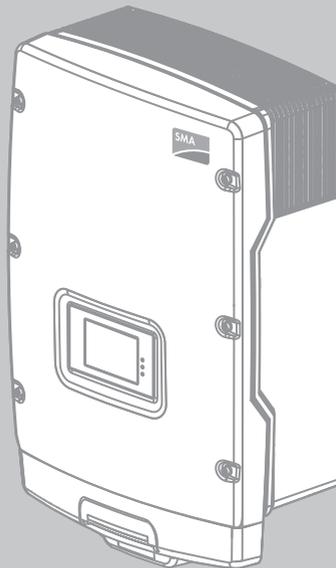




Operating Manual

**SUNNY TRIPOWER 5000TL / 6000TL / 7000TL /
8000TL / 9000TL / 10000TL / 12000TL**



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1 Information on this Document

Validity

This document is valid for the following device types from firmware version 2.52:

- STP 5000TL-20 (Sunny Tripower 5000TL)
- STP 6000TL-20 (Sunny Tripower 6000TL)
- STP 7000TL-20 (Sunny Tripower 7000TL)
- STP 8000TL-20 (Sunny Tripower 8000TL)
- STP 9000TL-20 (Sunny Tripower 9000TL)
- STP 10000TL-20 (Sunny Tripower 10000TL)
- STP 12000TL-20 (Sunny Tripower 12000TL)

Target Group

This document is intended for qualified persons and end users. Some of the tasks described in this document must only be performed by qualified persons with the appropriate skills (see Section 2.2 "Skills of Qualified Persons", page 7). Such tasks are marked with a warning symbol and the caption "Qualified person". Tasks that do not require any particular qualification are not marked and can also be performed by end users.

Additional Information

Links to additional information can be found at www.SMA-Solar.com:

Document title	Document type
SUNNY TRIPOWER 5000TL / 6000TL / 7000TL / 8000TL / 9000TL / 10000TL / 12000TL	Service Manual
Overview of the Rotary Switch Settings	Technical Information
Efficiency and Derating	Technical Information
Insulation Resistance (Riso) of Non-Galvanically Isolated PV Systems	Technical Information
Criteria for Selecting a Residual-Current Device	Technical Information
Circuit Breaker	Technical Information
Module Technology	Technical Information
SMA Bluetooth – SMA Bluetooth® Wireless Technology in Practice	Technical Information
SMA Bluetooth® Wireless Technology	Technical Description
Temperature Derating	Technical Information
Webconnect Systems in Sunny Portal	User Manual
Shade Management	Technical Information
Parameter List	Technical Information

Symbols

Symbol	Explanation
 DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury
 WARNING	Indicates a hazardous situation which, if not avoided, can result in death or serious injury
 CAUTION	Indicates a hazardous situation which, if not avoided, can result in minor or moderate injury
NOTICE	Indicates a situation which, if not avoided, can result in property damage
 QUALIFIED PERSON	Sections describing activities to be performed by qualified persons only
	Information that is important for a specific topic or goal, but is not safety-relevant
<input type="checkbox"/>	Indicates a requirement for meeting a specific goal
<input checked="" type="checkbox"/>	Desired result
	A problem that might occur

Nomenclature

Complete designation	Designation in this document
Electronic Solar Switch	ESS
PV system	System
SMA Bluetooth® Wireless Technology	Bluetooth
Sunny Tripower	Inverter, product

2 Safety

2.1 Intended Use

The Sunny Tripower is a transformerless PV inverter with two MPP trackers which converts the direct current of the PV array to grid-compliant three-phase current and feeds it into the utility grid.

The product is suitable for indoor and outdoor use.

The product must only be operated with PV arrays of protection class II, in accordance with IEC 61730, application class A. The PV modules must be suitable for use with this product.

PV modules with a high capacity to ground must only be used if their coupling capacity does not exceed 1.25 μF (for information on how to calculate the coupling capacity, see the Technical Information "Leading Leakage Currents" at www.SMA-Solar.com).

All components must remain within their permitted operating ranges at all times.

The product must only be used in countries for which it is approved or released by SMA Solar Technology AG and the grid operator.

Use this product only in accordance with the information provided in the enclosed documentation and with the locally applicable standards and directives. Any other application may cause personal injury or property damage.

Alterations to the product, e.g. changes or modifications, are only permitted with the express written permission of SMA Solar Technology AG. Making unauthorized changes will void the warranty and will normally result in invalidation of the operating permit. SMA Solar Technology AG shall not be held liable for any damage caused by such changes.

Any use of the product other than described in the Intended Use section does not qualify as intended use.

The enclosed documentation is an integral part of this product. Keep the documentation in a convenient place for future reference and observe all instructions contained therein.

The type label must remain permanently attached to the product.

2.2 Skills of Qualified Persons

Only qualified persons are allowed to perform the activities marked in this document with a warning symbol and the caption "Qualified person". Qualified persons must have the following skills:

- Knowledge of how an inverter works and is operated
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and systems
- Training in the installation and commissioning of electrical devices and systems
- Knowledge of the applicable standards and directives
- Knowledge of and compliance with this document and all safety precautions

2.3 Safety Precautions

This section contains safety precautions that must be observed at all times when working on or with the product.

To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and follow all safety precautions at all times.

DANGER

Danger to life due to high voltages of the PV array

When exposed to sunlight, the PV array generates dangerous DC voltage which is present in the DC conductors and the live components of the inverter. Touching the DC conductors or the live components can lead to lethal electric shocks. If you disconnect the DC connectors from the inverter under load, an electric arc may occur leading to electric shock and burns.

- Do not touch uninsulated cable ends.
- Do not touch the DC conductors.
- Do not touch any live components of the inverter.
- Have the inverter mounted, installed and commissioned by qualified persons with the appropriate skills only.
- If an error occurs, have it rectified by qualified persons only.
- Prior to performing any work on the inverter, disconnect it from all voltage sources as described in this document (see Section 10, page 51).

DANGER

Danger to life due to electric shock

Touching an ungrounded PV module or an array frame can cause a fatal electric shock.

- Connect and ground the PV modules, array frame and electrically conductive surfaces so that there is continuous conduction. Observe the applicable local regulations.

WARNING

Risk of burns due to hot enclosure parts

Some parts of the enclosure can get hot during operation.

- During operation, do not touch any parts other than the enclosure lid of the inverter.

NOTICE

Damage to the seal of the enclosure lid in sub-zero conditions

If you open the enclosure lid in sub-zero conditions, the sealing of the enclosure lid can be damaged. This can lead to moisture entering the inverter.

- Do not open the inverter at ambient temperatures lower than -5°C .
- If a layer of ice has formed on the seal of the enclosure lid in sub-zero conditions, remove it prior to opening the inverter (e.g. by melting the ice with warm air). Observe the applicable safety regulations.

NOTICE**Damage to the inverter due to electrostatic discharge**

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

- Ground yourself before touching any component.

NOTICE**Damage to the display or the type label due to the use of cleaning agents**

- If the inverter is dirty, clean the enclosure, the cooling fins, the enclosure lid, the type label, the display and the LEDs with a damp cloth only.

3 Scope of Delivery

Check the scope of delivery for completeness and any externally visible damage. Contact your distributor if the scope of delivery is incomplete or damaged.

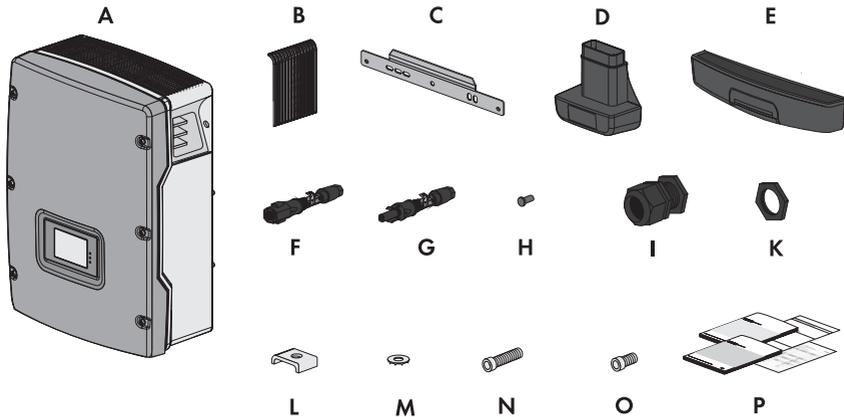


Figure 1: Components included in the scope of delivery

Position	Quantity	Designation
A	1	Inverter
B	2	Ventilation grid
C	1	Wall mounting bracket
D	1	Electronic Solar Switch
E	1	Protective cover
F	4	Negative DC connector
G	4	Positive DC connector
H	8	Sealing plug
I	1	Cable gland M32 x 1.5
K	1	Counter nut
L	1	Clamping bracket
M	2	Conical spring washer*
N	2	Cylindrical screw M6 x 16*
O	2	Cylindrical screw M6 x 8
P	1	Operating manual, supplementary sheet with default settings, supplementary sheet with information on SMA Speedwire/Webconnect, installation manual of the DC connectors

* One spare part for the enclosure lid included

4 Product Description

4.1 Sunny Tripower

The Sunny Tripower is a transformerless PV inverter with two MPP trackers which converts the direct current of the PV array to grid-compliant three-phase current and feeds it into the utility grid.

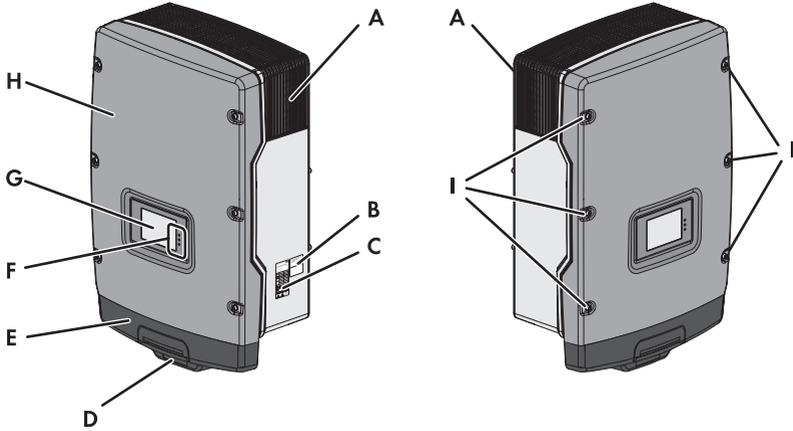


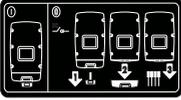
Figure 2: Design of the Sunny Tripower

Position	Designation
A	Ventilation grid
B	Additional label with details for registration in Sunny Portal: <ul style="list-style-type: none"> • Internet address of the system setup assistant • Identification key (PIC) • Registration ID (RID)
C	Type label The type label uniquely identifies the inverter. You will require the information on the type label to use the product safely and when seeking customer support from the SMA Service Line. You will find the following information on the type label: <ul style="list-style-type: none"> • Device type (Model) • Serial number (Serial No.) • Date of manufacture • Device-specific characteristics

Position	Designation
D	<p>Electronic Solar Switch (ESS)</p> <p>The ESS and the DC connectors together form a DC load-break switch.</p> <p>The <i>Bluetooth</i> antenna is integrated in the ESS.</p> <p>When plugged in, the ESS forms a conductive path between the PV array and the inverter. Removing the ESS interrupts the DC electric circuit and removing all DC connectors disconnects the PV array completely from the inverter.</p>
E	Protective cover
F	<p>LEDs</p> <p>The LEDs indicate the operating state of the inverter (see Section 9.2 "LED Signals", page 49).</p>
G	<p>Display</p> <p>The display shows the current operating data and events or errors.</p>
H	Enclosure lid
I	Screws and conical spring washers of the enclosure lid

Symbols on the inverter, the ESS and the type label

Symbol	Explanation
	<p>Inverter</p> <p>This symbol is located next to the green LED which indicates feed-in operation of the inverter.</p>
	<p>Observe the documentation.</p> <p>This symbol is located next to the red LED which indicates an error (for troubleshooting and error elimination, see service manual at www.SMA-Solar.com).</p>
	<p><i>Bluetooth</i></p> <p>This symbol is located next to the blue LED which indicates an active <i>Bluetooth</i> communication.</p>
	<p>Danger</p> <p>This symbol indicates that the inverter must be additionally grounded if additional grounding or equipotential bonding is required at the installation site (see Section 6.3.3, page 28).</p>
	<p>QR Code®</p> <p>Links to additional information on the inverter can be found at www.SMA-Solar.com.</p>

Symbol	Explanation
	<p>Operating principle of the ESS:</p> <ul style="list-style-type: none"> • If the ESS is plugged in, the DC electric circuit is closed. • To interrupt the DC electric circuit, you must perform the following steps in the given order: <ul style="list-style-type: none"> - Remove the ESS. - Remove the protective cover. -  Unlock and remove all DC connectors.
	<p>Operating the inverter without a protective cover is prohibited. Always operate the inverter with a protective cover in place.</p>
	<p>Danger to life due to high voltages in the inverter; observe the waiting time of five minutes.</p> <p>High voltages that can cause fatal electric shocks are present in the live components of the inverter. Prior to performing any work on the inverter always disconnect it from all voltage sources as described in this section (see Section 10, page 51).</p>
	<p>Danger to life due to high voltages</p> <p>The product operates at high voltages. All work on the product must be carried out by qualified persons only.</p>
	<p>Risk of burns from hot surfaces</p> <p>The product can get hot during operation. Avoid contact during operation. Allow the product to cool down sufficiently before carrying out any work. Wear personal protective equipment such as safety gloves.</p>
	<p>Observe the documentation</p> <p>Observe all documentation supplied with the product.</p>
	<p>Direct current</p>
	<p>The product does not have a transformer.</p>
<p>AC</p> 	<p>Alternating current</p>
	<p>WEEE designation</p> <p>Do not dispose of the product together with the household waste but in accordance with the locally applicable disposal regulations for electronic waste.</p>

Symbol	Explanation
	CE marking The product complies with the requirements of the applicable EU directives.
	Device class ID The product is equipped with a wireless component and complies with device class 2.
IP65	Degree of protection IP65 The product is protected against dust intrusion and water jets from any angle.
	The product is suitable for outdoor installation.
	RAL quality mark for solar products The product complies with the requirements of the German Institute for Quality Assurance and Certification.
	Certified safety The product is VDE-tested and complies with the requirements of the German Equipment and Product Safety Act.
	C-Tick The product complies with the requirements of the applicable Australian EMC standards.

4.2 Interfaces and Functions

The inverter can be equipped with the following interfaces and functions:

Bluetooth

Via *Bluetooth*, the inverter can communicate with various *Bluetooth* devices (for information on supported SMA products, see www.SMA-Solar.com).

SMA Speedwire/Webconnect

SMA Speedwire/Webconnect is a type of communication based on the Ethernet standard, and allows you to connect the inverter to a Speedwire network. Webconnect allows for data exchange between the inverter and Sunny Portal. Sunny Portal is an Internet portal which allows you to monitor PV systems and to visualize and present PV system data.

485 Data Module Type B or SMA Power Control Module

The 485 Data Module Type B is a communication interface which enables wired communication via RS485 with special communication products (for information on installation and wiring, see installation manual of the 485 Data Module Type B and RS485 cabling plan at www.SMA-Solar.com). Depending on the type of communication, the operating parameters and messages are displayed differently on the communication products.

Example: How the country data set parameter is displayed

For communication with RS485: parameter **CntrySet**

For communication via *Bluetooth* or *Speedwire/Webconnect*: parameter **Set country standard**

The SMA Power Control Module enables the inverter to perform grid management services (for information on installation and configuration, see the installation manual of the SMA Power Control Module at www.SMA-Solar.com).

If you want to use the 485 Data Module Type B or SMA Power Control Module in parallel with the multifunction relay in the inverter, you must ensure that no more than 30 V DC or 25 V AC are connected to the multifunction relay.

Multifunction relay

The multifunction relay is designed for several operating modes which you can select according to your requirement. All operating modes are described in another section (see Section 8.6, page 45). There is a different connection procedure depending on which operating mode you select (see Section 6.5.1 "Connection Options for the Multifunction Relay", page 31).

The operating mode of the multifunction relay is set by default to **Fault Indication** or **FtInd**. If you choose a different operating mode, you must use a communication product to set the operating mode of the multifunction relay after commissioning, and adjust further settings for the operating mode, if necessary (see Section 8.6 "Setting the Operating Mode of the Multifunction Relay", page 45).

Error message required by standard

In some countries, signaling of errors is required by standards, e.g. IEC 62109-2.

- In order to meet the requirements of IEC 62109-2, a display device signaling an error must be connected to the multifunction relay **or** the inverter must be registered in Sunny Portal where the fault alert must be activated (for information on fault alert via Sunny Portal, see Sunny Portal user manual at www.SMA-Solar.com).

Grid Management Services

The inverter is equipped with service functions for grid management.

Depending on the requirements of the grid operator, you can activate and configure the functions (e.g. active power limitation) via operating parameters.

All-pole sensitive residual-current monitoring unit

The all-pole sensitive residual-current monitoring unit detects alternating and direct differential currents. In single-phase and three-phase inverters, the integrated differential current sensor detects the current difference between the neutral conductor and the line conductor(s). If the current difference increases suddenly, the inverter disconnects from the utility grid.

5 Mounting

5.1 Requirements for Mounting

Requirements for the mounting location:

⚠ WARNING

Danger to life due to fire or explosion

Despite careful construction, electrical devices can cause fire.

- Do not mount the product in areas containing highly flammable materials or gases.
 - Do not mount the product in potentially explosive atmospheres.
-
- Do not mount the inverter on a pillar.
 - The mounting location must be inaccessible to children.
 - A solid support surface must be available for mounting, e.g. concrete or masonry. When mounted on plasterboard or similar materials, the inverter emits audible vibrations during operation which could be perceived as annoying.
 - The mounting location must be suitable for the weight and dimensions of the inverter (see Section 11 "Technical Data", page 53).
 - Climatic conditions must be met (see Section 11 "Technical Data", page 53).
 - The ambient temperature should be below 40°C to ensure optimum operation of the inverter.
 - The mounting location should be clear and safely accessible at all times without the need for any auxiliary equipment (such as scaffolding or lifting platforms). Non-fulfillment of these criteria may restrict servicing.
 - The mounting location should not be exposed to direct solar irradiation. Direct solar irradiation can cause the inverter to overheat. As a result, the inverter reduces its power output.

Dimensions for wall mounting:

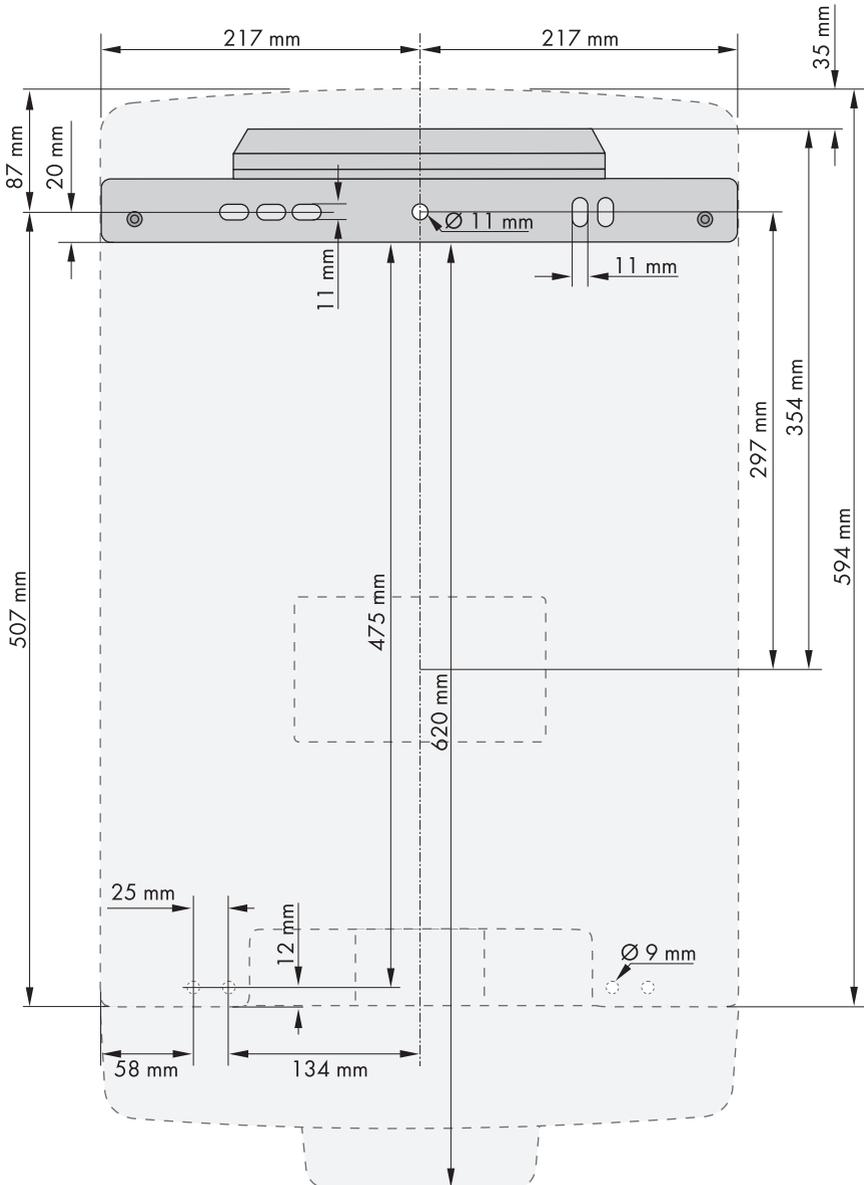


Figure 3: Dimensions of the wall mounting bracket and dimensions of the holes for the optional anti-theft device in the inverter enclosure

Recommended clearances:

Provided that the recommended clearances are observed, adequate heat dissipation will be ensured. This prevents a reduction in inverter power due to overheating (details on temperature derating can be found in the Technical Information "Temperature Derating" at www.SMA-Solar.com).

- Observe the recommended clearances to walls as well as to other inverters or objects.
- If multiple inverters are mounted in areas with high ambient temperatures, increase the clearances between the inverters and ensure sufficient fresh-air supply.

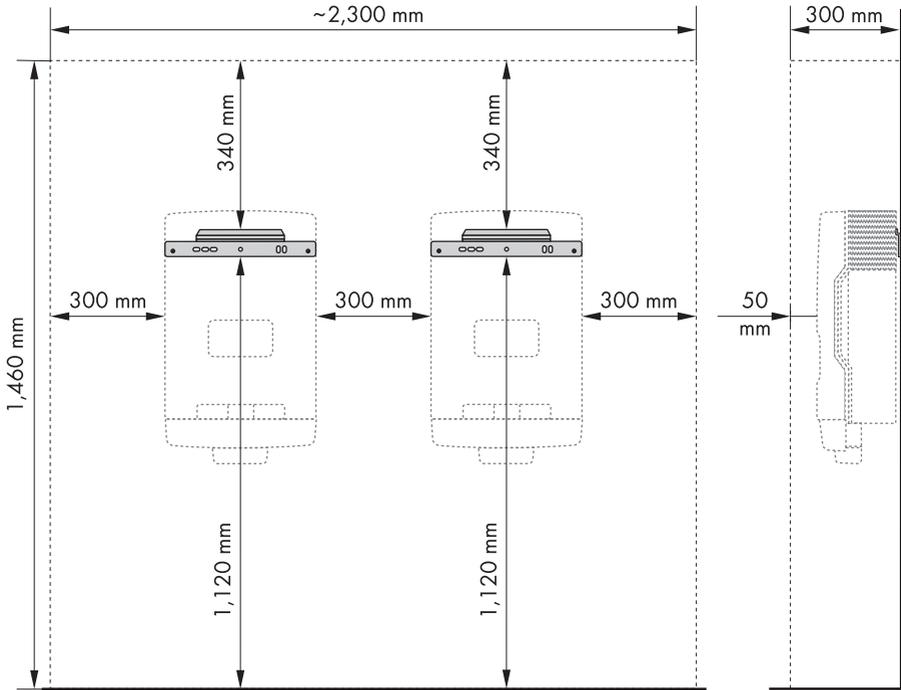


Figure 4: Recommended clearances

Permitted and prohibited mounting positions:

- The inverter must be mounted in one of the permitted positions. This will ensure that no moisture can penetrate the inverter.
- The inverter should be mounted at eye level. This will ensure that display messages and LED signals can be read without difficulty.

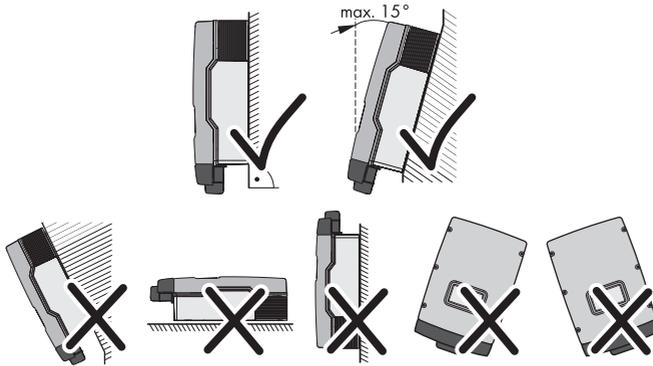


Figure 5: Permitted and prohibited mounting positions

5.2 Mounting the Inverter

⚠ QUALIFIED PERSON

Additionally required mounting material (not included in the scope of delivery):

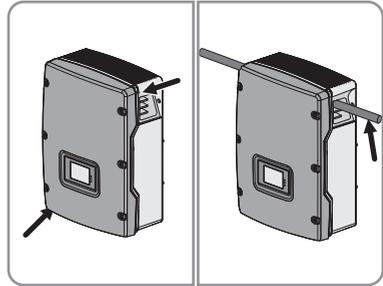
- At least two screws that are suitable for the support surface and the weight of the inverter
- At least two washers that are suitable for the screws
- Two screw anchors that are suitable for the support surface and the screws, if necessary
- To protect the inverter against theft: At least one safety screw and if necessary, a suitable screw anchor

⚠ CAUTION

Risk of injury when lifting the inverter, or if it is dropped

The inverter is heavy (see Section 11 "Technical Data", page 53). There is risk of injury if the inverter is lifted incorrectly or dropped while being transported or when attaching it to or removing it from the wall mounting bracket.

- Carry and lift the inverter upright with the help of several people. Use both hands to grasp the recessed grips at the top and bottom, or use a steel rod (diameter: 30 mm at maximum). This will prevent the inverter tipping forward.



NOTICE

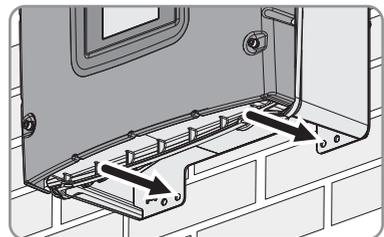
Damage to the ESS pin connector from dirt and foreign bodies

In single-phase and three-phase inverters, the integrated differential current sensor detects the current difference between the neutral conductor and the line conductor(s). This will impair the function of the ESS.

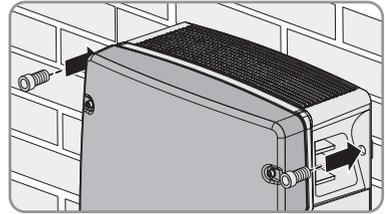
- Always set the inverter down on a level support surface or lay it on its back.

Procedure:

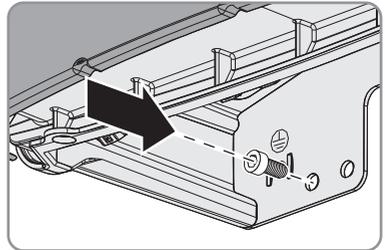
1. Ensure that there are no cables laid in the wall which could be damaged when drilling holes.
2. Align the wall mounting bracket horizontally on the wall and use it to mark the position of the drill holes. Use at least one hole on the right-hand and left-hand side in the wall mounting bracket.
3. Set the wall mounting bracket aside and drill the marked holes.
4. Insert screw anchors into the drill holes if necessary.
5. Secure the wall mounting bracket horizontally using screws and washers.
6. If the inverter is to be secured against theft, mark the drill hole for the attachment of the safety screw:
 - Hook the inverter into the wall mounting bracket.
 - Mark the drill hole on the left-hand or right-hand side. If you want to secure the inverter with two safety screws, mark one drill hole on the left-hand side and one on the right-hand side.



- Remove the inverter by lifting it vertically up and off the wall mounting bracket.
 - Drill the hole or holes to attach the safety screw(s) and insert the screw anchor(s).
7. Hook the inverter into the wall mounting bracket.
 8. Secure the inverter to the wall mounting bracket on both sides using the M6x8 screws provided and an Allen key (AF 5). Only tighten the screws hand-tight.



9. Close the recessed grips with the ventilation grids. Ensure that the assignment is correct. The correct assignment is marked on the inside of each ventilation grid: **links/left** for the left-hand side and **rechts/right** for the right-hand side.
10. Once the holes for attaching the safety screw have been pre-drilled, secure the inverter with at least one safety screw through the pre-drilled hole.



11. Ensure that the inverter is securely in place.

6 Electrical Connection

6.1 Safety during Electrical Connection

⚠ DANGER

Danger to life due to high voltages of the PV array

When exposed to sunlight, the PV array generates dangerous DC voltage which is present in the DC conductors and the live components of the inverter. Touching the DC conductors or the live components can lead to lethal electric shocks. If you disconnect the DC connectors from the inverter under load, an electric arc may occur leading to electric shock and burns.

- Do not touch uninsulated cable ends.
- Do not touch the DC conductors.
- Do not touch any live components of the inverter.
- Have the inverter mounted, installed and commissioned by qualified persons with the appropriate skills only.
- If an error occurs, have it rectified by qualified persons only.
- Prior to performing any work on the inverter, disconnect it from all voltage sources as described in this document (see Section 10, page 51).

NOTICE

Damage to the seal of the enclosure lid in sub-zero conditions

If you open the enclosure lid in sub-zero conditions, the sealing of the enclosure lid can be damaged. This can lead to moisture entering the inverter.

- Do not open the inverter at ambient temperatures lower than -5°C .
- If a layer of ice has formed on the seal of the enclosure lid in sub-zero conditions, remove it prior to opening the inverter (e.g. by melting the ice with warm air). Observe the applicable safety regulations.

NOTICE

Damage to the inverter due to electrostatic discharge

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

- Ground yourself before touching any component.

6.2 Overview of the Connection Area

6.2.1 View from Below

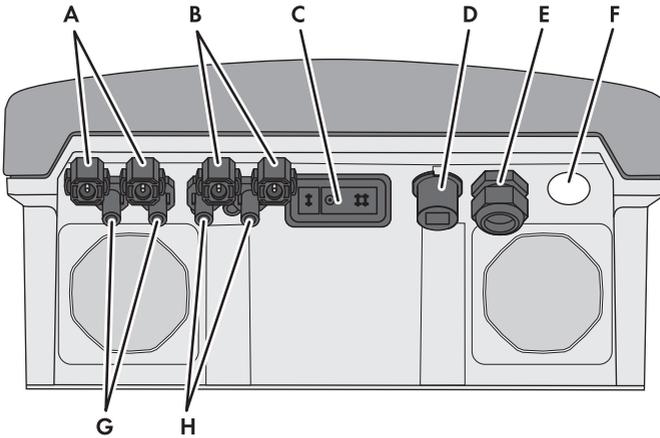


Figure 6: Connection areas and enclosure openings at the bottom of the inverter

Position	Designation
A	Positive DC connectors, input A for positive DC cables
B	Positive DC connectors, input B for positive DC cables
C	Pin connector for the ESS
D	Pin connector with filler plug for the network connection
E	Cable gland M25 with filler plug for the data cables
F	Enclosure opening for the AC cable
G	Negative DC connectors, input A for negative DC cables
H	Negative DC connectors, input B for negative DC cables

6.2.2 Interior View

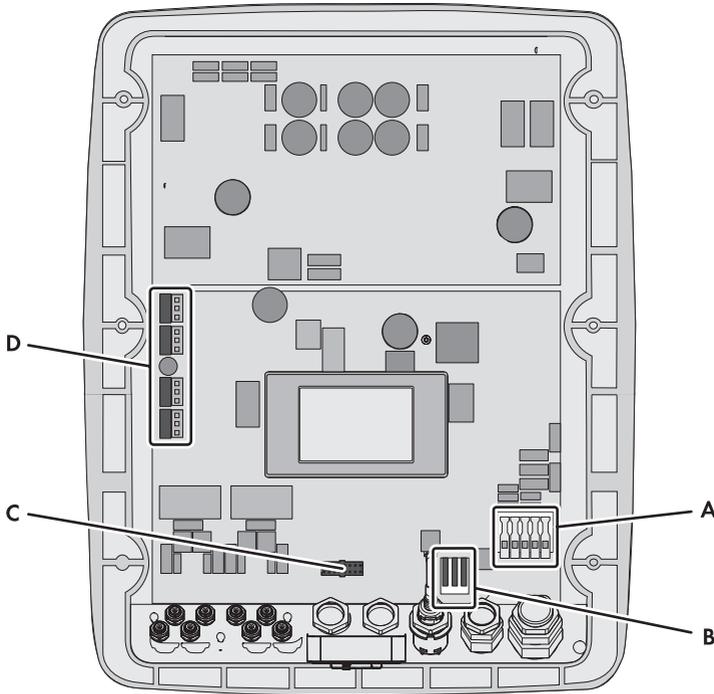


Figure 7: Connection areas in the interior of the inverter

Position	Designation
A	Connecting terminal plate for the AC cable
B	Multifunction relay with protective cover
C	Slot for 485 Data Module Type B or SMA Power Control Module
D	Varistors

6.3 AC Connection

6.3.1 Requirements for the AC Connection

Cable requirements:

- External diameter of the cable must correspond to the clamping range of the cable gland: 12 mm to 21 mm
- Recommended conductor cross-section for stiff or flexible cables, with or without bootlace ferrule: 1.5 mm² to 6 mm²

- Maximum conductor cross-section: 10 mm²
- Insulation stripping length of the conductors: 18 mm
- The cable must be dimensioned in accordance with any local and national guidelines on cable dimensions which specify requirements for the minimum conductor cross-section. Examples of factors influencing cable dimensioning are: nominal AC current, type of cable, routing method, cable bundling, ambient temperature and maximum desired line losses (for calculation of line losses, see design software "Sunny Design" from software version 2.0 at www.SMA-Solar.com).

Load-break switch and cable protection:

- In PV systems with multiple inverters, protect each inverter with a separate three-phase circuit breaker. Make sure to observe the maximum permissible fuse protection (see Section 11 "Technical Data", page 53). This will prevent residual voltage being present at the corresponding cable after disconnection.
- Loads installed between the inverter and the circuit breaker must be fused separately.

Residual-current monitoring unit:

- If an external residual-current device is required, install a residual-current device which trips at a residual current of 100 mA or higher (for details on selecting a residual-current device, see the Technical Information "Criteria for Selecting a Residual-Current Device" at www.SMA-Solar.com).
- If a residual-current device with a tripping threshold of 30 mA is required and used, you must set the tripping threshold of the residual-current device in the inverter to 30 mA (see Section 8.5, page 45).

Overvoltage category:

The inverter can be used in grids of installation category III or lower in accordance with IEC 60664-1. That means that the inverter can be permanently connected to the grid-connection point of a building. In case of installations with long outdoor cabling routes, additional measures to reduce overvoltage category IV to overvoltage category III are required (see the Technical Information "Overvoltage Protection" at www.SMA-Solar.com).

Grounding conductor monitoring:

The inverter is equipped with a grounding conductor monitoring device. This grounding conductor monitoring device detects when there is no grounding conductor connected and disconnects the inverter from the utility grid if this is the case.

i Connection of additional grounding

In some countries additional grounding is a basic required. In each case, observe the locally applicable regulations.

- If additional grounding is required, connect an additional grounding with the same cross-section as the connected grounding conductor to the connecting terminal plate for the AC cable (see Section 6.3.3 "Connecting Additional Grounding", page 28). This prevents touch current if the grounding conductor at the connecting terminal plate for the AC cable fails.

6.3.2 Connecting the Inverter to the Utility Grid

QUALIFIED PERSON

Requirements:

- The connection requirements of the grid operator must be met.
- The grid voltage must be in the permissible range. The exact operating range of the inverter is specified in the operating parameters (see the Technical Information "Parameter List" at www.SMA-Solar.com).

Procedure:

1. Disconnect the circuit breaker from all three line conductors and secure against reconnection.
2. Unscrew all six screws of the enclosure lid using an Allen key (AF 5) and remove the enclosure lid. Ensure that the conical spring washers are retained.
3. Remove the adhesive tape from the enclosure opening for the AC cable.
4. Attach the M32x1.5 cable gland to the enclosure opening for the AC cable using a counter nut.
5. Route the AC cable into the inverter through the cable gland. If necessary, slightly loosen the swivel nut of the cable gland.
6. Dismantle the AC cable.
7. Shorten L1, L2, L3 and N by 5 mm each.
8. Strip 18 mm of the insulation from each of L1, L2, L3, N and the grounding conductor.
9. Push the safety levers of the AC connecting terminal plate right up to the stop.

10. CAUTION

Risk of fire if two conductors are connected to one terminal

If you connect two conductors to a terminal, a fire can occur due to a bad electrical connection.

- Never connect more than one conductor per terminal.

11. Connect PE, N, L1, L2 and L3 to the connecting terminal plate for the AC cable according to the labeling. The direction of the rotating magnetic field of L1, L2 and L3 is not relevant.

12. CAUTION

Danger of crushing fingers when locking levers snap shut

The locking levers close by snapping down fast and hard.

- Press the locking levers of the connecting terminal plate for the AC cable down with your thumb only.
- Do not grip the entire connecting terminal plate for the AC cable.
- Do not place your fingers under the locking levers.

13. Tighten the swivel nut of the cable gland.

6.3.3 Connecting Additional Grounding

⚠ QUALIFIED PERSON

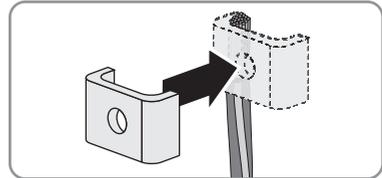
If local requirements stipulate the connection of additional grounding or equipotential bonding, you must connect additional grounding to the inverter. This prevents touch current if the grounding conductor at the connecting terminal plate for the AC cable fails.

Cable requirement:

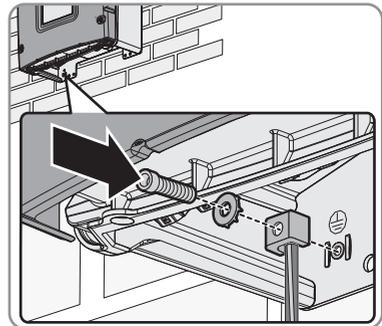
- Grounding cable cross-section: max. 16 mm²

Procedure:

1. Strip the grounding cable insulation.
2. Lead the clamping bracket over the grounding cable. Arrange the grounding cable to the left.



3. Screw the clamping bracket tight using the M6x16 cylindrical screw and the conical spring washer (torque: 6 Nm). The teeth of the conical spring washer must face the clamping bracket.



6.4 DC Connection

6.4.1 Requirements for the DC Connection

Requirements for the PV modules per input:

- All PV modules must be of the same type.
- The same number of series-connected PV modules must be connected to all strings.
- All PV modules must be aligned identically.
- All PV modules must have the same tilt angle.
- The maximum input current per string must be maintained and must not exceed the through-fault current of the DC connectors (see Section 11 "Technical Data", page 53).
- The thresholds for the input voltage and the input current of the inverter must be adhered to (see Section 11 "Technical Data", page 53).

- On the coldest day based on statistical records, the open-circuit voltage of the PV array must never exceed the maximum input voltage of the inverter.
- The positive connection cables of the PV modules must be fitted with the positive DC connectors (for information on assembling DC connectors, see the DC connector installation manual).
- The negative connection cables of the PV modules must be fitted with the negative DC connectors (for information on assembling DC connectors, see the DC connector installation manual).

i Use of Y adapters for parallel connection of strings

The Y adapters must not be used to interrupt the DC electric circuit.

- Do not use the Y adapters in the immediate vicinity of the inverter. The adapters must not be visible or freely accessible.
- In order to interrupt the DC electric circuit, always disconnect the inverter as described in this document (see Section 10, page 51).

6.4.2 Connecting the PV Array

⚠ QUALIFIED PERSON

NOTICE

Destruction of the inverter due to overvoltage

If the open-circuit voltage of the PV modules exceeds the maximum input voltage of the inverter, the inverter can be destroyed due to overvoltage.

- If the open-circuit voltage of the PV modules exceeds the maximum input voltage of the inverter, do not connect any strings to the inverter and check the design of the PV system.

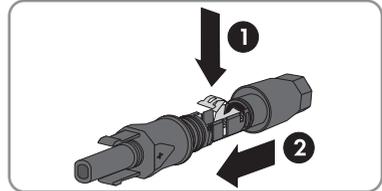
1. Disconnect the circuit breaker from all three line conductors and secure against reconnection.
2. If the ESS is plugged in, remove the ESS.
3. If the protective cover is mounted, loosen the two screws of the protective cover using an Allen key (AF 5) and remove the protective cover.
4. Ensure that there is no ground fault in the PV array.
5. Check whether the DC connectors have the correct polarity.
If the DC connector is equipped with a DC cable of the wrong polarity, the DC connector must be assembled again. The DC cable must always have the same polarity as the DC connector.
6. Ensure that the open-circuit voltage of the PV array does not exceed the maximum input voltage.
7. Connect the assembled DC connectors to the inverter.
 - The DC connectors snap into place.

8. **NOTICE**

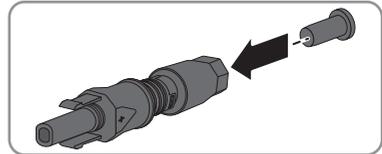
Damage to the inverter due to moisture ingress

The inverter is only properly sealed when all unused DC inputs are closed with DC connectors and sealing plugs.

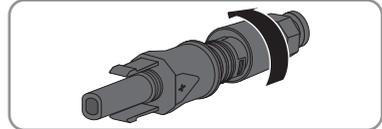
- Do not insert the sealing plugs directly into the DC inputs on the inverter.
- For unused DC connectors, push down the clamping bracket and push the swivel nut up to the thread.



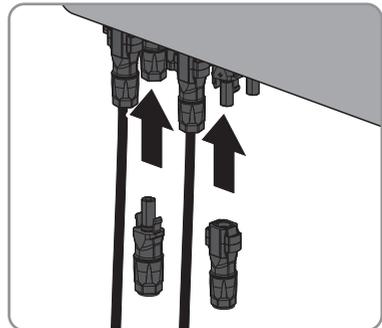
- Insert the sealing plug into the DC connector.



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



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



The DC connectors snap into place.

9. Ensure that all DC connectors are securely in place.

6.5 Connecting the Multifunction Relay

6.5.1 Connection Options for the Multifunction Relay

You can choose between three connection options:

- Using the multifunction relay as a fault indicator contact or operation signaling contact
- Controlling loads or charging batteries via the multifunction relay
- Reporting the switching status of the grid relay

Using the Multifunction Relay as a Fault Indicator Contact

You can make use of the multifunction relay as a fault indicator contact and have an error of the inverter either displayed or reported. Alternatively, you can choose to have fault-free operation displayed or reported. It is possible to connect several inverters to one fault indicator or operation indicator. To enable this function, the multifunction relays of multiple inverters must be interconnected.



Error message required by standard

In some countries, signaling of errors is required by standards, e.g. IEC 62109-2.

- In order to meet the requirements of IEC 62109-2, a display device signaling an error must be connected to the multifunction relay **or** the inverter must be registered in Sunny Portal where the fault alert must be activated (for information on fault alert via Sunny Portal, see Sunny Portal user manual at www.SMA-Solar.com).

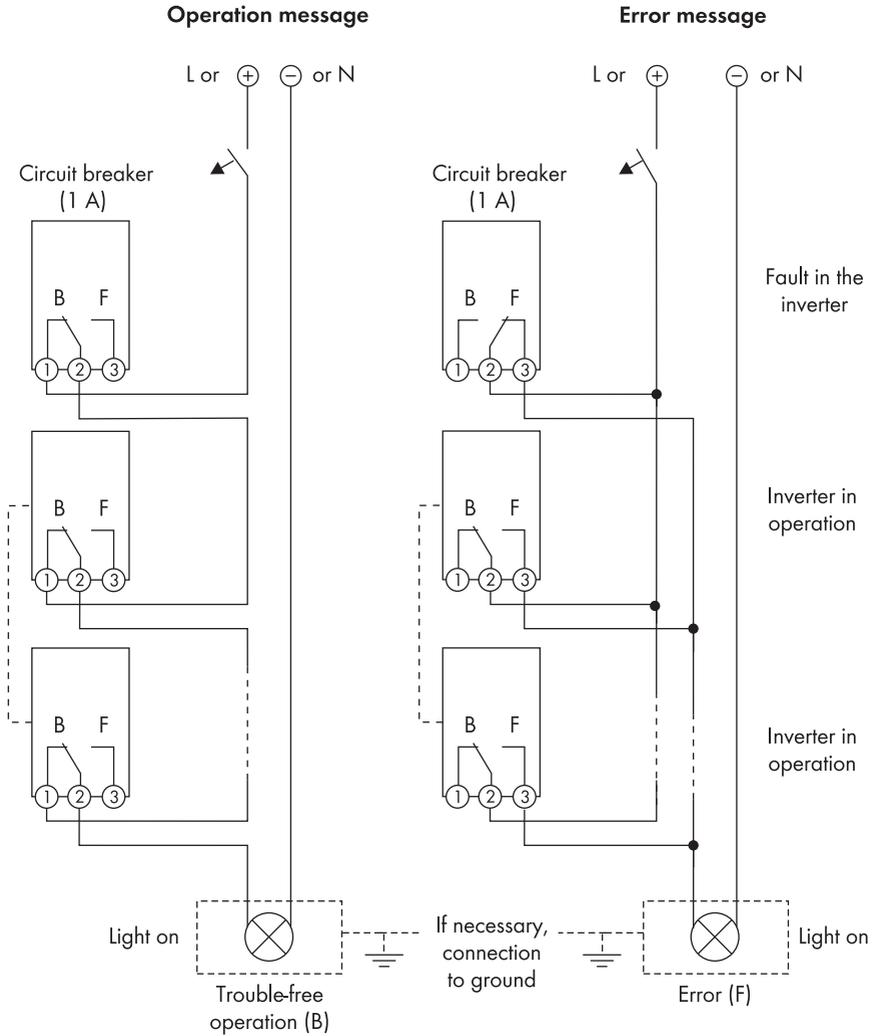


Figure 8: Circuit diagram with multiple inverters for connection to an operation indicator and circuit diagram for connection to a fault indicator (example)

Controlling Loads or Charging Batteries Power-Dependently via the Multifunction Relay

The multifunction relay can control loads or charge batteries power-dependently. To enable this function, you must connect a contactor (K1) to the multifunction relay. The contactor (K1) switches the operating current for the load on or off. If you want batteries to be charged depending on the available power, the contactor activates or deactivates the charging of the batteries.

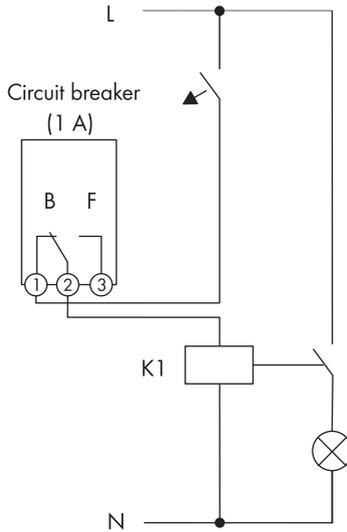


Figure 9: Circuit diagram for connection to control a load or for power-dependent charging of batteries

Reporting the Switching Status of the Grid Relay

The multifunction relay can trip a signal to the grid operator as soon as the inverter connects to the utility grid. To enable this function, the multifunction relays of all inverters must be connected in parallel.

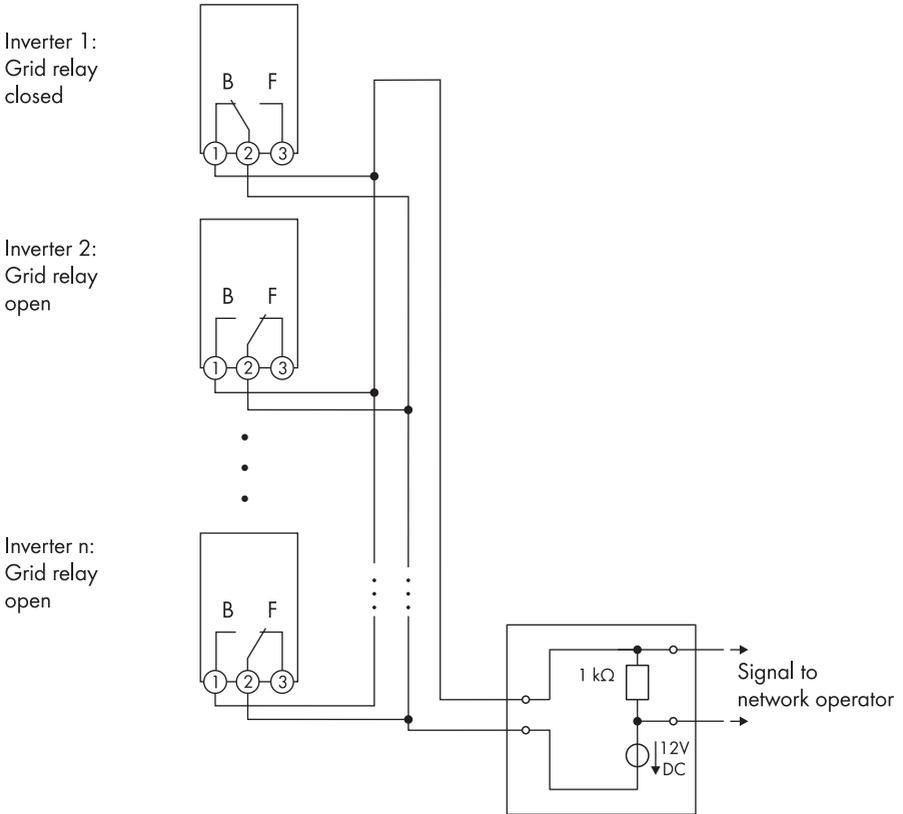


Figure 10: Circuit diagram for reporting the switching status of the grid relay (example)

6.5.2 Connection to the Multifunction Relay

⚠ QUALIFIED PERSON

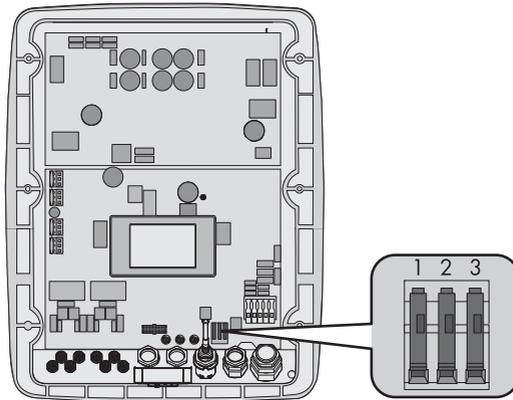


Figure 11: Connecting terminal plate for the connection to the multifunction relay

Requirement:

- The technical requirements of the multifunction relay must be met (see Section 11 "Technical Data", page 53).

Cable requirements:

- The cable must be double-insulated.
- External diameter: 5 mm to 12 mm
- Conductor cross-section: 0.08 mm² to 2.5 mm²
- The cable type and cable-laying method must be appropriate for the application and location.

NOTICE

Destruction of the multifunction relay as a result of excessive contact load

- Observe the maximum switching voltage and maximum switching current (see Section 11.7 "Multifunction relay", page 61).
- When connecting the multifunction relay to the utility grid, fuse the multifunction relay with a separate circuit breaker.

i Operating the multifunction relay and 485 Data Module Type B or SMA Power Control Module in parallel

If you want to operate the multifunction relay and the 485 Data Module Type B or the SMA Power Control Module in parallel, no more than 30 V DC or 25 V AC must be connected to the multifunction relay.

Procedure:

1. When connecting to the utility grid, protect the multifunction relay with a separate circuit breaker.

2. **⚠ DANGER**

Danger to life due to high voltages

- Ensure that the inverter is disconnected from all voltage sources (see Section 10, page 51)

3. Prepare the cable:

- Dismantle the cable jacket by a maximum of 15 mm.
- Strip off the conductor insulation by max. 8 mm.

4. Prepare the cable gland M25 for the connection to the multifunction relay as follows:

- Remove the swivel nut from the cable gland and remove the filler plug.
- Remove the one-hole cable support sleeve from the cable gland and insert the cable into the one-hole cable support sleeve.
- Press the one-hole cable support sleeve with the cable into the cable gland and lead the cable into the inverter.
- Screw the swivel nut onto the cable gland.

5. Remove the protective cover of the multifunction relay.

6. Depending on the operating mode, connect the cable to the connecting terminal plate for the connection to the multifunction relay in accordance with the circuit diagram.

7. **⚠ WARNING**

Danger to life due to live cables

If, during inverter operation, an insulated conductor (L1, L2 or L3) becomes detached from the AC terminal, there is a risk of the multifunction relay cables being live. Touching the cables can cause fatal electric shock.

- Reattach the protective cover to the multifunction relay. This isolates the AC connection area in the inverter from other terminals.

8. Tighten the swivel nut of the cable gland.

7 Commissioning

7.1 Procedure

QUALIFIED PERSON

Before you can commission the inverter, you must check various settings and make changes if necessary. This section describes the procedure for commissioning and gives an overview of the steps you must always perform in the prescribed order.

Procedure	See
1. Check which country data set the inverter is set to.	Supplementary sheet with the default settings, type label or display
2. If the country data set is not set correctly for your country or your purpose, adjust to the required country data set and the corresponding display language within the first ten feed-in hours via the rotary switches in the inverter.	Section 7.2, page 37
3. If the inverter is to communicate with several <i>Bluetooth</i> devices, or if <i>Bluetooth</i> is not to be used as a type of communication, configure the NetID.	Section 7.3, page 38
4. Commission the inverter.	Section 7.4, page 40

7.2 Configuring the Country Data Set

QUALIFIED PERSON

A display language is assigned to every country data set. Set the country data set appropriate for your country or purpose, with the corresponding display language, within the first ten feed-in hours via the rotary switches in the inverter. After the first ten feed-in hours, the country data set can only be changed by means of a communication product.

If the display language of the country data set does not match the required language, you can change it after commissioning (see Section 8.2, page 42).

The country data set must be set correctly.

If you select a country data set which is not valid for your country and purpose, it can cause a disturbance in the PV system and lead to problems with the grid operator. When selecting the country data set, you must always observe the locally applicable standards and directives as well as the properties of the PV system (e.g. PV system size, grid-connection point).

- If you are not sure which country data set is valid for your country or purpose, contact your grid operator for information on which country data set is to be configured.

Procedure:

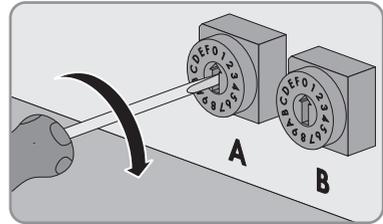
1. Determine the rotary switch position for your country and purpose. To do this, consult the Technical Information "Overview of the Rotary Switch Settings" at www.SMA-Solar.com.

2. **⚠ DANGER**

Danger to life due to high voltages

- Ensure that the inverter is disconnected from all voltage sources and that the enclosure lid is removed (see Section 10, page 51).

3. Set the rotary switches **A** and **B** to the required position using a flat-blade screwdriver (blade width: 2.5 mm).



- The inverter will adopt the setting after commissioning. This can take up to five minutes.

7.3 Setting the NetID

⚠ QUALIFIED PERSON

By default, the NetID is set to **1** for all SMA inverters and SMA communication products with *Bluetooth*. If your PV system consists of an inverter and a maximum of one further *Bluetooth* device (e.g. computer with *Bluetooth* or SMA communication product), you can leave the NetID set to **1**.

You must change the NetID in the following cases:

- If your PV system consists of one inverter and two other *Bluetooth* devices (e.g. computer with *Bluetooth* interface and SMA communication product) or of multiple inverters with *Bluetooth*, you must change the NetID of your PV system. This will enable communication with several *Bluetooth* devices.
- If another PV system with *Bluetooth* is located within 500 m of your PV system, you must change the NetID of your PV system. This will help keep both PV systems separate.
- If you do not wish to communicate via *Bluetooth*, deactivate the *Bluetooth* communication on your inverter. This will protect your PV system from unauthorized access.

All *Bluetooth* devices in a PV system must have the same NetID. You can use rotary switch C to set a new NetID in the inverter before commissioning. The setting will be adopted after commissioning. This can take up to five minutes.

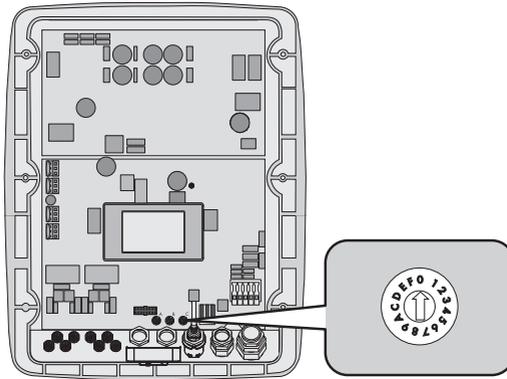


Figure 12: Positions of rotary switch C

Position	Explanation
0	Communication via <i>Bluetooth</i> is deactivated.
1	Communication via <i>Bluetooth</i> with a further <i>Bluetooth</i> device
2 to F	NetID for communication via <i>Bluetooth</i> with multiple <i>Bluetooth</i> devices

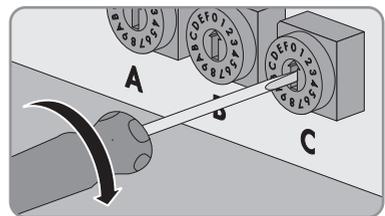
Procedure:

1. **⚠ DANGER**

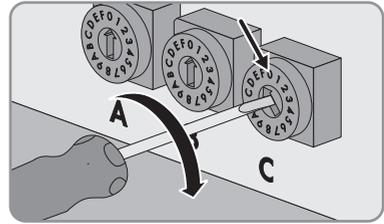
Danger to life due to high voltages

- Ensure that the inverter is disconnected from all voltage sources (see Section 10, page 51).

2. To configure a new NetID, set the rotary switch **C** to the determined NetID using a flat-blade screwdriver (blade width: 2.5 mm).



3. To deactivate the communication via *Bluetooth*, set the rotary switch **C** to the position **O** using a flat-blade screwdriver (blade width: 2.5 mm). This will protect your PV system from unauthorized access.



- The inverter will adopt the setting after commissioning. This can take up to five minutes.

7.4 Commissioning the Inverter

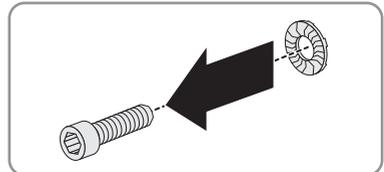
⚠ QUALIFIED PERSON

Requirements:

- The inverter must be correctly mounted.
- The circuit breaker must be correctly rated.
- All cables must be correctly connected.
- Unused DC inputs must be sealed using the corresponding DC connectors and sealing plugs.
- The country data set must be set correctly for the country or the purpose.

Procedure:

1. Mount the enclosure lid:
 - Attach one conical spring washer to each screw. The grooved side of the conical spring washer must point to the screw head.



- Tighten the screws of the enclosure lid diagonally to each other using an Allen key (AF 5) (torque: 6 Nm ± 0.5 Nm).
 - The teeth of the conical spring washers are pushed into the enclosure lid. This ensures that the enclosure lid is grounded.
2. Secure the protective cover using two screws and an Allen key (AF 5).
 3. Securely plug in the ESS.

4. Switch on the circuit breaker of all three line conductors.
 5. If the multifunction relay is used, switch on the load supply voltage, if necessary.
- The start-up phase begins.
 - The green LED is glowing and the display alternates between the firmware version, the serial number or designation of the inverter, the NetID, the IP address, the subnet mask, the configured country data set and the display language.

✘ The green LED is flashing?

Possible cause of error: the DC input voltage is still too low or the inverter is monitoring the utility grid.

- Once the DC input voltage is sufficiently high and the grid connection conditions are met, the inverter will start operation.
- ✘** The red LED is glowing and an error message and event number appear in the display?
- Rectify the error (for troubleshooting see service manual at www.SMA-Solar.com).

8 Configuration

8.1 Procedure

Once you have commissioned the inverter, you may have to adjust various settings via the rotary switches in the inverter or via a communication product. This section describes the procedure for configuration and gives an overview of the steps you must perform in the prescribed order.

Procedure	See
1. If the display language is not set correctly, adjust the settings.	Section 8.2, page 42
2. If you want to integrate the inverter into a Speedwire network, connect the inverter to the network.	Section 8.3, page 43
3. To manage the PV system data or to set the inverter parameters, capture the inverter in a communication product.	Manual of the communication product at www.SMA-Solar.com
4. Change the PV system time and PV system password.	Manual of the communication product at www.SMA-Solar.com
5. If a residual-current device with a tripping threshold of 30 mA was required and used, you must set the tripping threshold of the residual-current device.	Section 8.5, page 45
6. If using the multifunction relay, ensure that the operating mode is set correctly and adjust any further settings for the operating mode as necessary.	Section 8.6, page 45
7. Activate and set SMA OptiTrac Global Peak for partially shaded PV modules.	Section 8.7, page 46

8.2 Changing the Display Language

QUALIFIED PERSON

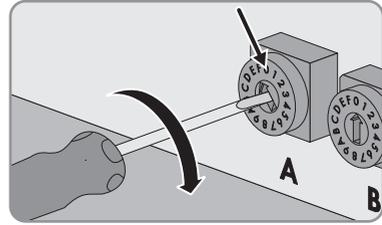
If the language for the country data set is not the language you want to use, you can change the display language as follows:

1. DANGER

Danger to life due to high voltages

- Disconnect the inverter from all voltage sources and open the enclosure lid (see Section 10, page 51).

2. Determine the rotary switch setting for the desired display language. To do this, consult the Technical Information "Overview of the Rotary Switch Settings" at www.SMA-Solar.com.
3. Set the rotary switch **A** to **0** using a flat-blade screwdriver (blade width: 2.5 mm). This ensures that the selected data country set remains unchanged.



4. Set the rotary switch **B** to the required language using a flat-blade screwdriver (blade width: 2.5 mm).
 5. Recommission the inverter (see service manual at www.SMA-Solar.com).
- The inverter adopts the settings after commissioning. This can take up to five minutes.

8.3 Connecting the Inverter to the Network

Additionally required material (not included in the scope of delivery):

- One mating plug for RJ45 pin connector in accordance with IEC 61076-3-106, model 4 with push-pull lock
SMA Solar Technology AG recommends the plug sets "STX V4 RJ45" from "Telegärtner" or "IE-PS-V04P-RJ45-FH" from "Weidmüller".
- One network cable

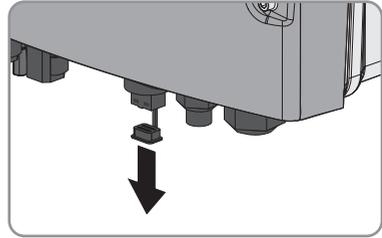
Cable requirements:

The cable length and quality affect the quality of the signal. Observe the following cable requirements.

- Cable type: 100BaseTx
SMA Solar Technology AG recommends cable type "SMA COMCAB-OUTxxx" for outdoor use and cable type "SMA COMCAB-INxxx" for indoor use, available in lengths xxx = 100 m, 200 m, 500 m, 1,000 m
- Shielding: S-FTP or S-STP
- Plug type: RJ45 of Cat5, Cat5e, Cat6, Cat6a
- Number of insulated conductor pairs and insulated conductor cross-section: at least $2 \times 2 \times 0.22 \text{ mm}^2$
- Maximum cable length between two nodes with patch cable: 50 m
- Maximum cable length between two nodes with installation cable: 100 m
- UV-resistant for outdoor use

Procedure:

1. Connect one end of the network cable to the mating plug (see mating plug documentation).
2. Remove the filler plug from the pin connector for network connection to the inverter.



3. Connect the end of the network cable with the mating plug to the inverter. Insert the mating plug firmly into the pin connector on the inverter.
4. Connect the other end of the network cable directly to the PC or router or connect it to another node. You can only connect the inverter to other nodes via star topology.

8.4 Changing Operating Parameters

⚠ QUALIFIED PERSON

This section describes the basic procedure for changing operating parameters. Always change operating parameters as described in this section. Some parameters that have sensitive functions can only be viewed and changed by qualified persons (for further information on changing parameters, refer to the manual of the communication product).

The operating parameters of the inverter are set to certain values by default. To optimize inverter operation, you can change the operating parameters using a communication product.

Requirements:

- Depending on the type of communication, a computer with a *Bluetooth* or Ethernet interface must be available.
- A communication product corresponding to the type of communication used must be available.
- The inverter must be registered in the communication product.
- The changes to the grid-relevant operating parameters must be approved by the responsible grid operator.
- When changing grid-relevant parameters, the SMA Grid Guard code must be available (see the Certificate "Order Form for the SMA Grid Guard Code" at www.SMA-Solar.com).

Procedure:

1. Call up the user interface of the communication product or software and log in as **Installer** or **User**.
2. If required, enter the SMA Grid Guard code.
3. Select and set the required parameter.
4. Save settings.

8.5 Setting the Tripping Threshold of the Residual-Current Device

QUALIFIED PERSON

If a residual-current device with a tripping threshold of 30 mA is required and used, you must set the parameter **RCD adjustment** to **30 mA** (for further information, see the Technical Information "Leading Leakage Currents" at www.SMA-Solar.com).

The basic procedure for changing operating parameters is explained in another section (see Section 8.4, page 44).

- Select the parameter **RCD adjustment** and set it to **30 mA**.

8.6 Setting the Operating Mode of the Multifunction Relay

QUALIFIED PERSON

By default, the multifunction relay is set to activate a fault indicator when a fault occurs. If you use the multifunction relay for a different purpose, you must change the operating mode and adjust further settings for the operating mode, if necessary.

The basic procedure for changing operating parameters is explained in another section (see Section 8.4, page 44).

Operating modes:

Operating mode of multifunction relay (Mlt.OpMode)	Description
Fault indication (FltInd)	The multifunction relay controls a display device which, depending on the type of connection, signals either an error or the undisturbed operation of the inverter.
Self-consumption (SelfCsmP)	The multifunction relay switches loads on or off, depending on the power supply status of the PV system.
Control via communication (ComCtl)	The multifunction relay switches loads on and off according to commands transmitted by a communication product.
Battery bank (BatCha)	The multifunction relay controls the charging of the batteries depending on the power situation of the PV system.
Fan control (FanCtl)	The multifunction relay controls an external fan, depending on the temperature of the inverter.
Switching status grid relay (GriSwCpy)	The local grid operator may require that a signal is transmitted as soon as the inverter connects to the utility grid. The multifunction relay simulates the switching status of the grid relay and transmits a signal to the grid operator.

Procedure:

1. Select the parameter **Operating mode of multifunction relay** or **Mlt.OpMode** and set the desired operating mode.
2. Once you have set the operating mode **Self-consumption** or **SelfCsmP**, you can configure other settings:
 - Select the parameter **Minimum On power for MFR self-consumption** or **Mlt.MinOnPwr** and set the desired value. This will configure the power threshold from which a load is to be activated.
 - Select the parameter **Minimum power On time, MFR self-consumption** or **Mlt.MinOnPwrTmm** and set the desired value. This will configure the minimum time for which the power must have exceeded the minimum switch-on power threshold in order to trip activation of the load.
 - Select the parameter **Minimum On time for MFR self-consumption** or **Mlt.MinOnTmm** and set the desired value. This will configure the minimum time for which the load remains activated.
3. If you have set the operating mode **Control via communication** or **ComCtl**, select the parameter **Status of MFR with control via communication** or **Mlt.ComCtl.Sw** and set the desired value. This will configure the status at which the multifunction relay is controlled via a communication product.
4. If you have set the operating mode **Battery bank** or **BatCha**, make further settings:
 - Select the parameter **Minimum On power for MFR battery bank** or **Mlt.BatCha.Pwr** and set the desired value. This will configure the power threshold from which the battery is to be charged.
 - Select the parameter **Minimum time before reconnection of MFR battery bank** or **Mlt.BatCha.Tmm** and set the desired value. This will configure the minimum time which must elapse after charging the battery before the battery can be charged again.

8.7 Activating and Setting SMA OptiTrac Global Peak

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For partially shaded PV modules, you should activate SMA OptiTrac Global Peak and set the interval at which the inverter optimizes the MPP of the PV system.

The basic procedure for changing operating parameters is explained in another section (see Section 8.4, page 44).

Procedure:

1. Select the parameter **OptiTrac Global Peak switched on** or **MPPShdw.IsOn** and set to **On**.
 2. Select the parameter **Cycle time of the OptiTrac Global Peak algorithm** or **MPPShdw.CycTms** and set the required time interval. The ideal time interval is usually six minutes. This value should only be increased if the shading situation changes extremely slowly.
- The inverter optimizes the MPP of the PV system at the predetermined time interval.

9 Operation

9.1 Display Overview

The display shows the current operating data of the inverter (e.g. current power, daily energy, total energy) as well as events or errors. Power and energy are displayed as bars in the diagram.

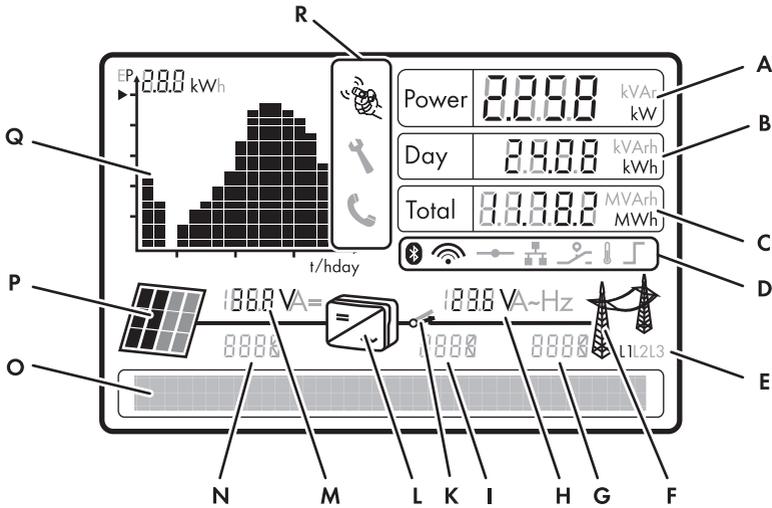


Figure 13: Layout of the display (example)

Position	Symbol	Explanation
A	-	Current power
B	-	Energy on the current day
C	-	Total amount of energy fed in

Position	Symbol	Explanation
D		Active <i>Bluetooth</i> connection
		Quality of the <i>Bluetooth</i> connection
		Active connection to a Speedwire network
		Active connection to Sunny Portal
		Multifunction relay is active
		Power limitation due to excessive temperature
		Active power limitation via PV system control
E	-	Line conductor to which the displayed values apply
F		Utility grid
G	-	Event number of an error on the utility grid side
H	-	Output voltage or output current of a line conductor
I	-	Event number of an error in the inverter
K		Grid relay If the grid relay is closed, the inverter is feeding into the utility grid. If the grid relay is open, the inverter is disconnected from the utility grid.
L		Inverter
M	-	Input voltage or input current of a line conductor
N	-	Event number of an error on the PV array side
O	-	Text line to display event and error messages
P		PV array

Position	Symbol	Explanation
Q	-	Diagram with the power curve of the last 16 feed-in hours or energy yields of the last 16 days <ul style="list-style-type: none"> In order to switch between the displays, tap once on the enclosure lid.
R		You can operate the display by tapping on the enclosure lid (see Section 9.3, page 49).
		The displayed error must be rectified on-site by a qualified person (for troubleshooting, see service manual at www.SMA-Solar.com).
		The displayed error cannot be rectified on-site. <ul style="list-style-type: none"> Contact the SMA Service Line.

9.2 LED Signals

The LEDs indicate the operating state of the inverter.

LED	Status	Explanation
Green LED	glowing	Operation
	flashing	The requirements for the connection to the utility grid have not been met.
Red LED	glowing	An error has occurred that must be rectified by a qualified person (for troubleshooting, see service manual at www.SMA-Solar.com).
Blue LED	glowing	Active communication via <i>Bluetooth</i>

9.3 Activating and Operating the Display

You can activate and operate the display by tapping on the enclosure lid.

- Activate the display. Tap on the enclosure lid once.
 - The backlight is switched on.
- To move to the next line, tap on the enclosure lid once.
- In order to switch between the power curve of the last 16 feed-in hours and the energy yields of the last 16 days in the diagram, tap on the enclosure lid once.

9.4 Calling Up Display Messages of the Start-Up Phase

Various inverter information is displayed during the start-up phase that can be called up whenever required during operation.

- Tap on the enclosure lid twice.
- The display alternates automatically between device type, firmware version, serial number or designation of the inverter, IP address, subnet mask, configured country data set and display language.

10 Disconnecting the Inverter from Voltage Sources

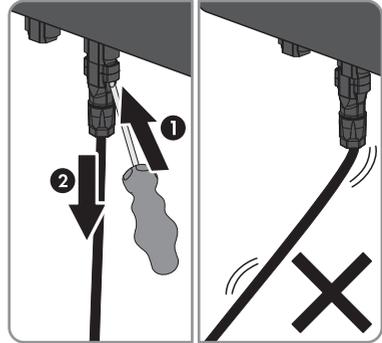
⚠ QUALIFIED PERSON

Prior to performing any work on the inverter, always disconnect it from all voltage sources as described in this section. It is important to always observe the prescribed sequence.

NOTICE

Destruction of the measuring device due to overvoltage

- Only use measuring devices with a DC input voltage range up to at least 1,000 V or higher.
1. Disconnect the circuit breaker from all three line conductors and secure against reconnection.
 2. Remove the ESS.
 3. Loosen two screws of the protective cover using an Allen key (AF 5) and remove the protective cover.
 4. Use a current clamp to ensure that no current is present in the DC cables.
 5. Release and remove all DC connectors. Insert a flat-blade screwdriver or an angled screwdriver (blade width: 3.5 mm) in one of the side slots and pull the DC connectors straight out. Do not pull on the cable.



6. ⚠ DANGER

Danger to life due to high voltages

The capacitors in the inverter take five minutes to discharge.

- Wait five minutes before opening the enclosure lid.
7. Ensure that no voltage is present at the DC inputs of the inverter.
 8. Unscrew all the screws of the enclosure lid using an Allen key (AF 5) and remove the enclosure lid.
 9. Use an appropriate measuring device to ensure that no voltage is present at the AC connecting terminal plate between **L1** and **N**, **L2** and **N**, and **L3** and **N**. Insert a test probe in each round opening of the terminal.
 10. Use an appropriate measuring device to ensure that no voltage is present at the AC connecting terminal plate between **L1** and **PE**, **L2** and **PE**, and **L3** and **PE**. Insert a test probe in each round opening of the terminal.
 11. Ensure that no voltage is present between any terminal of the multifunction relay and **PE** of the AC connecting terminal plate.

12. **NOTICE****Damage to the inverter due to electrostatic discharge**

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

- Ground yourself before touching any component.

11 Technical Data

11.1 DC/AC

11.1.1 Sunny Tripower 5000TL / 6000TL / 7000TL

DC Input

	STP 5000TL-20	STP 6000TL-20	STP 7000TL-20
Maximum DC power at $\cos \varphi = 1$	5,100 W	6,125 W	7,175 W
Maximum input voltage	1,000 V	1,000 V	1,000 V
MPP voltage range	245 V to 800 V	295 V to 800 V	290 V to 800 V
Rated input voltage	580 V	580 V	580 V
Minimum input voltage	150 V	150 V	150 V
Initial input voltage	188 V	188 V	188 V
Maximum input current, input A	11 A	11 A	15 A
Maximum input current, input B	10 A	10 A	10 A
Maximum input current per string, input A*	11 A	11 A	15 A
Maximum input current per string, input B*	10 A	10 A	10 A
Maximum short-circuit current, input A	16.5 A	16.5 A	22.5 A
Maximum short-circuit current, input B	15 A	15 A	15 A
Number of independent MPP inputs	2	2	2
Strings per MPP input	2	2	2

* Maximum permitted current allowed through one DC connector.

AC Output

	STP 5000TL-20	STP 6000TL-20	STP 7000TL-20
Rated power at 230 V, 50 Hz	5,000 W	6,000 W	7,000 W
Maximum apparent AC power at $\cos \varphi = 1$	5,000 VA	6,000 VA	7,000 VA
Rated grid voltage	~3/N/PE, 230 V / 400 V	~3/N/PE, 230 V / 400 V	~3/N/PE, 230 V / 400 V

	STP 5000TL-20	STP 6000TL-20	STP 7000TL-20
AC voltage range*	160 V to 280 V	160 V to 280 V	160 V to 280 V
Nominal AC current at 220 V	7.3 A	8.7 A	10.2 A
Nominal AC current at 230 V	7.3 A	8.7 A	10.2 A
Nominal AC current at 240 V	6.9 A	8.3 A	10.1 A
Maximum output current	7.3 A	8.7 A	10.2 A
Total harmonic distortion of the output current with total harmonic distortion of the AC voltage < 2%, and AC power > 50% of the rated power	≤3%	≤3%	≤3%
Maximum output current under fault conditions	12 A	15 A	17 A
Rated power frequency	50 Hz	50 Hz	50 Hz
AC power frequency*	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz
Operating range at AC power frequency 50 Hz	45.5 Hz to 54.5 Hz	45.5 Hz to 54.5 Hz	45.5 Hz to 54.5 Hz
Operating range at AC power frequency 60 Hz	55.5 Hz to 64.5 Hz	55.5 Hz to 64.5 Hz	55.5 Hz to 64.5 Hz
Displacement power factor cos phi, adjustable	0.8 underexcited to 1 to 0.8 overexcited	0.8 underexcited to 1 to 0.8 overexcited	0.8 underexcited to 1 to 0.8 overexcited
Feed-in phases	3	3	3
Connection phases	3	3	3
Overvoltage category as per IEC 60664-1	III	III	III

* depending on the configured country data set

Efficiency

	STP 5000TL-20	STP 6000TL-20	STP 7000TL-20
Maximum efficiency, η_{max}	98%	98%	98%
European efficiency, η_{EU}	97.1%	97.4%	97.5%

11.1.2 Sunny Tripower 8000TL / 9000TL / 10000TL

DC Input

	STP 8000TL-20	STP 9000TL-20	STP 10000TL-20
Maximum DC power at $\cos \varphi = 1$	8,200 W	9,225 W	10,250 W
Maximum input voltage	1,000 V	1,000 V	1,000 V
MPP voltage range	330 V to 800 V	370 V to 800 V	370 V to 800 V
Rated input voltage	580 V	580 V	580 V
Minimum input voltage	150 V	150 V	150 V
Initial input voltage	188 V	188 V	188 V
Maximum input current, input A	15 A	15 A	18 A
Maximum input current, input B	10 A	10 A	10 A
Maximum input current per string, input A*	15 A	15 A	18 A
Maximum input current per string, input B*	10 A	10 A	10 A
Maximum short-circuit current, input A	22.5 A	22.5 A	25 A
Maximum short-circuit current, input B	15 A	15 A	15 A
Number of independent MPP inputs	2	2	2
Strings per MPP input	2	2	2

* Maximum permitted current allowed through one DC connector.

AC Output

	STP 8000TL-20	STP 9000TL-20	STP 10000TL-20
Rated power at 230 V, 50 Hz	8,000 W	9,000 W	10,000 W
Maximum apparent AC power at $\cos \varphi = 1$	8,000 VA	9,000 VA	10,000 VA
Rated grid voltage	~3/N/PE, 230 V / 400 V	~3/N/PE, 230 V / 400 V	~3/N/PE, 230 V / 400 V
AC voltage range*	160 V to 280 V	160 V to 280 V	160 V to 280 V
Nominal AC current at 220 V	11.6 A	13.1 A	14.5 A
Nominal AC current at 230 V	11.6 A	13.1 A	14.5 A
Nominal AC current at 240 V	11.1 A	12.5 A	13.9 A
Maximum output current	11.6 A	13.1 A	14.5 A

	STP 8000TL-20	STP 9000TL-20	STP 10000TL-20
Total harmonic distortion of the output current with total harmonic distortion of the AC voltage < 2%, and AC power > 50% of the rated power	≤3%	≤3%	≤3%
Maximum output current under fault conditions	20 A	22 A	25 A
Rated power frequency	50 Hz	50 Hz	50 Hz
AC power frequency*	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz
Operating range at AC power frequency 50 Hz	45.5 Hz to 54.5 Hz	45.5 Hz to 54.5 Hz	45.5 Hz to 54.5 Hz
Operating range at AC power frequency 60 Hz	55.5 Hz to 64.5 Hz	55.5 Hz to 64.5 Hz	55.5 Hz to 64.5 Hz
Displacement power factor $\cos \varphi$, adjustable	0.8 underexcited to 1 to 0.8 overexcited	0.8 underexcited to 1 to 0.8 overexcited	0.8 underexcited to 1 to 0.8 overexcited
Feed-in phases	3	3	3
Connection phases	3	3	3
Overvoltage category in accordance with IEC 60664-1	III	III	III

* depending on the configured country data set

Efficiency

	STP 8000TL-20	STP 9000TL-20	STP 10000TL-20
Maximum efficiency, η_{\max}	98%	98%	98%
European efficiency, η_{EU}	97.6%	97.6%	97.6%

11.1.3 Sunny Tripower 12000TL

DC Input

	STP 12000TL-20
Maximum DC power at $\cos \varphi = 1$	12,275 W
Maximum input voltage	1,000 V
MPP voltage range	440 V to 800 V
Rated input voltage	580 V
Minimum input voltage	150 V
Initial input voltage	188 V

	STP 12000TL-20
Maximum input current, input A	18 A
Maximum input current, input B	10 A
Maximum input current per string, input A*	18 A
Maximum input current per string, input B*	10 A
Maximum short-circuit current, input A	25 A
Maximum short-circuit current, input B	15 A
Number of independent MPP inputs	2
Strings per MPP input	2

* Maximum permitted current allowed through one DC connector.

AC Output

	STP 12000TL-20
Rated power at 230 V, 50 Hz	12,000 W
Maximum apparent AC power at $\cos \varphi = 1$	12,000 VA
Rated grid voltage	~3/N/PE, 230 V / 400 V
AC voltage range*	160 V to 280 V
Nominal AC current at 220 V	17.4 A
Nominal AC current at 230 V	17.4 A
Nominal AC current at 240 V	16.7 A
Maximum output current	17.4 A
Total harmonic distortion of the output current with total harmonic distortion of the AC voltage < 2%, and AC power > 50% of the rated power	≤3%
Maximum output current under fault conditions	30 A
Rated power frequency	50 Hz
AC power frequency*	50 Hz / 60 Hz
Operating range at AC power frequency 50 Hz	45.5 Hz to 54.5 Hz
Operating range at AC power frequency 60 Hz	55.5 Hz to 64.5 Hz
Displacement power factor $\cos \varphi$, adjustable	0.8 underexcited to 1 to 0.8 overexcited
Feed-in phases	3
Connection phases	3

	STP 12000TL-20
Overvoltage category in accordance with IEC 60664-1	III

* depending on the configured country data set

Efficiency

	STP 12000TL-20
Maximum efficiency, η_{\max}	98.2%
European efficiency, η_{EU}	97.9%

11.2 General Data

Width x height x depth, with Electronic Solar Switch	470 mm x 730 mm x 240 mm
Weight of STP 5000TL-20 / 6000TL-20 / 7000TL-20 / 8000TL-20 / 9000TL-20 / 10000TL-20	37 kg
Weight of STP 12000TL-20	38 kg
Length x width x height of the packaging	798 mm x 598 mm x 398 mm
Transport weight of STP 5000TL-20 / 6000TL-20 / 7000TL-20 / 8000TL-20 / 9000TL-20 / 10000TL-20	40 kg
Transport weight of STP 12000TL-20	41 kg
Climatic category in accordance with IEC 60721-3-4	4K4H
Environmental category	outdoors
Pollution degree outside the enclosure	3
Pollution degree inside the enclosure	2
Operating temperature range	-25 °C to +60 °C
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above mean sea level (MSL)	3,000 m
Typical noise emission	≤40 dB(A)
Power loss in night mode	1 W
Maximum data volume per inverter with Speedwire/Webconnect	550 MB/month

Additional data volume when using the Sunny Portal live interface	600 kB/hour
Topology	transformerless
Cooling concept	SMA OptiCool
Fan connection	Designed for safe disconnection in accordance with DIN EN 62109
Degree of protection for electronics in accordance with IEC 60529	IP65
Protection class in accordance with IEC 62103	I
Grid configurations	TN-C, TN-S, TN-C-S, TT (when $V_{N,PE} < 20$ V)
Approvals and national standards, as per 06/2014*	AS 4777, CE, CEI 0-21, C10/11:2012, DIN EN 62109-1, EN 50438, G59/3, G83/2, IEC 61727/MEA IEC 61727/PEA, IEC 62109-2, NEN EN 50438, NRS 097-2-1, PPC, PPDS, RD 661/2007, RD 1699:2011, SI 4777, UTE C15-712-1, VDE0126-1-1, VDE-AR-N 4105, VFR 2013, VFR 2014

* **AS 4777, SI 4777:** For STP 12000TL-20 available as of October 2014

CE, EN 50438, G59/3, G83/2, IEC 62109-2, NEN EN 50438, NRS 097-2-1, PPC, PPDS, RD 661/2007, RD 1699:2011, UTE C15-712-1, VDE AR-N 4105, VFR 2013, VFR 2014: For STP 12000TL-20 available as of September 2014

CEI 0-21: only permitted with external decoupling protection. For STP 12000TL-20 available as of September 2014

C10/11:2012: only possible if the three-phase line-to-line voltage is 400 V.

IEC 61727/MEA and IEC 61727/PEA: only applicable for STP 9000TL-20.

EN 50438: does not apply to all national appendices of EN 50438.

IEC 62109-2: This standard requires that either the multifunction relay in the inverter is used as fault indicator or that the inverter is connected to Sunny Portal and that the fault alert is activated in Sunny Portal.

NRS 97-2-1: This standard requires a separate label be attached to the AC distribution board to indicate the AC-side disconnection of the inverter in case of a grid failure (for further details, see NRS 97-2-1, Sect. 4.2.7.1 and 4.2.7.2).

11.3 Protective Devices

DC reverse polarity protection	Short-circuit diode
Input-side disconnection point	Electronic Solar Switch, SUNCLIX DC connector
DC overvoltage protection	Thermally monitored varistors
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 4
Maximum permissible fuse protection	32 A

Ground-fault monitoring for STP 5000TL-20 / 6000TL-20 / 7000TL-20 / 8000TL-20 / 9000TL-20	Insulation monitoring: $R_{iso} > 385 \text{ k}\Omega$
Ground-fault monitoring for STP 10000TL-20 / 12000TL-20	Insulation monitoring: $R_{iso} > 200 \text{ k}\Omega$
All-pole sensitive residual-current monitoring unit	Available

11.4 Climatic Conditions

Installation in accordance with IEC 60721-3-3, Class 4K4H

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

Transport in accordance with IEC 60721-3-2, Class 2K3

Temperature range	-25 °C to +70 °C
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11.5 Equipment

DC connection	SUNCLIX DC connector
AC connection	Spring-cage terminal
Display	LC graphic display
<i>Bluetooth</i>	As standard
Speedwire/Webconnect interface	As standard
Multifunction relay	As standard
SMA Power Control Module	Optional
RS485 interface	Optional

11.6 Torques

Enclosure lid screws	6.0 Nm \pm 0.5 Nm
Protective cover screws	2.0 Nm
Additional grounding terminal	6.0 Nm
Cylindrical screw for attaching the enclosure to the wall mounting bracket	6.0 Nm
SUNCLIX swivel nut	2.0 Nm

11.7 Multifunction relay

Maximum AC switching voltage	240 V
Maximum DC switching voltage	30 V
Maximum AC switching current	1.0 A
Maximum DC switching current	1.0 A
Minimum electrical endurance when the maximum switching voltage and maximum switching current are complied with*	100,000 switching cycles

* Corresponds to 20 years at 12 switching operations per day

11.8 Electronic Solar Switch

Electrical endurance in the event of short circuit, at nominal current of 30 A	At least 50 switching operations
Maximum switching current	30 A
Maximum switching voltage	1,000 V
Maximum power	12 kW
Degree of protection when plugged in	IP65
Degree of protection when unplugged	IP65
Fuses for Electronic Solar Switch	2 x 1,000 V / 4 A, fast acting (soldered, non-replaceable)

11.9 Data Storage Capacity

Energy yields in the course of the day	63 days
Daily yields	30 years
Event messages for users	250 events
Event messages for installers	250 events

12 Contact

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

- Inverter device type
- Inverter serial number
- Inverter firmware version
- Special country-specific settings of the inverter (if applicable)
- Type and number of PV modules connected
- Mounting location and mounting altitude of the inverter
- Three-digit or four-digit event number and display message
- Optional equipment, e.g. communication products
- Use of the multifunction relay

Australia	SMA Australia Pty Ltd. Sydney	Toll free for Australia: 1800 SMA AUS (1800 762 287) International: +61 2 9491 4200
Belgien/Bel- gique/België	SMA Benelux BVBA/SPRL Mecheln	+32 15 286 730
Brasil	Vide España (Espanha)	
Česko	SMA Central & Eastern Europe s.r.o. Praha	+420 235 010 417
Chile	Ver España	
Danmark	Se Deutschland (Tyskland)	
Deutschland	SMA Solar Technology AG Niestetal	Medium Power Solutions Wechselrichter: +49 561 9522-1499 Kommunikation: +49 561 9522-2499 SMA Online Service Center: www.SMA.de/Service
		Hybrid Energy Solutions Sunny Island: +49 561 9522-399 PV-Diesel Hybridsysteme: +49 561 9522-3199
		Power Plant Solutions Sunny Central: +49 561 9522-299
España	SMA Ibérica Tecnología Solar, S.L.U. Barcelona	Llamada gratuita en España: 900 14 22 22 Internacional: +34 902 14 24 24

France	SMA France S.A.S. Lyon	Medium Power Solutions Onduleurs : +33 472 09 04 40 Communication : +33 472 09 04 41
		Hybrid Energy Solutions Sunny Island : +33 472 09 04 42
		Power Plant Solutions Sunny Central : +33 472 09 04 43
India	SMA Solar India Pvt. Ltd. Mumbai	+91 22 61713888
Italia	SMA Italia S.r.l. Milano	+39 02 8934-7299
Κύπρος/Kıbrıs	Βλέπε Ελλάδα/ Bkz. Ελλάδα (Yunanistan)	
Luxemburg/ Luxembourg	Siehe Belgien Voir Belgique	
Magyarország	lásd Česko (Csehország)	
Nederland	zie Belgien (België)	
Österreich	Siehe Deutschland	
Perú	Ver España	
Polska	Patrz Česko (Czechy)	
Portugal	SMA Solar Technology Portugal, Unipessoal Lda Lisboa	Isento de taxas em Portugal: 800 20 89 87 Internacional: +351 212377860
România	Vezi Česko (Cehia)	
Schweiz	Siehe Deutschland	
Slovensko	pozri Česko (Česká republika)	
South Africa	SMA Solar Technology South Africa Pty Ltd. Centurion (Pretoria)	08600 SUNNY (08600 78669) International: +27 (12) 643 1785
United King- dom	SMA Solar UK Ltd. Milton Keynes	+44 1908 304899
Ελλάδα	SMA Hellas AE Αθήνα	801 222 9 222 International: +30 212 222 9 222
България	Вижте Ελλάδα (Γърция)	
ไทย	SMA Solar (Thailand) Co., Ltd. กรุงเทพฯ	+66 2 670 6999

대한민국	SMA Technology Korea Co., Ltd. 서울	+82 2 508-8599	
中国	SMA Beijing Commercial Company Ltd. 北京	+86 10 5670 1350	
+971 2 234-6177	SMA Middle East LLC أبو ظبي		الإمارات العربية المتحدة
Other countries	International SMA Service Line Niestetal	Toll free worldwide: 00800 SMA SERVICE (+800 762 7378423)	



EC Declaration of Conformity

with the Guidelines of the European Community

- Electromagnetic compatibility 2004/108/EC (EMC)
- Low-voltage directive 2006/95/EC (LVD)
- Radio and telecommunications terminal equipment 1999/05/EC (R&TTE)

The products stated below have been developed, constructed and manufactured in accordance with the above mentioned EC directives. The applied harmonized standards are shown in the following table.

	Sunny Boy	Sunny Mini Central	Sunny Boy/ Sunny Tripower	Sunny Boy	Sunny Boy/ Sunny Tripower
	SB 1300TL-10, SB 1600TL-10, SB 2100TL	SMC 6000A-11, SMC 9000TLRP-10, SMC 10000TLRP-10, SMC 11000TLRP-10	SB 2500TLST-21, SB 3000TLST-21, SB 3000TL-21, SB 3600TL-21, STP 5000TL-20, STP 6000TL-20, STP 7000TL-20, STP 8000TL-20, STP 9000TL-20, STP 10000TL-10, STP 10000TL-20	SB 2000HF-30, SB 2500HF-30, SB 3000HF-30	SB 4000TL-21, SB 5000TL-21, SB 6000TL-21, STP 12000TL-10, STP 15000TL-10, STP 15000TL-10, STP 17000TL-10, STP 20000TL-10, STP 12000TL-20
Electromagnetic Interference (EMC directive, Article 5 – Annex I.1.a)					
EN 61000-6-3:2007 + A1:2011	✓	✓	✓	✓	✓
EN 61000-6-4:2007 + A1:2011	✓	✓	✓	✓	✓
Electromagnetic interference emissions (EMC Directive Article 5 – Annex I.1.a)					
EN 61000-3-3:2008	✓	✗	✓	✓	✗
EN 61000-3-2:2006 + A1:2009 + A2:2009	✓	✗	✓	✓	✗
EN 61000-3-11:2000	✗	✓	✗	✗	✓
EN 61000-3-12:2005	✗	✓	✗	✗	✓
Immunity to interference (EMC Directive Article 5 – Annex I.1.b)					
EN 61000-6-1:2007	✓	✓	✓	✓	✓
EN 61000-6-2:2005	✓	✓	✓	✓	✓
Device safety (LVD Article 2 – Annex I)					
EN 62109-1:2010	✓	✓	✓	✓	✓
EN 62109-2:2011	✓	✗	✓	✗	✓
Health and safety (R&TTE Directive Article 3.1.a)					
EN 62311:2008	✓	✓	✓	✓	✓
Electromagnetic compatibility (R&TTE Directive Article 3.1.b)					
EN 301 489-1 V1.9.2	✓*	✓*	✓	✓	✓
EN 301 489-17 V2.2.1	✓*	✓*	✓	✓	✓
Effective use of frequency spectrum (R&TTE Directive Article 3.2.)					
EN 300 328 V1.7.1	✓*	✓*	✓	✓	✓
	CE	CE	CE	CE	CE

* Only when equipped with SMA Bluetooth Piggy-Back.

✓ Standard applicable
 ✗ Standard not applicable

Information:

Without an explicit written confirmation by SMA, this declaration of conformity is no longer valid if:

- the product is modified, supplemented or changed in any other way,
- components which are not part of the SMA accessories kit, are integrated in the product, as well as if the product is used or installed improperly.

Niestetal, 2014-05-27
SMA Solar Technology AG

ppa. Frank Greizer

ppa. Frank Greizer
 (Vice President MPTPD)



Declaration of Conformity

**with German, European and International (Non-European) standards used for
SUNNY BOY, SUNNY MINI CENTRAL and SUNNY TRIPOWER inverters**

German Standard DIN EN		European Standard EN		International Standard IEC (IEC/CISPR)
DIN EN 61000-6-1:2007-10	based on	EN 61000-6-1:2007	based on	IEC 61000-6-1:2005
DIN EN 61000-6-2:2006-03	based on	EN 61000-6-2:2005	based on	IEC 61000-6-2:2005
DIN EN 61000-6-3:2011-09	based on	EN 61000-6-3:2007 + A1:2011	based on	IEC 61000-6-3:2006 + A1:2010
DIN EN 61000-6-4:2011-09	based on	EN 61000-6-4:2007 + A1:2011	based on	IEC 61000-6-4:2006 + A1:2010
DIN EN 61000-3-2:2010-03	based on	EN 61000-3-2:2006 + A1:2009 + A2:2009	based on	IEC 61000-3-2:2005 + A1:2008 + A2: 2009
DIN EN 61000-3-3:2009-06	based on	EN 61000-3-3:2008	based on	IEC 61000-3-3:2008
DIN EN 61000-3-11:2001-04	based on	EN 61000-3-11:2000	based on	IEC 61000-3-11:2000
DIN EN 61000-3-12:2005-09	based on	EN 61000-3-12:2005	based on	IEC 61000-3-12:2004
DIN EN 62109-1:2010	based on	EN 62109-1:2010	based on	IEC 62109-1:2010
DIN EN 62109-2:2011	based on	EN 62109-2:2011	based on	IEC 62109-2:2011
DIN EN 62311:2008-09	based on	EN 62311:2008	based on	IEC 62311:2007
DIN EN _____		EN 301 489-1 V1.9.2		IEC _____
DIN EN _____		EN 301 489-17 V2.2.1		IEC _____
DIN EN _____		EN 300 328 V1.7.1		IEC _____

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