiting values at the DC input of the inverter must not be exceeded:

Sunny Tripower	Maximum input voltage (DC)	Maximum input current (MPP) (DC)	Maximum short-circuit current per string input (DC)
		Input area A/B	A1 ... A5 / B
8000TL	1 000 V	22.0 A / 11.0 A	33 A / 12.5 A
10000TL	1 000 V	22.0 A / 11.0 A	33 A / 12.5 A
12000TL	1 000 V	22.0 A / 11.0 A	33 A / 12.5 A
15000TL	1 000 V	33.0 A / 11.0 A	40 A / 12.5 A
17000TL	1 000 V	33.0 A / 11.0 A	40 A / 12.5 A

WARNING!

Risk of fire as a result of overcurrent on the string input

Destruction of the inverter

Because the electronic string fuse shorts the PV array in the event of a fault, the limiting values for the maximum short-circuit current per string input given in the table above may not be exceeded. If a string input is overloaded, it can result in an electric arc and hence a risk of fire.

- Make sure that the limiting values specified in the table above are not exceeded.
- Check whether the short-circuit currents of the connected PV modules observe the limiting values given in the table above.

Function of the electronic string fuse

The electronic string fuse prevents reverse currents in the PV array. Activation of the electronic string fuse is only possible if the following conditions are met:

- At installation, the DC input voltage must be at least 188 V (see section 13 "Technical Data" (page 102)), in order that the protective function of the integrated electronic string fuse is activated. Otherwise, a reversed polarity at the DC connection or a defective string will not be recognized by the inverter.

NOTICE!

Risk of fire in the PV array due to non-recognition of reverse currents.

The integrated electronic string fuse monitors the PV array and protects it against dangerous reverse currents. In order to activate the electronic string fuse, you must observe the following during connection of the strings:

- If more than 2 strings are connected to the inverter, **ALWAYS FIRST connect the first string to input B**. If no string is connected at input B, the string fuse is not active.
- Each string must be clearly assigned to the correct string input. Do not cross-wire or combine the strings. See the graphic in section 6.4.1 "Conditions for the DC Connection" (page 32) for the correct assignment of the strings.

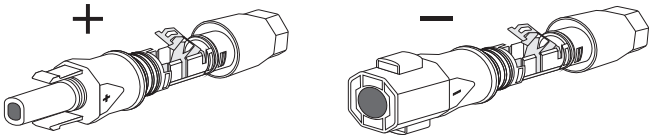
Use of external string collection boxes

When using string collection boxes, the functionality of the electronic string fuse may be limited.

6.4.2 Assembling the DC Plug Connectors

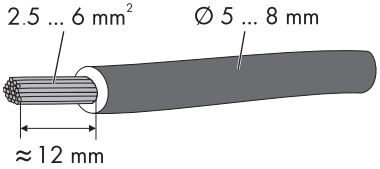
In order to be connected to the inverter, all connection cables of the PV modules must be equipped with the DC plug connectors provided.

Assemble the DC plug connectors as described in the following. At the same time ensure that the plug connectors have the correct polarity. The DC plug connectors are labelled with "+" and "–".



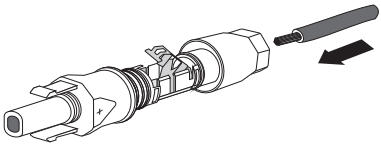
Cable Requirements

- Use a PV1-F cable.

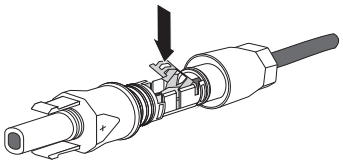


Procedure

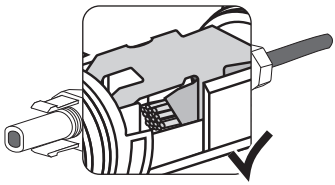
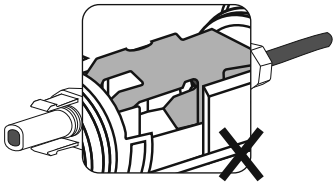
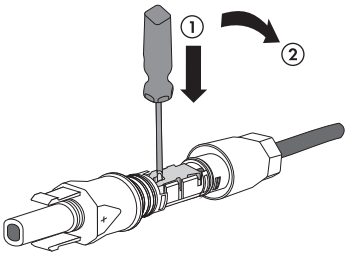
1. Lead the stripped cable all the way into the plug.



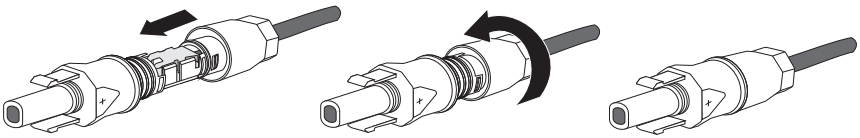
2. Press the clamping clip down until it audibly snaps into place.



3. Ensure that the cable is correctly positioned:

Result	Measure
☑ If the stranded wire is visible in the chamber of the clamping clip, the cable is correctly positioned. 	• Proceed to step 4.
☑ If the stranded wire is **not** visible in the chamber of the clamping clip, the cable is not correctly positioned. 	• Loosen the clamping clip. For this purpose, use a screwdriver with a blade width of 3.5 mm.  • Remove the cable and start again from step 1.

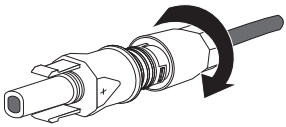
4. Push the screw connection to the thread and screw tight (torque: 2 Nm).



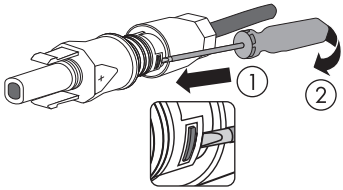
☑ The DC connectors are now assembled and can be connected to the inverters, as described in section 6.4.4 "Connecting the PV Array (DC)" (page 38).

6.4.3 Opening the DC Connectors

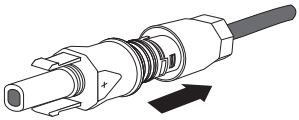
1. Unscrew the screw connection.



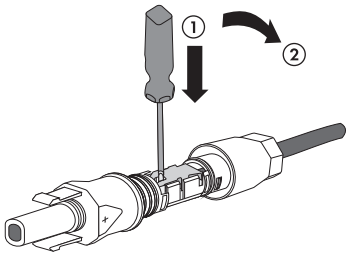
2. To release the plug, slot a screw driver into the side catch mechanism and lever out. For this purpose, use a screwdriver with a blade width of 3.5 mm.



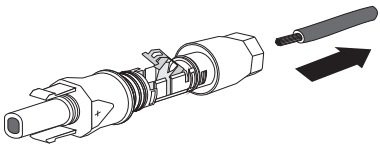
3. Carefully pull the DC connector apart.



4. Loosen the clamping clip. For this purpose, use a screwdriver with a blade width of 3.5 mm.



5. Remove the cable.



☑ The cable is now removed from the DC connector.

6.4.4 Connecting the PV Array (DC)

DANGER!

Danger to life due to high voltages in the inverter

- Before connecting the PV array, ensure that the AC miniature circuit-breaker is switched off from all 3 phases.

WARNING!

There is a risk of an electric arc if the DC plug connectors are pulled out while the Sunny Tripower is beeping!

The integrated electronic string fuse monitors the PV array. If it is installed incorrectly (e.g. reverse polarity) or there is a faulty string, the electronic string fuse short-circuits the PV array and the Sunny Tripower starts to beep.

- Do **NOT** pull out the DC plug connector as otherwise there is a risk of an electric arc.
- Do **NOT** pull out the Electronic Solar Switch as the entire reverse current will otherwise flow through the defective string and it could result in a fire.
- Proceed as described in section 11.1 "Sunny Tripower is beeping" (page 90).

NOTICE!

Destruction of the inverter due to overvoltage.

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

NOTICE!

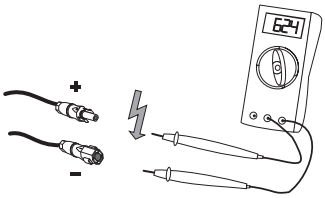
Excessive voltages can destroy the measuring device.

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

1. 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 input voltage of the inverter. Otherwise, check the plant design and the connection of the PV modules.

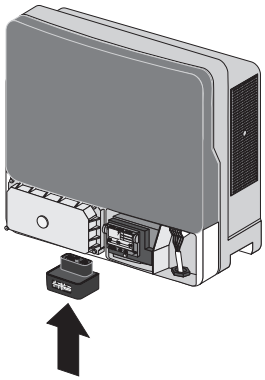
   At lower ambient temperatures, the maximum input voltage of the inverter can otherwise be exceeded.



2. Check the strings for ground faults, as described in section 11.2 "Checking the PV Array for a Ground Fault" (page 91).

3. Check the Electronic Solar Switch for wear, as described in section 9.2 . If it is in perfect condition, plug the Electronic Solar Switch in up to the stop.

   Only plug the Electronic Solar Switch during installation when the enclosure lid is open! This is necessary in order to activate the protective function of the electronic string fuse.



NOTICE!

Risk of fire in the PV array due to non-recognition of reverse currents.

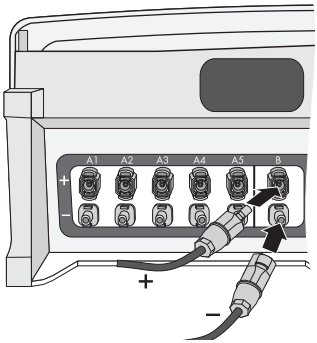
The integrated electronic string fuse monitors the PV array and protects it against dangerous reverse currents. In order to activate the electronic string fuse, you must observe the following during connection of the strings:

- If more than 2 strings are connected to the inverter, **ALWAYS FIRST connect the first string to input B**. If no string is connected at input B, the string fuse is not active.
- Each string must be clearly assigned to the correct string input. Do not cross-wire or combine the strings. See the graphic in section 6.4.1 "Conditions for the DC Connection" (page 32) for the correct assignment of the strings.

Use of external string collection boxes

When using string collection boxes, the functionality of the electronic string fuse may be limited.

4. If more than 2 strings are to be connected, check the first DC plug connector to ensure correct polarity and connect to input B.



5. After connecting the strings, pay attention to messages in the display and any acoustic signals!

   Only continue if the following conditions are fulfilled:

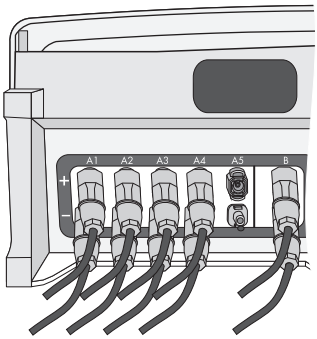
   – The green LED is glowing or flashing.
   – There is NO acoustic signal after 30 seconds.
   – NONE of the error messages 40, 64 or 82 are shown in the display.

   Otherwise follow the relevant instructions in the following table:

Event	Measure
The display is not showing anything after 30 seconds and the Sunny Tripower is not beeping although the DC input voltage is over 188 V.	There is a fault in the Sunny Tripower. • Contact the SMA Serviceline (see section 15 "Contact" (page 133)).
The Sunny Tripower starts beeping.	The Sunny Tripower short-circuits the PV array. • **On no account** disconnect the Electronic Solar Switch or the DC plug connectors. Wait until the Sunny Tripower stops beeping (in darkness). Pulling the DC plug connectors causes a danger of arcing, since the Sunny Tripower short-circuits the PV array in order to prevent reverse current through individual strings. Depending on the level of irradiation, this could cause high currents to flow. However, the PV array and the Sunny Tripower are in a safe state. • Before leaving the Sunny Tripower, install a contact barrier (e.g., a boundary fence) and moisture protection (e.g., tarpaulin). • Wait until dark before pulling out the Electronic Solar Switch and all DC plug connectors, and eliminate any errors (reversed poles or a defective string).
The display shows error message 40, 64 or 82.	• Follow the instructions on the display. You will find detailed information in section 10.2 "Error Messages" (page 81).

6. Follow the same procedure to connect all further strings.

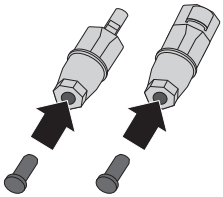
   It is no longer necessary to wait 30 seconds.

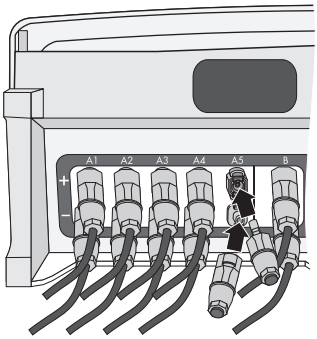


Number of Strings - Sunny Tripower 8000TL/10000TL/12000TL

The Sunny Tripower 8000TL/10000TL/12000TL only have 4 strings at input A!

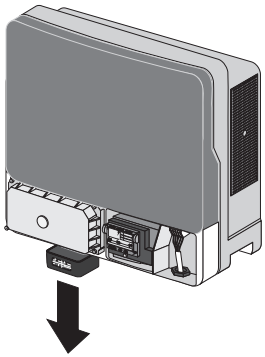
7. To create the sealing on the inverter, all the DC inputs that are not required have to be closed as follows:
   - Insert the sealing plugs provided into the DC plug connectors that are not required.
     Do **not** insert the sealing plus into the DC inputs on the inverter.
   - Insert the DC connectors with sealing plugs into the corresponding DC inputs on the inverter.





8. If the Sunny Tripower does not beep or display an error message, disconnect the Electronic Solar Switch.

   ☑ The display switches off.



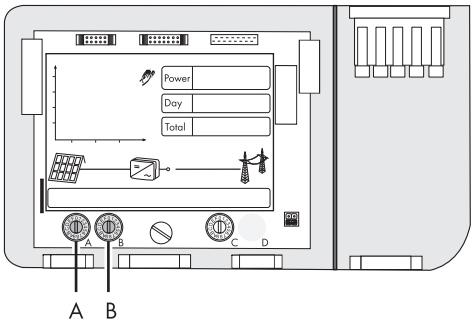
☑ You can now commission the inverter as described in section 7 "Commissioning" (page 61). The following connections and settings are optional.

6.5 Setting the Country Standard and Display Language

The inverter can be configured for various countries. This is carried out via the two rotary switches in the inverter before commissioning or via the configuration of the "CntrySet" or "Set country standard" parameters via a communication device (z. B. Sunny WebBox or Sunny Explorer) once you have commissioned the inverter.

The switch position 0/0 indicates the delivered state. If you have ordered the inverter with specific country settings, these will have already been preset in the factory via a communication device. In this case, you will not be able to recognize the setting by the switch position. If changes are made via the rotary switches or via a communication device, the default grid parameters are overwritten. They cannot be restored, and must be re-entered via a communication device. The display language can be changed at any time using the rotary switches, independently of the grid parameters. This means that the factory set grid parameters remain unchanged, but the display messages are shown in the set language. For devices ordered without any specified country of installation, the standard setting is "VDE0126-1-1" and the language is German.

Changes will be accepted immediately after switching the miniature circuit-breaker on. If an unprogrammed switch setting is selected, the inverter issues an error message on the display and the last valid setting is retained.



SMA Grid Guard Protected Country Data Sets

In some countries, the local grid connection requirements demand a mechanism which prevents the parameters for the grid feed-in from being changed. Some country data sets are therefore protected and can only be unlocked with a personal access code, the SMA Grid Guard code.

SMA Grid Guard protected country data sets are automatically blocked for 10 feed-in hours after commissioning, or after the last alteration. If the country data set is changed after these 10 feed-in hours, the inverter will not accept the changes and displays the error message "Grid parameter locked". If, however, a later change to the country data set only relates to a change of the display language via the rotary switches in the inverter, this change is immediately taken on.

It is also possible to set country data sets (parameter "CntrySet" and/or "Set country standard"), and to lock or unlock these manually via a communication device. To block a data set, enter the digit sequence "54321" instead of the password into the SMA Grid Guard Code field. The data set can only be unlocked by entering a personal, 10-digit SMA Grid Guard code which is valid for a maximum of 10 feed-in hours. The application form for the personal access code is available at www.SMA.de/en, in the "Certificate" category of the respective inverter. The language can be configured without a password, regardless of the country data set.

Changing parameters in SMA Grid Guard protected country data sets

If the parameters within protected country data sets are changed, these are no longer protected and instead of the standard, "ADJ" or "Special setting" is displayed. In this case the parameters are not changed automatically after 10 feed-in hours, but have to be manually locked. To manually lock the parameters, set the SMA Grid Guard Code to "54321".

Further information on parameter settings

You will find information on making adjustments and changing parameters in the corresponding user manual for your software.

The last change (executed via switch or communication device) is always verified and activated if applicable. Consequently, the switch position may not necessarily show the actual country configuration.

6.5.1 Checking the Country Standard

Check whether the inverter is set to the installation country.

Before commissioning:

- Check that the country setting of the inverter is correct using the supplement provided and comparing this to the factory settings of the inverter.

After commissioning:

- Check that the country standard is correct using the display message during (re-)commissioning (see section 7 "Commissioning" (page 61)),

  or

- Check that the country standard is correct using the "SMA Grid Guard" measuring channel via a communication device.

Display language

Once you have set the country standard, you can always set the display language later using rotary switch B. However, you have to then set rotary switch A to "0" in order to keep the country data set.

The settings of each country data set are specified in the operation parameters. The parameters can be read out using a communication device. The description of the operating parameters is available at www.SMA.de/en in the category "Technical Description" of the respective inverter.

Communication protocol DATA I and DATA II+

Depending on the type of communication (RS485 or *Bluetooth*), the inverter uses a different communication protocol and the parameters are displayed differently.

- Communication via RS485: DATA I
- Communication via *Bluetooth* and Sunny Explorer: DATA II+

(A)	(B)	Country data set (DATA I/DATA II+)	Display language	Grid Guard protection	Country
0	0	Delivery state	Delivery state	Dependent on parameter set	Dependent on parameter set
0	1	Retained	English	Dependent on parameter set	Dependent on parameter set
0	2	Retained	German	Dependent on parameter set	Dependent on parameter set
0	3	Retained	French	Dependent on parameter set	Dependent on parameter set
0	4	Retained	Spanish	Dependent on parameter set	Dependent on parameter set
0	5	Retained	Italian	Dependent on parameter set	Dependent on parameter set

(A)	(B)	Country data set (DATA I/DATA II+)	Display language	Grid Guard protection	Country
0	6	Retained	Unallocated***	Dependent on parameter set	Dependent on parameter set
0	7	Retained	Unallocated***	Dependent on parameter set	Dependent on parameter set
1	2	VDE-AR-N4105**	German	yes	Germany
1	4	VDE-AR-N4105-MP**	German	yes	Germany
1	6	VDE-AR-N4105-HP**	German	yes	Germany
1	0	VDE0126-1-1	German	yes	Germany, Switzerland
1	8	VDE0126-1-1	French	yes	Switzerland, France
1	9	VDE0126-1-1 B[a)] *	French	yes	France
2	0	VDE0126-1-1	Italian	yes	Switzerland
2	8	AS4777.3*	English	no	Australia
3	0	Enel-GUIDA*	Italian	no	Italy
3	8	Enel-GUIDA*	German	no	Italy
4	0	RD1663-A*	Spanish	yes	Spain
4	1	RD1663/661*	Spanish	yes	Spain
4	8	PPC*	Unallocated***	no	Greece
4	9	PPC*	English	no	Greece
5	1	KEMCO 501_2008**	English	no	South Korea
5	8	G83*	English	no	England
6	0	EN50438*	German	yes	Various EU countries
6	1	EN50438*	English	yes	
6	2	EN50438*	French	yes	
6	3	EN50438*	Italian	yes	
6	4	EN50438*	Spanish	yes	
6	5	EN50438*	Unallocated***	yes	
6	6	EN50438*	Unallocated***	yes	
7	4	PPDS*	Unallocated***	yes	Czech Republic
7	5	PPDS*	English	yes	Czech Republic
7	6	PPDS*	German	yes	Czech Republic
7	8	C10/11*	French	yes	Belgium
7	9	C10/11*	English	yes	Belgium

(A)	(B)	Country data set (DATA I/DATA II+)	Display language	Grid Guard protection	Country
7	A	C10/11*	German	yes	Belgium
A	0	MVtg-Directive/Medium-Voltage Directive*	German	yes	Germany
A	1	MVtg-Directive/Medium-Voltage Directive*	English	yes	Flexible
A	2	MVtg-Directive/Medium-Voltage Directive*	French	yes	France
A	3	MVtg-Directive/Medium-Voltage Directive*	Spanish	yes	Spain
A	4	MVtg-Directive/Medium-Voltage Directive*	Unallocated***	yes	Czech Republic
A	8	CN/CGC/GF001:2009**	English	no	China
A	C	SI 4777	English	yes	Israel
B	0	MVtg-Directive int/ MVtgDirective Internal*	German	yes	Germany
B	1	MVtg-Directive int/ MVtgDirective Internal*	English	yes	Flexible
B	2	MVtg-Directive int/ MVtgDirective Internal*	French	yes	France
B	3	MVtg-Directive int/ MVtgDirective Internal*	Spanish	yes	Spain
B	4	MVtg-Directive int/ MVtgDirective Internal*	Unallocated***	yes	Czech Republic
C	0	Customer	English	no	Flexible
C	1	Customer	German	no	Flexible
C	2	Customer	French	no	Flexible
C	3	Customer	Spanish	no	Flexible
C	4	Customer	Italian	no	Flexible
C	5	Customer	Unallocated***	no	Flexible
C	6	Customer	Unallocated***	no	Flexible
D	0	Off-Grid60/ Island mode 60Hz*	English	no	Flexible
D	1	Off-Grid60/ Island mode 60Hz*	German	no	Flexible
D	2	Off-Grid60/ Island mode 60Hz*	French	no	Flexible

(A)	(B)	Country data set (DATA I/DATA II+)	Display language	Grid Guard protection	Country
D	3	Off-Grid60/ Island mode 60Hz*	Spanish	no	Flexible
D	4	Off-Grid60/ Island mode 60Hz*	Italian	no	Flexible
D	5	Off-Grid60/ Island mode 60Hz*	Unallocated***	no	Flexible
D	6	Off-Grid60/ Island mode 60Hz*	Unallocated***	no	Flexible
E	0	Off-Grid50/ Island mode 50Hz*	English	no	Flexible
E	1	Off-Grid50/ Island mode 50Hz*	German	no	Flexible
E	2	Off-Grid50/ Island mode 50Hz*	French	no	Flexible
E	3	Off-Grid50/ Island mode 50Hz*	Spanish	no	Flexible
E	4	Off-Grid50/ Island mode 50Hz*	Italian	no	Flexible
E	5	Off-Grid50/ Island mode 50Hz*	Unallocated***	no	Flexible
E	6	Off-Grid50/ Island mode 50Hz*	Unallocated***	no	Flexible
F	0	SD-Card	SD-Card	no	Flexible

a) Special setting: *Bluetooth* transmission power reduced (in accordance with French standards)

* Applies to Sunny Tripower 10000TL/12000TL/15000TL/17000TL, is planned for Sunny Tripower 8000TL

** In planning

*** Currently unallocated. The previously configured display language remains set.

If the inverter is not set to the installation country, there are several ways of configuring the required country standard:

- Setting via the 2 rotary switches, as described in section 6.5.3 "Setting the Country Standard and Language using Rotary Switches" (page 51).
- Alternatively you can conduct the settings via the "CntrySet" or "Set country standard" parameters with a communication device once you have commissioned the inverter.
- If you require adjusted parameter settings for your installation location, you can change these with the help of a communication device.

6.5.2 Extension of the Deactivation Limits

The deactivation criteria (voltage, frequency) are specified via country parameters.

Sunny Tripower inverters have the additional country data set "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 plant or the inverter is operated with external three-phase decoupling protection, which will automatically disconnect the inverter from the 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.

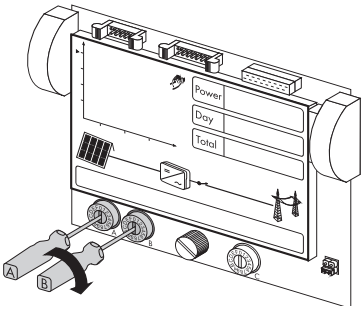
At country setting "MVtgDirective", the inverter may only be operated with an external three-phase decoupling protection device which complies with the country-specific requirements.

Without such external decoupling protection, the inverter will not disconnect from the grid when the standard requirement is exceeded.

- Install external three-phase decoupling protection.

6.5.3 Setting the Country Standard and Language using Rotary Switches

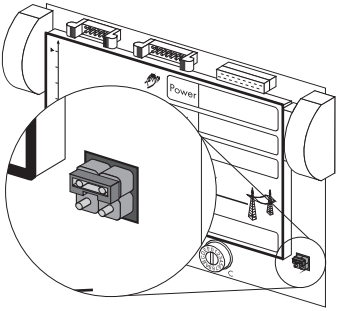
1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70).
2. Set the arrows on both rotary switches (A and B) using a screwdriver to the desired positions (see table in section 6.5.1 "Checking the Country Standard" (page 46)). For this purpose, use a screwdriver with a blade width of 2.5 mm.



Jumper for English

You can also set the language to English by means of a jumper (e.g. for service purposes).

- To do so, plug the jumper onto the upper two pins as shown on the right.



3. Re-commission the inverter as described in section 7 "Commissioning" (page 61).

6.6 Communication

6.6.1 Bluetooth

Communication via *Bluetooth* with a communication device is activated as standard. Networking via *Bluetooth* with other inverters is deactivated ex works.

The following setting options are possible via a rotary switch.

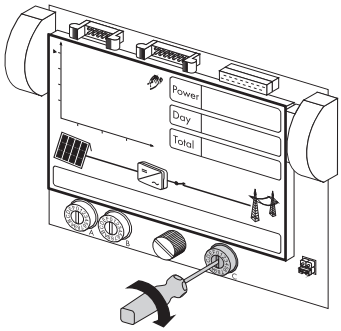
Switch position (NetID)	Setting
0	Off
1	Communication via *Bluetooth* with communication device possible, no networking with other inverters (factory setting)
2 ... F	Networking with other inverters

In order to restrict communication via *Bluetooth* between the inverters of your system and those of neighboring systems, you can assign an individual NetID to the inverters of your system (switch position 2 ... F). However, this is only necessary if neighboring systems are within a radius of 500 m.

So that all inverters in your system are detected by your communication device, all inverters must have the same NetID.

To do this, proceed as follows:

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70).
2. Set the arrow on the rotary switch (C) to the required position using a screwdriver. For this purpose, use a screwdriver with a blade width of 2.5 mm.



3. Re-commission the inverter as described in section 7 "Commissioning" (page 61).

Acceptance of settings

The *Bluetooth* settings will only be activated after the miniature circuit-breaker has been switched on, the PV array has been connected and the Electronic Solar Switch plugged in.

6.6.2 Multi-function Relay

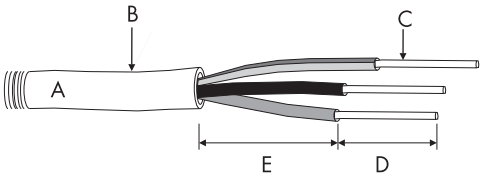
The inverter is equipped with a multi-function relay as standard. This can be activated, for instance, simultaneously with the red error LED beside the display. Other functions are being planned and can be retrofitted later via a firmware update.

Here you can connect separate loads both in the event of errors and for trouble-free operation.

The following table contains the maximum permissible voltages and currents:

	Voltage	Current
AC	maximum 240 V	maximum 1.0 A
DC	maximum 30 V	maximum 1.0 A

Cable requirements



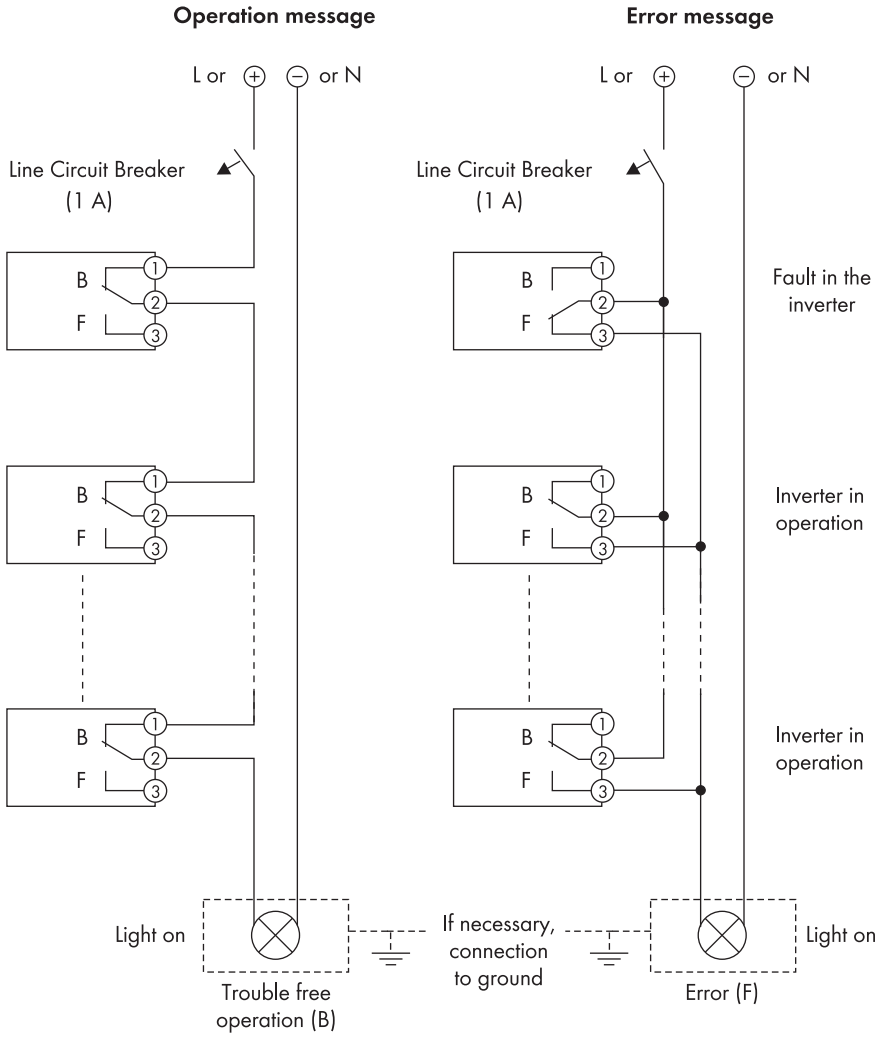
Position	Description	Value
A	Cable type	Double insulated
B	External diameter	5 mm ... 12 mm
C	Conductor cross-sectional area	0.08 mm² ... 2.5 mm²
D	Stripped insulation	maximum 8 mm
E	Stripping length	maximum 15 mm

The cable type and cable-laying method must be appropriate to the application and location.

Miniature circuit-breaker

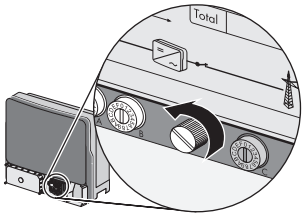
If you connect the multifunction relay to the power distribution grid, you must fuse this with an individual miniature circuit-breaker.

Connection plan

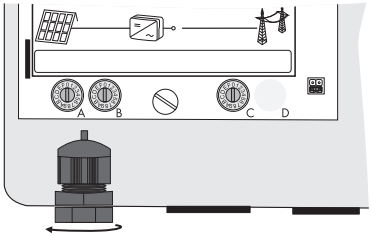


Connection Procedure

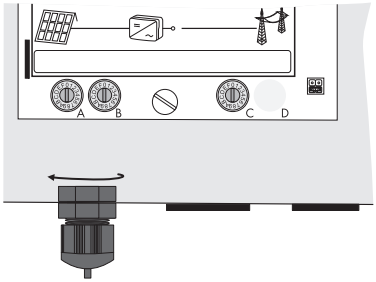
1. Switch off AC and DC supply voltage.
2. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70).
3. Loosen the screw of the display and flip the display up until it clicks into place.



4. Unscrew the outer counter nut and remove the cable gland from the cable entry.



5. Reinsert the cable gland from the outside and tighten it with the counter nut from the inside.

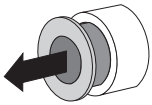


6. Loosen the hexagon cap nut of the screw connection a little and remove the filler-plug from the cable entry.

7. Insert the cable into the inverter.

Seal in screw connection

There is a two-part seal in the screw connection. If necessary, the inner seal can be removed to insert a thicker cable.



The following guideline values apply:

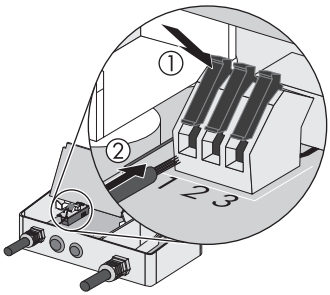
- Cable diameter with both seals: 5 mm ... 8 mm
- Cable diameter only with the outer seal: 8 mm ... 13 mm

DANGER!

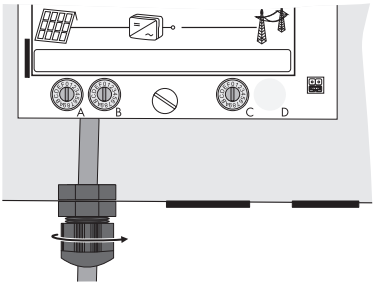
Danger to life due to high voltages in the inverter

- Do not use cables with single-layer insulation.
- Strip cable to a maximum length of 15 mm.

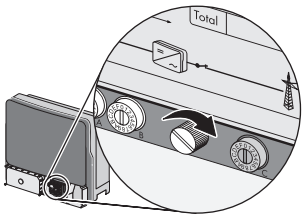
8. Strip max. 8 mm off the insulated conductors.
9. Press the terminals backwards and connect the conductors as shown in the connection plan on page 54 (depending on whether an operational or error message is desired).



10. Re-screw the hexagon cap nut of the screw connection tightly onto the cable entry.



11. Fold down the display and tighten the screw.



12. Re-commission the inverter as described in section 7 "Commissioning" (page 61).
13. Switch on the supply voltage.

☑ The multi-function relay is now operational.

6.6.3 Communication module

The inverter can be equipped with a RS485 communication module in order to engage in wire-linked communication with special data acquisition devices (e.g. Sunny WebBox) or a PC with corresponding software (e.g. Sunny Data Control).

A detailed circuit diagram and installation description can be found in the communication module manual.

6.7 Retrofitting a Surge Arrester Type II

The inverter can be equipped ex works with surge arresters, or they can be retrofitted at a later time. The order number for both retrofit kits (1 only for input A, 1 for input A and B) can be found in section 14 "Accessories" (page 132).

To carry out retrofitting, proceed as follows:

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70).

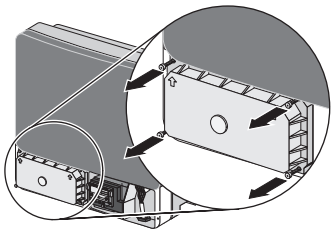
DANGER!

Danger to life due to high voltages in the inverter Death due to electric shock

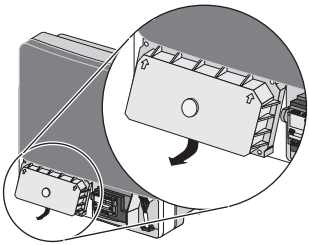
There is residual voltage in the inverter. The inverter needs 10 minutes to electrically discharge.

- Wait 10 minutes before you open the upper enclosure lid or the DC lid.

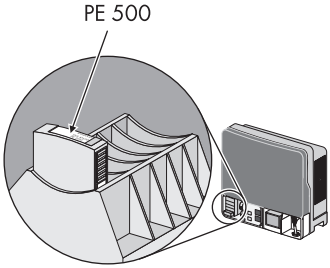
2. Unscrew the captive screws of the DC lid on the left-hand side of the connection area.



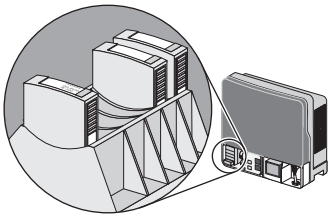
3. Lift the DC lid upwards and remove it.



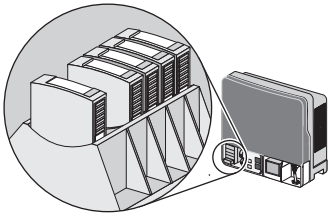
4. Plug all surge arresters into the slots provided until they lock into place with the side latches.
   - The surge arrester marked "PE 500" must be mounted in the lowermost slot.



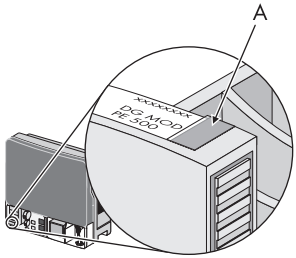
   - If surge arresters are only required for input A, the two surge arresters must be mounted in the two upper slots.



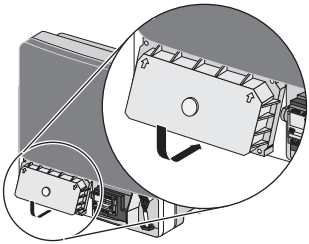
   - If input B is also to be fused, surge arresters must be plugged into all slots.



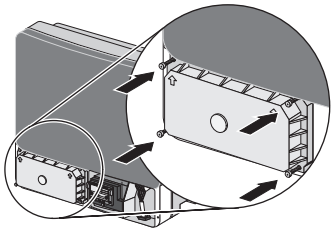
   - The green strip in the window (A) signals perfect operating condition. A red strip in the window indicates that the surge arrester is faulty. A warning also appears in the display with the event number "83".



5. Attach the DC lid so that it is at an angle. In the process, the captive screws must protrude.



6. Pre-screw all 4 screws of the DC lid and then tighten them (torque: 3.5 Nm).

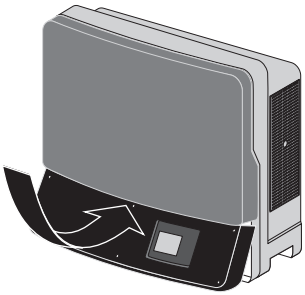


☑ The surge arresters are now installed and the inverter can be re-commissioned, as described in section 7 "Commissioning" (page 61).

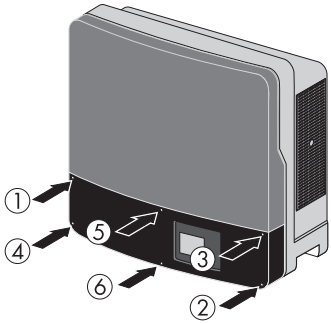
7 Commissioning

7.1 Commissioning the Inverter

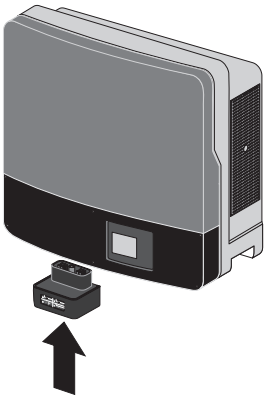
1. Check that the device is fixed securely to the wall.
   (see section 5 "Mounting" (page 19))
2. Check that the country configuration is correct.
   (see section 6.5 "Setting the Country Standard and Display Language" (page 44))
3. Check that the AC grid cable is connected correctly.
   (see Section 6.3 "Connecting the Power Distribution Grid (AC)" (page 27))
4. Check that the DC cables (PV strings) are connected correctly (see section 6.4 "Connecting the PV Array (DC)" (page 32)).
5. Close unnecessary DC inputs with the accompanying DC plug connectors and sealing plugs.
   (see section 6.4.4 "Connecting the PV Array (DC)" (page 38))
6. Close all enclosure entries.
7. Dock the lower enclosure lid at an angle and attach. In the process, the captive screws must protrude.



8. Pre-screw all 6 screws and then tighten them in the sequence shown on the right (torque: 2.0 Nm).



9. Securely plug the Electronic Solar Switch in up to the stop.



10. Switch on the miniature circuit-breaker.
11. If connected, switch on the multi-function relay power supply.

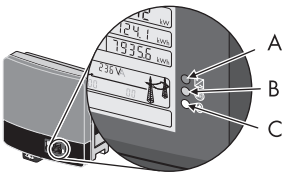
Self-test in accordance with ENEL guideline during initial commissioning (only for Italy)

The Italian 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.

If you have configured the Enel-GUIDA country data set, start the self-test as described in section 7.3 "Self-test in accordance with ENEL guideline (only for Italy)" (page 64). The test takes approx. 3 minutes.

12. Check whether the display and LEDs are indicating a normal operating state.

LED	Color	Meaning
A	Green	Glowing: operation
		Flashing: waiting for sufficient irradiation
B	Red	Fault
C	Blue	*Bluetooth* communication is active



☑ If the inverter has been commissioned successfully, the green LED should be glowing or flashing, provided there is sufficient solar irradiation.

The meaning of a glowing red LED and the meaning of the event numbers on the display are described in section 10.2 "Error Messages" (page 81).

7.2 Display Messages during the Start Phase

Illustrated display messages

The display messages illustrated in this section serve as examples and can, depending on the country setting, differ from the display messages of your inverter.

- Firstly, the firmware version of the internal processors appears in the text lines.

- After an interval of 5 seconds, or after tapping on the enclosure lid, the serial number (or the description of the inverter) and the NET ID for communication via *Bluetooth* will appear. The description of the inverter can be changed with a communication device.

- After a further 5 seconds, or when you tap again, the configured standard is displayed (example: "VDE0126-1-1").

- After a further 5 seconds, or when you tap again, the configured language is displayed (example: "Language German").

- During normal operation, the text line of the display will subsequently be clear. See section 10 "Messages" (page 80) for possible event messages which may be displayed in the text line, and their meaning.

7.3 Self-test in accordance with ENEL guideline (only for Italy)

7.3.1 Starting the Self-Test by Tapping

You can start the self-test by tapping on the enclosure lid. The country configuration of the inverter must be set to Italy (Enel-GUIDA) or a reconfigured based on the Enel-GUIDA country data set before the self-test can be carried out. In addition, an undisturbed feed-in operation must be possible.

Display language during the self-test

Independent of the configured language, the display messages for the self-test will always be displayed in Italian.

Proceed as follows for checking the disconnection times:

1. Commission the inverter as described in section 7 "Commissioning" (page 61).

   ☑ The inverter is now in the start phase.

   - Firstly, the firmware version of the internal processors appears in the text lines.
   - After 5 seconds or after tapping the enclosure lid, the serial number or the description of the inverter appears. The description of the inverter can be changed with a communication device.
   - After a further 5 seconds, or when you tap again, the configured standard is displayed.

2. In order to start the self-test, tap the enclosure lid **within 10 seconds**.

   ☑ The message shown on the right appears in the display.

3. Now activate the self-test **within 20 seconds** by tapping on the enclosure lid again.

☑ 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 7.3.2 "Test Sequence" (page 65). When the inverter has carried out the 4 tests, it switches to normal operation. The original calibration values are reset.

7.3.2 Test Sequence

Note the values which are displayed during the test sequence. These values must be entered into a test report. The test results of the individual tests are displayed three times one after the other.

Actual values in the display

During the self-test the actual voltage, the feed-in current and the frequency is displayed above the text rows independent of the test values.

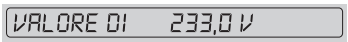
Overvoltage Test

The inverter starts the overvoltage test and shows the adjacent display message for 5 seconds.

During the test sequence, the voltage limit applied is shown in the display of the inverter. The voltage limit is reduced successively until the shut-down threshold is reached and the inverter disconnects from the grid.

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1. 

2. 

- Calibration value,

1. 

2. 

- Reaction time.

1. 

2. 

The change between the first and second display takes places every 2.5 seconds.

Undervoltage Test

The undervoltage test follows the overvoltage test and the inverter issues the adjacent display message for 5 seconds.

During the test sequence, the voltage limit applied is shown in the display of the inverter. The voltage limit is increased successively until the shutdown threshold is reached and the inverter disconnects from the grid.

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1. 

2. 

- Calibration value,

1. 

2. 

- Reaction time.

1. 

2. 

The change between the first and second display takes places every 2.5 seconds.

Maximum Frequency

The maximum frequency test follows the undervoltage test and the inverter issues the adjacent display message for 5 seconds.

During the test sequence, the frequency limit applied is shown in the display of the inverter. The frequency limit is reduced successively until the shutdown threshold is reached and the inverter disconnects from the grid.

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1. 

2. 

- Calibration value,

1. 

2. 

- Reaction time.

1. 

2. 

The change between the first and second display takes places every 2.5 seconds.

Minimum Frequency

After the maximum frequency test, the minimum frequency test takes place and the inverter shows the adjacent display message for 5 seconds.

During the test sequence, the frequency limit applied is shown in the display of the inverter. The frequency limit is increased successively until the shutdown threshold is reached and the inverter disconnects from the grid.

Once the inverter has disconnected from the grid, the display successively shows the following values, each for 10 seconds:

- Disconnection value,

1. 

2. 

- Calibration value,

1. 

2. 

- Reaction time.

1. 

2. 

The change between the first and second display takes places every 2.5 seconds.

7.3.3 Abortion of the Self-Test

If, during the self-test, an unexpected disconnection requirement occurs, the self-test is aborted. The same applies if the DC voltage is so low that the feed-in cannot be continued.

- The inverter then shows the adjacent display message for 10 seconds.

- Restart the self-test as described in the following section 7.3.4 "Restarting the Self-Test" (page 69).

7.3.4 Restarting the Self-Test

In order to restart the self-test, proceed as follows:

1. Disconnect the miniature circuit-breaker from all 3 phases and secure against re-connection.
2. If it is connected, disconnect the multi-function relay power supply.
3. Disconnect the Electronic Solar Switch from the inverter for 5 minutes and then re-connect firmly up to the stop.

☑ The inverter is now in the start phase and you can restart the self-test, as described in section 7.3.1 "Starting the Self-Test by Tapping" (page 64) from step 3.

7.4 Activating the Intelligent String Failure Detection

The intelligent string failure detection process is deactivated on delivery. You can activate the string failure detection by setting a parameter via communication (e.g. Sunny WebBox or Sunny Explorer). You need the installer password for this.

Communication protocol DATA I and DATA II+

Depending on the type of communication (RS485 or *Bluetooth*), the inverter uses a different communication protocol and the parameters are displayed differently.

- Communication via RS485: DATA I
- Communication via *Bluetooth* and Sunny Explorer: DATA II+

Activating or deactivating the string failure detection

Parameter (DATA I/DATA II+)	Setting (DATA I/DATA II+)	Description
Op.PvProMod/ Operating mode of string failure detection	Run/Switched on	String failure detection for both inputs activated.
	Stop/Stop	String failure detection for both inputs deactivated.

Resetting operating data for string failure detection

Parameter (DATA I /DATA II+)	Description
Op.PvValRsIstl/Reset operating data for string failure detection	Restart the teaching phase Operating data for string failure detection will be reset.

8 Disconnecting the Inverter

8.1 Safety

DANGER!

Danger to life due to high voltages in the inverter Death due to electric shock.

The inverter operates at high voltages and must be disconnected prior to carrying out work on the device. Furthermore, if the DC plug connectors are pulled out without first unplugging the Electronic Solar Switch, a dangerous electric arc can occur.

- Disconnect the inverter as described in the following section.

CAUTION!

Risk of burning due to hot DC lid.

During operation, the DC lid on the left-hand side of the connection area can get hot.

- Take care not to touch the DC lid when working in the connection area.

NOTICE!

Electrostatic discharges can damage the inverter

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

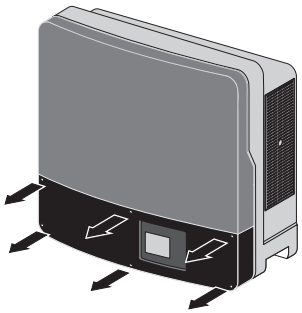
- Ground yourself before touching a component part.

8.2 Procedure

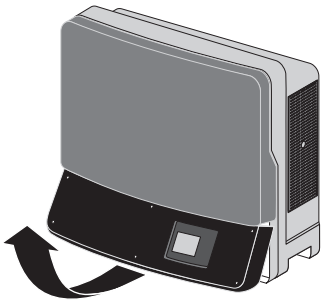
1. Disconnect the miniature circuit-breaker from all 3 phases and secure against re-connection.
2. If it is connected, switch off the power supply to the multifunction relay and ensure that the device cannot be unintentionally or accidentally reconnected during technical and maintenance work.
3. Check the status of the Sunny Tripower:

Event	Measure
The **Sunny Tripower is beeping** or there is an error message on the display prohibiting disconnection of the Electronic Solar Switch.	• Wait until the Sunny Tripower stops beeping (after dark) and only then disconnect the Electronic Solar Switch and the DC plug connectors. • Eliminate the fault (see section 11.1 "Sunny Tripower is beeping" (page 90) or section 10.2 "Error Messages" (page 81)).
The **Sunny Tripower is not beeping** and there is no message on the display.	• Remove the Electronic Solar Switch. • Proceed to step 4.

4. Wait until the LEDs, display and, if applicable, fault indicator have gone out.
5. Loosen all six captive lid screws.

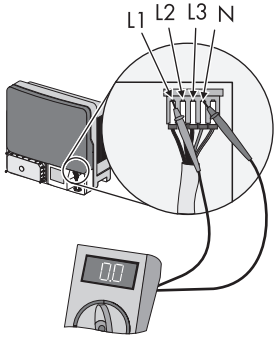


6. Lift and remove the enclosure lid from below.



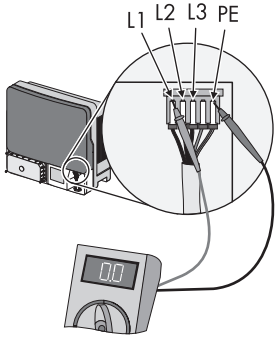
7. Verify the absence of voltage L1, L2 and L3 with respect to N at the AC terminal with an appropriate meter. The test probe may have a diameter of maximum 2 mm.

   ☑ If voltage is present, check the installation.



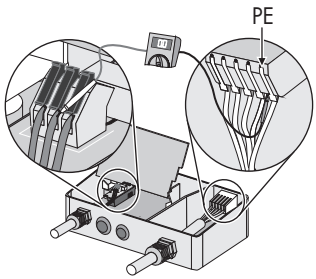
8. Verify the absence of voltage L1, L2 and L3 with respect to the protective conductor at the AC terminal.

   ☑ If voltage is present, check the installation.

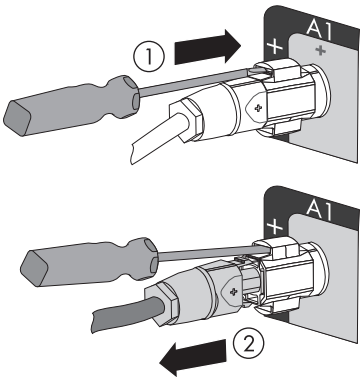


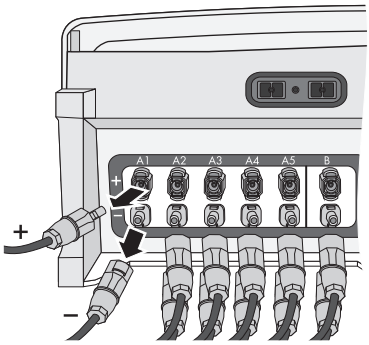
9. Verify the absence of voltage of the multi-function relay with respect to the protective conductor at all terminals.

   ☑ If voltage is present, check the installation.



10. With the help of a screwdriver unlock and remove all DC plug connectors in order to completely disconnect the PV array from the inverter. For this purpose, use a screwdriver with a blade width of 3.5 mm.





The Sunny Tripower 8000TL/10000TL/12000TL only have 4 strings at input A!

DANGER!

Danger to life due to high voltages in the inverter Death due to electric shock.

There is residual voltage in the inverter. The inverter needs 10 minutes to electrically discharge.

- Wait 10 minutes before you open the upper enclosure lid or the DC lid.

☑ The inverter is now free of voltage and work can be carried out.

9 Maintenance and Cleaning

9.1 Checking Heat Dissipation

If the inverter regularly reduces its output due to excessive heat (temperature symbol on the display illuminates), this may be due to one of the following reasons:

- The ventilation grids on the sides are clogged with dirt.

  Clean the ventilation grids as described in the following.

- One of the fans is clogged.

  The inverter has 2 integrated fans for cooling. One of these is located on the underside of the inverter at the connection area and the other on the left-hand side of the enclosure under the ventilation grid.

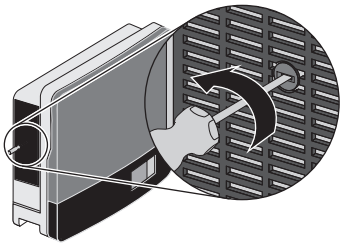
  If the fan enclosure is just covered in loose dust you can clean it with a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, you can dismantle the fan for cleaning, as described in the following sections.

9.1.1 Cleaning the Ventilation Grids

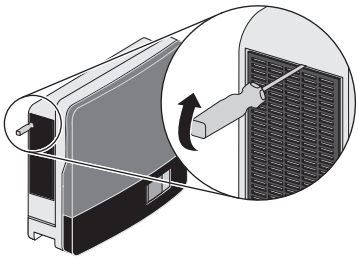
The inverter takes cooling air in from underneath and the left side and blows it out again above through the ventilation grids. Clean the ventilation grids if they are dirty.

Procedure

1. Turn the rotary fastener of the ventilation grid in the direction of the arrow until the notch is in a vertical position.

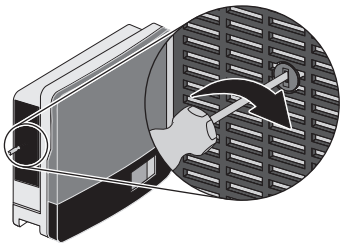


2. Remove the ventilation grid.



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

5. Turn the notch of the rotary fastener 90° once again until it lies horizontally.



NOTICE!

The inverter can be damaged if insects enter.

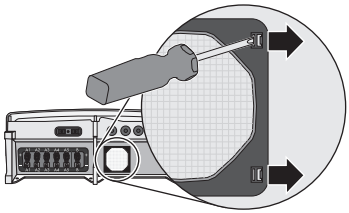
- The ventilation grids must not be removed permanently, because otherwise the device is not protected against the entrance of insects.

9.1.2 Cleaning the Fan on the Underside of the Inverter

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70).
2. Wait for the fan to stop rotating.

Cleaning the ventilation grid

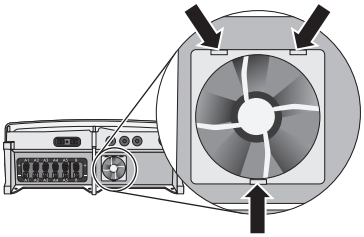
3. Remove the ventilation grid:
   - Press both latches on the right of the fan screen to the right using a screwdriver and loosen from the bracket.
   - Carefully remove the ventilation grid.



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

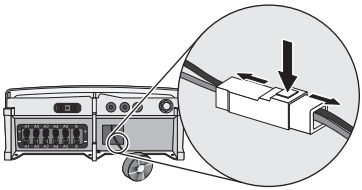
Cleaning the fan

5. Press the latches together to the middle.
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 fan far enough out to disconnect the internal plug connector in the inverter.



8. Remove the fan and clean with a soft brush, a paint brush or a cloth and water.

NOTICE!

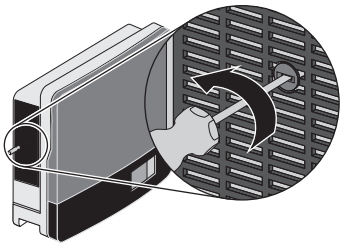
Damage to the fan through the use of compressed air.

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

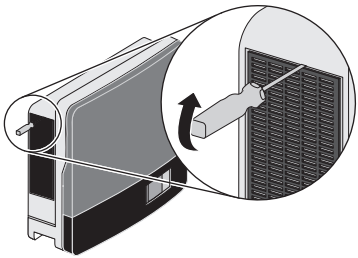
9. After cleaning, reassemble everything in reverse order.
10. Check the functioning of the fan as described in section 9.1.4 "Testing the Fans" (page 78).

9.1.3 Cleaning the Fan on the Left-Hand Side of the Inverter

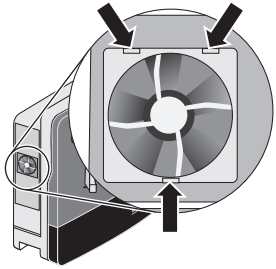
1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70).
2. Turn the rotary fastener of the ventilation grid in the direction of the arrow until the notch is in a vertical position.



3. Remove the ventilation grid.

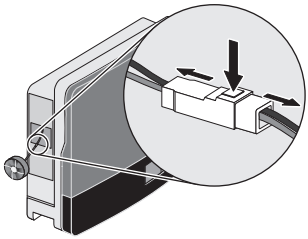


4. Wait for the fan to stop rotating.
5. Press the latches together to the middle.



6. Remove the fan by pulling it slowly and carefully to the side.
7. Unlock and remove the plug.

   The fan cables are long enough that you can lift the fan far enough out to disconnect the internal plug connector in the inverter.



8. Remove the fan and clean with a soft brush, a paint brush or a cloth and water.

NOTICE!

Damage to the fan through the use of compressed air.

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

9. After cleaning, reassemble everything in reverse order.
10. Check the function of the fans as described in section 9.1.4 "Testing the Fans" (page 78).

9.1.4 Testing the Fans

Testing the fans

To test the fans you will need a special data capture device (e.g. Sunny WebBox) or a PC with appropriate software (e.g. Sunny Explorer) in order to be able to change the parameters of the inverter.

You will also need the installer password to access the installer mode.

1. Enter the installer password.
2. Set the parameters "CoolSys.FanTst" and/or "Fan test" to "On" in the installer mode.
3. Check the air flow in both fans.

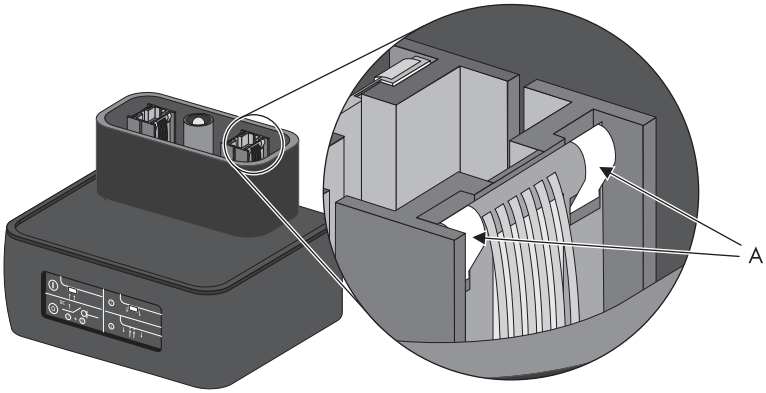
   The inverter takes cooling air in from underneath and the left side and blows it out again above through the ventilation grids. Listen for any unusual noise, which could indicate incorrect installation or that the fans are faulty.
4. After the test, set the parameter "CoolSys.FanTst" and/or "Fan test" back to the "Off" position.

☑ The test of the fans has been completed.

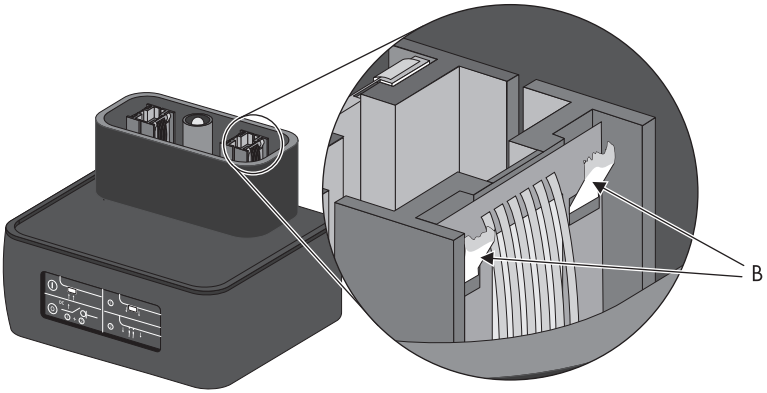
9.2 Checking the Electronic Solar Switch (ESS) for Wear

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

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



If the metal tongues show a brown discoloration or are completely burned out (B), the Electronic Solar Switch can no longer reliably disconnect the DC side.



You must replace the handle of the Electronic Solar Switch before you can re-commission the inverter. Replacements for damaged Electronic Solar Switch handles are available from your dealer (see section 14 "Accessories" (page 132)).

10 Messages

No display messages if no DC voltage present

Measurements and the issuing of messages are only possible when there is sufficient DC voltage (green LED flashes or glows).

10.1 Event Messages

During an update, the relevant display message is shown in the text line of the display.

Display	Description
< Avvio Autotest >	Only relevant for an installation in Italy: tapping on the display starts the self-test in accordance with ENEL-Guida (see section 7.3 "Self-test in accordance with ENEL guideline (only for Italy)" (page 64)).
< Inst.code valid >	The SMA Grid Guard code entered is valid. The configured country data set is now unblocked and can be changed. If the configured country data set is protected, the unlocking is valid for a maximum of 10 feed-in hours.
< No new update SDcard >	There is no update file relevant for the Sunny Tripower on the SD card or the available update has already been installed.
< Grid param.unchanged >	The selected switch setting is not programmed or there is no country data set available on the SD card.
< Parameters set successfully >	All parameters of the SD card, e.g. country data set, have been successfully accepted.
< SD card is read >	The inverter is currently reading the SD card.
< Set parameter >	The inverter sets the parameters of the SD card.
< Update completed >	The inverter has successfully completed the update.
< Update *Bluetooth* >	Successful update of the *Bluetooth* components.
< Update display >	Successful update of display.
< Update main CPU >	Successful update of inverter component.
< Update communication >	Successful update of communication component.
< Update string prot. >	Successful update of electronic string fuse.
< Update RS485i module >	Successful update of communication interface.
< Upd. language table >	Successful update of language table.
< Update file OK >	The update file found is valid.

10.2 Error Messages

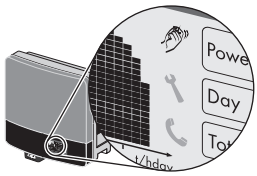
In the event of an error the relevant display message is shown in the text line of the display. Above the text line the event numbers of the displayed error messages appear. By tapping on the enclosure lid, multi-line messages can be switched further.

If the error exists over a long period of time, the red LED begins to glow and the multi-function relay is activated.

In addition, depending on the severity of the fault the "wrench" or "telephone receiver" symbol on the display will light up.

- Wrench: signifies a failure which can be remedied on site (see table below).
- Telephone receiver: signifies device failure

  Contact the SMA Serviceline.



Event no.	Cause	Corrective measures
1	< Grid fault > The grid voltage has exceeded the permissible range. This error can have the following causes: • The grid voltage at the connection point of the inverter is too high. • Grid impedance at the connection point of the inverter is too high. For safety reasons, the inverter disconnects itself from the grid.	• Check the grid voltage and connection on the inverter. If the grid voltage lies outside the tolerance range because of local grid conditions, ask the network operator if the voltage can be adjusted at the feeding point or if it would agree to changes in the values of the monitored operational limits. If the grid voltage lies within the tolerance range, yet this error is still being displayed, contact the SMA Serviceline.
2	< Grid fault > The grid voltage has fallen below the permissible range. This error can have the following causes: • Grid disconnected • AC cable damaged • The grid voltage at the point of connection of the inverter is too low. For safety reasons, the inverter disconnects itself from the grid.	• Check the triggering of the line circuit breaker. • Check the grid current and the grid connection on the inverter. If the grid voltage lies outside the tolerance range because of local grid conditions, ask the network operator if the voltage can be adjusted at the feeding point or if it would agree to changes in the values of the monitored operational limits. If the grid voltage lies within the tolerance range, yet this error is still being displayed, contact the SMA Serviceline.

Event no.	Cause	Corrective measures
3	< Grid fault > The average grid voltage over 10 minutes is no longer within the permissible range. This can have the following causes: • The grid voltage at the connection point of the inverter is too high. • Grid impedance at the connection point of the inverter is too high. The inverter disconnects to assure compliance with the power quality of the grid.	• Check the grid voltage at the point of connection of the inverter: If, due to local grid conditions, the grid voltage exceeds the configured limiting value, ask the network provider whether the voltage can be adjusted at the feeding point, or whether it would agree to a modification of the limiting value for voltage quality monitoring. If the grid voltage is continually within the tolerance range, and this error is still displayed, contact the SMA Serviceline.
4	< Grid fault > The inverter has left the grid parallel operation and for safety reasons interrupted feeding-in.	• Check the grid connection for strong, short-term frequency variations.
5	< Grid fault > The grid frequency is not within the permissible range. For safety reasons, the inverter disconnects itself from the grid.	• If possible, check the grid frequency and observe how often major deviations occur. If repeated frequency variations occur and as a result this error occurs, ask the network operator if they agree to modifying the operating parameters. Discuss the proposed parameters with the SMA Serviceline.
6	< Grid fault > The internal inverter monitoring has detected an impermissibly high proportion of direct current in the grid current.	• Check the grid connection for direct current. • If this event occurs often, check with the distribution grid operator whether it is possible to raise the limiting value of monitoring.
7	< Frq. not permitted > < Check parameter > The grid frequency has left the permissible range. For safety reasons, the inverter disconnects itself from the grid.	• As far as possible, check the grid frequency and observe how often major fluctuations occur. If repeated frequency variations occur and as a result this error occurs, ask the network operator if they agree to modifying the operating parameters. Discuss the proposed parameters with the SMA Serviceline.

Event no.	Cause	Corrective measures
13	< Waiting for grid voltage > or < Installation failure grid connection > < Check grid and fuses > The inverter has detected an error in the AC cabling and cannot connect to the grid. The reason for this could be an incorrect country setting.	• Check AC installation • Adjust the connection as described in section 6.3 "Connecting the Power Distribution Grid (AC)" (page 27). • Check that the country setting is correct: – Via the rotary switch: see section 6.5.1 "Checking the Country Standard" (page 46). – Via communication: setting the Parameter "CntrySet" or "Set country standard".
33	< Unstable operation > The supply at the DC input of the inverter is not sufficient for stable operation. This could be caused by snow on the PV modules.	• Wait for higher irradiation. • If this event recurs at medium irradiation, check the PV plant design and correct the connection of the PV array.
34	< DC overvoltage > < Disconnect generator > The DC input voltage connected to the inverter is too high.	• **Immediately disconnect the inverter from the PV array, as described in section 8 "Disconnecting the Inverter" (page 70). Otherwise, the inverter may be destroyed.** • Check the DC voltage of the strings for adherence to the maximum input voltage of the inverter, before you re-connect the inverter to the PV array.
35	< Insulation resist. > < Check generator > The inverter has detected a ground fault in the PV array.	• Check the strings for ground faults, as described in section 11.2 "Checking the PV Array for a Ground Fault" (page 91). • The installer of the PV array must remedy the ground faults before you re-connect the affected string.

Event no.	Cause	Corrective measures
36	< High discharge curr. > < Check generator > The leakage current from the inverter and the PV array is too high. This can be caused by a sudden grounding fault, residual current or an actual fault in the device. The inverter interrupts grid feed-in operation immediately after exceeding a limiting value and then automatically re-connects to the grid.	• Check the strings for ground faults, as described in section 11.2 "Checking the PV Array for a Ground Fault" (page 91). • The installer of the PV array must remedy the ground faults before you re-connect the affected string.
37	< Resid.curr.too.high > < Check generator > The inverter has detected a residual current through brief PV array grounding.	• Check the strings for ground faults, as described in section 11.2 "Checking the PV Array for a Ground Fault" (page 91). • The installer of the PV array must remedy the ground faults before you re-connect the affected string.
38	< DC overcurrent > < Check generator > On the DC side of the inverter, an overcurrent has been detected and the inverter has briefly interrupted grid feeding.	If this event occurs often: • Check the layout and the wiring of the PV array.
39	< Waiting for DC start conditions > < Start cond. not met > The input power or the voltage of the PV modules is not sufficient for feeding into the grid.	• Wait for higher irradiation. • If necessary, increase the voltage limit for the start of feed-in if the event occurs frequently in the morning (parameter setting via communication). • If this event recurs at medium irradiation, check the PV plant design and correct the connection of the PV array.

Event no.	Cause	Corrective measures
40	< String X defect. > < Do not disconn. ESS > "X" stands for the affected string. In this string there are reverse currents or the string has been reverse poled. Further strings could also be affected. The PV array is short-circuited.	• Disconnect the inverter after darkness has fallen, as described in section 8 "Disconnecting the Inverter" (page 70). • Check the layout and the wiring of the PV array (see section 6.4.1 "Conditions for the DC Connection" (page 32)). • In sufficient irradiation, check whether the same voltage is present at the string inputs A1 to A5. If not, one of the PV modules is possibly defective.
	< String X defective > < Check generator > "X" stands for the affected string. This string has been reverse poled or it has failed. Further strings could also be affected. The PV array is **not** short-circuited.	• Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70). • Check the layout and the wiring of the PV array (see section 6.4.1 "Conditions for the DC Connection" (page 32)). • Check whether the same voltage is present at the string inputs A1 to A5. If not, one of the PV modules is possibly defective.
	< String X defective > < Check generator > "X" stands for the affected string. In this string, a partial string has failed. Further strings could also be affected.	• Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70). • Repair the defect in the given string. • Restart the teaching phase of the string failure detection as described in section 7.4 "Activating the Intelligent String Failure Detection" (page 69).
60 - 64	< Self diagnosis > or < Interference device >	• Contact the SMA Serviceline (see section 15 "Contact" (page 133)).
65	< Self diagnosis > or < Overtemperature > The inverter switches off due to too high temperature	• Ensure sufficient ventilation. • Check heat dissipation, as described in section 9.1 "Checking Heat Dissipation" (page 74).

Event no.	Cause	Corrective measures
66	< Self diagnosis > or < Overload >	• Contact the SMA Serviceline (see section 15 "Contact" (page 133)).
67	< Comm. disturbed > A fault has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid.	If this event occurs often: • Contact the SMA Serviceline (see section 15 "Contact" (page 133)).
68	< Self-diagnosis > or < Input A defective >	• Contact the SMA Serviceline (see section 15 "Contact" (page 133)).
69	< Self-diagnosis > or < Input B defective >	• Contact the SMA Serviceline (see section 15 "Contact" (page 133)).
70	< Sensor fault fan permanently on >	• Contact the SMA Serviceline (see section 15 "Contact" (page 133)).
71	< SD card defective >	Re-format the SD card. • Re-save the files to the SD card.
	< Parameter file not found or defective >	• Copy the parameter file into the card drive:\PARASET directory.
	< Param. setting failed >	• Check the parameters of the SD card for valid values. • Ensure change rights via SMA Grid Guard Code.
	< Update file defect. >	• Re-format the SD card. • Re-save the files to the SD card.
	< No update file found >	• Copy the update file into the SD card drive:\UPDATE directory.
72	< Data stor. not poss. > Internal device fault: however, the inverter continues to feed in.	• If this fault occurs often, contact the SMA Serviceline (see section 15 "Contact" (page 133)).

Event no.	Cause	Corrective measures
73	< Update main CPU failed > Internal device fault.	• Contact the SMA Serviceline (see section 15 "Contact" (page 133)).
	< Update RS485i module failed > Internal device fault: however, the inverter continues to feed in.	• Re-try update. • If this fault occurs again, contact the SMA Serviceline (see section 15 "Contact" (page 133)).
	< Update *Bluetooth* failed > Internal device fault: however, the inverter continues to feed in.	
	< Upd. display failed > Internal device fault: however, the inverter continues to feed in.	
	< Update language table failed > Internal device fault: however, the inverter continues to feed in.	
	< Update string protection failed > Internal device fault: however, the inverter continues to feed in.	
74	< Varistor defective > At least one of the thermally monitored varistors is defective.	• Check the varistors as described in section 11.3 "Checking the Function of the Varistors" (page 93).
75	< Fan fault > < Clean fan > One of the external fans is blocked.	• Check heat dissipation as described in section 9.1 "Checking Heat Dissipation" (page 74).
77	< Self diagnosis > or < Interference device >	• Contact the SMA Serviceline (see section 15 "Contact" (page 133)).
80	< Derating occurred > The delivered power of the inverter was reduced below rated output power due to an excessive temperature for more than 10 minutes.	If this event occurs often: • Ensure sufficient ventilation. • Check heat dissipation, as described in section 9.1 "Checking Heat Dissipation" (page 74).
81	< Comm. disturbed > or < Interference device > A fault has occurred in the internal communication of the inverter. However, the inverter continues feeding into the grid.	If this event occurs often: • Contact the SMA Serviceline (see section 15 "Contact" (page 133)).

Event no.	Cause	Corrective measures
82	< Interference device > < Do not disconn. ESS >	• Disconnect the inverter after darkness has fallen, as described in section 8 "Disconnecting the Inverter" (page 70). • Contact the SMA Serviceline (see section 15 "Contact" (page 133)).
	< Connect ESS, do not open cover > Device disturbance or reverse current in the PV array. The PV array should only be disconnected from the inverter after darkness has fallen in order to prevent the risk of an electric arc when pulling out the DC plug connector.	• Securely plug the Electronic Solar Switch in up to the stop. • Disconnect the inverter after darkness has fallen, as described in section 8 "Disconnecting the Inverter" (page 70).
83	< Lightn.prot.inactive > < Chk lightn.prot.A/PE > < Chk lightn.prot.B/PE > At least one surge arrester is defective.	• Replace the surge arrester as described in Section 11.4 "Replacing the Surge Arrester Type II" (page 96).
84	< Overheating > < Disconn. device from Generator and grid > Device failure due to overheating in the inverter. The inverter is disconnected from both the DC and AC connections.	• Contact the SMA Serviceline (see section 15 "Contact" (page 133)).

Event no.	Cause	Corrective measures
90	< Inst. code invalid > The SMA Grid Guard Code entered (personal installer password) is not invalid.	• Enter a valid SMA Grid Guard Code.
	< Grid param. locked > The current country data set is locked.	• Enter a valid SMA Grid Guard Code for changing the country data set.
	< Changing grid param. not possible > < Ensure DC supply > • DC voltage at the DC input is not sufficient to run the main CPU. • The selected rotary switch setting for the country configuration is not programmed. • The parameters to be changed are protected.	• Make sure that there is sufficient DC voltage available (green LED is glowing or flashing). • Check the setting of the rotary switches (see section 5.4.2). • Enter the SMA Grid Guard Code.
	< Abort self-test > There is either an error in the AC installation or the set voltage and frequency values do not comply with the requirements of Italian grids.	• Check AC installation. • Adjust the connection as described in section 6.3 "Connecting the Power Distribution Grid (AC)" (page 27). • Check for correct country settings as described in section 6.5 "Setting the Country Standard and Display Language" (page 44). The self-test is only required for installations in Italy.

11 Troubleshooting

11.1 Sunny Tripower is beeping

DANGER!

- Electric shock as a result of electric arc when pulling out the DC plug connectors. Death or serious burns.

The Sunny Tripower has short-circuited the PV array to avoid reverse currents.

- Proceed as described in the following table.

Cause	Event number on the display	Measure
Installation fault (reverse polarity of a string or connection of strings with differing module quantities) OR **Reverse current in the PV plant** (defective string) The Sunny Tripower short circuits the PV array to avoid reverse currents through individual strings. Depending on the level of irradiation, this could cause high currents to flow. However, the PV array and the Sunny Tripower are in a safe state.	40	• **On no account** disconnect the Electronic Solar Switch or the DC plug connectors until the Sunny Tripower has stopped beeping (after dark). There is a risk of an electric arc if the DC plug connectors are pulled out. • When the Sunny Tripower is left open: Before you leave the Sunny Tripower, install a contact barrier (e.g., a boundary fence) and moisture protection (e.g., tarpaulin). • Wait until dark before pulling out the Electronic Solar Switch and all DC plug connectors, and eliminate any errors (reversed poles or a defective string).
There is a defect in the Sunny Tripower	64 or 82	• Contact the SMA Serviceline (see section 15 "Contact" (page 133)).

11.2 Checking the PV Array for a Ground Fault

If the inverter displays event numbers "35", "36" or "37", there is a high probability of a ground fault in the PV array.

Check the strings for ground faults as described below:

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70).

DANGER!

Danger to life due to PV array carrying voltage

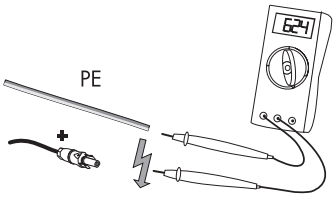
- Only touch the cables of the PV array on their insulation.
- Do not connect strings with ground faults to the inverter.
- Wait until there is no voltage can be measured.

NOTICE!

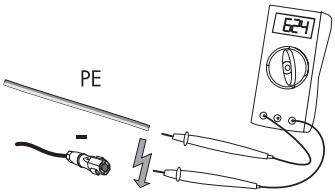
Excessive voltages can destroy the measuring device.

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

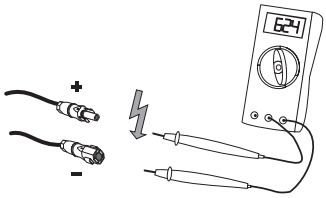
2. Measure the voltages between the plus pole of each string and the ground potential (PE).



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



4. Measure the voltages between the plus pole and the minus pole of each string.



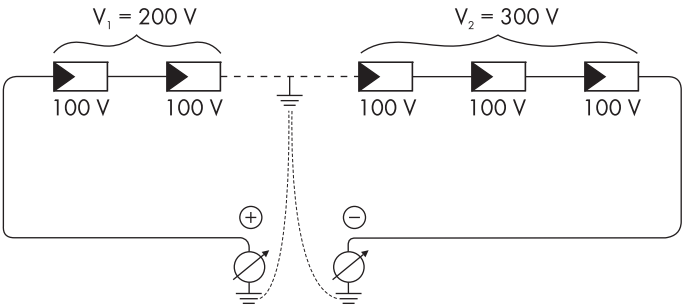
☑ A ground fault exists if the measured voltages are stable and the sum of the voltages from the plus pole to the ground potential and from the minus pole to the ground potential of a string are almost the same as the voltage between the plus and minus poles.

Result	Measure
☑ You have found **a ground fault**.	• 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. • Do **not** reconnect the faulty string. • Re-commission the inverter as described in section 7 "Commissioning" (page 61).
☑ You have found **no ground fault**.	It is likely that one of the thermally monitored varistors is defective. • Check the varistors as described in section 11.3 "Checking the Function of the Varistors" (page 93).

Location of the ground fault

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

Example:



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

☑ The ground fault check is finished.

11.3 Checking the Function of the Varistors

If the inverter displays the event number "74", then one of the varistors is probably defective.

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

Check the varistors as described below:

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70).

DANGER!

Danger to life due to high voltages in the inverter Death due to electric shock.

There is residual voltage in the inverter. The inverter needs 10 minutes to electrically discharge.

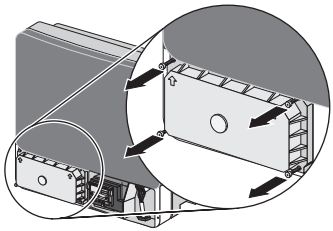
- Wait 10 minutes before you open the upper enclosure lid or the DC lid.

CAUTION!

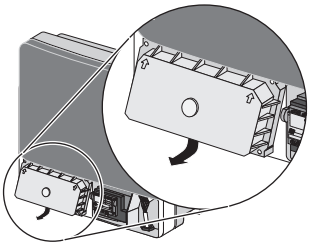
Danger of burn injury due to hot components inside the inverter!

- Wait until the components inside the inverter have cooled down.

2. Unscrew the captive screws of the DC lid on the left-hand side of the connection area.

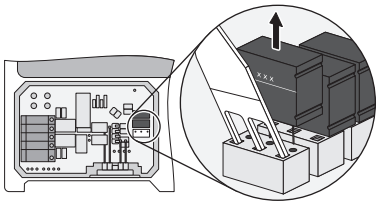


3. Lift the DC lid upwards and remove it.

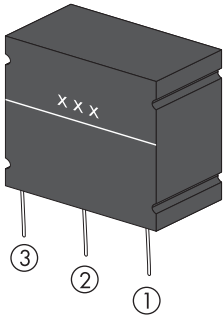


4. Remove all varistors from below upwards.

   If you do not receive an insertion tool for operating the terminals with your replacement varistors, contact SMA Solar Technology AG.



5. Use a multimeter to check each varistor to see if there is a conductive connection between terminals 2 and 3.



Result	Measure
☑ There is a **conducting** connection.	There is probably a different fault in the inverter. • Proceed to step 8. • Contact the SMA Serviceline (see section 15 "Contact" (page 133)).
☑ There is **no conducting** connection.	The respective varistor is defective and must be replaced. Varistor failure is due to influences which affect all varistors similarly (temperature, age, induced overvoltages). SMA Solar Technology AG recommends replacing all varistors. 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 14 "Accessories" (page 132)). Only use original varistors only that are sold by SMA Solar Technology AG. • To replace the varistors, proceed to step 6.

NOTICE!

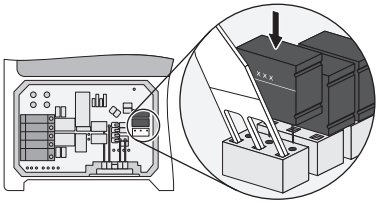
Destruction of the inverter due to overvoltage.

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

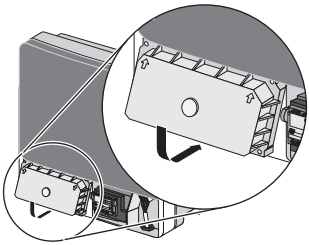
- Replacement varistors should be obtained as soon as possible.
- Do **not** operate the inverter without varistors in plants with a high risk of overvoltages.

6. Insert an insertion tool into the openings of the terminal contacts.
7. Insert new varistors downwards into the slots from above (as shown in the adjacent drawing).

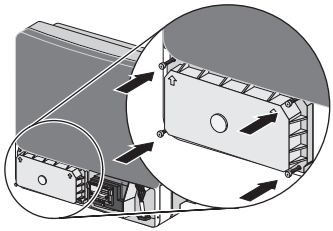
   Here, the labelling must point to the front, i.e. towards the insertion tool.



8. Attach the DC lid so that it is at an angle. In the process, the captive screws must protrude.



9. Pre-screw all 4 screws of the DC lid and then tighten them (torque: 3.5 Nm).



10. Re-commission the inverter as described in section 7 "Commissioning" (page 61).

☑ The varistors have been replaced and the inverter is back in operation.

11.4 Replacing the Surge Arrester Type II

If the inverter displays event number "83", one of the surge arresters is probably defective.

Surge arresters are wear parts. Their functional efficiency diminishes with age or following repeated responses as a result of overvoltages. It is therefore possible that one of the surge arresters no longer fulfills its protective function.

Since the failure of one surge arrester is generally due to factors that affect all surge arresters in a similar way (temperature, age, inductive overvoltages), SMA Solar Technology AG recommends replacing all surge arresters at once. The order numbers for both retrofit kits (one for input A, one for input A and B) can be found in section 14 "Accessories" (page 132).

The procedure for replacing surge arresters is as follows:

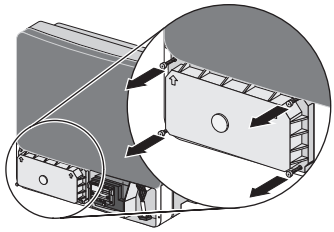
1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70).

DANGER!
Danger to life due to high voltages in the inverter Death due to electric shock

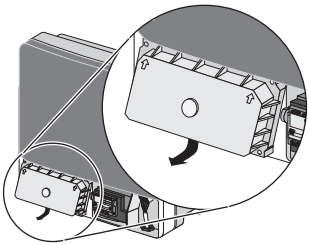
There is residual voltage in the inverter. The inverter needs 10 minutes to electrically discharge.

- Wait 10 minutes before you open the upper enclosure lid or the DC lid.

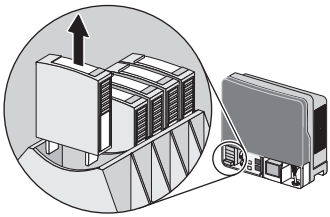
2. Unscrew the captive screws of the DC lid on the left-hand side of the connection area.



3. Lift the DC lid upwards and remove it.

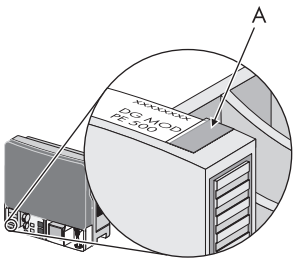


4. Remove all surge arresters from the slots. For this, press together the grooved surfaces on both sides.



☑ If a green strip is visible in the window (A), the surge arrester is in perfect condition.

☑ If a red strip is visible in the window (A), the surge arrester is defective.



5. Replace the surge arrester as described in Section 6.7 "Retrofitting a Surge Arrester Type II" (page 58).

12 Decommissioning

12.1 Disassembling the Inverter

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 70).
2. If connected, remove all communication cables from the inverter.

CAUTION!

Danger of burn injuries due to hot enclosure parts

- Wait 30 minutes for the enclosure to cool down before disassembling.

3. Screw off all projecting cable glands.
4. If necessary, open the anti-theft lock.
5. Remove the inverter from the rear panel and if necessary remove the rear panel.

12.2 Replacing the Enclosure Lid

In the event of a fault your inverter may need replacing. If this is the case, you will receive a replacement device fitted with transport lids.

DANGER!

Risk of lethal electric shock.

During operation, there are high voltages in the inverter.

- Do not operate the inverter without the upper and lower enclosure lid during operation.

Dismantling surge arresters Type II

If you have retrofitted your inverter with surge arresters type II, then you have to dismantle the surge arrester before you send your inverter back to SMA Solar Technology (see section 11.4 "Replacing the Surge Arrester Type II" (page 96)).

Prior to returning your inverter to SMA Solar Technology AG, you must replace the upper and lower enclosure lids of your inverter with the corresponding transport lid:

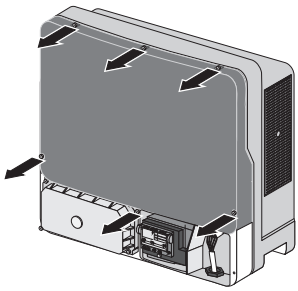
DANGER!

Danger to life due to high voltages in the inverter Death due to electric shock.

After disconnecting the inverter, there is residual voltage in the inverter. The inverter needs 10 minutes to electrically discharge.

- Wait 10 minutes before you open the upper enclosure lid or the DC lid.

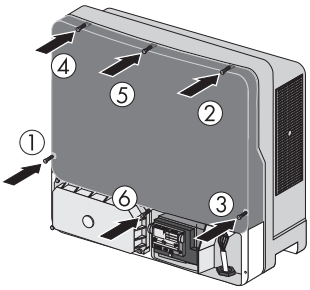
1. Disassemble the inverter as described in section 12.1 "Disassembling the Inverter" (page 98).
2. Loosen all screws of the upper enclosure lid and remove the enclosure lid from the front.
3. Remove the transport lid from the replacement device in the same manner.



4. Pre-screw the transport lid of the replacement device to your inverter with the 6 enclosure lid screws and corresponding conical spring washers and then tighten them in the sequence shown on the right (torque: 6.0 Nm).

   The toothing 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 upper enclosure lid is ensured by the toothed conical spring washers.

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

5. Screw the enclosure lower lid tight.

   ☑ Your inverter is now ready to be sent back to SMA Solar Technology AG.

6. Now mount the upper enclosure lid of your inverter onto the replacement device in the same manner.
7. Mount (see section 5.3 "Mounting the Inverter with Rear Panel" (page 21)) and connect (see section 6 "Electrical Connection" (page 25)) the replacement device.

12.3 Packing the Inverter

- If the original packaging is available, the inverter should be packed in its original packaging and be secured with tension belts.
- If the original packaging is not available, use a cardboard box suitable for the weight and size of the inverter.

12.4 Storing the Inverter

Store the inverter in a dry place where ambient temperatures are always between –25 °C and +60 °C.

12.5 Disposing of the Inverter

Dispose of the inverter at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation location at that time. Alternatively, send it back to SMA Solar Technology AG with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("FOR DISPOSAL") (contact see section Page 133).

13 Technical Data

13.1 Sunny Tripower 8000TL

DC Input

Maximum DC power at cos φ = 1	8 200 W
Maximum input voltage*	1 000 V
MPP voltage range	320 V ... 800 V
Rated input voltage	600 V
Minimum input voltage	150 V
Start input voltage	188 V
Maximum input current input A	22.0 A
Maximum input current input B	11.0 A
Maximum input current per string input A**	33.0 A
Maximum input current per string input B**	12.5 A
Number of independent MPP inputs	2
Strings per MPP input, input A	4
Strings per MPP input, input B	1

* The maximum open-circuit voltage, which can occur at a cell temperature of – 10 °C, must not exceed the maximum input voltage.

** To be observed in the event of short-circuit of the string fuse.

AC Output

Rated output power at 230 V, 50 Hz	8 000 W
Maximum apparent AC power	8 000 VA
Rated grid voltage	3/N/PE, 230 V/400 V
AC voltage range*	160 V ... 280 V
AC nominal current at 230 V	11.6 A
Maximum output current	16.0 A
Maximum short-circuit current	0.05 kA
Total harmonic factor of output current at AC THD voltage < 2 %, AC power > 0.5 nominal AC power	≤ 3 %
Maximum output failure current	96 mA
Rated grid 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_{lagging} ... 0.8_{leading}
Feed-in phases	3
Connection phases	3
Overvoltage category as per IEC 60644-1	III

* Depending on country configuration

Protective Devices

DC reverse-polarity protection	Short-circuit diode, electronic string fuse
Protection against module reverse currents	Electronic string fuse
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	thermally monitored varistors optional: surge arrester type II
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 4
Maximum permissible fuse protection	50.0 A
Ground fault monitoring	Insulation monitoring: R_{iso} > 687.5 kΩ
All-pole sensitive residual current monitoring unit	Available
String failure detection	Available

General Data

Width x height x depth with Electronic Solar Switch	665 mm x 690 mm x 265 mm
Weight	59 kg
Length x width x height of packaging	780 mm x 380 mm x 790 mm
Transport weight	65 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	3 000 m
Power loss in night operation	< 1 W
Topology	transformerless
Cooling concept	OptiCool: temperature-controlled fan
Fan connection	Designed for safe disconnection in accordance with DIN EN 50178:1998-04
Electronics degree of protection according to IEC 60529	IP65
Connection area protection rating in accordance with IEC 60529	IP54
Protection class according to IEC 62103	I

Country standards, as of 05/2011*	VDE-AR-N4105 VDE-AR-N4105-MP VDE-AR-N4105-HP VDE 0126-1-1 AS4777 C10/11 PPDS GBT19939-2005 UTE C15-712-1 PPC SI 4777 Enel-GUIDA EN 50438 RD1663/2000 RD661/2007 IEC 61727 G83/1-1 G5912

* VDE-AR-N4105, VDE-AR-N4105-MP, VDE-AR-N4105-HP: in planning.
C10/11: Only possible if the 3-phase nominal voltage of the phase conductor is 400 V
EN 50438: Does not apply to all country standard deviations of EN 50438.
IEC 61727: In planning.

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

Features

DC Connection	SUNCLIX DC plug connectors
AC Connection	Spring terminal
Display	LC graphic display
Bluetooth	as standard
RS485, galvanically isolated	optional

Multi-function relay	as standard

Electronic Solar Switch

Electrical endurance in the event of a short circuit, with a nominal current of 33 A	a minimum of 50 switching operations
Maximum switching current	33.0 A
Maximum switching voltage	1 000 V
Maximum PV power	20 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP21

Torque

Upper enclosure lid screws	6.0 Nm
Lower enclosure lid screws	2.0 Nm
DC lid screws	3.5 Nm
Additional ground terminal	6.0 Nm
Cylinder screws (M5x10) for securing the enclosure to the rear panel	6.0 Nm
SUNCLIX lock nut	2.0 Nm
RS485 communication connection	1.5 Nm
Multi-function relay connection	0.5 Nm

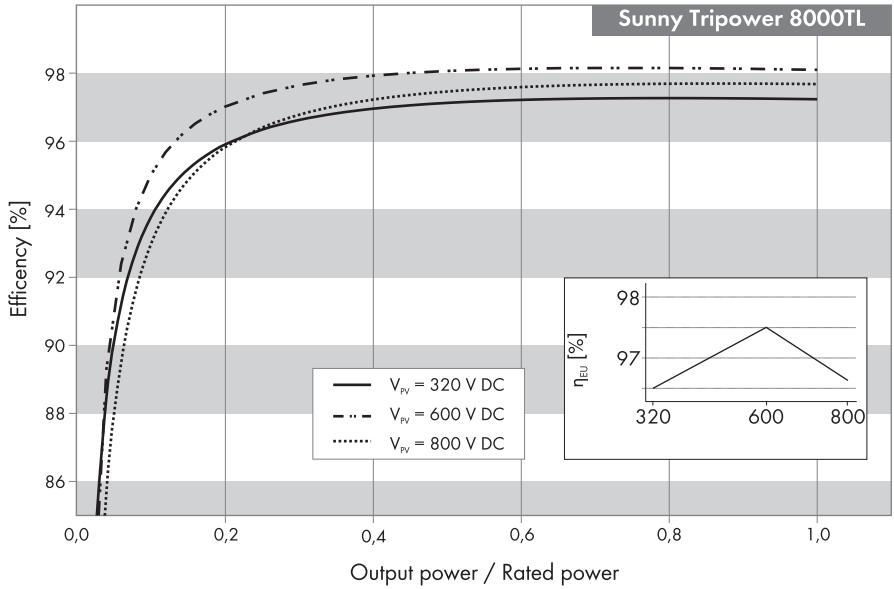
Grid Forms

TN-C grid	Suitable
TN-S grid	Suitable
TN-C-S grid	Suitable
TT grid	Suitable

Data storage capacity

Daily energy yield	63 days
Daily yields	30 years
Event messages for users	250 events
Event messages for installers	250 events

Efficiency



Maximum efficiency, η_{max}	98.1 %
European weighted efficiency, η_{EU}	97.5 %

Efficiency profile

Standardized output power	Efficiency		
	Minimum MPP voltage 320 V	Rated input voltage 600 V	Maximum MPP voltage 800 V
5 %	89.8 %	90.8 %	87.6 %
10 %	93.7 %	95.0 %	93.0 %
20 %	95.9 %	97.0 %	95.8 %
25 %	96.3 %	97.4 %	96.4 %
30 %	96.6 %	97.7 %	96.8 %
50 %	97.1 %	98.0 %	97.5 %
75 %	97.3 %	98.1 %	97.7 %
100 %	97.2 %	98.1 %	97.7 %

13.2 Sunny Tripower 10000TL

DC Input

Maximum DC power at cos φ = 1	10 200 W
Maximum input voltage*	1 000 V
MPP voltage range	320 V ... 800 V
Rated input voltage	600 V
Minimum input voltage	150 V
Start input voltage	188 V
Maximum input current input A	22.0 A
Maximum input current input B	11.0 A
Maximum input current per string input A**	33.0 A
Maximum input current per string input B**	12.5 A
Number of independent MPP inputs	2
Strings per MPP input, input A	4
Strings per MPP input, input B	1

* The maximum open-circuit voltage, which can occur at a cell temperature of – 10 °C, must not exceed the maximum input voltage.

** To be observed in the event of short-circuit of the string fuse.

AC Output

Rated output power at 230 V, 50 Hz	10 000 W
Maximum apparent AC power	10 000 VA
Rated grid voltage	3/N/PE, 230 V/400 V
AC voltage range*	160 V ... 280 V
AC nominal current at 230 V	14.5 A
Maximum output current	16.0 A
Maximum short-circuit current	0.05 kA
Total harmonic factor of output current at AC THD voltage < 2 %, AC power > 0.5 nominal AC power	≤ 3 %
Maximum output failure current	96 mA
Rated grid 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_{lagging} ... 0.8_{leading}
Feed-in phases	3
Connection phases	3
Overvoltage category as per IEC 60644-1	III

* depending on country configuration

Protective Devices

DC reverse-polarity protection	Short-circuit diode, electronic string fuse
Protection against module reverse currents	Electronic string fuse
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	thermally monitored varistors optional: surge arrester type II
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 4
Maximum permissible fuse protection	50.0 A
Ground fault monitoring	Insulation monitoring R_{iso} > 550 kΩ
All-pole sensitive residual current monitoring unit	Available
String failure detection	Available

General Data

Width x height x depth with Electronic Solar Switch	665 mm x 690 mm x 265 mm
Weight	59 kg
Length x width x height of packaging	780 mm x 380 mm x 790 mm
Transport weight	65 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	3 000 m
Power loss in night operation	< 1 W
Topology	transformerless
Cooling concept	OptiCool: temperature-controlled fan
Fan connection	Designed for safe disconnection in accordance with DIN EN 50178:1998-04
Electronics degree of protection according to IEC 60529	IP65
Connection area protection rating in accordance with IEC 60529	IP54
Protection class according to IEC 62103	I

Country standards, as of 05/2011*	VDE-AR-N4105 VDE-AR-N4105-MP VDE-AR-N4105-HP VDE 0126-1-1 AS4777 C10/11 PPDS GBT19939-2005 UTE C15-712-1 PPC SI 4777 Enel-GUIDA EN 50438 RD1663/2000 RD661/2007 IEC 61727 G83/1-1 G5912

* VDE-AR-N4105, VDE-AR-N4105-MP, VDE-AR-N4105-HP: in planning.

C10/11: Only possible if the 3-phase nominal voltage of the phase conductor is 400 V

EN 50438: Does not apply to all country standard deviations of EN 50438.

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

Features

DC Connection	SUNCLIX DC plug connectors
AC Connection	Spring terminal
Display	LC graphic display
Bluetooth	as standard
RS485, galvanically isolated	optional
Multi-function relay	as standard

Electronic Solar Switch

Electrical endurance in the event of a short circuit, with a nominal current of 33 A	a minimum of 50 switching operations
Maximum switching current	33.0 A
Maximum switching voltage	1 000 V
Maximum PV power	20 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP21

Torque

Upper enclosure lid screws	6.0 Nm
Lower enclosure lid screws	2.0 Nm
DC lid screws	3.5 Nm
Additional ground terminal	6.0 Nm
Cylinder screws (M5x10) for securing the enclosure to the rear panel	6.0 Nm
SUNCLIX lock nut	2.0 Nm
RS485 communication connection	1.5 Nm
Multi-function relay connection	0.5 Nm

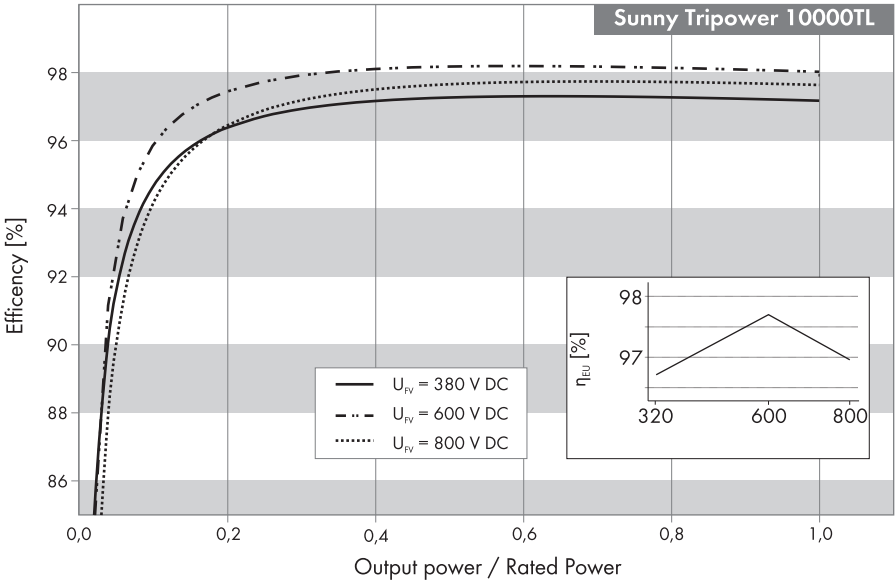
Grid Forms

TN-C grid	Suitable
TN-S grid	Suitable
TN-C-S grid	Suitable
TT grid	Suitable

Data storage capacity

Daily energy yield	63 days
Daily yields	30 years
Event messages for users	250 events
Event messages for installers	250 events

Efficiency



Maximum efficiency, η_{max}	98.1 %
European weighted efficiency, η_{EU}	97.7 %

Efficiency profile

	Efficiency		
Standardized output power	**Minimum MPP voltage 320 V**	**Rated input voltage 600 V**	**Maximum MPP voltage 800 V**
5 %	91.2 %	92.4 %	89.5 %
10 %	94.6 %	95.8 %	94.1 %
20 %	96.3 %	97.4 %	96.4 %
25 %	96.7 %	97.7 %	96.9 %
30 %	96.9 %	97.9 %	97.1 %
50 %	97.2 %	98.1 %	97.6 %
75 %	97.3 %	98.1 %	97.7 %
100 %	97.1 %	98.0 %	97.6 %

13.3 Sunny Tripower 12000TL

DC Input

Maximum DC power at cos φ = 1	12 250 W
Maximum input voltage*	1 000 V
MPP voltage range	380 V ... 800 V
Rated input voltage	600 V
Minimum input voltage	150 V
Start input voltage	188 V
Maximum input current input A	22.0 A
Maximum input current input B	11.0 A
Maximum input current per string input A**	33.0 A
Maximum input current per string input B**	12.5 A
Number of independent MPP inputs	2
Strings per MPP input, input A	4
Strings per MPP input, input B	1

* The maximum open-circuit voltage, which can occur at a cell temperature of – 10 °C, must not exceed the maximum input voltage.

** To be observed in the event of short-circuit of the string fuse.

AC Output

Rated output power at 230 V, 50 Hz	12 000 W
Maximum apparent AC power	12 000 VA
Rated grid voltage	3/N/PE, 230 V/400 V
AC voltage range*	160 V ... 280 V
AC nominal current at 230 V	17.4 A
Maximum output current	19.2 A
Maximum short-circuit current	0.05 kA
Total harmonic factor of output current at AC THD voltage < 2 %, AC power > 0.5 nominal AC power	≤ 3.6 %
Maximum output failure current	96 mA
Rated grid 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_{lagging} ... 0.8_{leading}
Feed-in phases	3
Connection phases	3
Overvoltage category as per IEC 60644-1	III

* depending on country configuration

Protective Devices

DC reverse-polarity protection	Short-circuit diode, electronic string fuse
Protection against module reverse currents	Electronic string fuse
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	Thermally monitored varistors, optional: surge arrester type II
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 4
Maximum permissible fuse protection	50.0 A
Ground fault monitoring	Insulation monitoring R_{iso} > 458.7 kΩ
All-pole sensitive residual current monitoring unit	Available
String failure detection	Available

General Data

Width x height x depth with Electronic Solar Switch	665 mm x 690 mm x 265 mm
Weight	59 kg
Length x width x height of packaging	780 mm x 380 mm x 790 mm
Transport weight	65 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	3 000 m
Power loss in night operation	< 1 W
Topology	transformerless
Cooling concept	OptiCool: temperature-controlled fan
Fan connection	Designed for safe disconnection in accordance with DIN EN 50178:1998-04
Electronics degree of protection according to IEC 60529	IP65
Connection area protection rating in accordance with IEC 60529	IP54
Protection class according to IEC 62103	I

Country standards, as of 05/2011*	VDE-AR-N4105 VDE-AR-N4105-MP VDE-AR-N4105-HP VDE 0126-1-1 AS4777 C10/11 PPDS GBT19939-2005 UTE C15-712-1 PPC SI 4777 Enel-GUIDA EN 50438 RD1663/2000 RD661/2007 IEC 61727 G83/1-1 G5912

* VDE-AR-N4105, VDE-AR-N4105-MP, VDE-AR-N4105-HP: in planning.

C10/11: Only possible if the 3-phase nominal voltage of the phase conductor is 400 V

EN 50438: Does not apply to all country standard deviations of EN 50438.

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

Features

DC Connection	SUNCLIX DC plug connectors
AC Connection	Spring terminal
Display	LC graphic display
Bluetooth	as standard
RS485, galvanically isolated	optional
Multi-function relay	as standard

Electronic Solar Switch

Electrical endurance in the event of a short circuit, with a nominal current of 33 A	a minimum of 50 switching operations
Maximum switching current	33.0 A
Maximum switching voltage	1 000 V
Maximum PV power	20 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP21

Torque

Upper enclosure lid screws	6.0 Nm
Lower enclosure lid screws	2.0 Nm
DC lid screws	3.5 Nm
Additional ground terminal	6.0 Nm
Cylinder screws (M5x10) for securing the enclosure to the rear panel	6.0 Nm
SUNCLIX lock nut	2.0 Nm
RS485 communication connection	1.5 Nm
Multi-function relay connection	0.5 Nm

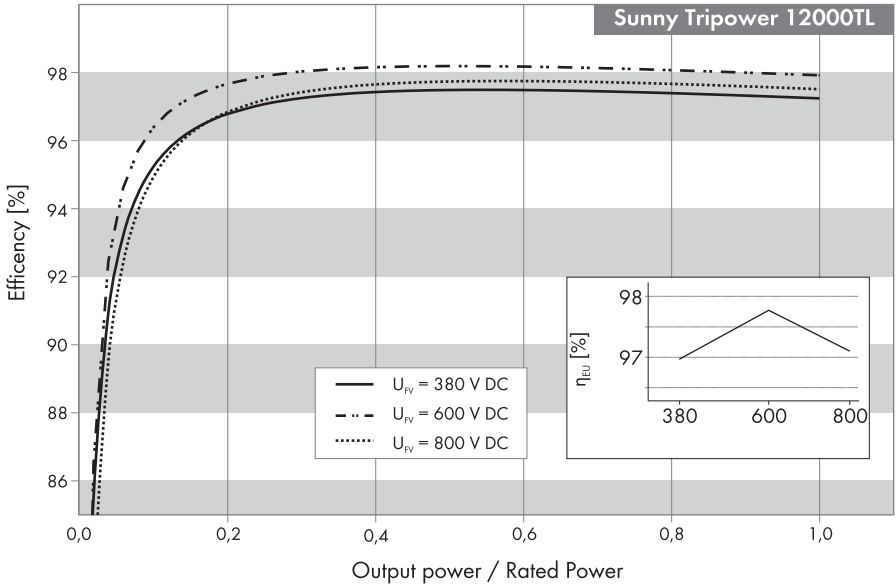
Grid Forms

TN-C grid	Suitable
TN-S grid	Suitable
TN-C-S grid	Suitable
TT grid	Suitable

Data storage capacity

Daily energy yield	63 days
Daily yields	30 years
Event messages for users	250 events
Event messages for installers	250 events

Efficiency



Maximum efficiency, η_{max}	98.1 %
European weighted efficiency, η_{EU}	97.7 %

Efficiency profile

	Efficiency		
Standardized output power	**Minimum MPP voltage 380 V**	**Rated input voltage 600 V**	**Maximum MPP voltage 800 V**
5 %	92.0 %	93.5 %	90.9 %
10 %	95.2 %	96.3 %	94.9 %
20 %	96.7 %	97.6 %	96.8 %
25 %	97.0 %	97.9 %	97.2 %
30 %	97.2 %	98.0 %	97.4 %
50 %	97.4 %	98.1 %	97.7 %
75 %	97.4 %	98.1 %	97.7 %
100 %	97.2 %	97.9 %	97.5 %

13.4 Sunny Tripower 15000TL

DC Input

Maximum DC power at cos φ = 1	15 340 W
Maximum input voltage*	1 000 V
MPP voltage range	360 V ... 800 V
Rated input voltage	600 V
Minimum input voltage	150 V
Start input voltage	188 V
Maximum input current input A	33.0 A
Maximum input current input B	11.0 A
Maximum input current per string input A**	40.0 A
Maximum input current per string input B**	12.5 A
Number of independent MPP inputs	2
Strings per MPP input, input A	5
Strings per MPP input, input B	1

* The maximum open-circuit voltage, which can occur at a cell temperature of – 10 °C, must not exceed the maximum input voltage.

** To be observed in the event of short-circuit of the string fuse.

AC Output

Rated output power at 230 V, 50 Hz	15 000 W
Maximum apparent AC power	15 000 VA
Rated grid voltage	3/N/PE, 230 V/400 V
AC voltage range*	160 V ... 280 V
AC nominal current at 230 V	21.7 A
Maximum output current	24.0 A
Maximum short-circuit current	0.05 kA
Total harmonic factor of output current at AC THD voltage < 2 %, AC power > 0.5 nominal AC power	≤ 3.0 %
Maximum output failure current	96 mA
Rated grid 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_{lagging} ... 0.8_{leading}
Feed-in phases	3
Connection phases	3
Overvoltage category as per IEC 60644-1	III

* depending on country configuration

Protective Devices

DC reverse-polarity protection	Short-circuit diode, electronic string fuse
Protection against module reverse currents	Electronic string fuse
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	Thermally monitored varistors, optional: surge arrester type II
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 4
Maximum permissible fuse protection	50.0 A
Ground fault monitoring	Insulation monitoring R_{iso} > 366.3 kΩ
All-pole sensitive residual current monitoring unit	Available
String failure detection	Available

General Data

Width x height x depth with Electronic Solar Switch	665 mm x 690 mm x 265 mm
Weight	59 kg
Length x width x height of packaging	780 mm x 380 mm x 790 mm
Transport weight	65 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	3 000 m
Power loss in night operation	< 1 W
Topology	transformerless
Cooling concept	OptiCool: temperature-controlled fan
Fan connection	Designed for safe disconnection in accordance with DIN EN 50178:1998-04
Electronics degree of protection according to IEC 60529	IP65
Connection area protection rating in accordance with IEC 60529	IP54
Protection class according to IEC 62103	I

Country standards, as of 05/2011*	VDE-AR-N4105 VDE-AR-N4105-MP VDE-AR-N4105-HP VDE 0126-1-1 AS4777 C10/11 PPDS GBT19939-2005 UTE C15-712-1 PPC SI 4777 Enel-GUIDA EN 50438 RD1663/2000 RD661/2007 IEC 61727 G83/1-1 G5912

* VDE-AR-N4105, VDE-AR-N4105-MP, VDE-AR-N4105-HP: in planning.

C10/11: Only possible if the 3-phase nominal voltage of the phase conductor is 400 V

EN 50438: Does not apply to all country standard deviations of EN 50438.

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

Features

DC Connection	SUNCLIX DC plug connectors
AC Connection	Spring terminal
Display	LC graphic display
Bluetooth	as standard
RS485, galvanically isolated	optional
Multi-function relay	as standard

Electronic Solar Switch

Electrical endurance in the event of a short circuit, with a nominal current of 33 A	a minimum of 50 switching operations
Maximum switching current	33.0 A
Maximum switching voltage	1 000 V
Maximum PV power	20 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP21

Torque

Upper enclosure lid screws	6.0 Nm
Lower enclosure lid screws	2.0 Nm
DC lid screws	3.5 Nm
Additional ground terminal	6.0 Nm
Cylinder screws (M5x10) for securing the enclosure to the rear panel	6.0 Nm
SUNCLIX lock nut	2.0 Nm
RS485 communication connection	1.5 Nm
Multi-function relay connection	0.5 Nm

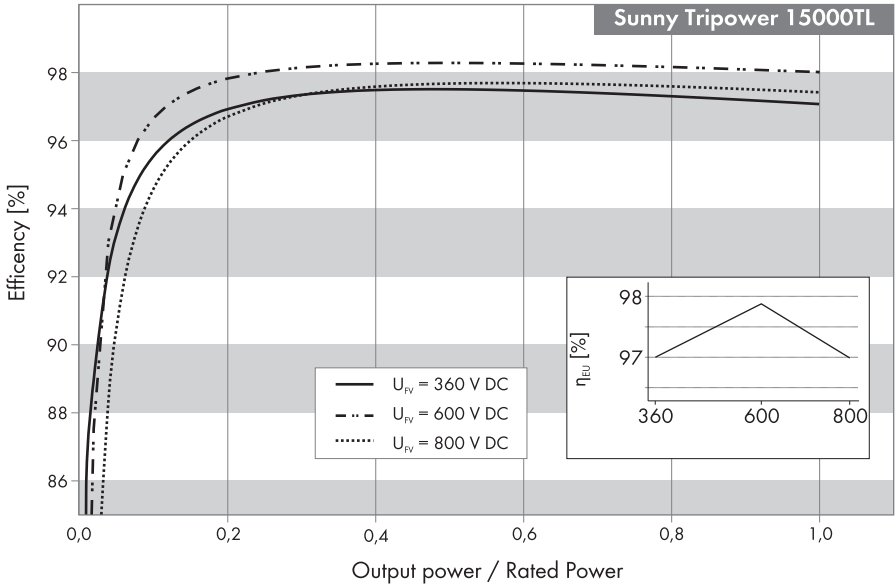
Grid Forms

TN-C grid	Suitable
TN-S grid	Suitable
TN-C-S grid	Suitable
TT grid	Suitable

Data storage capacity

Daily energy yield	63 days
Daily yields	30 years
Event messages for users	250 events
Event messages for installers	250 events

Efficiency



Maximum efficiency, η_{max}	98.2 %
European weighted efficiency, η_{EU}	97.8 %

Efficiency profile

	Efficiency		
Standardized output power	**Minimum MPP voltage 360 V**	**Rated input voltage 600 V**	**Maximum MPP voltage 800 V**
5 %	93.0 %	94.0 %	90.0 %
10 %	95.5 %	96.6 %	94.5 %
20 %	96.9 %	97.8 %	96.6 %
25 %	97.1 %	98.0 %	97.0 %
30 %	97.3 %	98.1 %	97.3 %
50 %	97.5 %	98.2 %	97.6 %
75 %	97.3 %	98.1 %	97.6 %
100 %	97.0 %	98.0 %	97.4 %

13.5 Sunny Tripower 17000TL

DC Input

Maximum DC power at cos φ = 1	17 410 W
Maximum input voltage*	1 000 V
MPP voltage range	400 V ... 800 V
Rated input voltage	600 V
Minimum input voltage	150 V
Start input voltage	188 V
Maximum input current input A	33.0 A
Maximum input current input B	11.0 A
Maximum input current per string input A**	40.0 A
Maximum input current per string input B**	12.5 A
Number of independent MPP inputs	2
Strings per MPP input, input A	5
Strings per MPP input, input B	1

* The maximum open-circuit voltage, which can occur at a cell temperature of – 10 °C, must not exceed the maximum input voltage.

** To be observed in the event of short-circuit of the string fuse.

AC Output

Rated output power at 230 V, 50 Hz	17 000 W
Maximum apparent AC power	17 000 VA
Rated grid voltage	3/N/PE, 230 V/400 V
AC voltage range*	160 V ... 280 V
AC nominal current at 230 V	24.6 A
Maximum output current	24.6 A
Maximum short-circuit current	0.05 kA
Total harmonic factor of output current at AC THD voltage < 2 %, AC power > 0.5 nominal AC power	≤ 2.6 %
Maximum output failure current	96 mA
Rated grid 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_{lagging} ... 0.8_{leading}
Feed-in phases	3
Connection phases	3
Overvoltage category as per IEC 60644-1	III

* depending on country configuration

Protective Devices

DC reverse-polarity protection	Short-circuit diode, electronic string fuse
Protection against module reverse currents	Electronic string fuse
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	Thermally monitored varistors, optional: surge arrester type II
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 4
Maximum permissible fuse protection	50.0 A
Ground fault monitoring	Insulation monitoring R_{iso} > 323.4 k Ω
All-pole sensitive residual current monitoring unit	Available
String failure detection	Available

General Data

Width x height x depth with Electronic Solar Switch	665 mm x 690 mm x 265 mm
Weight	59 kg
Length x width x height of packaging	780 mm x 380 mm x 790 mm
Transport weight	65 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	3 000 m
Power loss in night operation	< 1 W
Topology	transformerless
Cooling concept	OptiCool: temperature-controlled fan
Fan connection	Designed for safe disconnection in accordance with DIN EN 50178:1998-04
Electronics degree of protection according to IEC 60529	IP65
Connection area protection rating in accordance with IEC 60529	IP54
Protection class according to IEC 62103	I

Country standards, as of 05/2011*	VDE-AR-N4105 VDE-AR-N4105-MP VDE-AR-N4105-HP VDE 0126-1-1 AS4777 C10/11 PPDS GBT19939-2005 UTE C15-712-1 PPC SI 4777 Enel-GUIDA EN 50438 RD1663/2000 RD661/2007 IEC 61727 G83/1-1 G5912

* VDE-AR-N4105, VDE-AR-N4105-MP, VDE-AR-N4105-HP: in planning.

C10/11: Only possible if the 3-phase nominal voltage of the phase conductor is 400 V

EN 50438: Does not apply to all country standard deviations of EN 50438.

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

Features

DC Connection	SUNCLIX DC plug connectors
AC Connection	Spring terminal
Display	LC graphic display
Bluetooth	as standard
RS485, galvanically isolated	optional
Multi-function relay	as standard

Electronic Solar Switch

Electrical endurance in the event of a short circuit, with a nominal current of 33 A	a minimum of 50 switching operations
Maximum switching current	33.0 A
Maximum switching voltage	1 000 V
Maximum PV power	20 kW
Degree of protection when plugged	IP65
Degree of protection when unplugged	IP21

Torque

Upper enclosure lid screws	6.0 Nm
Lower enclosure lid screws	2.0 Nm
DC lid screws	3.5 Nm
Additional ground terminal	6.0 Nm
Cylinder screws (M5x10) for securing the enclosure to the rear panel	6.0 Nm
SUNCLIX lock nut	2.0 Nm
RS485 communication connection	1.5 Nm
Multi-function relay connection	0.5 Nm

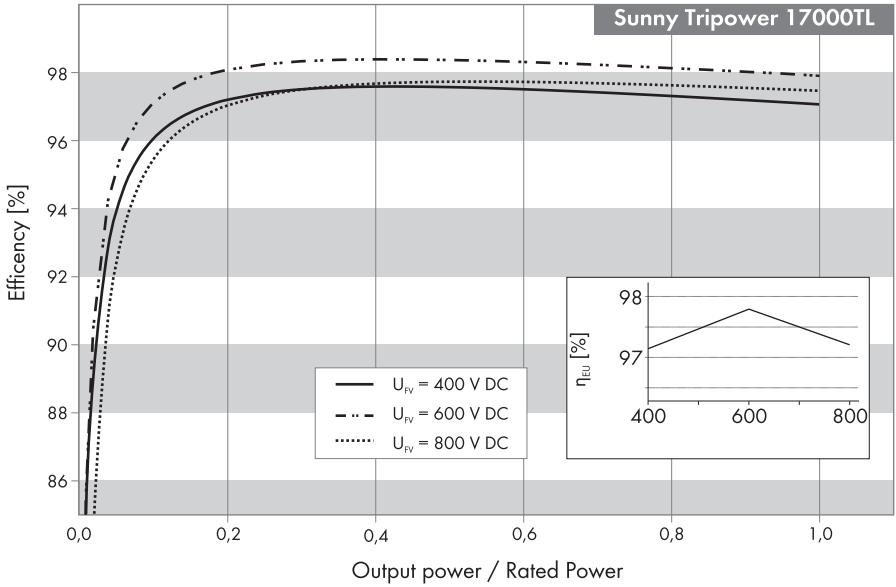
Grid Forms

TN-C grid	Suitable
TN-S grid	Suitable
TN-C-S grid	Suitable
TT grid	Suitable

Data storage capacity

Daily energy yield	63 days
Daily yields	30 years
Event messages for users	250 events
Event messages for installers	250 events

Efficiency



Maximum efficiency, η_{max}	98.2 %
European weighted efficiency, η_{EU}	97.8 %

Efficiency profile

	Efficiency		
Standardized output power	**Minimum MPP voltage 400 V**	**Rated input voltage 600 V**	**Maximum MPP voltage 800 V**
5 %	93.6 %	95.0 %	91.9 %
10 %	96.0 %	97.1 %	95.3 %
20 %	97.1 %	98.1 %	97.0 %
25 %	97.3 %	98.2 %	97.3 %
30 %	97.5 %	98.2 %	97.4 %
50 %	97.5 %	98.2 %	97.7 %
75 %	97.3 %	98.1 %	97.6 %
100 %	97.0 %	97.9 %	97.4 %

14 Accessories

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

Description	Brief description	SMA order number
Replacement varistors	Set of thermally monitored varistors (3 units)	STP-TV9
ESS handle	Electronic Solar Switch holder as spare part	ESS-HANDLE:06
RS485 upgrade kit	RS485 interface	DM-485CB-10
Surge Arrester Type II	Surge arrester type II for input A	DC_SPD_KIT_1-10
Surge Arrester Type II	Surge arrester type II for input A and B	DC_SPD_KIT_2-10
Ventilation grid	1 Ventilation grid as replacement part	45-10899080
SUNCLIX DC plug connector	Field connector for conductor cross-sectional areas 2.5 mm² ... 6 mm²	SUNCLIX-FC6-SET

15 Contact

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

- Inverter device type
- Inverter serial number
- Type the PV modules connected and quantity of the PV modules connected.
- Event number or display message on the inverter
- Mounting location
- Optional equipment (e.g. communication devices)
- Type of external wiring of the multi-functional relay

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- 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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