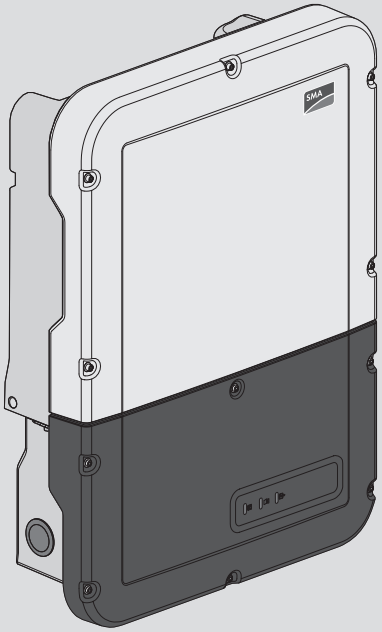
Operating manual

SUNNY BOY STORAGE 3.7 / 5.0 / 6.0



ENGLISH

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SMA Solar Technology AG

Sonnenallee 1

34266 Niestetal

Germany

Tel. +49 561 9522-0

Fax +49 561 9522-100

www.SMA.de

Email: info@SMA.de

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1 Information on this Document

1.1 Validity

This document is valid for:

- SBS3.7-10 (Sunny Boy Storage 3.7)
- SBS5.0-10 (Sunny Boy Storage 5.0)
- SBS6.0-10 (Sunny Boy Storage 6.0)

1.2 Target Group

This document is intended for qualified persons and end users. Only qualified persons are allowed to perform the activities marked in this document 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. Qualified persons must have the following skills:

- Knowledge of how batteries work and are operated
- Training in how to deal with the dangers and risks associated with installing, repairing and using electrical devices, batteries and installations
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of all applicable laws, standards and directives
- Knowledge of and compliance with this document and all safety information
- Knowledge of and compliance with the documents of the battery manufacturer with all safety information

1.3 Content and Structure of this Document

This document describes the mounting, installation, commissioning, configuration, operation, troubleshooting and decommissioning of the product as well as the operation of the product user interface.

You will find the latest version of this document and further information on the product in PDF format at www.SMA-Solar.com.

Illustrations in this document are reduced to the essential information and may deviate from the real product.

1.4 Levels of warning messages

The following levels of warning messages may occur when handling the product.

⚠ 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, could result in death or serious injury.

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

NOTICE
Indicates a situation which, if not avoided, can result in property damage.

1.5 Symbols in the Document

Symbol	Explanation
	Information that is important for a specific topic or goal, but is not safety-relevant
	Example
☐	Indicates a requirement for meeting a specific goal
☑	Desired result
✖	A problem that might occur
⚠ QUALIFIED PERSON	Sections describing activities to be performed by qualified persons only

1.6 Typographies in the document

Typography	Use	Example
bold	• Messages • Terminals • Elements on a user interface • Elements to be selected • Elements to be entered	• Connect the insulated conductors to the terminals **X703:1** to **X703:6**. • Enter **10** in the field **Minutes**.
>	• Connects several elements to be selected	• Select **Settings > Date**.
[**Button**] [**Key**]	• Button or key to be selected or pressed	• Select [**Enter**].

1.7 Designation in the document

Complete designation	Designation in this document
Sunny Boy Storage	Inverter, product

1.8 Additional Information

For more information, please go to www.SMA-Solar.com.

Title and information content	Type of information
"Approved batteries and battery communication connection" Overview of approved batteries	Technical Information
"Application for SMA Grid Guard Code"	Form
"SMA Smart Home" The System Solution for Greater Independence	Planning Guidelines
"Efficiency and Derating" Efficiency and derating behavior of the SMA inverters	Technical Information
"Parameters and Measured Values" Overview of all inverter operating parameters and their configuration options	Technical Information
"SMA Modbus® Interface" List with the product specific SMA Modbus registers	Technical Information
"SMA Modbus® Interface" Information on the commissioning and configuration of the SMA Modbus interface	Technical Information
"SunSpec® Modbus® Interface" List with the product specific SunSpec Modbus registers	Technical Information
"SunSpec® Modbus® Interface" Information on the commissioning and configuration of the SunSpec Modbus interface	Technical Information

2 Safety

2.1 Intended Use

The Sunny Boy Storage is an AC-coupled battery inverter for parallel grid and stand-alone mode operation. The Sunny Boy Storage converts the direct current supplied by a battery into grid-compliant alternating current. The Sunny Boy Storage, together with a battery and a compatible energy meter, make up a system for increased self-consumption (Flexible Storage System) or, together with a automatic transfer switch compatible with Sunny Boy Storage, a battery-backup system (Flexible Storage System with battery-backup function).

The product must only be used as stationary equipment.

The product is suitable for indoor and outdoor use.

The product may only be operated with one of the energy meters approved by SMA Solar Technology AG. An updated list of energy meters approved by SMA Solar Technology AG is available at www.SMA-Solar.com.

The product must only be operated in connection with an intrinsically safe lithium-ion battery approved by SMA Solar Technology AG. An updated list of batteries approved by SMA Solar Technology AG is available at www.SMA-Solar.com.

The battery must comply with the locally applicable standards and directives and must be intrinsically safe (see technical information "SMA Flexible Storage System - Detailed explanations of the safety concept" for detailed explanations regarding the safety concept of battery inverters by SMA Solar Technology AG).

The communication interface of the used battery must be compatible with the product. The entire battery voltage range must be completely within the permissible input voltage range of the product. The maximum permissible DC input voltage of the product must not be exceeded.

The product is not suitable for supplying life-sustaining medical devices. A power outage must not lead to personal injury.

All components must remain within their permitted operating ranges and their installation requirements 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. Unauthorized alterations will void guarantee and warranty claims and in most cases terminate the operating license. SMA Solar Technology AG shall not be held liable for any damage caused by such changes.

Any use of the product other than that described in the Intended Use section does not qualify as the 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 Safety Information

This section contains safety information 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 observe all safety information at all times.

⚠ DANGER

Danger to life from electric shock due to live DC cables at the battery.

The DC cables connected to a battery may be live. Touching the DC conductors or the live components leads to lethal electric shocks.

- Do not touch non-insulated cable ends.
- Do not touch any live components.
- Have the inverter and the battery mounted, installed and commissioned only by qualified persons with the appropriate skills.
- Observe all safety information of the battery manufacturer.
- Prior to performing any work on the inverter or the battery, disconnect the inverter from all voltage sources as described in this document.
- Wait five minutes before working on the inverter.
- If an error occurs, have it rectified by qualified persons only.

⚠ WARNING

Risk of burns due to electric arcs

Short-circuit currents in the battery can cause heat build-up and electric arcs.

- Disconnect the battery from all voltages sources prior to performing any work on the battery.
- Observe safety information of the battery manufacturer when working on the battery or inverter.

⚠ CAUTION

Risk of burns from hot surfaces

The surface of the inverter can get very hot. Touching the surface can result in burns.

- Mount the inverter in such a way that it cannot be touched inadvertently.
- Do not touch hot surfaces.
- Wait 30 minutes for the surface to cool sufficiently.
- Observe the safety messages on the inverter.

NOTICE

Damage to the enclosure seal in subfreezing conditions

If you open the product when temperatures are below freezing, the enclosure seals can be damaged. Moisture can penetrate the product then.

- Only open the product if the ambient temperature is not below 0°C.
- If a layer of ice has formed on the enclosure seal when temperatures are below freezing, remove it prior to opening the product (e.g. by melting the ice with warm air). Observe the applicable safety regulations.

NOTICE

Damage due to sand, dust and moisture ingress

Sand, dust and moisture penetration can damage the product and impair its functionality.

- Only open the product if the humidity is within the thresholds and the environment is free of sand and dust.
- Do not open the product during a dust storm or precipitation.

NOTICE

Damage due to cleaning agents

The use of cleaning agents may cause damage to the product and its components.

- Clean the product and all its components only with a cloth moistened with clear water.

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.

3 Scope of Delivery

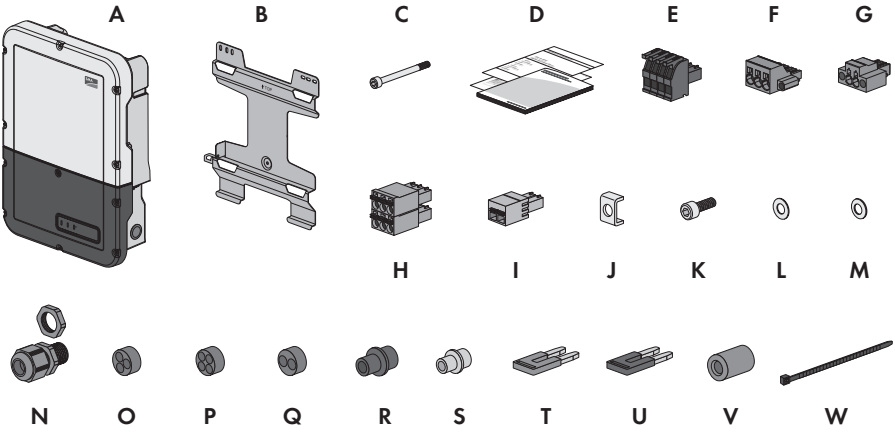


Figure 1: Components included in the scope of delivery

Position	Quantity	Designation
A	1	Inverter
B	1	Wall mounting bracket
C	1	Cylindrical screw M5 x 60
D	1	Quick Reference Guide
E	1	4-pole terminal block for connecting a RS485 energy meter
F	1	Terminal block for the AC connection
G	1	Terminal block for connecting the outlet for secure power supply operation
H	4	6-pole terminal block for connecting the battery communication cables and the communication cable of the automatic transfer switch
I	1	2-pole terminal block for the switch connection for secure power supply operation or for black start feature.
J	5	Clamping bracket
K	5	Cylindrical screw M5 x 16
L	5	Washer M5
M	5	Spring washer M5
N	6	Cable gland and counter nut PG 21
O	2	Three-hole cable support sleeve
P	4	Four-hole cable support sleeve

Position	Quantity	Designation
Q	1	Two-hole cable support sleeve
R	6	Sealing plug for two-hole and three-hole cable support sleeve
S	6	Sealing plug for four-hole cable support sleeve
T	2	Blue jumper
U	2	Red jumper
V	1	Ferrite
W	1	Cable tie

4 Product Overview

4.1 Product Description

The Sunny Boy Storage uses the connected battery for the intermediate storage of excess PV energy in the SMA Flexible Storage System. For this purpose, the Sunny Boy Storage receives the feed-in data and purchased electricity data from the energy meter. This data is used by the Sunny Boy Storage to control the charging and discharging of the battery.

The use of an automatic transfer switch is required in the battery-backup system. In the event of grid failure, the automatic transfer switch disconnects the PV system, loads and the Sunny Boy Storage from the utility grid and creates a battery-backup grid. The battery-backup grid supplies loads that should continue to be supplied with electricity in the event of grid failure. In the event of grid failure, the Sunny Boy Storage supplies the loads with energy after a short switching time. The PV system supplies additional energy that can be used to supply the loads and charge the battery.

Secure power supply operation in Flexible Storage Systems with backup power supply not possible

If the inverter is used in a battery-backup system and connected with an automatic transfer switch, the secure power supply operation is not available.

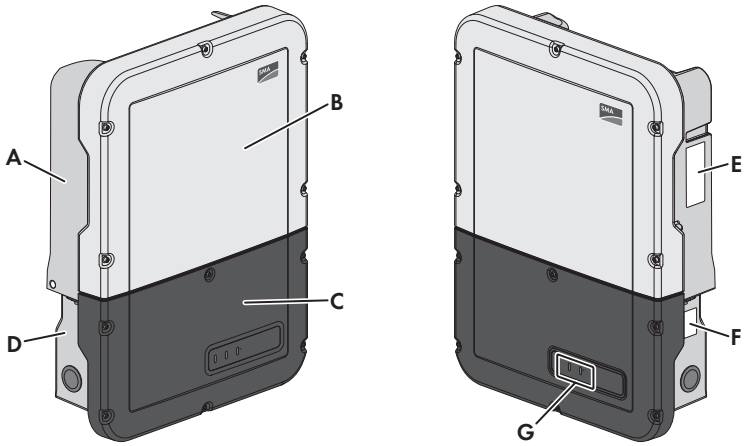


Figure 2: Design of the inverter

Position	Designation
A	Power Unit
B	Enclosure lid of the Power Unit
C	Enclosure lid for the Connection Unit
D	Connection Unit

Position	Designation
E	Type label The type label uniquely identifies the inverter. The type label must remain permanently attached to the product. You will find the following information on the type label: • Inverter device type (Model) • Serial number of the Power Unit (S/N) • Date of manufacture • Device-specific characteristics
F	Additional type label The additional type label must remain permanently attached to the product. You will find the following information on the additional type label: • Device type (Model) • Inverter serial number (S/N) • Identification key (PIC) for registration in Sunny Portal • Registration ID (RID) for registration in Sunny Portal • WLAN password (WPA2-PSK) for the direct connection to the user interface of the inverter via WLAN
G	LEDs The LEDs indicate the operating state of the inverter.

Symbols on the Product and on the Type Label

Symbol	Explanation
	Inverter Together with the green LED, this symbol indicates the operating state of the inverter.
	Observe the documentation Together with the red LED, this symbol indicates an error.
	Data transmission Together with the blue LED, this symbol indicates the status of the network connection.
	Grounding conductor This symbol indicates the position for connecting a grounding conductor.
	Risk of burns due to hot surfaces The product can get hot during operation. Avoid contact during operation. Prior to performing any work on the product, allow the product to cool down sufficiently.

Symbol	Explanation
	Danger to life due to electric shock The product operates at high voltages. Prior to performing any work on the product, disconnect the product from voltage sources. All work on the product must be carried out by qualified persons only.
	Observe the documentation Observe all documentation supplied with the product.
	Danger This symbol indicates that the product must be additionally grounded if additional grounding or equipotential bonding is required at the installation site.
	Direct current
	The product is has no galvanic isolation.
	Alternating current
	WEEE designation Do not dispose of the product together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.
	CE marking The product complies with the requirements of the applicable EU directives.
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.
	RCM (Regulatory Compliance Mark) The product complies with the requirements of the applicable Australian standards.

4.2 Interfaces and Functions

The inverter is equipped with the following interfaces and functions:

User interface for monitoring and configuration

The product is equipped as standard with an integrated webserver, which provides a user interface for configuring and monitoring the product. The product user interface can be called up via the web browser if there is an existing connection to an end device (e.g. computer, tablet PC or smartphone).

SMA Speedwire

The product is equipped with SMA Speedwire as standard. SMA Speedwire is a type of communication based on the Ethernet standard. SMA Speedwire is designed for a data transfer rate of 100 Mbps and enables optimum communication between Speedwire devices within systems.

SMA Webconnect

The inverter is equipped with a Webconnect function as standard. The Webconnect function enables direct data transmission between the inverters of a small-scale plant and the Internet portals Sunny Portal and Sunny Places without any additional communication device and for a maximum of 1 inverters per visualized system. If there is an existing WLAN or Ethernet connection, you can directly access your visualized system via the web browser on your end device.

WLAN

The product is equipped with a WLAN interface as standard. The inverter is delivered with the WLAN interface activated as standard. If you do not want to use WLAN, you can deactivate the WLAN interface.

In addition, the product has a WPS function. The WPS function is for automatically connecting the product to a network (e.g. via router) and establish a direct connection between the product and an end device.

Modbus

The product is equipped with a Modbus interface. The Modbus interface is deactivated by default and must be configured as needed.

The Modbus interface of the supported SMA products is designed for industrial use – via SCADA systems, for example – and has the following tasks:

- Remote query of measured values
- Remote setting of operating parameters
- Setpoint specifications for system control
- Controlling the battery

Grid management services

The product 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.

Secure power supply operation

In case of a grid failure, the secure power supply operation supplies the loads with energy from the battery. You can connect a standard outlet and a standard switch to the inverter. You can connect a load with a maximum of 16 A and 230/240 V to the outlet. The load is supplied with energy form the battery during grid failure. The switch is used to activate and deactivate secure power supply operation.

The secure power supply operation is not automatically activated in the event of a grid failure, neither is it automatically deactivated once the utility grid is available again. If the utility grid fails, the load supply must be activated manually by activating the switch. The inverter automatically regulates the energy supply of the outlet after activating the switch. When the utility grid is available again and the load can be supplied by this again, the secure power supply operation must be deactivated manually by switching the switch off.

During active secure power supply operation, the inverter is disconnected from the electricity and does not therefore feed into the utility grid. During secure power supply operation, the load can only be supplied with energy as long as there is stored energy available in the battery. If there is insufficient energy available from the battery, the secure power supply operation remains active, even if the utility grid is available again. Switching over to supplying the load from the utility grid does not take place automatically. Once the battery is sufficiently charged again and the load can be supplied, the secure power supply operation must be restarted.

i Secure power supply operation in Flexible Storage Systems with backup power supply not possible

If the inverter is used in a battery-backup system and connected with an automatic transfer switch, the secure power supply operation is not available.

i Do not connect any loads that require a stable energy supply

The secure power supply operation and the battery-backup operation may not be used for loads that require a stable energy supply. The energy that is available during the secure power supply operation or battery-backup operation depends on the battery capacity available and the state of charge of the battery (SOC).

- Do not connect loads if they are dependent on a stable energy supply for reliable operation.

Battery-backup function

The inverter is equipped with a battery-backup function. The battery-backup function is deactivated by default and must be activated via the user interface. The battery-backup function can only be activated if the inverter is operated in a battery-backup system with an automatic transfer switch. The battery-backup function ensures that the inverter forms a battery-backup grid that uses energy from the battery and the PV system to supply the household grid in the event of a utility grid failure. When the battery-backup operation is activated, the automatic transfer switch disconnects the PV system and the household grid from the utility grid in the event of a grid failure, and connects these to the battery-backup grid. After a short switch-over time, the battery-backup grid and loads connected can be supplied by the battery and supplemented with energy from the PV system. The loading of the battery is ensured by the existing PV system. As soon as the utility grid is available

again, the battery-backup operation is deactivated automatically and the loads are supplied with energy from the utility grid. If the automatic battery-backup operation is not set, the battery-backup operation must be manually activated in the event of a grid failure, and must also be deactivated again once the utility grid is available.

An updated list of automatic transfer switches approved by SMA Solar Technology AG is available at www.SMA-Solar.com.

i Secure power supply operation in Flexible Storage Systems with backup power supply not possible

If the inverter is used in a battery-backup system and connected with an automatic transfer switch, the secure power supply operation is not available.

i Do not connect any loads that require a stable energy supply

The secure power supply operation and the battery-backup operation may not be used for loads that require a stable energy supply. The energy that is available during the secure power supply operation or battery-backup operation depends on the battery capacity available and the state of charge of the battery (SOC).

- Do not connect loads if they are dependent on a stable energy supply for reliable operation.

Black start function

The inverter has a black start function and an auxiliary battery that provides energy for the black start. In battery-backup systems, you have the possibility to install a standard switch for black starting the inverter and battery. The black-start switch is used to start the battery-backup operation manually in the event of grid failure if the battery and inverter are in sleep mode and, therefore, are unable to provide energy. When the black-start switch is switched on manually, the energy from the auxiliary battery is made available in order to automatically switch the battery and therefore also the inverter from sleep mode to operation in order that the inverter can make energy available from the battery. You can stop the battery-backup operation by switching it off manually.

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.

SMA Smart Connected

SMA Smart Connected is the free monitoring of the inverter via the SMA Sunny Portal. Thanks to SMA Smart Connected, the PV system operator and qualified person will be informed automatically and proactively about inverter events that occur.

SMA Smart Connected is activated during registration in Sunny Portal. In order to use SMA Smart Connected, it is necessary that the inverter is permanently connected to Sunny Portal and the data of the PV system operator and qualified person is stored in Sunny Portal and up-to-date.

4.3 LED Signals

LED signal	Explanation
The green LED is flashing (two seconds on and two seconds off)	Waiting for feed-in conditions The conditions for feed-in operation are not yet met. As soon as the conditions are met, the inverter will start feed-in operation.
The green LED is flashing (1.5 s on and 0.5 s off)	Secure power supply operation or battery-backup function The secure power supply operation or battery-backup function is activated and the inverter supplies the loads with energy from the battery.
The green LED flashes quickly	Update of central processing unit The central processing unit of the inverter is being updated.
The green LED is glowing	Parallel grid operation
The green LED is off	The inverter is not feeding into the utility grid.
The red LED is glowing	Event occurred If an event occurs, a distinct event message and the corresponding event number will be displayed in addition on the inverter user interface or in the communication product.
The blue LED flashes slowly for approx. one minute	Communication connection is being established The inverter is establishing a connection to a local network or is establishing a direct connection to an end device via Ethernet (e.g. computer, tablet PC or smartphone).
The blue LED flashes quickly for approx. two minutes.	WPS active The WPS function is active.
The blue LED is glowing	Communication active There is an active connection with a local network or there is a direct connection with an end device via Ethernet (e.g. computer, tablet PC or smartphone).

4.4 System Structure

Flexible Storage System

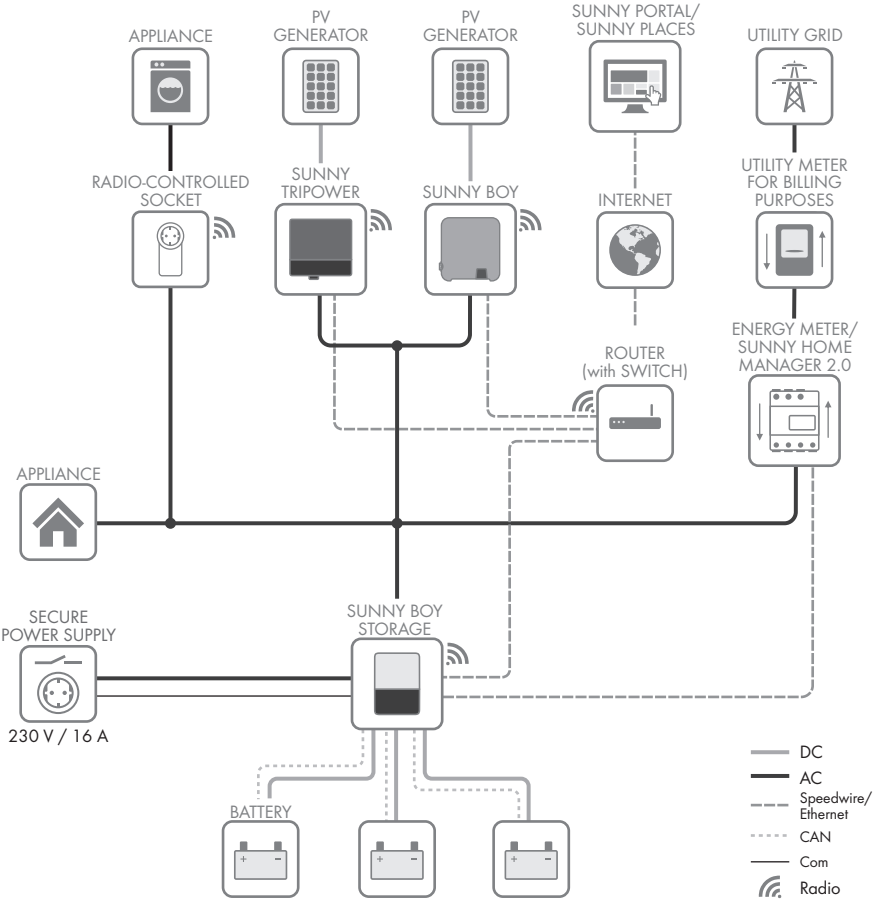


Figure 3: System design of a flexible storage system with switch and outlet for secure power supply operation (example)

SMA Flexible Storage System with Battery-Backup Function

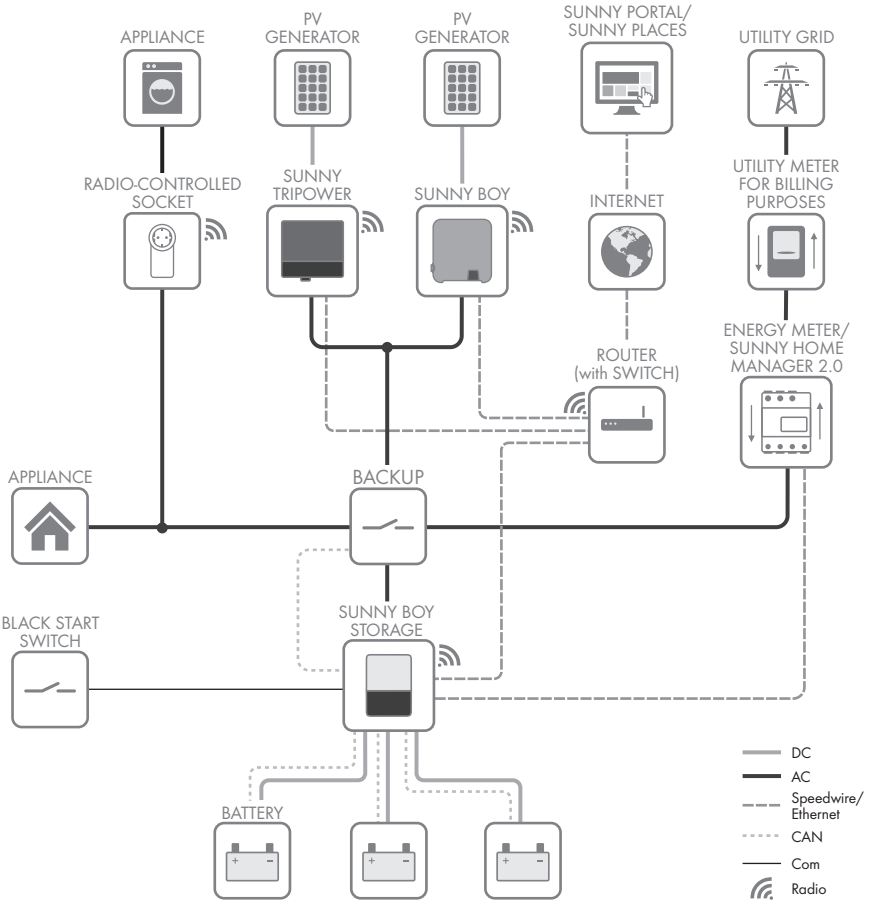


Figure 4: System design of a flexible storage system with battery-backup function (example)

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 fires.

- Do not mount the product in areas containing highly flammable materials or gases.
- Do not mount the product in potentially explosive atmospheres.

☐ 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 drywall 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 13 "Technical Data", page 119).

☐ The mounting location must not be exposed to direct solar irradiation. If the inverter is exposed to direct solar irradiation, the exterior plastic parts might age prematurely and overheating might occur. When becoming too hot, the inverter reduces its power output to avoid overheating.

☐ The mounting location should be freely 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.

☐ To ensure optimum operation, the ambient temperature should be between -25°C and +45°C.

☐ Climatic conditions must be met (see Section 13 "Technical Data", page 119).

Permitted and prohibited mounting positions:

☐ The inverter must only be mounted in one of the permitted positions. This will ensure that no moisture can penetrate the inverter.

☐ The inverter should be mounted in such a way that the LED signals can be read without difficulty.

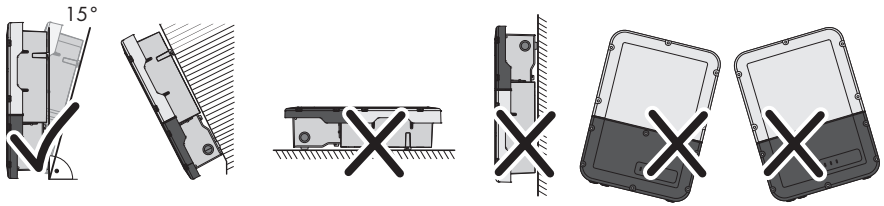


Figure 5: Permitted and prohibited mounting positions

☐ Do not mount multiple inverters directly above one another.

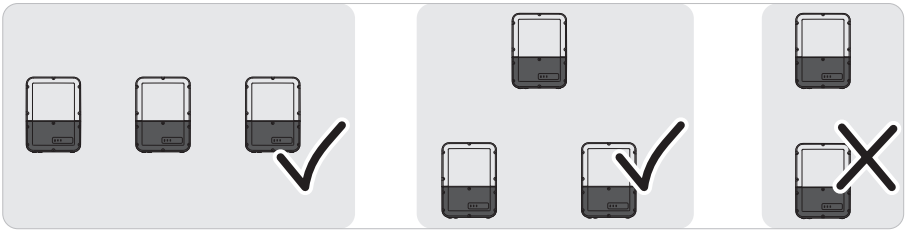


Figure 6: Permissible and impermissible mounting positions of multiple inverters

Dimensions for mounting:

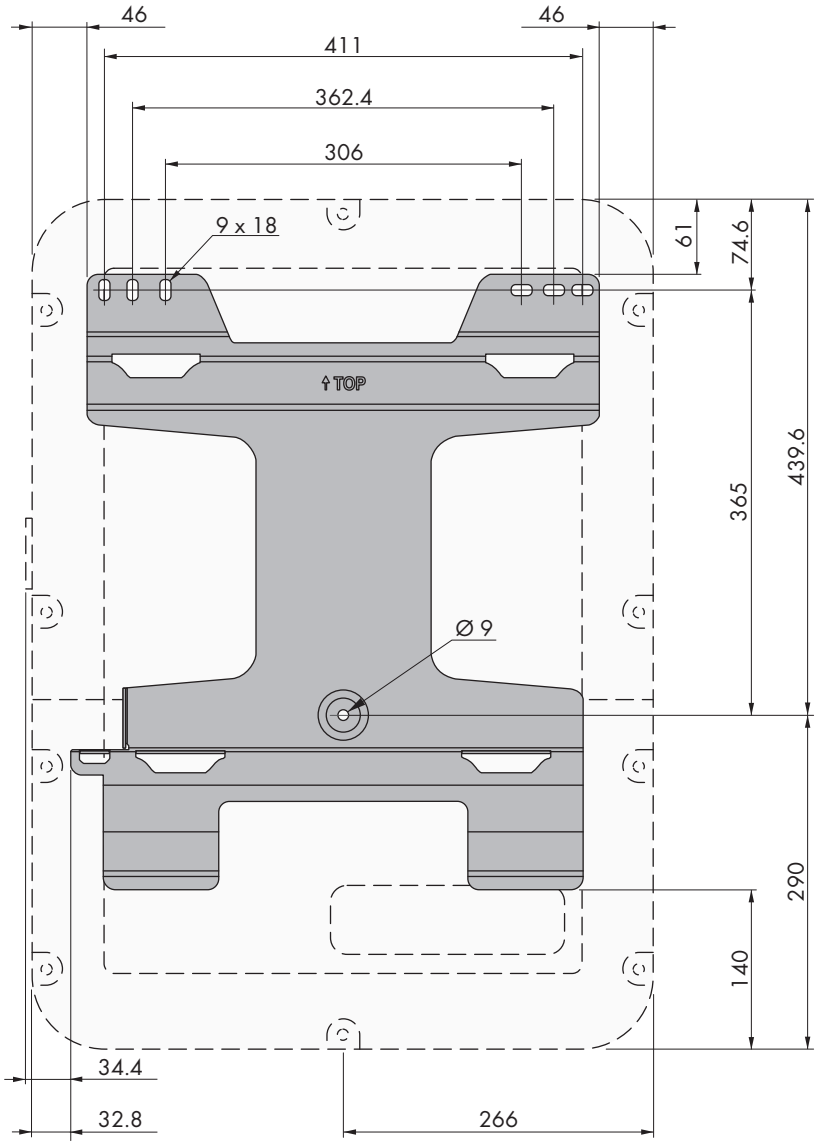


Figure 7: Position of the anchoring points(Dimensions in mm)

Recommended Clearances:

If you maintain the recommended clearances, adequate heat dissipation will be ensured. Thus, you will prevent power reduction due to excessive temperature.

- ☐ Maintain 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.

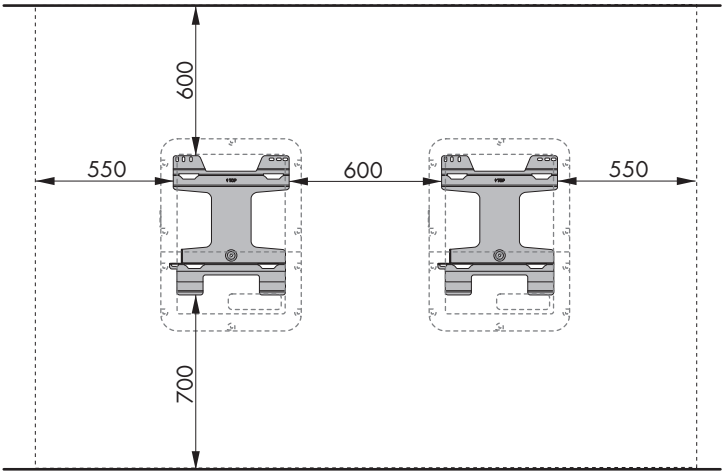


Figure 8: Recommended clearances(Dimensions in mm)

5.2 Mounting the Inverter

⚠ QUALIFIED PERSON

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

- ☐ Three screws suitable for the support surface (diameter: 8 mm)
- ☐ Three washers suitable for the screws
- ☐ Where necessary, 3 screw anchors suitable for the support surface and the screws
- ☐ To secure the inverter against theft: one padlock suitable for outdoor use

Padlock dimensions:

- Diameter of the shackle: 8 mm to 10 mm
- Width of the shackle (inner dimension): 30 mm to 40 mm
- Height of the shackle (inner dimension): 30 mm to 40 mm

⚠ CAUTION

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

The inverter weighs 26 kg. 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.

- Transport and lift the inverter carefully.

The Connection Unit and Power Unit can be disconnected from one another to make mounting easier

If the local conditions make it difficult to mount the entire inverter, you can disconnect the Connection Unit and Power Unit from each other if the ambient temperature is at least 0°C and there is no frost. This way, you can transport each enclosure part and also attach to the wall mounting bracket individually. Then, during assembly, both enclosure parts must be joined again. A detailed description for how to disconnect the Connection Unit and Power Unit from each other and to individually mount them to the wall mounting bracket can be found on the Internet under www.SMA-Solar.com.

Procedure:

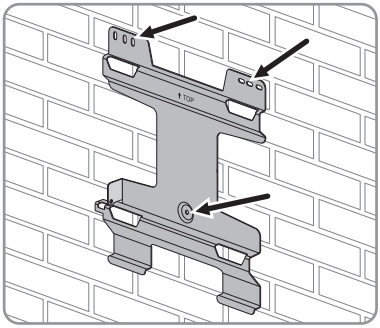
1. **⚠ CAUTION**

   Risk of injury due to damaged cables

   There may be power cables or other supply lines (e.g. gas or water) routed in the wall.

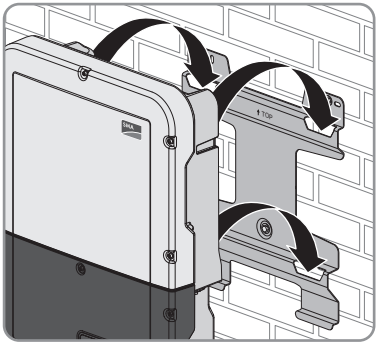
   - Ensure that no lines are laid in the wall which could be damaged when drilling holes.

2. Align the wall mounting bracket horizontally on the wall and use it to mark the position of the drill holes. Here, use at least one hole each, to the right and left, and the hole at the bottom center.



3. Set the wall mounting bracket aside and drill the marked holes.
4. Insert screw anchors into the drill holes if the support surface requires them.
5. Secure the wall mounting bracket horizontally using screws and washers.

6. Hook the inverter into the wall mounting bracket. Here, the lugs on the rear side of the Power Unit must be hooked into the upper recesses and the lugs in the Connection Unit into the lower recesses in the wall mounting bracket.

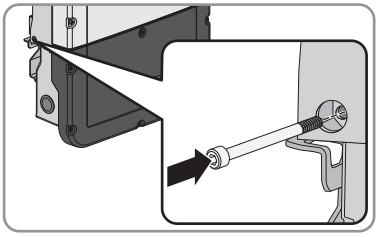


7. Check whether the inverter is securely in place.

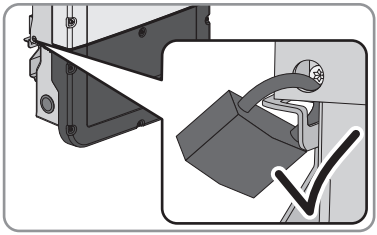
   If the Connection Unit can be moved forward, the lugs on the rear side of the Connection Unit are not hooked into the lower recesses in the wall mounting bracket. Remove the inverter from the wall mounting bracket and hook it in again.

   Once the Connection Unit cannot be moved forward, the inverter is securely in place.

8. Secure the inverter to the wall mounting bracket. To do this, insert the screw M5x60 through the hole on the left side of the Power Unit using a Torx screwdriver (TX 25) and screw it into the thread (torque: 1.7 Nm ± 0.3 Nm).



9. If the inverter is to be protected against theft, attach a padlock:
   - To do this, guide the shackle of the padlock through the provided hole on the left side of the Power Unit and close the shackle.



   - Keep the key of the padlock in a safe place.

6 Electrical Connection

6.1 Overview of the Connection Area

6.1.1 View from Below

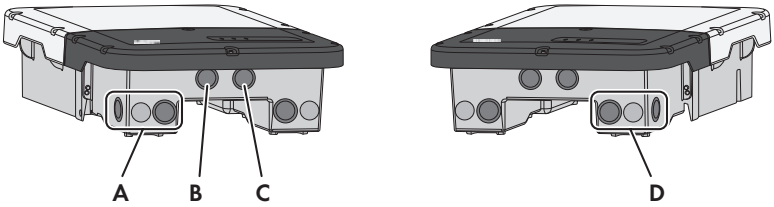


Figure 9: Enclosure openings at the bottom of the inverter

Position	Designation
A	Enclosure opening for the DC connection
B	Enclosure opening for the battery communication cable of the Antenna Extension Kit (optional)
C	Enclosure opening for the network cables and, if needed, for other data cables
D	Enclosure opening for the AC connection and the connection cables of the outlet and of the switch for the secure power supply operation or for the signal cable for the black start

6.1.2 Interior View

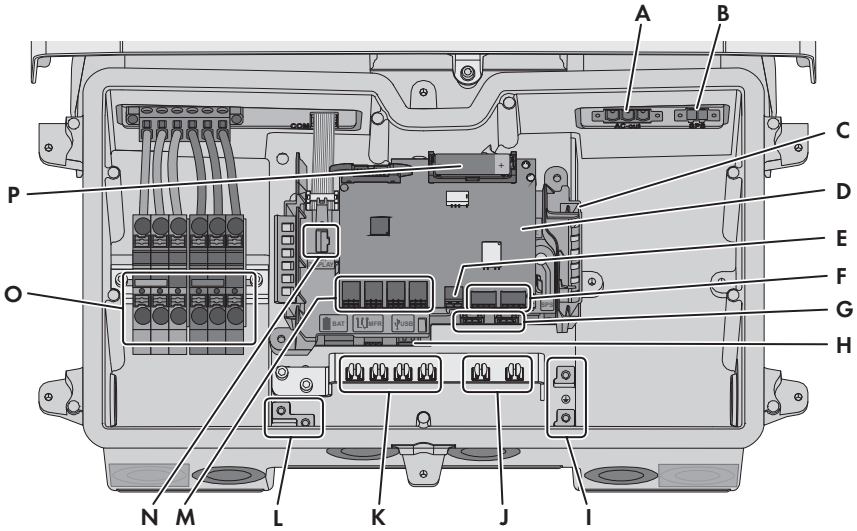


Figure 10: Connection areas in the interior of the inverter

Position	Designation
A	Slot **AC-out** for den direct connection of the utility grid or of the AC electric circuit via the automatic transfer switch
B	**SPS** slot for connecting the secure power supply outlet
C	Communication assembly
D	Interface module of the battery
E	Jack for the switch connection for secure power supply operation or black-start function
F	No function
G	Network ports **A** and **B** for connecting a router or network switch and for connecting an SMA Energy Meter
H	**USB** port for connecting a USB flash drive (for service purposes)
I	Grounding point for the grounding conductor of the utility grid, the outlet for secure power supply operation and, if necessary, an additional grounding or for the equipotential bonding
J	Shield clamps for the connection of the cable shields of the RS485 communication cables
K	Shield clamps for the connection of the cable shields of the battery communication cables

Position	Designation
L	Grounding point for grounding the battery/batteries
M	Jacks **BAT1** to **BAT4** for the connection of the battery communication cable and the communication cable of the automatic transfer switch
N	Jack **DISPLAY** for the LED assembly connection in the enclosure lid of the Connection Unit
O	Terminal blocks for DC connection
P	Auxiliary battery (3.6 V, 2600 mAh, size: AA / 14500) After switching the black-start switch, energy is made available from the auxiliary battery in order to switch the battery and therefore also the inverter on when they are in sleep mode. The auxiliary battery is designed to function for the entire service life of the product and must not be replaced when used in the usual manner.

6.2 AC Connection

6.2.1 Requirements for the AC Connection

Cable requirements:

- ☐ External diameter: 18 mm
- ☐ Conductor cross-section: 4 mm² to 16 mm²
- ☐ Insulation stripping length: 18 mm
- ☐ Sheath stripping length: 250 mm
- ☐ The cable must be dimensioned in accordance with the local and national directives for the dimensioning of cables. The requirements for the minimum wire size derive from these directives. 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 the design software "Sunny Design" from software version 2.0 at www.SMA-Solar.com).

Load-break switch and cable protection:

NOTICE

Damage to the inverter due to the use of screw-type fuses as load-break switches

Screw-type fuses (e.g. DIAZED fuse or NEOZED fuse) are not load-break switches.

- Do not use screw-type fuses as load-break switches.
- Use a load-break switch or circuit breaker as a load disconnection unit (for information and design examples, see the Technical Information "Circuit Breaker" at www.SMA-Solar.com).

- ☐ In PV systems with multiple inverters, protect each inverter with a separate circuit breaker. Make sure to observe the maximum permissible fuse protection (see Section 13 "Technical Data", page 119). 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).

Overvoltage category:

The inverter can be used in grids of overvoltage 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. Depending on the installation site and grid configuration, it may be advisable to deactivate the grounding conductor monitoring. This is necessary, for example, in an IT system if there is no neutral conductor present and you intend to install the inverter between two line conductors. If you are uncertain about this, contact your grid operator or SMA Solar Technology AG.

- Grounding conductor monitoring must be deactivated after initial start-up depending on the grid configuration (see Section 8.15, page 69).

6.2.2 Connecting the Inverter to the Utility Grid

⚠ QUALIFIED PERSON

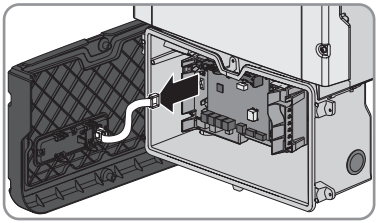
Requirements:

- ☐ The connection requirements of the grid operator must be met.
- ☐ The grid voltage must be within the permissible range. The exact operating range of the inverter is specified in the operating parameters.

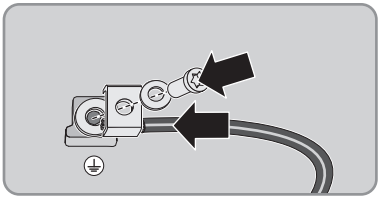
Procedure:

1. Disconnect the AC circuit breaker and secure it against reconnection.
2. If the enclosure lid of the Connection Unit is mounted, remove it as follows:

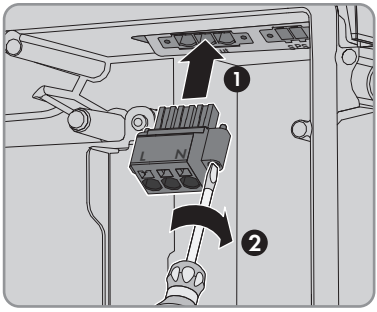
- Unscrew all six screws (TX 25) and carefully remove the enclosure lid towards the front. While doing so, note that the assembly on the enclosure lid of the Connection Unit and the communication assembly in the Connection Unit are connected via a ribbon cable. During the first installation, the ribbon cable is to be connected only to the LED assembly on the enclosure lid of the Connection Unit.
- Disconnect the ribbon cable from the socket on the communication assembly. During the first installation, the ribbon cable is to be connected only to the assembly on the enclosure lid of the Connection Unit.



3. Remove the adhesive tape from the enclosure opening for the AC connection.
4. Insert the cable gland into the opening and screw the counter nut on from the inside.
5. Guide each cable into the inverter. In the process, lay each cable in such a way that they do not come into contact with the communication assembly.
6. Connect the grounding conductor to the grounding terminal:
   - Strip off the conductor insulation by 18 mm.



   - Insert the screw through the spring washer, the clamping bracket and the washer.
   - Guide the conductor between the washer and clamping bracket and tighten the screw (TX 25) (torque: 6 Nm ± 0.3 Nm).
7. Plug the terminal block for the AC connection in the **AC-out** slot in the inverter, and tighten it with a flat-blade screwdriver (blade width: 3.5 mm) (torque: 0.3 Nm).



8. Ensure that the terminal block is securely in place and the screws are tightened.
9. Thread the conductors L and N through the ferrite.
10. Strip off the conductor insulation of L and N by 18 mm.
11. In the case of fine stranded wire, provide the conductors with a bootlace ferrule.

12. **Connection of conductors of finely stranded wire**

To connect conductors made of finely stranded wire, each terminal point must be opened.

- First insert the conductor into the terminal point all the way to the lock (round opening). Then insert a flat-blade screwdriver (blade width: 3.5 mm) as far as it can go into the actuation shaft (rectangular opening). Hereby the lock opens and the conductor can be placed into the terminal point as far as possible. After the connection has been made, the flat-blade screwdriver must be pulled out of the actuation shaft.

13.

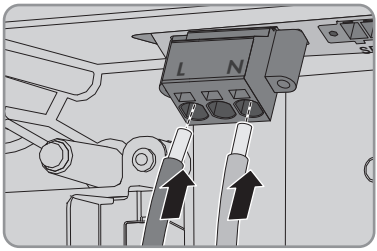
⚠ WARNING

Fire hazard due to faulty conductor connection

If the conductors are inserted into the actuation shafts (right-angled openings), a fire may occur during inverter commissioning.

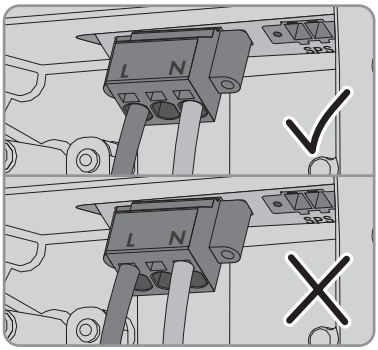
14. Connect the conductors to the terminal block for the AC connection:

- Connect the neutral conductor to the terminal block in accordance with the labeling. Insert the conductor into the corresponding terminal point (round opening) up to the stop.



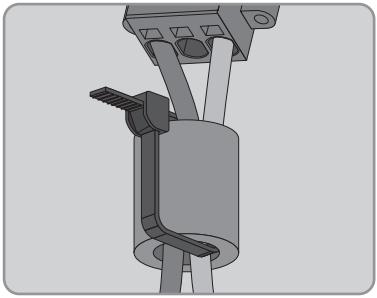
- Connect L to the terminal block in accordance with the labeling. Insert the conductor into the corresponding terminal point (round opening) up to the stop.

15. Ensure the conductors are plugged into the terminal points (round openings) as far at is will go and not into the actuation shafts (rectangular openings).



16. Ensure that the terminal points are allocated to the correct conductors.
17. Ensure that the conductors are plugged completely into the terminal points up to their insulation.

18. Position the ferrite as close as possible to the bottom of the AC connection terminal block and secure using the cable tie.



6.2.3 Connecting Additional Grounding

⚠ QUALIFIED PERSON

If additional grounding or equipotential bonding is required locally, you can connect additional grounding to the inverter. This prevents touch current if the grounding conductor at the terminal for the AC cable fails.

i Grounding of the battery

The grounding of the battery must not be connected to the connection point for additional grounding on the inverter.

- Connect the grounding of the battery to the grounding point of the battery.
- Ground the battery according to the battery manufacturer's specifications.

Cable requirements:

i Use of fine-stranded conductors

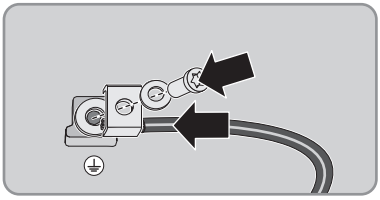
You can use an inflexible or a flexible, fine-stranded conductor.

- When using a fine-stranded conductor, it has to be double crimped by a ring terminal lug. Make sure that no insulated conductor is visible when pulling or bending. This will ensure sufficient strain relief by means of the ring terminal lug.

☐ Grounding cable cross-section: max. 10 mm²

Procedure:

- Connect the grounding conductor to the grounding terminal:
  - Strip off the conductor insulation by 18 mm.



  - Insert the screw through the spring washer, the clamping bracket and the washer.
  - Guide the conductor between the washer and clamping bracket and tighten the screw (TX 25) (torque: 6 Nm ± 0.3 Nm).

6.3 Connecting the Network Cables

⚠ QUALIFIED PERSON

⚠ DANGER

Danger to life due to electric shock if surge protection is missing

Overvoltages (e. g. in the event of a flash of lightning) can be further conducted into the building and to other connected devices in the same network via the network cables or other data cables if there is no surge protection. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Ensure that all devices in the same network and the battery are integrated into the existing surge protection.
- When laying the network cables or other data cables outdoors, suitable surge protection must be provided at the transition point of the cable from the product or the battery outdoors to the inside of a building.
- The Ethernet interface of the inverter is classified as "TNV-1" and offers protection against overvoltages of up to 1.5 kV.

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

☐ One to two network cables

☐ Where required: Field-assembly RJ45 connector.

Cable requirements:

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

☐ Cable type: 100BaseTx

☐ Cable category: Cat5, Cat5e, Cat6, Cat6a or Cat7

☐ Plug type: RJ45 of Cat5, Cat5e, Cat6 or Cat6a

☐ Shielding: SF/UTP, S/UTP, SF/FTP or S/FTP

☐ Number of insulated conductor pairs and insulated conductor cross-section: at least 2 x 2 x 0.22 mm²

☐ Maximum cable length between two nodes when using patch cables: 50 m

☐ Maximum cable length between two nodes when using installation cables: 100 m

☐ UV-resistant for outdoor use

Procedure:

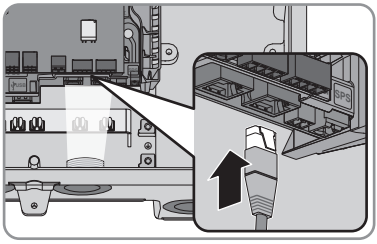
1. **⚠ DANGER**

   Danger to life due to electric shock

   - Disconnect the inverter from all voltage sources (see Section 9, page 72).

2. Remove the sealing plugs from the network connection opening on the inverter.
3. Insert the cable gland into the opening and screw the counter nut on from the inside.

4. Cut into the two-hole cable support sleeve with a box cutter. This will push the cable into the grommet.
5. Press the cable support sleeve into the two-hole cable gland.
6. Insert the cable into the enclosure opening of the two-hole cable support sleeve.
7. Lead one end of each network cable into the inverter.
8. Put the network plug of each cable into one of the network sockets of the communication assembly.



9. Ensure that the network connector is securely in place by pulling slightly on each cable.
10. Connect the other end of the network cable to the energy meter.

6.4 Connecting the energy meter

⚠ QUALIFIED PERSON

This section describes the connection of the energy meter to the inverter.

The energy meter measures the flow of energy out of and into the utility grid. The measured values of the energy meter are transmitted to the inverter and influence the charging behavior of the battery. The energy meter data may not be used for billing purposes.

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

- ☐ 1 approved energy meter (SMA Energy Meter)
- ☐ 1 network cable

Cable requirements:

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

- ☐ Cable type: 100BaseTx
- ☐ Cable category: Cat5, Cat5e, Cat6, Cat6a or Cat7
- ☐ Plug type: RJ45 of Cat5, Cat5e, Cat6 or Cat6a
- ☐ Shielding: SF/UTP, S/UTP, SF/FTP or S/FTP
- ☐ Number of insulated conductor pairs and insulated conductor cross-section: at least 2 x 2 x 0.22 mm²
- ☐ Maximum cable length between two nodes when using patch cables: 50 m
- ☐ Maximum cable length between two nodes when using installation cables: 100 m
- ☐ UV-resistant for outdoor use

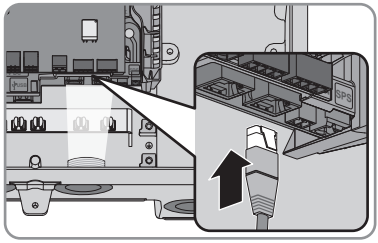
Procedure:

1. **⚠ DANGER**

   Danger to life due to electric shock

   - Disconnect the inverter from all voltage sources (see Section 9, page 72).

2. Remove the sealing plugs from the network connection opening on the inverter.
3. Insert the cable gland into the opening and screw the counter nut on from the inside.
4. Cut into the two-hole cable support sleeve with a box cutter. This will push the cable into the grommet.
5. Press the cable support sleeve into the two-hole cable gland.
6. Insert the cable into the enclosure opening of the two-hole cable support sleeve.
7. Lead one end of each network cable into the inverter.
8. When using a self-assembly network cable, assemble the RJ45 connector and connect to the network cable (see connector documentation).
9. Put the network plug of each cable into one of the network sockets of the communication assembly.



10. Ensure that the network connector is securely in place by pulling slightly on each cable.
11. If the inverter is installed outdoors, install overvoltage protection.
12. If you would like to establish a direct connection, connect the other end of the network cable directly to the end device.
13. If you would like to integrate the inverter into a local network, connect the other end of the network cable to the local network (e.g. via a router).

6.5 Connecting the Data Cable of the Battery and Communication Cable of the Automatic Transfer Switch

⚠ QUALIFIED PERSON

Connect the communication cable of each battery and, in battery-backup systems, the communication cable of the automatic transfer switch as described in the following.

i Communication between Inverter and Battery

- Communication between the inverter and the battery takes place via the battery communication cable via CAN bus.

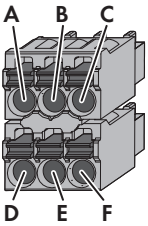
Additionally required material (not included in the scope of delivery):

- ☐ One battery communication cable for the communication between inverter and battery
- ☐ In battery-backup systems with automatic transfer switch: one communication cable between inverter and automatic transfer switch

Cable requirements:

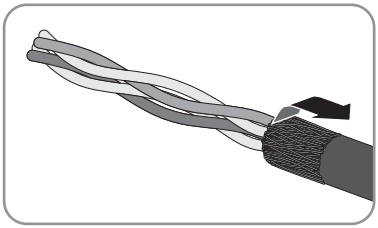
- ☐ Twisted pair conductors
- ☐ Cable category: minimum CAT5e
- ☐ Shielding: yes
- ☐ Conductor cross-section: 0.25 mm² to 0.34 mm²
- ☐ Recommended number of conductor pairs: 4
- ☐ External diameter: 6 mm to 8 mm
- ☐ Maximum cable length between battery and inverter and, in battery-backup systems, between automatic transfer switch and inverter: 10 m
- ☐ UV-resistant for outdoor use.
- ☐ Comply with the requirements of the battery manufacturer.

Assignment of the terminal block:

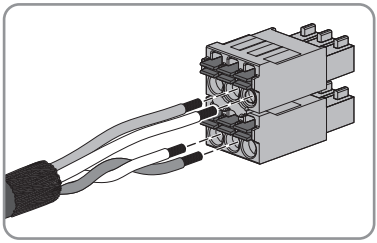
Terminal block	Position	Assignment
	A	Not assigned
	B	Enable
	C	GND
	D	CAN L
	E	CAN H
	F	+12 V

Procedure:

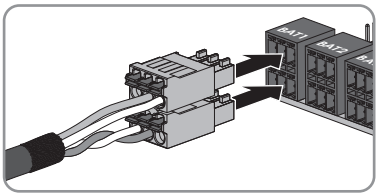
1. Remove the sealing plugs from the network connection opening on the inverter.
2. Insert the cable gland into the opening and screw the counter nut on from the inside.
3. Lead the communication cable into the inverter.
4. Strip the communication cable 50 mm.
5. Trim the cable shield to a length of 15 mm and fold it over the cable sheath.



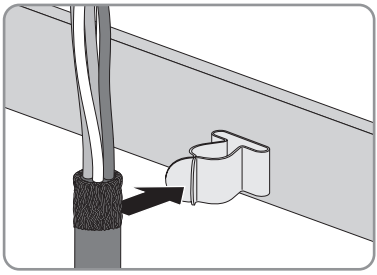
6. Strip the insulation on the insulated conductors each by 6 mm. The **CAN L** and **CAN H** must be a twisted pair.
7. If necessary, trim unused insulated conductors flush with the cable sheath or fold it over the cable sheath.
8. Connect the conductors of the communication cables to a 6-pole terminal block. Pay attention to the assignment of the terminal block and communication connection on the battery and/or automatic transfer switch and make sure that **CAN L** and **CAN H** consist of a pair of conductors.



9. Make sure that the conductors are plugged into the terminal points tightly by pulling slightly on the conductors.
10. Insert the terminal block for the communication connection into the jack **BATx** on the battery interface module. If only one battery is available, insert the plug into the jack **BAT1**. If multiple batteries and/or an automatic transfer switch are available, insert the communication connection of the first battery into the jack **BAT1** and connect all other communication cables in succession to the respective jacks.



11. Press the communication cable with cable shield into the shield clamp on the busbar below the communication assembly.



6.6 Connecting the Switch and Outlet for Secure Power Supply Operation

⚠ QUALIFIED PERSON

Requirements:

☐ The technical requirements must be met for connecting the switch and outlet for secure power supply operation (see Section 13 "Technical Data", page 119).

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

☐ One standard outlet

☐ One standard switch (e.g. light switch)

Procedure:

- Connect the outlet for secure power supply operation.
- Connect the switch for secure power supply operation.

Connect the outlet for secure power supply operation

Requirements on the conductors:

☐ Conductor type: copper wire

☐ The conductors must be made of solid wire, stranded wire or fine stranded wire. When using fine stranded wire, bootlace ferrules must be used.

☐ Conductor cross-section: 2.5 mm² to 4 mm²

Procedure:

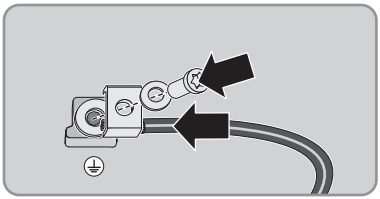
1. **⚠ DANGER**

   Danger to life due to high voltages

   - Ensure that the inverter is disconnected from all voltage sources (see Section 9, page 72).

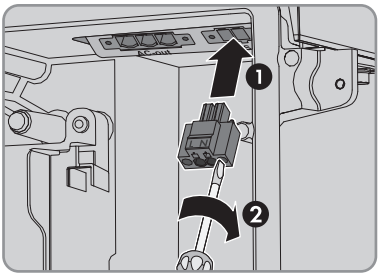
2. Remove the sealing plug from the enclosure opening for connecting the outlet for secure power supply operation.
3. Insert the cable gland into the opening and screw the counter nut on from the inside.
4. Guide the conductors into the inverter.
5. Connect the equipment grounding conductor of the outlet for secure power supply operation to an equipment grounding terminal:
   - Strip the insulation of the equipment grounding conductor by 18 mm (0.71 in).

- Insert the screw through the spring washer, the clamping bracket and the washer.



- Guide the equipment grounding conductor between the washer and clamping bracket and tighten the screw with a Torx screwdriver (TX 25) (torque: 6 Nm ± 0.3 Nm (53.10 in-lb ± 2.65 in-lb)).

6. Plug the terminal block for connecting the outlet for secure power supply operation into the **SPS** slot in the inverter and tighten it with a flat-blade screwdriver (blade width: 3.5 mm (0.14 in)).



7. Ensure that the terminal block is securely in place.
8. Strip off the conductor insulation by max. 15 mm.
9. In the case of finely stranded wire, provide the conductors L and N with a bootlace ferrule.
10. **Connection of conductors of finely stranded wire**

    To connect conductors made of finely stranded wire, each terminal point must be opened.

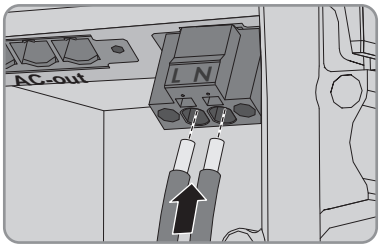
    - First insert the conductor into the terminal point all the way to the lock (round opening). Then insert a flat-blade screwdriver (blade: 3.5 mm) as far as it can go into the actuation shaft (rectangular opening). Hereby the lock opens and the conductor can be placed into the terminal point as far as possible. After the connection has been made, the flat-blade screwdriver must be pulled out of the actuation shaft.

11. **⚠ WARNING**

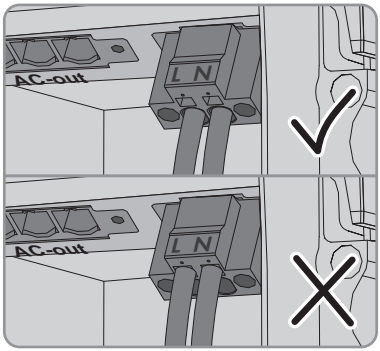
    Fire hazard due to faulty conductor connection

    If the conductors are inserted into the actuation shafts (right-angled openings), a fire may occur during inverter commissioning.

12. Connect the conductors L and N to the terminal block in accordance with the labeling. Insert each conductor into the corresponding terminal point (round opening) up to the stop.



13. Ensure the conductors are plugged into the terminal points (round openings) as far at is will go and not into the actuation shafts (rectangular openings).



14. Ensure that the terminal points are allocated to the correct conductors.
15. Ensure that the conductors are plugged completely into the terminal points up to their insulation.
16. Install the outlet in the desired position (e.g. next to the inverter or as switch/outlet combination optionally at short distance from the inverter).
17. Connect the other end of the two-core cable using it directly as energy supply to the outlet.

Connect the switch for secure power supply operation

Requirements on the conductors:

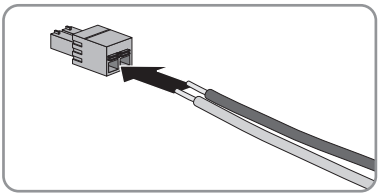
☐ Conductor cross-section: 0.2 mm² to 2.5 mm²

☐ The conductor type and wiring method must be appropriate for the application and location.

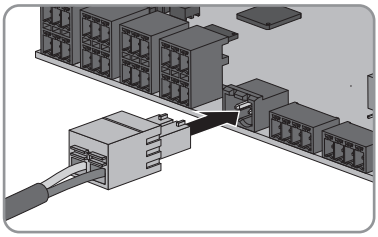
Procedure:

1. Remove the sealing plug from the opening for connecting the switch for secure power supply operation.
2. Insert the cable gland into the opening and screw the counter nut on from the inside.
3. Guide the conductors into the inverter.
4. Strip off the conductor insulation by min. 6 mm to max. 10 mm.

5. Connect the conductors to the 2-pole terminal blocks. Ensure that the conductors are plugged completely into the terminal points up to their insulation.



6. Stick the terminal block into the slot on the battery interface module in the inverter.



7. Ensure that the terminal block is securely in place.
8. Ensure that all conductors are correctly connected.
9. Ensure that the conductors sit securely in the terminal points. Tip: To release the conductors from the terminal block, open the terminal points using a suitable tool.
10. Install the switch in the desired position (e.g. next to the inverter or as switch/outlet combination optionally at short distance from the inverter).
11. Connect the other end of the two-core cable directly to the switch.

6.7 Connecting Switch for black start (in battery-backup systems)

⚠ QUALIFIED PERSON

The switch for black start is connected to the same jack as the switch for secure power supply operation. Observe that the secure power supply operation is not available in battery-backup systems.

Requirements on the conductors:

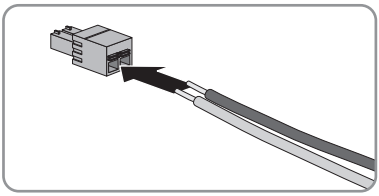
☐ Conductor cross-section: 0.2 mm² to 2.5 mm²

☐ The conductor type and wiring method must be appropriate for the application and location.

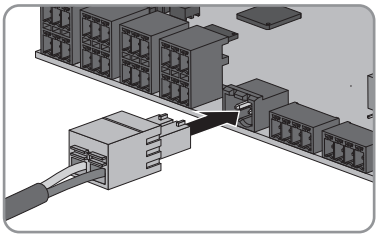
Procedure:

1. Remove the sealing plug from the opening for connecting the switch for secure power supply operation.
2. Insert the cable gland into the opening and screw the counter nut on from the inside.
3. Guide the conductors into the inverter.
4. Strip off the conductor insulation by min. 6 mm to max. 10 mm.

5. Connect the conductors to the 2-pole terminal blocks. Ensure that the conductors are plugged completely into the terminal points up to their insulation.



6. Stick the terminal block into the slot on the battery interface module in the inverter.



7. Ensure that the terminal block is securely in place.
8. Ensure that all conductors are correctly connected.
9. Ensure that the conductors sit securely in the terminal points. Tip: To release the conductors from the terminal block, open the terminal points using a suitable tool.
10. Install the switch in the desired position (e.g. next to the inverter or as switch/outlet combination optionally at short distance from the inverter).
11. Connect the other end of the two-core cable directly to the switch.

6.8 DC Connection

6.8.1 Requirements for the DC Connection

Connection options:

For the connection of a battery, which is rated for a maximum charge/discharge current of the inverter of 20 A, the DC inputs A and B must be connected in parallel by means of the provided jumpers, and the battery must be connected to input A.

For the connection of a single battery which is rated for a maximum charge/discharge current of the inverter of 10 A, the battery must be connected to input A. The inputs must not be connected in parallel.

Depending on battery type, an external protection must be provided if necessary to protect the inverter and batteries against short-circuit currents (Information on further connection options and protection see technical information "Approved Batteries and Battery Communication Connection" at www.SMA-Solar.com).

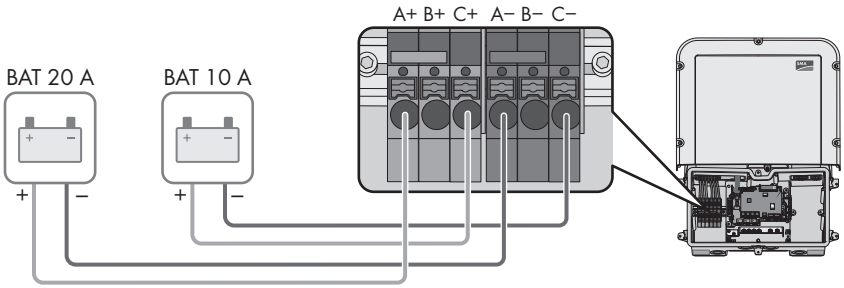


Figure 11: Connection options (example)

Fusing of DC inputs:

Each input is fused with a maximum charging and discharging current of 10 A. The short-time current-carrying capacity of the inputs is 40 A. Batteries that have no short-circuit current limitation or are designed for a limitation of the short-circuit current greater than 40 A must be additionally fused. The additional fusing must be designed so that it limits possible short-circuit currents to <40 A.

Cable requirements:

- ☐ Conductor cross-section: 2.5 mm² to 10 mm²
- ☐ Insulation stripping length: 12 mm
- ☐ The conductors must consist of copper.
- ☐ The conductors must be made of solid wire, stranded wire or fine stranded wire. When using fine stranded wire, bootlace ferrules must be used.
- ☐ Maximum cable length: 10 m

6.8.2 Connecting the power cable of the battery

⚠ QUALIFIED PERSON

This section describes the connection of a battery rated for a maximum charge/discharge current of the inverter of 20 A and a battery rated for a maximum charge/discharge current of the inverter of 10 A.

⚠ DANGER

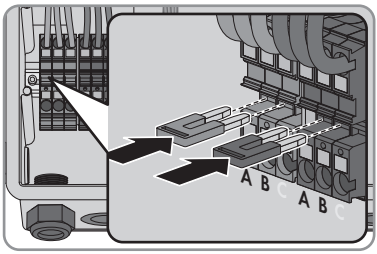
Danger to life from electric shock due to live DC cables at the battery.

The DC cables connected to a battery may be live. Touching the DC conductors or the live components leads to lethal electric shocks.

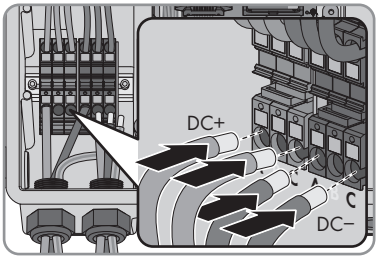
- Ensure that the inverter is disconnected from all voltage sources.
- Do not touch non-insulated cable ends.

Procedure:

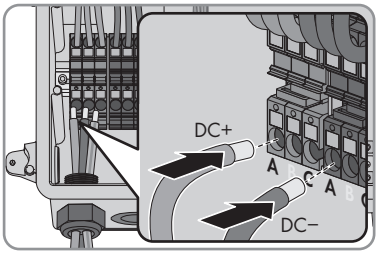
1. Remove the adhesive tape from the enclosure opening for the DC connection and, if other enclosure openings are to be used, take the sealing plugs out of these enclosure openings.
2. Insert the cable gland into the opening and screw the counter nut on from the inside.
3. For the connection of a battery rated for a maximum charge/discharge current of the inverter of 20 A and a battery rated for a maximum charge/discharge current of the inverter of 10 A, connect the inputs A and B in parallel. For this, insert a red plug-in jumper into the slots A and B of the red terminal blocks and a blue plug-in jumper into the slots A and B of the blue terminal blocks.



4. Guide each cable into the inverter. In the process, lay each cable in such a way that they do not come into contact with the communication assembly.
5. Strip off the conductor insulation.
6. When the inputs A and B are connected in parallel, connect the cables of the battery rated for a maximum charge/discharge current of the inverter of 20 A to input A, and the cables of the battery rated for a maximum charge/discharge current of the inverter of 10 A to input C. Insert each conductor into the corresponding terminal point.



7. If there is only one battery that is rated for a maximum charge/discharge current of the inverter of 10 A, connect the cables to input A. Insert each conductor into the corresponding terminal point.



8. Ensure that the terminal points are allocated to the correct conductors.
9. Ensure that the conductors are plugged completely into the terminal points up to their insulation.

7 Commissioning

7.1 Commissioning Procedure

⚠ QUALIFIED PERSON

This section describes the commissioning procedure and gives an overview of the steps you must perform in the prescribed order.

Procedure		See
1.	Commission the inverter.	Section 7.2, page 48
2.	Establish a connection to the user interface of the inverter. There are various connection options to choose from for this: • Direct connection via WLAN • Connection via WLAN in the local network • Connection via Ethernet in the local network	Section 8.1, page 53
3.	Log into the user interface.	Section 8.2, page 57
4.	Select the inverter configuration option. Please note that the SMA Grid Guard code (a charge is levied for this code) for changing the grid-relevant parameters must be available after completion of the first ten feed-in hours or installation assistant (see "Application for the SMA Grid Guard code" available at www.SMA-Solar.com).	Section 7.3, page 50
5.	Ensure that the country data set has been configured correctly.	Section 8.11, page 66
6.	Make further inverter settings as needed.	Section 8, page 53

7.2 Commissioning the Inverter

⚠ QUALIFIED PERSON

Requirements:

☐ The AC circuit breaker must be correctly rated and mounted.

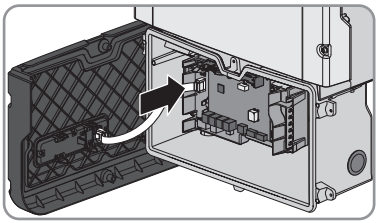
☐ The inverter must be correctly mounted.

☐ All conductors must be correctly connected.

☐ Unused enclosure openings must be sealed tightly with sealing plugs.

Procedure:

1. Lead the enclosure lid to the Connection Unit and plug the ribbon cable into the socket on the communication assembly.



2. Ensure that the ribbon cable is securely plugged into the sockets at both ends.
3. Position the enclosure lid of the Connection Unit on the enclosure and tighten all 6 screws crosswise with a Torx screwdriver (TX 25) (torque: 3 Nm ± 0.3 Nm).
4. Switch on the AC circuit breaker.
5. Switch on the battery or the load-break switch of the battery (see documentation of the battery manufacturer).
   - ☑ All three LEDs light up. The start-up phase begins.
   - ☑ All three LEDs go out again after approximately 90 seconds.
   - ☑ Depending on the available power, the green LED pulses or is continuously illuminated. The inverter is feeding in.
6. If the LEDs do not start to glow, the ribbon cable between the assembly in the enclosure lid and the communication assembly in the inverter is most likely not properly plugged in. Ensure that the ribbon cable is securely plugged into the sockets at both ends.
7. If the green LED is still flashing, the conditions for activating feed-in operation are not yet met. As soon as the conditions for feed-in operation are met, the inverter starts with feed-in operation and, depending on the available power, the green LED will light up continuously or it will pulse.

7.3 Selecting a configuration option

⚠ QUALIFIED PERSON

After you have logged onto the user interface as **Installer**, the **Configuring the Inverter** page opens.

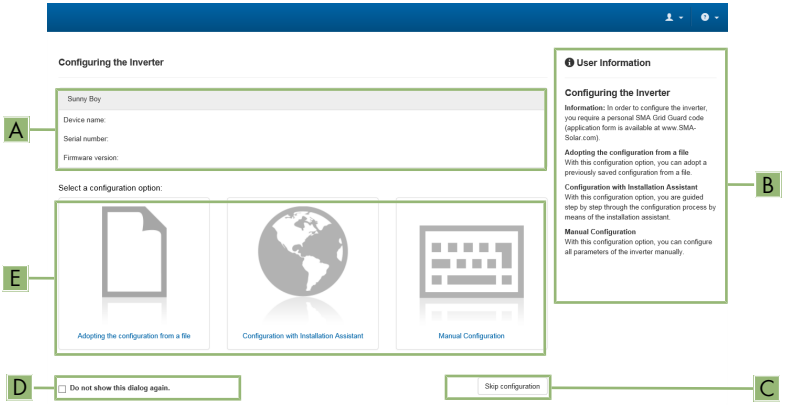


Figure 12: Layout of the **Configuring the Inverter** page

Position	Designation	Description
A	Device information	Provides the following information: • Device name • Inverter serial number • Inverter firmware version
B	User information	Provides brief information on the listed configuration options
C	Skip configuration	Offers the option of skipping the inverter configuration and going directly to the user interface (not recommended; the inverter cannot be operated without configuration)
D	Checkbox	Allows you to choose not to have the displayed page displayed again when the user interface is called up again
E	Configuration options	Provides a selection of the various configuration options

Procedure:

On the **Configuring the Inverter** page, different configuration options are available to choose from. Select one of the options and proceed for the selected option as described below. SMA Solar Technology AG recommends carrying out the configuration with the installation assistant. This way, you ensure that all relevant parameters are set for optimal inverter operation.

- Adoption of configuration from a file
- Configuration with the installation assistant (recommended)
- Manual configuration

Adopting the Configuration from a File

You can adopt the inverter configuration from a file. To do this, there must be an inverter configuration saved to a file.

Procedure:

1. Select the configuration option **Adopting configuration from a file**.
2. Select [**Browse...**] and select the desired file.
3. Select [**Import file**].

Configuring the Installation Assistant (Recommended)

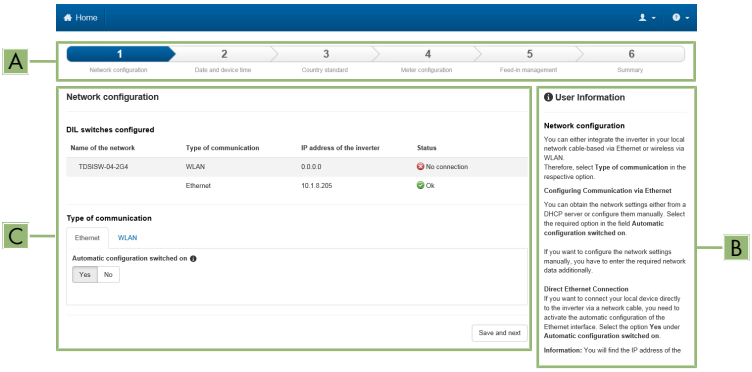


Figure 13: Layout of the installation assistant (example)

Position	Designation	Description
A	Configuration steps	Overview of the installation assistant steps. The number of steps depends on the type of device and the additionally installed modules. The current step is highlighted in blue.
B	User information	Information about the current configuration step and the setting options of the configuration step.
C	Configuration field	You can make settings in this field.

Procedure:

1. Select the configuration option **Configuration with Installation Assistant**.
   ☑ The installation assistant will open.
2. Follow the installation assistant steps and make the settings appropriate for your system.
3. For every setting made in a step, select [**Save and next**].
   ☑ In the last step, all made settings are listed in a summary.
4. To save the settings to a file, select [**Export a summary**] and save the file on your computer, tablet PC or smartphone.
5. To correct settings you made, select [**Back**], navigate to the desired step, correct settings and select [**Save and continue**].
6. Once all settings are correct, select [**Next**] in the summary.

☑ The start page of the user interface opens.

Manual configuration

You can configure the inverter manually by setting the desired parameters.

Procedure:

1. Select the configuration option **Manual Configuration**.
   ☑ The **Device Parameters** menu on the user interface will open and all available parameter groups of the inverter will be displayed.
2. Select [**Edit parameters**].
3. Select the desired parameter group.
   ☑ All available parameters of the parameter group will be displayed.
4. Set the desired parameters.
5. Select [**Save all**].

☑ The inverter parameters are set.

8 Operation

8.1 Establishing a connection to the user interface

8.1.1 Establishing a Direct Connection via Ethernet

Requirements:

- ☐ The product must be commissioned.
- ☐ An end device (e.g. computer) with an Ethernet interface must be available.
- ☐ The product must be connected directly to the end device.
- ☐ The respective latest version of one of the following web browsers must be installed: Chrome, Edge, Firefox, Internet Explorer or Safari.
- ☐ The SMA Grid Guard code of the Installer must be available for the changing of grid-relevant settings after completion of the first ten feed-in hours or installation assistant (see "Application for SMA Grid Guard Code" at www.SMA-Solar.com). A charge is levied for this code.

i IP address of the inverter

- Standard inverter IP address for direct connection via Ethernet: 169.254.12.3

Procedure:

1. Open the web browser of your device, enter the IP address **169.254.12.3** in the address line and press the enter key.
2. **i Web browser signals a security vulnerability**

   After the IP address has been confirmed by pressing the enter key, a message might appear indicating that the connection to the user interface of the inverter is not secure. SMA Solar Technology AG guarantees that calling up the user interface is secure.
   - Continue loading the user interface.

☑ The login page of the user interface opens.

8.1.2 Establishing a direct connection via WLAN

Requirements:

- ☐ The product must be commissioned.
- ☐ An end device (e.g. computer, tablet PC or smartphone) must be available.
- ☐ The respective latest version of one of the following web browsers must be installed: Chrome, Edge, Firefox, Internet Explorer or Safari.
- ☐ JavaScript must be enabled in the web browser of the end device.
- ☐ The SMA Grid Guard code of the Installer must be available for the changing of grid-relevant settings after completion of the first ten feed-in hours or installation assistant (see "Application for SMA Grid Guard Code" at www.SMA-Solar.com). A charge is levied for this code.

Inverter SSID and IP address and necessary passwords

- Inverter SSID in WLAN: SMA[serial number] (e.g. SMA0123456789)
- Standard WLAN password (usable until completion of the configuration by means of the installation assistant or prior to the end of the first ten feed-in hours): SMA12345
- Device-specific WLAN password (usable for initial configuration to completion of the first ten feed-in hours): see WPA2-PSK on the type label of the inverter or on the back of the manual included in the delivery
- Standard IP inverter address for a direct connection via WLAN outside of a local network: 192.168.12.3

Importing and exporting files with end devices having an iOS operating system is not possible.

For technical reasons, importing and exporting files (e.g. importing an inverter configuration, saving the current inverter configuration or exporting events) is not possible with mobile end devices having an iOS operating system.

- Use an end device that does not have an iOS operating system for importing and exporting files.

The procedure can be different depending on the end devices. If the procedure described does not apply to your end device, establish the direct connection via WLAN as described in the manual of your end device.

Procedure:

1. If your end device has a WPS function:
   - Activate the WPS function on the inverter. To do this, tap twice on the enclosure lid of the Connection Unit.
     ☑ The blue LED flashes quickly for approx. two minutes. The WPS function is active during this time.
   - Activate the WPS on your end device.
     ☑ The connection with your end device will be established automatically. It can take up to 20 seconds for this connection to be established.
2. If your end device has not a WPS function:
   - Search for WLAN networks with your end device.
   - Select the SSID of the inverter **SMA[serial number]** in the list with the found WLAN networks.
   - Enter the inverter WLAN password. Within the first ten feed-in hours and prior to completing the configuration by means of the installation assistant, you must use the standard WLAN password **SMA12345**. After the first ten feed-in hours or after completing the configuration by means of the installation assistant, you must use the device-specific WLAN password (WPA2-PSK) of the inverter. You find the WLAN password (WPA2-PSK) on the type label.
3. Enter the IP address **192.168.12.3** or, if your device supports mDNS services, **SMA[serial number].local** or **https://SMA[serial number]** in the address bar of the web browser and press the enter key.

4. **Web browser signals a security vulnerability**

   After the IP address has been confirmed by pressing the enter key, a message might appear indicating that the connection to the user interface of the inverter is not secure. SMA Solar Technology AG guarantees that calling up the user interface is secure.

   - Continue loading the user interface.

   ☑ The login page of the user interface opens.

8.1.3 Establishing a Connection via Ethernet in the local network

New IP address for connecting with a local network

If the product is connected to a local network (e.g. via a router), the product will receive a new IP address. Depending on the type of configuration, the new IP address will be assigned automatically by the DHCP server (router) or manually by you. Upon completion of the configuration, the product can only be reached via the following access addresses:

- Generally applicable access address: IP address manually assigned or assigned by the DHCP server (router) (identification via network scanner software or network configuration of the router).
- Access address for Apple and Linux systems: SMA[serial number].local (e.g. SMA0123456789.local)
- Access address for Windows and Android systems: https://SMA[serial number] (e.g. https://SMA0123456789)

Requirements:

☐ The product must be connected to the local network via a network cable (e.g. via a router).

☐ The product must be integrated into the local network. Tip: There are various methods of integrating the product into the local network with the aid of the installation assistant.

☐ An end device (e.g. computer, tablet PC or smartphone) must be available.

☐ The end device must be in the same local network as the product.

☐ The respective latest version of one of the following web browsers must be installed: Chrome, Edge, Firefox, Internet Explorer or Safari.

☐ The SMA Grid Guard code of the Installer must be available for the changing of grid-relevant settings after completion of the first ten feed-in hours or installation assistant (see "Application for SMA Grid Guard Code" at www.SMA-Solar.com). A charge is levied for this code.

Procedure:

1. Open the web browser of your end device, enter the IP address of the inverter in the address line of the web browser and press the enter key.

2. **Web browser signals a security vulnerability**

   After the IP address has been confirmed by pressing the enter key, a message might appear indicating that the connection to the user interface of the inverter is not secure. SMA Solar Technology AG guarantees that calling up the user interface is secure.

   - Continue loading the user interface.

☑ The login page of the user interface opens.

8.1.4 Establishing a Connection via WLAN in the Local Network

New IP address for connecting with a local network

If the product is connected to a local network (e.g. via a router), the product will receive a new IP address. Depending on the type of configuration, the new IP address will be assigned automatically by the DHCP server (router) or manually by you. Upon completion of the configuration, the product can only be reached via the following access addresses:

- Generally applicable access address: IP address manually assigned or assigned by the DHCP server (router) (identification via network scanner software or network configuration of the router).
- Access address for Apple and Linux systems: SMA[serial number].local (e.g. SMA0123456789.local)
- Access address for Windows and Android systems: https://SMA[serial number] (e.g. https://SMA0123456789)

Requirements:

☐ The product must be commissioned.

☐ The product must be integrated into the local network. Tip: There are various methods of integrating the product into the local network with the aid of the installation assistant.

☐ The end device must be in the same local network as the product.

☐ An end device (e.g. computer, tablet PC or smartphone) must be available.

☐ JavaScript must be enabled in the web browser of the end device.

☐ The respective latest version of one of the following web browsers must be installed: Chrome, Edge, Firefox, Internet Explorer or Safari.

☐ The SMA Grid Guard code of the Installer must be available for the changing of grid-relevant settings after completion of the first ten feed-in hours or installation assistant (see "Application for SMA Grid Guard Code" at www.SMA-Solar.com). A charge is levied for this code.

Importing and exporting files with end devices having an iOS operating system is not possible.

For technical reasons, importing and exporting files (e.g. importing an inverter configuration, saving the current inverter configuration or exporting events) is not possible with mobile end devices having an iOS operating system.

- Use an end device that does not have an iOS operating system for importing and exporting files.

Procedure:

1. Enter the IP address of the inverter in the address bar of the web browser.
2. **Web browser signals a security vulnerability**

   After the IP address has been confirmed by pressing the enter key, a message might appear indicating that the connection to the user interface of the inverter is not secure. SMA Solar Technology AG guarantees that calling up the user interface is secure.

   - Continue loading the user interface.

☑ The login page of the user interface opens.

8.2 Logging In and Out of the User Interface

After a connection to the user interface of the inverter has been established, the login page opens. Log onto the user interface as described below.

Log in as Installer or User for the First Time

Procedure:

1. In the drop-down list **Language**, select the desired language.
2. In the **User group** drop-down list, select the entry **Installer** or **User**.
3. In the **New password** field, enter a new password for the selected user group.
4. In the **Repeat password** field, enter the new password again.
5. Select **Login**.

☑ The **Configuring the Inverter** page opens.

Log in as the User or Installer

1. In the drop-down list **Language**, select the desired language.
2. In the **User group** drop-down list, select the entry **Installer** or **User**.
3. Enter the password in the field **Password**.
4. Select **Login**.

☑ The start page of the user interface opens.

Log Out as the User or Installer

1. On the right-hand side of the menu bar, select the menu **User Settings**.
2. In the subsequent context menu, select [**Logout**].

☑ The login page of the user interface opens. The logout was successful.

8.3 Start Page Design of the User Interface

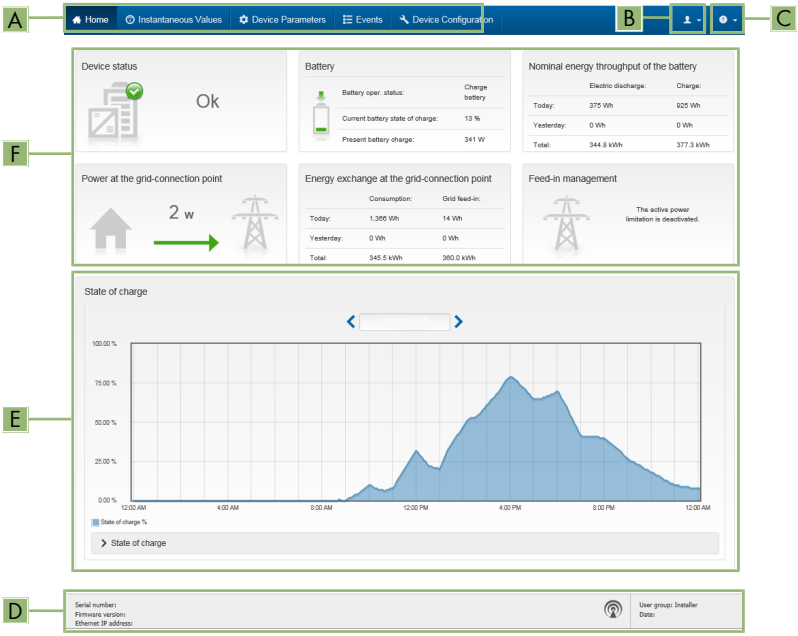


Figure 14: Start page design of the user interface (example)

Position	Designation	Description
A	Menu	Provides the following functions: • **Home** Opens the user interface homepage • **Instantaneous values** Current measured values of the inverter • **Device Parameters** The various operating parameters of the inverter can be viewed and configured here depending on the user group. • **Events** All events that have occurred in the selected time period are displayed here. The event types are **Information**, **Warning** and **Error**. Currently existing events of the types **Error** and **Warning** will be additionally displayed in the **Device status** viewlet. However, only the higher-priority event is displayed. If, for example, there is a Warning and an Error present at the same time, only the Error will be displayed. • **Device configuration** Various settings for the inverter can be made here. The selection available is dependent on which user group you are logged in as and the operating system of the device with which the user interface has been called up. • **Data** You will find all data that is saved in the internal memory of the inverter or on an external storage medium on this page.
B	User settings	Provides the following functions, depending on the user group logged in: • Starting the installation assistant • SMA Grid Guard login • Logout
C	Help	Provides the following functions: • Displaying information on Open Source licenses used • Link to the website of SMA Solar Technology AG

Position	Designation	Description
D	Status bar	Displays the following information: • Inverter serial number • Inverter firmware version • IP address of the inverter within the local network and/or IP address of the inverter during WLAN connection • With WLAN connection: Signal strength of WLAN connection • User group logged in • Date and device time of the inverter
E	State of charge	Chronological sequence of the state of charge (SOC) of the battery This value may be different from the values that the battery provides. Only the value supplied by the inverter is used for this purpose.
F	Status display	The various areas display information on the current status of the system. • **Device status** Displays whether the inverter and/or the battery is/are currently in a fault-free operating state or whether there is an event type **Error** or **Warning** present. • **Feed-in management** Displays whether the inverter is currently limiting its active power. • **Nominal energy throughput of the battery** Indicates how much energy has been charged to the battery and how much has been discharged from the battery. • **Battery** Displays the following information: – Operating status of battery – Current battery state of charge – Current battery charging power • **Energy exchange at the grid-connection point** Indicates how much energy was obtained from the utility grid to supply the household and how much the PV system fed in. • **Power at the grid-connection point** Indicates which power is currently fed in or obtained at the grid-connection point.

8.4 Displaying and Downloading the Stored Data

If an external storage device is plugged in, you can display and download the stored data.

Procedure:

1. Activate the user interface (see Section 8.1, page 53).

2. Log into the user interface (see Section 8.2, page 57).
3. Select the menu **Data**.
4. Select the folder **Data**.
5. To call up the data, select the respective folder and click on the required file.
6. To download the data, select the data type to be exported in the drop-down list. Then apply the time filter and select **Data export**.

8.5 Starting the Installation Assistant

⚠ QUALIFIED PERSON

The installation assistant leads you step-by-step through the steps necessary for the initial configuration of the inverter.

Layout of the installation assistant

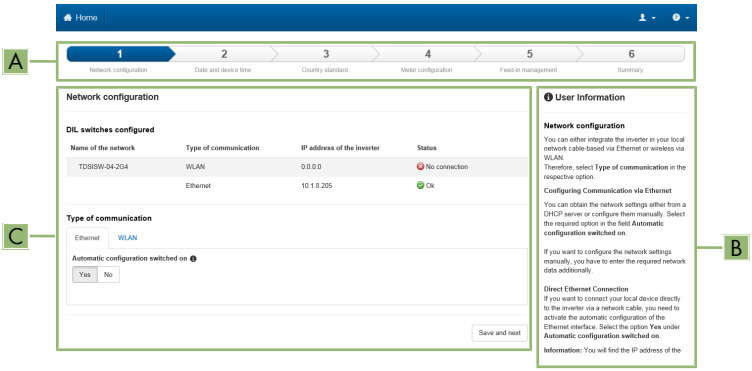


Figure 15: Layout of the installation assistant (example)

Position	Designation	Description
A	Configuration steps	Overview of the installation assistant steps. The number of steps depends on the type of device and the additionally installed modules. The current step is highlighted in blue.
B	User information	Information about the current configuration step and the setting options of the configuration step.
C	Configuration field	You can make settings in this field.

Requirement:

☐ When configuring after completion of the first ten feed-in hours or after exiting the installation assistant, the SMA Grid Guard code must be available in order to change the grid-relevant parameters (see "Application for SMA Grid Guard Code" at www.SMA-Solar.com). A charge is levied for this code.

Procedure:

1. Activate the user interface (see Section 8.1, page 53).
2. Log in as **Installer**.
3. Select the menu **User Settings** (see Section 8.3, page 58) on the start page of the user interface.
4. In the context menu, select [**Start the installation assistant**].

☑ The installation assistant will open.

8.6 Secure Power Supply Operation

If an outlet and a switch for secure power supply operation are connected to the inverter, you can supply a load with energy from the battery in case of a grid failure. If you activate the secure power supply operation, the inverter supplies the loads that are connected to the outlet for secure power supply operation until the battery's state of charge (SOC) has reached the lower limit. In case the battery's state of charge (SOC) is too low, the energy supply of the outlet is permanently interrupted. The secure power supply operation is only possible again when the battery can be recharged after connecting to the utility grid.

In case of overload, the energy supply of the outlet is briefly interrupted. The inverter automatically attempts to reestablish the energy supply 20 seconds after the interruption. This can lead to inadvertent starting of the load that is connected to the outlet. Ensure that the load connected to the outlet does not consume too much power. If necessary, reduce the power consumption of the load.

i Secure power supply operation in Flexible Storage Systems with backup power supply not possible

If the inverter is used in a battery-backup system and connected with an automatic transfer switch, the secure power supply operation is not available.

i Do not connect any loads that require a stable energy supply

The secure power supply operation and the battery-backup operation may not be used for loads that require a stable energy supply. The energy that is available during the secure power supply operation or battery-backup operation depends on the battery capacity available and the state of charge of the battery (SOC).

- Do not connect loads if they are dependent on a stable energy supply for reliable operation.

8.6.1 Activating Secure Power Supply Operation

1. If no load is connected to the outlet, connect a load.
2. Turn the switch of the outlet to secure power supply operation.

3. Wait one minute.
   ☑ The inverter commences secure power supply operation. Once the inverter supplies the outlet, the green LED flashes (1.5 s on and 0.5 s off). In addition, the control light of the outlet for secure power supply operation glows.
4. If the green LED is not flashing or the control light of the outlet is off, it is likely that the battery's state of charge (SOC) is too low and the following steps must be performed:
   - Ensure that the outlet's switch is set to secure power supply operation.
   - Connect a load with lower power consumption to the outlet.
5. If no voltage can be measured at the outlet, ensure that the switch of the outlet is set to secure power supply operation, and that the switch, outlet and control light for secure power supply operation are correctly connected.

8.6.2 Deactivating Secure Power Supply Operation

1. If necessary, disconnect the load from the outlet.
2. Turn the switch of the outlet to grid operation.
   ☑ Grid operation is activated.
3. Switch on the AC circuit breaker.

☑ The inverter connects to the utility grid and starts feed-in operation.

8.7 Activate WPS Function

The WPS function can be used for different purposes:

- Automatic connection to a network (e.g. via router)
- Direct connection between the product and an end device

Depending on the intended application of the WPS function, the procedure for activation will vary.

Activating WPS function for automatic connection to a network

Requirements:

☐ WLAN must be activated in the product.

☐ WPS must be activated on the router.

Procedure:

1. Activate the user interface (see Section 8.1, page 53).
2. Log in as **Installer**.
3. Start the installation assistant (see Section 8.5, page 61).
4. Select **Network configuration**.
5. Select **WPS for WLAN network** button in the **WLAN** tab.
6. Select **Activate WPS**.
7. Select **Save and next** and exit the installation assistant.

☑ The WPS function is activated and the automatic connection to the network can be established.

Activating the WPS function for direct connection to the end device.

- Activate the WPS function on the inverter. To do this, tap twice on the enclosure lid of the Connection Unit.
  ☑ The blue LED flashes quickly for approx. two minutes. The WPS function is active during this time.

8.8 Switching WLAN On and Off

The inverter is equipped with an activated WLAN interface as standard. If you do not want to use WLAN, you can switch the WLAN function off and switch it on again whenever needed. In doing so, you can switch the WLAN direct connection and the WLAN connection in the local network on independently of each other.

i Switching on the WLAN function only possible via Ethernet connection

If you switch off both the WLAN function for the direct connection and for the connection in the local network, access to the inverter user interface and therefore reactivation of the WLAN interface is only possible via an Ethernet connection.

Switching WLAN Off

If you would like to switch the WLAN function off completely, you must switch off both the direct connection and the connection in the local network.

Procedure:

- To switch off the direct connection in the parameter group **PV system communication > WLAN**, select the parameter **Soft-access-point is turned on** and set this to **No**.
- To switch off the connection in the local network in the parameter group **PV system communication > WLAN**, select the parameter **WLAN is turned on** and set this to **No**.

Switching WLAN On

If you have switched the WLAN function for direct connection or for connection in the local network off, you can switch the WLAN function back on in accordance with the following procedure.

Requirement:

☐ If the WLAN function was previously switched off completely, the inverter must be connected to a computer or router via Ethernet.

Procedure:

- To switch on the WLAN direct connection, in the parameter group **PV system communication > WLAN**, select the parameter **Soft-access-point is turned on** and set this to **Yes**.
- To switch on the WLAN connection in the local network, in the parameter group **System communication > WLAN**, select the parameter **WLAN is turned on** and set this to **Yes**.

8.9 Changing the Password

The password for the inverter can be changed for both user groups. Furthermore, the user group **Installer** can change the password for the user group **User** as well as its own password.

Procedure:

1. Activate the user interface (see Section 8.1, page 53).
2. Log into the user interface (see Section 8.2, page 57).
3. Call up the menu **Device Parameters**.
4. Select [**Edit parameters**].
5. In the parameter group **User Rights > Access Control** change the password of the desired user group.
6. Select [**Save all**] to save the changes.

8.10 Changing Operating Parameters

The operating parameters of the inverter are set to certain values by default. You can change the operating parameters to optimize the performance of the inverter.

This section describes the basic procedure for changing operating parameters. Always change operating parameters as described in this section. Some function-sensitive parameters can only be viewed by qualified persons and can only be changed by qualified persons by entering the personal SMA Grid Guard code.

Requirements:

☐ The changes to the grid-relevant parameters must be approved by the grid operator.

☐ When changing grid-relevant parameters, the SMA Grid Guard code must be available (see "Application for SMA Grid Guard Code" at www.SMA-Solar.com). A charge is levied for this code.

Procedure:

1. Activate the user interface (see Section 8.1, page 53).
2. Log into the user interface (see Section 8.2, page 57).
3. Call up the menu **Device Parameters**.
4. Select [**Edit parameters**].
5. Log in using the SMA Grid Guard code to change those parameters designated by a lock (only for installers):
   - Select the menu **User Settings** (see Section 8.3, page 58).
   - In the subsequent context menu, select [**SMA Grid Guard login**].
   - Enter the SMA Grid Guard code and select [**Login**].
6. Expand the parameter group that contains the parameter which is to be configured.
7. Change the desired parameters.
8. Select [**Save all**] to save the changes.

☑ The inverter parameters are set.

8.11 Configuring the Country Data Set

⚠ QUALIFIED PERSON

Procedure:

- In the parameter group **Grid monitoring > Grid monitoring** select the parameter **Set country standard** and set the required country data set.

8.12 Configuring Feed-In Management

⚠ QUALIFIED PERSON

Starting the installation assistant

1. Activate the user interface (see Section 8.1, page 53).
2. Log in as **Installer**.
3. Start the installation assistant (see Section 8.5, page 61).
4. Select [**Save and continue**] after each step up until the step **Configure grid management service**.
5. Make the settings as described in the following.

Setting the connected line conductors

- In the tab **Feed-in management**, select the line conductor to which the inverter is connected from the drop-down list **Connected line conductors**.

Making settings for systems without higher-level unit (e.g. Sunny Home Manager).

1. Set **Feed-in management at the grid-connection point** to [**On**].
2. Enter the total PV array power in the field **Nominal PV system power**.
3. In the drop-down list **Operating mode of active power limitation at the grid-connection point**, select whether active power limitation is to be performed via a fixed specification in percent or in watts.
4. In the field **Set active power limit at the grid-connection point**, enter the value to which the active power at the grid-connection point is to be limited. The value must be set to **0** for zero export.

- Set **Feed-in management at the grid-connection point** to [**Off**].

Activating unbalanced load limitation

Depending on the country data set, unbalanced load limitation may have already been set. In this case, check the settings.

- If there are single-phase PV inverters in the system and unbalanced load limitation is requested, set **Unbalanced load limitation** to [**On**] and enter the maximum permissible unbalanced load in the field **Maximum unbalanced load**.
- If there are three-phase PV inverters in the system, set **Unbalanced load limitation** to [**Off**].

Setting PV inverter feed-in management

1. Activate the PV inverter user interface.
2. Log in as **Installer**.
3. Start the installation assistant on the PV inverter user interface.
4. Select [**Save and continue**] after each step up until the step **Configure grid management service**.
5. Ensure that the function **System control and power limitation** is set to [**On**].
6. In the drop-down list **Operating mode active power**, select the entry **Active power limitation P via system control**.
7. In the drop-down list **Operating mode for absent system control**, select the entry **Use fallback setting**.
8. In the field **Fallback active power P**, enter the same value as the one entered for the battery inverter. Where necessary, convert this value into a percentage. This ensures that in systems with Sunny Home Manager, the correct fallback value will be adopted in the event of a communication breakdown between Sunny Home Manager and inverter.
9. In the field **Timeout**, enter the time that the PV inverter is to wait before it limits its nominal power to the set fallback value.
10. If, in the event of a 0% or 0 W specification, the PV inverter is not permitted to feed small amounts of active power into the utility grid, select the entry **Yes** in the drop-down list **Grid disconnection at zero export**. This ensures that in the event of a 0% or 0 W specification, the inverter disconnects from the utility grid and does not feed in active power.

8.13 Configuring the Modbus Function

⚠ QUALIFIED PERSON

The Modbus interface is deactivated by default and the communication ports 502 set.

In order to access SMA invertes with SMA Modbus® or SunSpec® Modbus®, the Modbus interface must be activated. After activating the interface, the communication ports of both IP protocols can be changed. For information on commissioning and configuration of the Modbus interface, see the Technical Information "SMA Modbus® Interface" or in the Technical Information "SunSpec® Modbus® Interface" at www.SMA-Solar.com.

For information on which Modbus registers are supported, see the Technical Descriptions "SMA Modbus® Interface" or "SunSpec® Modbus® Interface" at www.SMA-Solar.com.

Data security during activated Modbus interface

If you activate the Modbus interface, there is a risk that unauthorized users may access and manipulate the data or devices in your PV system.

- Take appropriate protective measures, such as:
  - Set up a firewall.
  - Close unnecessary network ports.
  - Only enable remote access via VPN tunnel.
  - Do not set up port forwarding at the communication port in use.
  - In order to deactivate the Modbus interface, reset the inverter to default settings or deactivate the activated parameter again.

Deactivate the dynamic active power limitation for the PV inverters when controlled via Modbus

If the PV inverters and the battery inverter are controlled in a PV system via Modbus, the dynamic active power limitation of the PV inverters must be deactivated.

Procedure:

- Activate the Modbus interface and adjust the communication ports if necessary (see the technical information "SMA Modbus® Interface" or "SunSpec® Modbus® Interface" at www.SMA-Solar.com).

8.14 Activating the Receipt of Control Signals (Only for Italy)

⚠ QUALIFIED PERSON

In order for PV systems in Italy to receive control commands from the grid operator, set the following parameters.

Parameter	Value/range	Resolution	Default
Application ID	0 to 16384	1	16384
GOOSE-Mac address	01:0C:CD:01:00:00 to 01:0C:CD:01:02:00	1	01:0C:CD:01:00:00

Procedure:

1. Select the parameter group **External communication > IEC 61850 configuration**.
2. In the field **Application ID**, enter the application ID of the grid operator gateway. You will receive this value from your grid operator. You can enter a value between 0 and 16384. The value 16384 indicates "deactivated".
3. In the field **GOOSE-Mac address**, enter the MAC address of the grid operator gateway from which the inverter is to receive the control commands. You will receive this value from your grid operator.

☑ The receipt of control signals from the grid operator is activated.

8.15 Deactivating Grounding Conductor Monitoring

⚠ QUALIFIED PERSON

If the inverter is to be installed in an IT network or another grid configuration in which deactivation of the grounding conductor monitoring is required, deactivate the grounding conductor monitoring as follows.

The basic procedure for changing operating parameters is explained in another section (see Section 8.10 "Changing Operating Parameters", page 65).

Procedure:

- In the parameter group **Grid monitoring > Grid monitoring > Country standard** set the parameter **PE connection monitoring** to **Off**.

8.16 Configuring the Energy Meter

⚠ QUALIFIED PERSON

You can add an energy meter to your PV system or replace an existing energy meter.

The basic procedure for changing operating parameters is explained in another section (see Section 8.10 "Changing Operating Parameters", page 65).

i Removing a detected energy meter from the PV system

If only one energy meter is detected by the inverter, this will be added to the PV system automatically. Removal via the menu **Device configuration** is not possible in this case. To remove the energy meter from the PV system, proceed as follows:

- In the parameter group **System communication > Measured values > Meter on Speedwire**, set the parameter **Serial number** to any number (e.g. **1**). In this way, instead of the energy meter detected, the PV system will add a fictitious energy meter to which the inverter cannot establish communication.

Procedure:

1. Activate the user interface (see Section 8.1, page 53).
2. Log in as **Installer**.
3. Start the installation assistant (see Section 8.5, page 61).
4. In the context menu, select [**Starting the installation assistant**].
5. Select [**Save and next**] until you get to the step **Meter configuration**.
6. Add or replace the desired energy meter.

8.17 Saving the Configuration in a File

Procedure:

1. Activate the user interface (see Section 8.1, page 53).
2. Log into the user interface (see Section 8.2, page 57).
3. Select the menu **Device Configuration**.
4. Select [**Settings**].

5. In the context menu, select [**Saving the configuration in a file**].
6. Follow the instructions in the dialog.

8.18 Adopting a Configuration from a File

⚠ QUALIFIED PERSON

Requirements:

☐ The SMA Grid Guard code must be available (see "Application for SMA Grid Guard Code" at www.SMA-Solar.com). A charge is levied for this code.

☐ Changes to grid-relevant parameters must be approved by the responsible grid operator.

Procedure:

1. Activate the user interface (see Section 8.1, page 53).
2. Log into the user interface as an **Installer**.
3. Select the menu **Device Configuration**.
4. Select [**Settings**].
5. In the context menu, select [**Adopting the configuration from a file**].
6. Follow the instructions in the dialog.

8.19 Updating the Firmware

⚠ QUALIFIED PERSON

If no automatic update is set in the communication product (e.g. Cluster Controller, Sunny Portal) or via the user interface of the inverter, you have the option of carrying out a manual firmware update.

Depending on the battery used, the firmware update of the inverter also updates the battery.

There are two options to update the firmware:

- Update the firmware via the user interface of the inverter.
- Update the firmware via USB flash drive.

Updating firmware via the user interface

Requirements:

☐ An update file with the desired inverter firmware must be available. The update file is, for example, available for download on the product page of the inverter at www.SMA-Solar.com. To download the update file, it is necessary to enter the serial number of the inverter.

Procedure:

1. Activate the user interface (see Section 8.1, page 53).
2. Log into the user interface (see Section 8.2, page 57).
3. Select the menu **Device Configuration**.
4. In the inverter row, click on the gear icon and select **Update firmware**.
5. Select [**Browse**] and select the update file for the inverter.

6. Select **Update firmware**.
7. Follow the instructions in the dialog.

Updating the Firmware via USB Flash Drive

Requirement:

☐ A USB flash drive with maximum 32 GB and file system FAT32 must be available.

Procedure:

1. Create an "UPDATE" folder on the USB stick.
2. Save the update file with the desired firmware in the "UPDATE" folder on the USB flash drive. The update file is, for example, available for download on the product page of the inverter at www.SMA-Solar.com. Make sure that only the update file to which the inverter is to be updated must be saved on the USB flash drive.
3. **⚠ DANGER**

   Danger to life due to high voltages

   - Disconnect the inverter from any voltage sources and open the enclosure lid of the Connection Unit (see the inverter installation manual).
4. Insert the USB flash drive in the USB port on the communication assembly.
5. Commission the inverter (see Section 7.2, page 48).

   ☑ During start-up phase of the inverter, the desired firmware is being installed.
6. **⚠ DANGER**

   Danger to life due to high voltages

   - Disconnect the inverter from any voltage sources and open the enclosure lid of the Connection Unit (see the inverter installation manual).
7. Pull the USB flash drive out of the USB port.
8. Commission the inverter (see Section 7.2, page 48).
9. Call up the user interface of the inverter and check the events to see whether a firmware update has been successfully completed.
10. If the firmware update has not been successfully completed, perform the firmware update again.

9 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. Always adhere to the prescribed sequence.

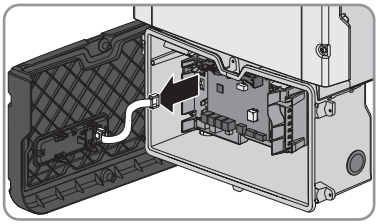
NOTICE

Destruction of the measuring device due to overvoltage

- Only use measuring devices with a DC input voltage range of 600 V or higher.

Procedure:

1. Disconnect the AC circuit breaker and secure it against reconnection.
2. Switch off the battery or the load-break switch of the battery (see documentation of the battery manufacturer).
3. Wait five minutes. This will ensure that the capacitors are discharged.
4. Unscrew all six screws of the enclosure lid of the Connection Unit with a Torx screwdriver (TX 25) and remove the enclosure lid carefully towards the front. When doing so, note that the LED assembly in the enclosure lid and the communication assembly in the inverter are connected via a ribbon cable.
5. Pull the ribbon cable connecting the LED assembly in the enclosure lid to the communication assembly out of the jack located on the communication assembly.



6. Ensure that no voltage is present on the **AC-out** terminal block between **L** and **N** using a suitable measuring device. To do this, stick the test probe in each rectangular opening of the terminal.
7. Ensure that no voltage is present on the **AC-out** terminal block between **L** and **PE** using a suitable measuring device. To do this, stick the test probe in each rectangular opening of the terminal.

10 Cleaning the Inverter

NOTICE

Damage to the type label due to the use of cleaning agents

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

11 Troubleshooting

11.1 Forgotten Password

If you have forgotten the password for the inverter, you can unlock the inverter with a Personal Unlocking Key (PUK). For each inverter, there is one PUK for each user group (**User** and **Installer**). Tip: With PV systems in Sunny Portal, you can also assign a new password via Sunny Portal for the user group **Installer**. The password for the user group **Installer** is the same as the system password in Sunny Portal.

Procedure:

1. Request PUK (application form available at www.SMA-Solar.com).
2. Activate the user interface (see Section 8.1, page 53).
3. Enter the PUK instead of the password into the field **Password**.
4. Select **Login**.
5. Call up the menu **Device Parameters**.
6. Select [**Edit parameters**].
7. In the parameter group **User Rights > Access Control** change the password of the desired user group.
8. Select [**Save all**] to save the changes.

PV Systems in Sunny Portal

The password for the user group **Installer** is also the system password for the PV system in Sunny Portal. Changing the password of the user group **Installer** can lead to the inverter no longer being able to be reached by Sunny Portal.

- Assign the changed password of the user group **Installer** as the new system password in Sunny Portal (see the Sunny Portal user manual at www.SMA-Solar.com).

11.2 Event Messages

Event number	Message, cause and corrective measures
101 to 105	⚠ QUALIFIED PERSON **Grid fault** The grid voltage or grid impedance at the connection point of the inverter is too high. The inverter has disconnected from the utility grid. **Corrective measures:** • Ensure that the correct country data set has been configured (see Section 8.11, page 66). • Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range. If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits. If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service (see Section 14, page 124).
202 to 206	⚠ QUALIFIED PERSON **Grid fault** The utility grid has been disconnected, the AC cable is damaged or the grid voltage at the connection point of the inverter is too low. The inverter has disconnected from the utility grid. **Corrective measures:** • Make sure that the circuit breaker is switched on. • Ensure that the AC cable is not damaged and that it is connected correctly. • Ensure that the country data set has been configured correctly. • Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range. If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits. If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
301	⚠ QUALIFIED PERSON **Grid fault** The ten-minute average value of the grid voltage is no longer within the permissible range. The grid voltage or grid impedance at the connection point is too high. The inverter disconnects from the utility grid to maintain power quality. **Corrective measures:** • During the feed-in operation, check whether the grid voltage at the connection point of the inverter is permanently in the permissible range. If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits. If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service (see Section 14, page 124).
302	**Active power limited AC voltage** The inverter has reduced its power due to a too-high grid voltage to ensure grid stability. **Corrective measures:** • If possible, check the grid voltage and observe how often fluctuations occur. If fluctuations occur frequently and this message is displayed often, contact the grid operator and request approval to change the operating parameters of the inverter. If the grid operator gives his approval, discuss any changes to the operating parameters with Service (see Section 14, page 124).
401 to 404	⚠ QUALIFIED PERSON **Grid fault** The inverter has disconnected from the utility grid. A stand-alone grid or a very large change in the power frequency was detected. **Corrective measures:** • Check the grid connection for significant short-term frequency fluctuations.

Event number	Message, cause and corrective measures
501	⚠ QUALIFIED PERSON **Grid fault** The power frequency is not within the permissible range. The inverter has disconnected from the utility grid. **Corrective measures:** • If possible, check the power frequency and observe how often fluctuations occur. If fluctuations occur frequently and this message is displayed often, contact the grid operator and request approval to change the operating parameters of the inverter. If the grid operator gives his approval, discuss any changes to the operating parameters with Service (see Section 14, page 124).
507	**Active power limited AC frequency** The inverter has reduced its power due to a too-high power frequency to ensure grid stability. **Corrective measures:** • If possible, check the power frequency and observe how often fluctuations occur. If fluctuations occur frequently and this message is displayed often, contact the grid operator and request approval to change the operating parameters of the inverter. If the grid operator gives his approval, discuss any changes to the operating parameters with Service (see Section 14, page 124).
601	⚠ QUALIFIED PERSON **Grid fault** The inverter has detected an excessively high proportion of direct current in the grid current. **Corrective measures:** • Check the grid connection for direct current. • If this message is displayed frequently, contact the grid operator and check whether the monitoring threshold on the inverter can be raised.

Event number	Message, cause and corrective measures
701	⚠ QUALIFIED PERSON **Frq. not permitted > Check parameter** The power frequency is not within the permissible range. The inverter has disconnected from the utility grid. **Corrective measures:** • If possible, check the power frequency and observe how often fluctuations occur. If fluctuations occur frequently and this message is displayed often, contact the grid operator and request approval to change the operating parameters of the inverter. If the grid operator gives his approval, discuss any changes to the operating parameters with Service (see Section 14, page 124).
1001	⚠ QUALIFIED PERSON **L/N swapped > Check connection** The connection of L and N is swapped. **Corrective measures:** • Ensure that L and N are correctly connected (see installation manual).
1101	⚠ QUALIFIED PERSON **2nd phase connected to N** A second line conductor is connected to N. **Corrective measures:** • Connect the neutral conductor to N (see installation manual).
1302	⚠ QUALIFIED PERSON **Phase(s) or neutral conductor not connected** L or N not connected. **Corrective measures:** • Ensure that L and N are connected (see installation manual). • Ensure that the AC conductors are not damaged and correctly connected (see installation manual). • Make sure that the circuit breaker is switched on.

Event number	Message, cause and corrective measures
1501	⚠ QUALIFIED PERSON **Reconnection fault grid** The changed country data set or the value of a parameter you have set does not correspond to the local requirements. The inverter cannot connect to the utility grid. **Corrective measures:** • Ensure that the country data set has been configured correctly. To do this, select the parameter **Set country standard** and check the value.
3301 to 3303	⚠ QUALIFIED PERSON **Unstable operation** There is not enough power at the DC input of the inverter for stable operation. The inverter cannot connect to the utility grid. **Corrective measures:** • Ensure that the correct battery type has been configured.
3401 to 3407	⚠ QUALIFIED PERSON **DC overvoltage > Disconnect generator** Overvoltage at the DC input. This can destroy the inverter. **Corrective measures:** • **Immediately** disconnect the inverter from all voltage sources. • Check whether the DC voltage is below the maximum input voltage of the inverter. If the DC voltage is below the maximum DC voltage of the inverter, reconnect the DC connectors to the inverter. • If the DC voltage is above the maximum DC voltage of the inverter, ensure that the correct battery has been selected. • If this message is repeated frequently, contact the Service (see Section 14, page 124).
3501	⚠ QUALIFIED PERSON **Insulation failure > Check generator** The inverter has detected a ground fault on the DC side. **Corrective measures:** • Check the battery and DC cabling for ground faults.

Event number	Message, cause and corrective measures
3601	⚠ QUALIFIED PERSON **High discharge curr. > Check generator** The leakage current of the inverter and the battery is too high. There is a ground fault, a residual current or a malfunction. The inverter interrupts parallel grid operation immediately after exceeding a threshold. When the fault is eliminated, the inverter automatically reconnects to the utility grid. **Corrective measures:** • Check the battery and DC cabling for ground faults.
3701	⚠ QUALIFIED PERSON **Resid.curr.too.high > Check generator** The inverter detected a residual current due to brief grounding of the battery or the DC cabling. **Corrective measures:** • Check the battery and DC cabling for ground faults.
3801 to 3805	⚠ QUALIFIED PERSON **DC overcurrent > Check generator** Overcurrent at the DC input. The inverter briefly interrupts feed-in operation. **Corrective measures:** • If this message is displayed frequently, ensure that the battery has been correctly connected and that the correct battery has been selected.
3901	⚠ QUALIFIED PERSON **DC power too low** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available, check for other events. If there are other events, carry out the corrective measures for the other events.

Event number	Message, cause and corrective measures
3902	⚠ QUALIFIED PERSON **Generator voltage too low** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If a new firmware version is not available, check whether there are other event messages. If there are further event messages, perform the corrective measures of the further messages.
6001	⚠ QUALIFIED PERSON **System data restored** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6002	⚠ QUALIFIED PERSON **System data defective** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6003	⚠ QUALIFIED PERSON **System data access not possible** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6004	⚠ QUALIFIED PERSON **Main memory defective** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6005	⚠ QUALIFIED PERSON **Code memory defective** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
6006	⚠ QUALIFIED PERSON **CPU self-test HP** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6009	**Data inconsistency** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6101	⚠ QUALIFIED PERSON **24 h watchdog test** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6105	⚠ QUALIFIED PERSON **Execution (Operation)** Processor defective. **Corrective measures:** • Contact the Service (see Section 14, page 124).
6107	⚠ QUALIFIED PERSON **Execution (State machine)** Processor defective. **Corrective measures:** • Contact the Service (see Section 14, page 124).
6109	⚠ QUALIFIED PERSON **General BSP fault** Processor defective. **Corrective measures:** • Contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
6111	⚠ QUALIFIED PERSON **Execution (SharedMemory)** Processor defective. **Corrective measures:** • Contact the Service (see Section 14, page 124).
6112	⚠ QUALIFIED PERSON **Execution (Watchdog)** Processor defective. **Corrective measures:** • Contact the Service (see Section 14, page 124).
6121	⚠ QUALIFIED PERSON **Watchdog DSP** Processor defective. **Corrective measures:** • Contact the Service (see Section 14, page 124).
6155	⚠ QUALIFIED PERSON **Version test failed** Processor defective. **Corrective measures:** • Contact the Service (see Section 14, page 124).
6202	⚠ QUALIFIED PERSON **DI converter fault** Measurement error. **Corrective measures:** • Contact the Service (see Section 14, page 124).
6301	⚠ QUALIFIED PERSON **Offset grid current sensor** Measurement error. **Corrective measures:** • Contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
6304	⚠ QUALIFIED PERSON **Grid voltage measurement offset** Measurement error. **Corrective measures:** • Contact the Service (see Section 14, page 124).
6305	⚠ QUALIFIED PERSON **Deviation grid voltage measurement** Measurement error. **Corrective measures:** • Contact the Service (see Section 14, page 124).
6306	⚠ QUALIFIED PERSON **DC voltage measurement deviation** Measurement error. **Corrective measures:** • Contact the Service (see Section 14, page 124).
6401	⚠ QUALIFIED PERSON **Sensor system insulation resistance** Measurement error. **Corrective measures:** • Contact the Service (see Section 14, page 124).
6403	⚠ QUALIFIED PERSON **Overvoltage grid (HW)** **Corrective measures:** • If there are several inverters in the system, check whether they also display this event message. If all inverters display this event message, a grid error is present. • If there is only one inverter, check for a grid error. • If there is no grid error and this message is displayed again, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
6404	⚠ QUALIFIED PERSON **Overvoltage grid (HW)** **Corrective measures:** • Check whether there is a new firmware version available for the inverter. If a newer version is available, perform the firmware update. • If no new firmware version is available, please contact Service (see Section 14, page 124).
6405	⚠ QUALIFIED PERSON **Overvoltage intermediate circuit (HW)** **Corrective measures:** • Check whether there is a new firmware version available for the inverter. If a newer version is available, perform the firmware update. • If no new firmware version is available, please contact Service (see Section 14, page 124).
6406	⚠ QUALIFIED PERSON **Overcurrent input A (HW)** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available, check for other events. If there are other events, carry out the corrective measures for the other events. • Check the battery for any faults. • Ensure that there is not a short circuit present at the DC connection. • If this message is displayed again, contact the Service (see Section 14, page 124).
6407	⚠ QUALIFIED PERSON **Overcurrent input B (HW)** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available, check for other events. If there are other events, carry out the corrective measures for the other events. • Check the battery for any faults. • Ensure that there is not a short circuit present at the DC connection. • If this message is displayed again, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
6408	⚠ QUALIFIED PERSON **UCE monitoring** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6409	⚠ QUALIFIED PERSON **Bridge short-circuit** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6410	⚠ QUALIFIED PERSON **On-board supply system disturbance** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6411	⚠ QUALIFIED PERSON **Power unit** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6412	⚠ QUALIFIED PERSON **Overcurrent input C (HW)** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available, check for other events. If there are other events, carry out the corrective measures for the other events. • Check the battery for any faults. • Ensure that there is not a short circuit present at the DC connection. • If this message is displayed again, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
6415	⚠ QUALIFIED PERSON **Reference voltage test** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6416	⚠ QUALIFIED PERSON **External watchdog (enable)** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6462	⚠ QUALIFIED PERSON **Overcurrent battery (HW)** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available and this message is displayed again, contact the Service (see Section 14, page 124).
6499	⚠ QUALIFIED PERSON **Precharging overload protection triggered** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6501	⚠ QUALIFIED PERSON **Overtemperature interior** **Corrective measures:** • Check whether the airflow is free of dirt. • Ensure that the ambient temperature does not exceed the maximum permissible temperatures. • If the maximum permissible temperatures are met at all times and this message is displayed again, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
6502	⚠ QUALIFIED PERSON **Overtemperature power unit** **Corrective measures:** • Check whether the airflow is free of dirt. • Ensure that the ambient temperature does not exceed the maximum permissible temperatures. • If the maximum permissible temperatures are met at all times and this message is displayed again, contact the Service (see Section 14, page 124).
6509	⚠ QUALIFIED PERSON **Overtemperature boost converter** **Corrective measures:** • Check whether the airflow is free of dirt. • Ensure that the ambient temperature does not exceed the maximum permissible temperatures. • If the maximum permissible temperatures are met at all times and this message is displayed again, contact the Service (see Section 14, page 124).
6512	**Minimum operating temperature not reached** The inverter will only recommence grid feed-in once the temperature has reached at least −25°C.
6603	⚠ QUALIFIED PERSON **Overcurrent grid (SW)** **Corrective measures:** • If there are several inverters in the system, check whether they also display this event message. If all inverters display this event message, a grid error is present. • If there is only one inverter, check for a grid error. • If there is no grid error and this message is displayed again, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
6604	⚠ QUALIFIED PERSON **Overvoltage intermediate circuit (SW)** **Corrective measures:** • Check whether there is a new firmware version available for the inverter. If a newer version is available, perform the firmware update. • If no new firmware version is available, please contact Service (see Section 14, page 124). • Check whether there was a DC overvoltage. If DC overvoltage was present, contact the Service (see Section 14, page 124).
6607	⚠ QUALIFIED PERSON **Charge battery overcurr. (SW limit)** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available and this message is displayed again, contact the Service (see Section 14, page 124).
6608	⚠ QUALIFIED PERSON **Disch. battery overcurr. (SW)** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available and this message is displayed again, contact the Service (see Section 14, page 124).
6609	⚠ QUALIFIED PERSON **Battery undervoltage (SW limit)** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available and this message is displayed again, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
6610	⚠ QUALIFIED PERSON **Battery overvoltage (SW limit)** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available and this message is displayed again, contact the Service (see Section 14, page 124).
6701	⚠ QUALIFIED PERSON **Program Sequence** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available and this message is displayed again, contact the Service (see Section 14, page 124).
6702	⚠ QUALIFIED PERSON **No system data** **Corrective measures:** • Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update. • If no new firmware version is available and this message is displayed again, contact the Service (see Section 14, page 124).
6801	⚠ QUALIFIED PERSON **Offset DC current sensor A** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6802	⚠ QUALIFIED PERSON **DC converter string A defective** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
6901	⚠ QUALIFIED PERSON **Offset DC current sensor B** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
6902	⚠ QUALIFIED PERSON **DC converter string B defective** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
7001	⚠ QUALIFIED PERSON **Fault sensor interior temperature** Measurement error. **Corrective measures:** • Contact the Service (see Section 14, page 124).
7002	⚠ QUALIFIED PERSON **Fault sensor power unit temperature** Measurement error. **Corrective measures:** • Contact the Service (see Section 14, page 124).
7106	**Update file defect.** The update file is defective. The update failed. The inverter continues to feed in.
7110	**No update file found** No new update file was found on the SD memory card. The update failed. The inverter continues to feed in.
7112	**Update file successfully copied**
7113	**The memory card is full or write-protected**
7201	**Data storage defective** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
7202	**Long term data defective** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
7303	⚠ QUALIFIED PERSON **Update main CPU failed** The cause must be determined by the Service. **Corrective measures:** • Contact the Service (see Section 14, page 124).
7320	**The device with serial number |u0| was successfully updated to firmware version |u/9/4|.**
7324	⚠ QUALIFIED PERSON **Wait for update conditions** The testing of the update conditions was not successful. The firmware update package is not suitable for this inverter. **Corrective measures:** • Retry update. • Ensure that the selected update file is suitable for this inverter. • If this message is displayed again, contact the Service (see Section 14, page 124).
7330	⚠ QUALIFIED PERSON **Condition test failed** **Corrective measures:** • Retry update. • Ensure that the selected update file is suitable for this inverter. • If this message is displayed again, contact the Service (see Section 14, page 124).
7331	**Update transport started** Update file is being copied.
7332	**Update transport successful** Update file was copied successfully to the inverter's internal memory.

Event number	Message, cause and corrective measures
7333	⚠ QUALIFIED PERSON **Update transport failed** Update file could not be copied to the inverter's internal memory. In the event of connection with the inverter via WLAN, a poor connection quality can be the cause. **Corrective measures:** • Retry update. • If this message is displayed again, contact the Service (see Section 14, page 124).
7337	⚠ QUALIFIED PERSON **Battery management system update unsuccessful (|d0|)** **Corrective measures:** • Retry update. • Ensure that the selected update file is suitable for this inverter. • If this message is displayed again, contact the Service (see Section 14, page 124).
7340	**Update communication failed**
7347	⚠ QUALIFIED PERSON **Incompatible file** The configuration file is not suitable for this inverter. **Corrective measures:** • Ensure that the selected configuration file is suitable for this inverter. • Retry import.
7348	⚠ QUALIFIED PERSON **Incorrect file format** The configuration file is not of the required format or is damaged. **Corrective measures:** • Ensure that the selected configuration file is of the required format and is not damaged. • Retry import.
7349	**Incorrect login rights for configuration file** The configuration file cannot be loaded. **Corrective measures:** • Make sure you are logged on in the correct user level to load the configuration file.

Event number	Message, cause and corrective measures
7350	**Transfer of a configuration file has started** The configuration file is being transferred.
7351	**Update WLAN** The inverter is updating the WLAN module.
7352	⚠ QUALIFIED PERSON **Update of WLAN not successful** The update of the WLAN module failed. **Corrective measures:** • Retry update. • If this message is displayed again, contact the Service (see Section 14, page 124).
7353	**Update time zone database** The inverter is updating the time zone database.
7354	⚠ QUALIFIED PERSON **Update of time zone database not successful** The update of the time zone database failed. **Corrective measures:** • Retry update. • If this message is displayed again, contact the Service (see Section 14, page 124).
7355	**Update WebUI** The inverter is updating the inverter user interface.
7356	⚠ QUALIFIED PERSON **Update of the WebUI not successful** The update of the inverter user interface failed. **Corrective measures:** • Retry update. • If this message is displayed again, contact the Service (see Section 14, page 124).
7357	**Update BIM** The Battery Interface Module on the communication assembly has been successfully updated.

Event number	Message, cause and corrective measures
7358	⚠ QUALIFIED PERSON **Update BIM failed** The Battery Interface Module on the communication assembly has not been updated successfully. **Corrective measures:** • Retry update. • If this message is displayed again, contact the Service (see Section 14, page 124).
7359	**Update BUC** The SMA Backup Unit Controller that is installed in the automatic transfer switch has been updated successfully.
7360	⚠ QUALIFIED PERSON **Update BUC failed** **Corrective measures:** • Ensure that the communication between SMA Backup Unit Controller and the inverter functions perfectly. • Ensure that the cable requirements of the communication cable for the communication between the SMA Backup Unit Controller and the inverter have been met. • Retry update. • If this message is displayed again, contact the Service (see Section 14, page 124).
7619	⚠ QUALIFIED PERSON **Communication fault with meter unit > Check communication to meter** The inverter is not receiving any data from the energy meter. **Corrective measures:** • Ensure that the energy meter is correctly integrated into the same network as the inverter (see energy meter manual).

Event number	Message, cause and corrective measures
7623	⚠ QUALIFIED PERSON **Communication to backup module disrupted** The communication between the inverter and the SMA Backup Unit Controller in the automatic transfer switch is disrupted. **Corrective measures:** • Ensure that the cable requirements of the communication cable for the communication between the SMA Backup Unit Controller and the inverter have been met. • Retry update. • Carry out communication test. • If the communication test was successful, contact the manufacturer of the automatic transfer switch. If the communication test failed, contact the Service (see Section 14, page 124).
7624	⚠ QUALIFIED PERSON **Communication to battery interface module disrupted** The communication between the inverter and the battery interface module on the communication assembly is disrupted. **Corrective measures:** • Ensure that the ribbon cable is in perfect condition and securely in place. • If the ribbon cable is in perfect condition and firmly plugged in the jack, contact the Service (see Section 14, page 124).
7701	⚠ QUALIFIED PERSON **Grid disconnection point** Grid relay of the inverter defective. **Corrective measures:** • Contact the Service (see Section 14, page 124).
7702	**Relay defect** Grid relay of the inverter defective. **Corrective measures:** • Contact the Service (see Section 14, page 124).
7703	⚠ QUALIFIED PERSON **24h relay test** Relay test failed. **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
8003	⚠ QUALIFIED PERSON **Active power limited derating** The inverter has reduced its power output for more than ten minutes due to excessive temperature. **Corrective measures:** • Clean the cooling fins on the rear of the enclosure and the air ducts on the top using a soft brush. • Ensure that the inverter has sufficient ventilation. • Ensure that the ambient temperature +45 °C has not been exceeded. • Ensure that the inverter is not exposed to direct solar irradiation.
8101	⚠ QUALIFIED PERSON **Main memory defective** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
8102	⚠ QUALIFIED PERSON **Code memory defective** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
8103	⚠ QUALIFIED PERSON **CPU self-test HP** The self-test failed. **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
8104	⚠ QUALIFIED PERSON **Internal communication** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
8501	⚠ QUALIFIED PERSON **DC current sensor C offset** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
8502	⚠ QUALIFIED PERSON **DC converter string C defective** **Corrective measures:** • If this message is displayed again, contact the Service (see Section 14, page 124).
8708	⚠ QUALIFIED PERSON **Timeout in communication for active power limitation** Communication to the system control absent. Depending on the fall-back setting, either the last received values will be retained or the active power will be limited to the set percentage value of the inverter nominal power. **Corrective measures:** • Ensure that the connection to the system control is intact and that no cables are damaged or that no plugs have been pulled.
8709	⚠ QUALIFIED PERSON **Timeout in communication for reactive power spec.** Communication to the system control absent. Depending on the fall-back setting, either the last received values will be retained or the active power will be limited to the set percentage value of the inverter nominal power. **Corrective measures:** • Ensure that the connection to the system control is intact and that no cables are damaged or that no plugs have been pulled.
8710	⚠ QUALIFIED PERSON **Timeout in communication for cos-Phi spec.** Communication to the system control absent. Depending on the fall-back setting, either the last received values will be retained or the active power will be limited to the set percentage value of the inverter nominal power. **Corrective measures:** • Ensure that the connection to the system control is intact and that no cables are damaged or that no plugs have been pulled.

Event number	Message, cause and corrective measures
8801 to 8803	**No display** No information can be shown on the display.
9002	⚠ QUALIFIED PERSON **SMA Grid Guard code invalid** The SMA Grid Guard code entered is incorrect. The operating parameters are still protected and cannot be changed. **Corrective measures:** • Enter the correct SMA Grid Guard code.
9003	**Grid parameter locked** Changes to the grid parameters are now blocked. In order to be able to make changes to the grid parameters, from now on you must log in using the SMA Grid Guard code.
9005	⚠ QUALIFIED PERSON **Changing of grid parameters not possible > Ensure DC supply** This error can have the following causes: • The parameters to be changed are protected. • The DC voltage at the DC input is not sufficient to run the main CPU. **Corrective measures:** • Enter the SMA Grid Guard code. • Ensure that at least the DC start voltage is available (green LED is flashing, pulsing or glowing).
9007	⚠ QUALIFIED PERSON **Abort self-test** The self-test was terminated. **Corrective measures:** • Restart the self-test.
9202	⚠ QUALIFIED PERSON **SPS AC overvoltage** An AC source has been connected to the socket connection for secure power supply operation. **Corrective measures:** • Check the connection at the **SPS** slots, and make any necessary corrections.

Event number	Message, cause and corrective measures
9203	⚠ QUALIFIED PERSON **Short circuit in the SPS power outlet** The maximum initial load has been overshot or the appliance's initial current is above the maximum permissible load current of the connection for secure power supply operation for more than 5 s. **Corrective measures:** • Reduce the load at the connection for secure power supply operation. • If necessary, select an appliance with a lower initial current.
9204	⚠ QUALIFIED PERSON **AC overvoltage backup (fast)** Voltage in the battery-backup grid too high or step changes in load too high in the battery-backup grid. **Corrective measures:** • Check whether there is a new firmware version available for the inverter. • If a newer version is available, perform the firmware update. • If no new firmware version is available, please contact Service (see Section 14, page 124).
9205	⚠ QUALIFIED PERSON **AC overvoltage backup (slow)** Voltage in the battery-backup grid too high or step changes in load too high in the battery-backup grid. **Corrective measures:** • Check whether there is a new firmware version available for the inverter. • If a newer version is available, perform the firmware update. • If no new firmware version is available, please contact Service (see Section 14, page 124).
9206	⚠ QUALIFIED PERSON **Short circuit in backup** Loads in the battery-backup grid too high. **Corrective measures:** • Reduce loads. • Contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
9207	⚠ QUALIFIED PERSON **Backup module bimetal switch** Automatic transfer switch error. **Corrective measures:** • Contact the automatic transfer switch manufacturer.
9208	⚠ QUALIFIED PERSON **Backup module relay error |d0|** Relay in the automatic transfer switch faulty. **Corrective measures:** • Contact the automatic transfer switch manufacturer.
9209	⚠ QUALIFIED PERSON **N-PE monitoring backup module** **Corrective measures:** • Contact the automatic transfer switch manufacturer.
9211	⚠ QUALIFIED PERSON **Backup module overtemperature** **Corrective measures:** • Check the installation of the automatic transfer switch. • Contact the automatic transfer switch manufacturer.
9214	⚠ QUALIFIED PERSON **Black start battery voltage too low** The service life of the backup battery has expired. The backup battery must be replaced when you want to use the black start for the battery-backup function or the secure power supply operation. **Corrective measures:** • Procure new backup battery and exchange batteries. • Contact the Service (see Section 14, page 124).
9215	⚠ QUALIFIED PERSON **Battery interface module hardware error** The battery interface module is defective. **Corrective measures:** • Contact the Service (see Section 14, page 124).

Event number	Message, cause and corrective measures
9216	⚠ QUALIFIED PERSON **Supply voltage too low** **Corrective measures:** • Check whether the ribbon cable between the inverter and the battery interface module on the communication assembly is correctly inserted. • If this message is displayed again, contact the Service (see Section 14, page 124).
9217	⚠ QUALIFIED PERSON **Output supply voltage of the battery interface module too low |b4| | b5|** **Corrective measures:** • Check whether the plugs for connecting the battery and the automatic transfer switch are correctly inserted. • If this message is displayed again, contact the Service (see Section 14, page 124).
9218	⚠ QUALIFIED PERSON **Battery interface module output communication error |b4| |b5|** **Corrective measures:** • Check whether the plugs for connecting the battery and the automatic transfer switch are correctly inserted. • Carry out communication test.
9219	⚠ QUALIFIED PERSON **Battery interface module output communication error |b4| |b5|** **Corrective measures:** • Make sure that only one node each is connected to the connections for the communication cables of the battery and the automatic transfer switch.
9220	**Battery interface module test mode |s0|** The communication test was successful.
9221	⚠ QUALIFIED PERSON **Limitation of the switching frequency of the input relay for current limitation** There are too many faulty control commands by the system control. **Corrective measures:** • Check system control.

Event number	Message, cause and corrective measures
9223	**Backup operation** The battery-backup function is enabled.
9301	**New battery detected**
9303	⚠ QUALIFIED PERSON **The service life of the battery is expiring** The battery can fail anytime. **Corrective measures:** • Procure new battery and exchange batteries.
9304	⚠ QUALIFIED PERSON **Battery connection fault** **Corrective measures:** • Check the connection for the data cable of the battery. • Carry out communication test.
9305	⚠ QUALIFIED PERSON **Unauthorized battery system** **Corrective measures:** • Check whether there is a new firmware version available for the battery. If a newer version is available, perform the firmware update. • If this message is displayed again, contact the Service (see Section 14, page 124).
9306	⚠ QUALIFIED PERSON **Deviation in battery voltage** **Corrective measures:** • Check the DC connection. • If this message is displayed again, contact the Service (see Section 14, page 124).
9307	⚠ QUALIFIED PERSON **Battery system defective** **Corrective measures:** • Contact the battery manufacturer.

Event number	Message, cause and corrective measures
9308	⚠ QUALIFIED PERSON **Communication error battery system** **Corrective measures:** • Carry out communication test. If the test was successful, contact the battery manufacturer. If the test was not successful, contact the Service (see Section 14, page 124).
9311	⚠ QUALIFIED PERSON **Battery cell overvoltage fault** **Corrective measures:** • Contact the battery manufacturer.
9312	⚠ QUALIFIED PERSON **Battery cell undervoltage fault** **Corrective measures:** • Contact the battery manufacturer.
9313	⚠ QUALIFIED PERSON **Battery low temperature fault** **Corrective measures:** • Contact the battery manufacturer.
9314	⚠ QUALIFIED PERSON **Battery overtemperature** **Corrective measures:** • Contact the battery manufacturer.
9315	⚠ QUALIFIED PERSON **Battery imbalancing fault** **Corrective measures:** • Contact the battery manufacturer.
9316	⚠ QUALIFIED PERSON **Internal battery hardware fault** **Corrective measures:** • Contact the battery manufacturer.
9334	**Battery charging test** The battery test for charging the battery is carried out.

Event number	Message, cause and corrective measures
9335	**Discharge battery test** The battery test for discharging the battery is carried out.
9336	⚠ QUALIFIED PERSON **Start conditions for battery test not fulfilled** The state of charge of the battery is too low or too high for carrying out the test. **Corrective measures:** • Perform the test that has not been performed yet.
9337	**Charge battery test successful**
9338	**Battery discharging test successful**
9339	⚠ QUALIFIED PERSON **Battery charging test failed** **Corrective measures:** • Check the installation of the battery. • Perform the test that has not been performed yet.
9340	⚠ QUALIFIED PERSON **Battery discharging test failed** **Corrective measures:** • Check the installation of the battery. • Perform the test that has not been performed yet.
9345	⚠ QUALIFIED PERSON **Battery charging for start process too low** **Corrective measures:** • Contact the battery manufacturer.
9346	⚠ QUALIFIED PERSON **Battery not configured** **Corrective measures:** • Start the installation assistant on the inverter user interface and perform the battery configuration.

Event number	Message, cause and corrective measures
9347	⚠ QUALIFIED PERSON **Battery |b0| reports event: 0x|x5||x4|, 0x|x7||x6|, 0x|x9||x8|, 0x|xB||xA|** **Corrective measures:** • Contact the battery manufacturer.
9351	⚠ QUALIFIED PERSON **Incorrect switch position for the battery disconnection point** **Corrective measures:** • Contact the battery manufacturer.
9352	⚠ QUALIFIED PERSON **Battery system short circuit** **Corrective measures:** • Contact the battery manufacturer.
9353	⚠ QUALIFIED PERSON **Battery system thermal management defective** **Corrective measures:** • Check whether there is a new firmware version available for the battery. If a newer version is available, perform the firmware update. • If this message is displayed again, contact the battery manufacturer.
9354	⚠ QUALIFIED PERSON **Battery system heating procedure unsuccessful** **Corrective measures:** • Check whether there is a new firmware version available for the battery. If a newer version is available, perform the firmware update. • If this message is displayed again, contact the battery manufacturer.
10100	**Parameter [ln04] set successfully. |lv04c| to |lv048|**
10101	**Setting of parameter |ln04| failed. |lv04c| to |lv048|** **Corrective measures:** • Change parameter again and save change.
10102	**Parameter [ln04] set successfully. |tnc| to |tn8|**
10103	**Setting of parameter |ln04| failed. |tnc| to |tn8|** **Corrective measures:** • Change parameter again and save change.

Event number	Message, cause and corrective measures
10104	**Parameter [ln04] set successfully**
10105	**Setting of parameter |ln04| failed.** **Corrective measures:** • Change parameter again and save change.
10108	**Time adjusted / old time**
10109	**Time adjusted / new time**
10110	**Time synchronization failed: [x]** No time information could be called up from the set NTP server. **Corrective measures:** • Ensure that the NTP server was configured correctly. • Ensure that the inverter is integrated into a local network with Internet connection.
10116	**Setting of parameter |ln04| failed. Conflict with parameter |ln8c|**
10118	**Parameter upload complete**
10120	**Currently permitted number of parameterizations exceeded**
10224	**Dynamic settings established**
10248	**|tn4|: network busy** The network is busy. Data exchange between the devices is not at an optimum and is greatly delayed. **Corrective measures:** • Reduce the number of devices in the network. • If necessary, increase the data query intervals. • If necessary, reduce the number of devices in the network.
10249	**⚠ QUALIFIED PERSON** **|tn4|: network overloaded** The network is busy. Data exchange between the devices is not at an optimum and is greatly delayed. **Corrective measures:** • Reduce the number of devices in the network. • If necessary, increase the data query intervals. • If necessary, reduce the number of devices in the network.

Event number	Message, cause and corrective measures
10250	⚠ QUALIFIED PERSON **[Interface]: package error rate [ok / high]** The package error rate has changed. If the package error rate is high, the network is overloaded or the connection to the network switch or DHCP server (router) is disturbed. **Corrective measures if the package error rate is high:** • Ensure that with an Ethernet connection, the network cable and the network connector are not damaged and that the network connectors are correctly plugged. • If necessary, increase the data query intervals. • If necessary, reduce the number of devices in the network.
10251	**[Interface]: communication status goes to [OK / Warning / Error / Not connected]** The communication status to the network switch or DHCP server (router) has changed. An additional error message may be displayed.
10252	⚠ QUALIFIED PERSON **[Interface]: communication disrupted** There is no valid signal on the network line. **Corrective measures:** • Ensure that with an Ethernet connection, the network cable and the network connector are not damaged and that the network connectors are correctly plugged. • Ensure that the DHCP server (router) and any network switches are signalizing correct operation.
10253	⚠ QUALIFIED PERSON **[Interface]: connection speed goes to [100 Mbit / 10 Mbit]** The data transfer rate has changed. The cause for the status [10 Mbit] can be a defective plug, a defective cable or the pulling or plugging of the network connector. **Corrective measures if the status is [10 Mbit]:** • Ensure that with an Ethernet connection, the network cable and the network connector are not damaged and that the network connectors are correctly plugged. • Ensure that the DHCP server (router) and any network switches are signalizing correct operation.

Event number	Message, cause and corrective measures
10254	⚠ QUALIFIED PERSON **[Interface]: duplex mode goes to [Full / Half]** The duplex mode (data transfer mode) has changed. The cause for the status [Half] can be a defective plug, a defective cable or the pulling or plugging of the network connector. **Corrective measures if the status is [Half]:** • Ensure that with an Ethernet connection, the network cable and the network connector are not damaged and that the network connectors are correctly plugged. • Ensure that the DHCP server (router) and any network switches are signalizing correct operation.
10255	**[Interface]: Network load OK** The network load has returned to a normal range after being busy.
10282	**[User group]-Login via [protocol] locked** After several incorrect login attempts, login has been blocked for a limited time. In this case, the User login will be blocked for 15 minutes, the Grid Guard login for 12 hours. **Corrective measures:** • Wait until the given time has expired and then retry login.
10283	**WLAN module faulty** The WLAN module integrated in the inverter is defective. **Corrective measures:** • Contact the Service (see Section 14, page 124).
10284	⚠ QUALIFIED PERSON **No WLAN connection possible** The inverter does not currently have a WLAN connection to the selected network. **Corrective measures:** • Ensure that the SSID, the WLAN password and the encryption method have been entered correctly. The encryption method is specified by your WLAN router or WLAN Access Point and can be changed there. • Ensure that the WLAN router or WLAN Access Point is in range and is signalizing correct operation. • If this message is displayed often, improve the WLAN connection by using a WLAN repeater (e.g. SMA Antenna Extension Kit).
10285	**WLAN connection established** Connection to the selected WLAN network has been established.

Event number	Message, cause and corrective measures
10286	⚠ QUALIFIED PERSON **WLAN connection lost** The inverter has lost WLAN connection to the selected network. **Corrective measures:** • Ensure that the WLAN router or WLAN Access Point is still active. • Ensure that the WLAN router or WLAN Access Point is in range and is signalizing correct operation. • If this message is displayed often, improve the WLAN connection by using a WLAN repeater (e.g. SMA Antenna Extension Kit).
10287	**WLAN module detected**
10339	**Webconnect enabled** The inverter can communicate with Sunny Portal without an additional SMA communications product (e.g. Cluster Controller).
10340	**Webconnect disabled** The Webconnect function has been switched off. This means that the inverter can not communicate with Sunny Portal without an additional SMA communications product (e.g. Cluster Controller). • If the inverter is to communicate with Sunny Portal without an additional SMA communication product, switch the Webconnect function on.
10341	**Webconnect error: no connection** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10343	**Webconnect error: Default gateway not configured** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)

Event number	Message, cause and corrective measures
10344	**Webconnect error: DNS server not configured** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10345	**No reply to DNS request** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10346	**SIP proxy DNS resolution failed** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10347	**Stun server DNS resolution failed** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)

Event number	Message, cause and corrective measures
10348	**Webconnect error: No reply to request to STUN server** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10349	**Webconnect error: No reply to SIP option packs** It is likely that there is an error in the network settings or a Sunny Portal maintenance message is present. **Corrective measures:** • If a Sunny Portal maintenance message is present, wait until the maintenance has been completed. • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10350	**Webconnect error: Registration rejected by SIP registrar** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)

Event number	Message, cause and corrective measures
10351	**Unknown SIP registry** It is likely that there is an error in the network settings. **Corrective measures:** • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10352	**Webconnect error: Faulty communication** It is likely that there is an error in the network settings or a Sunny Portal maintenance message is present. **Corrective measures:** • If a Sunny Portal maintenance message is present, wait until the maintenance has been completed. • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10353	**Webconnect error: registration of the SIP registry has not responded** It is likely that there is an error in the network settings or a Sunny Portal maintenance message is present. **Corrective measures:** • If a Sunny Portal maintenance message is present, wait until the maintenance has been completed. • Check the network components (DLAN, WLAN Access Point etc.). • Ensure that the following ports are not blocked: – Registrar: ied.sma.de:9523 – Proxy: ied.sma.de:9523 – Stun: stun.sma.de:3478 – Domain: ied.sma.de (for SIP URI)
10420	**Internal consumption control was started**
10421	**Internal consumption control was stopped**
10513	**NSS quick stop: |tn0| through |tn4| is executed**
10517	**Dynamic active power limitation started.**

Event number	Message, cause and corrective measures
10518	**Dynamic active power limitation terminated.**
10520	**Supplied power: [u0] W (permitted value: [u4] W)**
10521	**Active power was limited today for [u0] minutes.**
10525	**Inverter does not respond to active power limitation.**
10528	**Login for NSD function on device [s0] failed**
27107	**Update file OK** The update file is suitable for this inverter and its components and is fully available for the next update step.
27108	**Memory card is being read** The storage medium is being read.
27109	**No new update on the memory card** A new update file was not found on the storage medium.
27301	**Update communication** The inverter is updating the communication component.
27302	**Update main CPU** The inverter is updating the inverter component.
27312	**Update completed** The inverter has successfully completed the update.
27329	**Condition test successful**
27331	**Update transport started** The inverter has successfully started the update.
27332	**Update transport successful** The update file has been successfully transferred to the communication component.
27336	**Battery management system**
29001	**Inst. code valid** The entered Grid Guard code is valid. Protected parameters have now been unlocked and you can adjust the parameters. The parameters will be automatically locked again after ten feed-in hours.
29004	**Grid parameters unchanged** Changing the grid parameters is not possible.
29006	**Self-test**
29016	**Stand-alone operation**

Event number	Message, cause and corrective measures
29252	**SPS mode not available** The battery's state of charge is insufficient to supply the loads in secure power supply operation.
29253	**Input power for backup too low** The battery's state of charge is insufficient to supply the loads in the battery-backup grid.
29254	**Input power for SPS too low** The battery's state of charge is insufficient to supply the loads in secure power supply operation.

12 Decommissioning the Inverter

⚠ QUALIFIED PERSON

To decommission the inverter completely upon completion of its service life, proceed as described in this Section.

⚠ CAUTION

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

The inverter weighs 26 kg. 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.

- Transport and lift the inverter carefully.

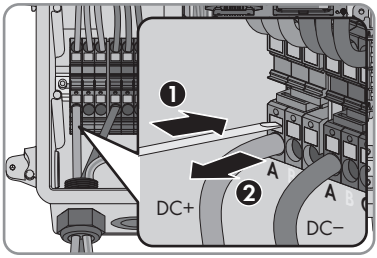
Procedure:

1. ### ⚠ DANGER

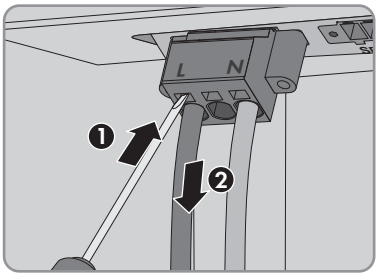
   Danger to life due to high voltages

   - Disconnect the inverter from all voltage sources (see Section 9, page 72).

2. Remove the DC cable from the terminal blocks for the DC connection.

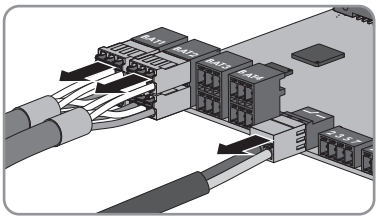


3. Remove the AC conductors from the **AC-out** terminal block. To release the conductors from the terminals, open the terminals with a flat-blade screwdriver (blade width: 3.5 mm).

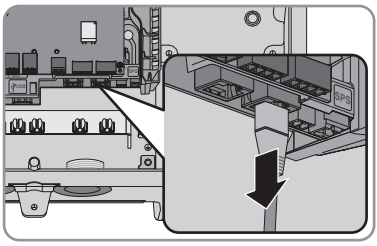


4. Screw out the screws from the **AC-out** terminal block using a flat-blade screwdriver (blade width: 3.5 mm) and pull the terminal block out of the slot.

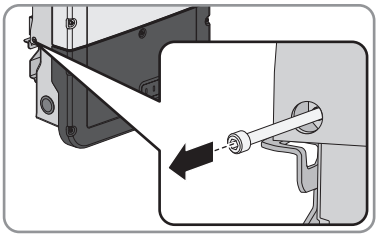
5. Remove all connection cables from the jacks located on the interface module of the battery.



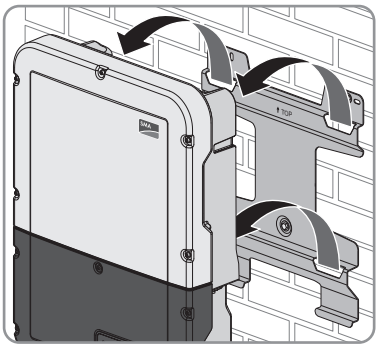
6. Remove all equipment grounding conductors from the equipment grounding terminals. To do this, remove each screw with a Torx screwdriver (TX 25) and remove the equipment grounding conductor from the inverter; screw each screw back in with a Torx screwdriver (TX 25).
7. Remove the network cables from the jacks of the communication assembly.



8. Remove all cable glands from the inverter. To do so, unscrew the counter nut from inside and remove the cable glad from the enclosure opening.
9. Seal all enclosure openings with sealing plugs.
10. Lead the enclosure lid to the Connection Unit and plug the ribbon cable into the socket on the communication assembly.
11. Ensure that the ribbon cable is securely plugged into the sockets at both ends.
12. Position the enclosure lid of the Connection Unit on the enclosure and tighten all 6 screws crosswise with a Torx screwdriver (TX 25) (torque: 3 Nm ± 0.3 Nm).
13. If the inverter is secured against theft with a padlock, open the padlock and remove it from the inverter.
14. Using a Torx screwdriver (TX 25), unscrew the screw M5x60 which fastens the inverter to the wall mounting bracket.



15. Remove the inverter by lifting it vertically up and off the wall mounting bracket.



16. Unscrew the screws for fastening the wall mounting bracket and remove the wall mounting bracket.
17. If the inverter is to be stored or shipped, pack the inverter and the wall mounting bracket. Use the original packaging or packaging that is suitable for the weight and dimensions of the inverter and secure the packaging with tension belts, if necessary.
18. Dispose of the inverter in accordance with the locally applicable disposal regulations for electronic waste.

13 Technical Data

AC connection

	SBS3.7-10	SBS5.0-10	SBS6.0-10
Rated power at 230 V, 50 Hz	3680 W	5000 W	6000 W
Nominal AC voltage	230 V	230 V	230 V
AC voltage range*	172.5 V to 264.5 V	172.5 V to 264.5 V	172.5 V to 264.5 V
Nominal AC current at 220 V	16.7 A	22.7 A	26 A
Nominal AC current at 230 V	16 A	21.7 A	26 A
Nominal AC current at 240 V	15.3 A	20.8 A	25 A
Maximum AC current in backup operation	20 A / 1 min	28 A / 1 min	32 A / 1 min
Total harmonic distortion of the alternating current	< 4 %	< 4 %	< 4 %
Maximum output current under fault conditions	198 Apeak	198 Apeak	198 Apeak
Inrush current	18.5 A	18.5 A	18.5 A
Rated power frequency	50 Hz	50 Hz	50 Hz
AC power frequency*	50 Hz / 60 Hz	50 Hz	50 Hz / 60 Hz
Operating range at AC power frequency 50 Hz	45 Hz to 55 Hz	45 Hz to 55 Hz	45 Hz to 55 Hz
Operating range at AC power frequency 60 Hz	55 Hz to 65 Hz	55 Hz to 65 Hz	55 Hz to 65 Hz
Power factor at rated power	1	1	1
Displacement power factor cos φ, adjustable	0.8 overexcited to **1** to 0.8 underexcited	0.8 overexcited to **1** to 0.8 underexcited	0.8 overexcited to **1** to 0.8 underexcited
Feed-in phases	1	1	1
Phase connection	1	1	1

	SBS3.7-10	SBS5.0-10	SBS6.0-10
Overvoltage category in accordance with IEC 60664-1	III	III	III

* Depending on the configured country data set

Battery DC Input

	SBS3.7-10	SBS5.0-10	SBS6.0-10
Maximum DC voltage	600 V	600 V	600 V
Voltage range*	100 V to 550 V	100 V to 550 V	100 V to 550 V
DC rated voltage	360 V	360 V	360 V
Maximum DC current per input	10 A	10 A	10 A
Number of DC inputs	3	3	3
Maximum short-circuit current	40 A	40 A	40 A
Battery type**	Li-ion	Li-ion	Li-ion
Overvoltage category in accordance with IEC 60664-1	III	III	III

* The charging and discharging voltage of the connected batteries must be in the range of 220 V and 500 V in order to make optimum use of the power of the inverter

** Only use batteries approved by SMA Solar Technology AG (technical information with list of approved batteries at www.SMA-Solar.com)

AC output, secure power supply operation

Maximum AC power	3680 W
Nominal AC voltage	230 V
Maximum output current	16 A
Minimum load	1 W

Protective Devices

DC reverse polarity protection	Available
Input-side disconnection point	Not available
AC short-circuit current capability	Current control
Ground fault monitoring	Available
Grid monitoring	SMA Grid Guard 6

Maximum permissible fuse protection	50 A
All-pole sensitive residual-current monitoring unit	Available

General Data

Width x height x depth	535 mm x 730 mm x 198 mm
Weight	26 kg
Length x width x height of the packaging	600 mm x 800 mm x 300 mm
Weight including packaging	30 kg
Climatic category in accordance with IEC 60721-3-4	4K4H
Environmental category	Outdoors
Pollution degree outside the inverter	3
Pollution degree inside the inverter	2
Operating temperature range	-25°C to +60°C
Maximum permissible value for relative humidity, non-condensing	100 %
Maximum operating altitude above MSL	3000 m
Noise emission, typical	39 dB(A)
Self-consumption in standby mode without the load necessary to supply the battery	< 5 W
Self-consumption without the load necessary to supply the battery	< 10 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
WLAN range in free-field conditions	100 m
Quantity maximum detectable WLAN networks	32
Topology	Transformerless
Cooling method	Convection
Degree of protection in accordance with IEC 60529	IP65
Protection class in accordance with IEC 62103	I
Grid configurations	Single-phase

National standards and approvals, as per 04/2018*	AS 4777.2:2015, C10/11:2012, CEI 0-21:2017, EN 50438:2013, G59/3, G83/2, IEC 61727, IEC 62109-1, IEC 62109-2, EN 62477-1, NEN-EN50438:2013, NRS097-2-1:2017, PPC, PPDS, RD 1699, VDE-AR-N 4105, VDE 0126-1-1, VFR2014

* **IEC 62109-2:** In order to meet the requirements of this standard, there must be a link to Sunny Portal with the fault alert via e-mail activated.

Climatic Conditions

Installation in accordance with IEC 60721-3-4, 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 60721-3-4, Class 2K3

Extended temperature range	-25°C to +70°C
Storage temperature	-40°C to +60°C

Equipment

DC connection	Spring-cage terminal
AC connection	Spring-cage terminal
Battery communication	CAN bus
Communication for automatic transfer switch	CAN bus
Speedwire interface	As standard
Webconnect function	As standard
WLAN interface	As standard

Torques

Screw M5x60 for securing the inverter to the wall mounting bracket	1.7 Nm ± 0.3 Nm
Screws for attaching the enclosure lid of the Connection Unit	3 Nm ± 0.3 Nm
Screws for grounding on the grounding terminals	6 Nm ± 0.3 Nm

Screws for **AC-out** terminal block for AC connection	0.3 Nm
Screws for **SPS** terminal block for connecting the outlet for secure power supply operation	0.3 Nm

Data Storage Capacity

Energy yields in the course of the day	63 days
Daily yields	30 years
Event messages for users	1000 events
Event messages for installers	1000 events

Efficiency

Maximum efficiency, η_{max}	97.5 %

14 Contact

If you have technical problems with our products, please contact the SMA Service Line. The following data is required in order to provide you with the necessary assistance:

- Battery inverter:
  - Device type
  - Serial number
  - Firmware version
  - Event message
  - Mounting location and mounting height
  - Optional equipment, e.g. communication products
  - Use the name of the system in Sunny Portal (if available)
  - Access data for Sunny Portal (if available)
  - Special country-specific settings (if available)
- Batteries:
  - Type
  - Firmware version
  - Type of automatic transfer switch (if available)

Deutschland Österreich Schweiz	SMA Solar Technology AG Niestetal Sunny Boy, Sunny Mini Central, Sunny Tripower: +49 561 9522-1499 Monitoring Systems (Kommunikationsprodukte): +49 561 9522-2499 Fuel Save Controller (PV-Diesel-Hybridsysteme): +49 561 9522-3199 Sunny Island, Sunny Boy Storage, Sunny Backup: +49 561 9522-399 Sunny Central, Sunny Central Storage: +49 561 9522-299 SMA Online Service Center: www.SMA-Service.com
Belgien Belgique België Luxemburg Luxembourg Nederland	SMA Benelux BVBA/SPRL Mechelen +32 15 286 730 SMA Online Service Center: www.SMA-Service.com
Česko Magyarország Slovensko	SMA Service Partner TERMS a.s. +420 387 6 85 111 SMA Online Service Center: www.SMA-Service.com
Türkiye	SMA Service Partner DEKOM Ltd. Şti. +90 24 22430605 SMA Online Service Center: www.SMA-Service.com

France	SMA France S.A.S. Lyon +33 472 22 97 00 SMA Online Service Center : www.SMA-Service.com	Ελλάδα Κύπρος	SMA Service Partner AKTOR FM. Αθήνα +30 210 8184550 SMA Online Service Center: www.SMA-Service.com
España Portugal	SMA Ibérica Tecnología Solar, S.L.U. Barcelona +34 935 63 50 99 SMA Online Service Center: www.SMA-Service.com	United Kingdom	SMA Solar UK Ltd. Milton Keynes +44 1908 304899 SMA Online Service Center: www.SMA-Service.com
Italia	SMA Italia S.r.l. Milano +39 02 8934-7299 SMA Online Service Center: www.SMA-Service.com	Australia	SMA Australia Pty Ltd. Sydney Toll free for Australia: 1800 SMA AUS (1800 762 287) International: +61 2 9491 4200
United Arab Emirates	SMA Middle East LLC Abu Dhabi +971 2234 6177 SMA Online Service Center: www.SMA-Service.com	India	SMA Solar India Pvt. Ltd. Mumbai +91 22 61713888
ไทย	SMA Solar (Thailand) Co., Ltd. กรุงเทพฯ +66 2 670 6999	대한민국	SMA Technology Korea Co., Ltd. 서울 +82-2-520-2666

South Africa	SMA Solar Technology South Africa Pty Ltd. Cape Town 08600SUNNY (08600 78669) International: +27 (0)21 826 0600 SMA Online Service Center: www.SMA-Service.com	Argentina Brasil Chile Perú	SMA South America SPA Santiago de Chile +562 2820 2101
Other countries	International SMA Service Line Niestetal 00800 SMA SERVICE (+800 762 7378423) SMA Online Service Center: www.SMA-Service.com		

15 EU Declaration of Conformity

within the scope of the EU directives

- Electromagnetic compatibility 2014/30/EU (29.3.2014 L 96/79-106) (EMC)
- Low Voltage Directive 2014/35/EU (29.3.2014 L 96/357-374) (LVD)
- Radio Equipment Directive 2014/53/EU (22.5.2014 L 153/62) (RED)

SMA Solar Technology AG confirms herewith that the products described in this document are in compliance with the fundamental requirements and other relevant provisions of the above-mentioned directives. The entire EU Declaration of Conformity can be found at www.SMA-Solar.com.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