



SUNNY TRIPOWER CORE1-US

STP 33-US-41 / STP 50-US-41 / STP 62-US-41

Important information

Depending on availability, the product is or is not equipped with Wi-Fi functionality. The reason for this is the currently problematic semiconductor supply, caused by the COVID-19 pandemic.

If the product is not equipped with Wi-Fi functionality, please use the standard Ethernet communication interface included for commissioning, configuration and integrating the product into a network.

If integrating the product into a Wi-Fi network is absolutely necessary, this can be done using a commercial Wi-Fi repeater, which is connected to the product via Ethernet.

Legal Provisions

The information contained in these documents is the property of SMA Solar Technology AG. No part of this document may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, be it electronic, mechanical, photographic, magnetic or otherwise, without the prior written permission of SMA Solar Technology AG. Internal reproduction used solely for the purpose of product evaluation or other proper use is allowed and does not require prior approval.

SMA Solar Technology AG makes no representations or warranties, express or implied, with respect to this documentation or any of the equipment and/or software it may describe, including (with no limitation) any implied warranties of utility, merchantability, or fitness for any particular purpose. All such representations or warranties are expressly disclaimed. Neither SMA Solar Technology AG nor its distributors or dealers shall be liable for any indirect, incidental, or consequential damages under any circumstances.

The exclusion of implied warranties may not apply in all cases under some statutes, and thus the above exclusion may not apply.

Specifications are subject to change without notice. Every attempt has been made to make this document complete, accurate and up-to-date. Readers are cautioned, however, that product improvements and field usage experience may cause SMA Solar Technology AG to make changes to these specifications without advance notice or per contract provisions. SMA Solar Technology AG shall not be responsible for any damages, including indirect, incidental or consequential damages, caused by reliance on the material presented, including, but not limited to, omissions, typographical errors, arithmetical errors or listing errors in the content material.

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.

SMA Solar Technology AG

Sonnenallee 1

34266 Niestetal

Germany

Phone +49 561 9522-0

Fax +49 561 9522 100

www.SMA.de

E-mail: info@SMA.de

Status: 3/7/2023

Copyright © 2023 SMA Solar Technology AG. All rights reserved.

Table of contents

1	Information on this Document.....	6
1.1	Validity.....	6
1.2	Target Group	6
1.3	Content and Structure of this Document.....	6
1.4	Levels of warning messages.....	6
1.5	Symbols in the Document.....	7
1.6	Typographical Elements in the Document	7
1.7	Designations in the Document.....	7
1.8	Additional Information.....	7
2	Safety	9
2.1	Intended Use.....	9
2.2	IMPORTANT SAFETY INSTRUCTIONS	9
3	Product Overview	14
3.1	Product Description.....	14
3.2	Symbols on the Product.....	15
3.3	Interfaces and Functions.....	15
3.4	LED Signals.....	20
4	Operation	22
4.1	Establishing a connection to the user interface	22
4.1.1	Establishing a Direct Connection via Ethernet.....	22
4.1.2	Establishing a direct connection via WLAN	22
4.1.3	Establishing a Connection via Ethernet in the local network	23
4.1.4	Establishing a Connection via WLAN in the Local Network.....	24
4.2	Logging In and Out of the User Interface	25
4.3	Start Page Design of the User Interface	27
4.4	Displaying and Downloading the Stored Data	29
4.5	Activating the Smart Inverter Screen	29
4.6	Starting the Installation Assistant.....	30
4.7	Activate WPS Function	31
4.8	Switching WLAN On and Off	31
4.9	Switching the Dynamic Power Display Off	32
4.10	Changing the Password	32
4.11	Generating or Changing a Product Key	33
4.12	Configuring the Service Access	33
4.13	Changing Operating Parameters	34
4.14	Configuring the Country Data Set	35
4.15	Configuring the Active Power Mode.....	35
4.16	Configuring the Rapid Shutdown Function.....	36
4.17	Changing the Operating Mode of the Multifunction Relay.....	36
4.18	Configuring the Modbus Function	37
4.19	Setting SMA ShadeFix	38
4.20	Generating the I-V Characteristic Curve.....	38
4.21	Activating or Deactivating the Arc-Fault Circuit Interrupter (AFCI)	38
4.22	Activating and Setting String-Failure Detection.....	39
4.23	Saving the Configuration in a File	41

4.24	Adopting a Configuration from a File	41
4.25	Firmware Update	41
4.25.1	Activating Automatic Firmware Update.....	42
4.25.2	Updating Firmware with Update File via the User Interface	42
4.25.3	Updating Firmware with Update File via the USB Flash Drive.....	42
4.25.4	Searching for and Installing New Firmware via the User Interface	43
5	Clean the product.....	44
6	Troubleshooting	45
6.1	Forgotten Password	45
6.2	Product Key Lost.....	45
6.3	Event Messages	46
6.4	Checking the PV System for Ground Faults.....	60
6.5	Resetting the Operation Inhibition after Detection of an Arc Fault	62
7	Accessories	64
8	Compliance Information	65
9	Contact	66

1 Information on this Document

1.1 Validity

This document is valid for:

- STP 33-US-41 (Sunny Tripower CORE1-US) with firmware version \geq 4.01.01.R
- STP 50-US-41 (Sunny Tripower CORE1-US) with firmware version \geq 4.01.01.R
- STP 62-US-41 (Sunny Tripower CORE1-US) with firmware version \geq 4.01.01.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.





CAUTION

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

NOTICE

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

1.5 Symbols in the Document

Icon	Explanation
	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
	Example

1.6 Typographical Elements in the Document

Typographical element	Use	Example
bold	<ul style="list-style-type: none"> • Messages • Terminals • Elements on a user interface • Elements to be selected • Elements to be entered 	<ul style="list-style-type: none"> • Connect the insulated conductors to the terminals X703:1 to X703:6. • Enter 10 in the field Minutes.
>	<ul style="list-style-type: none"> • Connects several elements to be selected 	<ul style="list-style-type: none"> • Go to Settings > Date.
[Button] [Key]	<ul style="list-style-type: none"> • Button or key to be clicked on or pressed down 	<ul style="list-style-type: none"> • Select [Enter].
#	<ul style="list-style-type: none"> • Placeholder for variable components (e.g., parameter names) 	<ul style="list-style-type: none"> • Parameter WCtlHz.Hz#

1.7 Designations in the Document

Complete designation	Designation in this document
Sunny Tripower CORE1-US	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
"PUBLIC CYBER SECURITY - Guidelines for a Secure PV System Communication"	Technical Information
"Grid Support Utility Interactive Inverters"	Technical Information
Information about how to activate and to set the grid supporting features according to UL 1741 SA	
"Efficiency and Derating"	Technical Information
Efficiency and derating behavior of the SMA inverters	

Title and information content	Type of information
<p>"Short-Circuit Currents"</p> <p>Information on short-circuit currents of SMA PV inverters</p>	Technical Information
<p>"Parameters and Measured Values"</p> <p>Overview of all inverter operating parameters and their configuration options as well as an overview of all SMA Modbus registers</p>	Technical Information
<p>"SUNSPEC MODBUS"</p> <p>Information on the activation of the SunSpec Modbus interface and information on the SunSpec Modbus profiles</p>	Technical Information
<p>"SMA MODBUS"</p> <p>Information on the SMA Modbus interface as well as an overview of all SMA Modbus registers</p>	Technical Information
<p>"Integrated Plant Control"</p> <p>Detailed explanation of the function and description for setting the function</p>	Technical Information
<p>"SMA SPEEDWIRE FIELDBUS"</p>	Technical information
<p>"Temperature Derating"</p>	Technical Information
<p>"I-V diagnostic function: Determination of the generator characteristic curve by the inverter for fault detection in the PV array"</p>	Technical Information

2 Safety

2.1 Intended Use

The Sunny Tripower is a transformerless PV inverter, with 6 MPP trackers, that converts the direct current of the PV array to grid-compliant, three-phase current and feeds it into the utility grid.

The product is suitable for indoor and outdoor use.

The product must only be operated with PV arrays (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.

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. The event will 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 grounded within the product as standard. When connecting a utility grid with neutral conductor, the bridge between the neutral conductor of the AC output and the enclosure must be removed.

PV modules with a high capacity to ground must only be used if the coupling capacity of all PV modules does not exceed 12.6 μF .

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

The product is approved for the USA 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 appropriate.

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 any regional, state, provincial, federal or national laws, regulations or standards that apply 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

Keep the manual for future reference.

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 ensure it cannot be reconnected before working on the device.
- Do not touch non-insulated parts or cables.
- Do not disconnect the DC connectors 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 ensure it cannot be reconnected before working on the device.
- Only touch the cables of the PV modules on their insulation.
- 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 5 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 product is classified as "TNV-1" and offers protection against overvoltages of up to 1.5 kV.

⚠ WARNING**Danger to life due to fire and explosion**

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

- In the event of a fault, do not perform any direct actions on the product.
- Ensure that unauthorized persons have no access to the product.
- Do not operate the AC or DC load-break switch on the inverter in case of an error.
- 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. Do not operate the AC load-break switch on the product.
- Only perform work on the product (e.g., troubleshooting, repair work) when wearing personal protective equipment for handling of hazardous substances (e.g., safety gloves, eye and face protection, respiratory protection).

⚠ 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 product. Touching toxic substances and inhaling toxic gases and dusts can cause skin irritation, burns or poisoning, trouble breathing and nausea.

- Only perform work on the product (e.g., troubleshooting, repair work) when wearing personal protective equipment for handling of hazardous substances (e.g., safety gloves, eye and face protection, respiratory protection).
- Ensure that unauthorized persons have no access to 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 1000 V or higher.

⚠ CAUTION**Risk of burns due to hot enclosure parts**

The enclosure and the enclosure lid may get hot during operation. The DC load-break switch can not become hot.

- Do not touch hot surfaces.
- Wait until the inverter has cooled down before touching the enclosure or enclosure lid.

⚠ 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.

- Carry and lift the product upright with the help of several people. Take the weight and the center of gravity of the product into account. The center of gravity is on the side of the AC-Connection Unit.
- Wear suitable personal protective equipment for all work on the product.
- Transport the product using the carrying handles or hoist. Take the weight of the product into account.
- Use all carrying handles provided during transport with carrying handles.
- Do not use the carrying handles as attachment points for hoist equipment (e.g. straps, ropes, chains). Insert eye bolts into threads provided on top of the product to attach the hoist system.

NOTICE**Damage to the enclosure seal in subfreezing conditions**

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

- Only open the product if the ambient temperature is not below -5°C (23°F).
- 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).

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 devices 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.

i A country data set must be set for feed-in operation

From firmware version 4.01.01.R, the activation conditions for feed-in operation were changed.

To ensure the inverter begins feed-in operation during initial commissioning, a country data set must be set (for instance via the installation assistant on the user interface of the product, or via a communication product).

If no country data set is set, then feed-in operation will be stopped. This state is signaled by the green and red LEDs flashing simultaneously.

The inverter will automatically start feed-in operation only after the inverter configuration is completed.

i When the utility grid is disconnected, the parameter settings are not applied

If you have made parameter settings and subsequently disconnected the utility grid without having first disconnected the DC side from the inverter, the settings cannot be saved. Proceed as follows if you would like to disconnect the utility grid after you have made parameter settings:

- Disconnect the DC side from the inverter.
- Wait 5 minutes.
- Disconnect the utility grid.

3 Product Overview

3.1 Product Description

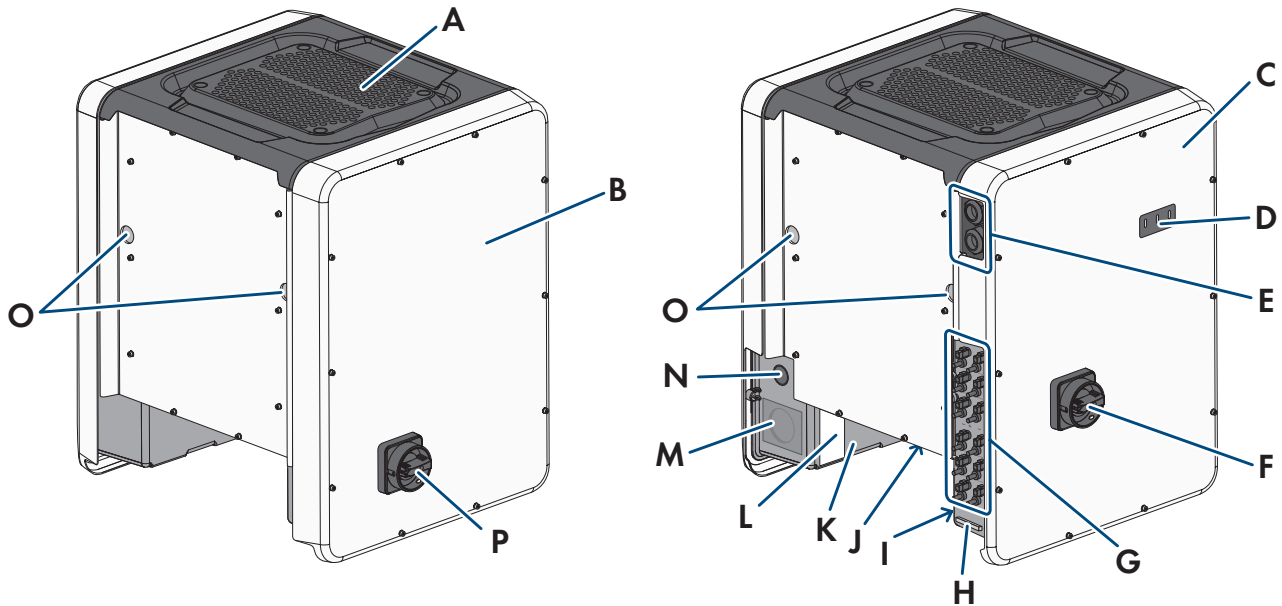











Figure 1: Design of the product

Position	Designation
A	Cover
B	AC Connection Unit
C	DC Connection Unit
D	LEDs The LEDs indicate the operating state of the product.
E	Cable glands for data cables
F	DC load-break switch
G	DC connector
H	Equipment grounding bar for the equipment grounding conductor of the PV array
I	Warning label with compliance information
J	Fan bracket with three fans
K	Type label The type label clearly identifies the product. The type label must remain permanently attached to the product. You will find the following information on the type label: <ul style="list-style-type: none"> • Device type (Model) • Serial number (Serial No. or S/N) • Date of manufacture • Device-specific characteristics

Position	Designation
L	Additional label with details for registration in Sunny Portal and WLAN password: <ul style="list-style-type: none"> • 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
M	Enclosure opening for AC connection
N	Enclosure opening for additional cable
O	Enclosure opening for carrying handle
P	AC load-break switch

3.2 Symbols on the Product

Icon	Explanation
	Beware of electrical voltage The product operates at high voltages.
	Beware of hot surface The product can get hot during operation.
	Observe the documentations Observe all documentations supplied with the product.
	Inverter Together with the green LED, this symbol indicates the operating state of the inverter.
	Observe the documentations Together with the red LED, this symbol indicates an error.
	Data transmission Together with the blue LED, this symbol indicates the status of the network connection.
	Equipment Grounding Terminal This symbol indicates the position for the connection of an equipment grounding conductor.
	Grounding This symbol indicates the position for the connection of an additional 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 <i>National Electrical Code</i> ®, the <i>Canadian Electrical Code</i> ® and IEEE 1547.

3.3 Interfaces and Functions

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

User interface for configuration and monitoring

The product is equipped as standard with an integrated webserver, which provides a user interface for configuring and monitoring the product.

Once the connection has been established to the smart device, use a terminal (e.g. smartphone, tablet or laptop) to connect to the product's user interface using a web browser.

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 product 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 product has been commissioned.

Configuring the inverter via file

You can adopt the inverter configuration from a file. To do this, there must be an inverter configuration saved to a file. Adhere to the following information about the file formats in the process:

SMA Standard (*.bck)

*.bck is a proprietary file format by SMA Solar Technology AG. This includes, for example, special country data sets (source requirement) or adjustments to various grid parameters. The *.bck file is always linked to a device family with up-to-date firmware. The bck files are available to download on the product page for the corresponding inverter. Data backup is possible for all settings of the inverter.

EPRI Common File Format for DER Settings (IEEE 1547 URP-File Beta-Version (*.csv))

csv is an open, manufacturer-independent URP (Utility-Required-Profile) file format that was defined by the "Electric Power Research Institute (EPRI)" in cooperation with US electric utility companies and inverter manufacturers. This common file definition utilizes the parameter attributes from the IEEE 1547.1-2020 standard, including the unique parameter labels, their data types, units, and possible value options. This standard dictates how these parameters and their values are expressed and formatted in a common file format so that anyone can interpret its contents without ambiguity. IEEE 1547-2018 specifies approximately 100 parameters for DER devices. This file format provides a practical way to verify the configuration of the standard parameters in DER inverters, as well as share the information with others. The ability to upload files and configure an inverter based on the EPRI Common File Format (.csv) is only available if the inverter has previously been configured to an IEEE 1547:2018 compliant US country code. The ability to save inverter applied settings to the EPRI Common File Format is currently not available.

SMA PUK2.0

SMA PUK2.0 replaces for products with firmware version $\geq 4.00.00.R$ the previous procedure for logging in to the user interface if you have forgotten the password for your product. Whether your product supports PUK2.0 is shown on the login page of the user interface via the information button.

To improve security for your product, you can generate a product key. With the product key, the product can be unlocked directly on the user interface and does not require a chargeable order of a PUK via SMA. If you have lost the product key, you can generate a new one by physically accessing the product.

Display of I-V characteristic curve

On the user interface of the product, a characteristic curve can be generated from current and voltage values of the PV array per MPP tracker. Using this I-V characteristic curve, problems in the PV array can be detected at an early stage.

SMA Speedwire

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

SMA Webconnect

The inverter is equipped with a Webconnect function as standard. The Webconnect function enables direct data transmission between the inverter and Sunny Portal without any additional communication device and for a maximum of 4 inverters per visualized system. In PV systems with more than 4 inverters, there is the option of establishing data transmission between the inverters and Sunny Portal via the data logger (e.g., SMA Data Manager) or distributing the inverters over several systems. You can directly access your visualized system via the web browser on your end device.

Wi-Fi

Depending on availability, the product is or is not equipped with a Wi-Fi interface. If the Wi-Fi interface is present, the Wi-Fi interface is enabled by default at delivery. If you do not want to use WLAN, you can deactivate the WLAN interface.

If the Wi-Fi interface is present, the product also 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 a smart 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

With the assembly of the RS485 Module, the inverter can communicate with special SMA communication products (Information on assembly and connection see manual of the SMA RS485 Module). The SMA RS485 Module can be retrofitted.

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 Sensor Module

The SMA Sensor Module has different interfaces for connecting various sensors (i.e. temperature sensor, irradiation sensor, anemometer or energy meter). The SMA Sensor Module converts the signals of the connected sensors and transmits them to the inverter. Information on installation, connection and configuration can be found in the manual for the SMA sensor module. The SMA Sensor Module can be retrofitted.

Grid management services

The inverter was tested in accordance with the UL 1741 SA (September 7, 2016) and UL 1741 SB / IEEE 1547-2018 (October 2022) 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.

For information about Grid Guard Code 10m, see the Technical Information "SMA GRID GUARD 10.0 - Grid Management Services via Inverter and System Controller".

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.

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 6 minutes. This means that the inverter determines the optimum operating point every 6 minutes. Depending on the PV system or shading situation, it may be useful to adjust the time interval.

String-failure detection

The string-failure detection measures the total current of every input and continuously calculates the mean values for the inputs in question. The total currents are compared with the mean values. If a total current exceeds or falls short of the mean value by the set tolerance value, an event is reported. Marginally increased total currents are reliably detected over several query intervals and distinguished from typical current fluctuations of the PV array. String-failure detection is deactivated by default and must be activated. In addition, the tolerance value can be set via the user interface and the mean values read off.

Surge arrester type 1 and 2

On the AC and DC side, the inverter is equipped with slots for type 1 and 2 surge protection devices. The surge protection devices limit dangerous overvoltages. The surge protection devices can be retrofitted.

Arc-Fault Circuit Interrupter (AFCI)

The inverter is equipped with an integrated photovoltaic (PV) arc-fault circuit interrupter as required for PV systems by *National Electrical Code*® ANSI/NFPA 70 (NEC). The inverters' arc-fault circuit interrupter (AFCI) functionality is certified to Standard UL 1699B Edition 1 (August 2018), Photovoltaic (PV) DC Arc-Fault Circuit Protection, which defines requirements for PV arc-fault protection devices intended for use in solar photovoltaic electrical energy systems as described in NEC 690.11.

Depending on the country data set, arc fault detection is activated or deactivated by default. If the installation conditions permit this, you can change the default setting.

The arc-fault circuit interrupter (AFCI) can detect electric arcs in the PV modules and the module wiring of connected strings. The arc-fault circuit interrupter ensures that the inverter ceases operations and interrupts any electric arcs as soon as they are detected. This involves halting the flow of current.

The arc-fault circuit interrupter (AFCI) has proved extremely reliable, meaning that the inverter dependably detects and interrupts electric arcs that actually occur in the PV electric circuit and is generally not susceptible to false tripping. AFCI incidents output by the inverter should be regarded as reliable indicators of actual errors in the PV electric circuit displayed and should be investigated immediately and thoroughly by qualified persons to localize and rectify errors in the PV electric circuit.

If the AFCI is configured without permanent operation inhibition, the system should be monitored closely and recurring faults in the AFCI should be investigated immediately by qualified persons. If it is not possible to identify the cause of the error, the inverter should be taken out of operation until the investigation and corrective action can be completed. Recurring errors may cause damage to neighboring conductors and system components, which could result in more extensive system failures and damage and even to uncontrolled electric arcs and fires.

SMA Smart Connected

SMA Smart Connected is the free monitoring of the product via the SMA Sunny Portal. Thanks to SMA Smart Connected, the operator and qualified person will be informed automatically and proactively about product 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 product is permanently connected to Sunny Portal and the data of the operator and qualified person is stored in Sunny Portal and up-to-date.

Universal mounting system (UMS_Kit-10)

The universal mounting system enables wall mounting of the inverter or serves as platform for higher mounting on the ground. The universal mounting system is available as an accessory.

3.4 LED Signals

The LEDs indicate the operating state of the product.

LED signal	Explanation
Green LED and red LED flash simultaneously (2 s on and 2 s off)	No country data set set Operation of the product is stopped because no country data set is set. Once the configuration has been completed (for instance using the installation assistant or via a communication product), the product will start operation automatically.
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 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.

LED signal	Explanation
The red LED is glowing	Event occurred If an event occurs, a distinct event message and the corresponding event number will be displayed in addition on the product user interface or in the communication product (e.g. SMA Data Manager).
The blue LED flashes slowly for approx. 1 minute	Communication connection is being established The product is establishing a connection to a local network or is establishing a direct connection to a smart device via Ethernet (e.g. smartphone, tablet or laptop).
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 via Ethernet with a smart end device (e.g. smartphone, tablet or laptop).

4 Operation

4.1 Establishing a connection to the user interface

4.1.1 Establishing a Direct Connection via Ethernet

Requirements:

- The product must be commissioned.
- A smart device (e.g. laptop) with an Ethernet interface must be available.
- The product must be connected directly to the smart device.
- The respective latest version of one of the following web browsers must be installed on the smart device: Chrome, Edge, Firefox or Safari.
- The installer's SMA Grid Guard code must be available to change network-relevant settings after the first 10 hours of feed-in operation, or after completing the installation assistant. You can request the SMA Grid Guard code via the Online Service Center.
- JavaScript must be enabled in the web browser of the smart device.

i IP address of the inverter

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

Procedure:

1. Open the web browser of your smart device and enter the IP address **169.254.12.3** in the address bar.

2. **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.

4.1.2 Establishing a direct connection via WLAN

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

The following connection options are available:

- Connection with WPS
- Connection with Wi-Fi network search

Requirements:

- The product must be commissioned.
- A smart device (e.g. smartphone, tablet or laptop) must be available.
- The respective latest version of one of the following web browsers must be installed on the smart device: Chrome, Edge, Firefox or Safari.
- JavaScript must be enabled in the web browser of the smart device.
- The installer's SMA Grid Guard code must be available to change network-relevant settings after the first 10 hours of feed-in operation, or after completing the installation assistant. You can request the SMA Grid Guard code via the Online Service Center.

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 smart 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 smart devices having an iOS operating system.

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

Connection with WPS

Requirement:

- The smart device must have a WPS function.

Procedure:

1. Enable the WPS function on the inverter. To do this, tap twice in succession on the enclosure lid of the DC-Connection Unit next to the LEDs.
 - The blue LED flashes quickly for approx. two minutes. The WPS function is active during this time.
2. Enable the WPS function on your smart device.
3. Open the web browser of your smart end device and enter **https://smalogin.net** in the address bar.

Connection with Wi-Fi network search

1. Search for Wi-Fi networks with your smart device.
2. Select the SSID of the product **SMA[serial number]** in the list with the detected Wi-Fi networks.
3. Open the web browser of your smart end device and enter **https://smalogin.net** in the address bar.
 - The login page of the user interface is displayed.
4. If the login page of the user interface does not open, enter the IP address **192.168.12.3** or, if your smart end device supports mDNS services, **SMA[serial number].local** or **https://SMA[serial number]** in the address bar of the web browser.

4.1.3 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.
- A smart device (e.g. smartphone, tablet or laptop) must be available.
- The smart 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 on the smart device: Chrome, Edge, Firefox or Safari.
- The installer's SMA Grid Guard code must be available to change network-relevant settings after the first 10 hours of feed-in operation, or after completing the installation assistant. You can request the SMA Grid Guard code via the Online Service Center.

Procedure:

1. Open the web browser of your smart device. Enter the IP address of the product in the address bar of the web browser.
 2. **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.

4.1.4 Establishing a Connection via WLAN 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 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.
- A smart device (e.g. smartphone, tablet or laptop) must be available.
- The smart 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 on the smart device: Chrome, Edge, Firefox or Safari.
- The installer's SMA Grid Guard code must be available to change network-relevant settings after the first 10 hours of feed-in operation, or after completing the installation assistant. You can request the SMA Grid Guard code via the Online Service Center.

i Importing and exporting files with smart 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 smart devices having an iOS operating system.

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

Procedure:

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

4.2 Logging In and Out of the User Interface

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

i 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

i 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.

i 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.

4.3 Start Page Design of the User Interface

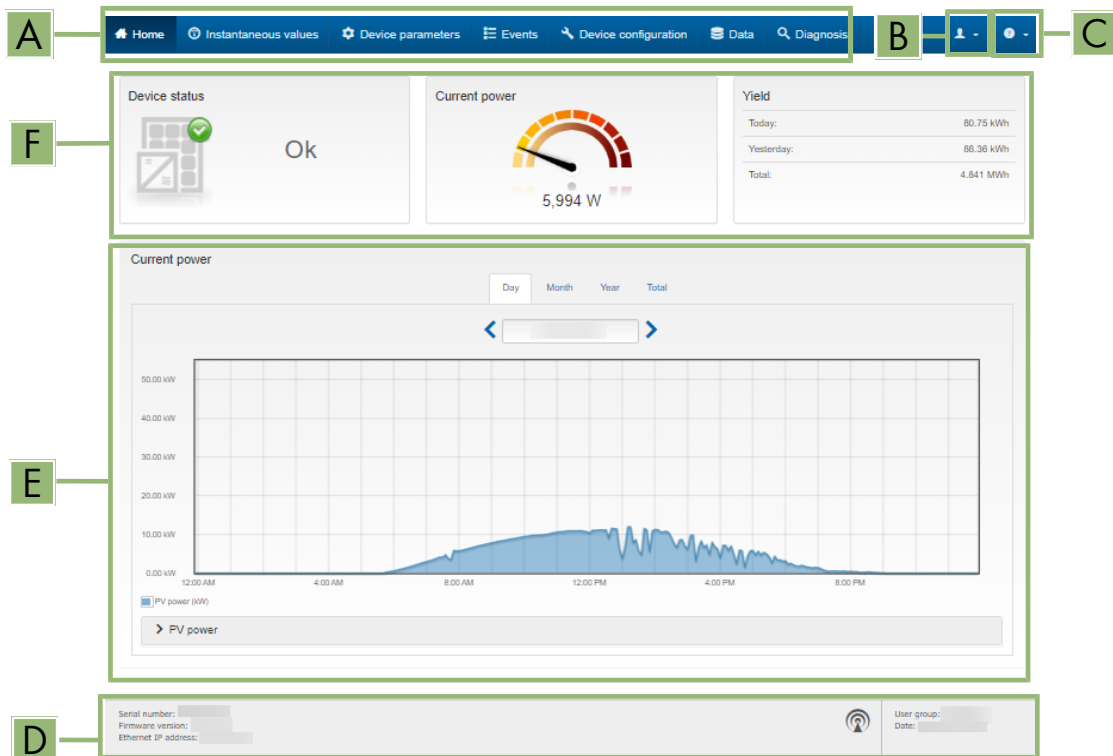


Figure 2: Design of the user interface's home page (example)

Position	Designation	Description
A	Menu	<p>Provides the following functions:</p> <ul style="list-style-type: none"> • Home Opens the user interface home page • 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. • Diagnosis Here, an I-V characteristic curve of the PV array per MPP tracker can be created and exported.
B	Help	<p>Provides the following functions:</p> <ul style="list-style-type: none"> • Displaying information on Open Source licenses used • Link to the website of SMA Solar Technology AG
C	Status bar	<p>Displays the following information:</p> <ul style="list-style-type: none"> • 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

Position	Designation	Description
D	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.
E	Status display	<p>The various areas display information on the current status of the PV system.</p> <ul style="list-style-type: none"> • 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.

4.4 Displaying and Downloading the Stored Data

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

Procedure:

1. Open the user interface (see Section 4.1, page 22).
2. Log into the user interface (see Section 4.2, page 25).
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**.

4.5 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 4.1, page 22).
2. Log in as **Installer** or **User**.

3. Select the menu **User Settings** (see Section 4.3, page 27) on the start page of the user interface.
 4. Select [**Smart Inverter Screen**].
- The Smart Inverter Screen has been activated.

4.6 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

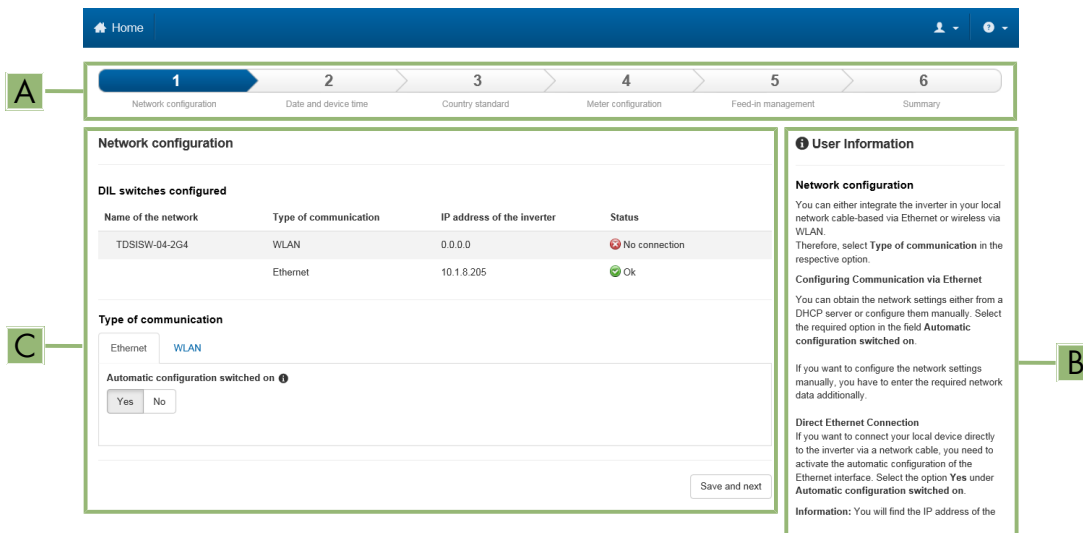


Figure 3: Layout of the installation assistant (example)

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:

- The SMA Grid Guard code must be available to change network-relevant parameters after the first 10 hours of feed-in operation, or after completing the installation assistant. You can request the SMA Grid Guard code via the Online Service Center.

Procedure:

1. Open the user interface (see Section 4.1, page 22).
 2. Log in as **Installer**.
 3. Select the menu **User Settings** (see Section 4.3, page 27) on the start page of the user interface.
 4. In the context menu, select [**Starting the installation assistant**].
- The installation assistant will open.

4.7 Activate WPS Function

The WPS function can be used for different purposes:

- Automatic connection to a network (e.g. via router)
- Direct connection between the product and a smart 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. Open the user interface (see Section 4.1, page 22).
 2. Log in as **Installer**.
 3. Start the installation assistant (see Section 4.6, page 30).
 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 smart device.

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

4.8 Switching WLAN On and Off

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

i Switching on the WLAN function only possible via Ethernet connection

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

The basic procedure for changing operating parameters is explained in another section (see Section 4.13, page 34).

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**.

4.9 Switching the Dynamic Power Display Off

As standard, the product 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 product. 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, page 34).

Procedure:

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

4.10 Changing the Password

The password for the product 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.

i 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. Open the user interface (see Section 4.1, page 22).
2. Log into the user interface (see Section 4.2, page 25).
3. Call up the menu **Device parameters**.
4. Click on **[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.

4.11 Generating or Changing a Product Key

If you have forgotten the product's password, you can use the product key to create a new one. The product key is stored only on the device. A lost product key cannot be recovered, it can only be recreated. Creating a product key is not mandatory, but is recommended by SMA Solar Technology AG because the product key significantly increases the security of the system.

Generating a product key for the first time

A product key must be generated for each of the groups **User** and **Installer**.

Procedure:

1. Open the user interface (see Section 4.1, page 22).
2. Log into the user interface as an **User** or **Installer** (see Section 4.2, page 25).
3. Select the menu **User settings**.
4. Select [**Access rights**].
5. Select [**Product key**].
6. Enter the specific device secret of the product. Which specific device secret is used and where you can find the specific device secret is indicated on the user interface.
7. Click on [**Generate**].
 - A string representing the product key is generated.
8. Write down the product key immediately and keep it safe. After leaving this page, the newly generated product key can no longer be displayed. The copy of the product key must be accessible only to you.

Generate new product key

If the product key has become accessible to unauthorized persons, you can generate a new product key at any time. To generate a new product key, the currently valid product key must be available.

Procedure:

1. Open the user interface (see Section 4.1, page 22).
2. Log into the user interface as an **User** or **Installer** (see Section 4.2, page 25).
3. Select the menu **User settings**.
4. Select [**Access rights**].
5. Select [**Product key**].
6. Enter the currently valid product key.
7. Click on [**Generate**].
 - A string representing the new product key is generated.
8. Write down the new product key immediately and keep it safe. After leaving this page, the newly generated product key can no longer be displayed. The previously valid product key is invalid after a new product key is generated. The copy of the product key must be accessible only to you.

4.12 Configuring the Service Access

In the event of a malfunction of the product, it may be necessary for a service user authorized by SMA Solar Technology AG to access the user interface of the product.

Service access must be activated to execute warranty services. If a quick and uncomplicated service intervention is to be enabled in an emergency, the service access must be permanently activated.

Service access can be activated or deactivated at any time.

Procedure:

1. Open the user interface (see Section 4.1, page 22).
2. Log into the user interface as an **User** or **Installer** (see Section 4.2, page 25).
3. Select the menu **User settings**.
4. Select [**Access rights**].
5. Select [**Service**].
6. Enable or disable service access using the drop-down list:
7. To activate service access permanently, click on [**Yes, permanently**] in the drop-down list.
8. To enable service access for a specific time, click on [**Yes, temporary**] in the drop-down list and adjust the expiration date if necessary.
9. To deactivate service access, click [**no**] in the drop-down list.
10. Click on [**Save**] to save the changes.

4.13 Changing Operating Parameters

The parameters of the inverter are set to certain values by default. You can change the 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. You can request the SMA Grid Guard code via the Online Service Center.

Requirements:

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

Procedure:

1. Open the user interface (see Section 4.1, page 22).
 2. Log into the user interface (see Section 4.2, page 25).
 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). In the menu, select **User Settings > 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 required parameters.
 8. Select [**Save all**] to save the changes.
- The parameters are set.

i Accepting the settings

Saving the made settings is indicated by an hourglass symbol on the user interface. If the DC voltage is sufficient, the data is transferred directly to the inverter and accepted. If the DC voltage is too low (e. g. in the evening), the settings are saved, but they cannot be directly transferred to or accepted by the inverter. As long as the inverter has not yet received and accepted the settings, the hourglass symbol will continue to be displayed on the user interface. The settings will be accepted when there is sufficient DC voltage applied and the inverter restarts. As soon as the hourglass symbol appears on the user interface, the settings have been saved. The settings will not be lost. You can log off of the user interface and leave the system.

4.14 Configuring the Country Data Set

⚠ QUALIFIED PERSON

By default, the inverter is set to a universally valid country data set. You will need to configure the country data set associated with the installation site and intended use before the product can begin operations. As long as no country data set is set, operation of the product will remain stopped. This state is signaled by the green and red LEDs flashing simultaneously. Once configuration of the product is completed, the product will start operating automatically.

The following tables provide an overview of the configurable country data sets based on the standards applicable in the location in question:

Standard	Configurable country data set
UL 1741 SA	[US] UL1741/2010/277
IEEE1547-2018/UL1741SB	[US] IEEE 1547:2018, Cat.B-II (from firmware version ≥ 4.1.1.R) [US] IEEE 1547:2018, Cat.B-III (from firmware version ≥ 4.1.1.R) [US] HECO SRD2.0 IEEE1547:2018 Cat.B-III (from firmware version ≥ 4.1.1.R)

The basic procedure for changing operating parameters is explained in another section (see Section 4.13, page 34).

Procedure:

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

4.15 Configuring the Active Power Mode

⚠ QUALIFIED PERSON

Starting the installation assistant

1. Open the user interface (see Section 4.1, page 22).
2. Log in as **Installer**.
3. Start the installation assistant (see Section 4.6, page 30).
4. Select [**Save and continue**] after each step up until the step **Grid management service**.
5. Make the settings as described in the following.

Make the settings for systems with external setpoint

1. In the tab **Active power mode** set the switch **Active power setpoint** to [**On**].
2. In the drop-down list **Operating mode active power setpoint**, select the entry **External setpoint**.
3. In the drop-down list **Fallback behavior**, select the entry **Apply fallback values**.
4. In the field **Fallback value of the maximum active power** enter the value to which the inverter is to limit its nominal power in case of a communication failure to the higher control unit at the end of the timeout time.
5. In the field **Timeout**, enter the time that the inverter is to wait before it limits its nominal power to the set fallback value.
6. If, in the event of a 0% or 0 W specification, the inverter is not permitted to feed small amounts of active power into the utility grid, select the entry **Yes** in the drop-down list **Grid disconnection for 0% active power setpoint**. This ensures that in the event of a 0% or 0 W specification, the inverter disconnects from the utility grid and does not feed in active power.

Make the settings for systems with manual setpoint

1. In the tab **Active power mode** set the switch **Active power setpoint** to [On].
2. In the **Operating mode active power setting** drop-down list, select **Manual setting in %** or **Manual setting in W** for the manual preset and enter the respective default value.

4.16 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 array that disconnects the PV array.
SunSpec Shutdown	For using PV array disconnect switch as per the SunSpec interoperability specification.
Off	The Rapid Shutdown function is disabled.

Procedure:

1. Open the user interface (see Section 4.1, page 22).
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 4.3, page 27).
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.

4.17 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, page 34).

Procedure:

1. Call up the menu **Device parameters**.
2. Click on [**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. In **Self-consumption** or **SelfCsmP** operating mode: 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 determines the power threshold at which a load is switched on.

5. In **Self-consumption** or **SelfCsmP** operating mode: 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 determines the minimum time for which the power must exceed the minimum switch-on power threshold before the load is switched on.
6. In **Self-consumption** or **SelfCsmP** operating mode: 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 determines the minimum time for which the load remains switched on.
7. In **Control via communication** or **ComCtl** operating mode: 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.
8. In **Battery bank** or **BatCha** operating mode: 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 determines the power threshold at which the battery is supposed to be charged.
9. In **Battery bank** or **BatCha** operating mode: 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 sets the minimum time which must elapse after charging the battery before battery charging can resume.
10. Select [**Save all**] to save the changes.

4.18 Configuring the Modbus Function

QUALIFIED PERSON

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

In order to access SMA inverters with SMA Modbus® or SunSpec® Modbus®, the Modbus interface must be enabled. After enabling 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.

Measures for data security during activated Modbus interface

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

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 deactivate the Modbus interface, reset the inverter to the default settings or deactivate the activated 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).

4.19 Setting SMA ShadeFix

QUALIFIED PERSON

You can set the time interval in which the inverter has to determine the optimum operating point and to optimize the MPP of the PV system. 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, page 34).

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 6 minutes. This value should only be increased if the shading situation changes extremely slowly.
- 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**.

4.20 Generating the I-V Characteristic Curve

QUALIFIED PERSON

During the measurement, the inverter can briefly interrupt the feed-in or feed in with reduced power. The duration of a measurement is approx. 20 seconds per MPP tracker. To avoid misuse of the function and thus yield loss, the measurement can be carried out a maximum of 10 times per day. If more than 10 measurements per day are to be carried out, the inverter must be restarted.

The measuring curve has over 200 measuring points. The display is from 0 V up to the maximum MPP voltage of the inverter. The current is limited by the maximum possible input current of the inverter.

The data is stored on the user interface until the next measurement.

Further information as well as help for the interpretation of the I-V-characteristic curve can be found in the technical information "I-V diagnostic function: Determination of the generator characteristic curve by the inverter for fault detection in the PV array".

Using the function when using external module optimizers is not recommended.

Using the function when using external module optimizers does not produce interpretable results and is therefore not recommended.

Requirements:

- In order to avoid misinterpretation of the determined characteristic curve at low powers, a measurement should be carried out at at least 50% of the inverter's nominal power.
- In the case of comparative measurements (e.g. at annual intervals), similar ambient conditions (solar irradiation, shading, temperature) should prevail.

Procedure:

1. Log on to the user interface of the inverter.
2. Click on **Diagnosis** in the menu.
3. Select the required MPP tracker.
4. Click on [**Start new measurement**].
5. Go to [**PDF export**] or [**CSV export**] to export the data shown.

4.21 Activating or Deactivating the Arc-Fault Circuit Interrupter (AFCI)

The basic procedure for changing operating parameters is explained in another section (see Section 4.13, page 34).

Deactivating the Arc-Fault Circuit Interrupter

Procedure:

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

Activating the Arc-Fault Circuit Interrupter with Operation Inhibition

When the arc-fault circuit interrupter is activated and an arc is detected, the inverter interrupts the feeding operation and operation is inhibited. The inhibited operation must be reset manually for the inverter to resume feeding into the grid (see Section 6.5, page 62).

The procedure for activation will vary depending on the country data set.

Procedure for country data sets in compliance with UL 1741 SA:

- Select the parameter **AFCI switched on** or **AfcilsOn** and set to **Yes**.

Procedure for country data sets in compliance with IEEE 1547-2018/UL1741SB:

1. Select the parameter **AFCI switched on** or **AfcilsOn** and set to **Yes**.
2. Set the parameter **Manual restart after arc fault detection** or **ManRstrAFCI** to **On**.

Activating the Arc-Fault Circuit Interrupter without Operation Inhibition

When the arc-fault circuit interrupter without operation inhibition is active and an electric arc is detected, the inverter interrupts the feed-in operation. No operation inhibition occurs. After a waiting period, the inverter starts automatically and checks whether the electric arc is still present. If the electric arc is still present, the inverter disconnects from the grid again and the process is repeated.

The procedure for activation will vary depending on the country data set.

Procedure for country data sets in compliance with UL 1741 SA:

- Select the parameter **AFCI switched on** or **AfcilsOn** and set to **Yes, without permanent operation inhibition**.

Procedure for country data sets in compliance with IEEE 1547-2018/UL1741SB:

1. Select the parameter **AFCI switched on** or **AfcilsOn** and set to **Yes, without permanent operation inhibition**.
2. Set the parameter **Manual restart after arc fault detection** or **ManRstrAFCI** to **Off**.

4.22 Activating and Setting String-Failure Detection

QUALIFIED PERSON

If you would like to use the string-failure detection, you will have to activate it.

You have the option of combining inputs with the same properties (e.g. shading, alignment or module type) in a group. A total of 3 groups are available. At least 2 inputs must be assigned per group.

You must set the sensitivity and tolerance for string-failure detection. You must also set the minimum time for which the tolerance must be exceeded before the inverter reports an event.

You can also set the activation threshold for string-failure detection to avoid an erroneous event message. In systems with a very inhomogeneous alignment of the PV modules, events of too low DC voltage or too low DC current can occur relatively frequently. If you increase the activation threshold, make sure that the string-failure detection only becomes active when there is sufficient DC power. In this way, you avoid erroneous event messages under unfavorable irradiation conditions.

You can carry out the activation and setting of the string-failure detection via the device parameters or using the installation assistant.

The activation threshold for the string-failure detection can only be set via the device parameters. The activation threshold is set to 20% of the inverter's nominal power by default.

Settings via device parameters

In the following table, you will find all parameters that are needed to activate and set the string-failure detection.

Object name	Parameter	Display group	Settings
Operation.StrFlt-Det.OpMod	Operating mode of the string-failure detection	DC side > Operation > String-failure detection > General operating mode	<ul style="list-style-type: none"> • Off • On
Operation.StrFlt-Det.ChGrp	String comparison group for string-failure detection	DC side > Operation > String-failure detection > Comparison group	<ul style="list-style-type: none"> • No Group (NoGrp) • Group 1 (Grp1) • Group 2 (Grp2) • Group 3 (Grp3)
Operation.StrFlt-Det.SnsLvl	Sensitivity of string-failure detection	DC side > Operation > String-failure detection > Sensitivity of the sensors	<ul style="list-style-type: none"> • Special setting (Adj) • Low (LowMod) • Normal (NrmMod) • High (HiMod)
Operation.StrFlt-Det.Tol	Tolerance of string-failure detection	DC side > Operation > String-failure detection > Tolerance	<ul style="list-style-type: none"> • 0% to 100%
Operation.StrFlt-Det.WrnTm	Time until string-failure detection warning	DC side > Operation > String-failure detection > Time until warning	<ul style="list-style-type: none"> • 5 min to 360 min
Operation.StrFlt-Det.WMinNom	Activation threshold for string-failure detection ¹⁾	DC side > Operation > String-failure detection > Nominal AC power	<ul style="list-style-type: none"> • 5% to 100%

Procedure:

1. Activate the user interface of the inverter.
2. Log into the user interface as an **Installer**.
3. Call up the menu **Device parameters**.
4. Click on **[Edit parameters]**.
5. Expand the display group that contains the parameter.
6. Set the parameter.
7. Select **[Save all]** to save the settings.

Configuration with the help of the installation assistant

Procedure:

1. Open the user interface (see Section 4.1, page 22).
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 4.3, page 27).
4. In the context menu, select **[Starting the installation assistant]**.

¹⁾ Parameter can exclusively be set via the device parameters.

5. Select [**Save and next**] until you reach the **String configuration** step.
6. Activate string-failure detection and making settings.
7. Select [**Save and next**].

4.23 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. Open the user interface (see Section 4.1, page 22).
2. Log into the user interface (see Section 4.2, page 25).
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.

4.24 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 4.23, page 41). 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. You can request the SMA Grid Guard code via the Online Service Center.

Procedure:

1. Open the user interface (see Section 4.1, page 22).
2. Log into the user interface as an **Installer** (see Section 4.2, page 25).
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.

4.25 Firmware Update

You can activate an automatic firmware update in the inverter or in the communication product.

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:

- Automatic Firmware Update (Recommended)
- 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.

4.25.1 Activating Automatic Firmware Update

QUALIFIED PERSON

You can activate the automatic firmware update in the inverter or in the communication product.

If the automatic firmware update is activated in the inverter, the inverter searches for updates and carries out the update.

If the automatic firmware update is activated in the communication product, the communication product searches for updates for the inverter and carries out the update of the inverter. In this case, the automatic firmware update is deactivated by default in the inverter. This prevents multiple downloads of updates.

In this section we describe how to activate the automatic firmware update in the inverter. The procedure for activating the automatic firmware update for detected devices in the communication product can be found in the manual for the communication product.

The basic procedure for changing operating parameters is explained in another section (see Section 4.13, page 34).

Procedure:

- In the parameter group **Device > Update**, select the **Automatic Update** parameter and set to **Yes**.

4.25.2 Updating Firmware with Update File via the User Interface

QUALIFIED PERSON

Requirements:

- An update file with the desired firmware of the product must be available. You can download the update file from the product page under www.SMA-Solar.com.

Procedure:

1. Open the user interface (see Section 4.1, page 22).
2. Log into the user interface as an **Installer** (see Section 4.2, page 25).
3. Click on **[Edit parameters]**.
4. Select the menu **Device Configuration**.
5. In the product row, click on the gear icon and select **Update firmware**.
6. Select **[Browse]** and select the update file for the product.
7. Select **Update firmware**.
8. Follow the instructions in the dialog.
9. Open the user interface and check the events to see whether the firmware update has been completed successfully.

4.25.3 Updating Firmware with Update File via the USB Flash Drive

QUALIFIED PERSON

Requirement:

- A USB flash drive with maximum 64 GB storage capacity 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 DC 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 manual at www.SMA-Solar.com).

- During start-up phase of the inverter, the desired firmware is being installed.

6.

⚠ DANGER**Danger to life due to high voltages**

- Disconnect the inverter from any voltage sources and open the enclosure lid of the DC Connection Unit (see the inverter installation manual).

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

8. Commission the inverter (see inverter manual at www.SMA-Solar.com).

9. Open the user interface and check the events to see whether the firmware update has been completed successfully.

10. If the firmware update has not been successfully completed, perform the firmware update again.

4.25.4 Searching for and Installing New Firmware via the User Interface

⚠ QUALIFIED PERSON**Requirement:**

- The inverter must be connected to the Internet.

Procedure:

1. Open the user interface (see Section 4.1, page 22).
 2. Log into the user interface as an **Installer** (see Section 4.2, page 25).
 3. Select the menu **Device Parameters**.
 4. Click on **[Edit parameters]**.
 5. Go to **Device > Update**.
 6. Select the parameter **Check for update and install it** and set it to **Execute**.
 7. Click on **[Save all]**.
- The firmware is updated in the background.

5 Clean the product

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.

Procedure:

- Ensure that the product is free of dust, leaves and other dirt.

6 Troubleshooting

6.1 Forgotten Password

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 PV 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).

Password forgotten for products with firmware version $\geq 4.00.00.R$

If you have forgotten the password for the inverter, you can unlock the inverter with your product key. If you have lost your product key, you can reset your password as described in (see Section 6.2, page 45).

If you have not yet generated the product key (see Section 4.1.1, page 33), you can unlock the product with a specific device secret.

Procedure:

1. Open the user interface (see Section 4.1, page 22).
2. Select the group **User** or **Installer**.
3. Click on [**Forgot your password?**].
4. Enter the product key. If you have not yet generated your product key, enter the specific device secret. Which specific device secret is used and where you can find the specific device secret is indicated on the user interface.
 - The page for generating a new password will open.
5. Generate a new password.
6. Click on [**Save**] to save the changes.

Password forgotten for products with firmware version $\leq 4.00.00.R$

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 1 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 4.1, page 22).
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.

6.2 Product Key Lost

If you have forgotten the password for the product and additionally lost the product key, use the procedure described below to generate a new password. The procedure requires physical access to the product.

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 PV 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).

Procedure:

1. Open the user interface (see Section 4.1, page 22).
2. Select the group **User** or **Installer**.
3. Click on **[Forgot your password?]**.
4. Click on **[Product key lost?]** wählen. If you have not yet generated a product key, the name of the specific device secret is displayed instead of **Product key**. In this case, click on **[### lost?]**.
5. Read the help text and enter a new password.
6. Select **[Next]**.
7. Perform one of the displayed actions within the specified time period.
 - A newly generated product key is displayed.
 - If the action performed was tapping the enclosure lid 2 times, the blue LED will flash rapidly.
8. Write down the new product key immediately and keep it safe. After leaving this page, the newly generated product key can no longer be displayed. The previously valid product key is invalid after a new product key is generated. The copy of the product key must be accessible only to you.
9. Select **[Login]**.
 - You are logged in on the user interface of the product.

6.3 Event Messages

Event number	Message, cause and corrective measures
101	<p>⚠ QUALIFIED PERSON</p> <p>Grid incident</p> <p>The grid voltage or grid impedance at the connection point of the inverter is too high. The inverter has disconnected from the utility grid.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range. <p>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.</p> <p>If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.</p>

Event number	Message, cause and corrective measures
301	<p>⚠ QUALIFIED PERSON</p> <p>Grid incident</p> <p>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.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"><li>• During the feed-in operation, check whether the grid voltage at the connection point of the inverter is permanently in the permissible range. <p>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.</p> <p>If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.</p>
401	<p>⚠ QUALIFIED PERSON</p> <p>Grid incident</p> <p>The inverter has disconnected from the utility grid. A stand-alone grid or a very large change in the grid frequency was detected.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"><li>• Check the grid connection for significant short-term frequency fluctuations.
501	<p>⚠ QUALIFIED PERSON</p> <p>Grid incident</p> <p>The power frequency is not within the permissible range. The inverter has disconnected from the utility grid.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"><li>• If possible, check the power frequency and observe how often fluctuations occur. <p>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.</p> <p>If the grid operator gives his approval, discuss any changes to the operating parameters with the Service.</p>
601	<p>⚠ QUALIFIED PERSON</p> <p>Grid incident</p> <p>The inverter has detected an excessively high proportion of direct current in the grid current.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"><li>• Check the grid connection for direct current.<li>• If this message is displayed frequently, contact the grid operator and check whether the monitoring threshold on the inverter can be raised.

Event number	Message, cause and corrective measures
801	<p>⚠ QUALIFIED PERSON</p> <p>Waiting for grid voltage > Grid failure > Check AC circuit breaker</p> <p>The AC cable is not correctly connected or the country data set is not correctly configured.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Ensure that the miniature 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. <p>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.</p> <p>If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.</p>
901	<p>⚠ QUALIFIED PERSON</p> <p>Grounding connection missing > Check connection</p> <p>The grounding conductor is not correctly connected.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Ensure that the grounding conductor is correctly connected.
3401 3402 3404 3407 3410 3411 3412	<p>⚠ QUALIFIED PERSON</p> <p>DC overvoltage > Disconnect PV array</p> <p>Overtoltage at the DC input. This can destroy the inverter.</p> <p>This message is signaled additionally by rapid flashing of the LEDs.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Immediately disconnect the inverter from all voltage sources. • Check whether the DC voltage is below the maximum input voltage of the inverter. If the DC voltage is below the maximum input voltage of the inverter, reconnect the DC connectors 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 Service.
3501	<p>⚠ QUALIFIED PERSON</p> <p>Insulation failure > Check generator</p> <p>The inverter has detected a ground fault in the PV system.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Check the PV system for ground faults.

Event number	Message, cause and corrective measures
3701	<p>⚠ QUALIFIED PERSON</p> <p>Residual current too high > Check PV array</p> <p>The inverter has detected a residual current through brief grounding of the PV array.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Check the PV system for ground faults.
3801	<p>⚠ QUALIFIED PERSON</p> <p>DC overcurrent > Check PV array</p> <p>Overcurrent at the DC input. The inverter briefly interrupts feed-in operation.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • If this message is displayed frequently, ensure that the PV array has been correctly rated and wired.
3802	
3803	
3805	
3806	
3807	
3808	
4301	<p>⚠ QUALIFIED PERSON</p> <p>Electric arc detected</p> <p>The arc-fault circuit interrupter has detected an electric arc. If the arc-fault circuit interrupter is activated using operation inhibition, the operation inhibition function must be reset manually.</p>
4302	
6002-6412	<p>⚠ QUALIFIED PERSON</p> <p>Self-diagnosis > Device disturbance</p> <p>The cause must be determined by the Service.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Contact the Service.
6502	<p>⚠ QUALIFIED PERSON</p> <p>Self-diagnosis > Overtemperature</p> <p>The inverter has switched off due to excessive temperature.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • 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 inverter is not exposed to direct solar irradiation.
6512	<p>Minimum operating temperature not reached</p> <p>The inverter will only recommence grid feed-in once the temperature has reached at least -25°C.</p>
6603	<p>⚠ QUALIFIED PERSON</p> <p>Self-diagnosis > Overload</p> <p>The cause must be determined by the Service.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Contact the Service.
6604	

Event number	Message, cause and corrective measures
6701	<div style="background-color: #cccccc; padding: 2px;">⚠ QUALIFIED PERSON</div>
6702	<p>Communication failure</p> <p>Error in the communication processor, the inverter continues feeding in, however. The cause must be determined by the Service.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • If this message is displayed frequently, contact the Service.
7102	<div style="background-color: #cccccc; padding: 2px;">⚠ QUALIFIED PERSON</div> <p>Parameter file not found or defective</p> <p>The parameter file was not found or is defective. Loading the parameter file has failed. The inverter continues to feed in.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Copy the parameter file to the correct folder again.
7105	<div style="background-color: #cccccc; padding: 2px;">⚠ QUALIFIED PERSON</div> <p>Parameter setting failed</p> <p>Parameters could not be set using the memory card. The inverter continues to feed in.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Ensure that the parameters are set correctly. • Ensure that you have an SMA Grid Guard code.
7106	<p>Update file defective</p> <p>The update file is defective. The update failed. The inverter continues to feed in.</p>
7110	<p>No update file found</p> <p>No new update file was found on the SD memory card. The update failed. The inverter continues to feed in.</p>
7112	<p>Update file successfully copied</p>
7113	<p>The memory card is full or write-protected</p>
7201	<p>Data storage not possible</p>
7202	
7303	<div style="background-color: #cccccc; padding: 2px;">⚠ QUALIFIED PERSON</div> <p>Host computer update failed</p> <p>The cause must be determined by the Service.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Contact the Service.
7320	<p>The device was successfully updated</p> <p>The firmware update was completed successfully.</p>

Event number	Message, cause and corrective measures
7330	<p>Condition test failed</p> <p>The testing of the update conditions was not successful. The firmware update package is not suitable for this inverter.</p>
7331	<p>Update transport started</p> <p>Update file is being copied.</p>
7332	<p>Update transport successful</p> <p>Update file was copied successfully to the inverter's internal memory.</p>
7333	<p>⚠ QUALIFIED PERSON</p> <p>Update transport failed</p> <p>Update file could not be copied to the inverter's internal memory. In the event of connection with the inverter via Wi-Fi network, a poor connection quality can be the cause.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Retry update. • For Wi-Fi connection: Improve the Wi-Fi connection quality (e.g. via Wi-Fi repeater) or establish connection with the inverter via Ethernet. • If this message is displayed again, contact the Service.
7341	<p>Update Bootloader</p> <p>The inverter is performing a bootloader update.</p>
7342	<p>⚠ QUALIFIED PERSON</p> <p>Update Bootloader failed</p> <p>The bootloader update failed.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Retry update. • If this message is displayed again, contact the Service.
7347	<p>⚠ QUALIFIED PERSON</p> <p>Incompatible file</p> <p>The configuration file is not suitable for this inverter.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Ensure that the selected configuration file is suitable for this inverter. • Retry import.
7348	<p>⚠ QUALIFIED PERSON</p> <p>Incorrect file format</p> <p>The configuration file is not of the required format or is damaged.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Ensure that the selected configuration file is of the required format and is not damaged. • Retry import.

Event number	Message, cause and corrective measures
7350	<p>Transfer of a configuration file has started</p> <p>The configuration file is being transferred.</p>
7351	<p>Update Wi-Fi</p> <p>The inverter is updating the Wi-Fi module.</p>
7352	<p>Update of Wi-Fi not successful</p> <p>The update of the Wi-Fi module failed.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Retry update. • If this message is displayed again, contact the Service.
7353	<p>Update time zone database</p> <p>The inverter is updating the time zone database.</p>
7354	<p>⚠ QUALIFIED PERSON</p> <p>Update of time zone database not successful</p> <p>The update of the time zone database failed.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Retry update. • If this message is displayed again, contact the Service.
7355	<p>Update WebUI</p> <p>The inverter is updating the inverter user interface.</p>
7356	<p>⚠ QUALIFIED PERSON</p> <p>Update of the WebUI not successful</p> <p>The update of the inverter user interface failed.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Retry update. • If this message is displayed again, contact the Service.
7619	<p>⚠ QUALIFIED PERSON</p> <p>Communication fault with meter unit > Check communication to meter</p> <p>The inverter is not receiving any data from the energy meter.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Ensure that the energy meter is correctly integrated into the same network as the inverter (see energy meter manual). • For Wi-Fi connection: Improve the Wi-Fi connection quality (e.g., via Wi-Fi repeater) or connect the inverter with the DHCP server (router) via Ethernet.
7622	<p>No communication with the I/O module</p> <p>This event is displayed during a device-internal communication error with the SMA I/O Module. The inverter will disconnect from the utility grid for safety reasons.</p>

Event number	Message, cause and corrective measures
7702	<p>⚠ QUALIFIED PERSON</p> <p>Device fault</p> <p>The cause must be determined by the Service.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Contact the Service.
7801	<p>⚠ QUALIFIED PERSON</p> <p>Fault overvoltage protector</p> <p>One or more surge arresters have tripped or one or more surge arresters are not inserted correctly.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Ensure that the surge arrester is inserted correctly. <li>• If surge arresters have tripped, replace the tripped surge arresters with new surge arresters.
8003	<p>⚠ QUALIFIED PERSON</p> <p>Active power limit Temperature</p> <p>The inverter has reduced its power output for more than 10 minutes due to excessive temperature.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Clean the cooling fins on the rear of the enclosure and the air ducts on the top using a soft brush. <li>• Ensure that the inverter has sufficient ventilation. <li>• Ensure that the ambient temperature +35 °C (95 °F) has not been exceeded. <li>• Ensure that the inverter is not exposed to direct solar irradiation.
8101	⚠ QUALIFIED PERSON
8102	Communication failure
8103	The cause must be determined by the Service.
8104	<p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Contact the Service.
8208	<p>⚠ QUALIFIED PERSON</p> <p>Self-test for arc fault detection: interference level too high</p> <p>An error has occurred during the self-test of the arc-fault circuit interrupter. The cause must be determined by the Service.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Contact the Service.

Event number	Message, cause and corrective measures
8209	<p>⚠ QUALIFIED PERSON</p> <p>Self-test for arc fault detection: interference level too low</p> <p>An error has occurred during the self-test of the arc-fault circuit interrupter. The cause must be determined by the Service.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Contact the Service.
9002	<p>⚠ QUALIFIED PERSON</p> <p>SMA Grid Guard code invalid</p> <p>The SMA Grid Guard code entered is incorrect. The operating parameters are still protected and cannot be changed.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Enter the correct SMA Grid Guard code.
9003	<p>Grid parameters locked</p> <p>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.</p>
9005	<p>⚠ QUALIFIED PERSON</p> <p>Changing of grid parameters not possible > Ensure DC supply</p> <p>This error can have the following causes:</p> <ul style="list-style-type: none"> • The parameters to be changed are protected. • The DC voltage at the DC input is not sufficient to run the main CPU. <p>Corrective measures:</p> <ul style="list-style-type: none"> • Enter the SMA Grid Guard code. • Ensure that at least the DC start voltage is available (green LED is flashing, pulsing or glowing).
9007	<p>⚠ QUALIFIED PERSON</p> <p>Abort self-test</p> <p>The self-test (Italy only) was terminated.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Ensure that the AC connection is correct. • Restart the self-test.
9033	<p>Rapid Shutdown was triggered</p> <p>The inverter detected the triggering of a Rapid Shutdown. The AC side of the inverter was disconnected.</p>

Event number	Message, cause and corrective measures
9034	<p>⚠ QUALIFIED PERSON</p> <p>Error in Rapid Shutdown System</p> <p>This message can have the following causes:</p> <ul style="list-style-type: none"> <li>• The Rapid Shutdown Function was not correctly configured. <li>• The PV array could not be correctly disconnected. Voltage can be applied to the DC inputs of the inverter. <li>• The standby voltage of all PV array disconnect switches of a string is > 30 V. <p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Check the configuration of the Rapid Shutdown function and ensure that the operating mode selected is selected according to the DC disconnection unit used. <li>• Check the functionality of the PV array disconnect switches. <li>• Check the standby voltage of the PV array disconnect switches used and ensure that the standby voltage of all PV array disconnect switches of a string < 30 V.
9035	<p>Rapid Shutdown successful</p> <p>The voltage at the DC inputs and at the AC output of the inverter was successfully discharged.</p>
9037	<p>⚠ QUALIFIED PERSON</p> <p>Generator connection not carried out</p> <p>The PV array disconnect switches did not connect the PV generator.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Check the functionality of the SunSpec-compliant PV array disconnect switches.
9038	<p>⚠ QUALIFIED PERSON</p> <p>Redundant Rapid Shutdown discharge function not ensured</p> <p>The cause must be determined by the Service.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Contact the Service.
10108	Time adjusted / old time
10109	Time adjusted / new time
10110	<p>⚠ QUALIFIED PERSON</p> <p>Time synchronization failed: [xx]</p> <p>No time information could be called up from the set NTP server.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Ensure that the NTP server was configured correctly. <li>• Ensure that the inverter is integrated into a local network with Internet connection.
10118	<p>Parameter upload complete</p> <p>The configuration file was loaded successfully.</p>

Event number	Message, cause and corrective measures
10248	<p>⚠ QUALIFIED PERSON</p> <p>[Interface]: network busy</p> <p>The network is busy. Data exchange between the devices is not at an optimum and is greatly delayed.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Increase the query intervals. <li>• If necessary, reduce the number of devices in the network.
10249	<p>⚠ QUALIFIED PERSON</p> <p>[Interface]: network overloaded</p> <p>The network is overloaded. There is no data exchange between the devices.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Reduce the number of devices in the network. <li>• If necessary, increase the data query intervals.
10250	<p>⚠ QUALIFIED PERSON</p> <p>[Interface]: package error rate [ok / high]</p> <p>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 impaired.</p> <p>Corrective measures if the package error rate is high:</p> <ul style="list-style-type: none"> <li>• Ensure that with an Ethernet connection, the network cable and the network connector are not damaged and that the network connectors are correctly plugged. <li>• If necessary, increase the data query intervals. <li>• If necessary, reduce the number of devices in the network.
10251	<p>[Interface]: communication status goes to [OK / Warning / Error / Not connected]</p> <p>The communication status to the network switch or DHCP server (router) has changed. An additional error message may be displayed.</p>
10252	<p>⚠ QUALIFIED PERSON</p> <p>[Interface]: communication disrupted</p> <p>There is no valid signal on the network line.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> <li>• Ensure that with an Ethernet connection, the network cable and the network connector are not damaged and that the network connectors are correctly plugged. <li>• Ensure that the DHCP server (router) and any network switches are signaling correct operation.

Event number	Message, cause and corrective measures
10253	<p>⚠ QUALIFIED PERSON</p> <p>[Interface]: connection speed goes to [100 Mbit / 10 Mbit]</p> <p>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.</p> <p>Corrective measures if the status is [10 Mbit]:</p> <ul style="list-style-type: none">• 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 signaling correct operation.
10254	<p>⚠ QUALIFIED PERSON</p> <p>[Interface]: duplex mode goes to [Full / Half]</p> <p>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.</p> <p>Corrective measures if the status is [Half]:</p> <ul style="list-style-type: none">• 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 signaling correct operation.
10255	<p>⚠ QUALIFIED PERSON</p> <p>[Interface]: Network load OK</p> <p>The network load has returned to a normal range after being busy.</p>
10282	<p>[User group]-Login via [protocol] locked</p> <p>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.</p> <p>Corrective measures:</p> <ul style="list-style-type: none">• Wait until the given time has expired and then retry login.
10283	<p>⚠ QUALIFIED PERSON</p> <p>Wi-Fi module faulty</p> <p>The Wi-Fi module integrated in the inverter is defective.</p> <p>Corrective measures:</p> <ul style="list-style-type: none">• Contact the Service.

Event number	Message, cause and corrective measures
10284	<p>⚠ QUALIFIED PERSON</p> <p>No Wi-Fi connection possible</p> <p>The inverter does not currently have a Wi-Fi connection to the selected network.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Ensure that the SSID, the Wi-Fi password and the encryption method have been entered correctly. The encryption method is specified by your Wi-Fi router or Wi-Fi access point and can be changed there. • Ensure that the Wi-Fi router or Wi-Fi access point is in range and is signaling correct operation. • If this message is displayed often, improve the Wi-Fi connection by using a Wi-Fi repeater.
10285	<p>Wi-Fi connection established</p> <p>Connection to the selected Wi-Fi network has been established.</p>
10286	<p>⚠ QUALIFIED PERSON</p> <p>Wi-Fi connection lost</p> <p>The inverter has lost Wi-Fi connection to the selected network.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Ensure that the Wi-Fi router or Wi-Fi access point is still active. • Ensure that the Wi-Fi router or Wi-Fi access point is in range and is signaling correct operation. • If this message is displayed often, improve the Wi-Fi connection by using a Wi-Fi repeater.
10339	Webconnect enabled
10340	Webconnect disabled
10431	I-V curve measurement successfully carried out
10502	Active power limit AC frequency
10513	<p>Grid management service Fast stop: Stop by system control is executed</p> <p>This event is generated by the monitoring relay of the monitoring unit when the grid and PV system protection device is triggered. The inverter disconnects from the utility grid.</p>
10901	Start self-test xx
10902	Current disconnection limit for voltage increase protection xxx V
10903	Current disconnection limit for voltage monitoring lower maximum threshold xxx V
10904	Current disconnection limit for voltage monitoring upper minimum threshold xxx V
10905	Current disconnection limit for voltage monitoring middle minimum threshold xxx V

Event number	Message, cause and corrective measures
10906	Current disconnection limit for frequency monitoring switchable maximum threshold xxx Hz
10907	Current disconnection limit for frequency monitoring switchable minimum threshold xxx Hz
10908	Current disconnection limit for frequency monitoring lower maximum threshold xxx Hz
10909	Current disconnection limit for frequency monitoring upper minimum threshold xxx Hz
10910	Measured disconnection threshold for the running test point xxx xx
10911	Standard value for the running test point xxx xx
10912	Measured disconnection time for the running test point xx s
27103	Set parameter The parameter changes are being adopted.
27104	Parameters set successfully The parameter changes were successfully adopted.
27107	Update file OK The update file found is valid.
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.
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 10 feed-in hours.
29004	Grid parameter unchanged Changing the grid parameters is not possible.

6.4 Checking the PV System for Ground Faults

⚠ QUALIFIED PERSON

⚠ 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 ensure it cannot be reconnected before working on the device.
- Only touch the cables of the PV modules on their insulation.
- 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 5 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 1000 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.

If PV module switches are installed that comply with the SunSpec communication signal for Rapid Shutdown systems, the voltage measurement can be taken as described. After the inverter is disconnected, the PV module switches no longer receive the "Permission-to-Operate" signal and output a standby voltage instead of the module voltage as per their specification. The respective string voltage can be determined via the standby voltage. When calculating the ground fault location, the module voltage must be replaced with the standby voltage as specified by the PV module switch.

Procedure:

1.

⚠ DANGER

Danger to life due to high voltages

- Disconnect the inverter from any voltage sources (see the inverter installation manual).

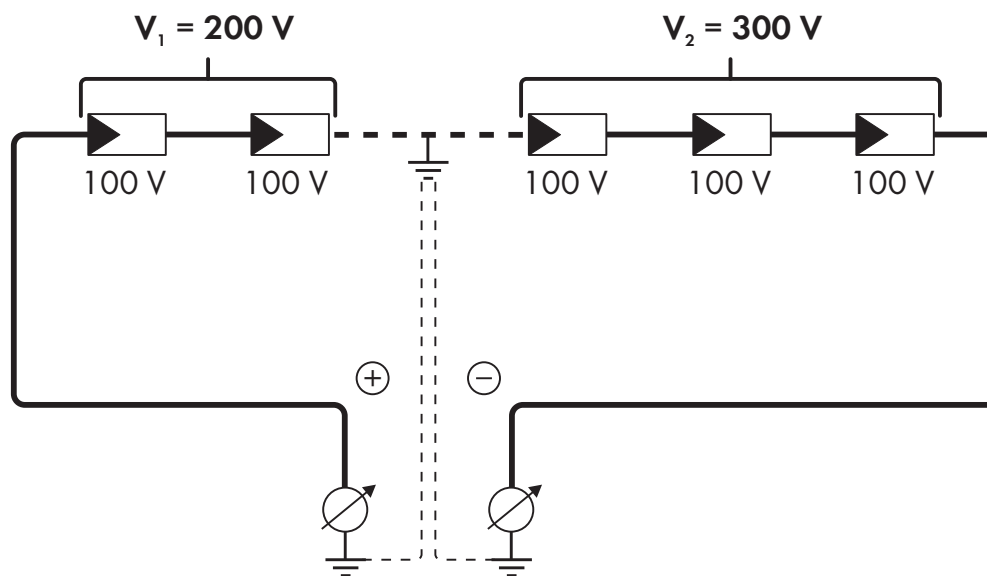
2. Measure the voltage between the positive terminal and the ground potential (PE).
3. Measure the voltage between the negative terminal and the ground potential (PE).

4. Measure the voltage between the positive and negative terminals.
5. 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.
6. 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.
7. If a definite ground fault cannot be measured and the message is still displayed, measure the insulation resistance.
8. 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.

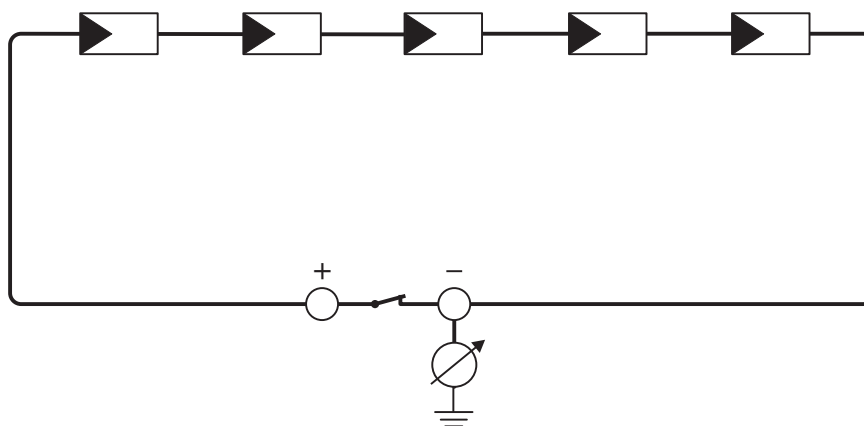


Figure 4: Schematic diagram of the measurement

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:

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

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 66). The PV modules might not be suitable for the inverter in the present quantity.

6.5 Resetting the Operation Inhibition after Detection of an Arc Fault

⚠ QUALIFIED PERSON

If the red LED is glowing and the event number **4301** or **4302** is shown in the event list on the user interface of the inverter, the inverter has detected an electric arc and interrupts feed-in operation.

Procedure:

1.

⚠ DANGER**Danger to life due to electric shock**

- Disconnect the inverter from any voltage sources (see the inverter installation manual).

2. Ensure that the PV modules, the connected DC cables and the terminal block for the DC connection are not defective.
 3. Repair or replace defective PV modules, DC cables or terminal block for the DC connection.
 4. Recommission the inverter (see inverter installation manual).
 5. Open the user interface (see Section 4.1, page 22).
 6. Log into the user interface as an **Installer** (see Section 4.2, page 25).
 7. To reset the operation inhibition, select the parameter **Reset operating data** and set it to **Reset operation inhibition** or select the parameter **AFCI switched on** and set it to **No** and then back to **Yes**.
- This effects resetting of the operation inhibition and the inverter will start feeding in again.

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 Sensor Module	Interface for one SMA inverter as retrofit kit for capturing environmental data (e.g. solar irradiation, ambient temperature, cell temperature, wind speed or SO meters).	MD.SEN-US-40
Universal mounting system	For wall mounting or as a platform for higher mounting of the inverter on the ground	UMS_KIT-10
SMA 485 Module	Interface for establishing cable-bound communication via RS485	MD.485-US-40

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 A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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 A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A 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

You can find your country's contact information at:



<https://go.sma.de/service>

ENERGY
THAT
CHANGES



www.SMA-Solar.com

