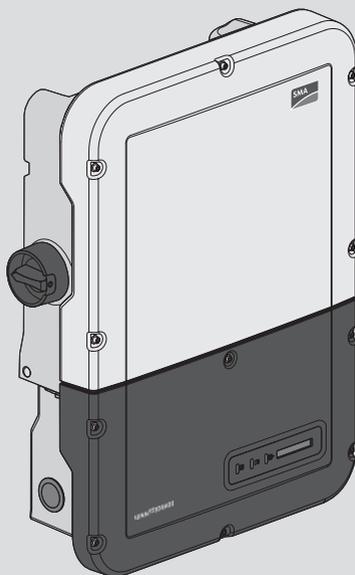User Manual

SUNNY BOY 3.0-US / 3.8-US / 5.0-US / 6.0-US / 7.0-US / 7.7-US

SMA

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SMA Warranty

You can download the current warranty conditions from the Internet at www.SMA-Solar.com.

Software Licenses

The licenses for the installed software modules (open source) can be found in the user interface of the product.

Trademarks

All trademarks are recognized, even if not explicitly identified as such. Missing designations do not mean that a product or brand is not a registered trademark.

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Table of Contents

1   Information on this Document

1.1   Validity

This document is valid for:

- SB3.0-1SP-US-41 (Sunny Boy 3.0-US) from firmware version 03.01.00.R
- SB3.8-1SP-US-41 (Sunny Boy 3.8-US) from firmware version 03.01.00.R
- SB5.0-1SP-US-41 (Sunny Boy 5.0-US) from firmware version 03.01.00.R
- SB6.0-1SP-US-41 (Sunny Boy 6.0-US) from firmware version 03.01.00.R
- SB7.0-1SP-US-41 (Sunny Boy 7.0-US) from firmware version 03.01.00.R
- SB7.7-1SP-US-41 (Sunny Boy 7.7-US) from firmware version 03.01.00.R

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 an inverter works and is operated
- Training in how to deal with the dangers and risks associated with installing, repairing and using electrical devices 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

1.3   Content and Structure of this Document

This document describes the configuration, operation and troubleshooting 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 and as eManual at www.SMA-Solar.com. You can also call up the eManual via the user interface of the product.

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.

<table>
<tr><td>⚠ CAUTION</td></tr>
<tr><td>Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</td></tr>
</table>

<table>
<tr><td>NOTICE</td></tr>
<tr><td>Indicates a situation which, if not avoided, can result in property damage.</td></tr>
</table>

1.5 Symbols in the Document

Symbol	Explanation
i	Information that is important for a specific topic or goal, but is not safety-relevant
☐	Indicates a requirement for meeting a specific goal
☑	Desired result
✖	A problem that might occur
	Example

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**].
#	• Placeholder for variable components (e.g., parameter names)	• Parameter **WCtlHz.Hz#**

1.7 Designation in the document

Complete designation	Designation in this document
Sunny Boy	Inverter, product

1.8   Additional Information

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

Title and information content	Type of information
Mounting, installation, commissioning and decommissioning	Installation manual
"Application for SMA Grid Guard Code"	Form
"PUBLIC CYBER SECURITY - Guidelines for a Secure PV System Communication"	Technical information
"Grid Support Utility Interactive Inverters" Information about how to activate and to set the grid supporting features according to UL 1741 SA	Technical Information
"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 and SunSpec Modbus® Interface" Information on the Modbus interface	Technical Information
"Modbus® parameters and measured values" Device-specific register HTML file	Technical Information
"SMA SPEEDWIRE FIELDBUS"	Technical information

2   Safety

2.1   Intended Use

The Sunny Boy is a transformerless PV inverter which converts the direct current of the PV array to grid-compliant alternating current and feeds it into the utility grid.

The product is suitable for indoor and outdoor use.

The product must only be operated with PV arrays (PV modules and cabling) that are approved by the electrical standards applicable on-site and the *National Electrical Code*® ANSI/NFPA 70 or the *Canadian Electrical Code*® CSA C22.1.

$\boxed{i}$ **No galvanic isolation**

The product is not equipped with a transformer and therefore has no galvanic isolation.

- Do not operate grounded PV modules together with the product. If grounded PV modules are connected to the product, an event will occur which will appear on the product display. The event will also be displayed, along with the associated message, in the event list on the user interface of the product.
- Only ground the mounting frames of the PV modules.
- The neutral conductor of the AC output is not bonded to ground within the product.
- The neutral conductor of the AC output for secure power supply operation is bonded to ground within the product.

PV modules with a high capacity to ground may only be used if their coupling capacity does not exceed 2.5 μF.

To protect the PV system against excessive reverse currents under fault conditions, a DC-side overcurrent protective device must be connected in accordance with the *National Electrical Code*® to prevent any short-circuit currents that exceed the ampacity of the DC electric circuit or the maximum series fuse rating of the PV modules. Typically, string fuses are used if more than two strings are connected in parallel.

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

The product is approved for the US and Canadian market.

Use SMA products only in accordance with the information provided in the enclosed documentation and with the locally applicable laws, regulations, standards and directives. Any other application may cause personal injury or property damage.

Alterations to the SMA products, 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, dry place for future reference and observe all instructions contained therein.

This document does not replace and is not intended to replace any local, state, provincial, federal or national laws, regulations or codes applicable to the installation, electrical safety and use of the product. SMA Solar Technology AG assumes no responsibility for the compliance or non-compliance with such laws or codes in connection with the installation of the product.

The type label must remain permanently attached to the product.

2.2 IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This section contains safety information that must be observed at all times when working.

The product has been designed and tested in accordance with international safety requirements. As with all electrical or electronical devices, there are residual risks despite careful construction. 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 due to electric shock when live components or DC conductors are touched

When exposed to light, the PV modules generate high DC voltage which is present in the DC conductors. Touching live DC conductors results in death or lethal injuries due to electric shock.

- Disconnect the product from voltage sources and make sure it cannot be reconnected before working on the device.
- Do not touch non-insulated parts or cables.
- Do not remove the terminal block with the connected DC conductors from the slot under load.
- Wear suitable personal protective equipment for all work on the product.

⚠ DANGER

Danger to life due to electric shock when touching live system components in case of a ground fault

If a ground fault occurs, parts of the system may still be live. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Disconnect the product from voltage sources and make sure it cannot be reconnected before working on the device.
- Touch the cables of the PV array on the insulation only.
- Do not touch any parts of the substructure or frame of the PV array.
- Do not connect PV strings with ground faults to the inverter.
- Ensure that no voltage is present and wait five minutes before touching any parts of the PV system or the product.

⚠ **DANGER**

Danger to life due to electric shock in case of overvoltages and 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 are integrated in the existing overvoltage protection.
- When laying the network cable outdoors, ensure that there is suitable surge protection at the network cable transition from the product outdoors to the network inside the building.
- The Ethernet interface of the inverter is classified as "TNV-1" and offers protection against overvoltages of up to 1.5 kV.

⚠ **WARNING**

Danger to life due to fire or explosion

In rare cases, an explosive gas mixture can be generated inside the inverter under fault conditions. In this state, switching operations can cause a fire inside the inverter or explosion. Death or lethal injuries due to hot or flying debris can result.

- Do not operate the DC load-break switch on the inverter in the event of ground fault
- Disconnect the PV array from the inverter via an external disconnection device. If there is no disconnecting device present, wait until no more DC power is applied to the inverter.
- Disconnect the AC circuit breaker, or keep it disconnected in case it has already tripped, and secure it against reconnection.

⚠ **WARNING**

Risk of injury due to toxic substances, gases and dusts.

In rare cases, damages to electronic components can result in the formation of toxic substances, gases or dusts inside the inverter. Touching toxic substances and inhaling toxic gases and dusts can cause skin irritation, burns or poisoning, trouble breathing and nausea.

⚠ **WARNING**

Danger to life due to electric shock from destruction of the measuring device due to overvoltage

Overvoltage can damage a measuring device and result in voltage being present in the enclosure of the measuring device. Touching the live enclosure of the measuring device results in death or lethal injuries due to electric shock.

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

⚠ 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.

⚠ CAUTION

Risk of injury due to weight of product

Injuries may result if the product is lifted incorrectly or dropped while being transported or mounted.

- Transport and lift the product carefully. Take the weight of the product into account.
- Wear suitable personal protective equipment for all work on the product.

NOTICE

Damage to the enclosure seal in subfreezing conditions

If you open the product or disconnect the Power Unit and Connection Unit when temperatures are below freezing, the enclosure seals can be damaged. Moisture can penetrate the product and damage it.

- 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).
- Do not disassemble the Power Unit and Connection Unit unless the ambient temperature is at least 0°C (32°F) and conditions are frost-free.

NOTICE

Damage to the product 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.
- Close tightly all enclosure openings.
- Only use listed rain-tight or liquid-tight conduit fittings to attach the conduits to the product.

NOTICE

Damage to the inverter due to electrostatic discharge

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

- Ground yourself before touching any component.

NOTICE

High costs due to inappropriate Internet tariff

Depending on use, the data volume of the product transferred via the Internet may vary in size. The data volume depends, for example, on the number of inverters in the system, the frequency of device updates, the frequency of data transfer to Sunny Portal or the use of FTP push. High costs for the Internet connection can be the result.

- SMA Solar Technology AG recommends using an Internet flat rate.

NOTICE

Damage to the product 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.

[i] **Electrical installations (for North America)**

All installations must conform with the laws, regulations, codes and standards applicable in the jurisdiction of installation (e.g. *National Electrical Code*® ANSI/NFPA 70 or *Canadian Electrical Code*® CSA-C22.1.).

- Before connecting the product to the utility grid, contact your local grid operator. The electrical connection of the product must be carried out by qualified persons only.
- Ensure that the cables or conductors used for electrical connection are not damaged.

3   Product Overview

3.1   Product Description
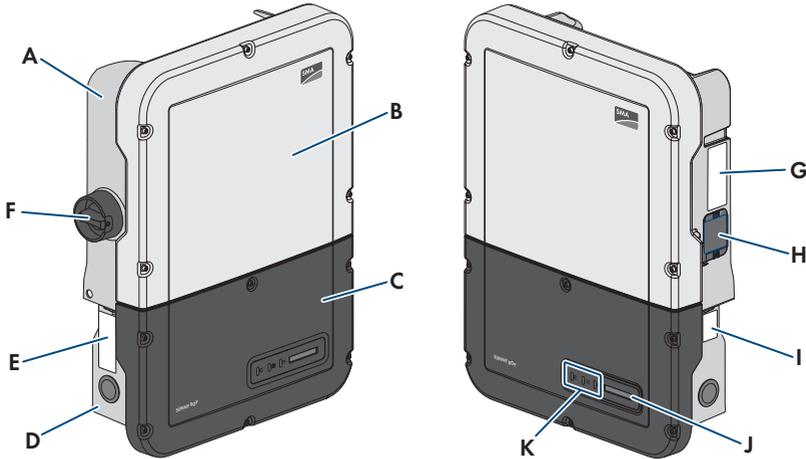
Figure 1: Design of the inverter

Position	Designation
A	Power Unit
B	Enclosure lid of the Power Unit
C	Enclosure lid for the Connection Unit
D	Connection Unit
E	Warning label with compliance information
F	DC load-break switch
G	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 (Serial No. Power Unit or S/N Power Unit)
	• Date of manufacture
	• Device-specific characteristics
H	Fan (only with Sunny Boy 7.0 and 7.7)

Position	Designation
I	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 (Serial number device or S/N device)
	• 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
J	Display
	The display shows the current operating data and events or errors.
K	LEDs
	The LEDs indicate the operating state of the product.

3.2   Symbols on the Product

Symbol	Explanation
	Beware of electrical voltage
	The product operates at high voltages.
	Beware of hot surface
	The product can get hot during operation.
	Observe the documentation
	Observe all documentation supplied with the product.
	Observe the documentation
	Together with the red LED, this symbol indicates an error.
	Inverter
	Together with the green LED, this symbol indicates the operating state of the inverter.
	Data transmission
	Together with the blue LED, this symbol indicates the status of the network connection.

Symbol	Explanation
	Equipment Grounding Terminal This symbol indicates the position for the connection of an equipment grounding conductor.
	UL 1741 and CSA C22.2 No. 107.1 are the standards applied by Underwriters Laboratories to the product to certify that it meets the requirements of the *National Electrical Code*®, the *Canadian Electrical Code*® and IEEE 1547.

3.3   Interfaces and Functions

The inverter can be equipped or retrofitted 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).

Smart Inverter Screen

The Smart Inverter Screen enables you to view the status display and to display the current power and consumption on the user interface login page. This gives you an overview of the most important inverter data without having to log into the user interface.

The Smart Inverter Screen is deactivated by default. The Smart Inverter Screen can be activated via the user interface once the inverter has been commissioned.

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.

The products supports the encrypted system communication with SMA Speedwire Encrypted Communication. In order to be able to use the Speedwire encryption in the system, all Speedwire devices, except for the SMA Energy Meter, must support the function SMA Speedwire Encrypted Communication.

Class 1 wiring methods are to be used for field wiring connection to the terminals of the communication interface.

SMA Webconnect

The inverter is equipped with a Webconnect function as standard. The Webconnect function enables direct data transmission between the inverter and Sunny Portal (online monitoring system from SMA).

There are two Sunny Portal versions: the classical Sunny Portal (https://www.sunnyportal.com) and the newly developed Sunny Portal powered by ennexOS (https://ennexOS.sunnyportal.com). Both systems differ in their supported functions. With an existing user account, you can log into both portals as well as into Sunny Design (system planning software from SMA).

In a Sunny Portal system, up to four inverters with Webconnect function can be displayed together. A communication product (e.g. SMA Data Manager) is required for systems with more than four inverters.

The system must be registered in the classic Sunny Portal if the inverter is integrated into a local network and connected to the Internet via this network. With this connection, you have the possibility to view the data online in real time.

If the inverter is connected to the Internet via the cellular network, you must register the system in Sunny Portal powered by ennexOS. The communication with the inverters is optimized with regard to the data volume and availability of the inverter. No data can be viewed in real time. Note that the inverter must be equipped with a firmware version ≥ 3.01.17.R for connection via the cellular network.

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.

> **i** **Expanding the radio range in the WLAN network**
>
> In order to expand the radio range of the inverter in the WLAN network, you can install the Antenna Extension Kit accessory set in the inverter.

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

Module slots

The inverter is standard-equipped with two module slots. The module slots are located on the communication assembly and allow additional modules to be connected (e.g. SMA Sensor Module). The modules are available as accessories. The installation of two identical modules is not permissible.

SMA RS485 Module

The inverters of type "SBx.x-1SP-US-41" can be retrofitted with the SMA RS485 Module.

By installing the SMA RS485 Module, the inverter is able to communicate with the energy meter of the SMA Revenue Grade Meter Kit.

Class 1 wiring methods are to be used for field wiring connection to the terminals of the communication interface.

Antenna Extension Kit

Within the WLAN network, the Antenna Extension Kit enables the radio range of the inverter to be upgraded (Information on assembly and connection see manual of the Antenna Extension Kit). The Antenna Extension Kit can be retrofitted.

SMA Cellular LTE Modem Kit

The inverter can be retrofitted with the SMA Cellular LTE Modem Kit from firmware version 03.01.17.R.

The SMA Cellular LTE Modem Kit allows the direct data transmission between the inverter and the internet portal Sunny Portal powered by ennexOS via the cellular network as an alternative to data transmission via Ethernet or WLAN. In addition, the SMA Cellular LTE Modem Kit enables the communication between the inverter and the energy meter.

The SMA Cellular LTE Modem Kit transmits up to four times a day a limited amount of data to Sunny Portal powered by ennexOS. The standard term of the mobile data plan for the SMA Cellular LTE Modem Kit is five years. All costs are covered within the term. No additional costs will be incurred. You have the possibility to extend the term of the mobile data plan. For this purpose, contact SMA Solar Technology AG. By using the SMA Cellular LTE Modem Kits, a local network connection is not absolutely necessary. However, it is recommended to be able to view all information regarding the system in Sunny Portal powered by ennexOS.

Energy meters in accordance with ANSI C12.20

The inverter type "SBx.x-1SP-US-41" can be retrofitted with the SMA Revenue Grade Meter Kit that in accordance with ANSI C12.20 includes an energy meter. The inverter must be equipped either with the SMA Cellular LTE Modem Kit or SMA RS485 Module to operate the SMA Revenue Grade Meter Kit. The inverter type "SBx.x-1TP-US-41" is equipped with an energy meter as standard.

The energy meter fulfills the accuracy class 0.5 in accordance with ANSI C12.20. The energy meter is a so called PV production meter intended to measure the generated energy of the inverter. The measured values of the energy meter can be used for billing purposes.

Grid Management Services

The inverter is a grid support interactive inverter.

The inverter was tested in accordance with the UL 1741 SA (2016-09-07) to be compliant with the source requirements documents of the states available at the time. For connecting the inverter to the utility grid, no additional grid monitoring equipment is necessary. A description of the tested functions and instructions on the activation and setting of functions can be found in the technical information "Grid Support Utility Interactive Inverters" at www.SMA-Solar.com.

PV Rapid Shutdown Equipment

The inverter is listed as PV Rapid Shutdown Equipment (PVRSE) according to UL 1741.

All DC inputs and AC outputs of this product comply with photovoltaic rapid shutdown requirements for controlled conductors outside the array.

A complete PV Rapid Shutdown System consists of the inverter, PV array disconnect switches, and a Rapid Shutdown initiation device. The Rapid Shutdown initiation device serves to initiate a rapid shutdown. The PV Rapid Shutdown System must limit the DC conductors to < 30 V within 30 seconds.

NOTICE - The inverter's Rapid Shutdown function is initiated by disconnecting the inverter from the AC grid voltage, for example, by opening the main PV system AC disconnect. The AC disconnect that serves as the Rapid Shutdown initiation device must be readily accessible and clearly marked in accordance with *National Electrical Code*®. The Rapid Shutdown status of the PV system will be indicated by the On/Off (Closed/Open) position of this AC disconnect. The Off (Open) position indicates that a rapid shutdown has been initiated.

If PV array disconnect switches compliant with the SunSpec communication signal for Rapid Shutdown systems are installed, the inverter can transmit a SunSpec-compliant "permission to operate" signal to them via its DC input conductors. When a rapid shutdown is initiated, the inverter will stop transmitting the SunSpec signal. When the SunSpec signal is not being received, the PV array disconnect switches are responsible for reducing line voltages within the PV array in accordance with *National Electrical Code*®. In the event of a rapid shutdown via the SunSpec communication signal, it is important that all PV modules connected to the inverter are always equipped with SunSpec-compliant PV array disconnect switches, otherwise the inverter cannot start feed-in operation. The sum of the standby voltages of all PV array disconnect switches of a string must be < 30 V to ensure safe discharging of the DC lines. In addition, the recommended total length of all DC lines of a string should not exceed 300 m (1000 ft). The total length defines the length of the entire string wiring including the connection cable of the PV module switch in the string (measured from the positive DC terminal to the negative DC terminal of the inverter).

A PV Rapid Shutdown system can also be installed using PV array disconnect switches initiated in case of power failures or other means. In these cases, it must be ensured that the PV system Rapid Shutdown initiation device initiates a rapid shutdown of the PV array devices at the same time that the inverter is disconnected from grid voltage.

The PV array disconnect switches must disconnect the PV array from the inverter within a maximum of 15 seconds after Rapid Shutdown initiation.

The inverter is capable of grid support operation where in case of a power failure or by activating the AC disconnect, the inverter remains connected to the utility grid for a defined ride-through time and waits for voltage recovery. If grid voltage does not recover within the defined ride-through time, the inverter disconnects from the grid and a rapid shutdown is initiated.

The Rapid Shutdown function is disabled by default. The Rapid Shutdown function should only be enabled when PV array disconnect switches have been installed within the PV array or between the PV array and the inverter. The Rapid Shutdown function can be enabled during or after inverter commissioning via the user interface by selecting the operating mode suitable for the PV array disconnect switches. If the Rapid Shutdown function is enabled and no PV array disconnect switches are installed, the inverter cannot discharge the connected DC input conductors during a rapid shutdown. As a result, the inverter can be damaged.

WARNING - THIS PV RAPID SHUTDOWN EQUIPMENT DOES NOT PERFORM ALL OF THE FUNCTIONS OF A COMPLETE PV RAPID SHUTDOWN SYSTEM. THIS PV RAPID SHUTDOWN EQUIPMENT MUST BE INSTALLED WITH OTHER EQUIPMENT TO FORM A COMPLETE PV RAPID SHUTDOWN SYSTEM THAT MEETS THE REQUIREMENTS OF NEC (NFPA 70) FOR

CONTROLLED CONDUCTORS OUTSIDE THE ARRAY. OTHER EQUIPMENT INSTALLED IN OR ON THIS PV SYSTEM MAY ADVERSELY AFFECT THE OPERATION OF THE PV RAPID SHUTDOWN SYSTEM. IT IS THE RESPONSIBILITY OF THE INSTALLER TO ENSURE THAT THE COMPLETED PV SYSTEM MEETS THE RAPID SHUT DOWN FUNCTIONAL REQUIREMENTS. THIS EQUIPMENT MUST BE INSTALLED ACCORDING TO THE MANUFACTURER'S INSTALLATION MANUAL.

Parallel Operation of the DC Inputs A and B

The DC inputs A and B of the inverter can be operated in parallel and up to three strings can be connected to it in parallel. As a result, as opposed to normal operation, up to three strings can be connected directly to inverters with two DC inputs and up to four strings to inverters with three DC inputs. The inverter automatically detects the parallel operation of the DC inputs A and B.

Secure power supply operation

You can connect an external outlet and a switch to the inverter in order to enable the outlet. In case of a grid failure, the outlet supplies a load with current from the PV system. When the outlet is enabled via the switch, the load is supplied with current from the PV system. The inverter automatically regulates the energy supply of the outlet depending on the solar irradiation on the PV system. When the outlet is enabled and a load is supplied with current from the PV system, the inverter is disconnected from the utility grid and does not feed into the utility grid.

When using the SMA Rooftop Communication Kit and the TS4-O module technology components, secure power supply operation is only available if an external rapid shutdown initiator and the switch for secure power supply operation are connected to the module of the SMA Rooftop Communication Kit. The switch for secure power supply operation must be connected to the module in series with a voltage supply of 18 V (e.g. two 9 V batteries). If an external rapid-shutdown initiator is used, the AC miniature circuit breaker is no longer the rapid-shutdown initiator in the system.

When using TS4-F or TS4-S module technology components, secure power supply operation is not available.

| i | **No secure power supply operation when using TS4-F and TS4-S module technology components** |

    If the SMA Rooftop Communication Kit is installed in the inverter and TS4-F and TS4-S module technology components are used in the system, the secure power supply operation is not available. Secure power supply operation is only available in connection with TS4-O module technology components.

| i | **No secure power supply operation when using PV array disconnect switch as per the SunSpec interoperability specification** |

    The secure power supply operation is not available if the Rapid Shutdown function of the inverter is enabled and the PV array disconnect switches are used in accordance with the SunSpec Interoperability Specification.

i **Do not connect loads that require a stable electricity supply to the outlet for secure power supply operation.**

Secure power supply operation must not be used for loads that require a stable electricity supply. The power available during secure power supply operation depends on the solar irradiation on the PV system. Therefore, power output can fluctuate considerably depending on the weather or may not be available at all.

• Do not connect loads to the outlet for secure power supply operation if they are dependent on a stable electricity supply for reliable operation.

Multifunction Relay

The inverter is equipped with a multifunction relay as standard. The multifunction relay is an interface that can be configured for the operating mode used by a particular system.

SMA ShadeFix

The inverter is equipped with the shade management system SMA ShadeFix. SMA ShadeFix uses an intelligent MPP tracking system to determine the operating point with the highest output during shading conditions. With SMA ShadeFix, inverters use the best possible energy supply from the PV modules at all times to increase yields in shaded systems. SMA ShadeFix is enabled by default. The time interval of SMA ShadeFix is usually six minutes. This means that the inverter determines the optimum operating point every six minutes. Depending on the PV system or shading situation, it may be useful to adjust the time interval.

String-failure detection

The self-learning string failure detection identifies to which of the three inverter DC inputs the strings are connected. The self-learning string failure detection identifies if the connected string is inoperable and is no longer contributing to the energy yield (e.g. due to damages such as a cable break) and monitors the input to which the defective string is connected. If the error persists, an event will be reported at the latest one day after the detection of the defective string. This prevents partial failures of the PV array from being undetected for a long time and which will result in yield losses. The self-learning string failure detections automatically identifies if a string has been repaired and resets the event. If the defective string should no longer be connected, the event must be reset manually.

Arc-Fault Circuit Interrupter (AFCI)

In accordance with the *National Electrical Code*®, the inverter has a system for DC arc fault detection and interruption. The arc-fault circuit interrupter is listed in accordance with UL 1699B Ed. 1. A detected electric arc causes the inverter to interrupt feed-in operation for a short time and to resume the feed-in operation automatically. If the installation conditions allow it, you can deactivate the arc-fault circuit interrupter.

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.

3.4   LED Signals

The LEDs indicate the operating state of the inverter.

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 The secure power supply operation is enabled and the inverter supplies the outlet with current from the PV system.
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	Feed-in operation The inverter feeds in with a power of at least 90%.
The green LED is pulsing	Feed-in operation The inverter is equipped with a dynamic power display via the green LED. Depending on the power, the green LED pulses fast or slow. If necessary, you can switch off the dynamic power display via the green LED.
The green LED is off	The inverter is not feeding into the utility grid.
The red LED is glowing	Event occurred In addition to the glowing red LED, the display indicates the following information about the event: • Event type • Event number • Date and time at which the event occurred
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).

LED signal	Explanation
The blue LED flashes quickly for approx. two minutes (0.25 s on and 0.25 s off).	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).

3.5   Display messages

Display message	Explanation
Package	Installed firmware version and configured country data set
Ser	Product serial number
HW	Hardware version of the product
FW-HP	Firmware version of the central processing unit
FW-KP	Firmware version of the communication processor
Ethcom A	Status of the network port A
Ethcom B	Status of the network port B
E-IP	Ethernet IP address of the product
SMsk	Subnet mask of the product
GW	Gateway address of the product
DNS	IP address of the domain name server
Wlancom	Status of the WLAN connection
W-IP	WLAN IP address of the product
DC A	Status of the DC input A
DC B	Status of the DC input B
DC C	Status of the DC input C
AC12	Voltage / current between the line conductors L1 and L2
AC13	Voltage / current between the line conductors L1 and L3
AC23	Voltage / current between the line conductors L2 and L3
SPS-mode active	The secure power supply operation is enabled.
P: Overload	Overload at the input for secure power supply operation
Update status	Firmware update information
Error	An event has occurred.

Display message	Explanation
P	Instantaneous output power
E-Total	Total produced energy
Pmax	Maximum output power
cos φ	Displacement power factor
Update file(s) found	New firmware version available
Update progress	Update is being performed

4   Operation

4.1   Activating and Operating the Display

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

Procedure:

1. Activate the display. Tap on the enclosure lid of the Connection Unit once.
   - ☑ The backlight is switched on.
2. To move to the next message, tap on the enclosure lid of the Connection Unit once.

4.2   Establishing a connection to the user interface

4.2.1   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).

☐ⁱ **IP address of the inverter**

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

Procedure:

1. Tap on the enclosure lid of the Connection Unit and continue to switch up to the message **E-IP: 169.254.xxx.xxx**.
2. Read off the displayed IP address for the direct connection via Ethernet and either remember it or write it down.
3. Open the web browser of your end device. Enter the IP address in the address bar of the web browser. Then press Enter key.
4. ☐ⁱ **Web browser signals a security vulnerability**

   After the IP address has been entered, a message might appear indicating that the connection to the user interface of the product is not secure. SMA Solar Technology AG guarantees the security of the user interface.

   - • Continue loading the user interface.

☑ The login page of the user interface opens.

4.2.2   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).

| i | **SSID, IP address and WLAN password**

   • SSID in WLAN: **SMA[serial number]** (e.g. SMA0123456789)

   • Device-specific WLAN password: see WPA2-PSK on the type label of the product or the rear side of the manual included in delivery

   • Standard access address for a direct connection via WLAN outside of a local network: **https://smalogin.net** or **192.168.12.3**

| i | **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 and parameters) 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.

You have several options to connect the product to an end device. The procedure can be different depending on the end devices. If the procedures described do not apply to your end device, establish the direct connection via WLAN as described in the manual of your end device.

The following connection options ar available:

   • Connection with WPS

   • Connection with WLAN network search

Connection with WPS

Requirement:

☐ The end device must have a WPS function.

Procedure:

1. Enable 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.

2. Enable the WPS function on your end device.

☑ The end device automatically connects to the inverter. The web browser of your end device opens and the login page of the user interface is displayed.

3. If the web browser of your end device does not open automatically and the login page of the user interface is not displayed, open the web browser and enter **https://smalogin.net** in the address bar.

Connection with WLAN network search

1. Search for WLAN networks with your end device.

2. Select the SSID of the inverter **SMA[serial number]** in the list with the found WLAN networks.

3. Enter the device-specific WLAN password (see WPA2-PSK on the type label of the product or the rear side of the manual included in delivery).

4. Open the web browser of your end device and enter **https://smalogin.net** in the address bar.

☑ The login page of the user interface is displayed.

5. If the login page of the user interface does not open, enter the IP address **192.168.12.3** or, if your end device supports mDNS services, **SMA[serial number].local** or **https:// SMA[serial number]** in the address bar of the web browser.

4.2.3 Establishing a Connection via Ethernet in the local network

i **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).

Procedure:

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

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

   After the IP address has been entered, a message might appear indicating that the connection to the user interface of the product is not secure. SMA Solar Technology AG guarantees the security of the user interface.

   • Continue loading the user interface.

☑ The login page of the user interface opens.

4.2.4   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.

☐ 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).

ⓘ **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 and parameters) 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:

- Enter the IP address of the inverter in the address bar of the web browser.
    - ☑ The login page of the user interface opens.

4.3 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.

ⓘ **Usage of cookies**

For the correct display of the user interface, cookies are required. The cookies are used for convenience only. By using this user interface you agree to the placement of cookies.

Log in as Installer or User for the First Time

ⓘ **Password assignment for user and installer**

The passwords for the user groups **Installer** and **User** must be assigned when accessing the user interface for the first time. If the inverter was registered in a communication device (e.g., SMA Data Manager) and the system password was assigned, the system password is also the installer password. In this case, only the user password must be assigned.

- If you as a specialist assign the user password, only pass the password on to persons to access the inverter data via the user interface.

- If you as a user assign the installer password, only pass the password on to persons to receive access to the system.

ⓘ **Installer password for inverters registered in a communication device or in Sunny Portal**

To be able to register the inverter in a communication device (e.g., SMA Data Manager) or in a Sunny Portal system, the password for the user group **Installer** must match the system password. If you assign a password for the user group **Installer** via the user interface of the inverter, the same password must also be used as the system password.

- Assign a uniform installer password to all SMA devices in the system.

Procedure:

1. In the drop-down list **Language**, select the desired language.
2. In the **Password** field, enter a password for the **User** user group.
3. In the **Repeat password** field, enter the password again.
4. Click on **Save**.
5. In the **New password** field, enter a password for the **Installer** user group. Assign a uniform password to all SMA devices to be registered in a system. The installer password is also the system password.
6. In the **Repeat password** field, enter the password again.
7. Click on **Save and log in**.
☑ 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.

4.4   Start Page Design of the User Interface

Figure 2: Design of the user interface's start page (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	Current power and current consumption	Temporal progression of the PV power and the power consumption of the household over the selected time period. Please note, the power consumption will only be displayed if an energy meter is installed in the PV system.
F	Status display	The various areas display information on the current status of the PV system. • **Device status** Displays whether the inverter is currently in a fault-free operating state or whether there is an Error or Warning present. • **Current power** Displays the power currently being generated by the inverter. • **Yield** Displays the energy yield of the inverter. • **Grid supply** Displays the energy supply from the utility grid. • **Power at the grid-connection point** Indicates which power is currently fed in or obtained at the grid-connection point. • **Irradiation / wind speed** Depending on the connected sensors, displays the current solar irradiation and/or wind speed. • **Temperature measurement** Depending on the connected sensors, displays the current temperature of the PV modules and/or the ambient temperature.

4.5   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 4.2, page 24).
2. Log into the user interface (see Section 4.3, page 28).
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**.

4.6   Activating the Smart Inverter Screen

With the Smart Inverter Screen, the most important inverter data is displayed directly on the user interface login page. To activate the Smart Inverter Screen, proceed as listed in the following.

Procedure:

1. Activate the user interface (see Section 4.2, page 24).
2. Log in as **Installer** or **User**.
3. Select the menu **User Settings** (see Section 4.4, page 30) on the start page of the user interface.
4. Select [**Smart Inverter Screen**].
☑ The Smart Inverter Screen has been activated.

4.7 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
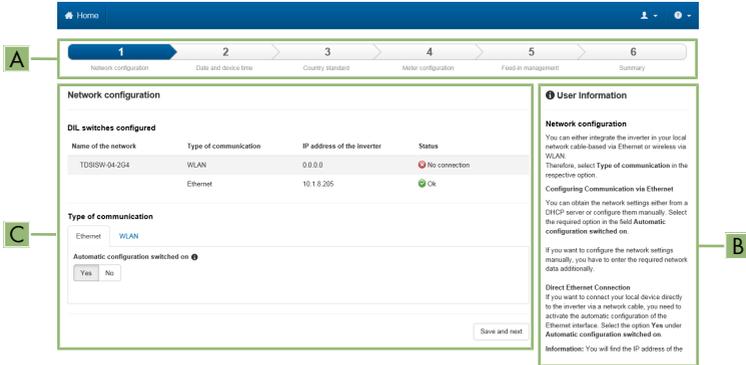
Figure 3: Layout of the installation assistant (example)

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).

Procedure:

1. Open the user interface (see Section 4.2, page 24).
2. Log in as **Installer**.
3. Select the menu **User Settings** (see Section 4.4, page 30) on the start page of the user interface.
4. In the context menu, select [**Starting the installation assistant**].
☑ The installation assistant will open.

4.8 Secure power supply operation

4.8.1 Enable 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 current from the PV system in case of a grid failure during the day. If you enable the secure power supply operation, the inverter supplies loads that are connected to the outlet for secure power supply operation.

In case of overload, underload or insufficient solar irradiation, the voltage supply of the outlet is briefly interrupted. The inverter automatically attempts to reestablish the voltage 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.

☐ **In case of a grid failure during the night, secure power supply operation is not possible.**

During the night, secure power supply operation cannot be enabled since the PV system does not produce power that is required to supply the load.

- In case of a grid failure during the night, do not enable secure power supply operation.
- Continue to operate the inverter on the utility grid and wait for restoration of grid operation.
- In the event of a persistent grid failure, switch to secure power supply operation after sunrise.

☐ **Do not connect loads that require a stable electricity supply to the outlet for secure power supply operation.**

Secure power supply operation must not be used for loads that require a stable electricity supply. The power available during secure power supply operation depends on the solar irradiation on the PV system. Therefore, power output can fluctuate considerably depending on the weather or may not be available at all.

- Do not connect loads to the outlet for secure power supply operation if they are dependent on a stable electricity supply for reliable operation.

Procedure:

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. As soon as the inverter supplies the outlet with power, the green LED flashes (1.5 s on and 0.5 s off) and the message **SPS-mode active** is shown in the display along with the amount of power being supplied from the inverter to the outlet. In addition, the control light of the outlet for secure power supply operation glows.

4. The PV system's output is too low when: the green LED does not flash and no message that the secure power supply operation mode is enabled appears on the display or the control lamp of the outlet does not glow. Irradiation on the PV system is probably too low or the connected load requires more power than currently available. Carry out the following measures:

   - Ensure that the outlet's switch is set to secure power supply operation.
   - If irradiation is too low, wait for it to increase.
   - 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.

4.8.2 Disable 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 circuit breaker of the PV system.
☑ The inverter connects to the utility grid and starts feed-in operation.

4.9 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 4.2, page 24).
2. Log in as **Installer**.
3. Start the installation assistant (see Section 4.7, page 34).
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.

4.10   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.

The basic procedure for changing operating parameters is explained in another section (see Section 4.13 "Changing Operating Parameters", page 38).

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**.

4.11   Switching the Dynamic Power Display Off

As standard, the inverter signals its power dynamically via the pulsing of the green LED. When doing so, the LED flashes on and off uniformly or is permanently lit at full power. The various gradations are related here to the set active power limit of the inverter. If this display is not desired, switch this function off in accordance with the following procedure. Once this has been done, the green LED is lit permanently to signalize feed-in operation.

The basic procedure for changing operating parameters is explained in another section (see Section 4.13 "Changing Operating Parameters", page 38).

Procedure:

- In the parameter group **Device > Operation**, select the parameter **Dynamic power display via green LED** and set this to **Off**.

4.12   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.

☐ **PV systems registered in a communication product**

　　With PV systems that are registered in a communication product (e.g. Sunny Portal, Cluster Controller), you can also assign a new password for the user group **Installer** via the communication product. The password for the user group **Installer** is also the system password. If you assign a password for the user group **Installer** via the user interface of the inverter that does not correspond to the system password in the communication product, the inverter can no longer be reached by the communication product.

- 　Ensure that the password for the user group **Installer** is the same as the system password in the communication product.

Procedure:

1. Activate the user interface (see Section 4.2, page 24).
2. Log into the user interface (see Section 4.3, page 28).
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.

4.13   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.

> **ℹ️ No configuration via Sunny Explorer**
>
> Sunny Explorer does not support the configuration of inverters with their own user interface. The inverter can be detected via Sunny Explorer, however it is expressly not recommended to use Sunny Explorer to configure this inverter. SMA Solar Technology AG does not accept liability for missing or incorrect data and possibly resulting yield losses.
>
> - Use the user interface for the configuration of the inverter.

Requirements:

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

Procedure:

1. Open the user interface (see Section 4.2, page 24).
2. Log into the user interface (see Section 4.3, page 28).
3. Call up the menu **Device Parameters**.
4. Click on [**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 4.4, page 30).
   - 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.

4.14   Configuring the Country Data Set

⚠ QUALIFIED PERSON

As standard, the inverter is meant for connection to a utility grid with a 208 V wye connection or a 240 V split-phase system, and the associated country data set **UL1741/2016/120** is factory-set. If the default country data set does not correspond with the grid configuration, the country data set can be adapted to the connected grid configuration.

The basic procedure for changing operating parameters is explained in another section (see Section 4.13 "Changing Operating Parameters", page 38).

Grid configuration	Configurable country data sets
208 V delta connection	UL 1741: UL1741/2016/208
	CA Rule 21:
	HECO_OHM Rule 14H SRD 1.1: HECO_OHM Rule 14H SRD 1.1 / 208 L-L
	ISO-NE: NE-ISO / 208 L-L
208 V wye connection	UL 1741: UL1741/2016/120
	CA Rule 21: CA Rule 21 / 120 L-N-L
	HECO_OHM Rule 14H SRD 1.1: HECO_OHM Rule 14H SRD 1.1 / 120 L-N-L
	ISO-NE: NE-ISO / 120 L-N-L
240 V delta connection	UL 1741: UL1741/2016/240
	CA Rule 21: CA Rule 21 / 240 L-L
	HECO_OHM Rule 14H SRD 1.1: HECO_OHM Rule 14H SRD 1.1 / 240 L-L
	ISO-NE: NE-ISO / 240 L-L
240 V split-phase system	UL1741/2016/120
	CA Rule 21: CA Rule 21 / 120 L-N-L
	HECO_OHM Rule 14H SRD 1.1: HECO_OHM Rule 14H SRD 1.1 / 120 L-N-L
	ISO-NE: NE-ISO / 120 L-N-L
Stand-alone grid	Island Mode 50Hz / Island Mode 60Hz

Procedure:

- Select the parameter **Set country standard** and set the required country data set.

4.15   Configuring the Rapid Shutdown Function

⚠ **QUALIFIED PERSON**

The Rapid Shutdown function of the inverter must be enabled if the PV modules or PV strings are equipped with an additional DC disconnection unit that disconnects the PV array from the inverter. You can enable the Rapid Shutdown function by selecting one of three available operating modes in accordance with the DC disconnection unit used. If you do not want to use the Rapid Shutdown function, you can disable it.

Explanation of operating modes:

Operating mode	Explanation
On	For using an additional DC disconnection unit independent of the inverter between the inverter and PV generator that disconnects the generator.
SunSpec Shutdown	For using PV array disconnect switch as per the SunSpec interoperability specification.
Off	The Rapid Shutdown function is disabled.
TS4 Shutdown	When using TS4 module technology TS4-R-F devices are excluded. With TS4-R-F, SunSpec Shutdown must be selected.

ℹ️ **No secure power supply operation when using PV array disconnect switch as per the SunSpec interoperability specification**

The secure power supply operation is not available if the Rapid Shutdown function of the inverter is enabled and the PV array disconnect switches are used in accordance with the SunSpec Interoperability Specification.

Procedure:

1. Open the user interface (see Section 4.2, page 24).
2. Log into the user interface as an **Installer**.
3. On the right-hand side of the menu bar, select the menu **User Settings** (see Section 4.4 "Start Page Design of the User Interface", page 30).
4. In the context menu, select [**Starting the installation assistant**].
5. Select [**Save and next**] until you reach the **Safety functions** step.
6. Configure the Rapid Shutdown function according to the DC disconnection unit used.

4.16 Changing the Operating Mode of the Multifunction Relay

⚠️ **QUALIFIED PERSON**

The default operating mode of the multifunction relay is **Fault indication (FltInd)** . If you decide to use another operating mode and have established the correct electrical connection for this operating mode and the associated connection variant, you will have to change the operating mode of the multifunction relay and make other settings, if necessary.

The basic procedure for changing operating parameters is explained in another section (see Section 4.13 "Changing Operating Parameters", page 38).

Procedure:

1. Call up the menu **Device Parameters**.
2. Select [**Edit parameters**].
3. In the parameter group **Device > Multifunction relay > Operating mode** select the parameter **Operating mode of multifunction relay** or **Mlt.OpMode** and set the desired operating mode.

4. Once you have set the operating mode **Self-consumption** or **SelfCsmp**, you can configure other settings:

- In the parameter group **Device > Multifunction relay > Self-consumption > Minimum On power** select the parameter **Minimum On power for MFR self-consumption** or **Mlt.MinOnPwr** and set the desired value. This will configure the power threshold from which a load is to be activated.

- In the parameter group **Device > Multifunction relay > Self-consumption > Minimum power On time** select the parameter **Minimum power On time, MFR self-consumption** or **Mlt.MinOnPwrTmm** and set the desired value. This will configure the minimum time for which the power must have exceeded the minimum switch-on power threshold in order to trip activation of the load.

- In the parameter group **Device > Multifunction relay > Self-consumption > Minimum On power** select the parameter **Minimum On time for MFR self-consumption** or **Mlt.MinOnTmm** and set the desired value. This will configure the minimum time for which the load remains activated.

5. If you have set the operating mode **Control via communication** or **ComCtl**, in the parameter group **Device > Multifunction relay > Control via communication > Status** select the parameter **Status of MFR with control via communication** or **Mlt.ComCtl.Sw** and set the desired value. This determines whether the multifunction relay can be controlled via a communication product.

6. If you have set the operating mode **Battery bank** or **BatCha**, make further settings:

- In the parameter group **Device > Multifunction relay > Battery bank > Minimum On power** select the parameter **Minimum On power for MFR battery bank** or **Mlt.BatCha.Pwr** and set the desired value. This will configure the power threshold from which the battery is to be charged.

- In the parameter group **Device > Multifunction relay > Battery bank > Minimum time before reconnection** select the parameter **Minimum time before reconnection of MFR battery bank** or **Mlt.BatCha.Tmm** and set the desired value. This will configure the minimum time which must elapse after charging the battery before the battery can be charged again.

7. Select [**Save all**] to save the changes.

4.17 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 and SunSpec Modbus® Interface" at www.SMA-Solar.com.

For information on which Modbus registers are supported, see the technical information "Modbus® parameters and measured values" at www.SMA-Solar.com.

| i | **Data security during enabled Modbus interface**

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

To ensure data security, 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 disable the Modbus interface, reset the inverter to the default settings or disable the parameter again.

Procedure:

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

4.18   Setting SMA ShadeFix

⚠ **QUALIFIED PERSON**

You can set the time interval in which the inverter has to determine the optimum operating point. If you do not want to use SMA ShadeFix, you can disable the feature.

The basic procedure for changing operating parameters is explained in another section (see Section 4.13 "Changing Operating Parameters", page 38).

Procedure:

- In the parameter group **DC-side > DC settings > SMA ShadeFix**, set the parameter **Time interval of SMA ShadeFix** and set the required time interval. The ideal time interval is usually six minutes. This value should only be increased if the shading situation changes extremely slowly.
  - ☑ The inverter optimizes the MPP of the PV system at the predetermined time interval.
- In order to disable the SMA ShadeFix feature, in the parameter group **DC-side > DC settings > SMA ShadeFix**, set the parameter **SMA ShadeFix switched on** to **Off**.

4.19   Deactivating the Arc-Fault Circuit Interrupter (AFCI)

⚠ **QUALIFIED PERSON**

The basic procedure for changing operating parameters is explained in another section (see Section 4.13 "Changing Operating Parameters", page 38).

Procedure:

- Select the parameter **AFCI switched on** or **AfciIsOn** and set to **No**.

4.20 Saving the Configuration in a File

You can save the current configuration of the inverter in a file. You can use this file as a data backup for this inverter and then import this file into this inverter again or another inverter from the same type or device family to configure the inverter. When saving, only the device parameters will be saved, not any passwords.

Procedure:

1. Activate the user interface (see Section 4.2, page 24).
2. Log into the user interface (see Section 4.3, page 28).
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.

4.21 Adopting a Configuration from a File

⚠ **QUALIFIED PERSON**

To configure the inverter, you can adopt the configuration from a file. To be able to do this, you must first save the configuration of another inverter from the same type or device family in a file (see Section 4.20 "Saving the Configuration in a File", page 44). When saving, only the device parameters will be adopted, not any passwords.

Requirements:

☐ Changes to grid-relevant parameters must be approved by the responsible grid operator.
☐ The SMA Grid Guard code must be available (see "Application for SMA Grid Guard Code" at www.SMA-Solar.com).

Procedure:

1. Open the user interface (see Section 4.2, page 24).
2. Log into the user interface as an **Installer** (see Section 4.3, page 28).
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.

4.22 Updating the Firmware

⚠ **QUALIFIED PERSON**

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

You have the following options to update the firmware:

• Update the firmware with the existing update file via the user interface of the inverter.

- Update the firmware with the existing update file via USB flash drive.
- Search and install the firmware via the user interface of the inverter.

| i | **Faulty firmware update due to disconnecting the inverter from the utility grid.**

The inverter must be connected to the utility grid during the firmware update. This will ensure a proper firmware update.

- Do not disconnect the inverter from the utility grid during the firmware update.

Update the firmware with the existing update file via the user interface of the inverter.

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. Open the user interface (see Section 4.2, page 24).
2. Log into the user interface as an **Installer** (see Section 4.3, page 28).
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.

Update the firmware with the existing update file via USB flash drive.

Requirements:

☐ 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 required 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. Ensure that only the update file to which the inverter is to be updated must be stored 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 inverter installation manual).

   ☑ During start-up phase of the inverter, the desired firmware is being installed. At the same time, the status of the update is shown in the display: **Update status: xxxxxxx**

   ☑ Once the desired firmware has been installed in the inverter, the status **successful** is shown in the display.

6. If the message **error occurred** is shown in the display, perform the firmware update again.

7.

⚠ **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).

8. Pull the USB flash drive out of the USB port.

9. Commission the inverter (see inverter installation manual).

Search and install the firmware via the user interface of the inverter.

Requirements:

☐ The inverter must be connected to the Internet.

Procedure:

1. Open the user interface (see Section 4.2, page 24).

2. Log into the user interface as an **Installer** (see Section 4.3, page 28).

3. Click on [**Edit parameters**].

4. Go to **Device > Update**.

5. Select the parameter **Check for update and install it** and set it to **Execute**.

6. Click on [**Save all**].

☑ The firmware is updated in the background.

5 Cleaning the Inverter

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.

• Ensure that the inverter is free of dust, foliage and other dirt.

6 Troubleshooting

6.1 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**). Tipp: With PV systems that are registered in a communication product, you can also assign a new password for the user group **Installer** via the communication product. The password for the user group **Installer** is the same as the system password in the communication product.

Procedure:
1. Request PUK (application form available at www.SMA-Solar.com).
2. Open the user interface (see Section 4.2, page 24).
3. Enter the PUK instead of the password into the field **Password**.
4. Select **Login**.
5. Call up the menu **Device Parameters**.
6. Click on [**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.

| i | **Password assignment for inverters that are registered in a communication product**

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

- In the communication product, assign the changed password of the user group **Installer** as the new system password (see the manual of the communication product).

6.2 Event Messages

Event number	Message, cause and corrective measures
101 102 103 105	⚠ **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. • 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 Service.
202 203 205 206	⚠ **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:** • Ensure 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 Service.

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 Service.
401 404	**⚠ 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.
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 the Service.

Event number	Message, cause and corrective measures
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.
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 the Service.
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).
1302	⚠ **QUALIFIED PERSON**
	Waiting for grid voltage > Installation failure grid connection > Check grid and fuses
	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).
	• Ensure 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 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 PV array is designed correctly. • Ensure that the PV array is not covered by snow or otherwise shaded. • Ensure that the PV array is free of errors.
3401 3402 3407	**⚠ QUALIFIED PERSON** **DC overvoltage > Disconnect generator** Overvoltage at the DC input. This can destroy the inverter. This message is signalized additionally by rapid flashing of the LEDs. **Corrective measures:** • Disconnect the inverter from voltage sources **immediately** (see installation manual). • Check whether the DC voltage is below the maximum input voltage of the inverter. If the DC voltage is below the maximum input voltage of the inverter, reconnect the terminal block with the connected DC conductors to the inverter. • If the DC voltage exceeds the maximum input voltage of the inverter, ensure that the PV array has been correctly rated or contact the installer of the PV array. • If this message is repeated frequently, contact the Service.
3501	**⚠ QUALIFIED PERSON** **Insulation failure > Check generator** The inverter has detected a ground fault in the PV array. **Corrective measures:** • Check the PV system 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 PV array is too high. There is a ground fault, a residual current or a malfunction. The inverter interrupts feed-in operation immediately after exceeding a threshold. When the fault is eliminated, the inverter automatically reconnects to the utility grid. **Corrective measures:** • Check the PV system for ground faults.
3701	**⚠ QUALIFIED PERSON** **Resid.curr.too.high > Check generator** The inverter has detected a residual current due to temporary grounding of the PV array. **Corrective measures:** • Check the PV system for ground faults.
3801 3802 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 PV array has been correctly rated and wired.
3901 3902	**⚠ QUALIFIED PERSON** **Waiting for DC start conditions > Start cond. not met** The feed-in conditions for the utility grid are not yet fulfilled. **Corrective measures:** • Ensure that the PV array is not covered by snow or otherwise shaded. • Wait for higher irradiation. • If this message is displayed frequently in the morning, increase the voltage limit for starting grid feed-in. Change the parameter **Critical voltage to start feed-in**. • If this message is displayed frequently with medium irradiation, ensure that the PV array is correctly rated.

Event number	Message, cause and corrective measures
4301	**⚠ QUALIFIED PERSON** **Electric arc detected > Check DC generator** The inverter has detected an electric arc. A detected electric arc causes the inverter to interrupt feed-in operation for a short time and to resume the feed-in operation automatically. **Corrective measures:** • Check the PV array.
6512	**Minimum operating temperature not reached** The inverter will only recommence grid feed-in once the temperature has reached at least −25°C.
6701 6702	**⚠ QUALIFIED PERSON** **Communication disturbed** Error in the communication processor, the inverter continues feeding in, however. The cause must be determined by the Service. **Corrective measures:** • If this message is displayed frequently, contact the Service.
6803	**⚠ QUALIFIED PERSON** **Self-diagnosis > Input A defective** **Corrective measures:** • Check whether a string is connected to input A. If a string that once was connected is not used anymore, the string-failure detection must be reset. • Contact the Service.
6903	**⚠ QUALIFIED PERSON** **Self-diagnosis > Input B defective** **Corrective measures:** • Check whether a string is connected to input B. If a string that once was connected is not used anymore, the string-failure detection must be reset. • Contact the Service.
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**

Event number	Message, cause and corrective measures
7113	**The memory card is full or write-protected**
7303	⚠ **QUALIFIED PERSON** **Update main CPU failed** The cause must be determined by the Service. **Corrective measures:** • Contact the Service.
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.
7331	**Update transport started** Update file is being copied.
7332	**Update transport successful** Update file was copied successfully to the inverter's internal memory.
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. • For WLAN connection, improve the WLAN connection quality (e.g. via SMA Antenna Extension Kit) or establish connection with the inverter via Ethernet. • If this message is displayed again, contact the Service.
7340	**Update communication failed**

Event number	Message, cause and corrective measures
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.
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.
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.
7355	**Update WebUI** The inverter is updating the inverter user interface.

Event number	Message, cause and corrective measures
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.

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).
- For WLAN connection, improve the WLAN connection quality (e.g. via SMA Antenna Extension Kit) or connect the inverter with the DHCP server (router) via Ethernet.

8003	⚠ **QUALIFIED PERSON**

Active power limited temperature

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 (113°F) has not been exceeded.
- Ensure that the inverter is not exposed to direct solar irradiation.

8206	⚠ **QUALIFIED PERSON**

Electr. arc detected > Please confirm by tapping

The inverter has detected an electric arc and was recommissioned after a disconnection. By tapping, you are confirming that you have repaired any possible damage to PV modules, DC conductors or plugs in the PV system.

Corrective measures:

- Tap on the enclosure lid of the Connection Unit within ten seconds of the message appearing in order to recommission the inverter.

Event number	Message, cause and corrective measures
8503	**⚠ QUALIFIED PERSON** **Self-diagnosis > Input C defective** **Corrective measures:** • Check whether a string is connected to input C. If a string that once was connected is not used anymore, the string-failure detection must be reset. • Contact the Service.
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 manager (e.g. Sunny Home Manager) is intact and that no cables are damaged or that no plugs have been pulled.
8801 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).

Event number	Message, cause and corrective measures
9034	**⚠ QUALIFIED PERSON** **Error in Rapid Shutdown System** This message can have the following causes: • The Rapid Shutdown Function was not correctly configured. • The PV generator could not be correctly disconnected. Voltage can be applied to the DC inputs of the inverter. • The standby voltage of all PV module switches of a string is > 30 V. **Corrective measures:** • Check the configuration of the Rapid Shutdown function and ensure that the operating mode selected is selected according to the DC disconnection unit used. • Check the functionality of the PV module switches. • Check the standby voltage of the PV module switches used and ensure that the standby voltage of all PV module switches of a string < 30 V.
9037	**⚠ QUALIFIED PERSON** **Generator connection not carried out** The PV module switches did not connect the PV generator. **Corrective measures:** • Check the functionality of the SunSpec-compliant PV module switches.
9202	**⚠ QUALIFIED PERSON** **SPS AC overvoltage** An AC source has been connected to the outlet for secure power supply operation. **Corrective measures:** • Check the connection at the **SPS** slots, and make any necessary corrections.
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 terminal for secure power supply operation for more than 5 s. **Corrective measures:** • Reduce the load at the terminal for secure power supply operation. • If necessary, select an appliance with a lower initial current.

Event number	Message, cause and corrective measures
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.
10248 10249	**Load reduced through device reduction or increase of query interval** 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.
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.

Event number	Message, cause and corrective measures
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.
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.

Event number	Message, cause and corrective measures
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.
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).
10339	**Webconnect enabled** The inverter can communicate with Sunny Portal without an additional SMA communications product (e.g. Sunny Data Manager).
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. Sunny Data Manager). • If the inverter is to communicate with Sunny Portal without an additional SMA communication product, switch the Webconnect function on.

Event number	Message, cause and corrective measures

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)

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)

Event number	Message, cause and corrective measures

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)

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)

Event number	Message, cause and corrective measures

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)

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)

Event number	Message, cause and corrective measures
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)
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.

Event number	Message, cause and corrective measures
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.
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.

6.3   Checking the PV System for Ground Faults

⚠ **QUALIFIED PERSON**

If the inverter displays the event numbers **3501**, **3601** or **3701**, there could be a ground fault. The electrical insulation from the PV system to ground is defective or insufficient.

⚠ DANGER

Danger to life due to electric shock when touching live system components in case of a ground fault

If a ground fault occurs, parts of the system may still be live. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Disconnect the product from voltage sources and make sure it cannot be reconnected before working on the device.
- Touch the cables of the PV array on the insulation only.
- Do not touch any parts of the substructure or frame of the PV array.
- Do not connect PV strings with ground faults to the inverter.
- Ensure that no voltage is present and wait five minutes before touching any parts of the PV system or the product.

⚠ WARNING

Danger to life due to electric shock from destruction of the measuring device due to overvoltage

Overvoltage can damage a measuring device and result in voltage being present in the enclosure of the measuring device. Touching the live enclosure of the measuring device results in death or lethal injuries due to electric shock.

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

Procedure:

In order to check the PV system for ground faults, perform the following actions in the prescribed order. The exact procedure is described in the following sections.

- Check the PV system for ground faults by measuring the voltage.
- If the voltage measurement was not successful, check the PV system via insulation resistance measurement for ground faults.

Test by Measuring the Voltage

Proceed as follows to check each string in the PV system for ground faults.

Procedure:

1.

> ### ⚠ DANGER
>
> **Danger to life due to high voltages**
> - Disconnect the inverter from any voltage sources (see the inverter installation manual).

2. Measure the voltages:

    - Measure the voltage between the positive terminal and the ground potential (PE).
    - Measure the voltage between the negative terminal and the ground potential (PE).
   - Measure the voltage between the positive and negative terminals.
      If the following results are present at the same time, there is a ground fault in the PV system:
        - ☑ All measured voltages are stable.
        - ☑ The sum of the two voltages to ground potential is approximately equal to the voltage between the positive and negative terminals.

3. If a ground fault is present, determine the location of the ground fault via the ratio of the two measured voltages and eliminate the ground fault.

4. If a definite ground fault cannot be measured and the message is still displayed, measure the insulation resistance.

5. Reconnect the strings without ground faults to the inverter and recommission the inverter (see inverter installation inverter).

Location of the ground fault

The example shows a ground fault between the second and third PV module.
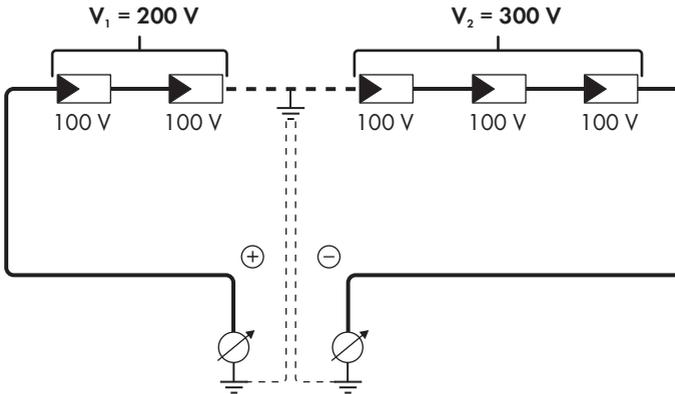
Test by Measuring the Insulation Resistance

If the voltage measurement does not provide sufficient evidence of a ground fault, the insulation resistance measurement can provide more exact results.
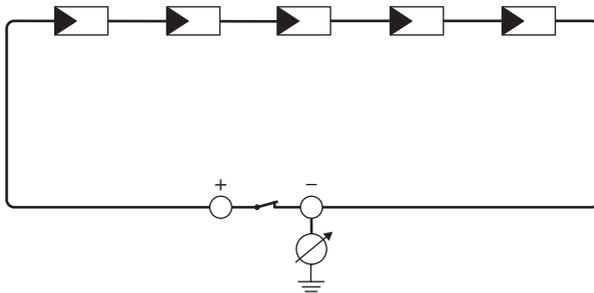

Figure 4: Schematic diagram of the measurement

⌈i⌉ **Calculating the insulation resistance**

The expected total resistance of the PV system or of an individual string can be calculated using the following formula:

$$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + ...$$

The exact insulation resistance of a PV module can be obtained from the module manufacturer or the datasheet.

For the resistance of a PV module an average value can be assumed: for thin-film PV modules approximately 40 MOhm and for polycrystalline and monocrystalline PV modules approximately 50 MOhm per PV module (for further information on calculating the insulation resistance see the Technical Information "Insulation Resistance (Riso) of Non-Galvanically Isolated PV Systems" at www.SMA-Solar.com).

Required devices:

☐ Suitable device for safe disconnection and short-circuiting

☐ Measuring device for insulation resistance

⌈i⌉ **Device required for safe disconnection and short-circuiting of the PV array**

The insulation resistance can only be measured with a suitable device for safe disconnection and short-circuiting of the PV array. If no suitable device is available, the insulation measurement must not be carried out.

Procedure:

1. Calculate the expected insulation resistance per string.

2.
⚠ **DANGER**
Danger to life due to high voltages
• Disconnect the inverter from any voltage sources (see the inverter installation manual).

3. Install the short circuit device.

4. Connect the measuring device for insulation resistance.

5. Short-circuit the first string.

6. Set the test voltage. The test voltage should be as close as possible to the maximum system voltage of the PV modules but must not exceed it (see datasheet of the PV modules).

7. Measure the insulation resistance.

8. Eliminate the short circuit.

9. Measure the remaining strings in the same manner.

   ☑ If the insulation resistance of a string deviates considerably from the theoretically calculated value, there is a ground fault present in that string.

10. Reconnect to the inverter only those strings from which the ground fault has been eliminated.

11. Reconnect all other strings to the inverter.

12. Recommission the inverter (see inverter installation manual).
13. If the inverter still displays an insulation error, contact the Service (see Section 9, page 74).
    The PV modules might not be suitable for the inverter in the present quantity.

7 Accessories

You will find the accessories for your product in the following overview. If required, these can be ordered from SMA Solar Technology AG or your distributor.

Designation	Short designation	SMA order number
SMA Antenna Extension Kit	Accessory set for one SMA inverter for the optimization of the SMA inverter's WLAN radio range.	EXTANT-US-40
SMA 485 Module	Only for inverters of type "SBx.x-1SP-US-41": for establishing communication between the inverter and the energy meter of the SMA Revenue Grade Meter Kit (only applicable if no SMA Cellular Modem Kit is used)	MD.485-US-40
SMA Cellular LTE Modem Kit	Only for inverters of type "SBx.x-1SP-US-41": for establishing communication with the Sunny Portal via the mobile communication network (as an alternative to Ethernet or WLAN) For establishing communication between the inverter and the energy meter of the Revenue Grade Meter Kit	CellModKit-US-10
SMA Revenue Grade Meter Kit	Only for inverters of type "SBx.x-1SP-US-41": for the installation of an energy meter according to ANSI C12.20	RGM05Kit-US-10

8   Compliance Information

FCC Compliance

This device complies with Part 15 of the FCC Rules and with Industry Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes :

1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications made to this equipment not expressly approved by SMA Solar Technology AG may void the FCC authorization to operate this equipment.

IC Compliance

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

9   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:

- Device type
- Serial number
- Firmware version
- Event message
- Mounting location and mounting height
- Type and number of PV modules
- 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)
- Operating mode of the multifunction relay

United States	SMA Solar Technology America LLC Rocklin, CA	Toll free for USA and US Territories +1 877-MY-SMATech (+1 877-697-6283) International: +1 916 625-0870
Canada	SMA Solar Technology Canada Inc. Mississauga	Toll free for Canada / Sans frais pour le Canada : +1 877-MY-SMATech (+1 877-697-6283)
México	SMA Solar Technology de México Mexico City	Internacional: +1 916 625-0870