System Manual



SMA Home Storage Solution with secure power supply function - Generate solar power, store and use it effectively

The solution for the flexible and effective use of solar energy with added peace of mind in the event of power outage with Sunny Boy Smart Energy, SMA Energy Meter or Sunny Home Manager 2.0, secure power supply function and battery

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Software licenses

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

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1 Information on this Document

1.1 Validity

This document is valid for:

- SMA Home Storage Solution with Sunny Boy Smart Energy, SMA Energy Meter or Sunny Home Manager 2.0, secure power supply operation and battery

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 to safely disconnect SMA inverters
- Knowledge of how an inverter works and is operated
- Knowledge of how batteries work and are operated
- Knowledge of how battery-backup and secure power supply operation works in PV systems and is set up
- Knowledge of how energy meters work and are operated
- Training to deal with risks associated with installing, repairing, and using electrical devices, inverters, and batteries
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of all applicable laws, regulations, standards, and directives
- Knowledge of and compliance with this document and all safety information
- Knowledge of and compliance with the documents of the battery manufacturer with all safety information

1.3 Content and Structure of this Document

This document summarizes the specific information for the system and describes the procedure for installation and commissioning.

Circuitry overviews provide the basic principle of how a system must be set up and connected.

The latest version of this document and additional information about the SMA products can be found in PDF format and as an eManual at www.SMA-Solar.com. You can also call up the eManual via the user interface of the inverter.

This document supplements the documents that are enclosed with each product and does not replace any locally applicable codes or standards. Read and observe all documents supplied with 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

Symbol	Explanation
	Information that is important for a specific topic or goal, but is not safety-relevant
☐	Indicates a requirement for meeting a specific goal
☑	Required result
	Example

1.6 Typographies in the document

Typography	Use	Example
bold	• Messages • Terminals • Elements on a user interface • Elements to be selected • Elements to be entered	• Connect the insulated conductors to the terminals **X703:1** to **X703:6**. • Enter **10** in the field **Minutes**.
>	• Connects several elements to be selected	• Go to **Settings > Date**.
[**Button**] [**Key**]	• Button or key to be selected or pressed	• Select [**Enter**].
#	• Placeholder for variable components (e.g., parameter names)	• Parameter **WCtlHz.Hz#**

1.7 Designations in the Document

Complete designation	Designation in this document
SMA Home Storage Solution	System
Sunny Boy Smart Energy	Inverter, hybrid inverter
SMA Energy Meter	Energy meter
Sunny Home Manager 2.0	Energy meter, communication product

1.8 Additional Information

Additional information is available at www.SMA-Solar.com.

Title and information content	Type of information
"PUBLIC CYBER SECURITY - Guidelines for a Secure PV System Communication"	Technical Information
"Commissioning and configuration of reactive power control of systems in the low-voltage grid in accordance with VDE-AR-N-4105"	Technical Information
"SMA GRID GUARD 10.0 - Grid Management Services via Inverter and System Controller"	Technical Information
"Efficiency and Derating" Efficiency and derating behavior of the SMA inverters	Technical Information
"Compatibility between common grid configurations and SMA inverters and SMA charging stations"	Technical Information
"Parameters and Measured Values" Device-specific overview of all parameters and measured values and their setting options Information about the SMA Modbus registers	Technical Information
"Approved Batteries and Information on Battery Communication Connection" Overview of approved batteries	Technical Information
"SMA Modbus ®-interface - ennexOS" Information on the SMA Modbus interface	Technical Information
"SunSpec Modbus ®-interface - ennexOS" Information about the SunSpec Modbus interface and supported information models	Technical Information

2 Safety

2.1 Intended Use

The SMA Energy Solution Home is a PV and storage system and optimizes self-consumption of PV energy and lowers the energy obtained from the utility grid by the following measures:

- Use of self-generated PV energy
- Intermediate storage of PV energy in the battery
- Energy management of the battery either with the inverter as System Manager and the SMA Energy Meter or the inverter as a subordinate device and the Sunny Home Manager
- Visualization of consumption and generation data from the system in the SMA Energy App, in Sunny Portal, and in the SMA 360° app
- Use of self-generated PV energy for selected loads in the event of power outage

The power measured at the point of interconnection is recorded using either the SMA Energy Meter or the Sunny Home Manager. The product used does not replace the energy meter of the electric utility company.

The SMA Energy Solution Home is equipped by default with a manual secure power supply function. When needed, for example in case of a power outage, the inverter can continue to supply electric current from the battery and the PV system to selected loads by means of a socket connected to the inverter.

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

The products by SMA Solar Technology AG are not suitable for use in

- Medical devices, in particular products for supplying life-support systems and machines,
- Aircraft, the operation of aircraft, the supply of critical airport infrastructure and airport systems,
- Rail vehicles, the operation and supply of rail vehicles and their critical infrastructure.

The above list is not exhaustive. Contact us if you are unsure whether products by SMA Solar Technology AG are suitable for your application.

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

Use 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 other than that described in the Intended Use section does not qualify as appropriate.

The documentation supplied is an integral part of SMA products. 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.

Sunny Boy Smart Energy:

The Sunny Boy Smart Energy is a single-phase, transformerless hybrid inverter with 3 PV inputs and a battery connection. The inverter feeds the direct current from the PV modules into the connected battery or converts it to grid-compliant alternating current and then feeds it into the utility grid. The Sunny Boy Smart Energy also converts the direct current supplied by the battery into grid-compliant alternating current. In a system with additional PV inverters, the Sunny Boy Smart Energy can convert the alternating current generated by the PV inverters into direct current and feed it into the battery.

The product is intended for use in residential and industrial environments.

The product must only be used as stationary equipment.

The product is suitable for indoor and outdoor use.

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

The product is not equipped with an integrated transformer and therefore has no galvanic isolation. The product must not be operated with PV modules or batteries whose outputs are grounded. This can cause the product to be destroyed. The product may be operated with PV modules whose frame is grounded. The product may be operated with batteries whose enclosure is grounded.

PV modules with a high capacity to ground must only be used if the coupling capacity of all PV modules does not exceed 1.54 µF (for information on how to determine the coupling capacity, see the Technical Information "Leading Leakage Currents" at www.SMA-Solar.com).

The product must only be operated in connection with an intrinsically safe lithium-ion battery approved by SMA Solar Technology AG. An updated list of the batteries approved by SMA Solar Technology AG can be found in the technical information "Approved Batteries and Information on Battery Communication Connection" at www.SMA-Solar.com.

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

The 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.

⚠ DANGER

Danger to life due to electric shock when live components or DC cables are touched

The DC cables connected to a battery or a PV module may be live. Touching live DC cables results in death or serious injury due to electric shock.

- Disconnect the system from voltage sources and make sure it cannot be reconnected before working on the device.
- Observe all safety information of the battery manufacturer.
- Do not touch non-insulated parts or cables.
- Do not pull the DC conductors under load out of the terminal blocks.
- Wear suitable personal protective equipment for all work on the product.

⚠ DANGER

Danger to life due to electric shock from touching an ungrounded PV module or array frame

Touching ungrounded PV modules or array frames results in death or lethal injuries due to electric shock.

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

⚠ 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 system from voltage sources and make sure 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.
- Once disconnected from voltage sources, wait five minutes before touching any parts of the PV system or the system.

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

⚠ WARNING

Danger to life due to fire and deflagration

In rare cases, an explosive gas mixture can be generated inside the inverter under fault conditions. In this state, switching operations can cause a fire and, in very rare cases, a deflagration inside the inverter. Death or lethal injuries due to the spread of a fire can result.

- In case of failure, do not perform any direct actions on the inverter.
- In case of failure, ensure that unauthorized persons have no access to the product.
- In case of failure, disconnect the PV module 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.
- In case of failure, disconnect the battery from the inverter via an external disconnection device. Do not operate the DC load-break switch on the inverter.
- In the event of a fault, disconnect the AC circuit breaker, or keep it disconnected in case it has already tripped, and secure it against reconnection.

⚠ WARNING

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

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

- Only perform work on the inverter and battery (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 system.

⚠ WARNING

Danger to life due to fire or explosion when batteries are fully discharged

A fire may occur due to incorrect charging of fully discharged batteries. This can result in death or serious injury.

- Before commissioning the system, verify that the battery is not fully discharged.
- Do not commission the system if the battery is fully discharged.
- If the battery is fully discharged, contact the battery manufacturer for further proceedings.
- Only charge fully discharged batteries as instructed by the battery manufacturer.

⚠ WARNING

Danger to life due to burns caused by electric arcs through short-circuit currents

Short-circuit currents in the battery can cause heat build-up and electric arcs. Heat build-up and electric arcs may result in lethal injuries due to burns.

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

⚠ 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 measurement ranges designed for the maximum AC and DC voltage of the inverter.
- Only use measuring devices with measurement ranges designed for the maximum DC voltage of the battery.

⚠ CAUTION

Risk of burns due to hot inverter enclosure parts

Some parts of the inverter enclosure can get hot during operation. Touching hot enclosure parts can result in burn injuries.

- During operation, do not touch any parts other than the enclosure lid of the inverter.
- Wait until the inverter has cooled down before touching the enclosure.

NOTICE

Damage to the system due to sand, dust and moisture ingress

Sand, dust and moisture penetration can damage the products of the system and impair its functionality.

- Only open the inverter if the humidity is within the thresholds and the environment is free of sand and dust.
- Do not open the inverter during a dust storm or precipitation.
- Close the inverter in case of interruption of work or after finishing work.
- Only operate the inverter in a closed state.
- Close all enclosure openings of the inverter tightly.
- Only use listed rain-tight conduit fittings or conduit fittings for wet locations to attach the conduits to the inverter.

NOTICE

Damage to the enclosure seal in subfreezing conditions

If you open the inverter when temperatures are below freezing, the enclosure seals can be damaged. This can lead to moisture entering the inverter.

- Only open the inverter 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 inverter (e.g. by melting the ice with warm air).
- If the inverter must be opened in freezing conditions, make sure that the DC load-break switch is free of ice.

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.

DHCP Server is recommended

The DCHP server automatically assigns the appropriate network settings to your nodes in the local network. A manual network configuration is therefore not necessary. In a local network, the Internet router is usually the DHCP server. If the IP addresses in the local network are to be assigned dynamically, DHCP must be activated in the Internet router (see the Internet router manual). In order to receive the same IP address by the internet router after a restart, set the MAC address binding.

In networks where no DHCP server is active, proper IP addresses must be assigned from the free address pool of the network segment to all network participants to be integrated during commissioning.

Communication disturbances in the local network

The IP address range 192.168.12.0 to 192.168.12.255 is occupied for communication amongst SMA products and for direct access to SMA products.

Communication problems might occur if this IP address range is used in the local network.

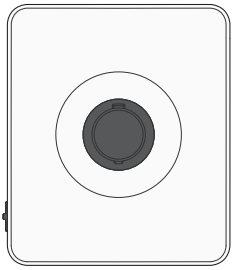
- Do not use the IP address range 192.168.12.0 to 192.168.12.255 in the local network.

2.3 Approved PID Boxes

Only PID Boxes (Potential Induced Degradation Boxes) that galvanically isolate the inverter and the PV modules from each other may be used with the Sunny Boy Smart Energy.

3 System Components

3.1 Sunny Boy Smart Energy

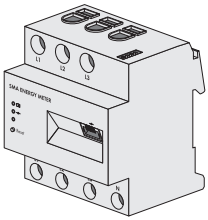


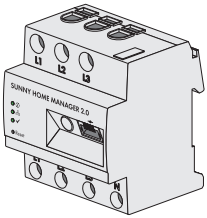
In systems with multiple inverters and with one SMA Energy Meter, 1 Sunny Boy Smart Energy must be used as a System Manager, making it the central device for energy management in households with a PV system for self-consumption. The Sunny Boy Smart Energy as System Manager can perform the following tasks:

- Managing the energy flows in the system
- Energy management of a total of 3 Sunny Boy Smart Energy with battery
- Incorporating PV and battery power into the system

In systems with Sunny Home Manager, the Sunny Home Manager is the central device for energy management. All inverters in a system with Sunny Home Manager must be configured as subordinate devices.

3.2 SMA Energy Meter or Sunny Home Manager





Either an SMA Energy Meter or a Sunny Home Manager can be used in the system.

Both products record energy flows bidirectionally at the point of interconnection.

The Sunny Boy Smart Energy as System Manager can perform the following tasks together with the energy meter:

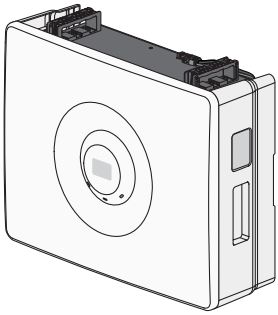
- Collection of energy- and power measured values in the interconnected household
- Energy monitoring: display energy flows via the SMA Energy App and Sunny Portal powered by ennexOS
- Dynamic limiting of the active power feed-in

When a Sunny Home Manager is used, it is the central device for energy management and performs the following tasks:

- Monitoring and forecasting energy flows in the system
- Optimized self-consumption through load control
- Increased self-consumption for dynamic active power limitation
- Increased self-consumption through forecast-based battery charging
- Increased Self-Consumption and Peak Load Shaving

Only 1 battery inverter or hybrid inverter can be used in systems with Sunny Home Manager.

3.3 SMA Home Storage

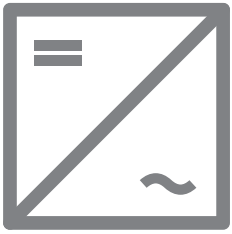


The SMA Home Storage performs the following tasks in the system:

- Storage of surplus energy from the PV system
- Optimization of self-consumption or energy self-sufficiency in parallel grid operation through the energy in intermediate storage
- Supply loads with temporarily stored energy in secure power supply operation in the event of a grid failure or at night when the PV system is not supplying any energy

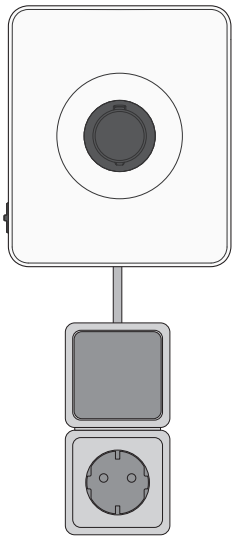
As an alternative to SMA Home Storage, other approved batteries can also be used in the system. An updated list of the batteries approved by SMA Solar Technology AG can be found in the technical information "Approved Batteries and Information on Battery Communication Connection" at www.SMA-Solar.com.

3.4 Additional PV inverters



The system contains additional PV inverters that convert the direct current from the PV modules into grid-compliant alternating current. The hybrid inverter can convert the power generated by the PV inverters into direct current and feed it to the battery. In secure power supply and battery-backup operation, power generated by additional PV inverters cannot be used.

3.5 Secure Power Supply Operation



The Sunny Boy Smart Energy is equipped with a manual secure power supply function. In the event of a power outage, the inverter can continue to supply selected consumers with power from the batteries and PV modules present in the system. The loads are connected to the inverter via a socket. The secure power supply operation is started manually, if needed, via a switch connected to the inverter. The secure power supply operation can be activated when AC voltage is no longer being applied to the inverter. Switch and socket are not sold by SMA Solar Technology AG. When AC voltage is applied to the inverter again, the secure power supply operation must be deactivated manually via the switch and the loads connected to another energy source.

4 Device function of Sunny Boy Smart Energy

In systems with multiple inverters, you have the option of using and configuring the Sunny Boy Smart Energy either as a System Manager or as a subordinate inverter.

When using a Sunny Boy Smart Energy as a System Manager, you can integrate up to 5 additional devices (e.g. 3 Sunny Boy Smart Energy, 1 PV inverter and 1 energy meter) into one system. It is important to note that there may be a maximum of 3 batteries in the system.

Only 1 Sunny Boy Smart Energy can be used in systems with Sunny Home Manager. The Sunny Boy Smart Energy must be configured as subordinate inverter.

You can set the device function using the commissioning wizard.

Inverter as System Manager

If you configure the inverter as System Manager, the inverter as a higher-level device in conjunction with an energy meter takes over the control at the point of interconnection. The inverter can control other subordinate devices, takes over the monitoring of the system and the communication to the Sunny Portal powered by ennexOS.

Inverter as subordinate

If you configure the inverter as a subordinate device, there is no independent closed-loop control or open-loop control at the point of interconnection. The subordinate inverter receives specifications from a superordinate device (e.g. inverter as System Manager or Sunny Home Manager) and implements them. It should be noted that the Sunny Home Manager cannot be used for reactive power control of the subordinate inverters.

5 System Overview

5.1 SMA Home Energy Solution with Sunny Boy Smart Energy as System Manager

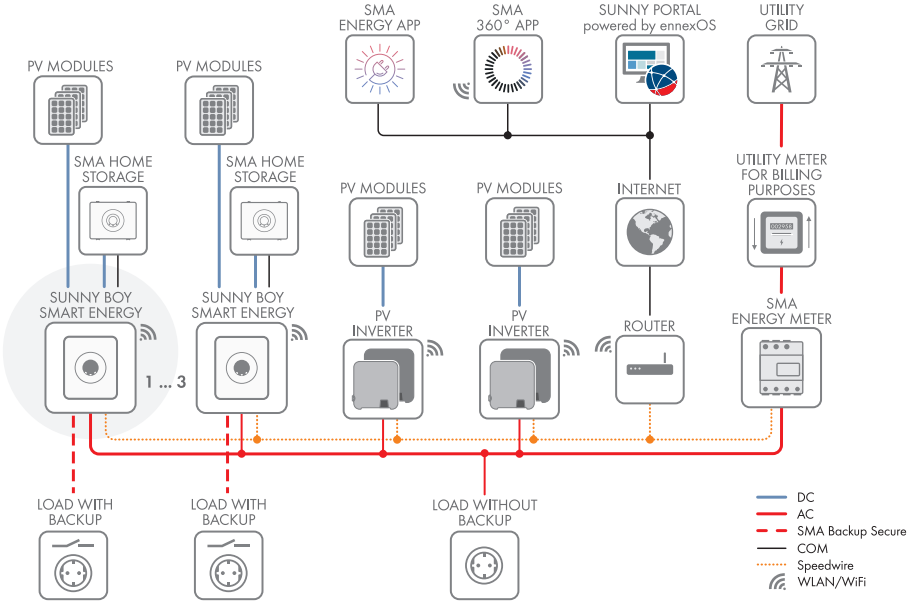


Figure 1: System with Sunny Boy Smart Energy as system manager and one energy meter

5.2 SMA Home Energy Solution with Sunny Home Manager

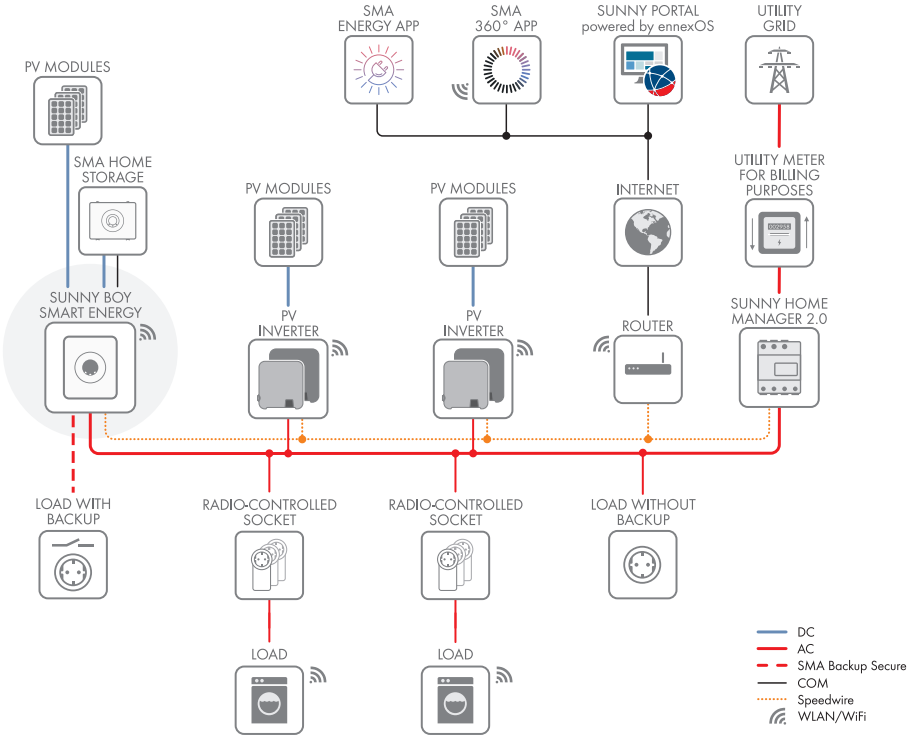


Figure 2: System with Sunny Home Manager as the central device for energy management

6 Interfaces and Functions

6.1 User Interface

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

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

Also see:

- Access rights to the user interface ⇒ page 83

6.2 Device Key (DEV KEY)

If you have forgotten the administrator password for the inverter, you can reset the administrator account with the Device Key and assign a new password. The Device Key can be used to prove the identity of the inverter in digital communication. The Device Key is provided on a sheet with a password label supplied with the inverter. Keep the device key safe in case you forget the administrator password.

6.3 Diagnostic function

The inverter has a diagnostic function for measuring the current/voltage characteristic curve (I-V characteristic curve) of the PV modules connected to DC inputs. The characteristic curve shows deviations and changes from the ideal curve. By this, problems in the PV modules can be detected at an early stage.

6.4 Increased self-consumption

With increased self-consumption, the highest possible proportion of the energy of a generator (e.g., a PV system) is consumed and stored at the place where it is generated. With increased self-consumption, power output at the point of interconnection is reduced when the energy can be consumed or stored at the place where it is generated. The power draw at the point of interconnection is reduced since a large proportion of the self-generated energy is being used.

The SMA Home Storage Solution supports the increased self-consumption through intermediate storage of energy from generators.

6.5 Energy Monitoring

The inverter supports the display of balances for PV generation and battery charging and discharging in the Sunny Portal powered by ennexOS or in the SMA Energy App. When the inverter is used together with the SMA Energy Meter or the Sunny Home Manager, further and more detailed balances are displayed.

6.6 Peak load shaving

With the "Peak Load Shaving" function, you can optimize the behavior of the inverter with respect to the power exchange at the point of interconnection. This is mostly useful when a higher supply of energy would lead to a higher electricity cost. With the "Peak Load Shaving" function, certain grid-exchange power outputs to which the battery inverter is adjusted depending on its power and battery capacity available can be set. Power peaks and additional costs can thus be avoided.

You can configure maximum values for the power drawn at the point of interconnection. When the loads require additional energy, the battery is discharged and the maximum value is kept constant at the grid-connection point. This is based on the prerequisite that the battery is sufficiently charged.

The peak load shaving function in the inverter is not available if the inverter is operated in a system with the Sunny Home Manager. In these systems, the Sunny Home Manager takes over the function.

6.7 SMA ArcFix

SMA ArcFix is an Arc Fault Circuit Interrupter (AFCI). With this function, the inverter effectively detects arcs on the DC side and interrupts them.

A detected electric arc causes the inverter to interrupt feed-in operation. To restart feed-in operation, the operational disruption which has occurred, must be reset through a manual restart. Alternatively, the arc-fault circuit interrupter can be activated without inhibiting operation. 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.

SMA ArcFix complies with the requirements of the IEC 63027 and corresponds to the following installation classes:

- F-I-AFPE-1-6-1
- F-I-AFPE-2-3-1

Also see:

- Manual restart after electric arc ⇒ page 128

6.8 Modbus

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

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

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

6.9 Secure Power Supply Operation

In case of a grid failure, the secure power supply operation supplies the loads with energy from the battery and the PV system. You can connect a standard socket (230 V) and a standard switch to the inverter. You can connect a load with a maximum of 16 A and 230 V to the secure power supply socket. The load is supplied with energy from the battery and PV system during grid failure. The switch is used to enable and disable secure power supply operation.

The secure power supply operation is not automatically enabled in the event of a grid failure, neither is it automatically disabled once the utility grid is available again. If the utility grid fails, the load must be connected to the socket for secure power supply operation. The supply to the load must be activated manually by switching on the switch to secure power supply operation. The inverter automatically regulates the energy supply of the socket after activating the secure power supply operation. When the utility grid is available again and the loads can be supplied from it, the loads must be connected to the previous supply and the secure power supply operation must be deactivated manually by switching off the switch.

During active secure power supply operation, the inverter is disconnected from the building's main electrical system and does not therefore feed into the utility grid. The loads can only be supplied in secure power supply operation as long as energy can still be provided by the PV modules and/or the battery. If there is insufficient energy available, the secure power supply operation remains active, even if the utility grid is available again. Switching over to supplying the loads from the utility grid is not carried out automatically.

6.10 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.

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.

6.11 SMA Smart Connected

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

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

6.12 SMA Speedwire

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

The inverter supports the encrypted system communication with SMA Speedwire Encrypted Communication. In order to be able to use the Speedwire encryption in the system, all Speedwire devices, except for the energy meter (e.g. SMA Energy Meter) must support the function SMA Speedwire Encrypted Communication.

6.13 Wi-Fi

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

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

6.14 Wi-Fi connection to SMA 360° app and SMA Energy app

There is a QR code on the inverter as standard. By scanning the QR Code attached to the product via the SMA 360° app or SMA Energy app, access to the product is established via Wi-Fi and the connection to the user interface is made automatically.

Also see:

- Direct connection via Wi-Fi ⇒ page 79

7 Scope of Delivery

7.1 Scope of Delivery of the Inverter

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

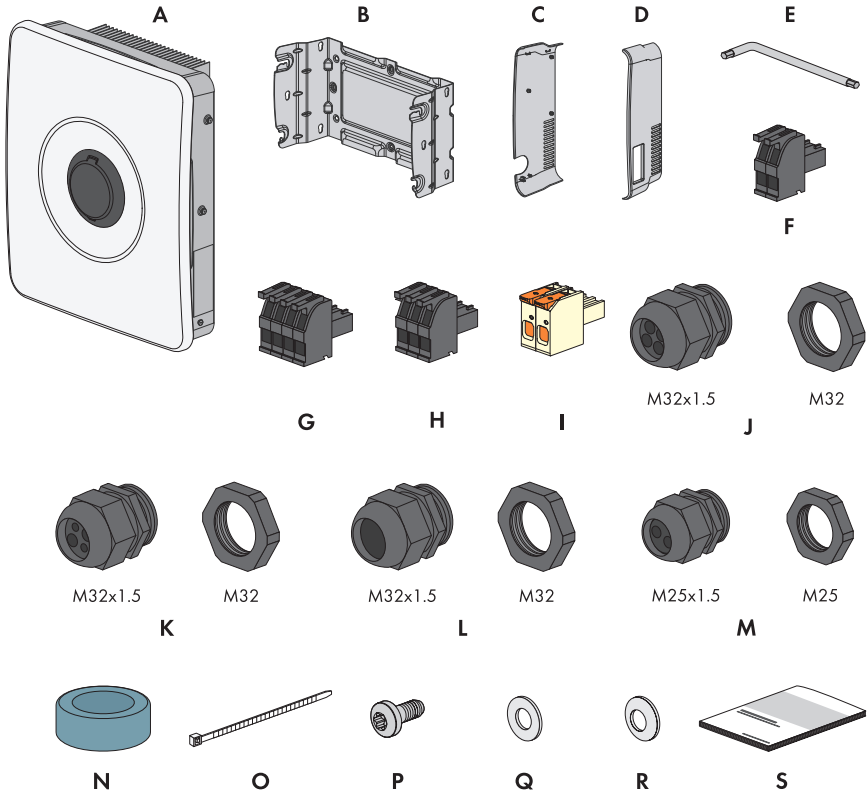


Figure 3: Components included in scope of delivery

Position	Quantity	Designation
A	1	Inverter
B	1	Mounting bracket
C	1	Left side cover
D	1	Right side cover

Position	Quantity	Designation
E	1	Allen key 1/4
F	3	2-pole connector for connecting the switch for secure power supply operation, fast stop, and monitored DC-SPD
G	1	3-pole connector for connecting the multifunctional relay
H	1	4-pole connector for connecting the energy meter per RS485
I	3	Terminal blocks for connection of PV modules
J	3	M32x1.5 cable gland with four-hole cable support sleeve with 2 differently sized enclosure openings for the communication connections
K	2	M32x1.5 cable gland with four-hole cable support sleeve with 4 equally sized enclosure openings for the DC connection
L	1	M32x1.5 cable gland with seal insert for connection to the utility grid
M	1	Cable gland M25x1.5 with two-hole cable support sleeve for connection of battery power cables
N	1	Ferrite
O	1	Cable tie
P	1	Screw M5x12
Q	1	Washer M5
R	1	Spring washer M5
S	1	Documentation package consists of: • Safety information booklet • Quick reference guide poster with illustrated instructions for initial installation and commissioning • Sheet with a password label contains the following information: – PIC (Product Identification Code) identification key for registering the system in Sunny Portal – RID (Registration Identifier) registration ID for registering the system in Sunny Portal – Wi-Fi password WPA2-PSK (WiFi Protected Access 2 - Preshared Key) for direct connection to the product via Wi-Fi – Device Key (DEV KEY) for resetting the administrator password

7.2 Scope of Delivery of SMA Energy Meter

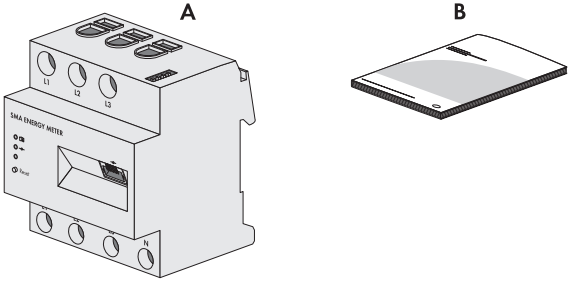


Figure 4: Components included in scope of delivery

Position	Quantity	Designation
A	1	SMA Energy Meter (EMETER-20)
B	1	Installation manual

7.3 Scope of Delivery of Sunny Home Manager

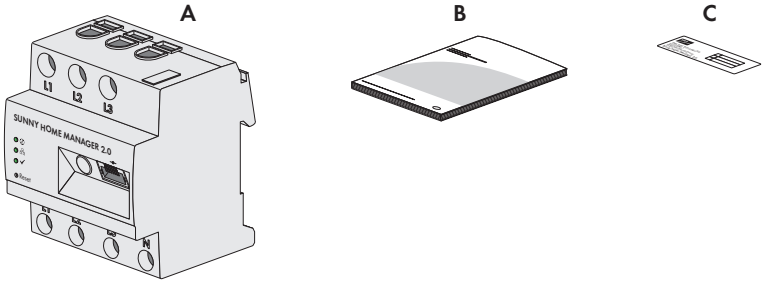


Figure 5: Components included in scope of delivery

Position	Quantity	Designation
A	1	Sunny Home Manager 2.0 (HM-20)
B	1	Quick Reference Guide for Commissioning
C	1	Label with serial number (SN), registration ID (RID) and identification key (PIC) for registration of the device by means of the setup assistant in the Sunny Portal

8 Product Overview of the inverter

8.1 Product Description

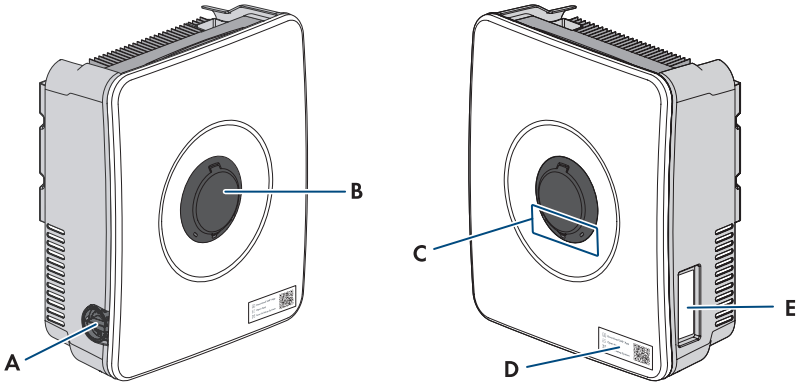


Figure 6: Design of the product

Position	Designation
A	DC load-break switch
B	SMA Easy Lock enclosure lock
C	LEDs The LEDs indicate the operating state of the product.
D	A label with a QR code to be scanned using the SMA apps
E	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: • Device type (Model) • Serial number (Serial No. or S/N) • Date of manufacture • Device-specific characteristics

8.2 Symbols on the Inverter

Symbol	Explanation
	Beware of a danger zone This symbol indicates that the product must be additionally grounded if additional grounding or equipotential bonding is required at the installation site.

Symbol	Explanation
	Beware of electrical voltage The product operates at high voltages.
	Beware of hot surface The product can get hot during operation.
	Observe the documentations Observe all documentations supplied with the product.
	Danger to life due to high voltages in the inverter; observe a waiting time of 5 minutes. High voltages that can cause lethal electric shocks are present in the live components of the inverter. Prior to performing any work on the inverter, disconnect it from all voltage sources as described in this document.
	Operation LED Indicates whether the product is in operation.
	Error Together with the red LED, this symbol indicates an error. Observe the documentation.
	Data transmission Together with the blue LED, this symbol indicates the status of the network connection.
	Grounding conductor This symbol indicates the position for connecting a grounding conductor.
	Grounding This symbol indicates the position for the connection of an additional grounding conductor.
	The product has no galvanic isolation.
	CE marking The product complies with the requirements of the applicable EU directives.

8.3 LED Signals

The LEDs indicate the operating state of the inverter.

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 inverter is stopped because no country data set is set. The inverter automatically starts operation as soon as the configuration has been carried out (e.g., using the commissioning wizard or via a System Manager).
The green LED is flashing (2 s on and 2 s off)	Waiting for feed-in conditions The conditions for feed-in operation are not yet met. As soon as the conditions are met, the inverter will start feed-in operation.
The green LED is glowing	Operation The inverter is in operation.
The green LED is off	No DC voltage is present.
The red LED is glowing	Error Inverter operation has been stopped. In addition, a specific event message and the associated event number are displayed on the user interface of the inverter or System Manager (see Section 17.1, page 98).
Red LED is flashing (0.25 s on, 0.25 s off, 0.25 s on, 1.25 s off)	Warning Communication with the System Manager failed. The inverter continues to operate with restricted function (e.g., with set fallback level). In addition, a specific event message and the associated event number are displayed on the user interface of the inverter or System Manager (see Section 17.1, page 98).
The blue LED is flashing slowly (2 s on and 2 s off)	Communication connection is being established. The inverter is establishing a connection with a local network or is establishing a direct connection to a smart device (e.g., smartphone, tablet, or laptop).
The blue LED is flashing fast (0.25 s on and 0.25 s off)	A System Manager is requesting identification of the inverter.
The blue LED is glowing	There is an active connection with a local network or there is a direct connection with a smart device (e.g., smartphone, tablet or laptop).

LED signal	Explanation
Blue LED is off	There is no active connection.
All 3 LEDs are on	Inverter update or booting procedure.

9 Procedure for Installing and Commissioning the System

The procedure for installation, electrical connection, and commissioning of the system is described in the following. It provides an overview of the steps, which must be performed in the prescribed sequence.

Procedure		See
1.	Ensure that the requirements for the installation of the system components are fulfilled.	Section 10.1, page 38
2.	Mount the inverter.	Mounting the Inverter
3.	Ensure that the requirements for the electrical connection are fulfilled.	Section 11.1, page 43
4.	Install the SMA Energy Meter or Sunny Home Manager.	Manual of the SMA Energy Meter or Sunny Home Manager
5.	Mount the battery.	Manual for the battery
6.	Connect to utility grid.	Section 11.3, page 50
7.	Connect the switch and socket for secure power supply operation.	Section 11.4, page 51 Section 11.5, page 54
8.	Connect the network cables to the inverter.	
9.	Connect SMA Energy Meter or Sunny Home Manager to the inverter.	
10.	Connect the data cables of the battery.	
11.	Connect switch for fast stop to digital input (optional).	Section 11.9, page 63
12.	Connect to the multifunction relay (optional).	Section 11.8, page 61
13.	Connect the PV modules to the inverter.	
14.	Connect the battery power cables.	
15.	Connect the additional grounding to the inverter.	Connecting Additional Grounding
16.	Commission the system.	Section 12, page 71
17.	Check secure power supply operation.	Section 12.5, page 76

10 Mounting

10.1 Requirements for Mounting

10.1.1 Requirements for the mounting location of the inverter

⚠ WARNING

Danger to life due to fire or explosion

Despite careful construction, electrical devices can cause fires. This can result in death or serious injury.

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

- ☐ The mounting location must be suitable for the weight and dimensions of the product.
- ☐ A solid support surface must be available (e.g., concrete or masonry, free-standing constructions). When mounted on drywall or similar materials, the inverter emits audible vibrations during operation which could be perceived as annoying.
- ☐ Drywall must have a minimum thickness of 25 mm. This means that double-layer drywall must be used or the drywall must be additionally reinforced (e.g., with plywood, OSB, or chipboard).
- ☐ The installation site can be exposed to direct solar irradiation. There is, however, the possibility that the product reduces its power output to avoid overheating due to high temperatures.
- ☐ The mounting location should be freely and safely accessible at all times without the need for any auxiliary equipment (such as scaffolding or lifting platforms). Non-fulfillment of these criteria may restrict servicing.
- ☐ The DC load-break switch of the product must always be freely accessible.
- ☐ All ambient conditions must be met.
- ☐ The ambient temperature should be -25°C to +45°C to ensure optimal operation.

Also see:

- Mounting the Inverter ⇒ page 40

10.1.2 Permissible and impermissible mounting positions of the inverters

- ☐ The product may only be mounted in a permitted position. This will ensure that no moisture can penetrate the product.
- ☐ The product should be mounted such that the LED signals can be read off without difficulty.

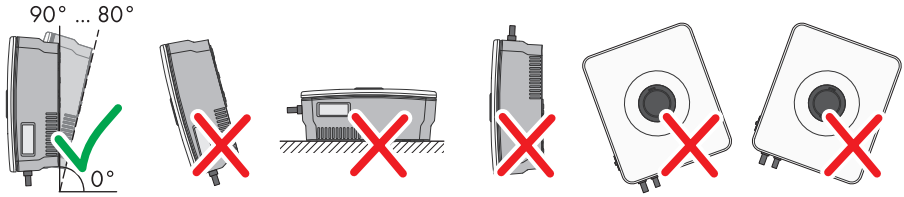
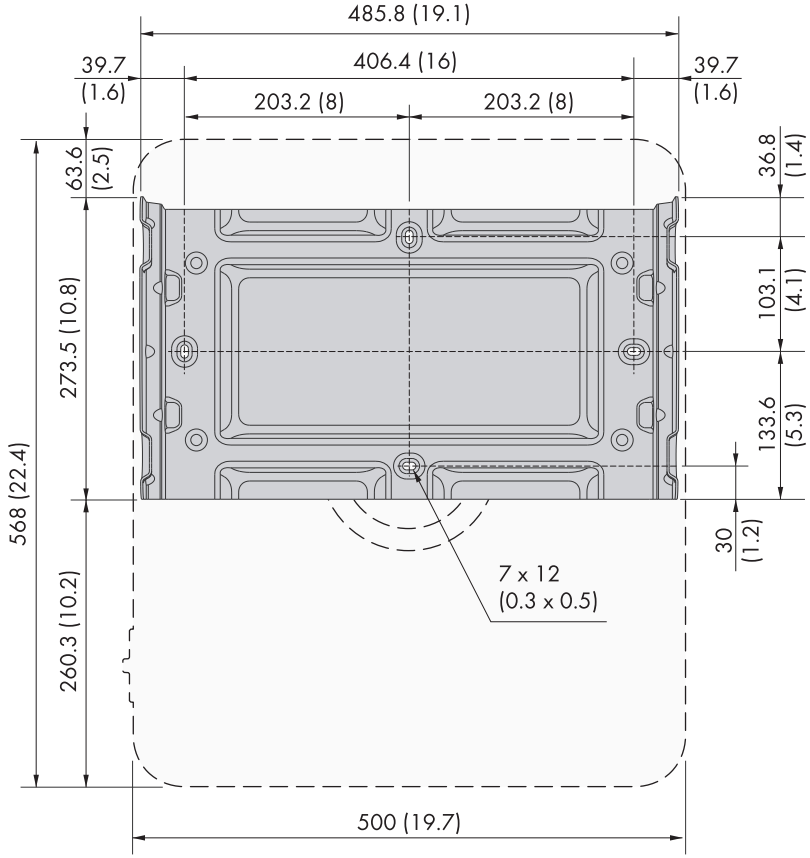


Figure 7: Permitted and prohibited mounting positions

Also see:

- Mounting the Inverter ⇒ page 40

10.1.3 Inverter Mounting Dimensions



Position of the anchoring points (dimensions in mm (in))

Also see:

- Mounting the Inverter ⇒ page 40

10.1.4 Recommended inverter mounting clearances

☐ Recommended distances to walls, other devices and objects should be maintained.

☐ If multiple products are mounted in areas with high ambient temperatures, increase the clearances between the products and ensure sufficient fresh-air supply.

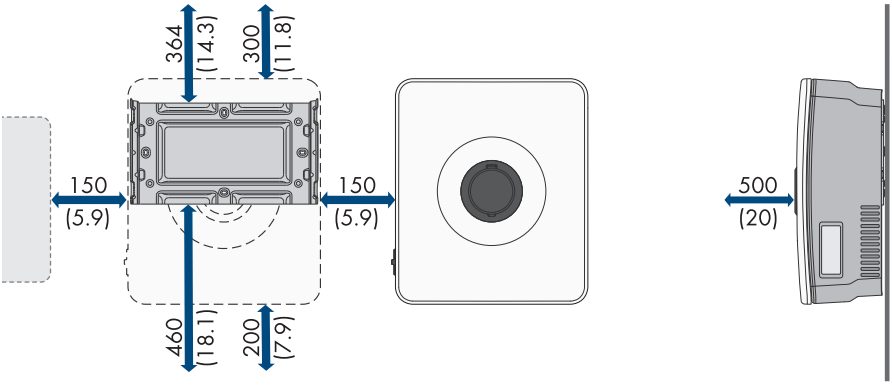


Figure 8: Recommended clearances (dimensions in mm (in))

Also see:

- Mounting the Inverter ⇒ page 40

10.2 Mounting the Inverter

⚠ QUALIFIED PERSON

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

☐ 2 pcs M6 screws, suitable for the support surface and weight of the inverter.

☐ 2 washers suitable for the screws

☐ Where necessary, 2 screw anchors suitable for the support surface and the screws

⚠ CAUTION

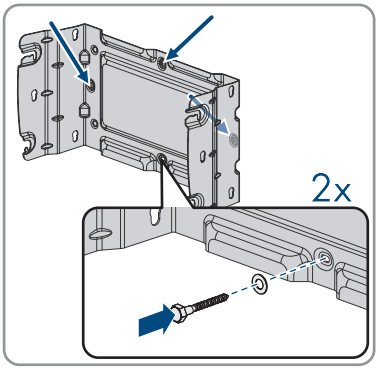
Risk of injury due to weight of product

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

- Wear suitable personal protective equipment for all work on the product.

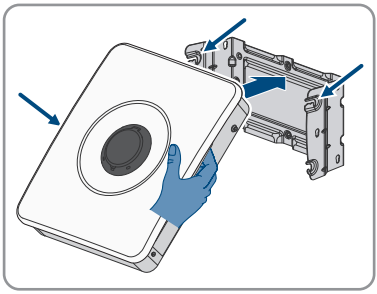
Procedure:

1. Align the mounting bracket horizontally and mark the position of the drill holes. Use either the 2 holes in the center of the wall mounting bracket, or 1 hole each on the left and right.
2. Set the mounting bracket aside and drill the marked holes.
3. Insert screw anchors into the drill holes if the support surface requires them.
4. Tighten the mounting bracket horizontally with screws and washers. Ensure the mounting bracket is correctly aligned.

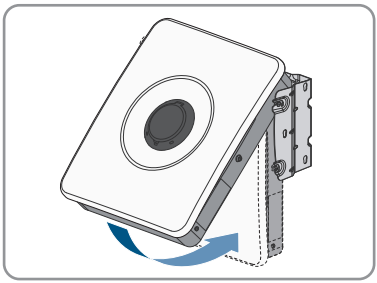


☑ The mounting bracket is installed correctly.

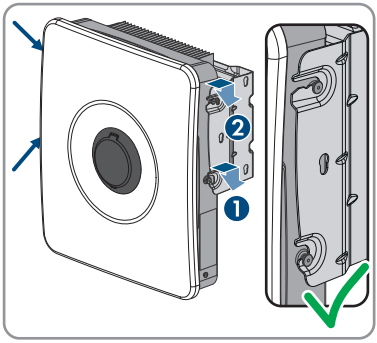
5. Lift the inverter with the help of the indentations on the enclosure and suspend it at a 45° angle in the top guide rails of the mounting bracket with the top 2 rivets.



6. Carefully rotate the bottom of the inverter toward the support surface and place it at a 90° angle to the base.



7. Engage the top and bottom rivets in the corresponding recesses.



8. Make sure that the inverter is securely attached by carefully moving the enclosure back and forth.

Also see:

- Recommended inverter mounting clearances ⇒ page 40
- Inverter Mounting Dimensions ⇒ page 39
- Permissible and impermissible mounting positions of the inverters ⇒ page 38
- Requirements for the mounting location of the inverter ⇒ page 38

11 Electrical Connection

11.1 Requirements for the electrical connection

11.1.1 Equipotential Bonding

If components are used in the PV system that require equipotential bonding (e.g., mounting racks, module frames), these must be connected to a central equipotential panel provided for this purpose.

Observe the installation guidelines and regulations applicable in your country. The enclosure of the inverter is not suitable as equipotential bonding. Incorrect implementation of equipotential bonding can lead to an inverter defect that is not covered under warranty.

11.1.2 Residual-current monitoring unit (RCMU)

The inverter is equipped with an all-pole sensitive residual-current monitoring unit in accordance with IEC/EN 62109-2 and VDE 0126-1-1. The all-pole sensitive residual-current monitoring unit monitors AC and DC residual currents. It disconnects the inverter redundantly from the utility grid in the event of residual current jumps of > 30 mA. If the residual current monitoring unit malfunctions, the inverter is immediately disconnected from the utility grid at all poles. If the protection by automatic disconnection of supply according to DIN VDE 0100-410 is fulfilled by an appropriate overcurrent protective device, the inverter does not require an external residual-current device for safe operation. If local regulations require the use of a residual-current device, the following must be observed:

- The inverter is compatible with type A and B residual-current devices. The rated residual current of the residual-current device must be 30 mA or higher (for information on selecting a residual-current device, see Technical Information "Criteria for Selecting a Residual-Current Device" under www.SMA-Solar.com). Each inverter in the system must be connected to the utility grid via a separate residual-current device.
- When using residual-current device with a lower rated residual current, there is a risk of false tripping of the residual-current device, depending on the system design.

11.1.3 Overvoltage category

The product can be used in grids of overvoltage category III or lower in accordance with IEC 60664-1. That means that the product can be permanently connected to the grid-connection point of a building.

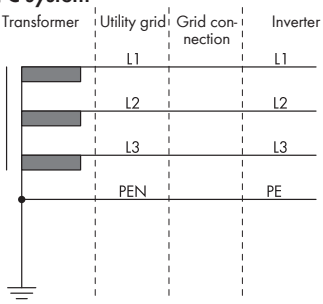
11.1.4 Permitted grid configurations

The inverter approved for operation in the following utility grids:

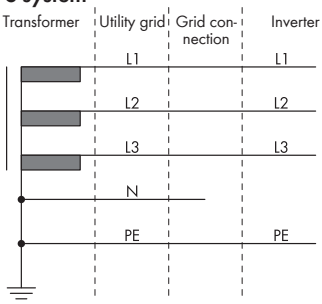
- TN-C
- TN-S
- TN-C-S

- TT[1)]
- Delta IT

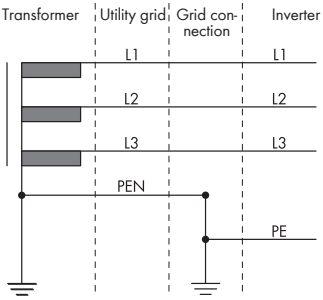
TN-C system



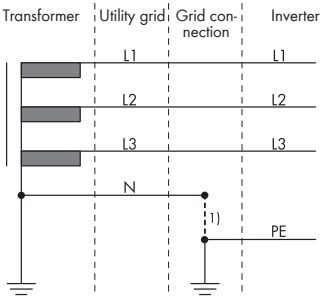
TN-S system



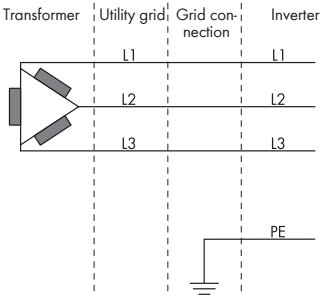
TN-C-S grid configuration



TT system



Delta-IT system



[1)] It must be ensured that the local grounding has a sufficiently low-impedance connection to the grounding of the transformer, otherwise operational leakage currents can lead to potential differences. For error-free operation, the ground potential at the neutral point of the transformer must be the same as that of the grounding conductor connection on the inverter. SMA Solar Technology AG recommends a bridge between N and grounding conductor at the point of interconnection to ensure error-free operation. Improper implementation of the transformer/grid connection with regard to low-impedance grounding/zeroing of the neutral point can lead to a device defect that is not covered by the warranty.

11.1.5 Requirements for the PV modules per input

- ☐ All PV modules should be of the same type.
- ☐ All PV modules should be aligned and tilted identically. Otherwise the yields may be reduced.
- ☐ If 2 strings are connected to one input, the same number of PV modules wired in series should be connected to each string. Otherwise the yields may be reduced.
- ☐ On the coldest day based on statistical records, the open-circuit voltage of the PV array must never exceed the maximum input voltage of the inverter.
- ☐ The maximum input current per string must not be exceeded, and must not be greater than the rated through-current of the DC connectors.
- ☐ The thresholds for the input voltage and the input current of the inverter must be adhered to.

11.1.6 Cable Requirements

11.1.6.1 AC cable requirements

- ☐ Conductor type: copper wire
- ☐ The conductors must be made of solid wire, stranded wire or fine stranded wire. When using fine stranded wire, bootlace ferrules must be used.
- ☐ Conductor cross-section: 1.5 mm² to 10 mm²
- ☐ The cross-section of the grounding conductor must not be smaller than the cross-section of the other conductors.
- ☐ External diameter: 10 mm to 25 mm
- ☐ The cable must be dimensioned in accordance with the local and national directives for the dimensioning of cables. The requirements for the minimum conductor cross-section derive from these directives. Examples of factors influencing cable dimensioning are: nominal AC current, the connected AC backup loads, type of cable, routing method, cable bundling, ambient temperature and maximum desired line losses (for calculation of line losses, see the design software "Sunny Design" from software version 2.0 at www.SMA-Solar.com).
- ☐ Insulation stripping length: 18 mm

11.1.6.2 Requirements for the PV cables

The following requirements apply only to the PV+ and PV- cables. For PE, note that the requirements are different.

- ☐ Conductor type: copper wire
- ☐ Conductor cross-section: 2 mm² to 6 mm²
- ☐ External outer diameter: max. 6 mm
- ☐ Nominal voltage: at least 600 V
- ☐ Insulation stripping length: 12 mm
- ☐ The cables must be designed according to the local and national guidelines for the dimensioning of lines.

11.1.6.3 Requirements for cables for secure power supply outlets

- ☐ Conductor type: copper wire

- ☐ The conductors must be solid or stranded wire.
- ☐ Conductor cross-section when using solid or stranded wire without bootlace ferrules: 1.5 mm² to 6 mm²
- ☐ Conductor cross-section when using bootlace ferrules: 1.5 mm² to 4 mm²
- ☐ External diameter: 10 mm to 14 mm
- ☐ Insulation stripping length: 10 mm to 12 mm
- ☐ Maximum length of conductors: 10 m

Also see:

- Connect the socket for secure power supply operation ⇒ page 54

11.1.6.4 Signal cable requirements

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

- ☐ Conductor type: copper wire
- ☐ The conductors must be solid or stranded wire.
- ☐ Conductor cross-section: 0.2 mm² to 1.5 mm²
- ☐ External outer diameter: max. 6 mm
- ☐ Insulation stripping length: 6 mm
- ☐ Nominal voltage: at least 600 V
- ☐ Maximum length of conductors: 10 m
- ☐ The cable type and cable-laying method must be appropriate for the application and location.

Also see:

- Connect the switch for secure power supply operation ⇒ page 51

11.1.6.5 Network cable requirements

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

- ☐ Cable type: 100BaseTx
- ☐ Cable category: minimum CAT5e
- ☐ Plug type: RJ45 of Cat5e or higher
- ☐ Shielding: SF/UTP, S/UTP, SF/FTP or S/FTP
- ☐ Number of insulated conductor pairs and insulated conductor cross-section: at least 2 x 2 x 0.22 mm²
- ☐ Maximum cable length between 2 nodes when using patch cables: 50 m
- ☐ Maximum cable length between 2 nodes when using installation cables: 100 m
- ☐ UV-resistant for outdoor use.

11.1.6.6 Battery Communication Cable Requirements

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

- ☐ Cable type: 100BaseTx
- ☐ Cable category: minimum CAT5e
- ☐ Plug type: RJ45 of Cat5e or higher
- ☐ Shielding: SF/UTP, S/UTP, SF/FTP or S/FTP
- ☐ Number of insulated conductor pairs and insulated conductor cross-section: at least 2 x 2 x 0.34 mm²
- ☐ Maximum cable length between 2 nodes when using patch and installation cables: 10 m
- ☐ UV-resistant if installed outdoors.

11.1.6.7 Requirements for the Battery Power Cables

- ☐ Conductor type: copper wire
- ☐ Conductor cross-section: 6 mm² to 8 mm²
- ☐ Insulation stripping length: 12 mm
- ☐ Cables can be used with or without bootlace ferrules
- ☐ Nominal voltage: at least 600 V

11.1.6.8 Requirements for the grounding cable for additional grounding

- ☐ The conductor must be solid or stranded or finely stranded wire. If finely stranded wire is used, the conductor must be double-crimped with a ring terminal lug. Ensure that no insulated conductor is visible when pulling or bending. This will ensure sufficient strain relief by means of the ring terminal lug.
- ☐ Cable cross section: at least 6 mm²
- ☐ The cable must be dimensioned in accordance with the local and national directives for the dimensioning of cables. The requirements for the minimum conductor cross-section derive from these directives. Examples of factors influencing cable dimensioning are: nominal AC current, the connected AC backup loads, type of cable, routing method, cable bundling, ambient temperature and maximum desired line losses (for calculation of line losses, see the design software "Sunny Design" from software version 2.0 at www.SMA-Solar.com).

Also see:

- Connecting Additional Grounding ⇒ page 70

11.2 Overview of the Inverter's Connection Area

11.2.1 View from Below

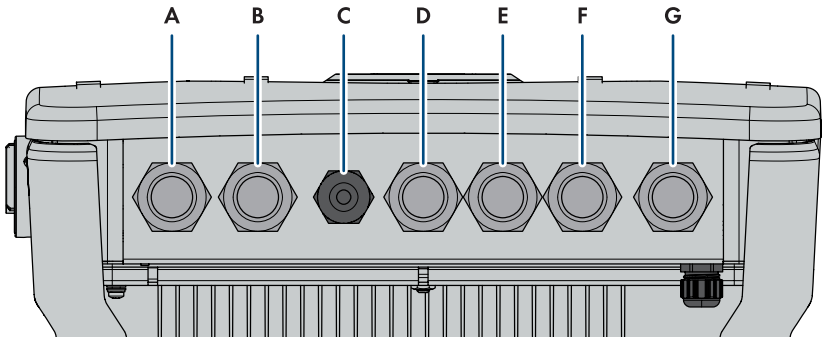


Figure 9: Bottom view of inverter

Position	Designation
A	Enclosure opening for connecting the PV modules to input A and B
B	Enclosure opening for connecting the PV modules to input C
C	Enclosure opening for battery connection
D	Enclosure opening for connecting the battery communication cable and for the switch for secure power supply operation
E	Enclosure opening for connecting to the multifunction relay
F	Enclosure opening for connecting the network cable and the fast-stop switch
G	Enclosure opening for connecting the utility grid

11.2.2 Interior View

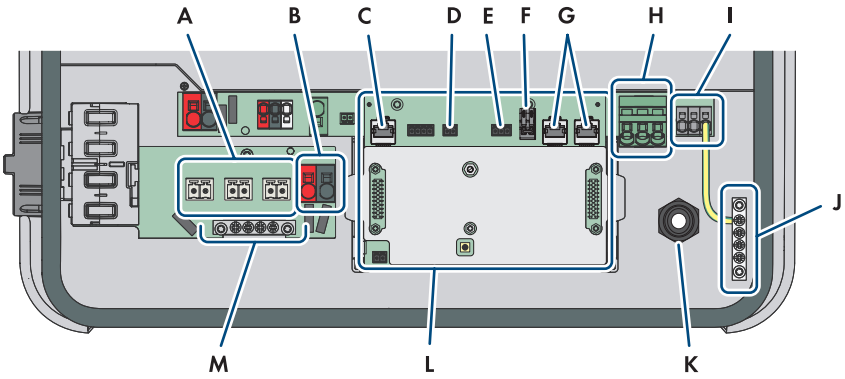


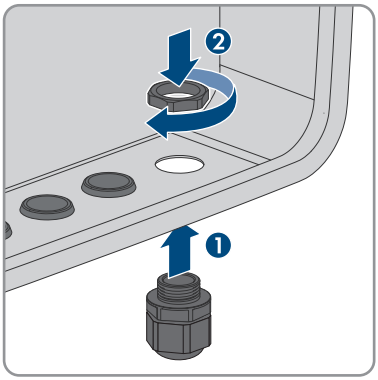
Figure 10: Connection Area of the Inverter

Position	Designation
A	Terminal blocks **+PVA-**, **+PVB-** und **+PVC-** for connection of PV modules
B	Connection terminals **BAT+** and **BAT -** for connecting the battery power cables
C	Network connector **BATTERY** for connecting the battery communication cable
D	**SPS** slot for connecting the switch for secure power supply operation
E	**MFR** slot for connection to the multifunction relay
F	Terminal block **GSI** with inserted bridge for the connection of a fast-stop switch
G	Network connectors **LAN-1** and **LAN-2** for connecting the energy meter and the router
H	Terminal block **AC** for the connection of L and N of the utility grid
I	Terminal block **SPS** for the connection of L and N of the socket for secure power supply operation
J	Busbar for grounding of AC connections
K	Cable gland M20x1.5 for AC cables of the socket for secure power supply operation
L	Communication assembly
M	Grounding busbar for connection of additional grounding (if necessary)

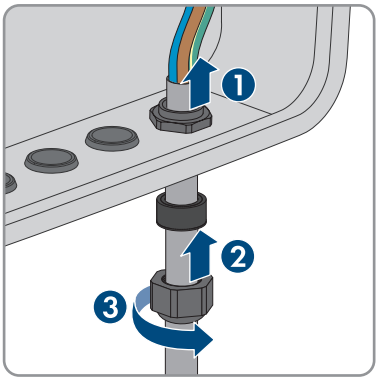
11.3 Connecting the Utility Grid

⚠ QUALIFIED PERSON

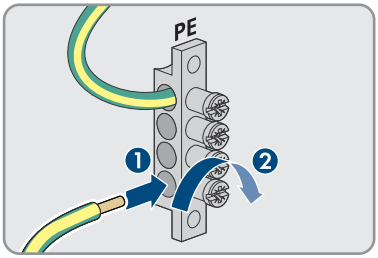
1. Disconnect the inverter from all voltage sources .
2. Remove the filler plug from the enclosure opening for connection to the utility grid.
3. Insert the M32x1.5 cable gland with seal insert into the enclosure opening for connecting to the utility grid and tighten it from the inside with the counter nut.



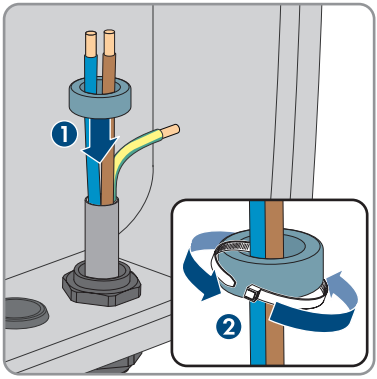
4. Feed the cable through the cable gland and the seal insert into the interior of the inverter. If necessary, slightly loosen the swivel nut of the cable gland.



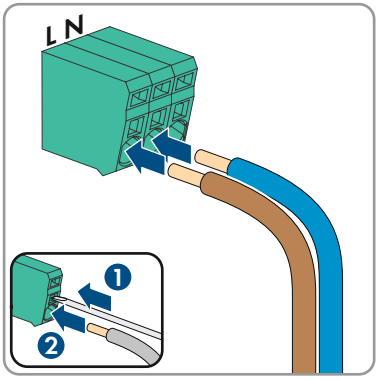
5. Dismantle the cable by 100 mm.
6. Strip the insulation of L, N and the grounding conductor by 18 mm.
7. Connect the PE to the busbar ⏚ according to the label, as short as possible without the conductor being under tension. To do so, insert the conductor into the busbar against the stop and tighten the screw (PZ2, minimum torque 2.5 Nm).



8. Pass the N and L through the ferrite and secure the ferrite with cable ties.



9. Connect N and L to the terminal block **AC** according to labeling. If necessary, open the terminal points with a flat-blade screwdriver (4 mm).



10. Ensure that the correct conductors are assigned to the terminals.
11. Ensure that all conductors are securely in place.
12. Tighten the union nut on the cable gland hand-tight.

11.4 Connect the switch for secure power supply operation

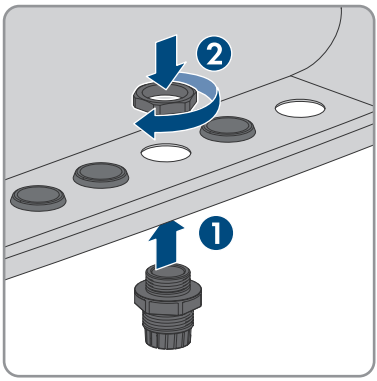
Additionally required material (not included in the scope of delivery):

☐ 1 standard commercial switch

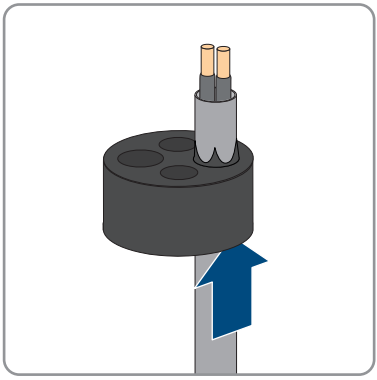
Procedure:

1. Connect the connection cable to the switch (see the manual of switch).
2. Disconnect the inverter from all voltage sources .
3. Remove the filler plug from the enclosure opening for connection to the multifunction relay and the switch for secure power supply operation.

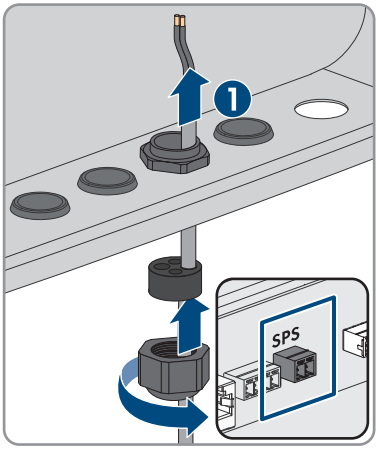
4. Insert the M32x1.5 cable gland with four-hole cable support sleeve for communication connections into the enclosure opening for connection to the multifunction relay and the switch for secure power supply operation and tighten it from the inside with the counter nut.



5. Unscrew the union nut from the cable gland and lead the cable through.
6. Remove the four-hole cable support sleeve from the cable gland.
7. Insert the cable into a fitting enclosure opening of the four-hole cable support sleeve. In doing so, pierce the closed side of the enclosure opening.

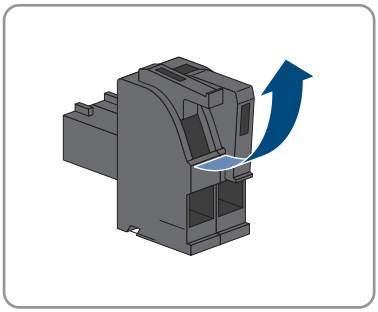


8. Press the four-hole cable support sleeve with the cable into the cable gland and route the cable to the **SPS** slot on the communication assembly.

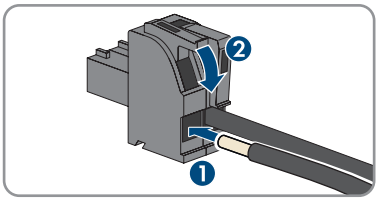


9. Dismantle the cable by 20 mm.

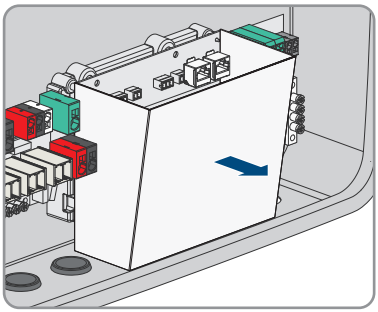
10. Strip off the conductor insulation by 6 mm.
11. Release the conductor entries on the supplied 2-pole connector.



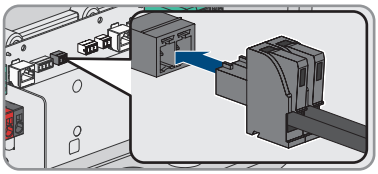
12. Connect the conductors to the supplied 2-pole connector. To do so, plug the conductors into the conductor entries and close the conductor entries. Observe the connector assignment.



13. Remove the cover from the communication assembly.



14. Plug the 2-pole connector into the socket **SPS** on the communication assembly. Observe the pin assignment.



15. Ensure that the connector is securely in place.
16. Ensure that all conductors are correctly connected.
17. Ensure that the conductors sit securely in the terminal points.
18. Tighten the swivel nut on the cable gland hand-tight.

Also see:

- Signal cable requirements ⇒ page 46

11.5 Connect the socket for secure power supply operation

⚠ QUALIFIED PERSON

Requirements:

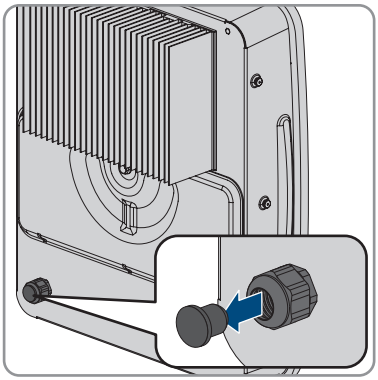
☐ The cables for the socket for secure power supply operation must be pre-assembled.

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

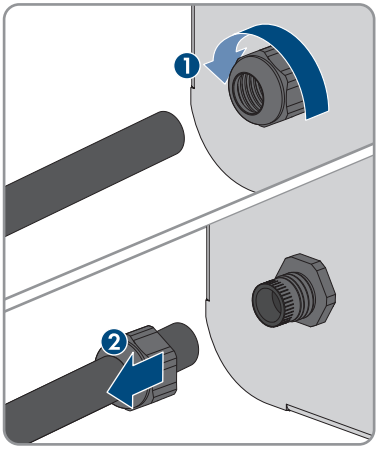
☐ 1 standard socket

Procedure:

1. Disconnect the inverter from all voltage sources .
2. Remove the filler plug from the cable gland.

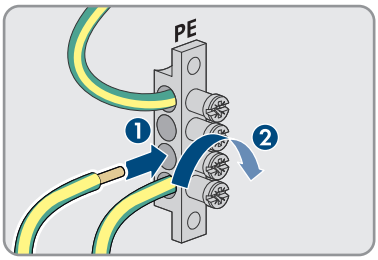


3. Unscrew the union nut at the back of the inverter from the cable gland and lead the cable through.

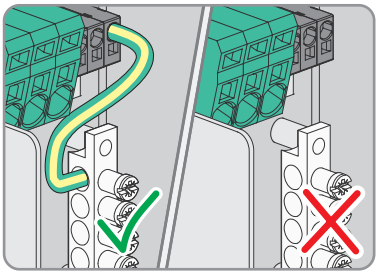


4. Feed the cable through the cable gland into the interior of the inverter.
5. Dismantle the cable by 100 mm.
6. Strip off the conductor insulation by 10 mm to 12 mm each.

7. Connect the grounding conductor to the busbar ⏚, as short as possible without the conductor being under voltage. To do so, insert the conductor into the busbar against the stop and tighten the screw (PZ2, minimum torque 2.5 Nm).



8. Connect N and L to the terminal block **SPS** according to labeling. To do this, unlock the terminal with a flat-blade screwdriver (3.5 mm).
9. Ensure that the cable bridge is fitted between **N** and the busbar ⏚.



10. Tug lightly to ensure that all conductors are secured in the terminals.
11. Tighten the union nut on the cable gland hand-tight.

Also see:

- Requirements for cables for secure power supply outlets ⇒ page 45

11.6 Connecting the Network Cables

⚠ QUALIFIED PERSON

The following action describes how you can connect the inverter to the local network and the SMA Energy Meter or Sunny Home Manager. If there are multiple inverters in the system, the SMA Energy Meter must be connected to the inverter that will be configured as System Manager.

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

Network cable and fast-stop switch use the same cable gland

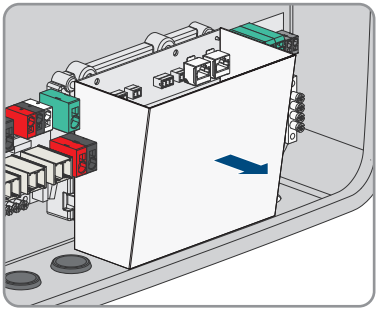
If a fast-stop switch is to be connected, plug the network cables into the cable support sleeve along with the fast-stop switch connection cable and insert them into the inverter.

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

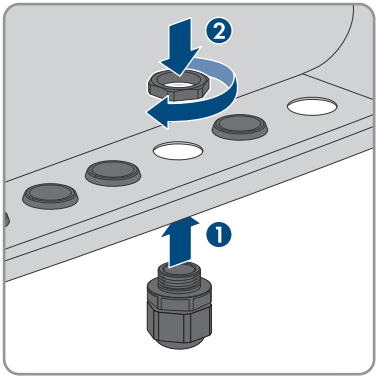
- ☐ Network cablesNetwork cable requirements
- ☐ Where required: Field-assembly RJ45 connector.

Procedure:

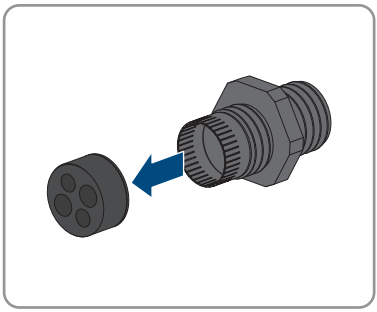
1. Disconnect the inverter from all voltage sources .
2. Remove the filler plug from the enclosure opening for connecting the network cables.
3. If the cover is still mounted on the communication assembly, remove the cover.



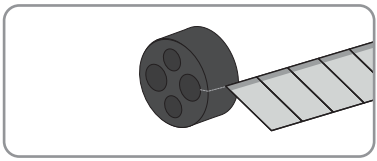
4. Insert the M32x1.5 cable gland with four-hole cable support sleeve for communication connections into the enclosure opening for connecting the network cables and tighten it from the inside with the counter nut.



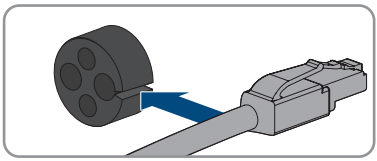
5. Unscrew the union nut from the cable gland and run it over each network cable.
6. Remove the four-hole cable support sleeve from the cable gland.



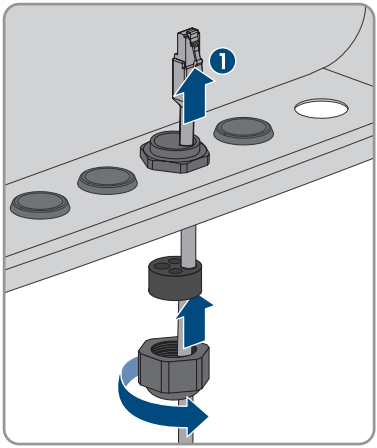
7. Use a cutter knife to cut a enclosure opening suitable for each network cable into the four-hole cable support sleeve.



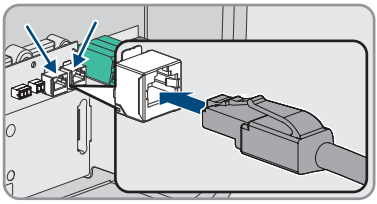
8. Insert each network cable into one of the enclosure opening.



9. Press the four-hole cable support sleeve into the cable gland and guide each network cable to the network port.



10. When using a self-assembly network cable, assemble the RJ45 connectors and connect them to the network cable (see connector documentation).
11. Insert each network cable into one of the network connectors **LAN-1** and **LAN-2**. Ensure that the network cable cannot touch the AC cables.



12. Tug lightly to ensure that the network cable is secure.
13. If you would like to integrate the inverter into a local network, connect the other end of a network cable to the local network (e.g., via a router).
14. To connect the inverter to an SMA Energy Meter or an SMA Home Manager, connect the other end of the network cable to the SMA Energy Meter or to the Sunny Home Manager. Note that an SMA energy meter must always be connected to the inverter, which is configured as a System Manager.
15. Tighten the union nut on the cable gland hand-tight.

Also see:

- Network cable requirements ⇒ page 46

11.7 Connecting the Data Cable of the Battery

⚠ QUALIFIED PERSON

Battery communication and switch for secure power supply operation use the same cable gland

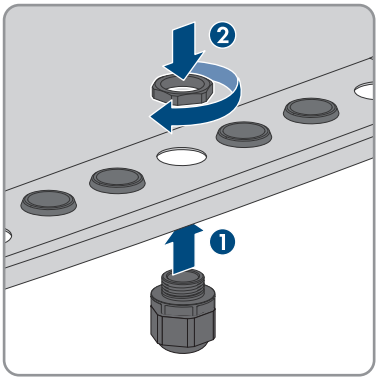
If a switch for secure power supply operation is to be connected, insert the battery communication cable into the cable support sleeve along with the switch connection cable for secure power supply operation and insert it into the inverter.

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

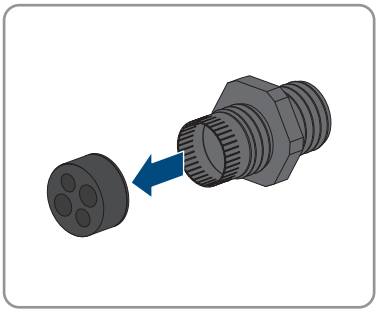
- Where required: Field-assembly RJ45 connector.

Procedure:

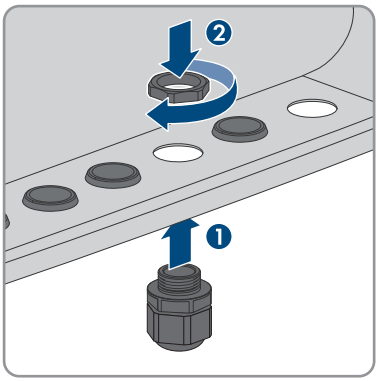
1. Disconnect the inverter from all voltage sources .
2. When using a self-assembly network cable, assemble the RJ45 connectors and connect them to the network cable (see connector documentation).
3. Remove the filler plug from the enclosure opening for connecting the battery communication cable.
4. Insert the M32x1.5 cable gland with four-hole cable support sleeve for communication connections into the enclosure opening for connecting the battery communication cable and tighten it from the inside with the counter nut.



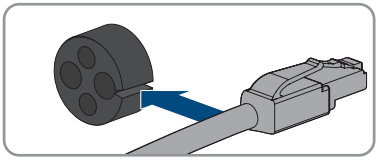
5. Unscrew the union nut from the cable gland and lead the battery communication cable through.
6. Remove the four-hole cable support sleeve from the cable gland.



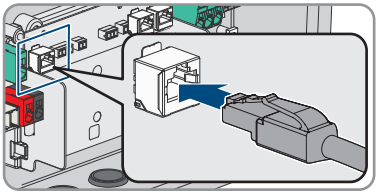
7. Use a cutter knife to cut an enclosure opening suitable for the battery communication cable into the four-hole cable support sleeve.



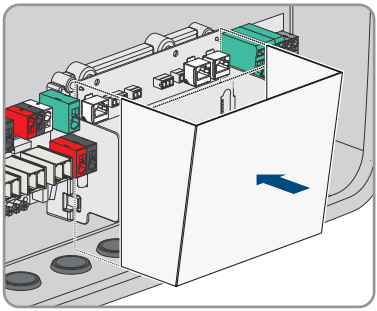
8. Insert the battery communication cable into the enclosure opening.



9. Press the cable support sleeve into the four-hole cable gland and guide the battery communication cable to the network port **BATTERY**.
10. Plug the battery communication cable into the **BATTERY** network port.



11. Ensure that the battery data cable is securely in place by pulling slightly on it.
12. If there are no other communication ports, install the communication assembly cover.



13. Tighten the union nut on the cable gland hand-tight.

Also see:

- Network cable requirements ⇒ page 46

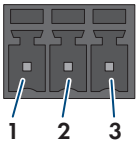
11.8 Connection to the Multifunction Relay

11.8.1 Digital output (MFR)

The multifunction relay (MFR) is a digital output that can be specifically configured to the system.

In a system with multiple inverters, you must carry out the connection to the multifunction relay of the System Manager.

11.8.2 Pin assignment MFR

Digital input	Pin	Assignment
	1	NO
	2	CO
	3	NC

11.8.3 Connect signal source to MFR

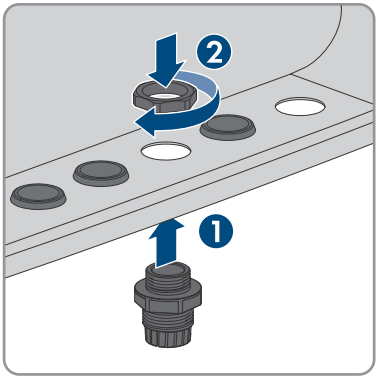
⚠ QUALIFIED PERSON

Requirements:

☐ The technical requirements of the multifunction relay must be met (see Section 20, page 131).

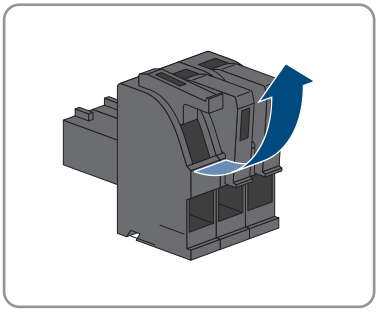
Procedure:

1. Disconnect the inverter from all voltage sources .
2. Remove the filler plug from the enclosure opening for connection to the multifunction relay and the switch for secure power supply operation.
3. Insert the M32x1.5 cable gland with four-hole cable support sleeve for communication connections into the enclosure opening for connection to the multifunction relay and the switch for secure power supply operation and tighten it from the inside with the counter nut.

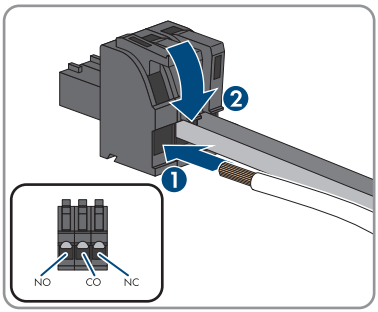


4. Unscrew the union nut from the cable gland and lead the cable through.
5. Remove the four-hole cable support sleeve from the cable gland.

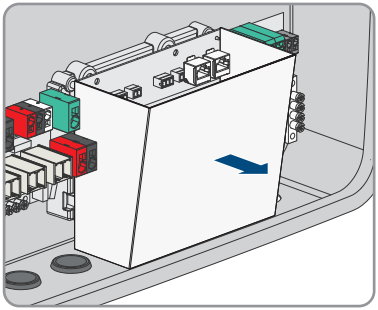
6. Insert the cable into a fitting enclosure opening of the four-hole cable support sleeve. In doing so, pierce the closed side of the enclosure opening.
7. Press the four-hole cable support sleeve with the cable into the cable gland and route the cable to the **MFR** slot on the communication assembly.
8. Dismantle the cable by 20 mm.
9. Strip off the conductor insulation by 6 mm.
10. Release the conductor entries on the supplied 3-pole connector.



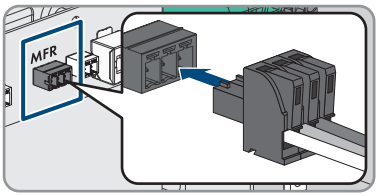
11. Connect the conductors to the supplied 3-pole connector. To do so, plug the conductors into the conductor entries and close the conductor entries. Observe the connector assignment.



12. If the communication assembly cover is mounted, remove the cover from the communication assembly.



13. Plug the 3-pole connector into the socket **MFR** on the communication assembly. Observe the pin assignment.



14. Ensure that the connector is securely in place.
15. Ensure that all conductors are correctly connected.
16. Ensure that the conductors sit securely in the terminal points.
17. Tighten the swivel nut on the cable gland hand-tight.

Also see:

- Digital output (MFR) ⇒ page 61
- Pin assignment MFR ⇒ page 61

11.9 Connection to digital input GSI

11.9.1 Digital Input GSI

You can connect a fast-stop switch at digital input **GSI**. In a system with multiple inverters, the switch for the fast stop must be connected to digital input **GSI** of the System Manager.

Also see:

- Connecting Signal Source to Digital Input GSI ⇒ page 64

11.9.2 Circuitry overview GSI

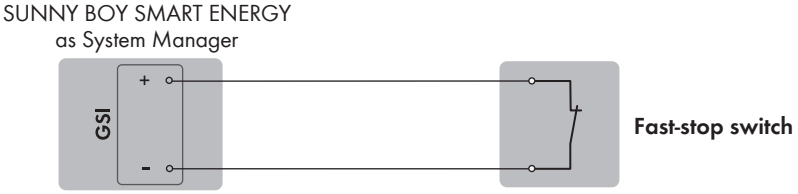


Figure 11: Connection of a switch for the fast stop to digital input GSI of the Sunny Boy Smart Energy that is to be configured as System Manager

Also see:

- Connecting Signal Source to Digital Input GSI ⇒ page 64

11.9.3 Connecting Signal Source to Digital Input GSI

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Network cable and fast-stop switch use the same cable gland

If a fast-stop switch is to be connected, plug the network cables into the cable support sleeve along with the fast-stop switch connection cable and insert them into the inverter.

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

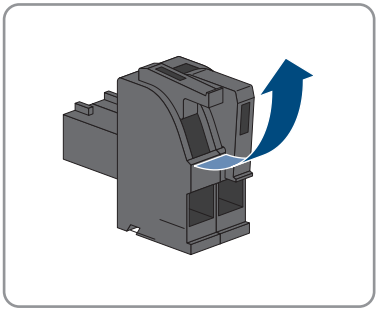
☐ 1 fast-stop switch (break contact)

Requirements:

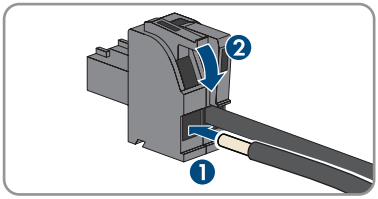
☐ The signal source must be technically suitable for connection to the digital inputs Technical Data.

Procedure:

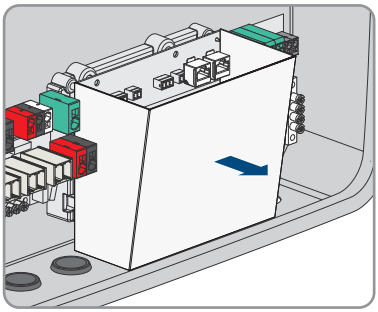
1. Disconnect the inverter from all voltage sources .
2. Remove the filler plug from the enclosure opening for connecting the network cables.
3. Insert the M32x1.5 cable gland with four-hole cable support sleeve for communication connections into the enclosure opening for connection to the multifunction relay and the switch for secure power supply operation and tighten it from the inside with the counter nut.
4. Unscrew the union nut from the cable gland and lead the cable through.
5. Remove the four-hole cable support sleeve from the cable gland.
6. Insert the cable into a fitting enclosure opening of the four-hole cable support sleeve. In doing so, pierce the closed side of the enclosure opening.
7. Press the four-hole cable support sleeve with the cable into the cable gland and route the cable to the **GSI** slot on the communication assembly.
8. Dismantle the cable by 20 mm.
9. Strip off the conductor insulation by 6 mm.
10. Release the conductor entries on the supplied 2-pole connector.



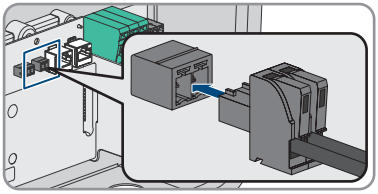
11. Connect the conductors to the supplied 2-pole connector. To do so, plug the conductors into the conductor entries and close the conductor entries. Observe the connector assignment.



12. If the communication assembly cover is mounted, remove the cover from the communication assembly.



13. Remove the plugged 2-pole connector with bridge from the **GSI** socket.
14. Plug the 2-pole connector with connection cables into the socket **GSI** on the communication assembly. Observe the pin assignment.



15. Ensure that the connector is securely in place.
16. Ensure that all conductors are correctly connected.
17. Ensure that the conductors sit securely in the terminal points.
18. Tighten the swivel nut on the cable gland hand-tight.

Also see:

- Circuitry overview GSI ⇒ page 63
- Digital Input GSI ⇒ page 63

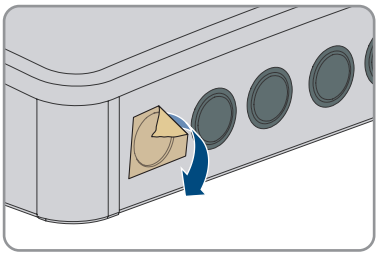
11.10 Connecting the PV Array

⚠ QUALIFIED PERSON

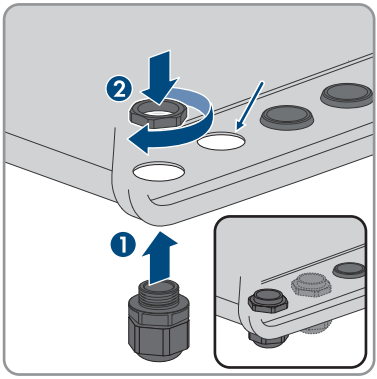
Procedure:

1. Disconnect the inverter from all voltage sources .

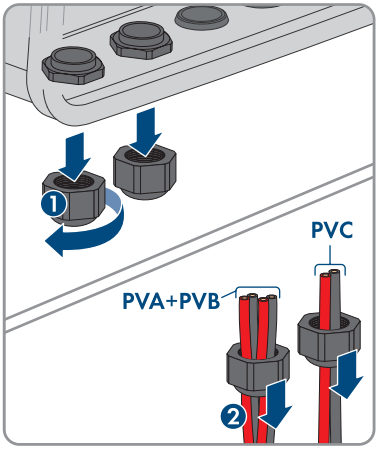
2. Remove the adhesive tape from the enclosure opening for connecting the PV modules to inputs A and B.



3. Depending on the number of strings available, insert 1 or 2 M32x1.5 cable glands with four-hole cable support sleeve into an enclosure opening for connecting the PV modules and tighten them from the inside with the counter nut.

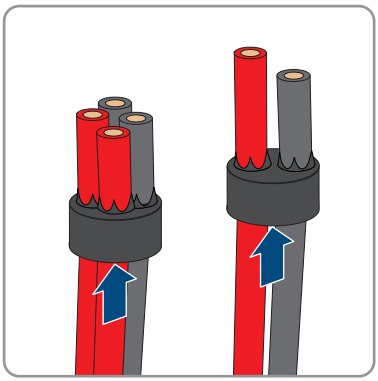


4. Unscrew the union nut from each cable gland and run it over the DC cables. If all 3 PV inputs are occupied, run the cables for **PVA** and **PVB** together through a union nut and cable gland, and the cable for **PVC** through another union nut and cable gland.

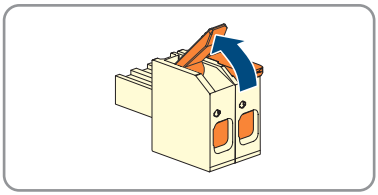


5. Remove the four-hole cable support sleeve from the cable gland.

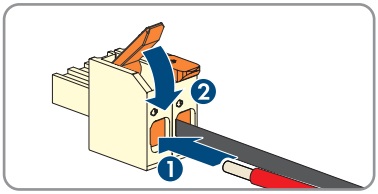
6. Plug the DC cables into one enclosure opening in each of the four-hole cable support sleeves. In doing so, pierce the closed side of the enclosure opening.



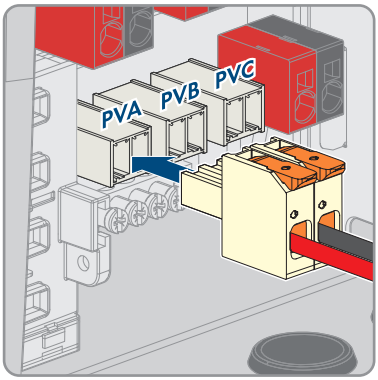
7. Strip the insulation of the DC cables by approx. 12 mm.
8. Push up the levers on the terminal blocks for connecting the PV modules.



9. Connect the DC cables to the terminal blocks for connecting the PV modules. To do this, insert the conductor and push down the lever.



10. Plug the terminal blocks onto the **PVA**, **PVB** and **PVC** slots.



11. Firmly hand-tighten the swivel nuts of the cable glands.

Also see:

- Requirements for the PV modules per input ⇒ page 45

- Requirements for the PV cables ⇒ page 45

11.11 Connecting the power cable of the battery

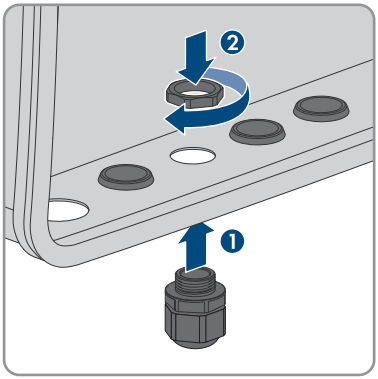
⚠ QUALIFIED PERSON

Requirements:

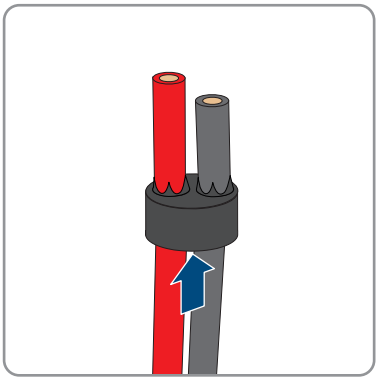
☐ The battery power cables must be pre-assembled.

Procedure:

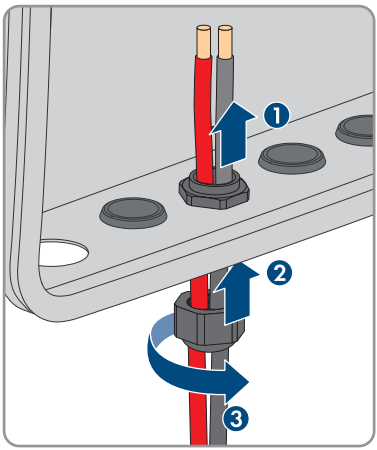
1. Disconnect the inverter from all voltage sources .
2. Insert the M25x1.5 cable gland with two-hole cable support sleeve into the enclosure opening for connecting the battery power cables and tighten it from the inside with the counter nut.



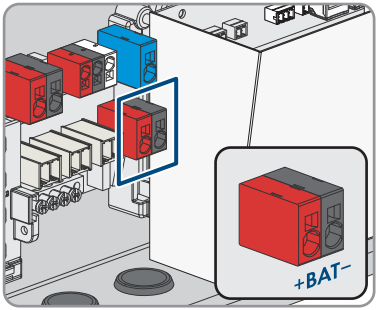
3. Unscrew the union nut from the cable gland and lead the cable through.
4. Remove the two-hole cable support sleeve from the cable gland.
5. Insert the battery power cables into the enclosure openings. In doing so, pierce the closed side of the enclosure opening.



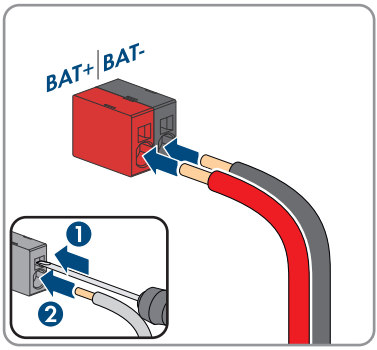
6. Press the two-hole cable support sleeve including the battery power cables into the cable gland.



7. Route the battery power cables to the terminal block **BAT+** and **BAT-**.



8. Connect the battery power cables to the terminal block **BAT+** and **BAT-** according to the label. To do so, insert a flathead screwdriver into the top opening of the terminal and insert the cable into the bottom opening. Then remove the screwdriver.



9. Tug lightly to ensure that the cables are secured in the terminals.
10. Tighten the union nut on the cable gland hand-tight.

Also see:

- Requirements for the Battery Power Cables ⇒ page 47

11.12 Connecting Additional Grounding

⚠ QUALIFIED PERSON

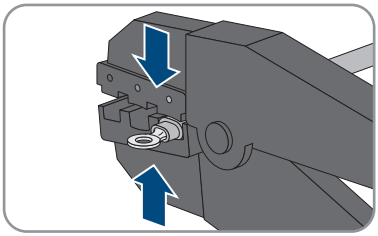
If additional grounding or equipotential bonding is required locally, you can connect additional grounding to the product. This prevents touch current if the grounding conductor at the terminal for the AC cable fails. The required M5x16 screw, the washer, and the conical spring washer are included in the scope of delivery of the inverter.

Additionally required material:

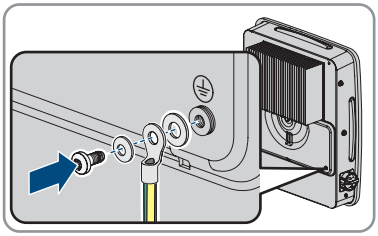
- 1 ring terminal lug

Procedure:

1. Strip the grounding cable insulation.
2. Insert the stripped part of the grounding cable into the ring terminal lug and crimp using a crimping tool.



3. Insert the screw with conical spring washer through the hole in the ring terminal lug and washer and tighten the ring terminal lug with the screw to the connection point for additional grounding with a Torx screwdriver (TX25) (tightening torque: 2.5 Nm).



Also see:

- Requirements for the grounding cable for additional grounding ⇒ page 47

12 Commissioning

12.1 Procedure for commissioning as System Manager

This section describes the procedure of commissioning an inverter that is used in systems as System Manager.

Only 1 device in the system can be used as System Manager at a time. All other devices must be configured as a subordinate device and recorded in the System Manager.

If a Sunny Home Manager is available, all inverters must be configured as subordinate inverters (see Section 12.2, page 72).

It provides an overview of the steps, which must be performed in the prescribed sequence.

Procedure		See
1.	Commission all SMA Speedwire devices that are to be subordinate to the System Manager (e.g., inverters, SMA Energy Meter).	Manual of the devices
2.	Commission the inverter that is to be configured as the System Manager.	Commissioning the Inverter
3.	Establish a connection to the user interface of the inverter that is to be configured as System Manager. There are various connection options to choose from for this: • Direct connection via Wi-Fi • Connection via WLAN in the local network • Connection via Ethernet in the local network	Section 13.2.2, page 79 Section 13.2.1, page 77
4.	If required, change the network configuration on the welcome page. The automatic network configuration recommended by SMA Solar Technology AG via DHCP server is activated by default. Only change the network configurations if the default configuration is not suitable for your network.	Commissioning Assistant
5.	Carry out the configuration using the Commissioning Assistant. Select **Inverter as System Manager** in the device function.	Commissioning Assistant
6.	Configure energy management and activate increased self-consumption.	Section 13.10, page 86

Procedure		See
7.	Make further settings if necessary (e.g., configure multifunction relay,configure digital input of fast stop, configure arc-fault circuit interrupter).	Operation
8.	To monitor the system in the Sunny Portal and view the data visually, create a user account in the Sunny Portal and create a system in the Sunny Portal or add devices to an existing system.	https://ennexOS.SunnyPortal.com

12.2 Procedure for commissioning in systems with Sunny Home Manager

This section describes the procedure of commissioning an inverter that is used in systems with Sunny Home Manager.

If a Sunny Home Manager is available, all inverters must be configured as subordinate inverters.

It provides an overview of the steps, which must be performed in the prescribed sequence.

Procedure		See
1.	Commission each inverter in the system.	Commissioning the Inverter
2.	Establish a connection to the user interface of the inverter. There are various connection options to choose from for this: • Direct connection via Wi-Fi • Connection via WLAN in the local network • Connection via Ethernet in the local network	Section 13.2.2, page 79 Section 13.2.1, page 77
3.	If required, change the network configuration on the welcome page. The automatic network configuration recommended by SMA Solar Technology AG via DHCP server is activated by default. Only change the network configurations if the default configuration is not suitable for your network.	Commissioning Assistant
4.	Carry out the configuration using the Commissioning Assistant. Select **Subordinate inverter** in the device function and set the country data set.	Commissioning Assistant
5.	Put the Sunny Home Manager into operation and register all inverters in the Sunny Home Manager.	Manual of the Sunny Home Manager

12.3 Procedure for commissioning as a subordinate device

This section describes the procedure of commissioning an inverter that is used in systems with or without System Manager.

In systems with System Manager, only 1 device can be used as System Manager at a time. All other devices must be configured as a subordinate device and recorded in the System Manager.

If a Sunny Home Manager is available, all inverters must be configured as subordinate inverters (see Section 12.2, page 72).

It provides an overview of the steps, which must be performed in the prescribed sequence.

Procedure		See
1.	Commission the inverter.	Commissioning the Inverter
2.	Establish a connection to the user interface of the inverter. There are various connection options to choose from for this: • Direct connection via Wi-Fi • Connection via WLAN in the local network • Connection via Ethernet in the local network	Section 13.2.2, page 79 Section 13.2.1, page 77
3.	If required, change the network configuration on the welcome page. The automatic network configuration recommended by SMA Solar Technology AG via DHCP server is activated by default. Only change the network configurations if the default configuration is not suitable for your network.	Commissioning Assistant
4.	Carry out the configuration using the Commissioning Assistant. Select **Subordinate inverter** in the device function.	Commissioning Assistant
5.	Commissioning the inverter to be configured as a System Manager, performing the plant-wide configuration using the commissioning wizard. Register all devices in the system and carry out the system-wide configuration.	Procedure for commissioning as System Manager

12.4 Commissioning the Inverter

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Requirements:

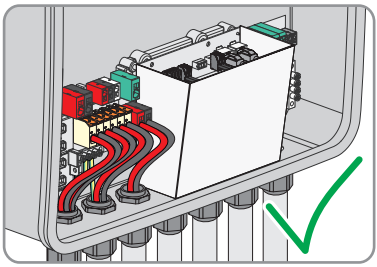
☐ The AC circuit breaker must be correctly rated and mounted.

☐ The inverter must be correctly mounted.

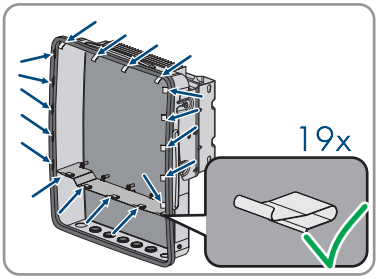
☐ All cables must be correctly connected.

Procedure:

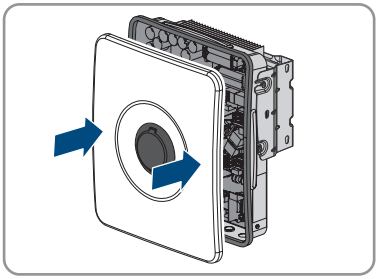
1. Make sure that the communication cables do not touch the AC or DC cables and that the cover for the connection area is attached.



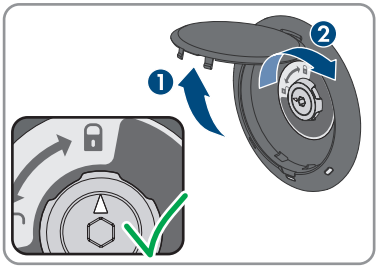
2. Make sure that all EMC terminals are present and correctly attached to the enclosure.



3. Make sure that cables do not protrude out of the enclosure, so that they could press against the cover when it is installed.
4. Align the cover with the enclosure and press in place with both hands.

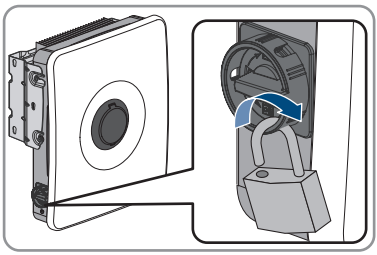


5. Open the cover of the enclosure lock and tighten the screw in the middle with an Allen key (1/4") until an audible click can be heard. Note the direction of rotation printed on the cover.

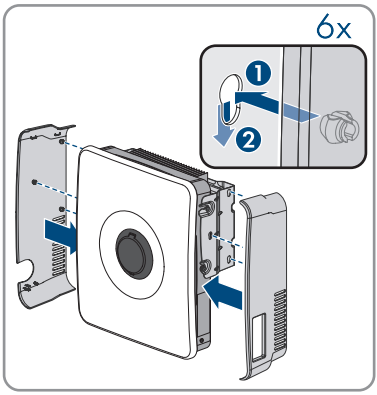


6. Close the cover of the enclosure lock again.
   ☑ The enclosure cover is attached.

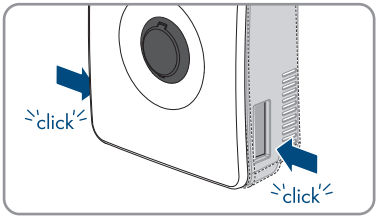
7. If the DC load-break switch was secured with a lock, open and remove the lock.



8. Hang the side covers on the hooks on the left and right of the mounting bracket and slide them downwards.



9. Press the side covers downwards until an audible click can be heard.



10. Make sure that the side covers are mounted correctly. Otherwise, the inverter is not protected against being prized out.
11. Switch on the AC circuit breaker.
12. Switch on the battery.
13. Switch on the DC load-break switch of the inverter.
14. Wait until the green LED lights up or pulses or the green and red LEDs flash simultaneously. This can take up to 5 minutes.
15. If the green and red LEDs flash simultaneously during initial commissioning, operation is stopped because no country data set has been set yet. For the inverter to begin operation, the configuration must be completed and a country data set must be set.
16. If the green LED is still flashing, the conditions for activating feed-in operation are not yet met. As soon as the conditions for feed-in operation are met, the inverter starts with feed-in operation and, depending on the available power, the green LED will light up continuously or it will pulse.

17. If the red LED lights up, an event has occurred. Find out which event has occurred and, if necessary, initiate countermeasures.
18. Ensure that the inverter feeds in correctly.

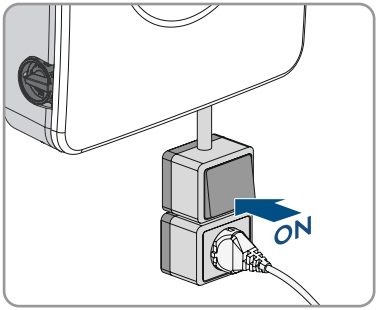
12.5 Checking the Secure Power Supply Operation

Requirements:

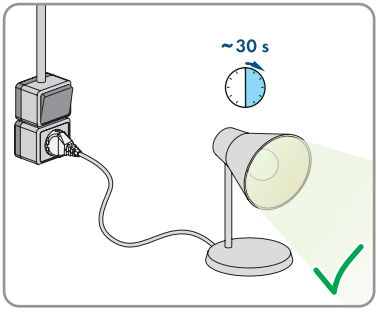
☐ The socket and switch for the secure power supply operation must be connected.
☐ The inverter must be commissioned.
☐ Secure power supply operation must have been configured during commissioning.
☐ A load must be connected to the socket for the secure power supply operation.

Procedure:

1. Switch off the AC miniature circuit breaker.
2. Turn on the switch for secure power supply operation.



3. Check whether the load connected to the socket for secure power supply operation is turning on. This can take up to 30 seconds.



4. If the load does not turn on, ensure that the socket and the switch for the secure power supply operation are correctly connected. If the load still fails to turn on, contact Service.
5. Switch on AC miniature circuit breaker.
6. Switch off the switch for secure power supply operation.

13 Using the System Manager

13.1 Operation notes

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.
- If you do not use a flat rate, you can set the amount of data transmission in the Sunny Portal powered by EnnexOS.

The following sections describe how to control the system via the System Manager user interface. Settings made in the System Manager are transferred to other devices, e.g., lower-level inverters.

13.2 Establishing a connection to the user interface

13.2.1 Connection in the local network

13.2.1.1 Access addresses for the product in the local network

DHCP Server is recommended

The DCHP server automatically assigns the appropriate network settings to your nodes in the local network. A manual network configuration is therefore not necessary. In a local network, the Internet router is usually the DHCP server. If the IP addresses in the local network are to be assigned dynamically, DHCP must be activated in the Internet router (see the Internet router manual). In order to receive the same IP address by the internet router after a restart, set the MAC address binding.

In networks where no DHCP server is active, proper IP addresses must be assigned from the free address pool of the network segment to all network participants to be integrated during commissioning.

Communication disturbances in the local network

The IP address range 192.168.12.0 to 192.168.12.255 is occupied for communication amongst SMA products and for direct access to SMA products.

Communication problems might occur if this IP address range is used in the local network.

- Do not use the IP address range 192.168.12.0 to 192.168.12.255 in the local network.

If the product is connected to a local network (e.g. via a router or Wi-Fi), 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 listed 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: **https://SMA[serial number]** (e.g. https://SMA0123456789)

13.2.1.2 Establishing a Connection via Ethernet in the local network

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: You can change the network configuration on the welcome page of the product.
☐ A smart device (e.g. 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.

Procedure:

1. Open the web browser of your smart device.
2. Enter the access address of the product in the address bar of the web browser.
3. **Web browser displays warning**

   After the access address of the product has been entered, a message might appear indicating that the connection to the user interface of the product is not secure.
   - Continue loading the user interface (scroll to bottom and click proceed/advance).

☑ When you connect to the user interface for the first time, the welcome page opens. The Commissioning Assistant for configuring the product can be started via the welcome page.
☑ The login page of the user interface opens if the product has already been configured.

Also see:

- Access addresses for the product in the local network ⇒ page 77

13.2.1.3 Establishing a Connection via WLAN in the Local Network

Requirements:

☐ The product must be commissioned.
☐ The product must be integrated into the local network. Tip: You can change the network configuration on the welcome page of the product.
☐ A smart device (e.g. 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.

Procedure:

1. Open the web browser of your smart device.
2. Enter the access address of the product in the address bar of the web browser.
3. **Web browser displays warning**

   After the access address of the product has been entered, a message might appear indicating that the connection to the user interface of the product is not secure.

   - Continue loading the user interface (scroll to bottom and click proceed/advance).

☑ When you connect to the user interface for the first time, the welcome page opens. The Commissioning Assistant for configuring the product can be started via the welcome page.

☑ The login page of the user interface opens if the product has already been configured.

Also see:

- Access addresses for the product in the local network ⇒ page 77

13.2.2 Direct connection via Wi-Fi

13.2.2.1 Connection options for Wi-Fi direct connection

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 end device, establish the direct connection via Wi-Fi as described in the manual of your end device.

The following connection options ar available:

- Direct Wi-Fi connection with 360° app (see Section 13.2.2.3, page 80)
- Direct Wi-Fi connection with WPS (see Section 13.2.2.4, page 80)
- Direct Wi-Fi connection with Wi-Fi network search (see Section 13.2.2.5, page 80)

Also see:

- Establishing a direct Wi-Fi connection with the 360° app ⇒ page 80

13.2.2.2 Access information for direct Wi-Fi connection

Communication disturbances in the local network

The IP address range 192.168.12.0 to 192.168.12.255 is occupied for communication amongst SMA products and for direct access to SMA products.

Communication problems might occur if this IP address range is used in the local network.

- Do not use the IP address range 192.168.12.0 to 192.168.12.255 in the local network.

Access information for the direct WiFi connection can be found below:

- SSID: **SMA[serial number]** (e.g. SMA0123456789)
- Device-specific Wi-Fi password: WPA2-PSK (see type label of the product)
- Default access address: **https://smalogin.net** or **https://192.168.12.3**

13.2.2.3 Establishing a direct Wi-Fi connection with the 360° app

Requirements:

☐ A smart end device with camera must be available.

☐ The SMA 360° App must be installed on the smart device.

☐ An user account for Sunny Portal must already exist.

Procedure:

1. Open the SMA 360° App and login with the Sunny Portal account details.
2. Select **QR-Code Scan** in the menu.
3. Scan the QR Code on you product via the SMA 360° App.
   ☑ The smart device automatically connects to the product. The login page of the user interface is displayed in the 360° App.
4. If the login page of the user interface is not displayed, open the web browser and enter **https://smalogin.net** in the address bar.

Also see:

- Access information for direct Wi-Fi connection ⇒ page 79

13.2.2.4 Establishing a direct Wi-Fi connection with WPS

Requirements:

☐ A smart device with WPS function must be available.

Procedure:

1. Enable the WPS function on the inverter. To do this, tap on the enclosure lid of the inverter twice.
   ☑ 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 device and enter **https://smalogin.net** in the address bar.

☑ When you connect to the user interface for the first time, the welcome page opens. The Commissioning Assistant for configuring the product can be started via the welcome page.

☑ The login page of the user interface opens if the product has already been configured.

Also see:

- Access information for direct Wi-Fi connection ⇒ page 79

13.2.2.5 Establishing direct Wi-Fi 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. Enter the device-specific Wi-Fi password (see WPA2-PSK on the type label).
4. Open the web browser of your smart end device and enter **https://smalogin.net** in the address bar.
   ☑ When you connect to the user interface for the first time, the welcome page opens. The Commissioning Assistant for configuring the product can be started via the welcome page.
   ☑ The login page of the user interface opens if the product has already been configured.
5. If the login page of the user interface does not open, enter the IP address **192.168.12.3** or, if your smart terminal supports mDNS services, **SMA[serial number].local** or **https://SMA[serial number]** in the address bar of the web browser.

Also see:

- Access information for direct Wi-Fi connection ⇒ page 79

13.3 WPS function

13.3.1 Connection options with WPS

You have several options to use the WPS function. Depending on the possible application of the WPS function, the procedure for activation will vary.

The following options are available:

- WPS for automatic connection to a network (e.g. via a router)
- WPS for direct connection between the product and a smart device

13.3.2 Activating WPS for automatic connection

Requirements:

☐ WLAN must be activated in the product.

☐ WPS must be activated on the router.

☐ The user interface is open and you are logged in.

Procedure:

1. Select the menu **Configuration**.
2. Select **Network configuration** menu item.
3. Click on the button **Use WPS** in the **Wi-Fi** section.
4. Click on [**Save**].

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

13.3.3 Activating WPS for direct connection to a smart device

- Tap on the enclosure lid of the product twice in direct succession.

☑ The WPS function is activated for about 2 minutes. Activation is signaled by rapid flashing of the blue LED.

13.4 Design of the User Interface

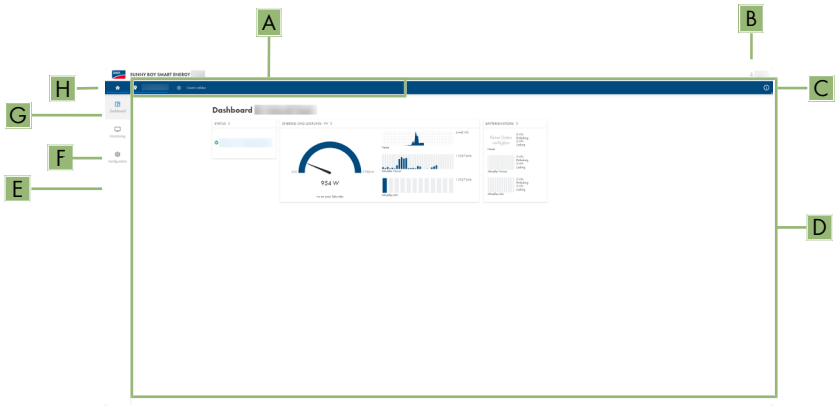


Figure 12: Design of the User Interface

Position	Designation	Description
A	Focus navigation	Enables the navigation between the following levels: • System • Device
B	User settings	Provides the following functions: • Configuring personal data • Logout
C	System information	Displays the following information: • System • Device information • Licenses • eManual
D	Content Area	Displays the dashboard or content of the selected menu.
E	Configuration	Offers different views for configuration, depending on the selected level and user role.
F	Monitoring	Offers different views for monitoring, depending on the scope of the connected devices.
G	Dashboard	Displays information and instantaneous values of the device or system currently selected.
H	Home	Opens the user interface home page

13.5 Access rights to the user interface

1 administrator is created during registration. As administrator, you can add further system users who can configure user rights or delete users.

This gives users access to the system and to the devices recorded in the system.

You can assign the following rights for users:

- Administrator
- User
- Installer

13.6 Changing parameters

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

This section describes the basic procedure for changing parameters. Always change parameters as described in this section.

Requirements:

☐ The user interface must be open and you must be logged in.

☐ Changes to grid-relevant parameters must be approved by the responsible grid operator, and can only be made as **Administrator** or **Installer**.

Procedure:

1. Choose the product in the focus navigation.
2. Select the menu **Configuration**.
3. Select the **Parameters** menu item.
4. Call up the parameter via the search function or navigate to the parameter.
5. Change the parameter value.
6. Click on [**Save**].

13.7 SMA ArcFix

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You can set the arc-fault circuit interrupter using the following parameters.

Channel	Name	Settings
AfciIsOn	AFCI switched on	Yes
		No

You can use the following parameters to set the manual restart after an arc fault detection.

Channel	Name	Settings
Operation.ManRstr.IsOn	Manual restart activated	Yes No
Operation.ManRstr.ManRstrAFCI	Manual restart after arc detection	On Off Yes, after 5 electric arc detections within 24 hrs

Also see:

- Changing parameters ⇒ page 83
- Manual restart after electric arc ⇒ page 128

13.8 Digital output (MFR)

13.8.1 Use of the digital output (MFR)

The digital output (MFR) can be switched depending on measured values or states.

You have several options to use the digital output.

Possible use	Category	Explanation
Notification in the event of an error	System state	System is in warning or error state.
Alarm in case of warning or error	System state	System is in error state.
Direct selling enabled	System state	The active power limitation of the direct seller is currently used for the point of interconnection.
Battery state of charge[2)]	Monitoring	Balanced state of charge of all batteries in the system
System active power[2)]	Monitoring	Sum of the active power of all PV inverters in the system.
System reactive power[2)]	Monitoring	Balance of the reactive power of all selected PV inverters in the system.
Reactive power setpoint[2)]	Setpoints	Reactive power value to be set.
Setpoint of active power limitation[2)]	Setpoints	The active power value currently to be set.

[2)] Conditions for activating the outlet signal must be specified

Possible use	Category	Explanation
Standardized measured voltage value for Q(V)[2)]	Grid connection point	Standardized measured voltage value from the point of interconnection. For this, you require a valid Q(V) configuration in the grid management services.
System active power (grid-supplied power)[2)]	Grid connection point	Currently drawn active power.
System active power (grid feed-in)[2)]	Grid connection point	Currently fed-in active power.
System reactive power at the grid connection point[2)]	Grid connection point	Current reactive power.

13.8.2 Configure the digital output (MFR)

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Requirements:

☐ A signal source must be connected to the digital output (**MFR**).

☐ The inverter to which the signal source is connected, must be configured as System Manager.

☐ The user interface must be open and you must be logged in as **Installer** or **Administrator**.

Procedure:

1. Select the product in the focus navigation.
2. Select the menu **Configuration**.
3. Select the menu item **I/O configurations**.
4. Select + to add a new configuration.
5. Select the type of the I/O channel **Digital output**.
6. Select the use for the digital output.
7. If necessary, activate inversion of the signal. Observe the pin assignment of the terminal block.
8. Click on [**Save**].

13.9 Configuring the Digital Input for Fast Stop

⚠ QUALIFIED PERSON

Requirements:

☐ A switch for a fast stop must be connected to the digital input **GSI**.

☐ The inverter to which the switch is connected, must be configured as System Manager.

☐ The user interface must be open and you must be logged in as **Installer** or **Administrator**.

Procedure:

1. Select the product in the focus navigation.

2. Select the menu **Configuration**.
3. Select the menu item **I/O configurations**.
4. Select + to add a new configuration.
5. Select the type of the I/O channel **Digital input**.
6. Select the use for the digital input **Signal fast stop**.
7. Configure the connected switch as a break contact to ensure the safety of the system in the event of a cable break.
8. Select the System Manager to which the switch for the fast stop is connected.
9. Select the digital input.
10. Assign the name of the I/O channel (e.g. fast stop).
11. Click on [**Save**].

13.10 Energy management

13.10.1 Home page of the energy management

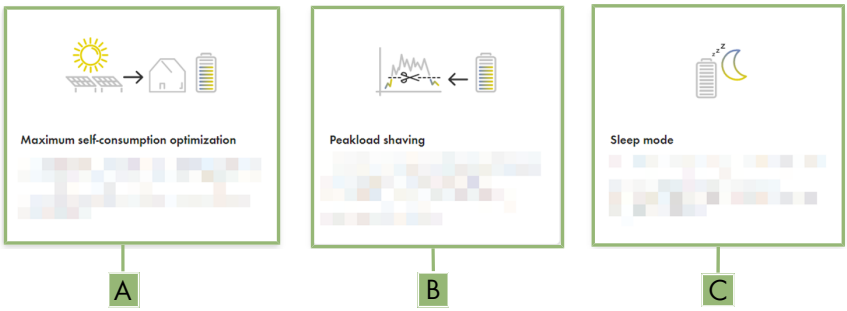


Figure 13: Energy management profiles on the home page of the energy management

Position	Energy management profile
A	Maximum increased self-consumption
B	Peak load shaving
C	Sleep mode

When energy management is started for the first time after commissioning, the energy management home page always appears first. The home page of the energy management shows predefined energy management profiles that are stored in the product. These profiles form the basis for configuring the energy management.

Also see:

- Overview of used energy management profiles ⇒ page 87
- Creating a new energy management profile ⇒ page 88

13.10.2 Overview of used energy management profiles

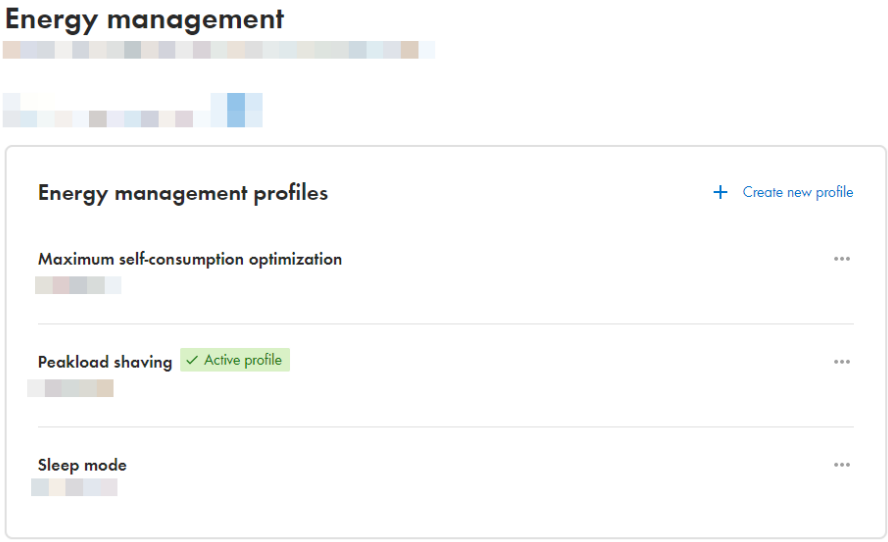


Figure 14: Overview of the used energy management profiles (example)

This overview shows all energy management profiles that were activated at least once before. The energy management profile currently active is highlighted.

Also see:

- Home page of the energy management ⇒ page 86
- Creating a new energy management profile ⇒ page 88
- Activating the energy management ⇒ page 89
- Deactivating the energy management ⇒ page 89
- Changing an energy management profile ⇒ page 90

13.10.3 Setting options for peak load shaving

Setting option	Explanation
Limiting value for peak shaving	Limiting value for the grid supply from which the battery is to be used to reduce peak loads. Only whole numbers are accepted as an entry.
Billing interval in the tariff	Interval for billing the performance prices: If the tariff of your electric utility company does not specify an interval for billing the performance prices or if the interval for billing the performance prices is not known, select the **Unknown** option.

Setting option	Explanation
Adjustment	If no value is specified for the **Billing interval in the tariff**, the option **Immediate adjustment** is always active. In this case, peak load shaving is controlled according to the instantaneous value of the grid supply at the point of interconnection. If a value for the **Averaging interval in the tariff** is specified, the option **Averaging interval** can be selected. In this case, peak load shaving is controlled according to the averaging value of the grid supply at the point of interconnection. If a peak load that is too high cannot be curtailed, the resulting overload can be compensated for at another time in the averaging interval. It can happen that the inverter curtails the grid-supplied power even further than specified by the threshold for peak load shaving.
Automatic threshold adjustment	Only if a value for the **Averaging interval in the tariff** is specified, can the function **Autom. threshold adjustment** be used. If the option **Adaptively increase threshold** is activated and the threshold for peak load shaving could not be observed despite adjustment via the averaging interval, the threshold is automatically increased. Exceeding the original threshold specifies the measure for the adaptive increase. Optionally, the threshold for peak load shaving can be reset to the originally entered value at the end of the billing period.
Battery charging	The parameter **Battery charge** controls the charging behavior of the inverter during peak load shaving: If the state of charge of the battery should always be as high as possible, for example, activate or leave the option **Recharge start voltage corresponds to threshold for peak load shaving** activated for the parameter **Battery state of charge**. If recharging of the battery from the utility grid is to be avoided, for example, deactivate the option **Recharge start voltage corresponds to threshold for peak load shaving** and set the **Recharge start voltage** to 0 kW for the parameter **Battery state of charge**.

Also see:

- Creating a new energy management profile ⇒ page 88

13.10.4 Creating a new energy management profile

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When an energy management profile is created, energy management activates automatically.

Prerequisite:

☐ A suitable energy meter is installed and configured at the point of interconnection within the system.

☐ A battery is available in the system and has been put into operation.

☐ The user interface is open and you are logged in.

Procedure:

1. Select the menu item **Energy management** in the menu **Configuration**.
   ☑ If no energy management profile has been created yet, the home page of the energy management opens.
   ☑ If at least 1 energy management profile has been created, the overview of the energy management profiles used opens.
2. To open the home page of the energy management, select the button [**Create new profile**] in the overview of the energy management profile used.
3. Click on the profile you want.
   ☑ In the energy management profiles **Maximum increased self-consumption** and **Sleep mode**, the selected energy management profile is activated automatically.
   ☑ In the energy management profile **Peak load shaving**, the page to set the parameters opens.
4. To use peak load shaving, set the parameters for the peak load shaving. Take the parameter description for peak load shaving into account.

Also see:

- Home page of the energy management ⇒ page 86
- Overview of used energy management profiles ⇒ page 87
- Setting options for peak load shaving ⇒ page 87

13.10.5 Deactivating the energy management

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A single energy management profile cannot be deactivated, only changed. To deactivate the entire energy management, proceed as described in this section.

Procedure:

1. Log into the user interface of the product.
2. Select the menu item **Energy management** in the menu **Configuration**.
3. Select the slider **Activate energy management**.

Also see:

- Overview of used energy management profiles ⇒ page 87

13.10.6 Activating the energy management

⚠ QUALIFIED PERSON

Requirements:

☐ A suitable energy meter is installed and configured at the point of interconnection within the system.

☐ At least 1 energy management profile has already been created.
☐ The user interface is open and you are logged in.

Procedure:

1. Select the menu item **Energy management** in the menu **Configuration**.
2. Select the slider **Activate energy management**.
3. If the required energy management profile is not activated, in the row of the energy management profile, select the ••• button.
4. Select **Activate profile**.

Also see:

- Overview of used energy management profiles ⇒ page 87

13.10.7 Changing an energy management profile

⚠ QUALIFIED PERSON

A single energy management profile cannot be deactivated, only changed.

Requirements:

☐ At least 1 energy management profile has already been created.
☐ The user interface is open and you are logged in.

Procedure:

1. Log into the user interface of the product.
2. Select the menu item **Energy management** in the menu **Configuration**.
3. In the row of the required energy management profile, select the ••• button.
4. Select **Activate profile**.

Also see:

- Overview of used energy management profiles ⇒ page 87

13.11 Backup file

13.11.1 Function and content of the backup file

The backup file is used to transfer configuration information, e.g. when commissioning a replacement device or when restoring previously saved parameter settings.

The backup file includes the following system and device configuration data for your product:

- Grid management services
- Network
- Energy meter
- Sunny Portal setting
- Self-defined Modbus profiles
- System password

- User interface login data
- List of connected devices

The following information is not included in the backup file:

- Notifications
- Historic energy and performance values

13.11.2 Creating a Backup File

Requirements:

☐ The user interface must be open and you must be logged in.

Procedure:

1. Select the product in the focus navigation.
2. Select the menu **Configuration**.
3. Select the **Update and backup** menu item.
4. Select the [**Create backup file**] button.
5. Enter a password to encrypt the backup file and confirm with [**Create and download backup file**]. Please note that the password will be needed later for importing the backup file.
   ☑ An lbd file with all parameter settings is downloaded.

Also see:

- Function and content of the backup file ⇒ page 90

13.12 Carry out a manual firmware update

Requirements:

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

☐ The user interface must be open and you must be logged in as **Installer** or **Administrator**.

Procedure:

1. Select the product in the focus navigation.
2. Select the menu **Configuration**.
3. Select the **Update and backup** menu item.
4. In the **Manual update** area, click [**Select file**] and select the update file for the product.
   ☑ The user interface confirms that the update file is compatible.
5. If the user interface does not confirm the compatibility of the update file, replace the update file.
6. Select [**Start update**].
7. Follow the instructions in the dialog.
8. Select the **Monitoring** menu.

9. Select the menu item **Event monitor**.
10. Check the events to see whether the firmware update has been completed successfully.

13.13 Device Administration

13.13.1 Register Devices

You can register new devices and add them to the system on system level. This is required, for example, if your system has been expanded.

Procedure:

1. Select the system in the focus navigation.
2. Select the menu **Configuration**.
3. Select the **Device management** menu item.
4. Select the ⊕ button.
5. Follow the steps of the device registration wizard.

13.13.2 Delete devices

You can delete registered devices on system level.

Requirements:

☐ The login page of the user interface must be open.

Procedure:

1. Select the system in the focus navigation.
2. Select the menu **Configuration**.
3. Select the **Device management** menu item.
4. In the row of the device to be deleted, click the ••• button.
5. Select **Delete device**.
6. Select [**Delete**] in the displayed message.

13.14 Resetting the product to default setting

i Loss of data due to replacement or due to resetting to default settings

If the product is reset to the default settings or replaced, all data saved in the product and the admin account will be deleted. The data saved in Sunny Portal can be transmitted to the product after calling up the Sunny Portal system again.

Requirements:

☐ The user interface must be open and you must be logged in.

Procedure:

1. Select the product in the focus navigation.
2. Select the menu **Configuration**.

3. Select the menu item **Device properties**.
4. Select the button [**If you want to reset the device to the default settings, click here**].
5. Select [**Reset**].

13.15 Deleting the Admin Account

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In case the password gets lost, the admin account can be reset and newly created. All system data will be retained.

Requirements:

☐ The Device Key from the label on the back of the supplied manual must be present.

☐ The login page of the user interface must be open.

Procedure:

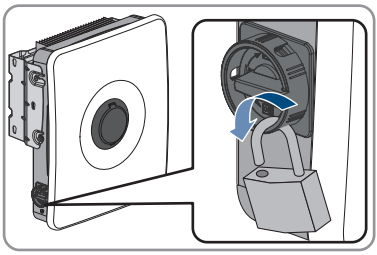
1. Select the [**Delete admin account?**] button.
2. Enter the Device Key from the label on the back of the supplied manual.
3. Select [**Delete**].

☑ The product is performing a restart. Then a new admin account can be created.

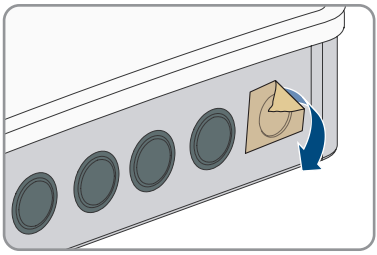
14 Remove enclosure lid

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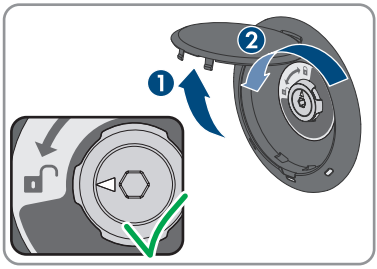
1. Ensure that the AC miniature circuit breaker is switched off and that it cannot be reconnected.
2. Ensure that the DC load-break switch of the inverter is in the **O** position.
3. If your country requires the DC load-break switch to be protected against reconnection, remove the side covers. To do so, slide the side covers upward slightly, so that they can be removed from the hooks on the mounting bracket and the inverter.
4. If your country requires the DC load-break switch to be protected against reconnection, secure the DC load-break switch against reconnection with a padlock.



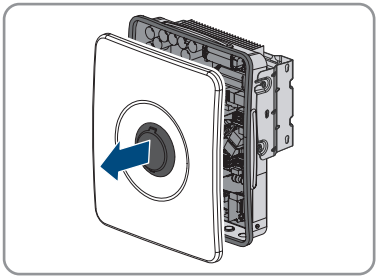
5. Switch off the battery or the load-break switch of the battery (see documentation of the battery manufacturer).
6. If the inverter is wet, ensure that the areas around all openings are dry and that no water can get into the inside of the inverter when it is opened.
7. Ensure that the battery is switched off.
8. Wait until the LEDs have gone out.
9. Wait 5 minutes until the capacitors inside the inverter have discharged.
10. If the enclosure cover is being opened for the first time: remove the adhesive tape from the first enclosure opening on the right.



11. Open the cover of the enclosure lock and loosen the screw in the middle with an Allen key (1/4") until an audible click can be heard. Note the direction of rotation printed on the cover.



12. Remove the enclosure cover and place it to one side.



13. Disconnect the inverter from all voltage sources .

15 Disconnecting the Inverter from Voltage Sources

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

Prerequisite:

☐ The enclosure cover must be removed (see Section 14, page 94).

Procedure:

1. Use a current clamp to check that no current is present in the DC conductors for the PV modules.
2. Write down the positions of the terminal blocks for connecting the PV modules.
3. Remove the terminal blocks for connecting the PV modules from the slots.
4. Use a suitable measuring device to ensure that there is no voltage between each of the slots **PVA**, **PVB** and **PVC** and **PV+** and **PV-**.
5. Ensure that there is no voltage between each of the slots **PVA**, **PVB** and **PVC** and **PV+** and **PE** on the busbar for grounding the PV modules.
6. Use a current clamp to ensure that no current is present in the DC conductors for the battery.
7. Remove the DC conductors from the connection terminals.
8. Use a suitable measuring device to ensure that there is no voltage between the connection terminals **BAT+** and **BAT-**.
9. Use a suitable measuring device to ensure that there is no voltage between the connection terminal **BAT+** and **PE** on the busbar for grounding the PV modules.
10. Ensure that there is no voltage at the **AC** connection terminals between **L** and **N**.
11. Ensure that there is no voltage between **L** on the **AC** connection terminals and **PE** on the busbar for grounding the AC connection.

16 Cleaning

System components exposed to soiling must be cleaned regularly to ensure that all products are free of dust, leaves, and other dirt.

NOTICE

Damage to system components due to cleaning agents

The use of cleaning agents may cause damage to the system components and parts of the components.

- Clean the inverter and all its components only with a cloth moistened with clear water.
- Clean all battery components with a dry cloth only.

NOTICE

Yield reduction due to dirty cooling fins

The power output of the inverter is reduced if the cooling fins are very dirty.

- Clean the cooling fins of the inverter.

17 Troubleshooting

17.1 Event messages

17.1.1 Event 101

⚠ QUALIFIED PERSON

Event message:

- Grid incident

Explanation:

The grid voltage or grid impedance at the connection point of the inverter is too high. The inverter has disconnected from the utility grid.

Corrective measures:

- Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range.

  If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits.

  If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.

17.1.2 Event 102

⚠ QUALIFIED PERSON

Event message:

- Grid incident

Explanation:

The grid voltage or grid impedance at the connection point of the inverter is too high. The inverter has disconnected from the utility grid.

Corrective measures:

- Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range.

  If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits.

  If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.

17.1.3 Event 103

⚠ QUALIFIED PERSON

Event message:

- Grid incident

Explanation:

The grid voltage or grid impedance at the connection point of the inverter is too high. The inverter has disconnected from the utility grid.

Corrective measures:

- Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range.

  If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits.

  If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.

17.1.4 Event 105

⚠ QUALIFIED PERSON

Event message:

- Grid incident

Explanation:

The grid voltage or grid impedance at the connection point of the inverter is too high. The inverter has disconnected from the utility grid.

Corrective measures:

- Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range.

  If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits.

  If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.

17.1.5 Event 202

⚠ QUALIFIED PERSON

Event message:

- Grid incident

Explanation:
The utility grid has been disconnected, the AC cable is damaged or the grid voltage at the connection point of the inverter is too low. The inverter has disconnected from the utility grid.

Corrective measures:
- Ensure that the miniature circuit breaker is switched on.
- Ensure that the AC cable is not damaged and that it is connected correctly.
- Ensure that the country standard has been configured correctly.
- Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range.

  If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits.

  If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.

17.1.6 Event 203

⚠ QUALIFIED PERSON

Event message:
- Grid incident

Explanation:
The utility grid has been disconnected, the AC cable is damaged or the grid voltage at the connection point of the inverter is too low. The inverter has disconnected from the utility grid.

Corrective measures:
- Ensure that the miniature circuit breaker is switched on.
- Ensure that the AC cable is not damaged and that it is connected correctly.
- Ensure that the country standard has been configured correctly.
- Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range.

  If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits.

  If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.

17.1.7 Event 206

⚠ QUALIFIED PERSON

Event message:
- Grid incident

Explanation:

The utility grid has been disconnected, the AC cable is damaged or the grid voltage at the connection point of the inverter is too low. The inverter has disconnected from the utility grid.

Corrective measures:

- Ensure that the miniature circuit breaker is switched on.
- Ensure that the AC cable is not damaged and that it is connected correctly.
- Ensure that the country standard has been configured correctly.
- Check whether the grid voltage at the connection point of the inverter is permanently in the permissible range.

  If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits.

  If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.

17.1.8 Event 301

⚠ QUALIFIED PERSON

Event message:

- Grid incident

Explanation:

The ten-minute average value of the grid voltage is no longer within the permissible range. The grid voltage or grid impedance at the connection point is too high. The inverter disconnects from the utility grid to maintain power quality.

Corrective measures:

- During the feed-in operation, check whether the grid voltage at the connection point of the inverter is permanently in the permissible range.

  If the grid voltage is outside the permissible range due to local grid conditions, contact the grid operator. The grid operator must agree with an adjustment of the voltage at the feed-in point or with a change of the monitored operating limits.

  If the grid voltage is permanently within the permissible range and this message is still displayed, contact the Service.

17.1.9 Event 302

⚠ QUALIFIED PERSON

Event message:

- Temperature AC voltage

Explanation:

The inverter has reduced its power due to a too-high grid voltage to ensure grid stability.

Corrective measures:

- If possible, check the grid voltage and observe how often fluctuations occur. If fluctuations occur frequently and this message is displayed often, contact the grid operator and request approval to change the operating parameters of the inverter. If the grid operator gives approval, discuss any changes to the operating parameters with the Service.

17.1.10 Event 401

⚠ QUALIFIED PERSON

Event message:

- Grid incident

Explanation:

The inverter has disconnected from the utility grid. A stand-alone grid or a very large change in the grid frequency was detected.

Corrective measures:

- Make sure there is no power outage or work being done on the utility grid and contact a grid operator if necessary.
- Check the grid connection for significant short-term frequency fluctuations.

17.1.11 Event 404

⚠ QUALIFIED PERSON

Event message:

- Grid incident

Explanation:

The inverter has disconnected from the utility grid. A stand-alone grid or a very large change in the grid frequency was detected.

Corrective measures:

- Make sure there is no power outage or work being done on the utility grid and contact a grid operator if necessary.
- Check the grid connection for significant short-term frequency fluctuations.

17.1.12 Event 501

⚠ QUALIFIED PERSON

Event message:

- Grid incident

Explanation:

The grid frequency is not within the permissible range. The inverter has disconnected from the utility grid.

Corrective measures:

- If possible, check the grid frequency and observe how often fluctuations occur.

  If fluctuations occur frequently and this message is displayed often, contact the grid operator and request approval to change the operating parameters of the inverter.

  If the grid operator gives approval, discuss any changes to the operating parameters with the Service.

17.1.13 Event 507

⚠ QUALIFIED PERSON

Event message:

- Temperature AC frequency

Explanation:

The inverter has reduced its power due to a too-high grid frequency to ensure grid stability.

Corrective measures:

- If possible, check the grid frequency and observe how often fluctuations occur. If fluctuations occur frequently and this message is displayed often, contact the grid operator and request approval to change the operating parameters of the inverter. If the grid operator gives approval, discuss any changes to the operating parameters with the Service.

17.1.14 Event 601

⚠ QUALIFIED PERSON

Event message:

- Grid incident

Explanation:

The inverter has detected an excessively high proportion of direct current in the grid current.

Corrective measures:

- Check the grid connection for direct current.
- If this message is displayed frequently, contact the grid operator and check whether the monitoring threshold on the inverter can be raised.

17.1.15 Event 701

⚠ QUALIFIED PERSON

Event message:

- Frequency not permitted
- Check parameter

Explanation:

The grid frequency is not within the permissible range. The inverter has disconnected from the utility grid.

Corrective measures:

- Check the AC wiring from the inverter to the feed-in meter.
- If possible, check the grid frequency and observe how often fluctuations occur.

  If fluctuations occur frequently and this message is displayed often, contact the grid operator and request approval to change the operating parameters of the inverter.

  If the grid operator gives approval, discuss any changes to the operating parameters with the Service.

17.1.16 Event 901

⚠ QUALIFIED PERSON

Event message:

- PE connection missing
- Check connection

Explanation:

The grounding conductor is not correctly connected.

Corrective measures:

- Ensure that the grounding conductor is correctly connected.

17.1.17 Event 1001

⚠ QUALIFIED PERSON

Event message:

- L / N swapped

Explanation:

Incorrect installation of the L / N connection.

Corrective measures:

- Check the AC wiring from the inverter to the feed-in meter.

- Check the AC voltages on the inverter connection.
- If this message is still displayed, contact the Service.

17.1.18 Event 1101

⚠ QUALIFIED PERSON

Event message:

- Installation fault
- Check connection

Explanation:

A second line conductor is connected to N.

Corrective measures:

- Connect the neutral conductor to N.

17.1.19 Event 1302

⚠ QUALIFIED PERSON

Event message:

- Waiting for grid voltage
- Grid connection installation error
- Check grid connections and fuses

Explanation:

L or N not connected.

Corrective measures:

- Ensure that the line conductors are connected.
- Ensure that the miniature circuit breaker is switched on.
- Ensure that the AC cable is not damaged and that it is connected correctly.

17.1.20 Event 1501

⚠ QUALIFIED PERSON

Event message:

- Reconnection fault grid

Explanation:

The changed country standard or the value of a parameter you have set does not correspond to the local requirements. The inverter cannot connect to the utility grid.

Corrective measures:

- Ensure that the country standard has been configured correctly. To do this, select the parameter **Set country standard** and check the value.

17.1.21 Event 3302

⚠ QUALIFIED PERSON

Event message:

- Unstable operation

Explanation:

There is not enough power at the DC input of the inverter for stable operation. The inverter cannot connect to the utility grid.

Corrective measures:

- Ensure that the PV module is dimensioned correctly.
- Ensure that the PV module is not covered by snow or otherwise shaded.
- Ensure that the PV module is free of defects.
- Ensure that the battery is fault-free.

17.1.22 Event 3303

⚠ QUALIFIED PERSON

Event message:

- Unstable operation

Explanation:

There is not enough power at the DC input of the inverter for stable operation. The inverter cannot connect to the utility grid.

Corrective measures:

- Ensure that the PV module is dimensioned correctly.
- Ensure that the PV module is not covered by snow or otherwise shaded.
- Ensure that the PV module is free of defects.
- Ensure that the battery is fault-free.

17.1.23 Event 3401

⚠ QUALIFIED PERSON

Event message:

- DC overvoltage
- Disconnecting generator

Explanation:

Overvoltage at the DC input. This can destroy the inverter.

Corrective measures:

- **Immediately** disconnect the inverter from all voltage sources.
- Check whether the DC voltage is below the maximum input voltage of the inverter. If the DC voltage is below the maximum input voltage of the inverter, reconnect the DC cables to the inverter.
- If the DC voltage is above the maximum DC voltage of the inverter, ensure that the correct battery has been selected.
- If the DC voltage exceeds the maximum input voltage of the inverter, ensure that the PV array has been correctly rated or contact the installer of the PV array.
- If this message is repeated frequently, contact the Service.

17.1.24 Event 3402

⚠ QUALIFIED PERSON

Event message:

- DC overvoltage
- Disconnecting generator

Explanation:

Overvoltage at the DC input. This can destroy the inverter.

Corrective measures:

- **Immediately** disconnect the inverter from all voltage sources.
- Check whether the DC voltage is below the maximum input voltage of the inverter. If the DC voltage is below the maximum input voltage of the inverter, reconnect the DC cables to the inverter.
- If the DC voltage is above the maximum DC voltage of the inverter, ensure that the correct battery has been selected.
- If the DC voltage exceeds the maximum input voltage of the inverter, ensure that the PV array has been correctly rated or contact the installer of the PV array.
- If this message is repeated frequently, contact the Service.

17.1.25 Event 3407

⚠ QUALIFIED PERSON

Event message:

- DC overvoltage
- Disconnect generator

Explanation:

Overvoltage at the DC input. This can destroy the inverter.

This message is signalized additionally by rapid flashing of the LEDs.

Corrective measures:

- **Immediately** disconnect the inverter from all voltage sources.
- Check whether the DC voltage is below the maximum input voltage of the inverter. If the DC voltage is below the maximum input voltage of the inverter, reconnect the DC cables to the inverter.
- If the DC voltage exceeds the maximum input voltage of the inverter, ensure that the PV module has been correctly rated or contact the installer of the PV module.
- If this message is repeated frequently, contact the Service.

17.1.26 Event 3410

⚠ QUALIFIED PERSON

Event message:

- DC overvoltage
- Disconnect generator

Explanation:

Overvoltage at the DC input. This can destroy the inverter.

This message is signalized additionally by rapid flashing of the LEDs.

Corrective measures:

- **Immediately** disconnect the inverter from all voltage sources.
- Check whether the DC voltage is below the maximum input voltage of the inverter. If the DC voltage is below the maximum input voltage of the inverter, reconnect the DC cables to the inverter.
- If the DC voltage exceeds the maximum input voltage of the inverter, ensure that the PV module has been correctly rated or contact the installer of the PV module.
- If this message is repeated frequently, contact the Service.

17.1.27 Event 3411

⚠ QUALIFIED PERSON

Event message:

- DC overvoltage
- Disconnect generator

Explanation:

Overvoltage at the DC input. This can destroy the inverter.

This message is signalized additionally by rapid flashing of the LEDs.

Corrective measures:

- **Immediately** disconnect the inverter from all voltage sources.
- Check whether the DC voltage is below the maximum input voltage of the inverter. If the DC voltage is below the maximum input voltage of the inverter, reconnect the DC cables to the inverter.
- If the DC voltage exceeds the maximum input voltage of the inverter, ensure that the PV module has been correctly rated or contact the installer of the PV module.
- If this message is repeated frequently, contact the Service.

17.1.28 Event 3501

⚠ QUALIFIED PERSON

Event message:

- Ground fault
- Check generator

Explanation:

The inverter has detected a ground fault on the DC side.

Corrective measures:

- Check the PV system for ground faults.
- Check the battery and DC cabling for ground faults.

17.1.29 Event 3523

Event message:

- Start of cyclic insulation test

Explanation:

During the cyclic insulation test, it is tested whether the electric strength of the battery and PV system is within the safe range. The inverter will be restarted once during an insulation test.

17.1.30 Event 3601

⚠ QUALIFIED PERSON

Event message:

- High leakage current
- Check generator

Explanation:

The leakage current of the inverter and the PV modules or the battery is too high. There is a ground fault, a residual current or a malfunction.

The inverter interrupts feed-in operation immediately after exceeding a threshold. When the fault is eliminated, the inverter automatically reconnects to the utility grid.

Corrective measures:

- Check the PV system for ground faults.
- Check the battery and DC cabling for ground faults.

17.1.31 Event 3701

⚠ QUALIFIED PERSON

Event message:

- Residual current too high
- Check generator

Explanation:

The inverter detected a residual current due to brief grounding of the PV modules, the battery, or the DC wiring.

Corrective measures:

- Check the PV system for ground faults.
- Check the battery and DC cabling for ground faults.

17.1.32 Event 3901

⚠ QUALIFIED PERSON

Event message:

- Waiting for DC start conditions
- Start conditions not met

Explanation:

The feed-in conditions for the utility grid are not yet fulfilled.

Corrective measures:

- Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update.
- Ensure that the PV module is not covered by snow or otherwise shaded.
- Wait for higher irradiation.
- If this message is displayed frequently in the morning, increase the voltage limit for starting grid feed-in. Change the parameter **Critical voltage to start feed-in**.
- If this message is displayed frequently with medium irradiation, ensure that the PV module is correctly rated.

17.1.33 Event 3902

⚠ QUALIFIED PERSON

Event message:

- Waiting for DC start conditions
- Start conditions not met

Explanation:

The feed-in conditions for the utility grid are not yet fulfilled.

Corrective measures:

- Check whether a new firmware version is available for the inverter and the battery. If a newer version is available, perform the firmware update.
- Ensure that the PV module is not covered by snow or otherwise shaded.
- Wait for higher irradiation.
- If this message is displayed frequently in the morning, increase the voltage limit for starting grid feed-in. Change the parameter **Critical voltage to start feed-in**.
- If this message is displayed frequently with medium irradiation, ensure that the PV module is correctly rated.

17.1.34 Event 4013

⚠ QUALIFIED PERSON

Event message:

- Reverse currents or input X polarity reversed
- Check generator

Explanation:

The displayed input is in reverse polarity or reverse current has been detected in the input.

Corrective measures:

- Check the correct polarity of the connected PV modules.
- Ensure correct design and circuitry of the PV array.
- If solar irradiation is sufficient, check whether the same voltage is present at the DC inputs.
- Ensure that no PV module is defective.

17.1.35 Event 4014

⚠ QUALIFIED PERSON

Event message:

- Reverse currents or input X polarity reversed
- Check generator

Explanation:
The displayed input is in reverse polarity or reverse current has been detected in the input.

Corrective measures:
- Check the correct polarity of the connected PV modules.
- Ensure correct design and circuitry of the PV array.
- If solar irradiation is sufficient, check whether the same voltage is present at the DC inputs.
- Ensure that no PV module is defective.

17.1.36 Event 4015

⚠ QUALIFIED PERSON

Event message:
- Reverse currents or input X polarity reversed
- Check generator

Explanation:
The displayed input is in reverse polarity or reverse current has been detected in the input.

Corrective measures:
- Check the correct polarity of the connected PV modules.
- Ensure correct design and circuitry of the PV array.
- If solar irradiation is sufficient, check whether the same voltage is present at the DC inputs.
- Ensure that no PV module is defective.

17.1.37 Event 4016

⚠ QUALIFIED PERSON

Event message:
- Reverse currents or input X polarity reversed
- Check generator

Explanation:
The displayed input is in reverse polarity or reverse current has been detected in the input.

Corrective measures:
- Check the correct polarity of the connected PV modules.
- Ensure correct design and circuitry of the PV array.
- If solar irradiation is sufficient, check whether the same voltage is present at the DC inputs.
- Ensure that no PV module is defective.

17.1.38 Event 4017

⚠ QUALIFIED PERSON

Event message:

- Reverse currents or input X polarity reversed
- Check generator

Explanation:

The displayed input is in reverse polarity or reverse current has been detected in the input.

Corrective measures:

- Check the correct polarity of the connected PV modules.
- Ensure correct design and circuitry of the PV array.
- If solar irradiation is sufficient, check whether the same voltage is present at the DC inputs.
- Ensure that no PV module is defective.

17.1.39 Event 4301

⚠ QUALIFIED PERSON

Event message:

- Serial electric arc in string X detected by AFCI module

Explanation:

The inverter has detected an electric arc in the displayed string. If "String N/A" is displayed, the string could not be uniquely assigned.

The inverter stops feeding into the utility grid.

Corrective measures:

- Disconnect the inverter from all voltage sources.
- Check the PV modules and the cabling in the affected string or, if the string was not displayed, in all strings for damage.
- Ensure that the DC connection in the inverter is correct.
- Repair or replace defective PV modules, DC cables or the DC connection in the inverter.
- Start manual restart (if necessary).

17.1.40 Event 6001-6499

⚠ QUALIFIED PERSON

Event message:

- Self-diagnosis
- Device fault

Explanation:
The cause must be determined by the Service.

Corrective measures:
- Contact Service.

17.1.41 Event 6501

⚠ QUALIFIED PERSON

Event message:
- Self-diagnosis
- Overtemperature

Explanation:
The inverter has switched off due to excessive temperature.

Corrective measures:
- Clean the cooling fins on the rear of the enclosure and the air ducts on the top using a soft brush.
- Ensure that the inverter has sufficient ventilation.
- Ensure the maximum ambient temperature is not exceeded.

17.1.42 Event 6502

⚠ QUALIFIED PERSON

Event message:
- Self-diagnosis
- Overtemperature

Explanation:
The inverter has switched off due to excessive temperature.

Corrective measures:
- Clean the cooling fins on the rear of the enclosure and the air ducts on the top using a soft brush.
- Ensure that the inverter has sufficient ventilation.
- Ensure that the maximum permissible ambient temperature is complied with.

17.1.43 Event 6509

⚠ QUALIFIED PERSON

Event message:
- Self-diagnosis

- Overtemperature

Explanation:

The inverter has switched off due to excessive temperature.

Corrective measures:

- Clean the cooling fins on the rear of the enclosure and the air ducts on the top using a soft brush.
- Ensure that the inverter has sufficient ventilation.
- Ensure the maximum ambient temperature is not exceeded.

17.1.44 Event 6511

⚠ QUALIFIED PERSON

Event message:

- Overtemperature

Explanation:

An overtemperature has been detected in the choke area.

Corrective measures:

- Clean the cooling fins on the rear of the enclosure and the air ducts on the top using a soft brush.
- Ensure that the inverter has sufficient ventilation.

17.1.45 Event 6512

Event message:

- Minimum operating temperature not reached

Explanation:

The inverter will only recommence grid feed-in once the temperature has reached at least −25°C.

17.1.46 Event 6602

⚠ QUALIFIED PERSON

Event message:

- Overvoltage grid (AF)

Explanation:

The effective value of the grid voltage is above the permitted voltage threshold values for a specified period of time (AF limit).

Corrective measures:

- Check the grid voltage and connection on the inverter.

  If the grid voltage lies outside the permissible range due to local grid conditions, ask your grid operator if the voltage can be adjusted at the feed-in point or if it would be acceptable to change the monitored operating limits.

17.1.47 Event 6606

⚠ QUALIFIED PERSON

- Self-diagnosis
- Device fault

Explanation:

The cause must be determined by the Service.

Corrective measures:

- Contact the Service.

17.1.48 Event 6633

⚠ QUALIFIED PERSON

Event message:

- Self-diagnosis
- Device fault

Explanation:

The cause must be determined by the Service.

Corrective measures:

- Contact the Service.

17.1.49 Event 6801

⚠ QUALIFIED PERSON

Event message:

- Self-diagnosis > Input A defective

Explanation:

Polarity error on the inverter.

Corrective measures:

- Check whether a string is connected to input A.
- Contact Service.

17.1.50 Event 6901

⚠ QUALIFIED PERSON

Event message:

- Self-diagnosis > Input B defective

Explanation:

Polarity error on the inverter.

Corrective measures:

- Check whether a string is connected to input B.
- Contact Service.

17.1.51 Event 7001

⚠ QUALIFIED PERSON

Event message:

- Fault sensor interior temperature

Explanation:

A temperature sensor in the inverter is defective and the inverter interrupts the feed-in operation. The cause must be determined by the Service.

Corrective measures:

- Contact Service.

17.1.52 Event 7002

⚠ QUALIFIED PERSON

Event message:

- Fault sensor interior temperature

Explanation:

A temperature sensor in the inverter is defective and the inverter interrupts the feed-in operation. The cause must be determined by the Service.

Corrective measures:

- Contact Service.

17.1.53 Event 7014

⚠ QUALIFIED PERSON

Event message:

- Fault boost converter temperature sensor

Explanation:

Fan is always on.

Corrective measures:

- Contact Service.

17.1.54 Event 7015

⚠ QUALIFIED PERSON

Event message:

- Fault sensor interior temperature

Explanation:

A temperature sensor in the inverter is defective and the inverter interrupts the feed-in operation. The cause must be determined by the Service.

Corrective measures:

- Contact Service.

17.1.55 Event 7702

⚠ QUALIFIED PERSON

Event message:

- Self-diagnosis
- Interference device

Explanation:

The cause must be determined by the Service.

Corrective measures:

- Contact Service.

17.1.56 Event 7703

⚠ QUALIFIED PERSON

Event message:

- Self-diagnosis
- Interference device

Explanation:

The cause must be determined by the Service.

Corrective measures:

- Contact Service.

17.1.57 Event 7801

⚠ QUALIFIED PERSON

Event message:

- Fault overvoltage protector

Explanation:

One or more surge arresters have tripped or one or more surge arresters are not inserted correctly.

Corrective measures:

- Ensure that the surge arrester is inserted correctly.
- If surge arresters have tripped, replace the tripped surge arresters with new surge arresters.

17.1.58 Event 8003

⚠ QUALIFIED PERSON

Event message:

- Temperature derating

Explanation:

The inverter has reduced its power output for more than 10 minutes due to excessive temperature.

Corrective measures:

- Clean the cooling fins on the rear of the enclosure and the air ducts on the top using a soft brush.
- Ensure that the inverter has sufficient ventilation.
- Ensure the maximum ambient temperature is not exceeded.
- Ensure that the inverter is not exposed to direct solar irradiation.

17.1.59 Event 8104

⚠ QUALIFIED PERSON

Event message:

- Communication impaired

Explanation:

The cause must be determined by the Service.

Corrective measures:

- Contact Service.

17.1.60 Event 8205

⚠ QUALIFIED PERSON

Event message:

- Arc fault detection self-test successful.

Explanation:

The self-test of SMA ArcFix has been completed successfully.

17.1.61 Event 8708

⚠ QUALIFIED PERSON

Event message:

- Timeout in communication for active power limitation

Explanation:

Communication to the system control absent. Depending on the fallback setting, either the last received values will be retained or the active power will be limited to the set percentage value of the inverter nominal power.

Corrective measures:

- Ensure that the connection to the System Manager is intact and that no cables are damaged or that no plugs have been pulled.

17.1.62 Event 8709

⚠ QUALIFIED PERSON

Event message:

- Timeout in communication for reactive power setpoint

Explanation:

Communication to the system control absent.

Corrective measures:

- Ensure that the connection to the System Manager is intact and that no cables are damaged or that no plugs have been pulled.

17.1.63 Event 8710

⚠ QUALIFIED PERSON

Event number:

- Timeout in communication for cos phi setpoint

Explanation:

Communication to the system control absent.

Corrective measures:

- Ensure that the connection to the System Manager is intact and that no cables are damaged or that no plugs have been pulled.

17.1.64 Event 9007

⚠ QUALIFIED PERSON

Event message:

- Abort self-test

Explanation:

The self-test was terminated.

Corrective measures:

- Ensure that the AC connection is correct.
- Ensure that the country data set has been entered correctly.
- Restart the self-test.

17.1.65 Event 9033

⚠ QUALIFIED PERSON

Event message:

- Rapid shutdown has been triggered

Explanation:

The inverter detected the triggering of a rapid shutdown. The AC side of the inverter has been disconnected or the external rapid shutdown initiator has been activated.

17.1.66 Event 9034

⚠ QUALIFIED PERSON

Event message:

- Error in the rapid shutdown system

Explanation:

This message can have the following causes:

- The rapid shutdown function was not correctly configured.
- The PV module could not be correctly disconnected. Voltage can be applied to the DC inputs of the inverter.
- The standby voltage of all PV module switches of a string is > 30 V.

- With DC lines laid in parallel, another inverter in the system has caused the Sunspec signal to be overwritten.

Corrective measures:

- Check the settings of the rapid shutdown function and ensure that the operating mode selected is selected according to the DC disconnection unit used.
- Check the functionality of the PV module switches.
- Check the standby voltage of the PV module switches used and ensure that the standby voltage of all PV module switches of a string < 30 V.

17.1.67 Event 9035

⚠ QUALIFIED PERSON

Event message:

- Rapid shutdown performed successfully

Explanation:

The voltage at the DC inputs and at the AC output of the inverter was successfully discharged.

17.1.68 Event 9037

⚠ QUALIFIED PERSON

Event message:

- Generator not connected

Explanation:

The PV module switches did not connect the PV module.

Corrective measures:

- Check the functionality of the SunSpec-compliant PV module switches.

17.1.69 Event 9038

⚠ QUALIFIED PERSON

Event message:

- Redundant rapid shutdown discharge function not assured

Explanation:

The cause must be determined by the Service.

Corrective measures:

- Contact Service.

17.1.70 Event 9101

⚠ QUALIFIED PERSON

Event message:

- AC voltage calibration failed.

Explanation:

An error has occurred during calibration. The cause must be determined by the Service.

Corrective measures:

- Contact Service.

17.1.71 Event 9107

⚠ QUALIFIED PERSON

Event message:

- Self-diagnosis
- Interference device

Explanation:

The cause must be determined by the Service.

Corrective measures:

- Contact Service.

17.1.72 Event 9202

⚠ QUALIFIED PERSON

Event message:

- SPS AC overvoltage

Explanation:

The cause must be determined by the Service.

Corrective measures:

- Contact the Service.

17.1.73 Event 9203

⚠ QUALIFIED PERSON

Event message:

- Short circuit in the SPS power outlet

Explanation:
A short circuit occurred at the socket for manual secure power supply operation.

Corrective measures:
- Ensure that the socket is correctly wired.
- Ensure that the load connected to the socket is working correctly.
- Unplug the load from the socket and switch on secure power supply operation.

17.1.74 Event 9342

⚠ QUALIFIED PERSON

Event message:
- DC connection, polarity reversed
- Check connection

Explanation: The DC conductors are not assigned to the correct inputs in the inverter.

Corrective measures:
- Ensure that all DC conductors for PV and battery are connected to the correct terminals.

17.1.75 Event 9350

⚠ QUALIFIED PERSON

Event message:
- Timeout for battery status change

Explanation:
A requested status change of the battery did not occur within the specified time.

Corrective measures:
- Ensure that the battery is switched on.
- Ensure that the battery is fault-free.

17.1.76 Event 9394

Event message:
- Deep discharge protection activated

Explanation:
The battery management system has activated the deep discharge protection. For grid-connected systems, this message is an event message, not a warning message.

17.1.77 Event 9395

Event message:

- Battery separated externally

Explanation:

The DC power connection to the battery was disconnected.

17.1.78 Event 29252

Event message:

- SPS mode not available

Explanation:

SPS mode is not started because the connection to the utility grid is still active.

Corrective measures:

- Ensure that the parameter settings for battery-backup operation are configured to SPS.

17.1.79 Event 29254

Event message:

- Input power for SPS too low

Explanation:

The battery and PV power are not sufficient to supply the SPS load.

Corrective measures:

- Ensure that sufficient PV power is available.
- Ensure that the battery is charged correctly.
- Reduce the SPS load.

17.2 Calculating the insulation resistance

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

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

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

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.

Also see:

- Checking the PV System for Ground Faults ⇒ page 126

17.3 Checking the PV System for Ground Faults

⚠ QUALIFIED PERSON

If the red LED is glowing and the event number 3501, 3601 or 3701 is being displayed in the **Results** menu on the inverter user interface, there may be a ground fault present. The electrical insulation from the PV system to ground is defective or insufficient.

⚠ DANGER

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

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

- Disconnect the system from voltage sources and make sure 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.
- Once disconnected from voltage sources, wait five minutes before touching any parts of the PV system or the system.

⚠ 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 measurement ranges designed for the maximum AC and DC voltage of the inverter.
- Only use measuring devices with measurement ranges designed for the maximum DC voltage of the battery.

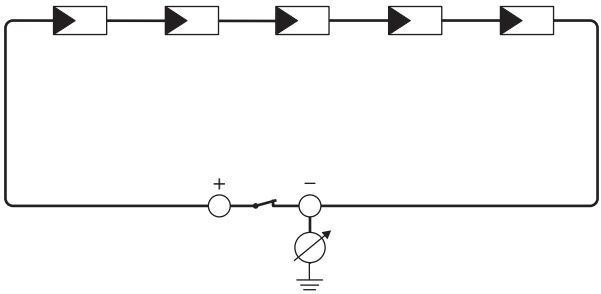


Figure 15: Schematic diagram of the measurement

Required equipment:

☐ Suitable device for safe disconnection and short-circuiting

☐ Measuring device for insulation resistance

Device required for safe disconnection and short-circuiting of the PV modules

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

Procedure:

1. Calculate the expected insulation resistance per string.
2. Disconnect the inverter from all voltage sources .
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.
13. If the inverter still displays an insulation error, contact the Service. The PV modules might not be suitable for the inverter in the present quantity.

Also see:

- Calculating the insulation resistance ⇒ page 125

17.4 Manual restart after electric arc

⚠ QUALIFIED PERSON

You can use the following parameter to resume feed-in operation after an electric arc has been detected.

Channel	Name	Settings
Operation.OpMod	General operating mode	Start

18 Decommissioning

18.1 Disconnecting the Terminals from the Inverter

⚠ QUALIFIED PERSON

18.2 Disassembling the Inverter

⚠ CAUTION

Risk of injury due to weight of product

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

- Wear suitable personal protective equipment for all work on the product.

Requirement:

- The terminals must be disconnected from the inverter Disconnecting the Terminals from the Inverter.

Procedure:

1. Remove the side covers. To do so, slide the side covers upward slightly, so that they can be removed from the hooks on the mounting bracket and the inverter.
2. Lift the inverter with the help of the indentations on the enclosure and unhook it from the mounting bracket.
3. Remove the mounting bracket from the wall.
4. If the inverter is to be stored or shipped in packaging, pack the inverter and mounting bracket. Use the original packaging or packaging that is suitable for the weight and dimensions of the inverter.

18.3 Disposal

The product must be disposed of in accordance with the locally applicable disposal regulations for waste electrical and electronic equipment.



19 Replacing the Product

Under fault conditions, an SMA product in the system may need to be replaced. If this is the case, you will receive a replacement device from SMA Solar Technology AG. If you received a replacement device, replace the defective product with the replacement device as described below.

1. Decommission the defective product.
2. Mount the replacement device and make the electrical connections.
3. Commission the replacement device.
4. If the defective product was included in a System Manager (e.g., inverter configured as a System Manager) or communication product (e.g., Sunny Home Manager), replace it with the new product in System Manager or communication product (see Communication Product or System Manager instructions).
5. Pack the defective product in the packaging of the replacement device and arrange with SMA Solar Technology AG for it to be picked up. If a wall mounting bracket is enclosed with the replacement device, pack it with the defective product.

20 Technical Data for Inverter

20.1 General Data

Width x height x depth	500 mm x 586 mm x 236 mm
Weight	17.5 kg
Length x width x height of the packaging	760 mm x 580 mm x 350 mm
Transport weight	23 kg
Climatic category in accordance with IEC 60721-3-4	4K26
Environmental category	outdoors
Pollution degree of all enclosure parts	2
Operating temperature range	-25°C to +60°C
Max. permissible value for relative humidity (condensing)	100 %
Maximum operating altitude above mean sea level (MSL)	3000 m
Typical noise emission	35 dB(A)
Power loss in night mode	< 6 W
Topology	Transformerless (Non-isolated)
Cooling method	natural convection
Degree of protection for electronics in accordance with IEC 60529	IP65
Protection class in accordance with IEC 62109-1	I
Radio technology	WLAN 802.11 b/g/n
Radio spectrum	2.4 GHz
Maximum transmission power	100 mW
Wi-Fi range in free-field conditions	10 m
Quantity maximum detectable Wi-Fi networks	32
Grid configurations	TN-C, TN-S, TN-C-S, TT (when V_{N_PE} < 20 V), Delta-IT

20.2 DC input of PV

	SBSE3.6-50	SBSE4.0-50	SBSE5.0-50	SBSE6.0-50
Maximum power of PV array	7200 Wp STC	8000 Wp STC	10000 Wp STC	12000 Wp STC
Maximum input voltage	600 V	600 V	600 V	600 V
MPP voltage range	60 V to 480 V	60 V to 480 V	60 V to 480 V	60 V to 480 V
Minimum input voltage	60 V	60 V	60 V	60 V
Initial input voltage	66 V	66 V	66 V	66 V
Maximum usable input current per input	15 A	15 A	15 A	15 A
Maximum short-circuit current per input[3)]	30 A	30 A	30 A	30 A
Maximum short-circuit current for all inputs in total[3)]	60 A	60 A	60 A	60 A
Maximum reverse current into the PV modules	0 A	0 A	0 A	0 A
Number of independent MPP inputs	3	3	3	3
Strings per MPP input	1	1	1	1
Coupling capacity of all PV modules in case of PV modules with high capacity to ground	1.54 µF	1.54 µF	1.54 µF	1.54 µF
Overvoltage category as per IEC 62109-1	II	II	II	II

[3)] In accordance with IEC 62109-2: $I_{SC\ PV}$

20.3 Battery DC input

	SBSE3.6-50	SBSE4.0-50	SBSE5.0-50	SBSE6.0-50
Voltage range	90 V to 500 V	90 V to 500 V	90 V to 500 V	90 V to 500 V
Maximum charging current	30 A	30 A	30 A	30 A
Maximum discharge current	30 A	30 A	30 A	30 A
Maximum short-circuit current	55 A	55 A	55 A	55 A
Maximum charging power	10000 W	10000 W	10000 W	10000 W
Maximum discharge power	3789 W	4211 W	5263 W	6316 W
Battery type[4]	Li-ion	Li-ion	Li-ion	Li-Ion
Number of independent inputs	1	1	1	1
Overvoltage category (according to IEC 60664-1)	II	II	II	II

20.4 AC output

	SBSE3.6-50	SBSE4.0-50	SBSE5.0-50	SBSE6.0-50
Rated power at 230 V, 50 Hz	3600 W	4000 W	5000 W	6000 W
Maximum apparent power	3600 VA	4000 VA	5000 VA	6000 VA
Nominal grid voltage	230 V / 240 V	230 V / 240 V	230 V / 240 V	230 V / 240 V
Voltage range[5]	184 V to 253 V / 192 V to 264 V	184 V to 253 V / 192 V to 264 V	184 V to 253 V / 192 V to 264 V	184 V to 253 V / 192 V to 264 V
Rated current at 230 V	15.7 A	17.4 A	21.8 A	26.1 A
Maximum output current	16 A	20 A	25 A	30 A

[4] Warning! Danger of fire due to use of non-approved batteries. Only use batteries approved by SMA Solar Technology AG (technical information with list of approved batteries at www.SMA-Solar.com).

[5] Depending on the configured country data set

	SBSE3.6-50	SBSE4.0-50	SBSE5.0-50	SBSE6.0-50
Maximum output current under fault conditions	488 A	488 A	488 A	488 A
Total harmonic distortion of the output current with total harmonic distortion of the AC voltage <2%, and AC power >50% of the rated power	< 3 %	< 3 %	< 3 %	< 3 %
Inrush current	< 10% of the nominal AC current for a maximum of 10 ms	< 10% of the nominal AC current for a maximum of 10 ms	< 10% of the nominal AC current for a maximum of 10 ms	< 10% of the nominal AC current for a maximum of 10 ms
Rated grid frequency	50 Hz	50 Hz	50 Hz	50 Hz
Grid frequency[5)]	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz
Operating range at grid frequency 50 Hz	44 Hz to 56 Hz	44 Hz to 56 Hz	44 Hz to 56 Hz	44 Hz to 56 Hz
Operating range at grid frequency 60 Hz	54 Hz to 66 Hz	54 Hz to 66 Hz	54 Hz to 66 Hz	54 Hz to 66 Hz
Power factor at rated power	1	1	1	1
Displacement power factor, adjustable	0.8 overexcited to 0.8 underexcited	0.8 overexcited to 0.8 underexcited	0.8 overexcited to 0.8 underexcited	0.8 overexcited to 0.8 underexcited
Feed-in phases	1	1	1	1
Connection phases	1-(N)-PE	1-(N)-PE	1-(N)-PE	1-(N)-PE
Overvoltage category as per IEC 62109-1	III	III	III	III

20.5 Digital inputs

Digital inputs

Quantity	1
Maximum cable length	100 m

20.6 Digital output (multifunction relay)

Quantity	1
Execution	Potential-free relay contacts
Maximum switching voltage	30 V_{DC}
Maximum switching current	1 A
Minimum switching current	10 mA
Minimum electrical endurance when the maximum switching voltage and maximum switching current are complied with[6]	100000 switching cycles
Bounce time	5 ms
Reset time	5 ms
Maximum cable length	100 m

20.7 Communication

SMA devices	Max. 5 inverters with SMA Speedwire and 1 energy meter, 100 Mbit/s
I/O systems and meters	Ethernet, 10/100 Mbit/s, Modbus TCP

20.8 Data Storage Capacity

1-minute values	7 days
5-minute values	7 days
15-minute values	30 days
60-minute values	3 years
Event messages	1024 events

20.9 Efficiency

Maximum efficiency, η_{max}	98.15 %

[6] Corresponds to 20 years at 12 switching operations per day

20.10 Protective Devices

DC reverse polarity protection	Short-circuit diode
Input-side disconnection point	DC load-break switch[7]
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 10.0
Maximal output overcurrent protection	50 A
Ground fault monitoring	Insulation monitoring: R_{iso} > 120 kΩ
All-pole sensitive residual-current monitoring unit	Available
Residual-current device (RCD)	Compatible with Type A and Type B
SMA ArcFix arc-fault circuit interrupter	Available
Active anti-islanding method	Frequency shift

20.11 Climatic Conditions

Installation in accordance with IEC 60721-3-4, Class 4K26

Extended temperature range	-25°C to +60°C
Extended humidity range	0% to 100%
Threshold for relative humidity, non-condensing	100 %
Extended air pressure range	79.5 kPa to 106 kPa

Transport in accordance with IEC 60721-3-4, Class 2K12

Temperature range	-40°C to +70°C

20.12 Equipment

PV connection	Lever clamp
Battery connection	Push-in terminal
AC connection	Push-in terminal
Multifunction relay	As standard

[7] Usage category according to IEC 60947: DC-PV2

21 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
- Device configuration (System Manager or subordinate device)
- Special country-specific settings (if available)
- Event message
- Mounting location and mounting height
- Type and number of PV modules
- Optional equipment (e.g. accessories used)
- Use the name of the system in Sunny Portal (if available)
- Access data for Sunny Portal (if available)
- Information on the ripple control receiver (if available)
- Operating mode of the multifunction relay (if used)
- Detailed description of the problem

You can find your country's contact information at:

https://go.sma.de/service

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