PV Inverter

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

Installation Guide

STP8-17TL-IEN110121 | IMEN-STP10-17TL | Version 2.1

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 line display

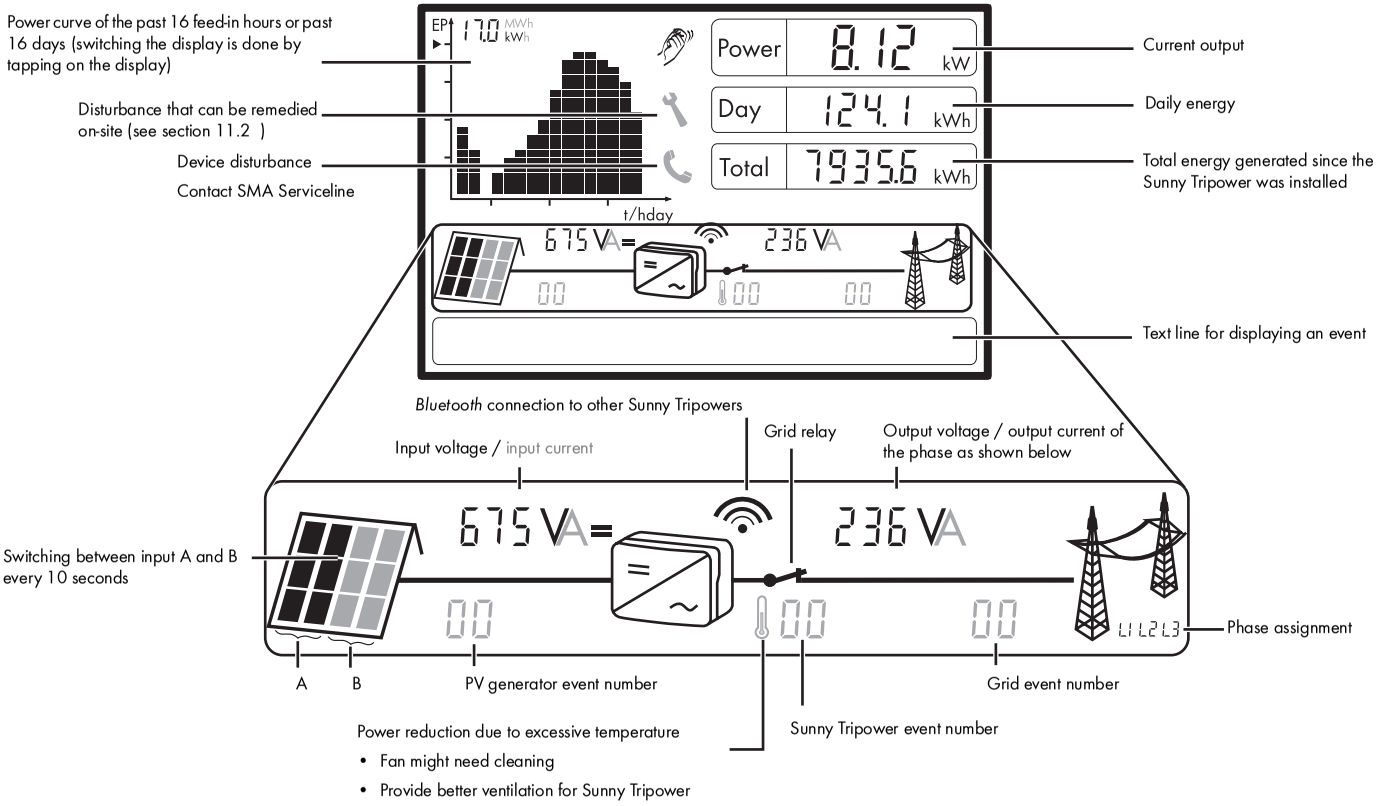


Table of Contents

1 Notes on this Manual

1.1 Scope of Validity

This installation guide describes the assembly, installation, commissioning, maintenance and failure search of 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)

Store this manual where it will be accessible at all times.

1.2 Target Group

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

1.3 Additional Information

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

1.4 Symbols Used

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

DANGER!

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

WARNING!

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

CAUTION!

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

NOTICE!

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

Information

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

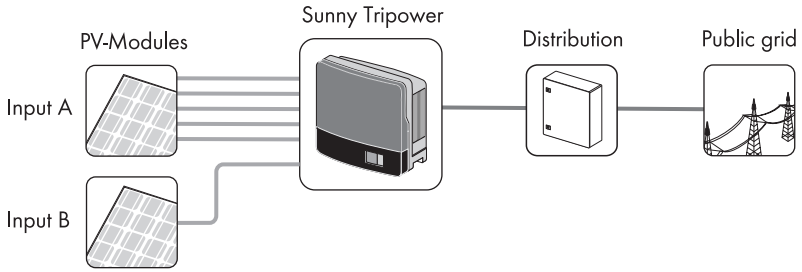
☑ This symbol indicates an outcome.

2 Safety

2.1 Appropriate Usage

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

Principle of a PV plant with this Sunny Tripower



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

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

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

Capacitive Leakage Currents

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

During grid feeding, a leakage current flows from the cells to ground. The strength of this current depends on the manner in which the modules are installed (e.g. foil on metal roof) and on the prevailing weather conditions (e.g. 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. Further information on this topic is available in the Technical Information "Capacitive Leakage Currents" in the download area at www.SMA.de/en.

When designing the PV system, ensure that the values comply with the permitted operating range of all components at all times. The free design program "Sunny Design" (www.SMA.de/en/SunnyDesign) will assist you. The manufacturer of the PV modules must have approved the modules for use with this Sunny Tripower unit. You must also ensure that all measures recommended by the module manufacturer for long-term maintenance of the module properties are taken (see also Technical Information "Module Technology", in the download area of www.SMA.de/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 components not expressly recommended or sold by SMA Solar Technology AG void the warranty claims and operation permission.

Certified countries

With the appropriate settings, the Sunny Tripower 10000TL/12000TL/15000TL/17000TL comply with the requirements specified in the following standards and directives (dated: January/2011):

- UTE C15-712*
- VDE 0126-1-1 (02.2006)
- Enel-GUIDA*
- C10/C11(08.2003)[a]*
- PPDS*
- RD 1663/2000 (2000)*
- RD 1663/661*
- EN 50438 (12.2007)[b]*
- AS 4777 (2005)*
- PPC (06.2006)*
- G83/1-1*
- SI 4777*
- IEC 61727 (MEA)*
- IEC 61727 (PEA)*

a) only possible if the 3-phase nominal voltage of the phase conductor is 400 V

b) does not apply to all national standard deviations of EN 50438

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

SMA Solar Technology AG can preset special grid parameters for other countries/installation locations according to customer requests after evaluation by SMA Solar Technology AG.

You can make later modifications yourself by changing software parameters with respective communication products (e.g. Sunny Data Control or Sunny Explorer). To change the grid-relevant parameters, you need a personal access code, the so-called SMA Grid Guard code. The application form for the personal access code can be found in the download area at www.SMA.de/en in the category "Certificate" of the respective inverter.

2.2 Safety Instructions

DANGER!

Danger to life due to high voltages in the inverter!

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

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 radiation!

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

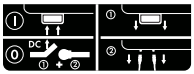
Grounding the PV generator

Comply with the local requirements for grounding the PV modules and the PV generator. SMA Solar Technology AG recommends connecting the generator frame and other electrically conductive surfaces in a manner which ensures continuous conduction and ground these in order to have optimal protection of the system and personnel.

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. Shows the operating status of the inverter.
	An error has occurred. Read section 12 "Failure search" (page 88) to remedy the error.
	*Bluetooth*® Wireless Technology. Shows the status of *Bluetooth* Communication.
	DC circuit breaker Electronic Solar Switch (ESS) • ❶ If the ESS connects, then the DC circuit is completed. • ❶ To interrupt the DC circuit and disconnect the inverter securely under load, you have to first pull out the ESS ❶ and then remove all DC plug connectors ❷, as described in section 8 "Disconnecting the Inverter" (page 66).
	**Danger to life due to high voltages in the inverter!** There is residual voltage in the inverter. The inverter requires 10 minutes to discharge. • Wait 10 minutes before you open the upper 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 26).

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 be carried out by qualified personnel only.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.

Symbol	Explanation
	Observe all documentation accompanying the inverter.
	The inverter must not be disposed of with the household waste. For further information on disposal, see section 13.5 "Disposing of the Inverter" (page 98).
	CE mark. The inverter complies with the requirements of the applicable EC guidelines.
	The inverter has no transformer.
	Direct Current (DC)
	Alternating Current (AC)
	Protection rating 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.
	Certified safety The inverter complies with the requirements of the Equipment and Product Safety Act in Europe.
	Australian mark of conformity
	Korean mark of conformity

3 Product Description

The Sunny Tripower is a multi-string inverter which converts the DC current of a PV generator into AC current. To do this, it is equipped with 2 separate MPP trackers which can be connected to different PV modules. Power is fed to the public grid in 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.

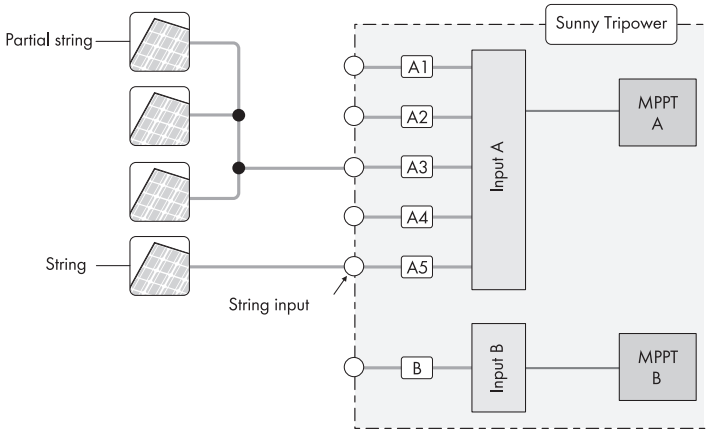
In addition, Sunny Tripower is equipped with the features described below.

3.1 Overvoltage Protectors Type II

Alongside the standard, thermally controlled varistors, the Sunny Tripower is equipped with module plug-in slots for connecting additional overvoltage protectors of type II. The modules are monitored when plugged in. If a module triggers, a warning will come up on the display or in the 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 Auto-adaptive Identification of String Failure

The Sunny Tripower is equipped with a system which recognizes total failure of individual strings or part-strings (see following figure). For this system to function reliably, at least 2 string inputs on the Sunny Tripower must be occupied. With a PV module system of approx. 1 A, monitoring of up to 6 part-strings per string input is possible. One advantage of this system is that its auto-adaptive function completely eliminates the necessity of any configuration. A learning curve of approx. 14 days from initial activation is required by the Sunny Tripower in moderate irradiation. If string failure occurs, a warning will come up on the display or in the external communication (e.g. Sunny WebBox or Sunny Explorer).



3.3 Electronic string fuse

The Sunny Tripower is equipped with an electronic string fuse. It prevent dangerous reverse currents in the PV generator 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 such defects and short-circuits the PV generator. 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 get the full benefit of this function, it is crucial to take great care during commissioning of the device (see Section 6.4 "Connection of the PV Generator (DC)" (page 31)). The Sunny Tripower warns about 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 feeding and grid safety management

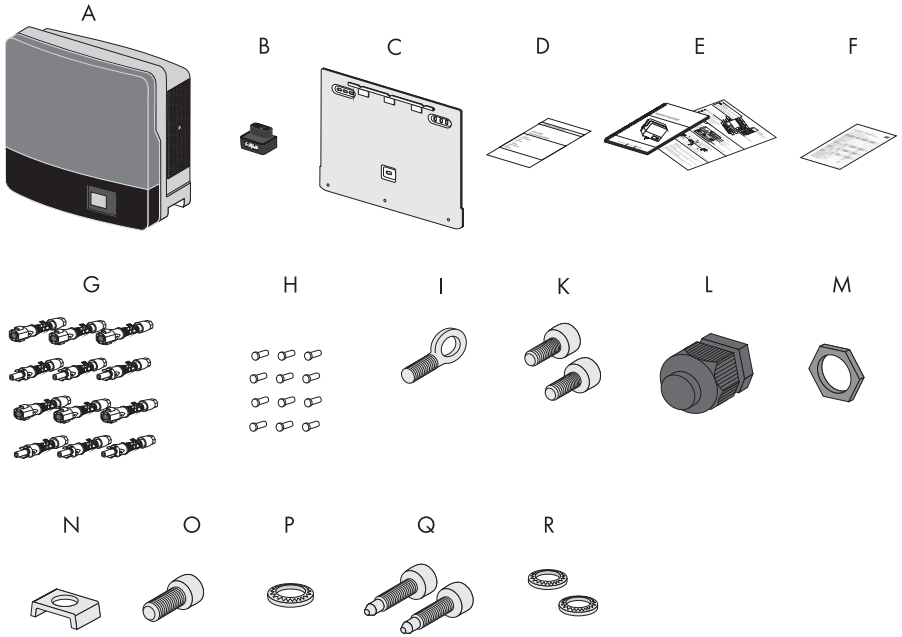
Sunny Tripower inverters are capable of utilizing reactive power and can feed reactive power to the grid by setting a default value for the displacement power factor (cos ϕ). Moreover, these inverters are equipped with extended grid management functions, e.g. power limiter and dynamic grid support. These functions can be activated and configured depending on the requirements of the utility operator.

Detailed information on the setting parameters of this function is available in the Technical Description "Sunny Tripower reactive power feeding and grid safety 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	Number	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	Supplement with the factory settings of the inverter
—	1	Installation guide for RS485 communication module (optional)

Object	Number	Description
Contents of Sunclix DC plug connector bag		
G	10/12	DC plug connector Sunny Tripower 8000TL/10000TL/12000TL: 10 units (5 x plus, 5 x minus) Sunny Tripower 15000TL/17000TL: 12 units (6 x plus, 6 x minus)
H	10/12	Sealing plug Sunny Tripower 8000TL/10000TL/12000TL: 10 units Sunny Tripower 15000TL/17000TL: 12 units
Contents of inverter accessories bag		
I	1	Eyebolt (M5) to secure the Sunny Tripower to the rear panel
K	2	Cylinder head screws: (M5x10) to fix the enclosure to the rear panel
L	1	Cable gland for AC connection
C	1	Counternut for cable gland at AC connection
N	1	Terminal clamp (M6) for additional ground
O	1	Cylinder head screw (M6) for ground terminal
p	1	Lock washer (M6) for ground terminal
Q	2	Cylinder head screws (M5x20) for upper lid
R	2	Lock washers (M5) for lid screws (spares)

4.2 Identifying the Inverter

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

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

5 Installing the Device

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 install the inverter in areas where highly flammable materials are stored.
- Do not install inverters 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 rear panel, use fastening material suitable for the mounting surface.
- Two people are needed to mount the inverter.

CAUTION!

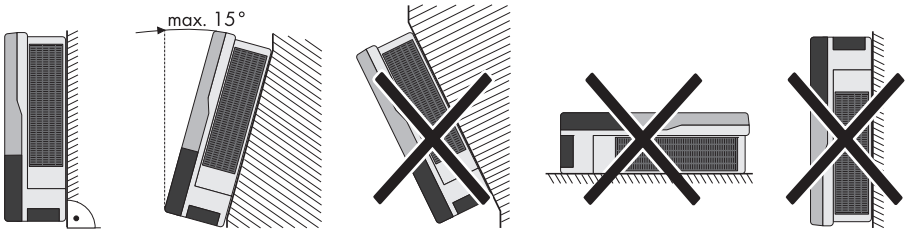
Danger of burn injuries due to hot enclosure parts!

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

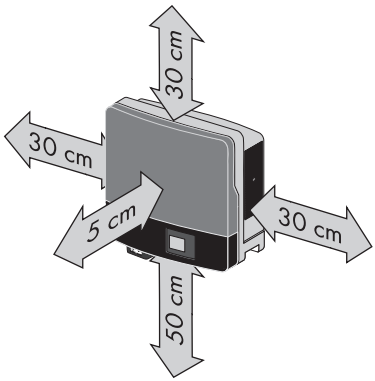
5.2 Selecting the Mounting Location

Consider the following points when selecting where to install:

- The installation method and location must be suitable for the inverter's weight and dimensions (see section 14 "Technical Data" (page 99)).
- Mount on a solid surface.
- It must be possible to access the installation location freely and safely at all times without the need for additional tools such as scaffolding or lifting platforms. Service actions are otherwise limited.



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



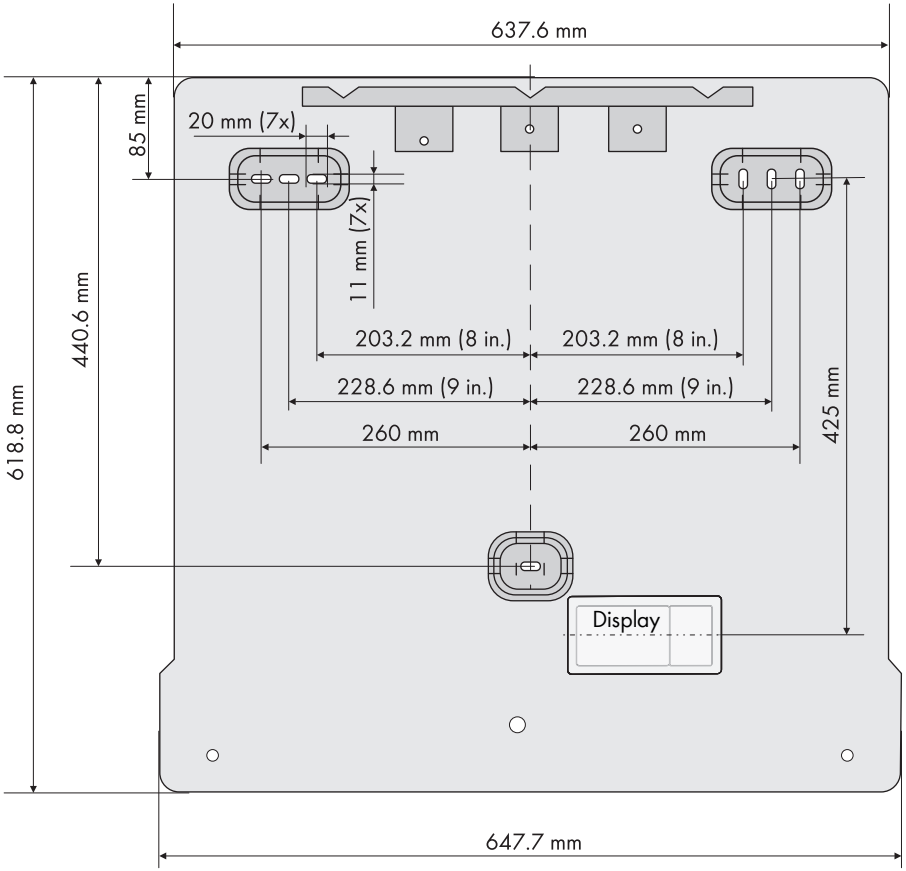
Multiple inverters installed in areas with high ambient temperatures

There must be sufficient clearance between the individual inverters so that the cooling air from the adjacent inverter is not drawn in.

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

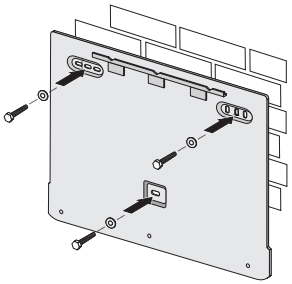
5.3 Mounting the Inverter with Rear Panel

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

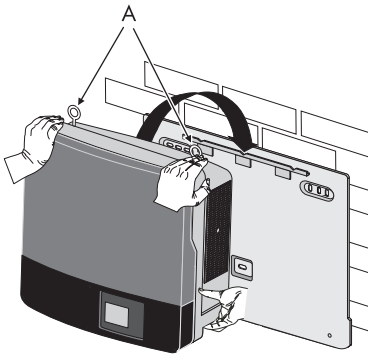


2. Mount the rear panel.

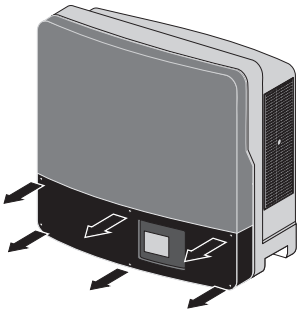
   Use 1 upper hole on the right and on the left and the hole in the middle.



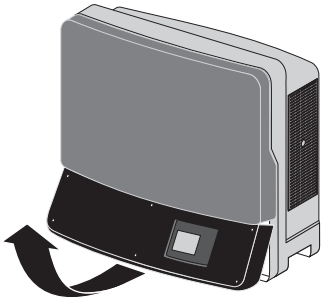
3. Attach the inverter to the rear panel so that the enclosure of the inverter is flush with the rear panel.
   - For two people to transport the inverter, each person must use the recessed grips underneath and at the same time take a hold of the upper edge of the lid.
   - When transporting with a crane,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



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

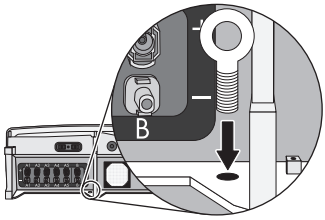


6. Lift the lower lid upwards and remove it.

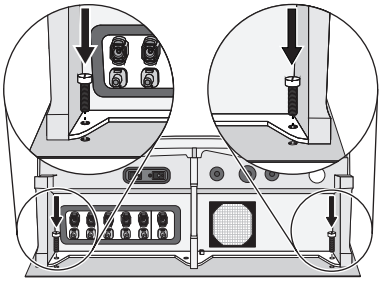


7. Screw the eye bolt supplied into the hole provided to secure the enclosure from being lifted off.

   Only tighten the eyebolt hand-tight.



8. Using the two M5x10 cylinder head screws provided, secure the enclosure on the underside to prevent the enclosure from being lifted off the rear panel (for torque, see section 14 "Technical Data" (page 99)).

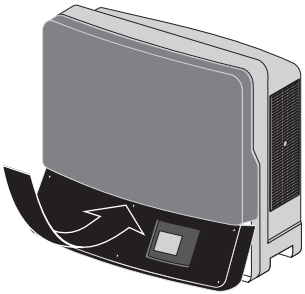


9. Ensure the inverter is firmly fastened.

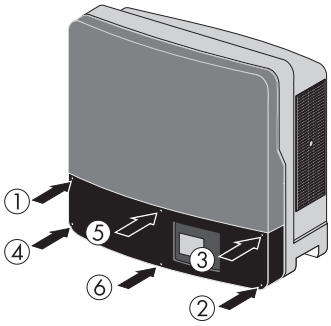
☑ The inverter is now securely mounted to the wall.

If the inverter does not need to be connected immediately, re-attach the lower lid.

– Attach the lower lid so that it is at an angle. Ensure that the captive screws protrude.



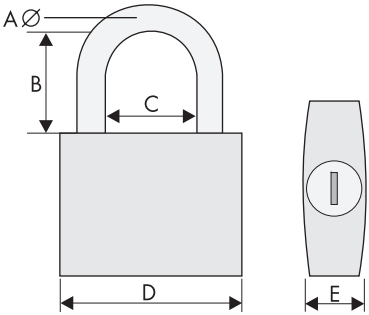
– Pre-screw all 6 screws and then tighten them in the sequence shown on the right (see section 14 "Technical Data" (page 99)).



Optional Theft Protection

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

The lock must meet the following requirements:

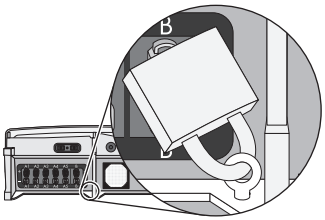


- Size:
  A: 6 – 8 mm diameter
  B: 23 – 29 mm
  C: 23 – 28 mm
  D: 39 – 50 mm
  E: 13 – 18 mm
- Stainless
- Hardened shackle
- Secured lock cylinder

Storage of the key

Store the key carefully for possible service purposes.

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



☑ The inverter is now protected against theft.

6 Electrical Connection

6.1 Safety

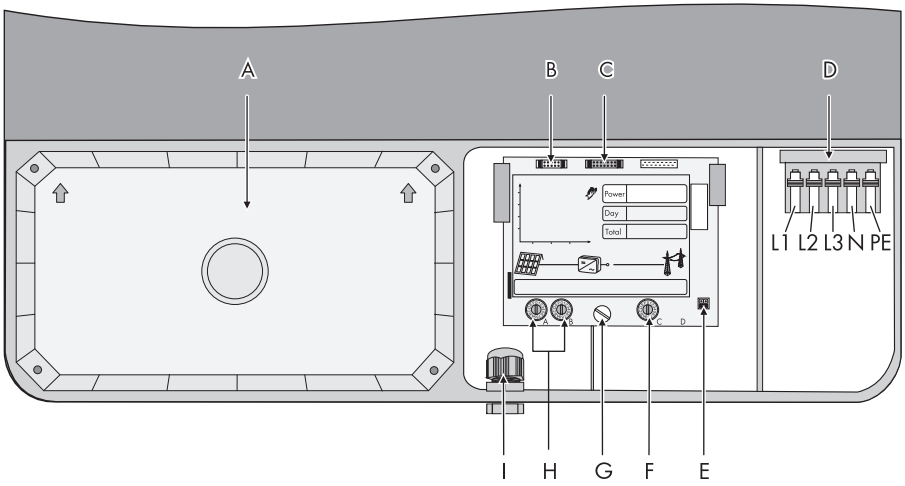
NOTICE!

Electrostatic discharge can damage the inverter.

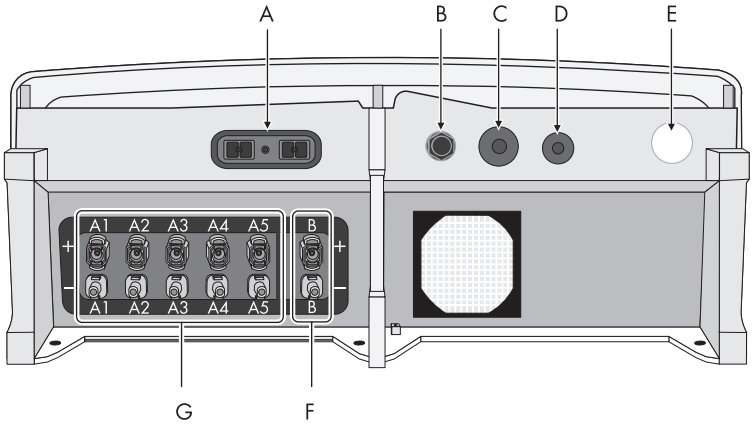
Internal components of the inverter can be irreparably damaged by static discharge.

- Ground yourself before touching a component.

6.2 Overview of the Connection Area



Object	Description
A	DC lid (slots for overvoltage protectors and varistors are located here)
B	Plug for connecting the multi-function relay
C	Plug for connecting the RS485 communication module (optional)
D	Clamp for power supply line
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 opening for the multi-function relay (M20, 5 mm ... 13 mm)



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

6.3 Connecting the Public Grid (AC)

6.3.1 Conditions for the AC Connection

You must comply with the connection requirements of your utility operator.

Residual current breaker

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

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

Cable Sizing

The grid impedance of the AC cable must not exceed 1 Ohm. Otherwise, the inverter will disconnect at full feed capacity due to excessive voltage at the feed-in point.

Dimension the conductor cross-section with the help of the "Sunny Design" design program (www.SMA.de/en) in such a way that the conduction loss at nominal power does not exceed 1 %.

The maximum cable lengths relative to the conductor cross-section are shown in the following table. Do not exceed the maximum cable length.

Conductor cross section	Max. cable length				
	STP 8000TL-10	STP 10000TL-10	STP 12000TL-10	STP 15000TL-10	STP 17000TL-10
6.0 mm²	60 m	53 m	43 m	35 m	31 m
8.0 mm²	80 m	70 m	58 m	46 m	41 m
10.0 mm²	100 m	88 m	73 m	58 m	52 m
16.0 mm²	1160 m	141 m	116 m	93 m	83 m

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 under 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 cable cross section of at least 10 mm² Cu.

or

- Installation of a second protective conductor on the ground terminal with the same cross section as the original productive conductor on the AC terminal (see section 6.3.3 "Connecting the Second Protective Conductor" (page 30)).

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

Load Disconnection Unit

You must install a **separate three-phase** circuit-breaker for each inverter in order to ensure that the inverter can be safely disconnected under load. The maximal permissible rating is located in section 14 "Technical Data" (page 99)

DANGER!

Danger to life due to fire!

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

- Never connect several inverters to a single line circuit breaker.
- Install a separate line circuit breaker for each phase.
- Comply with the maximum permissible fuse protection of the inverter when selecting the circuit breaker.

DANGER!

Danger to life due to fire!

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

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

NOTICE!

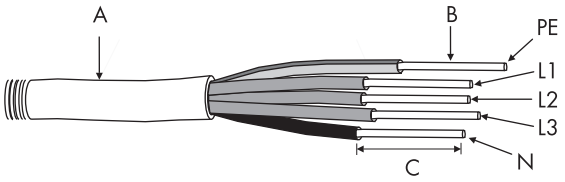
Damage to the inverter by using screw type fuse elements as a load disconnection unit!

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

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

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

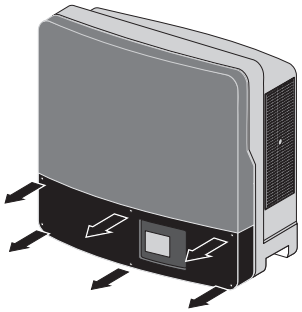
Cable Requirements



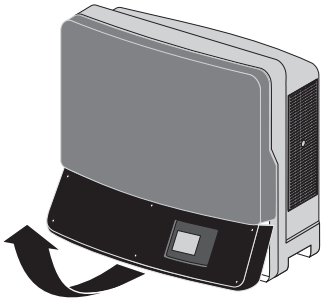
Position	Name	Value
A	Cable diameter	14 ... 25 mm
B	Conductor cross section	1.5 ... 16 mm², with bootlace ferrule max. 10 mm²
C	Strip insulation	Approx. 12 mm
The PE wire must be 5 mm longer than the L and N conductors!		

6.3.2 AC Connection Procedure

1. Check the grid voltage and compare it with the permissible voltage range (see section 14 "Technical Data" (page 99)).
2. Disconnect the line circuit breaker from all 3 phases and and prevent it from being reactivated.
3. Loosen all 6 captive screws of the lower lid.



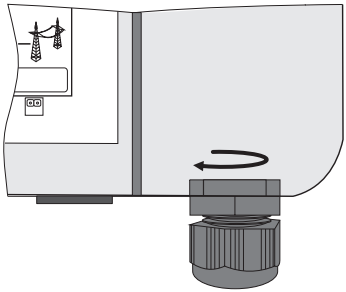
4. Lift the lower lid upwards and remove it.



5. Check the correct country setting of the inverter using the supplement provided against 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 48).

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 counternut.



8. Pull the cable through.
9. Raise the AC clamp terminals as far as they will go.

NOTICE!

Risk of fire when connecting 2 conductors!

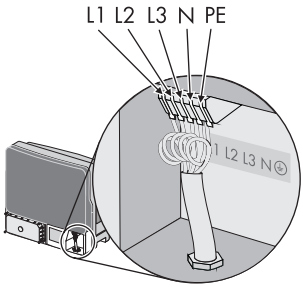
If 2 conductors are connected to one terminal, a poor electrical contact can result in overheating or a risk of fire.

- Never connect more than one conductor per terminal.

10. Connect L1, L2, L3, N and the protective conductor (PE) to the AC terminal in accordance with the label.

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

    L and N must not be swapped.



CAUTION!

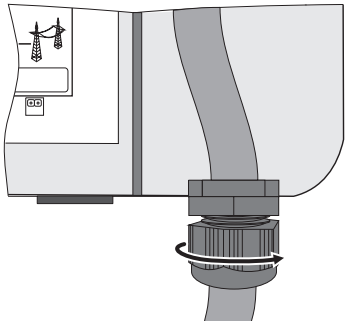
Danger of crushing when terminals snap shut!

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 cap nut tightly on to the cable at the feed-through.



DANGER!

Danger to life due to high voltages in the inverter!

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

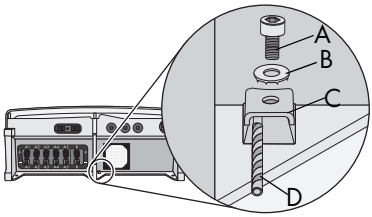
6.3.3 Connecting the Second Protective Conductor

If required in the installation country, the ground terminal can be used to connect a second protective conductor.

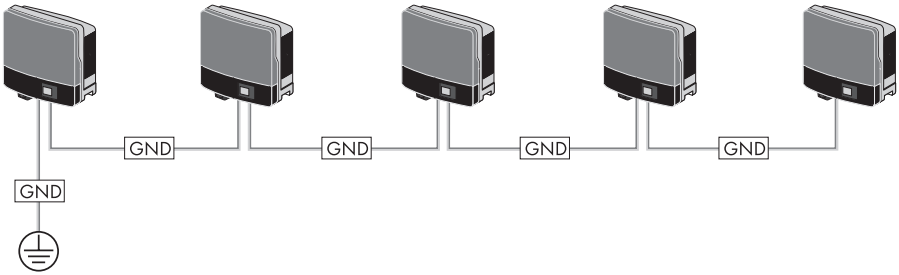
Procedure

1. Take terminal clamp, cylinder head screw (M6) and lock washer (M6) out of the accessory pack.
2. Insert the stripped ground cable (D) under the terminal clamp (max. cross section 16 mm²).
3. Screw terminal (C) tight with bolt (A).

   The toothing of the lock washer (B) must face toward the terminal clamp.



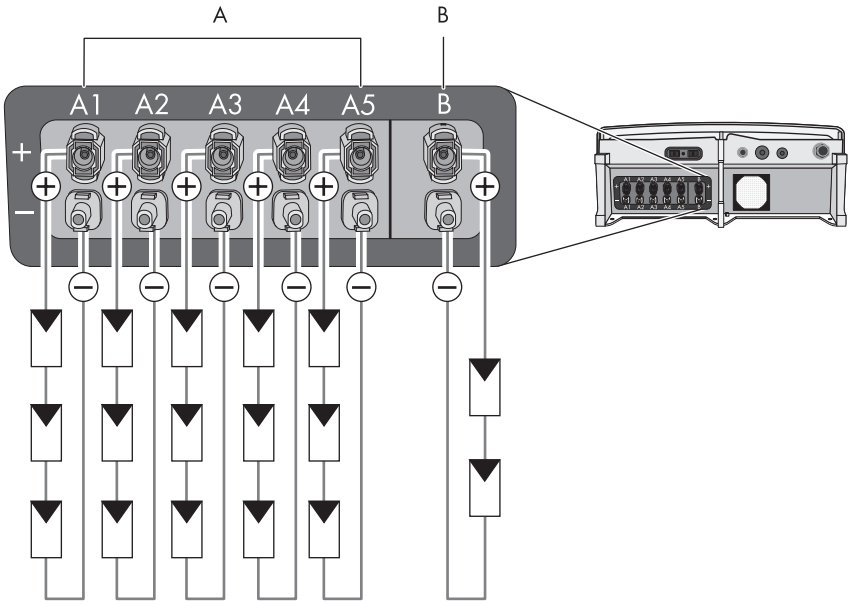
You can ground multiple inverters as shown in the diagram below:



6.4 Connection of the PV Generator (DC)

6.4.1 Conditions for the DC connection

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



At input zone A up to 4 (Sunny Tripower models 8000TL/10000TL/12000TL) or 5 strings (Sunny Tripower models 15000TL/17000TL) respectively can be connected. At input zone B, 1 string can be connected.

- For input zone A, the connected modules have the following requirements:
  - Same type
  - Same number
  - Identical alignment
  - Identical tilt
- The connection cables of the PV modules must be equipped with plug connectors. You will find the necessary DC plug connectors for the DC connection in the delivery.

Use of Adaptors

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

- The DC current flow may not be interrupted via adaptors.
- Disconnect the inverter, as described in section 8 "Disconnecting the Inverter" (page 66).

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

Sunny Tripower	Max. input voltage (DC)	Max. input current (MPP) (DC)	Max. short-circuit current (DC)	Max. short-circuit current per string input (DC)
		Input zone A/B	Input zone A/B	A1 ... A5/B
8000TL	1 000 V	22.0 A/11.0 A	33 A/12.5 A	33 A/12.5 A
10000TL	1 000 V	22.0 A/11.0 A	33 A/12.5 A	33 A/12.5 A
12000TL	1 000 V	22.0 A/11.0 A	33 A/12.5 A	33 A/12.5 A
15000TL	1 000 V	33.0 A/11.0 A	50 A/12.5 A	33 A/12.5 A
17000TL	1 000 V	33.0 A/11.0 A	50 A/12.5 A	33 A/12.5 A

WARNING!

Risk of fire as a result of overcurrent on the string input! Irreparable damage to the Sunny Tripower.

Because the electronic string fuse shorts the PV generator when a fault occurs, the following limiting values may not be exceeded for the maximum short-circuit current per string input. 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 modules observe the above-mentioned limiting values.

- At installation, the DC input voltage should be at least 188 V (see section 14 "Technical Data" (page 99)). This will ensure 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 with the PV generator due to a failure to detect reverse currents!

The integrated electronic string fuse monitors the PV generator and protects it against dangerous reverse currents. To activate the electronic string fuse, proceed as follows when connecting the strings:

- If more than 2 strings are connected to the inverter, **ALWAYS INITIALLY connect the first string to input B**.

No mixed connections between input zones

For instance, if the positive pole of a string is connected at input zone A and the negative pole at input zone B, this is called a mixed connection.

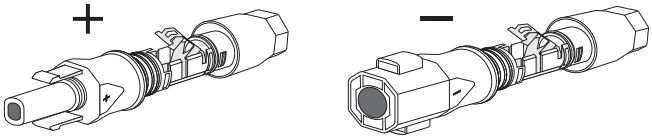
Only connect strings at one input zone and never mix the input zones A and B! Otherwise, the electronic string fuse cannot fulfill its function.

Furthermore, the inverter in this case no longer fulfills the requirements of the EMC Directive (Directive on the **e**lectro**m**agnetic **c**ompatibility of a device) and therefore loses its operation license.

6.4.2 Assembling the DC plug connector

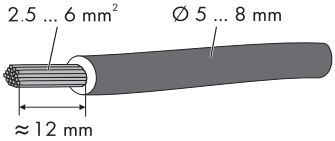
The connection cables of the PV modules must be equipped with the DC plug connectors provided for connecting the inverter.

To assemble the DC plug connectors, proceed as follows: Make sure the plug connectors have the correct polarity. The DC plug connectors have the symbols "+" and " – ".



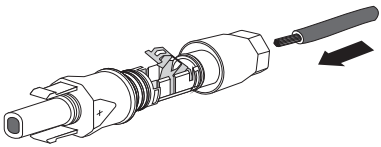
Cable Requirements

- Use a PV1-F cable.

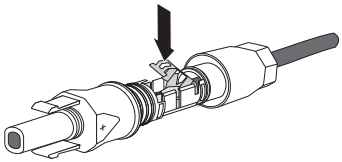


Procedure

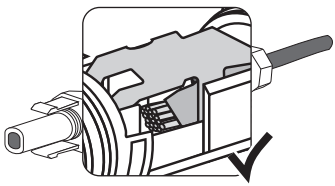
1. Insert the stripped cable into the plug connector as far as it will go.

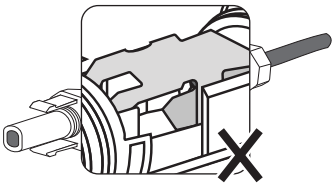
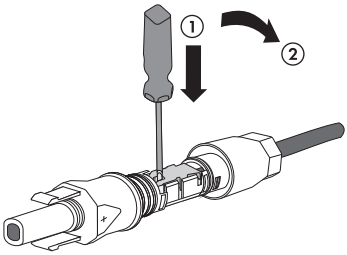


2. Press the clamping bracket down until it audibly snaps into place.

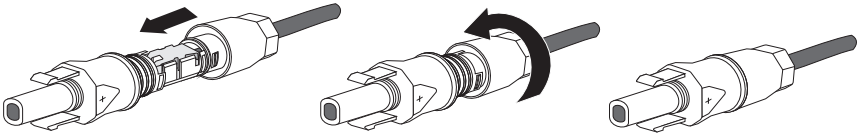


3. Ensure the cable is correctly in place.

Result	Action
☑ If the conductors are visible in the hollow cavity of the clamp, the cable is in the correct position. 	• Proceed to step 4.

Result	Action
☑ If the conductors are **not** visible in the hollow cavity of the clamp, the cable is not in the correct position. 	• Loosen the terminal clamp. Use a screwdriver with a width of 3.5 mm.  • Remove the cable and start again from step 1.

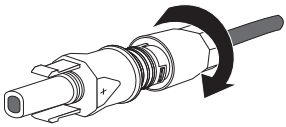
4. Push the threaded joint to the thread and screw into place with a torque of 2 Nm.



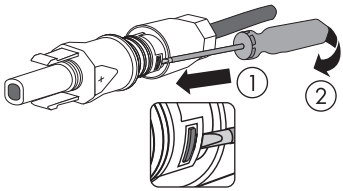
☑ The DC plug connectors are now assembled and can be connected to the inverter as described in section 6.4.4 "Connecting the PV Generator (DC)" (page 37).

6.4.3 Opening the DC Plug Connector

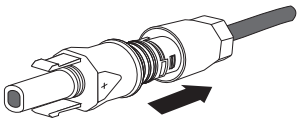
1. Screw the threaded joint off.



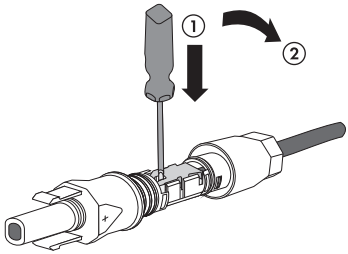
2. To release the plug, slot a screw driver into the side catch mechanism and lever out. Use a screwdriver with a width of 3.5 mm.



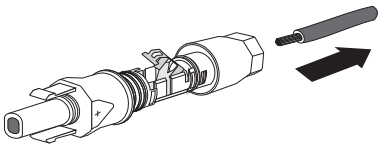
3. Carefully pull apart the DC plug connector.



4. Loosen the terminal clamp. Use a screwdriver with a width of 3.5 mm.



5. Remove cable.



☑ The cable is removed from the DC plug connector.

6.4.4 Connecting the PV Generator (DC)

DANGER!

Danger to life due to high voltages in the inverter!

- Before connecting the PV generator, ensure that the AC line 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 generator. If installation has not been carried out correctly (e.g. poles reversed) or a string is faulty, the electronic string fuse will short the PV generator and the Sunny Tripower will start beeping.

- 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 12.1 "Sunny Tripower is beeping" (page 88).

NOTICE!

Destruction of the inverter by overvoltage!

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

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

NOTICE!

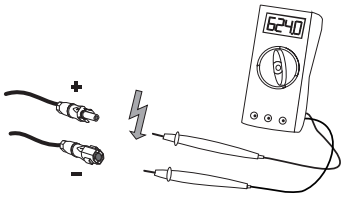
Excessive voltages can destroy the measuring device!

- 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 that the maximum input voltage of the inverter is not exceeded.

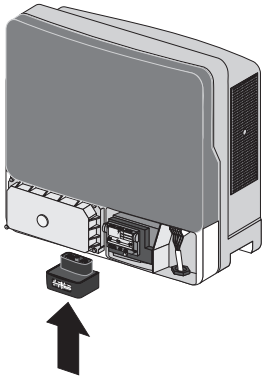
   With an ambient temperature over 10 °C, the open circuit voltage of the PV modules should not exceed 90 % of the maximum input voltage of the inverter. Otherwise, check the system design and the PV module connection!

   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 12.2 "Checking the PV Array for a Ground Fault" (page 89).
3. Check the Electronic Solar Switch for wear, as described in section 9.2 "Checking the Electronic Solar Switch (ESS) for wear" (page 76) and attach it only if it is in perfect condition.

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



NOTICE!

Risk of fire with the PV generator due to a failure to detect reverse currents!

The integrated electronic string fuse monitors the PV generator and protects it against dangerous reverse currents. To activate the electronic string fuse, proceed as follows when connecting the strings:

- If more than 2 strings are connected to the Sunny Tripower, **ALWAYS INITIALLY connect the first string to input B**.

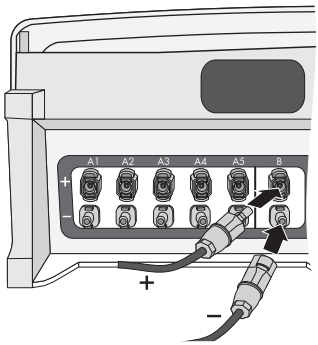
Use of external string collection boxes

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

4. Check the first DC plug connector to ensure correct polarity and connect (at input B if more than 2 strings are connected to the inverter).
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.



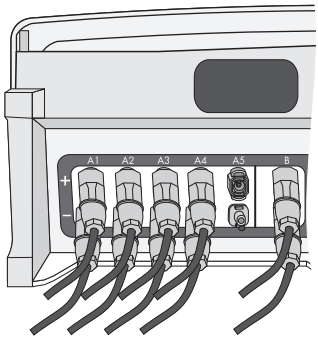
Proceed according to the instructions given in the following table:

Event	Action
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 16 "Contact" (page 125)).

Event	Action
The Sunny Tripower starts beeping.	The Sunny Tripower short-circuits the PV generator. • **On no account** disconnects the Electronic Solar Switch or the DC plug connectors. Wait until the Sunny Tripower stops beeping (in darkness). If you pull out the DC plug connectors, there is a risk of an electric arc, since the Sunny Tripower shorts the PV generator in order to prevent reverse currents flowing through individual strings. Depending on the irradiation intensity, strong currents can be generated. However, the PV generator and the Sunny Tripower are in a safe state. • Before you leave the Sunny Tripower, install a contact barrier (e.g. a fence boundary) and moisture protection (e.g. tarpaulin). • Wait until dark before pulling out the Electronic Solar Switch and any DC plug connectors, and eliminate any errors (e.g. reversed poles or defective string).
The display shows error message 40, 64 or 82.	• Follow the instructions on the display. For more detailed information, see section 11.2 "Error Messages" (page 79).

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

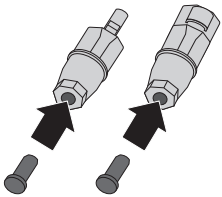
   It is no longer necessary to wait 30 seconds.

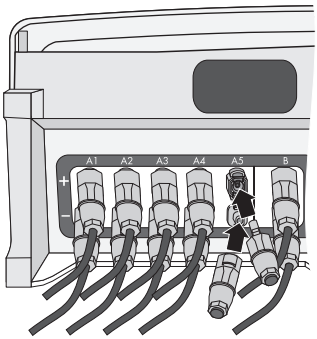


Number of Strings - Sunny Tripower 8000TL/10000TL/12000TL

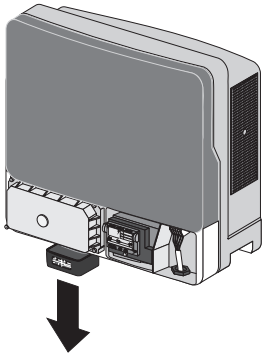
The Sunny Tripower models 8000TL/10000TL/12000TL only have 4 strings at input A!

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 plug 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, you can disconnect the Electronic Solar Switch.
   ☑ The display switches off.



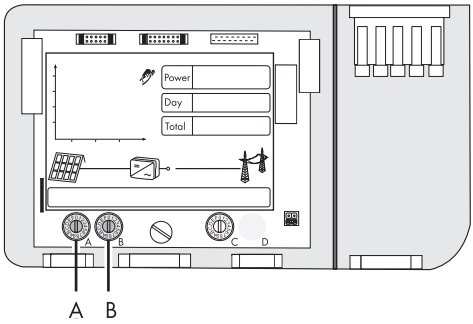
☑ You can now commission the inverter as described in section 7 "Commissioning" (page 57). The following connections and settings are optional:

6.5 Setting the Country Standard and Display Language

The inverter can be configured for various countries. This can be done via two rotary switches in the inverter or by configuring the "CntrySet" and/or "Set Country Standard" parameter using a communication device (e.g. Sunny WebBox or Sunny Explorer).

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, these settings will be overwritten and cannot be automatically restored. For devices ordered without any specified country of installation, the standard setting is "VDE0126-1-1" and the language is German.

Changes will be immediately accepted after switching the line circuit breaker on. If an un-programmed switch setting is selected, the inverter issues an error message.



Grid Guard Protected Country Data Sets

In some countries, the local power supply line requirements demand a mechanism which prevents the parameters for grid feeding from being able to be changed. Some country data sets are therefore protected and can only be unlocked with a personal access code, the so-called SMA Grid Guard code.

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, 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 lock, you have to set the so-called SMA Grid Guard code to "54321". This will automatically appear as an input window when changing the first grid-relevant parameter. 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 grid-feed hours. The application form for the personal access code can be found in the download area at www.SMA.de/en in the category "Certificate" of the respective inverter. The language is configurable without a password independent of the country data set.

Changing of parameters in 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 grid-feed 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

Detailed information on how to proceed with respect to setting and changing parameters is available in the respective 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.

1. Check that the country standard is correct on the basis of the display message during (re-)commissioning (see section 7 "Commissioning" (page 57)), or by means of the "SMA Grid Guard" measuring channel via a communication device.
2. If necessary, change the setting via the parameter "CntrySet" and/or "Set Country Standard" using the communication device or the rotary switches (see section 6.5.3 "Setting the Country Standard and Language using Rotary Switches" (page 48)) according to the following table.

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 the 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 parameter is available in the download area at www.SMA.de/en in the category "Technical Description" of the respective inverter.

(A)	(B)	Country data set	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
0	6	Retained	Not programmed***	Dependent on parameter set	Dependent on parameter set
0	7	Retained	Not programmed***	Dependent on parameter set	Dependent on parameter set
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

(A)	(B)	Country data set	Display language	Grid Guard protection	Country
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*	Not programmed***	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	EN 50438*	German	Yes	Various EU countries
6	1	EN 50438*	English	Yes	
6	2	EN 50438*	French	Yes	
6	3	EN 50438*	Italian	Yes	
6	4	EN 50438*	Spanish	Yes	
6	5	EN 50438*	Not programmed***	Yes	
6	6	EN 50438*	Not programmed***	Yes	
7	4	PPDS*	Not programmed***	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
7	A	C10/11*	German	Yes	Belgium
A	0	MVtg Directive*	German	Yes	Germany
A	1	MVtg Directive*	English	Yes	Flexible
A	2	MVtg Directive*	French	Yes	France
A	3	MVtg Directive*	Spanish	Yes	Spain
A	4	MVtg Directive*	Not programmed***	Yes	Czech Republic
A	8	CN/CGC/ GF001:2009**	English	No	China
B	0	MVtg Directive int*	German	Yes	Germany
B	1	MVtg Directive int*	English	Yes	Flexible
B	2	MVtg Directive int*	French	Yes	France

(A)	(B)	Country data set	Display language	Grid Guard protection	Country
B	3	MVtg Directive int*	Spanish	Yes	Spain
B	4	MVtg Directive int*	Not programmed***	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	Not programmed***	No	Flexible
C	6	Customer	Not programmed***	No	Flexible
D	0	Off-grid 60 Hz**	English	No	Flexible
D	1	Off-grid 60 Hz**	German	No	Flexible
D	2	Off-grid 60 Hz**	French	No	Flexible
D	3	Off-grid 60 Hz**	Spanish	No	Flexible
D	4	Off-grid 60 Hz**	Italian	No	Flexible
D	5	Off-grid 60 Hz**	Not programmed***	No	Flexible
D	6	Off-grid 60 Hz**	Not programmed***	No	Flexible
E	0	Off-grid 50 Hz**	English	No	Flexible
E	1	Off-grid 50 Hz**	German	No	Flexible
E	2	Off-grid 50 Hz**	French	No	Flexible
E	3	Off-grid 50 Hz**	Spanish	No	Flexible
E	4	Off-grid 50 Hz**	Italian	No	Flexible
E	5	Off-grid 50 Hz**	Not programmed***	No	Flexible
E	6	Off-grid 50 Hz*	Not programmed***	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 not programmed. The previously configured display language remains set.

Should the inverter not be set to the installation country, configure it using the 2 rotary switches as described in section 6.5.3 "Setting the Country Standard and Language using Rotary Switches" (page 48).

Alternatively you can adjust the settings via the parameter "CntrySet" and/or "Set Country Standard" using a communication device.

If you require adjusted parameter settings for your installation location, you can change these with the help of a communication device or enter the settings into the inverter via an SD card.

6.5.2 Expansion of shutdown thresholds

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

Sunny Tripower inverters have the additional country data set "MVtgDirective". This parameter expand the deactivation limits of the inverter for voltage and frequency to a maximum/minimum. This country setting may only be selected if the system 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!

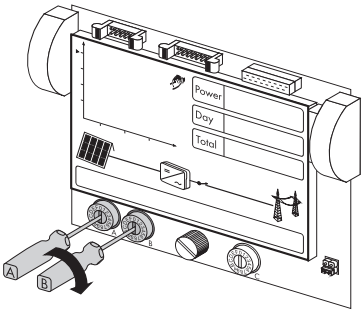
At country setting "MVtgDirective", the inverter may only be operated with an external three-phase decoupling protection device which complies with the country-specific requirements.

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

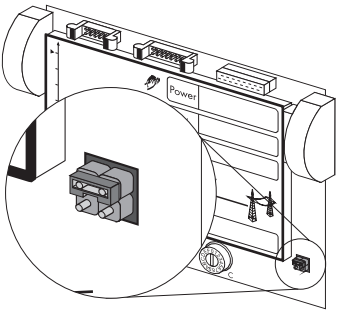
1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 66).
2. Set the arrows on both rotary switches (A and B) using a screw driver (2.5 mm) to the desired positions (see table in section 6.5.1 "Checking the Country Standard" (page 44)).



Jumper for English language.

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 57).

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:

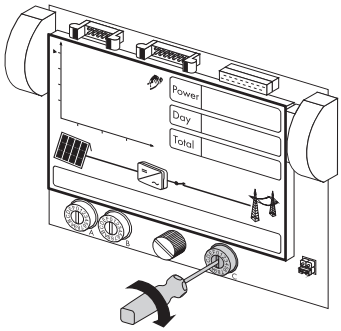
Switch position (NetID)	Setting
0	Off
1	Communication via *Bluetooth* with communication device possible, no networking with other inverters (factory setting)
2 ... F	Networking with other inverters

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). This, however, 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 66).
2. Set the arrow on the rotary switch (C) to the required position using a screwdriver (2.5 mm).



3. Re-commission the inverter as described in section 7 "Commissioning" (page 57).

Acceptance of settings

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

6.6.2 Multi-function relay

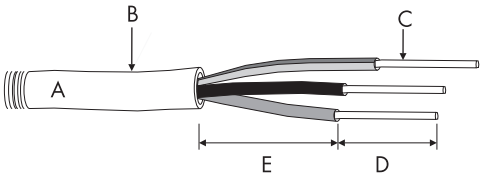
The inverter is equipped with a multi-function relay as standard. This can be activated, for instance, simultaneously with the red error LED beside the display. Other functions are being planned can be later retrofitted via a firmware update.

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

The following table gives you the maximum permissible voltages and currents:

	Voltage	Current
AC	Max. 240 V	Max. 1.0 A
DC	Max. 30 V	Max. 1.0 A

Cable Requirements



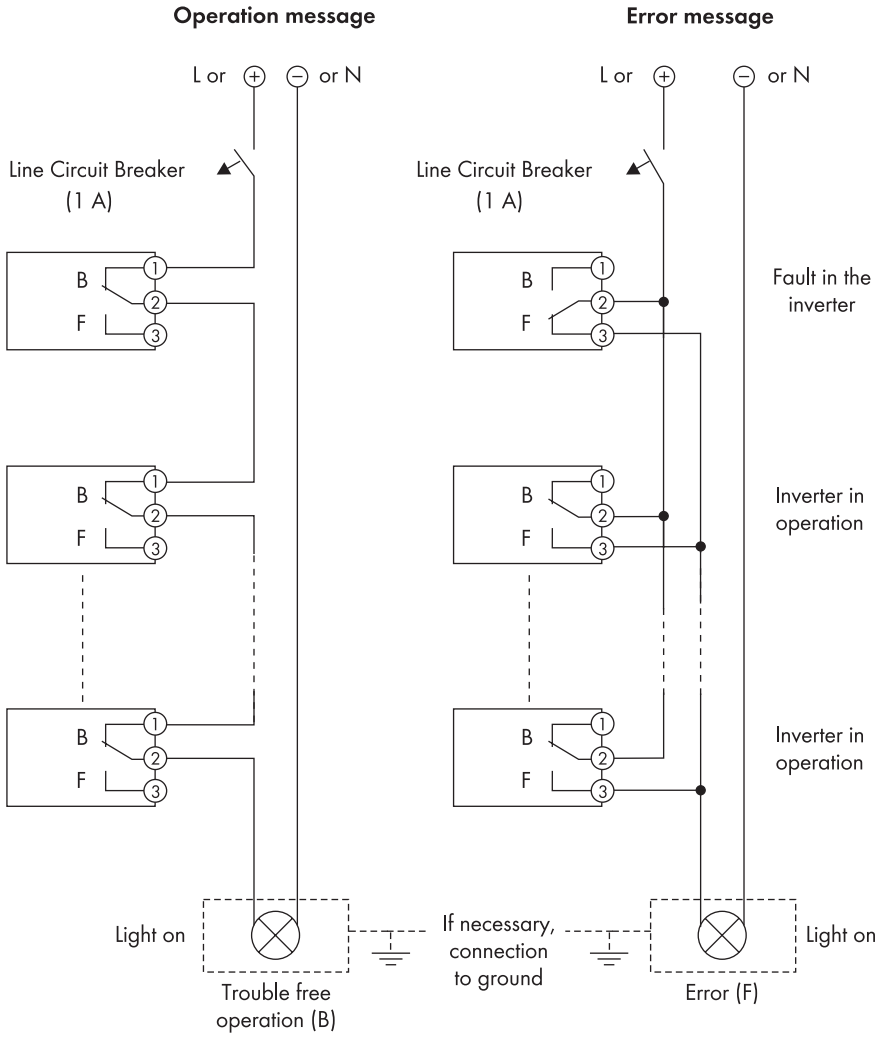
Position	Name	Value
A	Cable type	Double insulated
B	External diameter	5 ... 12 mm
C	Conductor cross section	0.08 ... 2.5 mm²
D	Strip insulation	max. 8 mm
E	Stripping length	max. 15 mm

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

Line Circuit Breaker

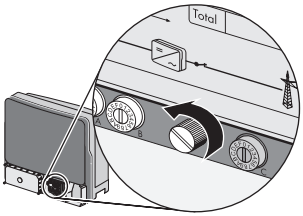
If you are connecting the multi-function relay to the public grid, it must be protected with a separate line circuit breaker.

Connection plan

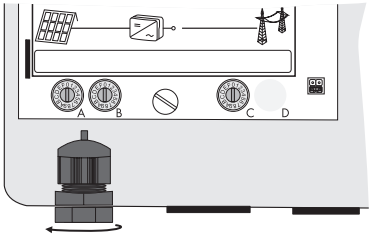


Connection Procedure

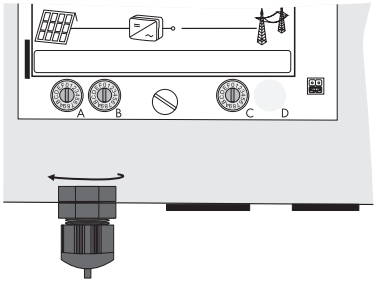
1. Switch off AC and DC supply voltage.
2. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 66).
3. Loosen the display screw and raise the display until it snaps into place.



4. Unscrew outer counternut and remove cable gland from the cable feed-through.



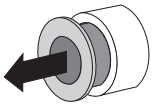
5. Reinsert the cable gland from the outside and tighten it with the counternut from the inside.



6. Slightly release the cap nut from the screw gland and remove the blank plug from the cable feed-through.
7. Insert the cable into each inverter.

Seal in screw fitting

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



The following guideline values apply:

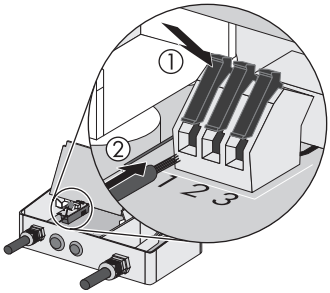
- Cable cross section with both seals: 5 - 8 mm
- Cable cross section with outer seal only: 8 - 13 mm

DANGER!

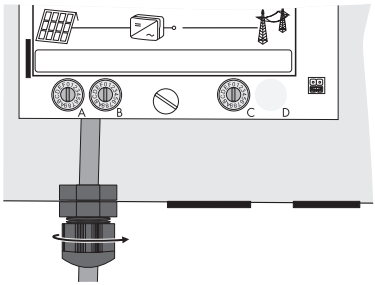
Danger to life due to high voltages in the inverter!

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

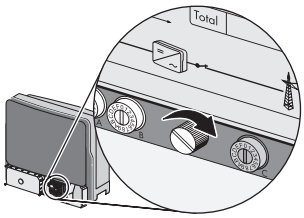
8. Strip max. 8 mm off the insulated conductors.
9. Press the terminals backwards and connect the insulated conductors as shown in the connection plan on page 51 (depending on whether you require an operating or an error message).



10. Screw cap nut tightly back onto the screw fitting in the cable feed-through.



11. Fold down the display and screw it tightly.



12. Re-commission the inverter as described in section 7 "Commissioning" (page 57).
13. Switch on supply voltage.

☑ The multifunction 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 wiring diagram and installation description can be found in the communication module manual.

6.7 Retrofitting Overvoltage Protectors Type II

The inverter can be equipped ex works with overvoltage protectors, or they can be retrofitted at a later time. The order number for both retrofit kits (one for input A, one for input A and B) can be found in section 15 "Accessories" (page 124).

To carry out retrofitting, proceed as follows:

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 66).

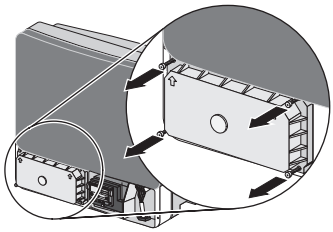
DANGER!

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

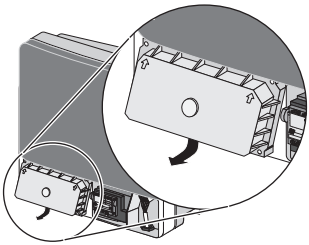
There is residual voltage in the inverter. The inverter requires 10 minutes to discharge.

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

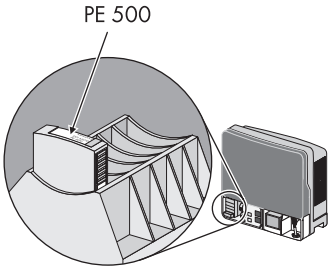
2. Unscrew the captive screws of the DC lid on the left-hand side of the connection area.



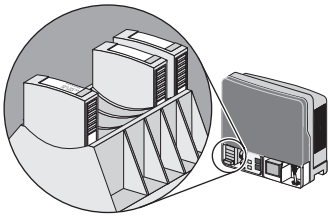
3. Lift the DC lid upwards and remove it.



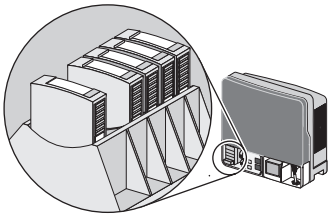
4. Plug all overvoltage protectors into the slots provided until they lock into place with the side latches.
   - The overvoltage protector marked "PE 500" must be mounted in the lowermost slot.



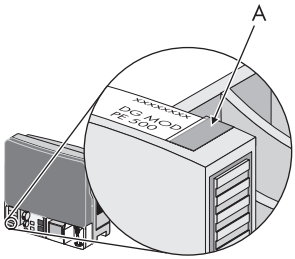
– If overvoltage protectors are only required for input A, the two overvoltage protectors must be mounted in the two upper slots.



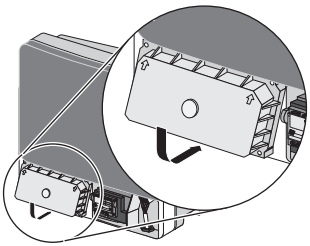
– If input B is also to be fuse-protected, overvoltage protectors must be plugged into all slots.



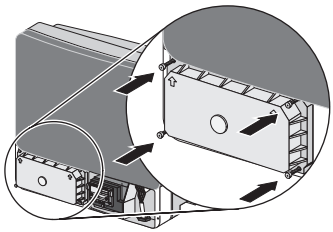
– The green strip in the window (A) signals that the overvoltage protector is in perfect operating condition. A red strip in the window indicates that the overvoltage protector is faulty. A warning also appears in the display with the event number "83".



5. Attach the DC lid so that it is at an angle. Ensure that the captive screws protrude.



6. Pre-screw all 4 screws of the DC lid and then tighten them (for torque, see section 14 "Technical Data" (page 99)).

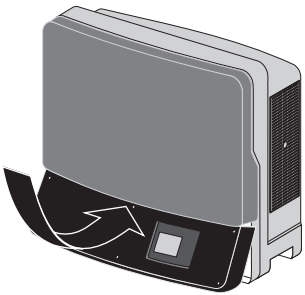


☑ The overvoltage protectors are now installed and the inverter can be put back into operation, as described in section 7 "Commissioning" (page 57).

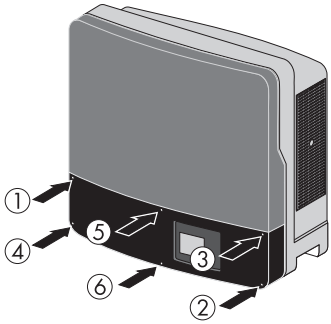
7 Commissioning

7.1 Commissioning the Inverter

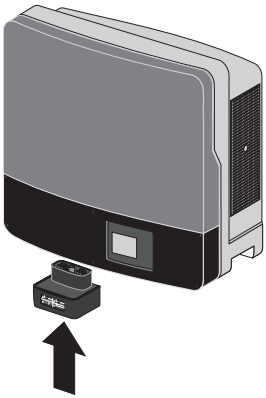
1. Check that the device is fixed securely to the wall.
   (see section 5 "Installing the Device" (page 18)).
2. Check that the country configuration is correct.
   (see section 6.5 "Setting the Country Standard and Display Language" (page 42)).
3. Check that the AC power supply line is correct.
   (see Section 6.3 "Connecting the Public Grid (AC)" (page 26)).
4. Check that the DC lines (PV strings) are assigned correctly.
   (see section 6.4 "Connection of the PV Generator (DC)" (page 31)).
5. Close the DC inputs that are not needed with the corresponding DC plug connectors and blank plugs. (see section 6.4.4 "Connecting the PV Generator (DC)" (page 37)).
6. Close all housing openings.
7. Attach the lower lid so that it is at an angle. Ensure that the captive screws protrude.



8. Pre-screw all 6 screws and then tighten them in the sequence shown on the right (for torque, see section 14 "Technical Data" (page 99)).



9. Firmly connect the Electronic Solar Switch.



10. Switch on the line circuit breaker.
11. Switch on the power supply to the multifunction relay (if applicable).

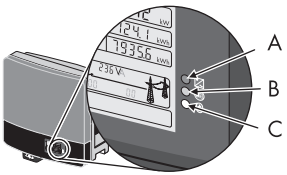
Self-test in accordance with ENEL guideline during initial commissioning (only for Italy)

The Italian standard requires that an inverter can first operate on the public grid when 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 60). 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	Disturbance
C	Blue	*Bluetooth* communication is active



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

The meaning of the illuminated red LED and the meaning of the event numbers on the display are described in section 11.2 "Error Messages" (page 79).

7.2 Display messages during initialization

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

- After an interval of 5 seconds, or after tapping on the 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 country standard is displayed.

- After a further 5 seconds, or when you tap again, the configured language is displayed.

- During normal operation, the text line of the display will subsequently be clear. See Section 11 "Messages" (page 78) 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. Prerequisite here is that the country configuration of the inverter has been set to Italy (Enel-GUIDA) or a reconfiguration based on the Enel-GUIDA country data set has been 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 57).
   ☑ The inverter is now in the initialization 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 on 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 61). 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 protocol. The test results of the individual tests are displayed three times one after the other.

Current 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 begins with 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 achieved 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 Interruption of the Self-Test

If, during the self-test, an unexpected disconnection requirement occurs, the self-test is interrupted. The same applies if the DC voltage is so low that the feed-in can not 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 64).

7.3.4 Restarting the Self-Test

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

1. Disconnect the line circuit breaker from all 3 phases and and prevent it from being reactivated.
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 connect it again.

☑ The inverter is now in the initialization phase and you can restart the self-test, as described in section 7.3.1 "Starting the Self-Test by Tapping" (page 60) from point 3.

7.4 Activating the auto-adaptive string failure detection

The process of auto-adaptive string failure detection is activated on delivery. You can deactivate the string failure detection system by setting a parameter via a communication device (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

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

Resetting operating data of string failure detection

Parameters (DATA I/DATA II+)	Description
Op.PvValRsIstl/ Reset operating data of string failure detection	Restart the learning curve Operating data of string failure detection is reset.

8 Disconnecting the Inverter

8.1 Safety

DANGER!

Danger to life due to high voltages in the inverter! Death resulting from 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!

Danger of burn injuries 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 discharge can damage the inverter.

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

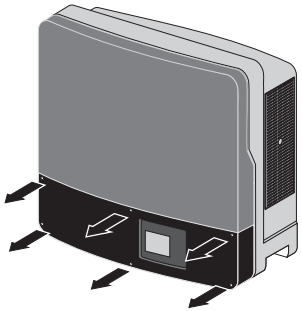
- Ground yourself before touching a component.

8.2 Procedure

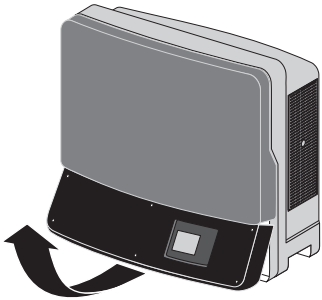
1. Disconnect the line circuit breaker from all 3 phases and and prevent it from being reactivated.
2. If it is connected, switch off the power supply to the multifunction relay and prevent it from switching back on.
3. Check the operating status of the Sunny Tripower:

Event	Action
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 has stopped beeping (after dark) and only then disconnect the Electronic Solar Switch and the DC plugs. • Eliminating errors (see section 12.1 "Sunny Tripower is beeping" (page 88) or section 11.2 "Error Messages" (page 79)
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 LEDs, display and, if applicable, fault indicator have gone out.
5. Loosen all six captive lid screws.

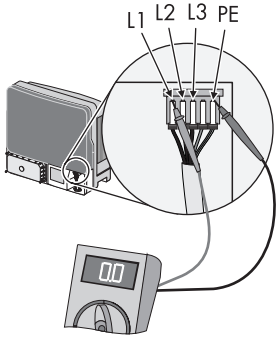


6. Lift the lid upwards and remove it.



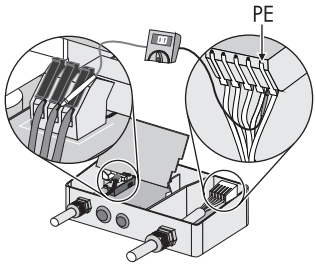
7. Using a suitable voltmeter, test for absence of voltage to ground at the AC terminal. The max. permissible diameter of the probe tip is 2 mm.

   If there is voltage present, check the installation!

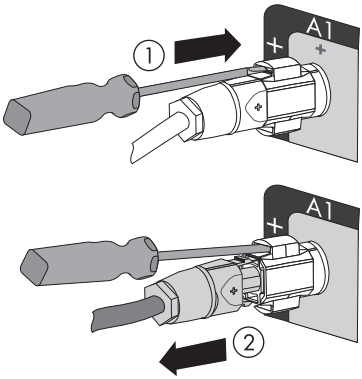


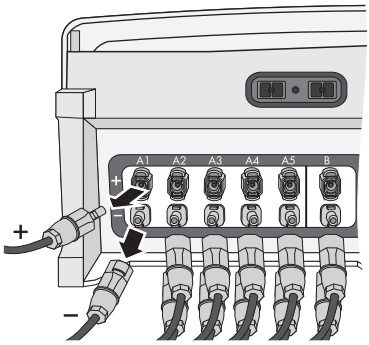
8. Verify the absence of voltage to ground at the multifunction relay.

   If there is voltage present, check the installation!



9. With the help of a screwdriver, remove all DC plug connectors to completely disconnect the PV generator from the inverter. Use a screwdriver with a width of 3.5 mm.





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

DANGER!

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

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

- Wait 10 minutes before you open the upper 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 too high warming (temperature symbol on the display illuminates), this can be caused by the following:

- The air grills on both sides are clogged with dirt particles.

  Clean the air grills as described in the following section.

- 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 air grill.

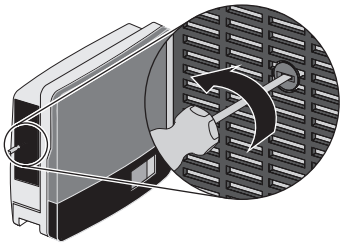
  If the fan enclosure is just covered in loose dust you can clean it with a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, you can dismantle the fan for cleaning, as described in the following sections.

9.1.1 Cleaning the Air Grills

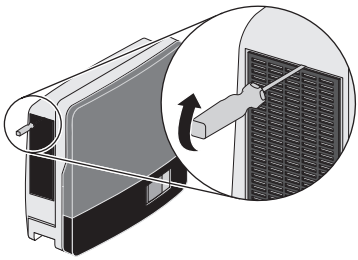
The inverter sucks air in from underneath and on the upper left side and blows it out again via the air grills. Clean the air grills if they are dirty.

Procedure

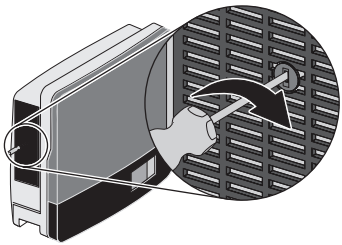
1. Turn the rotary fastener of the air grill in the direction of the arrow until the notch is in a vertical position.



2. Remove the air grills.



3. Clean the air grill with a soft brush, a paint brush, or pressurized air.
4. Re-attach the air grill to the inverter.
5. Turn the notch of the rotary fastener 90 ° once again until it lies horizontally.



NOTICE!

Risk of damage to the inverter if insects enter it!

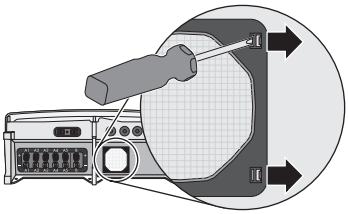
- The air grills must not be removed permanently, because otherwise the device is not protected against the entrance of insects!

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 66).
2. Wait for the fan to stop rotating.

Cleaning the Fan Grills

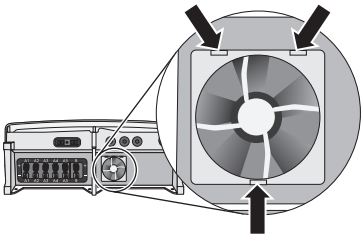
3. Remove the fan grill:
   - Press the two latches on the right edge of the fan grill to the right using a screwdriver and loosen it from the bracket.
   - Carefully remove the fan grill.



4. Clean the fan guard with a soft brush, a paint brush, a cloth or pressurized air.

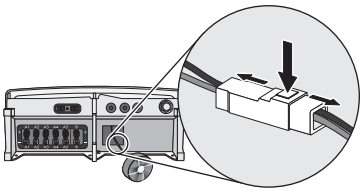
Clean the fan

5. Press the latches together to the middle.
6. Remove the fan by pulling it slowly and carefully downwards.



7. Unlock and remove the plug connectors.

   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 fans and clean them with a soft brush, a paint brush or a cloth and water.

NOTICE!

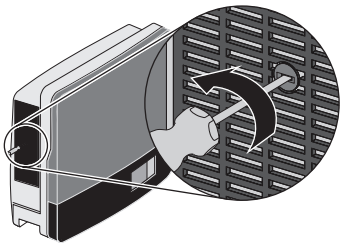
Damage to the fan through the use of pressurized air.

- Under no circumstances should you use pressurized air to clean the fan. This can damaged the fan.

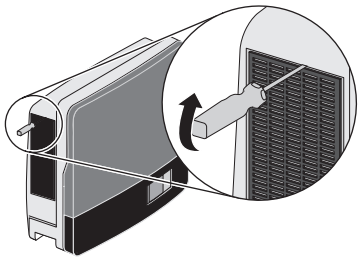
9. After cleaning, assemble everything in reverse order.
10. Check the functioning of the fans as described in section 9.1.4 "Checking the fans" (page 75).

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

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 66).
2. Turn the rotary fastener of the air grill in the direction of the arrow until the notch is in a vertical position.

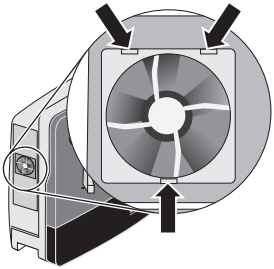


3. Remove the air grills.



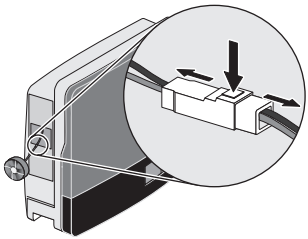
4. Wait for the fan to stop rotating.

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 connectors.

   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 fans and clean them with a soft brush, a paint brush or a cloth and water.

NOTICE!

Damage to the fan through the use of pressurized air.

- Under no circumstances should you use pressurized air to clean the fan. This can damaged the fan.

9. After cleaning, assemble everything in reverse order.
10. Check the functioning of the fans as described in section 9.1.4 "Checking the fans" (page 75).

9.1.4 Checking the fans

Checking the fans

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

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

1. Request the installer password from the SMA Serviceline (contact: see Page 125).
2. In the installer mode set the parameter "CoolSys.FanTst" and/or "Fan Test" to "on" (by means of a communication device).
3. Check the air flow in both fans.

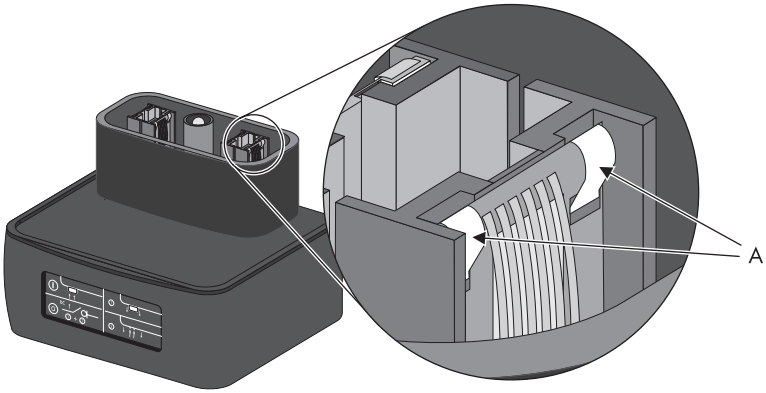
   The inverter sucks air in from underneath and on the upper left side and blows it out again via the air grills. Listen for any unusual noise, which could indicate incorrect installation or that the fans are faulty.
4. After the test, set the parameter "CoolSys.FanTst" and/or "Fan test" back to the "off" position.

☑ The test of the fans has been completed.

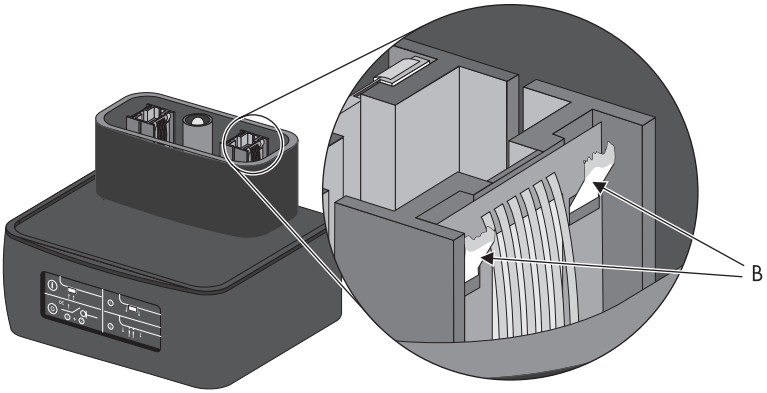
9.2 Checking the Electronic Solar Switch (ESS) for wear

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 15 "Accessories" (page 124)).

10 Slot for SD card

There are a number of cases which require an SD card to be read in, such as:

- Under consultation with the SMA Serviceline, a firmware update is necessary.

  SMA Solar Technology AG will send you a file with the firmware update per e-mail. Instructions on performing a firmware update are available in the download area at www.SMA.de/en.

- You require adjusted parameter settings for you installation location.

  Request these from SMA Solar Technology AG. SMA Solar Technology AG will then send you a file with the relevant settings and instructions on how to install these per e-mail.

- You need to enter the SMA Grid Guard code in order to unlock certain parameter sets (for setting a new country data set via the rotary switches or changing other parameters). Instructions on installation can, when necessary, be requested from SMA Solar Technology AG, or will be sent with the necessary files.

Use an SD card with a maximum of 2 GB of storage space.

11 Messages

No display messages if no DC voltage present

Measurements or output of messages are only possible if there is sufficient DC voltage (indicated by the green LED flashing or glowing).

11.1 Event messages

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

Display	Description
< Inst. code valid >	The SMA Guard Grid 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.
< Avvio Autotest >	Only relevant for an installation in Italy: start the self-test by tapping on the display according to Enel-GUIDA (see section 7.3 "Self-test in accordance with ENEL guideline (only for Italy)" (page 60)).
< 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.

Display	Description
< Update file OK >	The file found is valid.

11.2 Error Messages

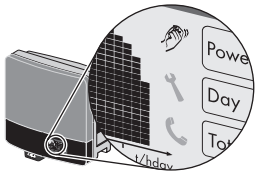
When errors occur, a display message including the corresponding event number will appear in the text line of the display. By tapping on the enclosure lid, multi-line messages can be switched further.

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 point of connection of the inverter is too high. • Grid impedance at the terminal of the inverter is too high. For safety reasons, the inverter disconnects itself from the grid.	• Check the grid current and the grid connection on the inverter. If the grid voltage lies outside the acceptable range because of local grid conditions, ask the utility operator if the voltage can be adjusted at the feed-in point or if he agrees 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 acceptable range because of local grid conditions, ask the utility operator if the voltage can be adjusted at the feed-in point or if he agrees 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 point of connection of the inverter is too high. • Grid impedance at the terminal of the inverter is too high. The inverter disconnects to assure compliance with the voltage 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 utility operator whether the voltage can be adjusted at the feed-in point, or whether he will agree to a modification of the limiting value for voltage quality monitoring. If the grid voltage is continually within the acceptable 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 power supply line 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 utility operator if it would agree to modify the operating parameter. 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 power supply line for direct current. • If this is a recurrent phenomenon, check with the utility operator whether it is possible to raise the limiting value of monitoring.
7	< Frq. not permitted > < Check parameter > The grid frequency has left the allowable 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 utility operator if it would agree to modify the operating parameter. 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 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 Public Grid (AC)" (page 26). • Check that the country setting is correct: – Via the rotary switch (see section 6.5.1 "Checking the Country Standard" (page 44). – 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. The reason for this could be snow-covered PV modules.	• Wait for higher irradiation. • If this event recurs at medium irradiation, check the PV system design and correct the connection of the PV generator.
34	< DC overvoltage > < Disconnect generator > The DC input voltage connected to the inverter is too high.	• **Immediately disconnect the inverter from the PV generator, as described in section 8 "Disconnecting the Inverter" (page 66)! 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 generator.
35	< Insulation resist. > < Check generator > The inverter has detected a ground fault in the PV generator.	• Check the strings for ground faults, as described in section 12.2 "Checking the PV Array for a Ground Fault" (page 89). • The installer of the PV generator 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 generator is too high. This can be caused by a sudden grounding fault, failure current or an actual fault in the device. The inverter interrupts grid feed immediately after exceeding a limiting value and then automatically re-connects to the grid.	• Check the strings for ground faults, as described in section 12.2 "Checking the PV Array for a Ground Fault" (page 89). • The installer of the PV generator must remedy the ground faults before you re-connect the affected string.
37	< Resid.curr.too.high > < Check generator > The inverter has detected a failure current by briefly grounding the PV generator.	• Check the strings for ground faults, as described in section 12.2 "Checking the PV Array for a Ground Fault" (page 89). • The installer of the PV generator 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 generator.
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 inverter's startup voltage if the event occurs frequently in the morning (parameter setting via communication). • If this event recurs at medium irradiation, check the PV system design and correct the connection of the PV generator.

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 generator is short-circuited.	• Disconnect the inverter in darkness, as described in section 8 "Disconnecting the Inverter" (page 66). • Check design and connection of the PV generator (see section 6.4.1 "Conditions for the DC connection" (page 31)). • 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 defect. > "X" stands for the affected string. This string has been reverse poled or it has failed. Further strings could also be affected. The PV generator is **not** short-circuited.	• Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 66). • Check design and connection of the PV generator (see section 6.4.1 "Conditions for the DC connection" (page 31)). • 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 defect. > < 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 66). • Repair the defect in the given string. • Restart the learning phase for the string failure detection as described in section 7.4 "Activating the auto-adaptive string failure detection" (page 65).
60 - 64	< Self diagnosis > or < Interference device >	• Contact the SMA Serviceline (see section 16 "Contact" (page 125)).
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 70).

Event no.	Cause	Corrective measures
66	< Self diagnosis > or < Overload >	• Contact the SMA Serviceline (see section 16 "Contact" (page 125)).
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 16 "Contact" (page 125)).
68	< Self diagnosis > or < Input A defective >	• Contact the SMA Serviceline (see section 16 "Contact" (page 125)).
69	< Self diagnosis > or < Input B defective >	• Contact the SMA Serviceline (see section 16 "Contact" (page 125)).
70	< Sensor fault fan permanently on >	• Contact the SMA Serviceline (see section 16 "Contact" (page 125)).
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 defectiv. >	• 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 16 "Contact" (page 125)).

Event no.	Cause	Corrective measures
73	< Update main CPU failed > Internal device fault.	• Contact the SMA Serviceline (see section 16 "Contact" (page 125)).
	< 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 16 "Contact" (page 125)).
	< Update BT 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.	
74	< Varistor defective > At least one of the thermally monitored varistors is defective.	• Check the varistors as described in section 12.3 "Check varistors" (page 91).
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 70).
77	< Self diagnosis > or < Interference device >	• Contact the SMA Serviceline (see section 16 "Contact" (page 125)).
80	< Derating occurred > The delivered power of the inverter was reduced below nominal power due to a too-high 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 70).
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 16 "Contact" (page 125)).

Event no.	Cause	Corrective measures
82	< Interference device > < Do not disconn. ESS >	• Disconnect the inverter in darkness, as described in section 8 "Disconnecting the Inverter" (page 66). • Contact the SMA Serviceline (see section 16 "Contact" (page 125)).
	< Connect ESS, do not open cover > Device failure or reverse current in the PV generator. The PV generator should only be disconnected from the inverter in darkness in order to prevent the risk of an electric arc when pulling out the DC plug connector.	• Connect the Electronic Solar Switch. • Disconnect the inverter in darkness, as described in section 8 "Disconnecting the Inverter" (page 66).
83	< Lightn.prot.inactive > At least one overvoltage protector is defective.	• Replace the overvoltage protector as described in section 12.4 "Replacing overvoltage protectors type II" (page 94).
84	< Overheating > 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 16 "Contact" (page 125)).

Event no.	Cause	Corrective measures
90	< Inst. code invalid > The SMA Grid Guard code entered (personal installer password) is invalid.	• A valid SMA Grid Guard code has been entered.
	< Grid param. locked > The actual country data set is locked.	• Enter the 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 computer. • 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 Public Grid (AC)" (page 26). • Check for correct country settings as described in section 6.5 "Setting the Country Standard and Display Language" (page 42). The self-test is only required for installations in Italy.

12 Failure search

12.1 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 generator to prevent reverse currents.

- Proceed as described in the following table.

Cause	Event number on the display	Action
Installation fault (a string is reverse poled or strings with differing numbers of modules have been connected) OR **Reverse current in the PV plant** (defective string) Sunny Tripower short-circuits the PV generator in order to prevent reverse currents through individual strings. Depending on the irradiation intensity, strong currents can be generated. However, the PV generator and the Sunny Tripower are in a safe state.	40	• **On no account** disconnect the Electronic Solar Switch or the DC plug connector 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 fence) and moisture protection (e.g. tarpaulin). • Wait until dark before pulling out the Electronic Solar Switch and any DC plug connectors, and eliminate any errors (e.g. reversed poles or defective string).
There is a defect in the Sunny Tripower	64 or 82	• Contact the SMA Serviceline (see section 16 "Contact" (page 125)).

12.2 Checking the PV Array for a Ground Fault

If the inverter displays event number "35", "36" or "37", there is probably a ground fault in the PV array.

Check the strings for ground faults as described in the following:

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 66).

DANGER!

Danger to life due to live PV array!

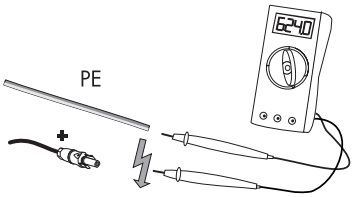
- Only touch the insulation sleeves of the PV array cables.
- Do not connect strings with ground faults to the inverter.
- Wait until there is no voltage present.

NOTICE!

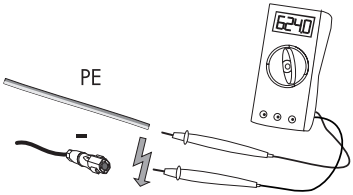
Excessive voltages can destroy the measuring device!

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

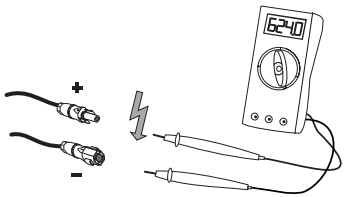
2. Measure the voltages between the plus pole of each string and the ground potential (PE).



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.



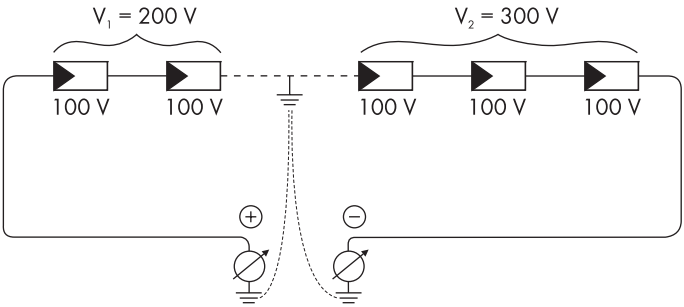
When the voltages measured are stable and the total of the voltages from the plus pole against ground potential and the minus pole against ground potential of a string roughly corresponds to the voltage between the plus pole and minus pole, then there is a ground fault.

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 57).
☑ 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 12.3 "Check varistors" (page 91).

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 module.

☑ The ground fault check is finished.

12.3 Check 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 66).

DANGER!

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

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

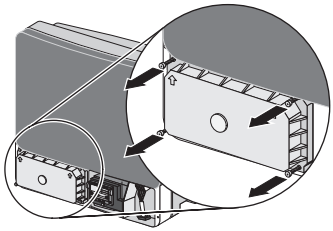
- Wait 10 minutes before you open the upper lid or the DC lid.

CAUTION!

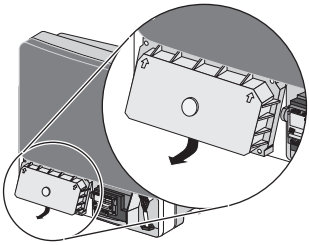
Danger of burn injury due to hot components inside the inverter!

- 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.

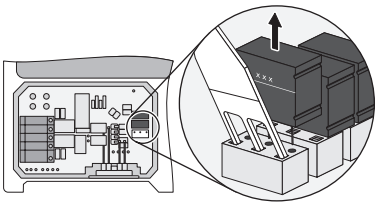


3. Lift the DC lid upwards and remove it.

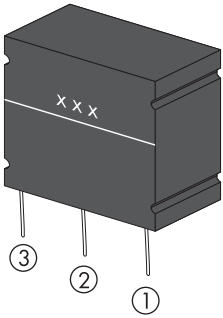


4. Remove all varistors upwards.

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



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



Result	Action
☑ There is a **conducting** connection.	There is probably a different fault in the inverter. • Continue with point 8. • Consult the SMA Serviceline for details on further procedure.
☑ There is **no conducting** connection.	The respective varistor is defective and must be replaced. Varistor failure is generally due to influences which affect all varistors similarly (temperature, age, induced overvoltages). SMA Solar Technology AG recommends that you replace 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 15 "Accessories" (page 124)). Use original varistors only that are sold by SMA Solar Technology AG. • To replace the part, proceed to step 6.

NOTICE!

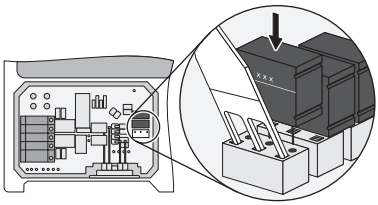
Destruction of the inverter by overvoltage!

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

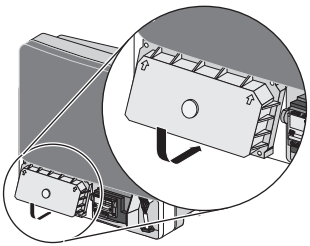
- Do **not** operate the inverter without varistors in systems with a high risk of overvoltages.
- Replacement varistors should be obtained as soon as possible.

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).

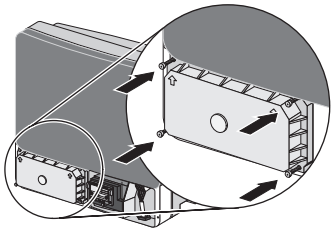
   The label must point to the front when installed, i.e. towards the insertion tool!



8. Attach the DC lid so that it is at an angle. Ensure that the captive screws protrude.



9. Pre-screw all 4 screws of the DC lid and then tighten them (see section 14 "Technical Data" (page 99)).



10. Re-commission the inverter as described in section 7 "Commissioning" (page 57).

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

12.4 Replacing overvoltage protectors type II

If the inverter displays event number "83", one of the overvoltage protectors is probably defective.

Overvoltage protectors 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 overvoltage protectors no longer fulfills its protective function.

Since the failure of one varistor is generally due to factors that affect all varistors in a similar way (temperature, age, inductive overvoltages), SMA Solar Technology AG recommends replacing all overvoltage protectors at once. The order numbers for both retrofit kits (one for input A, one for input A and B) can be found in section 15 "Accessories" (page 124).

The procedure for replacing overvoltage protectors is as follows:

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 66).

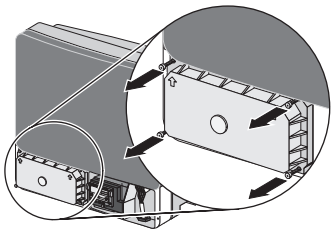
DANGER!

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

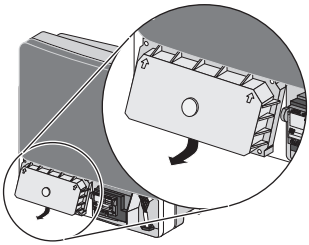
There is residual voltage in the inverter. The inverter requires 10 minutes to discharge.

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

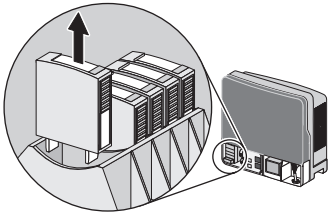
2. Unscrew the captive screws of the DC lid on the left-hand side of the connection area.



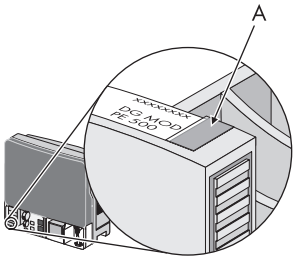
3. Lift the DC lid upwards and remove it.



4. Remove all overvoltage protectors from the slots.
   Press together grooved surfaces on both sides.



   The green strip in the window (A) signals that the overvoltage protector is in perfect operating condition. A red strip in the window indicates that the overvoltage protector is faulty.



5. Replace the overvoltage protector as described in Section 6.7 "Retrofitting Overvoltage Protectors Type II" (page 55).

13 Decommissioning

13.1 Dismantling the Inverter

1. Disconnect the inverter as described in section 8 "Disconnecting the Inverter" (page 66).
2. Remove all connection cables from the inverter.

CAUTION!

Danger of burn injuries due to hot enclosure parts!

- Wait 30 minutes before disassembling until the housing has cooled down.

3. Screw off all projecting cable glands.
4. If necessary, open anti-theft lock.
5. Lift the inverter off the rear panel and unscrew the rear panel wall screws.

13.2 Replacing the enclosure lid

In the event of a fault it can be that your inverter must be replaced. 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 run the inverter without the upper and lower lid during operation.

Dismantling overvoltage protectors type II

If you have retrofitted your inverter with overvoltage protectors type II, then you have to dismantle the overvoltage protectors before you send your inverter back to SMA Solar Technology (see section 12.4 "Replacing overvoltage protectors type II" (page 94)).

Prior to returning your inverter to SMA Solar Technology AG, you must swap over the upper and lower lids of your inverter with the corresponding transport lid.

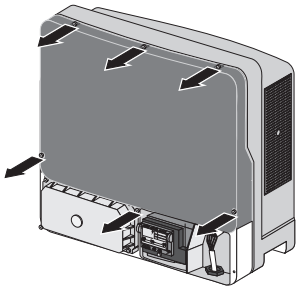
DANGER!

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

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

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

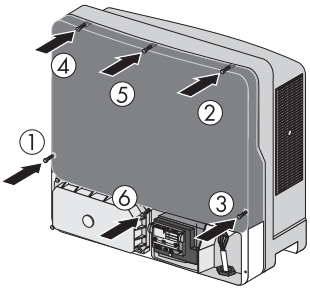
1. Dismantle the inverter as described in section 13.1 "Dismantling the Inverter" (page 96).
2. Loosen all lid screws of the upper lid and pull the lid forwards to remove it.
3. Remove the transport lid from the replacement device in the same manner.



4. Pre-screw the transport lid of the replacement device to your inverter with the 6 lid screws and corresponding lock washers and then tighten them in the sequence shown on the right (for torque, see section 14 "Technical Data" (page 99)).

   The toothing of the lock washers must face toward the lid.

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



DANGER!

Danger to life due to live lid!

The grounding of the upper lid is ensured by the toothed lock washers.

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

5. Screw the lower lid tight.

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

6. Now mount the upper lid of your inverter onto the replacement device in the same manner.
7. Re-assemble the replacement device (see section 5.3 "Mounting the Inverter with Rear Panel" (page 20)) and connect it (see section 6 "Electrical Connection" (page 24)).

13.3 Packing the Inverter

If possible, always pack the inverter in its original packaging and secure it with tension belts. If it is no longer available, you can also use an equivalent carton. The box must be capable of being closed completely and made to support both the weight and the size of the inverter.

13.4 Storing the Inverter

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

13.5 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 site 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 Page 125).

14 Technical Data

14.1 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 A
Maximum input current input B	11 A
Maximum short-circuit current input A	33 A
Maximum short-circuit current input B	12.5 A
Maximum short-circuit current per string for input A	33.0 A
Maximum short-circuit current per string for 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, may not exceed the maximum input voltage.

AC Output

Rated power at 230 V, 50 Hz	8 000 W
Maximum AC apparent power	8 000 VA
Rated grid voltage	3/N/PE, 230 V/400 V
AC voltage range**	160 V ... 280 V
Nominal AC current at 230 V	11.6 A
Maximum output current	16 A
Maximum short-circuit current	0.05 kA
Harmonic distortion of output current at AC THD voltage < 2 %, AC power > 0.5 AC nominal power	≤ 3 %
Rated grid frequency	50 Hz
AC grid frequency**	50 Hz/60 Hz
Operating range at nominal AC frequency 50 Hz	44 Hz ... 55 Hz
Operating range at nominal AC frequency 60 Hz	54 Hz ... 65 Hz
Power factor at rated power	1
Shift factor, adjustable	$0.8_{lagging}$ ... $0.8_{leading}$
Feed-in phases	3
Connection phases	3
Overvoltage category as per IEC 60664-1	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: overvoltage protector type II
AC short-circuit protection	Current control
Grid monitoring	SMA Grid Guard 4
Maximum permissible fuse protection	40 A
Ground fault monitoring	Insulation monitoring R_{iso} > 550 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 as per IEC 60721-2-1	4K4H
Operating temperature range	– 25 °C ... +60 °C
Maximum operating altitude above mean sea level	3 000 m
Noise emission (typical)	No data
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 protection rating in accordance with IEC 60529	IP65
Connection area protection rating in accordance with IEC 60529	IP54
Protection class in accordance with IEC 62103	I

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 connector
AC connection	Spring terminal
Display	LC graphic display
Bluetooth	standard
RS485, galvanically isolated	optional
Multi-function relay	standard

Electronic Solar Switch

Electrical service life in the event of a short-circuit, with a nominal current of 33 A	A minimum of 50 switching operations
Maximum switching current	33 A
Maximum switching voltage	1 000 V
Maximum PV power	20 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP21

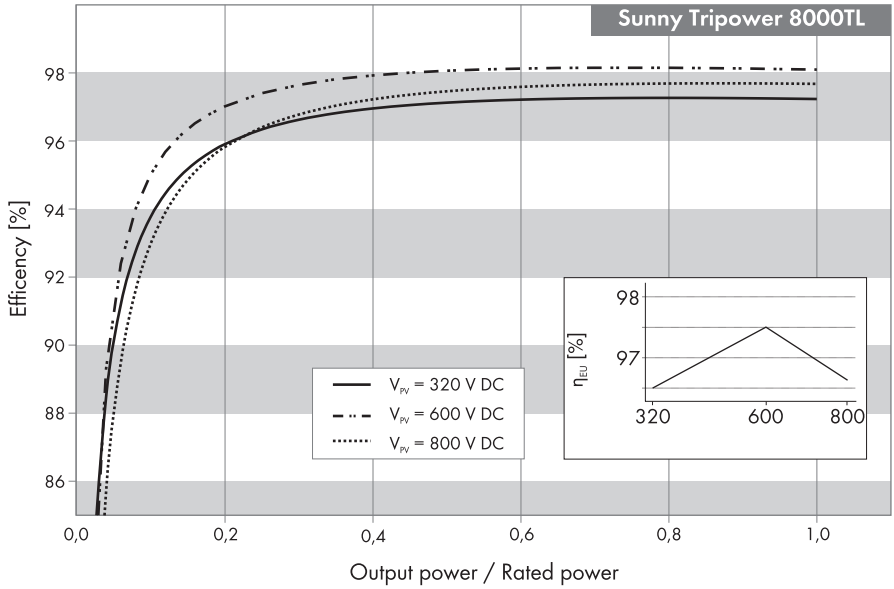
Torque

Upper lid screws	6.0 Nm
Lower lid screws	2.0 Nm
DC lid screws	3.5 Nm
Additional ground terminal	6.0 Nm
Cylinder screws (M5 x 10) for securing the enclosure at the rear wall	6.0 Nm
SUNCLIX lock nuts	2 Nm
RS485 Communication connection	1.5 Nm

Grid forms

TN-C grid	suitable
TN-S grid	suitable
TN-C-S grid	suitable
TT grid	suitable

Efficiency



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

Efficiency profile

	Efficiency		
	Minimum MPP voltage	**Rated input voltage**	**Maximum MPP voltage**
Output power	**320 V**	**600 V**	**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 %	98.1 %	97.5 %
75 %	97.3 %	98.2 %	97.7 %
100 %	97.2 %	98.1 %	97.7 %

14.2 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 A
Maximum input current input B	11 A
Maximum short-circuit current input A	33 A
Maximum short-circuit current input B	12.5 A
Maximum short-circuit current per string for input A	33.0 A
Maximum short-circuit current per string for 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, may not exceed the maximum input voltage.

AC Output

Rated power at 230 V, 50 Hz	10 000 W
Maximum AC apparent power	10 000 VA
Rated grid voltage	3/N/PE, 230 V/400 V
AC voltage range**	160 V ... 280 V
Nominal AC current at 230 V	14.5 A
Maximum output current	16 A
Maximum short-circuit current	0.05 kA
Harmonic distortion of output current at AC THD voltage < 2 %, AC power > 0.5 AC nominal power	≤ 3 %
Rated grid frequency	50 Hz
AC grid frequency**	50 Hz/60 Hz
Operating range at nominal AC frequency 50 Hz	44 Hz ... 55 Hz
Operating range at nominal AC frequency 60 Hz	54 Hz ... 65 Hz
Power factor at rated power	1
Shift factor, adjustable	$0.8_{lagging}$ ... $0.8_{leading}$
Supply phases	3
Connection phases	3
Overvoltage category as per IEC 60664-1	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: overvoltage protectors type II
AC short-circuit protection	Current control
Grid monitoring	SMA Grid Guard 4
Maximum permissible fuse protection	40 A
Ground fault monitoring	Insulation monitoring R_{iso} > 550 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 as per IEC 60721-2-1	4K4H
Operating temperature range	– 25 °C ... +60 °C
Maximum operating altitude above mean sea level	3 000 m
Noise emission (typical)	No data
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 protection rating in accordance with IEC 60529	IP65
Connection area protection rating in accordance with IEC 60529	IP54
Protection class in accordance with IEC 62103	I

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 connector
AC connection	Spring terminal
Display	LC graphic display
Bluetooth	standard
RS485, galvanically isolated	optional
Multi-function relay	Standard

Electronic Solar Switch

Electric service life in the event of a short-circuit, with a nominal current of 33 A	A minimum of 50 switching operations
Maximum switching current	33 A
Maximum switching voltage	1 000 V
Maximum PV power	20 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP21

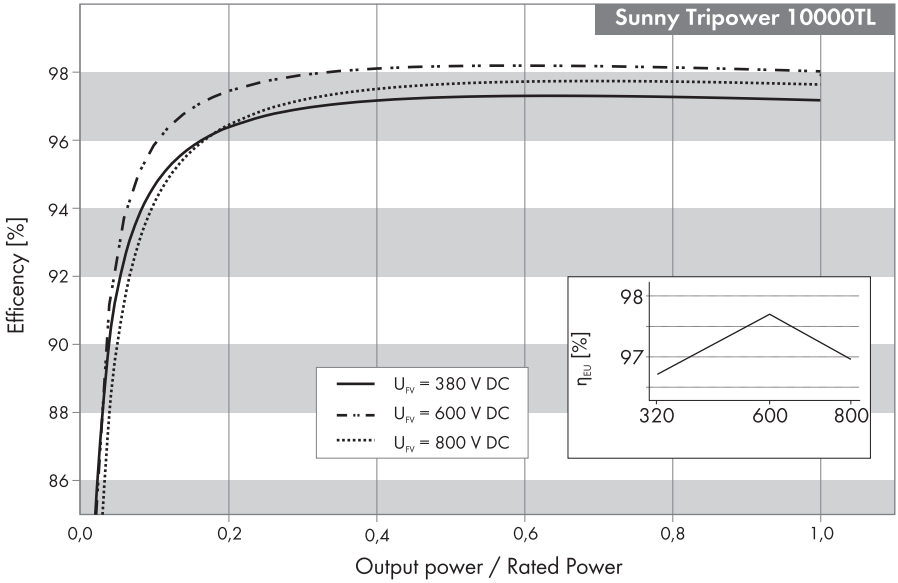
Torque

Upper lid screws	6.0 Nm
Lower lid screws	2.0 Nm
DC lid screws	3.5 Nm
Additional ground terminal	6.0 Nm
Cylinder screws (M5 x 10) for securing the enclosure at the rear wall	6.0 Nm
SUNCLIX lock nuts	2 Nm
RS485 Communication connection	1.5 Nm

Grid forms

TN-C grid	suitable
TN-S grid	suitable
TN-C-S grid	suitable
TT grid	suitable

Efficiency



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

Efficiency profile

	Efficiency		
	Minimum MPP voltage	**Rated input voltage**	**Maximum MPP voltage**
Output power	**320 V**	**600 V**	**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 %

14.3 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 A
Maximum input current input B	11 A
Maximum short-circuit current input A	33 A
Maximum short-circuit current input B	12.5 A
Maximum short-circuit current per string for input A	33.0 A
Maximum short-circuit current per string for 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, may not exceed the maximum input voltage.

AC Output

Rated power at 230 V, 50 Hz	12 000 W
Maximum AC apparent power	12 000 VA
Rated grid voltage	3/N/PE, 230 V/400 V
AC voltage range**	160 V ... 280 V
Nominal AC current at 230 V	17.4 A
Maximum output current	19.2 A
Maximum short-circuit current	0.05 kA
Harmonic distortion of output current at AC THD voltage < 2 %, AC power > 0.5 AC nominal power	≤ 3.6 %
Rated grid frequency	50 Hz
AC grid frequency**	50 Hz/60 Hz
Operating range at nominal AC frequency 50 Hz	44 Hz ... 55 Hz
Operating range at nominal AC frequency 60 Hz	54 Hz ... 65 Hz
Power factor at rated power	1
Shift factor, adjustable	$0.8_{lagging}$ ... $0.8_{leading}$
Feed-in phases	3
Connection phases	3
Overvoltage category as per IEC 60664-1	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: overvoltage protector type II
AC short-circuit protection	Current control
Grid monitoring	SMA Grid Guard 4
Maximum permissible fuse protection	40 A
Ground fault monitoring	Insulation monitoring R_{iso} > 458.7 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 as per IEC 60721-2-1	4K4H
Operating temperature range	– 25 °C ... +60 °C
Maximum operating altitude above mean sea level	3 000 m
Noise emission (typical)	No data
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 protection rating in accordance with IEC 60529	IP65
Connection area protection rating in accordance with IEC 60529	IP54
Protection class in accordance with IEC 62103	I

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 connector
AC connection	Spring terminal
Display	LC graphic display
Bluetooth	standard
RS485, galvanically isolated	optional
Multi-function relay	standard

Electronic Solar Switch

Electrical service life in the event of a short-circuit, with a nominal current of 33 A	A minimum of 50 switching operations
Maximum switching current	33 A
Maximum switching voltage	1 000 V
Maximum PV power	20 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP21

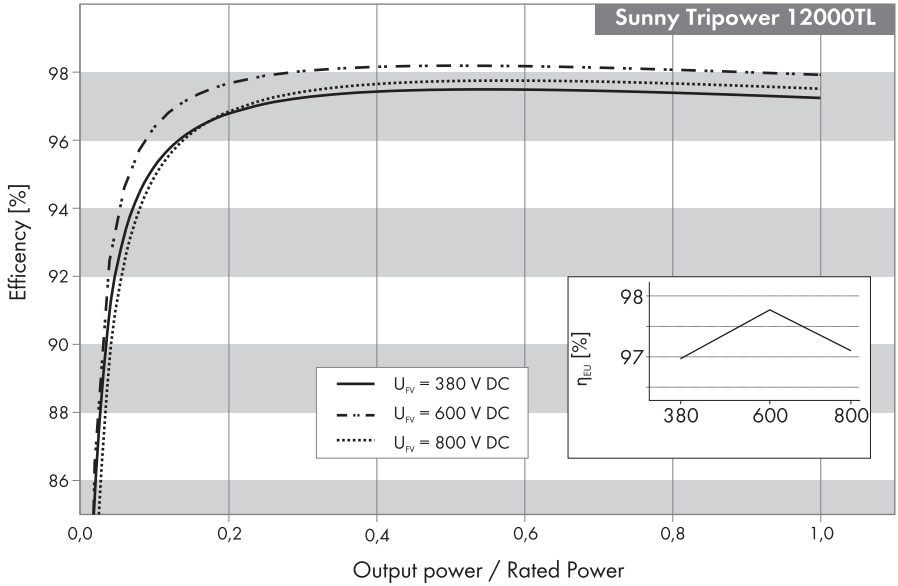
Torque

Upper lid screws	6.0 Nm
Lower lid screws	2.0 Nm
DC lid screws	3.5 Nm
Additional ground terminal	6.0 Nm
Cylinder screws (M5 x 10) for securing the enclosure at the rear wall	6.0 Nm
SUNCLIX lock nuts	2 Nm
RS485 Communication connection	1.5 Nm

Grid forms

TN-C grid	suitable
TN-S grid	suitable
TN-C-S grid	suitable
TT grid	suitable

Efficiency



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

Efficiency profile

	Efficiency		
	Minimum MPP voltage	**Rated input voltage**	**Maximum MPP voltage**
Output power	**380 V**	**600 V**	**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 %	98.2 %	97.7 %
75 %	97.4 %	98.1 %	97.7 %
100 %	97.2 %	97.9 %	97.5 %

14.4 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 A
Maximum input current input B	11 A
Maximum short-circuit current input A	50.0 A
Maximum short-circuit current input B	12.5 A
Maximum short-circuit current per string for input A	33.0 A
Maximum short-circuit current per string for 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, may not exceed the maximum input voltage.

AC Output

Rated power at 230 V, 50 Hz	15 000 W
Maximum AC apparent power	15 000 VA
Rated grid voltage	3/N/PE, 230 V/400 V
AC voltage range**	160 V ... 280 V
Nominal AC current at 230 V	21.7 A
Maximum output current	24 A
Maximum short-circuit current	0.05 kA
Harmonic distortion of output current at AC THD voltage < 2 %, AC power > 0.5 AC nominal power	≤ 3.0 %
Rated grid frequency	50 Hz
AC grid frequency**	50 Hz/60 Hz
Operating range at nominal AC frequency 50 Hz	44 Hz ... 55 Hz
Operating range at nominal AC frequency 60 Hz	54 Hz ... 65 Hz
Power factor at rated power	1
Shift factor, adjustable	$0.8_{lagging}$ ... $0.8_{leading}$
Feed-in phases	3
Connection phases	3
Overvoltage category as per IEC 60664-1	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: overvoltage protector type II
AC short-circuit protection	Current control
Grid monitoring	SMA Grid Guard 4
Maximum permissible fuse protection	40 A
Ground fault monitoring	Insulation monitoring R_{iso} > 366.3 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 as per IEC 60721-2-1	4K4H
Operating temperature range	– 25 °C ... +60 °C
Maximum operating altitude above mean sea level	3 000 m
Noise emission (typical)	No data
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 protection rating in accordance with IEC 60529	IP65
Connection area protection rating in accordance with IEC 60529	IP54
Protection class in accordance with IEC 62103	I

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 connector
AC connection	Spring terminal
Display	LC graphic display
Bluetooth	standard
RS485, galvanically isolated	optional
Multi-function relay	standard

Electronic Solar Switch

Electrical service life in the event of a short-circuit, with a nominal current of 33 A	A minimum of 50 switching operations
Maximum switching current	33 A
Maximum switching voltage	1 000 V
Maximum PV power	20 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP21

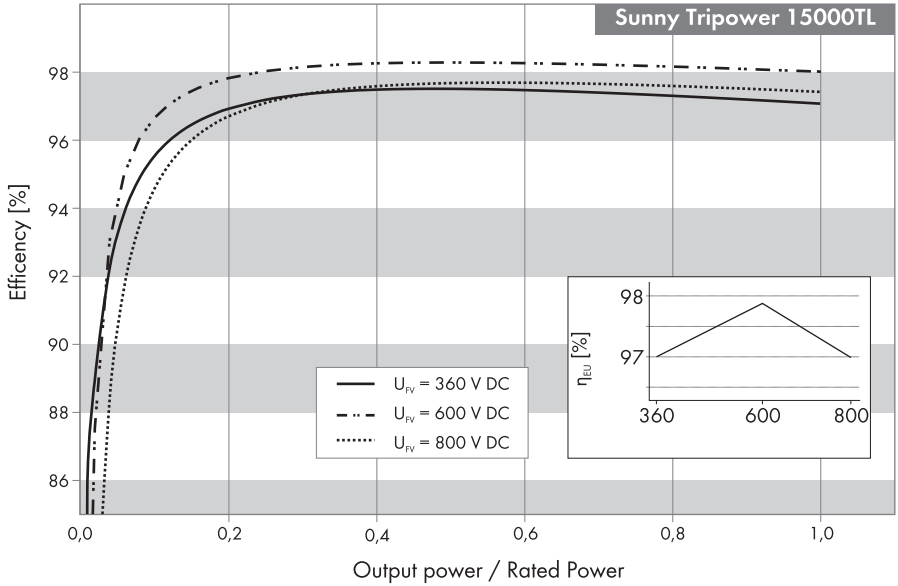
Torque

Upper lid screws	6.0 Nm
Lower lid screws	2.0 Nm
DC lid screws	3.5 Nm
Additional ground terminal	6.0 Nm
Cylinder screws (M5 x 10) for securing the enclosure at the rear wall	6.0 Nm
SUNCLIX lock nuts	2 Nm
RS485 Communication connection	1.5 Nm

Grid forms

TN-C grid	suitable
TN-S grid	suitable
TN-C-S grid	suitable
TT grid	suitable

Efficiency



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

Efficiency profile

	Efficiency		
	Minimum MPP voltage	**Rated input voltage**	**Maximum MPP voltage**
Output power	**360 V**	**600 V**	**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 %

14.5 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 A
Maximum input current input B	11 A
Maximum short-circuit current input A	50 A
Maximum short-circuit current input B	12.5 A
Maximum short-circuit current per string for input A	33.0 A
Maximum short-circuit current per string for 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, may not exceed the maximum input voltage.

AC Output

Rated power at 230 V, 50 Hz	17 000 W
Maximum AC apparent power	17 000 VA
Rated grid voltage	3/N/PE, 230 V/400 V
AC voltage range**	160 V ... 280 V
Nominal AC current at 230 V	24.6 A
Maximum output current	24.6 A
Maximum short-circuit current	0.05 kA
Harmonic distortion of output current at AC THD voltage < 2 %, AC power > 0.5 AC nominal power	≤ 2.6 %
Rated grid frequency	50 Hz
AC grid frequency**	50 Hz/60 Hz
Operating range at nominal AC frequency 50 Hz	44 Hz ... 55 Hz
Operating range at nominal AC frequency 60 Hz	54 Hz ... 65 Hz
Power factor at rated power	1
Shift factor, adjustable	$0.8_{lagging}$ ... $0.8_{leading}$
Feed-in phases	3
Connection phases	3
Overvoltage category as per IEC 60664-1	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: overvoltage protector type II
AC short-circuit protection	Current control
Grid monitoring	SMA Grid Guard 4
Maximum permissible fuse protection	40 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 as per IEC 60721-2-1	4K4H
Operating temperature range	– 25 °C ... +60 °C
Maximum operating altitude above mean sea level	3 000 m
Noise emission (typical)	No data
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 protection rating in accordance with IEC 60529	IP65
Connection area protection rating in accordance with IEC 60529	IP54
Protection class in accordance with IEC 62103	I

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 connector
AC connection	Spring terminal
Display	LC graphic display
Bluetooth	standard
RS485, galvanically isolated	optional
Multi-function relay	Standard

Electronic Solar Switch

Electric service life in the event of a short-circuit, with a nominal current of 33 A	A minimum of 50 switching operations
Maximum switching current	33 A
Maximum switching voltage	1 000 V
Maximum PV power	20 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP21

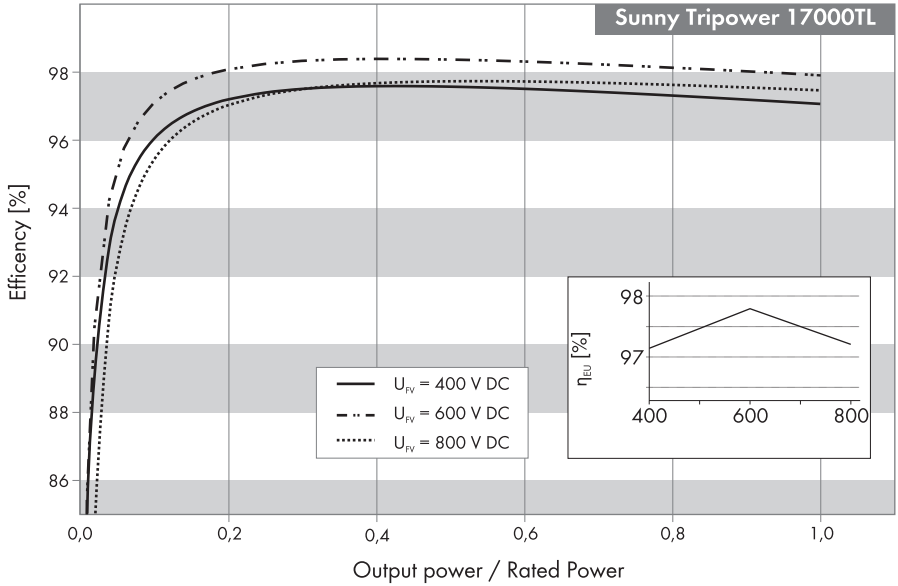
Torque

Upper lid screws	6.0 Nm
Lower lid screws	2.0 Nm
DC lid screws	3.5 Nm
Additional ground terminal	6.0 Nm
Cylinder screws (M5 x 10) for securing the enclosure at the rear wall	6.0 Nm
SUNCLIX lock nuts	2 Nm
RS485 Communication connection	1.5 Nm

Grid forms

TN-C grid	suitable
TN-S grid	suitable
TN-C-S grid	suitable
TT grid	suitable

Efficiency



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

Efficiency profile

	Efficiency		
	Minimum MPP voltage	**Rated input voltage**	**Maximum MPP voltage**
Output power	**400 V**	**600 V**	**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 %

15 Accessories

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

Name	Brief description	SMA order number
Replacement varistors	Set of thermally monitored varistors (3 units)	STP-TV9
ESS holder	Electronic Solar Switch holder as spare part	ESS-HANDLE:06
RS485 upgrade set	RS485 interface	DM-485CB-10
Overvoltage protector type II	Overvoltage protector type II for input A	DC_SPD_KIT_1-10
Overvoltage protector type II	Overvoltage protector type II for input A and B	DC_SPD_KIT_2-10
Air grills	1 air grill as a spare part	45-10899080
SUNCLIX DC plug connectors	Field plug for conductor cross sections of 2.5 mm^2 ... 6 mm^2	SUNCLIX-FC6-SET

16 Contact

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

- Inverter type
- Serial number of the Sunny Tripower
- Type and number of PV modules connected
- Event number or display message of the inverter
- Mounting location
- Optional equipment (e.g. communication devices)
- Type of fault signaling contact connected, if applicable

SMA Solar Technology AG

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- 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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