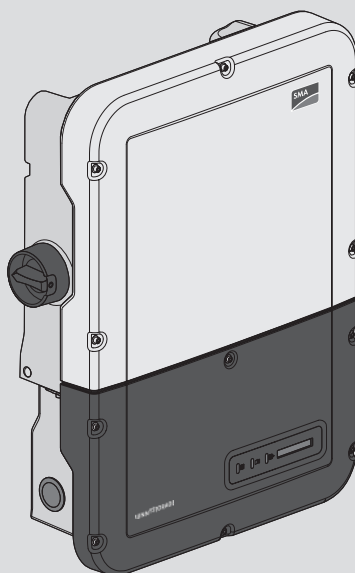


SUNNY BOY 3.0-US / 3.8-US / 5.0-US / 6.0-US / 7.0-US / 7.7-US



SB3.0-1SP-US-41 / SB3.8-1SP-US-41 / SB5.0-1SP-US-41 /
SB6.0-1SP-US-41 / SB7.0-1SP-US-41 / SB7.7-1SP-US-41



eManual



ENGLISH

Installation Manual

ESPAÑOL

Instrucciones de instalación

FRANÇAIS

Instructions d'installation



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SMA Warranty

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

Software licenses

The licenses for the used software modules can be called up on the user interface of the product.

Trademarks

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

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Table of Contents

1	Information on this Document	5
1.1	Validity	5
1.2	Target Group	5
1.3	Content and Structure of this Document	5
1.4	Levels of Warning Messages	5
1.5	Symbols in the Document	6
1.6	Typographies in the Document	6
1.7	Designation in the document	6
1.8	Additional Information	6
2	Safety	8
2.1	Intended Use	8
2.2	IMPORTANT SAFETY INSTRUCTIONS	9
3	Scope of Delivery	13
4	Product Overview	14
4.1	Product Description	14
4.2	Symbols on the Product	15
4.3	Interfaces and Functions	16
4.4	LED Signals	21
5	Mounting	23
5.1	Requirements for Mounting	23
5.2	Mounting the Inverter	26
6	Electrical Connection	29
6.1	Overview of the Connection Area	29
6.1.1	View from Below	29
6.1.2	Interior View	30
6.2	AC Connection	31
6.2.1	Requirements for the AC Connection	31
6.2.2	Connecting the Inverter to the Utility Grid	33
6.3	Connecting the Network Cables	35
6.4	Connecting the Multifunction Relay	36
6.4.1	Procedure for connecting the multifunction relay	36
6.4.2	Operating Modes of the Multifunction Relay	36
6.4.3	Connection Options	37
6.4.4	Connection to the Multifunction Relay	40
6.5	Connecting the Switch and Outlet for Secure Power Supply Operation	42

6.6	DC Connection	46
6.6.1	Requirements for the DC Connection	46
6.6.2	Connecting the PV Array	48
7	Commissioning	51
7.1	Commissioning Procedure	51
7.2	Commissioning the Inverter	51
7.3	Establishing a connection to the user interface	53
7.3.1	Establishing a Direct Connection via Ethernet	53
7.3.2	Establishing a direct connection via WLAN	53
7.3.3	Establishing a Connection via Ethernet in the local network	55
7.3.4	Establishing a Connection via WLAN in the Local Network	56
7.4	Logging Into the User Interface	57
7.5	Selecting a configuration option	58
8	Disconnecting the Inverter from Voltage Sources	61
9	Decommissioning the Inverter	63
10	Technical Data	65
10.1	DC/AC	65
10.1.1	Sunny Boy 3.0-US / 3.8-US / 5.0-US	65
10.1.2	Sunny Boy 6.0-US / 7.0-US / 7.7-US	67
10.2	AC Output, Secure Power Supply Operation	69
10.3	Multifunction Relay	69
10.4	Triggering Thresholds and Tripping Time	70
10.5	General Data	70
10.6	Fan (only with Sunny Boy 7.0-US / 7.7-US)	72
10.7	Protective Devices	72
10.8	Torques	72
10.9	Data Storage Capacity	73
11	Compliance Information	74
12	Contact	75

1 Information on this Document

1.1 Validity

This document is valid for:

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

1.2 Target Group

The tasks described in this document must only be performed by qualified persons. Qualified persons must have the following skills:

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

1.3 Content and Structure of this Document

This document describes the installation, commissioning and decommissioning of the product.

The latest version of this document and the manual for operating the user interface as well as information on configuration and troubleshooting of the product are to be found in PDF format and as eManual at www.SMA-Solar.com. You will find the QR code that links to the eManual on the title page of this document. You can also call up the eManual via the user interface of the product. Illustrations in this document are reduced to the essential information and may deviate from the real product.

1.4 Levels of Warning Messages

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

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

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

NOTICE

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

1.5 Symbols in the Document

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
	Desired result
	A problem that might occur
	Example

1.6 Typographies in the Document

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

1.7 Designation in the document

Complete designation	Designation in this document
Sunny Boy	Inverter, product

1.8 Additional Information

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

Title and information content	Type of information
Operation, configuration and troubleshooting	User manual (eManual)
"Application for SMA Grid Guard Code"	Form
"PUBLIC CYBER SECURITY - Guidelines for a Secure PV System Communication"	Technical information
"Efficiency and Derating" Efficiency and derating behavior of the SMA inverters	Technical Information
"Grid Support Utility Interactive Inverters" Information about how to activate and to set the grid supporting features according to UL 1741 SA	Technical Information
"Parameters and Measured Values" Overview of all inverter operating parameters and their configuration options	Technical Information
"SMA and SunSpec Modbus® Interface" Information on the Modbus interface	Technical Information
"Modbus® parameters and measured values" Device-specific register HTML file	Technical Information

2 Safety

2.1 Intended Use

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

The product is suitable for indoor and outdoor use.

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

No galvanic isolation

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

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

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

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

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

The product is approved for the US and Canadian market.

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

Alterations to the SMA products, e.g., changes or modifications, are only permitted with the express written permission of SMA Solar Technology AG. Unauthorized alterations will void guarantee and warranty claims and in most cases terminate the operating license. SMA Solar Technology AG shall not be held liable for any damage caused by such changes.

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

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

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

The type label must remain permanently attached to the product.

2.2 IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

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

The product has been designed and tested in accordance with international safety requirements. As with all electrical or electronical devices, there are residual risks despite careful construction. To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and observe all safety information at all times.

DANGER

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

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

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

DANGER

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

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

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

⚠ DANGER**Danger to life due to electric shock in case of overvoltages and if surge protection is missing**

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

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

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

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

- In case of error, only carry out corrective measures specified by SMA Solar Technology AG (for corrective measures see section "troubleshooting" in the detailed manual. If no corrective measures are specified, do not perform any actions on the product. Contact the Service.
- Ensure that unauthorized persons have no access to the product.
- Disconnect the AC circuit breaker and secure it against reconnection.
- Disconnect the PV array from the product via an external disconnection device. Do not operate the DC load-break switch on the product in the event of ground fault

⚠ CAUTION**Risk of burns from hot surfaces**

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

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

⚠ CAUTION**Risk of injury due to weight of product**

Injuries may result if the product is lifted incorrectly or dropped while being transported or when attaching it to or removing it from the wall mounting bracket.

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

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

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

- If a layer of ice has formed on the enclosure seal when temperatures are below freezing, remove it prior to opening the product (e.g. by melting the ice with warm air). Observe the applicable safety regulations.
- Do not disassemble the Power Unit and Connection Unit unless the ambient temperature is at least 0°C (32°F) and conditions are frost-free.

NOTICE**Damage to the product due to sand, dust and moisture ingress**

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

- Only open the product if the humidity is within the thresholds and the environment is free of sand and dust.
- Do not open the product during a dust storm or precipitation.
- Close tightly all enclosure openings.
- Only use listed rain-tight or liquid-tight conduit fittings to attach the conduits to the product.

NOTICE**Damage due to cleaning agents**

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

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

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

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

- Ground yourself before touching any component.

NOTICE**Destruction of the measuring device due to overvoltage**

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

** Electrical installations (for North America)**

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

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

3 Scope of Delivery

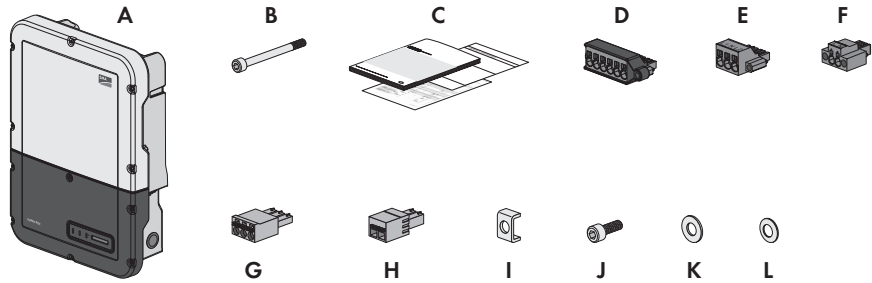


Figure 1 : Components included in the scope of delivery

Position	Quantity	Designation
A	1	Inverter
B	1	Hexagon socket cap head screw M5 x 60 (not required)
C	1	Installation manual, production test report, supplementary sheet with the default settings
D	1	Terminal block for the DC connection
E	1	Terminal block for the AC connection
F	1	Terminal block for connecting the outlet for secure power supply operation
G	1	3-pole terminal block for the connection to the multifunction relay
H	1	2-pole terminal block for the switch connection for secure power supply operation
I	5	Clamping bracket
J	5	Cylindrical screw M5 x 16
K	5	Washer M5
L	5	Spring washer M5

4 Product Overview

4.1 Product Description

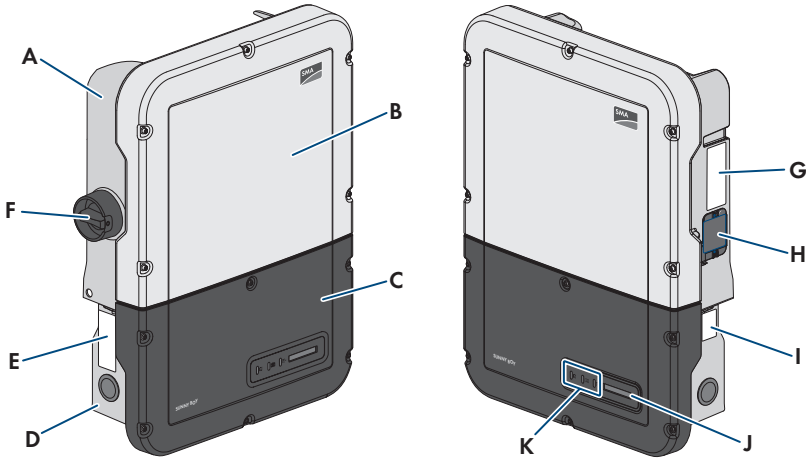


Figure 2 : Design of the inverter

Position	Designation
A	Power Unit
B	Enclosure lid of the Power Unit
C	Enclosure lid for the Connection Unit
D	Connection Unit
E	Warning label with compliance information
F	DC load-break switch
G	Type label The type label uniquely identifies the inverter. The type label must remain permanently attached to the product. You will find the following information on the type label: • Inverter device type (Model) • Serial number of the Power Unit (Serial No. Power Unit or S/N Power Unit) • Date of manufacture • Device-specific characteristics
H	Fan (only with Sunny Boy 7.0 and 7.7)

Position	Designation
I	Additional type label The additional type label must remain permanently attached to the product. You will find the following information on the additional type label: • Device type (Model) • Inverter serial number (Serial number device or S/N device) • Identification key (PIC) for registration in Sunny Portal • Registration ID (RID) for registration in Sunny Portal • WLAN password (WPA2-PSK) for the direct connection to the user interface of the inverter via WLAN
J	Display The display shows the current operating data and events or errors.
K	LEDs The LEDs indicate the operating state of the inverter.

4.2 Symbols on the Product

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

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

4.3 Interfaces and Functions

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

User interface for monitoring and configuration

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

Smart Inverter Screen

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

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

SMA Speedwire

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

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

SMA Webconnect

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

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

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

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

If the inverter is connected to the Internet via the cellular network, you must register the system in Sunny Portal powered by ennexOS. The communication with the inverters is optimized with regard to the data volume and availability of the inverter. No data can be viewed in real time. Note that the inverter must be equipped with a firmware version $\geq 2.04.88.R$ for connection via the cellular network.

WLAN

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

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

Expanding the radio range in the WLAN network

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

Modbus

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

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

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

Module slots

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

SMA RS485 Module

The inverter can be retrofitted with the SMA RS485 Module.

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

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

Antenna Extension Kit

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

SMA Cellular LTE Modem Kit

The inverter can be retrofitted with the SMA Cellular LTE Modem Kit.

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

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

Energy meters in accordance with ANSI C12.20

The inverter can be retrofitted with the SMA Revenue Grade Meter Kit that in accordance with ANSI C12.20 includes an energy meter.

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

Grid Management Services

The inverter is a grid support interactive inverter.

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

PV Rapid Shutdown Equipment

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

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

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

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

If PV array disconnect switches compliant with the SunSpec communication signal for Rapid Shutdown systems are installed, the inverter can transmit a SunSpec-compliant "permission to operate" signal to them via its DC input conductors. When a rapid shutdown is initiated, the inverter will stop transmitting the SunSpec signal. When the SunSpec signal is not being received, the PV array disconnect switches are responsible for reducing line voltages within the PV array in accordance with *National Electrical Code*®. In the event of a rapid shutdown via the SunSpec communication signal, it is important that all PV modules connected to the inverter are always equipped with SunSpec-compliant PV array disconnect switches, otherwise the inverter cannot start feed-in operation. The sum of the standby voltages of all PV array disconnect switches of a string must be < 30 V to ensure safe discharging of the DC lines.

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

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

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

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

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

ON THIS PV SYSTEM MAY ADVERSLY AFFECT THE OPERATION OF THE PV RAPID SHUTDOWN SYSTEM. IT IS THE RESPONSIBILITY OF THE INSTALLER TO ENSURE THAT THE COMPLETED PV SYSTEM MEETS THE RAPID SHUT DOWN FUNCTIONAL REQUIREMENTS. THIS EQUIPMENT MUST BE INSTALLED ACCORDING TO THE MANUFACTURER'S INSTALLATION MANUAL.

Parallel Operation of the DC Inputs A and B

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

Secure power supply operation

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

If the available accessory communication set for TS4-R module technology components (SMA Rooftop Communication Kit) is installed in the inverter, the secure power supply operation is no longer available. The Rooftop Communication Kit supports the Rapid Shutdown function. The AC circuit breaker in the system is simultaneously the Rapid Shutdown Initiator. In the event of a grid failure or when operating the Rapid Shutdown initiator, the inverter is also disconnected from voltage sources on the DC side. Thus the supply of the outlet for secure power supply operation can no longer be guaranteed.

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

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

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

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

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

Multifunction Relay

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

String-failure detection

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

Arc-Fault Circuit Interrupter (AFCI)

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

SMA Smart Connected

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

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

4.4 LED Signals

The LEDs indicate the operating state of the inverter.

LED signal	Explanation
The green LED is flashing (two seconds on and two seconds off)	Waiting for feed-in conditions The conditions for feed-in operation are not yet met. As soon as the conditions are met, the inverter will start feed-in operation.
The green LED is flashing (1.5 s on and 0.5 s off)	Secure power supply operation The secure power supply operation is activated and the inverter supplies the outlet with current from the PV system.
The green LED flashes quickly	Update of central processing unit The central processing unit of the inverter is being updated.
The green LED is glowing	Feed-in operation The inverter feeds in with a power of at least 90%.

LED signal	Explanation
The green LED is pulsing	Feed-in operation The inverter is equipped with a dynamic power display via the green LED. Depending on the power, the green LED pulses fast or slow. If necessary, you can switch off the dynamic power display via the green LED.
The green LED is off	The inverter is not feeding into the utility grid.
The red LED is glowing	Event occurred In addition to the glowing red LED, the display indicates the following information about the event: • Event type • Event number • Date and time at which the event occurred
The blue LED flashes slowly for approx. one minute	Communication connection is being established The inverter is establishing a connection to a local network or is establishing a direct connection to an end device via Ethernet (e.g. computer, tablet PC or smartphone).
The blue LED flashes quickly for approx. two minutes (0.25 s on and 0.25 s off).	WPS active The WPS function is active.
The blue LED is glowing	Communication active There is an active connection with a local network or there is a direct connection with an end device via Ethernet (e.g. computer, tablet PC or smartphone).

5 Mounting

5.1 Requirements for Mounting

Requirements for the Mounting Location:

⚠ WARNING

Danger to life due to fire or explosion

Despite careful construction, electrical devices can cause fires.

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

- ☐ 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.
- ☐ 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.
- ☐ When using the SMA Cellular LTE Modem Kit, the installation site should not be located in the basement. The data transmission during basement installation can be restricted due to an insufficient connection quality.
- ☐ 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 (see Section 10, page 65).

Permitted and prohibited mounting positions:

- ☐ 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 in such way that display messages and LED signals can be read without difficulty.

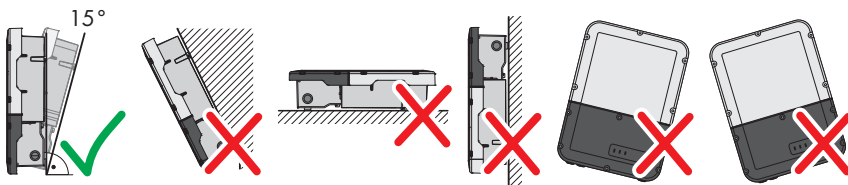
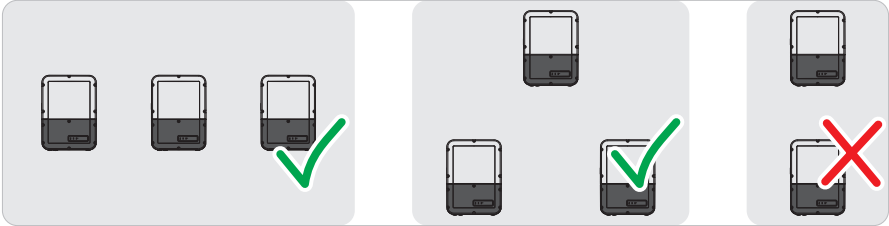


Figure 3 : Permitted and prohibited mounting positions

- ☐ Do not mount multiple inverters directly above one another.

Sunny Boy 3.0-US / 3.8-US / 5.0-US / 6.0-US



Sunny Boy 7.0-US / 7.7-US

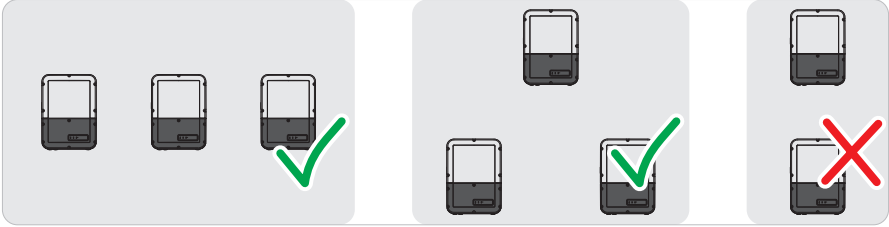


Figure 4 : Permissible and impermissible mounting positions of multiple inverters

Dimensions for mounting:

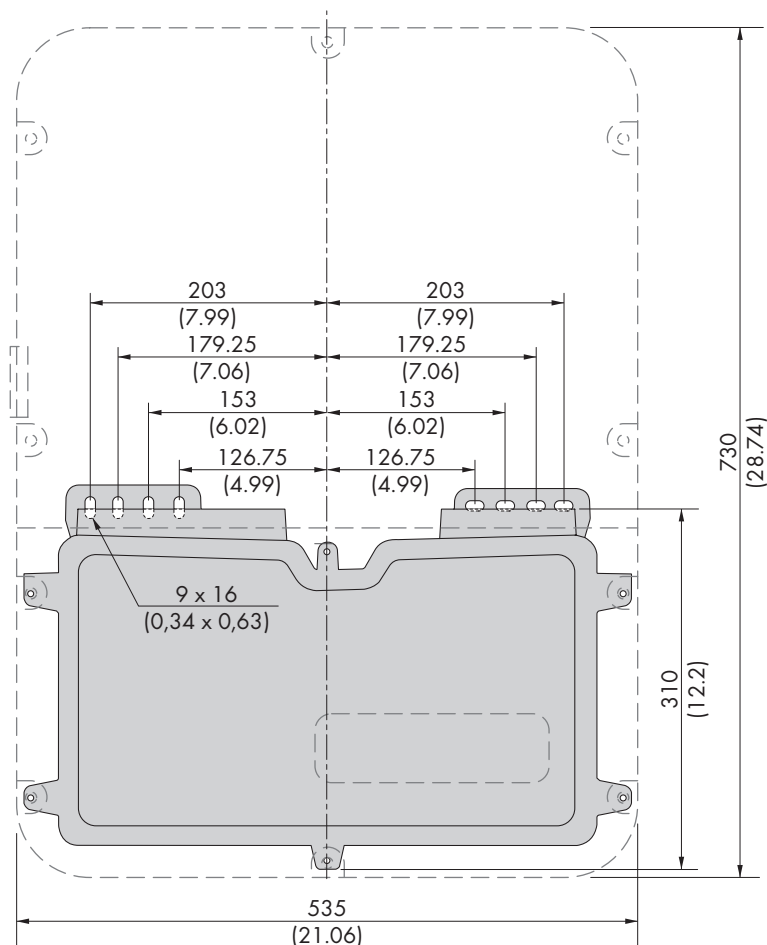


Figure 5 : Position of the anchoring points(Dimensions in mm (in))

Recommended Clearances:

To guarantee optimal operation and adequate heat dissipation for the inverter as well as a good connection quality when using the SMA Cellular LTE Modem Kit, the following requirements for clearances should be observed. This will prevent the inverter power output from being reduced due to excessive temperatures. However, smaller clearances are permitted without causing any risk.

i Prescribed clearances in accordance with the *National Electrical Code*® or *Canadian Electrical Code*® CSA C22.1

Under certain conditions, the *National Electrical Code*® or the *Canadian Electrical Code*® CSA C22.1 specify greater clearances.

- Ensure that the prescribed clearances in accordance with the *National Electrical Code*® or *Canadian Electrical Code*® CSA C22.1 are adhered to.
- ☐ Maintain the recommended clearances to walls as well as to other inverters or objects.
- ☐ If multiple inverters are mounted in areas with high ambient temperatures, increase the clearances between the inverters and ensure sufficient fresh-air supply.

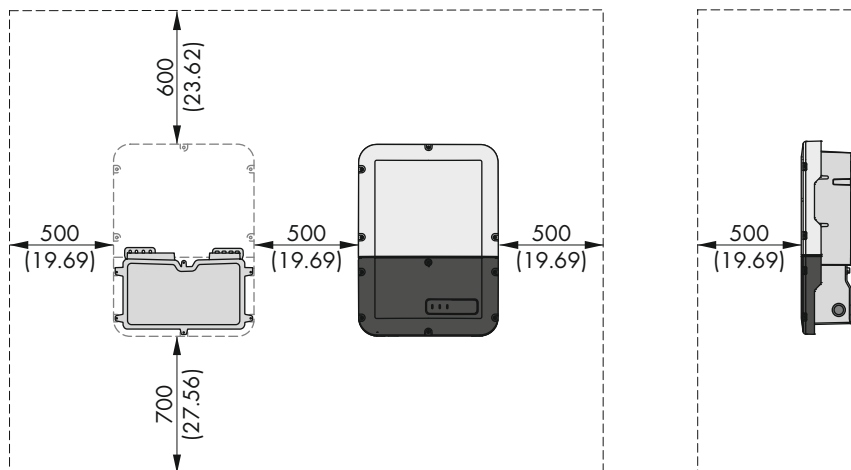


Figure 6 : Recommended clearances (Dimensions in mm (in))

5.2 Mounting the Inverter

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

- ☐ 2 Three screws suitable for the support surface (diameter: 8 mm (5/16 in))
- ☐ Two washers suitable for the screws
- ☐ Where necessary, two 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 when attaching it to or removing it from the wall mounting bracket.

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

Procedure:

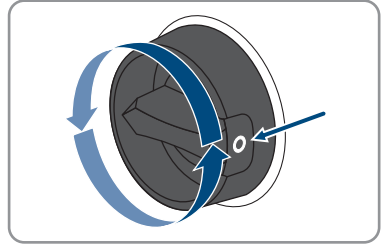
1.

⚠ CAUTION**Risk of injury due to damaged cables**

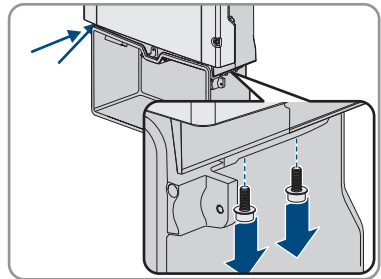
There may be power cables or other supply lines (e.g. gas or water) routed in the wall.

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

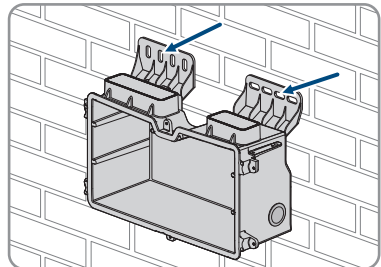
2. Ensure that the DC load-break switch of the inverter is in the **○** position.



3. Opening the Connection Unit Unscrew all six screws (TX25) and carefully remove the enclosure lid toward the front.
4. Unscrew the two screws on the right and left side of the Power Unit (TX25). As a result, the Power Unit and the Connection Unit are not connected to one another.

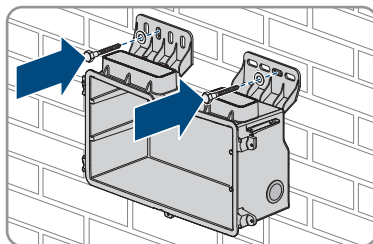


5. Disconnect the Connection Unit from the Power Unit.
6. Align the Connection Unit horizontally on the wall and mark the position of the drill holes using the brackets.



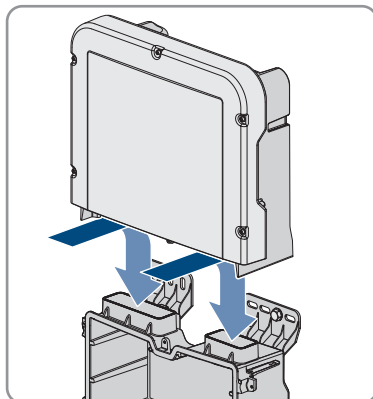
7. Drill the holes in the marked positions.
8. Insert screw anchors into the drill holes if the support surface requires them.

9. Secure the Connection Unit horizontally using screws and washers.

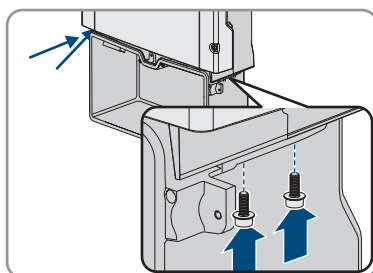


10. Check whether the Connection Unit is firmly positioned.

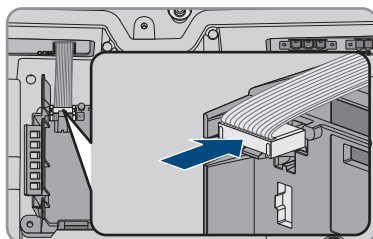
11. Plug the Power Unit into the Connection Unit. Make sure that the screw holes on the left and right sides of the Power Unit are directly over those of the Connection Unit; and the cables protruding from the Power Unit must not be pinched.



12. Tighten two screws on the right and left side of the Power Unit (TX25) (torque: $6 \text{ Nm} \pm 0.3 \text{ Nm}$ ($53 \text{ in-lb} \pm 2.65 \text{ in-lb}$)).



13. Pull the ribbon cable used to connect the communication assembly to the Power Unit into the Connection Unit, and plug it into the jack on the communication assembly.



6 Electrical Connection

6.1 Overview of the Connection Area

6.1.1 View from Below

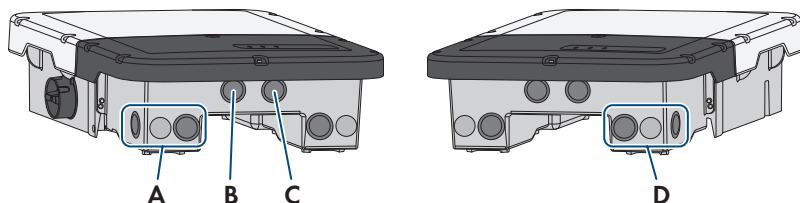


Figure 7 : Enclosure openings at the bottom of the inverter

Position	Designation
A	Enclosure opening for DC connection (for 21 mm (0.75 in) trade size conduits)
B	Enclosure opening for the connection cables of the Antenna Extension Kit and, if needed, for other data cables (for 21 mm (0.75 in) trade size conduits)
C	Enclosure opening for the network cables and, if needed, for other data cables (for 21 mm (0.75 in) trade size conduits)
D	Enclosure opening for the AC connection and the connection cables of the outlet and, if necessary, for the switch for the secure power supply operation (for 21 mm (0.75 in) trade size conduits)

6.1.2 Interior View

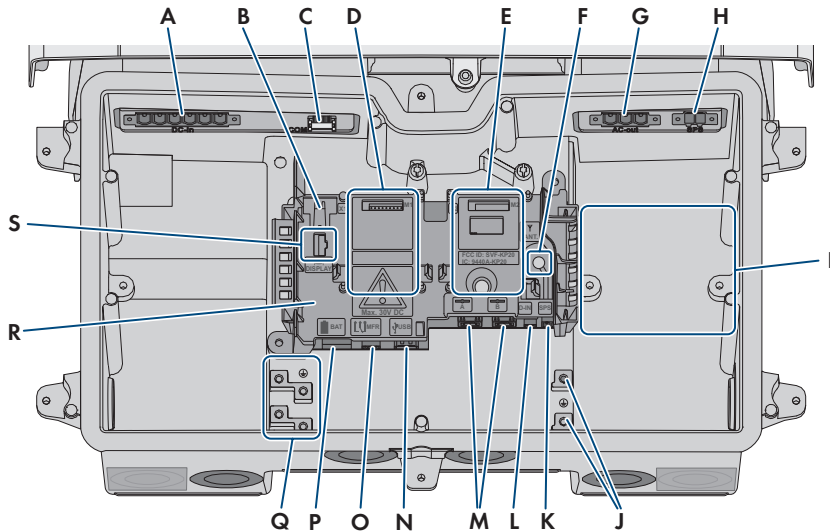


Figure 8 : Connection areas in the interior of the inverter

Position	Designation
A	DC-in slot for DC connection
B	Jack for connecting the ribbon cable for the connection of the communication assembly to the Power Unit.
C	The COM slot with the inserted ribbon cable with plug for the connection of the communication assembly with the Power Unit
D	Module slot M1
E	Module slot M2
F	ANT. slot for connecting the Antenna Extension Kit (optional)
G	AC-out slot for the AC connection
H	SPS slot for connecting the secure power supply outlet
I	Installation location for accessories (optional) approved by SMA Solar Technology AG
J	Equipment grounding terminal for the equipment grounding conductor of the utility grid, the outlet for secure power supply operation and, if necessary, an additional grounding or for the equipotential bonding
K	SPS slot for connecting the secure power supply switch
L	Pin connector D-IN is not used

Position	Designation
M	Network ports A and B for connecting a router or network switch
N	USB port for connecting a USB flash drive (for service purposes)
O	MFR slot for connection to the multifunction relay
P	Pin connector BAT is not used
Q	Equipment grounding terminals for the equipment grounding conductors of the PV array
R	Communication assembly
S	Jack DISPLAY for the LED assembly connection in the enclosure lid of the Connection Unit

6.2 AC Connection

6.2.1 Requirements for the AC Connection

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

- ☐ Conduits (trade size: 21 mm (0.75 in) or smaller with suitable reducer bushing)
- ☐ UL-listed raintight or liquidtight conduit fittings (trade size: 21 mm (0.75 in) or smaller with suitable reducer bushing)

Requirements on the AC conductors:

- ☐ The maximum permitted temperature of the terminal block for AC connection of 105°C (221 °F) must be observed.
- ☐ The conductors with regards to its ampacity, rated temperatures, operating conditions and its power loss must be made in accordance with the local standards and the *National Electrical Code*® ANSI/NFPA 70 or the *Canadian Electrical Code*® CSA C22.1.
- ☐ Conductor type: copper wire
- ☐ Maximum permissible temperature at SB3.0-1SP-US-41, SB3.8-1SP-US-41, SB5.0-1SP-US-41 and SB6.0-1SP-US-41: 75°C (+167°F)
- ☐ 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: 4 mm² to 16 mm² (12 AWG to 6 AWG)

Load-break switch and cable protection:

- ☐ In PV systems with multiple inverters, protect each inverter with its own overcurrent protective device. Observe the maximum permissible fuse protection (see Section 10 "Technical Data", page 65). This will prevent residual voltage from being present at the corresponding conductor after disconnection.
- ☐ The load-break switch or circuit breaker must be listed (see *National Electrical Code*® ANSI/NFPA 70) or Canadian Electrical Code® CSA C22.1).
- ☐ Loads installed between the inverter and the overcurrent protective device must be fused separately.
- ☐ The overcurrent protective device for the AC output circuit is to be provided by others.

Compatible grid configurations:

The connection procedure will vary, depending on the grid configuration; the country data set may have to be set. The following table provides an overview of the compatible grid configurations, which conductors have to be connected to the inverter to comply with the grid configuration and which country data set can be set. As standard, the inverter is meant for connection to a utility grid with a 208 V wye connection or a 240 V split-phase system, and the country data set

UL1741/2016/120 L-N-L is factory-set.

Compatible grid configuration	Conductors to be connected	Configurable country data sets
240 V split-phase system	L1, L2 and N	• UL1741/2016/120 L-N-L
208 V wye connection	L1, L2 and N	• HECO_OHM Rule 14H SDR 1.1/120 L-N-L • CA Rule 21 / 120 L-N-L • NE-ISO / 120 L-N-L
208 V delta connection	L1 and L2	• UL1741/2016/208 L-L • HECO_OHM Rule 14H SDR 1.1/208 L-L • CA Rule 21 / 208 L-L • NE-ISO / 208 L-L
240 V delta connection	L1 and L2	• UL1741/2016/240 L-L • HECO_OHM Rule 14H SDR 1.1/208 L-L • CA Rule 21 / 240 L-L • NE-ISO / 240 L-L

6.2.2 Connecting the Inverter to the Utility Grid

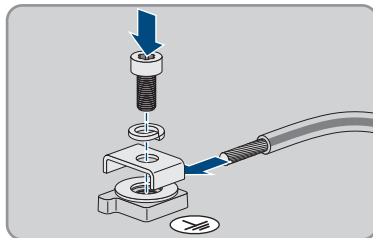
Requirements:

- ☐ All electrical installations must be carried out in accordance with the local standards and the *National Electrical Code*® ANSI/NFPA 70 or the *Canadian Electrical Code*® CSA C22.1.
- ☐ The connection requirements of the grid operator must be met.
- ☐ The grid voltage must be within the permissible range. The exact operating range of the inverter is specified in the operating parameters.

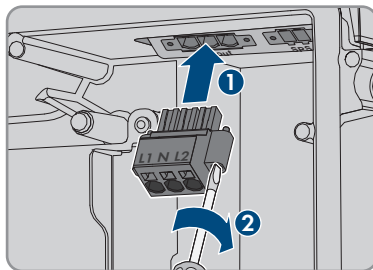
Procedure:

1. Disconnect the AC circuit breaker and secure it against reconnection.
2. Remove the adhesive tape from the enclosure opening for the AC connection.
3. Insert the conduit fitting into the opening and tighten from the inside using the counter nut.
4. Attach the conduit to the conduit fitting.
5. Guide the conductors from the conduit into the inverter. In the process, install the conductors in the inverter such that they do not come into contact with communication cables, the cable of the LED assembly or other live conductors. Lay the conductors as a loop if they are too long.
6. Connect the equipment grounding conductor of the utility grid to the equipment grounding terminal:

- Strip the insulation of the equipment grounding conductor by 18 mm (0.71 in).



- Insert the screw through the spring washer, the clamping bracket and the washer.
 - Guide the equipment grounding conductor between the washer and clamping bracket and tighten the screw (TX 25) (torque: 6 Nm $\pm$ 0.3 Nm (53.10 in-lb $\pm$ 2.65 in-lb)).
7. Plug the terminal block for the AC connection in the **AC-out** slot in the inverter, and tighten it with a flat-blade screwdriver (blade width: 4 mm ($\frac{5}{32}$ in)) (torque: 0.3 Nm (2.65 in-lb)).



8. Ensure that the terminal block is securely in place and the screws are tightened.
9. Strip off the conductor insulation of L1, L2 and, if applicable, N by 18 mm (0.71 in) each.
10. In the case of fine stranded wire, provide the conductors with a bootlace ferrule.

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

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

- First insert the connector into the terminal point all the way to the lock (round opening). Then insert a flat-blade screwdriver (blade: 4 mm ($\frac{5}{32}$ in)) as far as it can go into the actuation shaft (rectangular opening). Hereby the lock opens and the conductor can be placed into the terminal point as far as possible. After the connection has been made, the flat-blade screwdriver must be pulled out of the actuation shaft.

12.

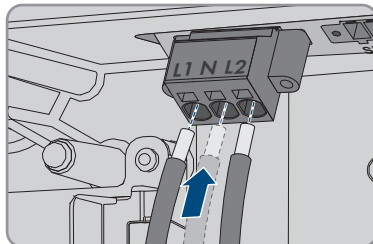
WARNING

Fire hazard due to faulty conductor connection

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

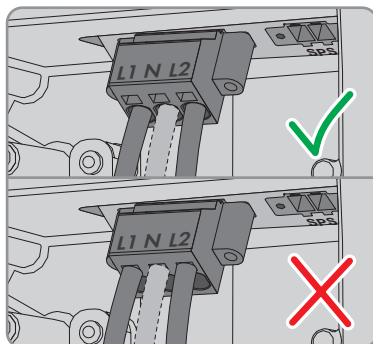
13. Connect the conductors to the terminal block for the AC connection:

- If there is a neutral conductor, connect the neutral conductor to the terminal block in accordance with the labeling. Insert the conductor into the corresponding terminal point (round opening) up to the stop.



- Connect L1 and L2 to the terminal block in accordance with the labeling. Insert each conductor into the corresponding terminal point (round opening) up to the stop.

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



15. Ensure that the terminal points are allocated to the correct conductors.

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

6.3 Connecting the Network Cables

DANGER

Danger to life due to electric shock in case of overvoltages and if surge protection is missing

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

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

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

- One to two network cables
- Where required: Field-assembly RJ45 connector.

Network cable requirements:

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

- ☐ Cable type: 100BaseTx
- ☐ Cable category: Cat5, Cat5e or higher
- ☐ Plug type: RJ45 of Cat5, 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 (2 x 2 x 24 AWG)
- ☐ Maximum cable length between two nodes when using patch cables: 50 m (164 ft)
- ☐ Maximum cable length between two nodes when using installation cables: 100 m (328 ft)
- ☐ UV-resistant for outdoor use

Procedure:

1.

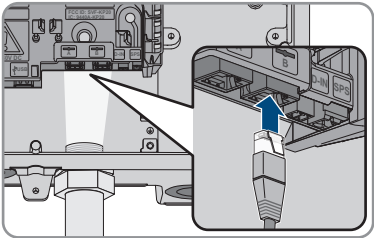
DANGER

Danger to life due to electric shock

- Disconnect the inverter from all voltage sources (see Section 8, page 61).

2. Remove the sealing plugs from the network connection opening on the inverter.
3. Insert the conduit fitting into the opening and tighten from the inside using the counter nut.
4. Attach the conduit to the conduit fitting.

5. Lead one end of each network cable from the conduit into the inverter.
6. Put the network plug of each cable into one of the network sockets of the communication assembly.



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

6.4 Connecting the Multifunction Relay

6.4.1 Procedure for connecting the multifunction relay

Procedure	See
1. Select for which operating mode you would like to use the multifunction relay.	see section 6.4.2, page 36
2. Connect to the multifunction relay according to the operating mode and the associated connection variant.	see section 6.4.3, page 37 and see section 6.4.4, page 40
3. After commissioning the inverter, change the operating mode of the multifunction relay, if necessary.	User manual under www.SMA-Solar.com

6.4.2 Operating Modes of the Multifunction Relay

Operating mode of multifunction relay (Mlt.Op-Mode)	Description
Fault indication (FltInd)	The multifunction relay controls a display device (e.g. a warning light) which, depending on the type of connection, signals either an error or the undisturbed operation of the inverter.
Self-consumption (SelfC-smp)	The multifunction relay switches loads on or off, depending on the power production of the PV system.
Control via communication (ComCtl)	The multifunction relay switches loads on or off according to commands transmitted by a communication product.
Battery bank (BatCha)	The multifunction relay controls the charging of the batteries depending on the power production of the PV system.

Operating mode of multifunction relay (Mlt.Op-Mode)	Description
Fan control (FanCtl)	The multifunction relay controls an external fan, depending on the temperature of the inverter.
Switching status grid relay (GriSwCpy)	The local grid operator may require that a signal is transmitted as soon as the inverter connects to the utility grid. The multifunction relay can be used to trigger this signal.

6.4.3 Connection Options

The connection procedures vary, depending on the operating mode.

Operating mode	Connection option
Fault indication (FltInd)	Using the Multifunction Relay as a Fault Indicator Contact
Self-consumption (SelfC-smp)	Controlling loads via the multifunction relay or charging batteries depending on the power production of the PV system
Control via communication (ComCtl)	Controlling loads via the multifunction relay or charging batteries depending on the power production of the PV system
Battery bank (BatCha)	Controlling loads via the multifunction relay or charging batteries depending on the power production of the PV system
Fan control (FanCtl)	Connecting the external fan (see fan documentation)
Switching status grid relay (GriSwCpy)	Reporting the switching status of the grid relay

Using the Multifunction Relay as a Fault Indicator Contact

You can use the multifunction relay as a fault indicator contact and have an error or smooth operation of the inverter displayed or signaled via a suitable display device. You can connect multiple inverters to one fault indicator or operation indicator, as needed.

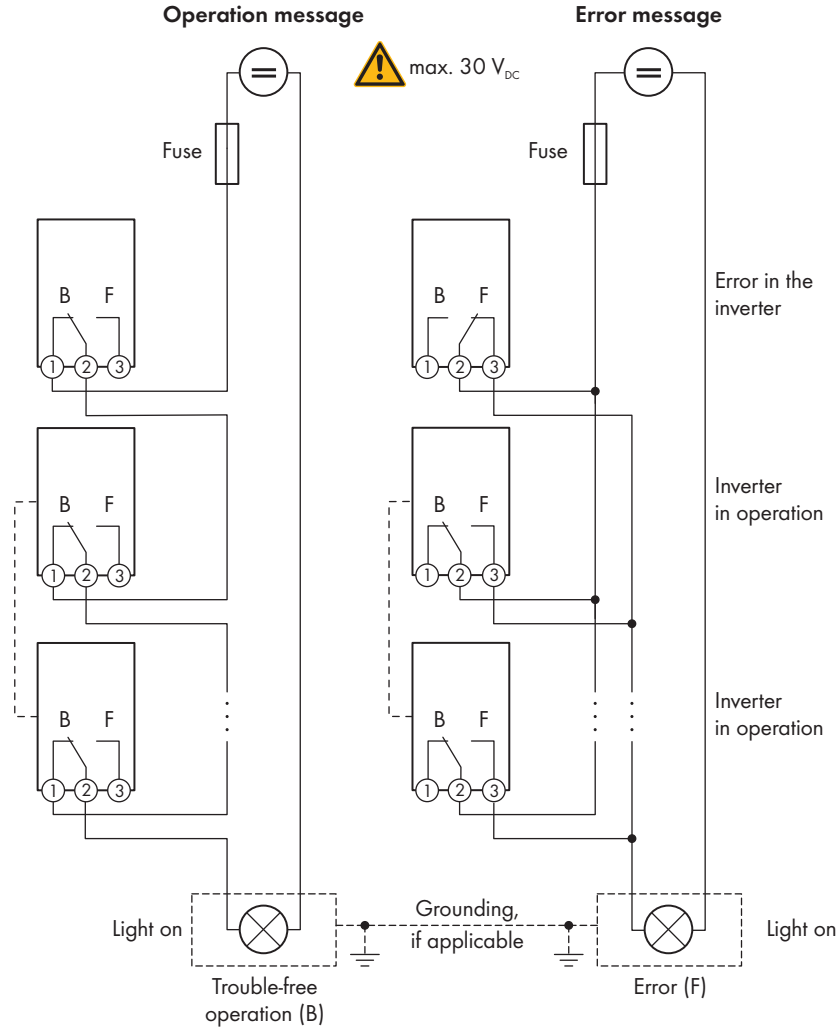


Figure 9 : Circuit diagram with multiple inverters for connection to an operation indicator and circuit diagram for connection to a fault indicator (example)

Controlling loads via the multifunction relay or charging batteries depending on the power production of the PV system

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

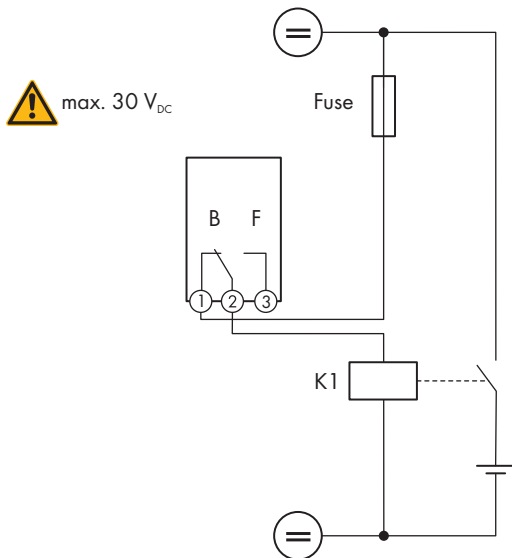


Figure 10 : Wiring diagram for connection for controlling a load or for the power-dependent charging of the batteries

Reporting the switching status of the grid relay

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

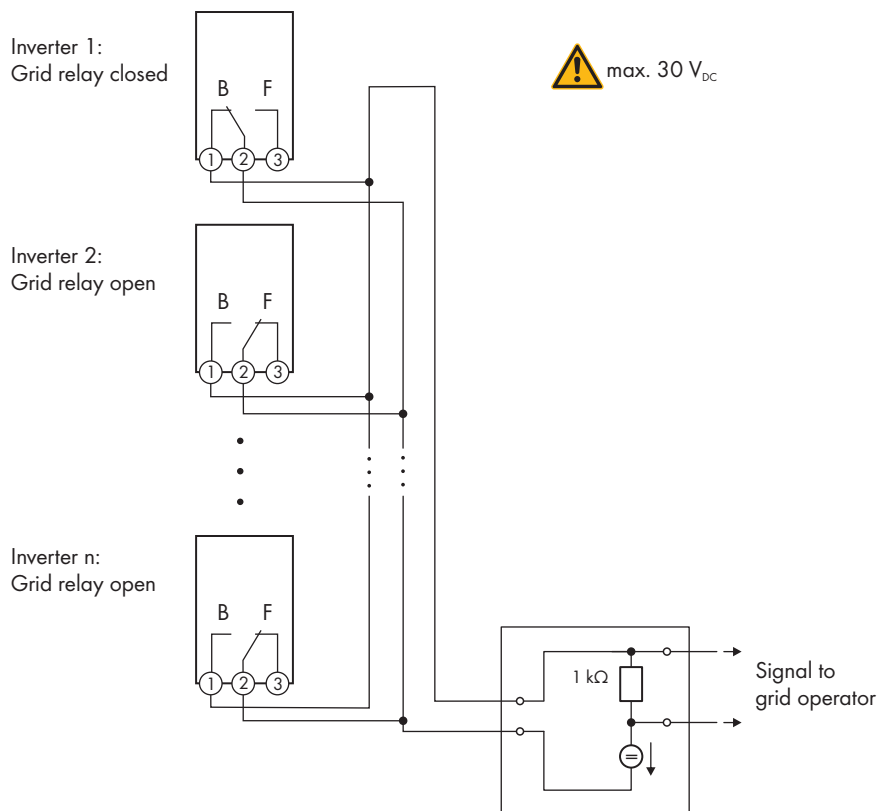


Figure 11 : Wiring diagram for signaling the switching status of the grid relay (example)

6.4.4 Connection to the Multifunction Relay

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

- ☐ Conduits: 21 mm (0.75 in) or smaller with a proper reducing bush
- ☐ Rain-tight conduit fittings for wet locations complying with UL 514B: 21 mm (0.75 in) or smaller with a proper reducing bush

Requirements:

- ☐ The technical requirements of the multifunction relay must be met (see Section 10 "Technical Data", page 65).
- ☐ All electrical installations must be carried out in accordance with the local standards and the *National Electrical Code*® ANSI/NFPA 70 or the *Canadian Electrical Code*® CSA C22.1.

Requirements on the conductors:

- Conductor cross-section: 0.2 mm² to 1.5 mm² (24 AWG to 16 AWG)
- The conductor type and wiring method must be appropriate for the application and location.

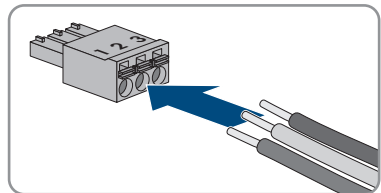
Procedure:

1.

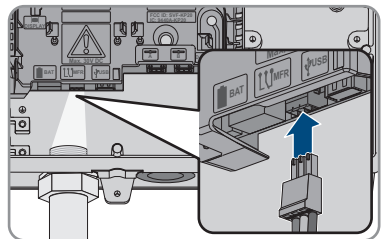
**Danger to life due to high voltages**

- Ensure that the inverter is disconnected from all voltage sources (see Section 8, page 61).

2. Remove the sealing plug from the enclosure opening on the multifunction relay.
3. Insert the conduit fitting into the opening and tighten from the inside using the counter nut.
4. Attach the conduit to the conduit fitting.
5. Guide the conductors from the conduit into the inverter.
6. Strip off the conductor insulation by max. 9 mm (0.35 in).
7. Connect the conductors to the 3-pole terminal block according to the circuit diagram, depending on the operating mode (see Section 6.4.3, page 37). Ensure that the conductors are plugged completely into the terminal points (round openings) up to their insulation.



8. Stick the terminal block into the **MFR** slot on the communication assembly in the inverter.



9. Ensure that the terminal block is securely in place.
10. Ensure that all conductors are correctly connected.
11. Ensure that the conductors sit securely in the terminal points. Tip: To release the conductors from the terminal block, open the terminal points using a suitable tool.

6.5 Connecting the Switch and Outlet for Secure Power Supply Operation

i Neutral and grounding conductor of output for secure power supply permanently connected

The inverter's output for secure power supply includes a permanent connection between neutral and grounding conductor, which cannot be disconnected.

Requirements:

- ☐ The technical requirements must be met for connecting the switch and outlet for secure power supply operation (see Section 10 "Technical Data", page 65).
- ☐ All electrical installations must be carried out in accordance with the local standards and the *National Electrical Code*® ANSI/NFPA 70 or the *Canadian Electrical Code*® CSA C22.1.

Residual-current device:

- ☐ SMA Solar Technology AG recommends to install a residual-current device (type A) between the inverter's output for secure power supply and the outlet for secure power supply operation, which trips at a residual current of 30 mA. Observe all locally applicable standards and directives when doing so.

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

- ☐ One standard outlet
- ☐ One standard switch (e.g. light switch)
- ☐ Conduits (trade size: 21 mm (0.75 in) or smaller with suitable reducer bushing)
- ☐ UL-listed raintight or liquidtight conduit fittings (trade size: 21 mm (0.75 in) or smaller with suitable reducer bushing)

Procedure:

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

Connect the outlet for secure power supply operation

Requirements for the conductors:

- ☐ The conductors with regards to its ampacity, rated temperatures, operating conditions and its power loss must be made in accordance with the local standards and the *National Electrical Code*® ANSI/NFPA 70 or the *Canadian Electrical Code*® CSA C22.1.
- ☐ Conductor type: copper wire
- ☐ The conductors must be made of solid wire, stranded wire or fine stranded wire. When using fine stranded wire, bootlace ferrules must be used.
- ☐ Conductor cross-section: 2.5 mm² to 4 mm² (14 AWG to 12 AWG)
- ☐ Maximum length of conductors: 10 m (33 ft)

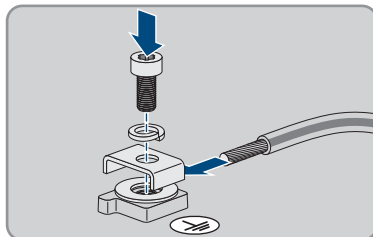
Procedure:

1.

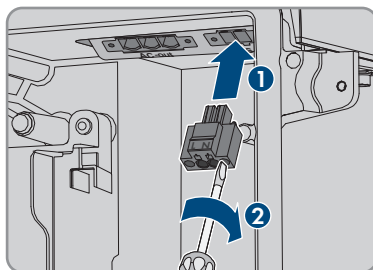
⚠ DANGER**Danger to life due to high voltages**

- Ensure that the inverter is disconnected from all voltage sources (see Section 8, page 61).

2. Remove the sealing plug from the enclosure opening for connecting the outlet for secure power supply operation.
3. Insert the conduit fitting into the opening and tighten from the inside using the counter nut.
4. Attach the conduit to the conduit fitting.
5. Guide the conductors into the inverter.
6. Connect the equipment grounding conductor of the outlet for secure power supply operation to an equipment grounding terminal:
 - Strip the insulation of the equipment grounding conductor by 18 mm (0.71 in).
 - Insert the screw through the spring washer, the clamping bracket and the washer.



- Guide the equipment grounding conductor between the washer and clamping bracket and tighten the screw (TX 25) (torque: 6 Nm $\pm$ 0.3 Nm (53.10 in-lb $\pm$ 2.65 in-lb)).
7. Plug the terminal block for connecting the outlet for secure power supply operation into the **SPS** slot in the inverter and tighten it with a flat-blade screwdriver (blade width: 4 mm ($\frac{5}{32}$ in)).



8. Ensure that the terminal block is securely in place.
9. Strip off the conductor insulation by max. 15 mm (0.59 in).
10. In the case of finely stranded wire, provide the conductors L and N with a bootlace ferrule.

11. Connection of conductors of finely stranded wire

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

- First insert the connector into the terminal point all the way to the lock (round opening). Then insert a flat-blade screwdriver (blade: 3.2 mm ($\frac{1}{8}$ in)) as far as it can go into the actuation shaft (rectangular opening). Hereby the lock opens and the conductor can be placed into the terminal point as far as possible. After the connection has been made, the flat-blade screwdriver must be pulled out of the actuation shaft.

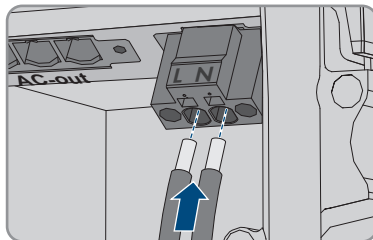
12.

WARNING

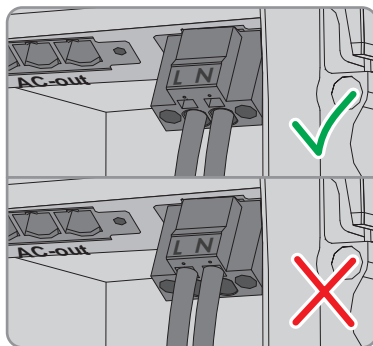
Fire hazard due to faulty conductor connection

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

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



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



15. Ensure that the terminal points are allocated to the correct conductors.
16. Ensure that the conductors are plugged completely into the terminal points up to their insulation.
17. Install outlet in desired position (e.g. next to the inverter or as switch/outlet combination optionally at short distance from the inverter (to max. 10 m (393.7 in))).
18. Connect the other end of the cable using it directly as energy supply to the outlet.

Connect the switch for secure power supply operation

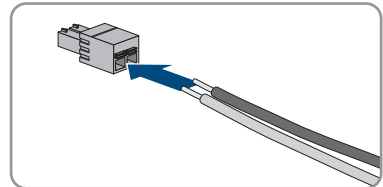
Requirements for the conductors:

- ☐ Conductor cross-section: 0.2 mm² to 2.5 mm² (24 AWG to 14 AWG)
- ☐ The conductor type and wiring method must be appropriate for the application and location.
- ☐ Maximum length of conductors: 10 m (393.7 in)

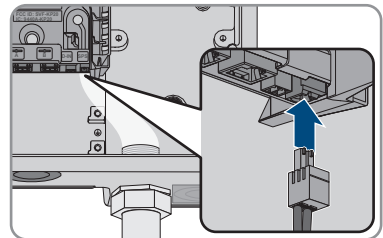
Procedure:

1. Remove the sealing plug from the opening for connecting the switch for secure power supply operation.
2. Insert the conduit fitting into the opening and tighten from the inside using the counter nut.
3. Attach the conduit to the conduit fitting.
4. Guide the conductors into the inverter.
5. Strip off the conductor insulation by min. 6 mm (0.24 in) to max. 10 mm (0.39 in).

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



7. Stick the terminal block into the **SPS** slot on the communication assembly in the inverter.



8. Ensure that the terminal block is securely in place.
9. Ensure that all conductors are correctly connected.
10. Ensure that the conductors sit securely in the terminal points. Tip: To release the conductors from the terminal block, open the terminal points using a suitable tool.
11. Install switch in desired position (e.g. next to the inverter or as switch/outlet combination optionally at short distance from the inverter (to max. 10 m (393.7 in))).
12. Connect the other end of the cable directly to the switch.

6.6 DC Connection

6.6.1 Requirements for the DC Connection

Connection options:

One string each can be connected to each DC input of the inverter during normal operation. The DC inputs A and B can however be operated in parallel, and thus up to three strings can be connected to inverters with two DC inputs and up to four strings to inverters with three DC inputs.

The following device types have two MPP trackers and therefore two DC inputs (A and B):

- SB3.0-1SP-US-41
- SB3.8-1SP-US-41

The following device types have three MPP trackers and therefore three DC inputs (A, B, and C):

- SB5.0-1SP-US-41
- SB6.0-1SP-US-41
- SB7.0-1SP-US-41
- SB7.7-1SP-US-41

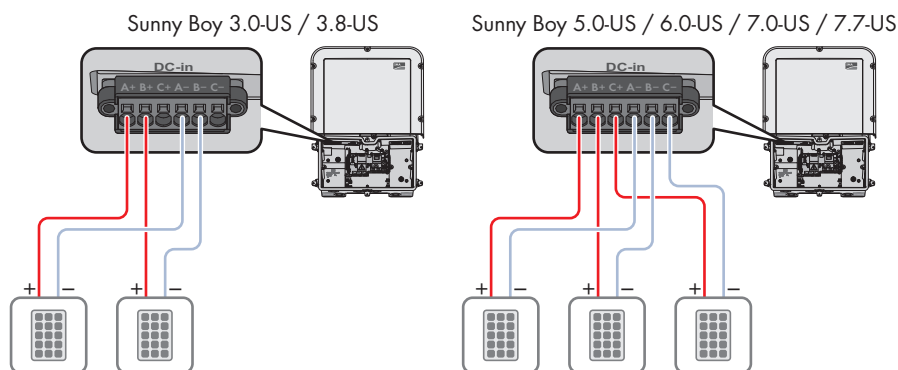


Figure 12 : Connection overview for normal operation

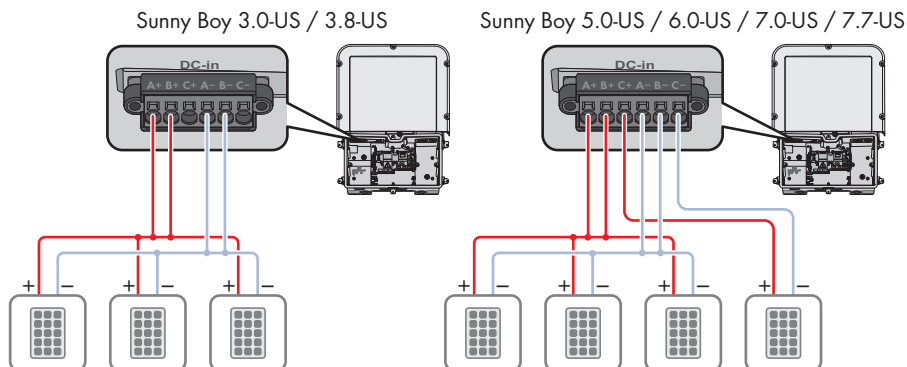


Figure 13 : Connection overview for parallel connection of the DC inputs A and B

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.
- ☐ If inputs A and B are connected in parallel, the PV modules of inputs A and B should be identically aligned and the same number of PV modules connected in series must be connected to all strings of inputs A and B.
- ☐ The maximum inverter system voltages permitted may not be exceeded (see Section 10 "Technical Data", page 65).
- ☐ The maximum short-circuit current may not be exceeded (see Section 10 "Technical Data", page 65).

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

- ☐ Conduits (trade size: 21 mm (0.75 in) or smaller with suitable reducer bushing)
- ☐ UL-listed raintight or liquidtight conduit fittings (trade size: 21 mm (0.75 in) or smaller with suitable reducer bushing)

Requirements on the DC conductors:

- ☐ The conductors with regards to its ampacity, rated temperatures, operating conditions and its power loss must be made in accordance with the local standards and the *National Electrical Code*® ANSI/NFPA 70 or the *Canadian Electrical Code*® CSA C22.1.
- ☐ The DC terminal block temperature rating is +90 °C (+194 °F).
- ☐ Conductor type: copper wire
- ☐ Maximum permissible temperature: 75 °C (+167 °F) or 90 °C (194 °F)
- ☐ The conductors must be made of solid wire, stranded wire or fine stranded wire. When using fine stranded wire, bootlace ferrules must be used.
- ☐ Conductor cross-section: 2.5 mm² to 10 mm² (14 AWG to 8 AWG)

6.6.2 Connecting the PV Array

NOTICE

Damage to the inverter due to ground fault on DC side during operation

Due to the transformerless topology of the product, the occurrence of ground faults on DC side during operation can lead to irreparable damage. Damages to the product due to a faulty or damaged DC installation are not covered by warranty. The product is equipped with a protective device that checks whether a ground fault is present during the starting sequence. The product is not protected during operation.

- Ensure that the DC installation is carried out correctly and no ground fault occurs during operation.

Requirements:

- ☐ The grounding of the PV system must be executed as per the specifications of the *National Electrical Code*® ANSI/NFPA 70 and is the responsibility of the installer.
- ☐ All electrical installations must be carried out in accordance with the local standards and the *National Electrical Code*® ANSI/NFPA 70 or the *Canadian Electrical Code*® CSA C22.1.

Procedure:

1.

DANGER

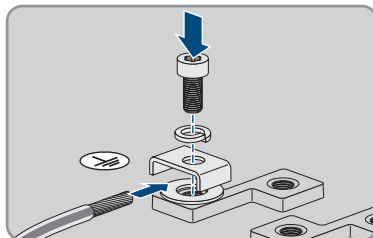
Danger to life due to high voltages

When exposed to sunlight, the PV array generates dangerous DC voltage which is present in the DC conductors. Touching the DC conductors can lead to lethal electric shocks.

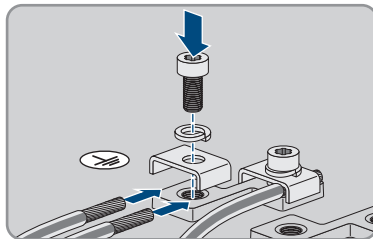
- If an external DC disconnecting switch is available, open the external DC disconnecting switch.
- Ensure that the DC load-break switch on the inverter is in the **0** position.
- Ensure that there is no voltage on the DC inputs of the inverter.

- Remove the adhesive tape from the enclosure opening for the DC connection and, if other enclosure openings are to be used, take the sealing plugs out of these enclosure openings.
- Insert the conduit fitting into the opening and tighten from the inside using the counter nut.
- Attach the conduit to the conduit fitting.
- Guide the conductors from the conduit into the inverter. In the process, lay the conductors in the inverter such that they do not come into contact with the communication assembly.
- Connect each equipment grounding conductor of the PV array to an equipment grounding terminal:
 - Strip the insulation of the equipment grounding conductor by 18 mm (0.71 in).
 - Insert the screw through the spring washer, the clamping bracket and the washer.

- Guide the equipment grounding conductor between the washer and clamping bracket and tighten the screw (TX 25) (torque: $6 \text{ Nm} \pm 0.3 \text{ Nm}$ ($53.10 \text{ in-lb} \pm 2.65 \text{ in-lb}$)). Here, the equipment grounding conductor must have contact with an inner edge of the clamping bracket.



- If two equipment grounding conductors are to be connected to one equipment grounding terminal, guide both equipment grounding conductors between the washer and clamping bracket and tighten the screw (TX 25, torque: $6 \text{ Nm} \pm 0.3 \text{ Nm}$ ($53.10 \text{ in-lb} \pm 2.65 \text{ in-lb}$)). Here, every equipment grounding conductor must have contact with an inner edge of the clamping bracket.



7. Plug the terminal block for the DC connection into the **DC-in** slot in the inverter.

8.

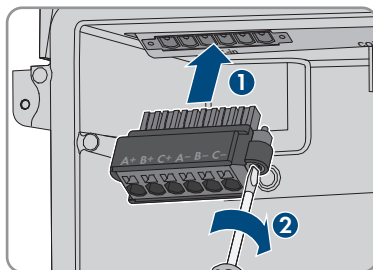
DANGER

Danger to life due to electric arc

The terminal block must be fastened to the slot with two screws. If the terminal block is not correctly mounted and comes out of the slot, an electric arc can form. An electric arc can cause life-threatening burns and can cause fire.

- Mount the terminal block using the two screws as described in the following.

9. Tighten the screws of the terminal block using a flat-blade screwdriver (blade width: 3.5 mm (0.14 in)) (torque: 0.3 Nm (2.65 in-lb)).



10. Ensure that the terminal block is securely in place and the screws are tightened.
11. Strip off the conductor insulation by 18 mm (0.71 in).
12. In the case of fine stranded wire, provide each conductor with a bootlace ferrule.

13. Connection of conductors of finely stranded wire

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

- First insert the connector into the terminal point all the way to the lock (round opening). Then insert a flat-blade screwdriver (blade: 3.5 mm (0.14 in)) as far as it can go into the actuation shaft (rectangular opening). Hereby the lock opens and the conductor can be placed into the terminal point as far as possible. After the connection has been made, the flat-blade screwdriver must be pulled out of the actuation shaft.

14.

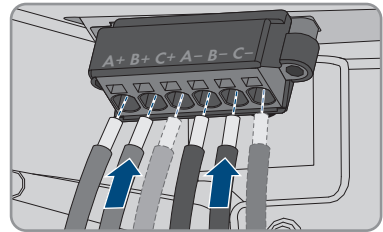
WARNING

Fire hazard due to faulty conductor connection

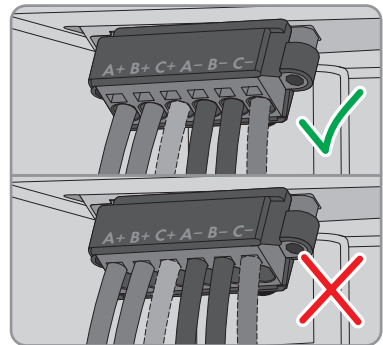
If the conductors are inserted into the actuation shafts (right-angled openings), a fire may occur during inverter commissioning.

- Connect the conductors to the terminal block as described in the following.

15. Connect the conductors to the terminal block in accordance with the labeling. Insert each conductor into the corresponding terminal point (round opening) up to the stop. Always connect the positive terminal and the negative terminal of a string to the same input, and keep in mind that the terminals **C+** and **C-** of inverters with two DC inputs must not be assigned.



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



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

7 Commissioning

7.1 Commissioning Procedure

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

Procedure	See
1. Commission the inverter.	see section 7.2, page 51
2. Establish a connection to the user interface of the inverter. There are various connection options to choose from for this: • Direct connection via WLAN • Direct connection via Ethernet • Connection via WLAN in the local network • Connection via Ethernet in the local network	see section 7.3, page 53
3. Log into the user interface.	see section 7.4, page 57
4. Select the inverter configuration option. Please note that the SMA Grid Guard code for changing the grid-relevant parameters must be available after completion of the first ten feed-in hours or installation assistant (see "Application for the SMA Grid Guard code" available at www.SMA-Solar.com).	see section 7.5, page 58
5. Ensure that the country data set has been configured correctly.	Inverter user manual
6. Make further inverter settings as needed.	Inverter user manual

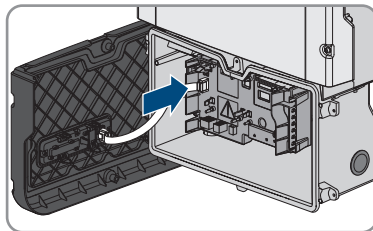
7.2 Commissioning the Inverter

Requirements:

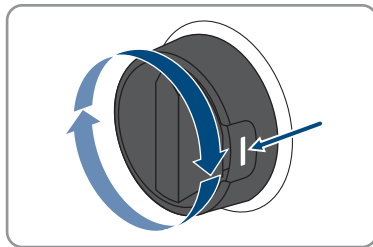
- ☐ The AC circuit breaker must be correctly rated and mounted.
- ☐ A means of disconnecting the inverter from the PV array must be present.
- ☐ The inverter must be correctly mounted.
- ☐ All conductors must be correctly connected.
- ☐ Unused enclosure openings must be sealed tightly with sealing plugs.

Procedure:

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



2. Ensure that the ribbon cable is securely plugged into the sockets at both ends.
3. Position the enclosure lid of the Connection Unit on the enclosure and tighten all 6 screws crosswise (TX 25, torque: $3 \text{ Nm} \pm 0.3 \text{ Nm}$ ($26.55 \text{ in-lb} \pm 2.65 \text{ in-lb}$)).
4. Turn the DC load-break switch of the inverter to position I.



5. Switch on the AC circuit breaker.
 - ☒ All three LEDs light up and the display is illuminated. The start-up phase begins.
 - ☒ After approximately 90 seconds, all three LEDs will go out again and the display will show a succession of different messages with inverter data.
 - ☒ Depending on the available power, the green LED pulses or is continuously illuminated. The inverter is feeding in.
6. If the LEDs do not start to glow and the display remains dark, the ribbon cable between the assembly in the enclosure lid and the communication assembly in the inverter is most likely not properly plugged in. Ensure that the ribbon cable is securely plugged into the sockets at both ends.
7. If the green LED is still flashing, the conditions for activating feed-in operation are not yet met. As soon as the conditions for feed-in operation are met, the inverter starts with feed-in operation and, depending on the available power, the green LED will light up continuously or it will pulse.
8. If the red LED lights up, an error has occurred. Rectify the error (for information regarding troubleshooting see the user manual under www.SMA-Solar.com).

7.3 Establishing a connection to the user interface

7.3.1 Establishing a Direct Connection via Ethernet

Requirements:

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

Procedure:

1. Tap on the enclosure lid of the Connection Unit and continue to switch up to the message **E-IP: 169.254.xxx.xxx**.
 2. Read off the displayed IP address for the direct connection via Ethernet and either remember it or write it down.
 3. Open the web browser of your device, enter the IP address in the address line of the web browser and press the enter key.
 4.  **Web browser signals a security vulnerability**
After the IP address has been confirmed by pressing the enter key, a message might appear indicating that the connection to the user interface of the inverter is not secure. SMA Solar Technology AG guarantees that calling up the user interface is secure.
 - Continue loading the user interface.
- ☒ The login page of the user interface opens.

7.3.2 Establishing a direct connection via WLAN

Requirements:

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

SSID, IP address and necessary passwords

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

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

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

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

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

Procedure:

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

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

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

- Continue loading the user interface.

☒ The login page of the user interface opens.

7.3.3 Establishing a Connection via Ethernet in the local network

New IP address for connecting with a local network

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

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

Requirements:

- ☐ The product must be connected to the local network via a network cable (e.g. via a router).
- ☐ The product must be integrated into the local network. Tip: There are various methods of integrating the product into the local network with the aid of the installation assistant.
- ☐ An end device (e.g. computer, tablet PC or smartphone) must be available.
- ☐ The end device must be in the same local network as the product.
- ☐ The respective latest version of one of the following web browsers must be installed: Chrome, Edge, Firefox, Internet Explorer or Safari.
- ☐ The SMA Grid Guard code of the Installer must be available for the changing of grid-relevant settings after completion of the first ten feed-in hours or installation assistant (see "Application for SMA Grid Guard Code" at www.SMA-Solar.com).

Procedure:

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

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

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

- Continue loading the user interface.

☒ The login page of the user interface opens.

7.3.4 Establishing a Connection via WLAN in the Local Network

New IP address for connecting with a local network

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

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

Requirements:

- ☐ The product must be commissioned.
- ☐ The product must be integrated into the local network. Tip: There are various methods of integrating the product into the local network with the aid of the installation assistant.
- ☐ An end device (e.g. computer, tablet PC or smartphone) must be available.
- ☐ The end device must be in the same local network as the product.
- ☐ The respective latest version of one of the following web browsers must be installed: Chrome, Edge, Firefox, Internet Explorer or Safari.
- ☐ The SMA Grid Guard code of the Installer must be available for the changing of grid-relevant settings after completion of the first ten feed-in hours or installation assistant (see "Application for SMA Grid Guard Code" at www.SMA-Solar.com).

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

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

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

Procedure:

1. Enter the IP address of the inverter in the address bar of the web browser.

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

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

- Continue loading the user interface.

☒ The login page of the user interface opens.

7.4 Logging Into the User Interface

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

Procedure:

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

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

7.5 Selecting a configuration option

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

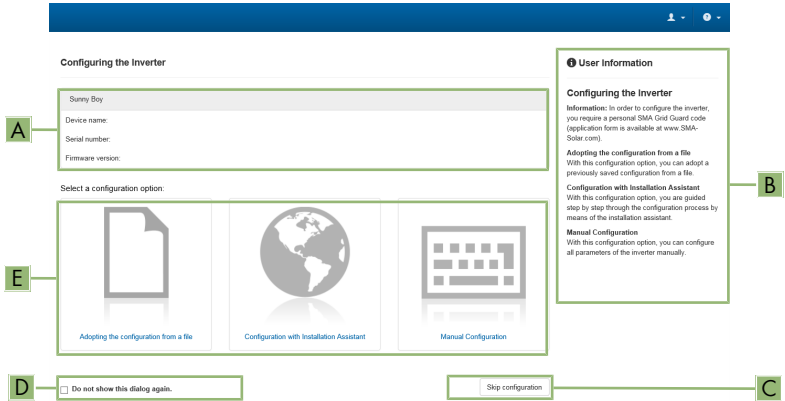


Figure 14 : Layout of the **Configuring the Inverter** page

Position	Designation	Description
A	Device information	Provides the following information: • Device name • Inverter serial number • Inverter firmware version
B	User information	Provides brief information on the listed configuration options
C	Skip configuration	Offers the option of skipping the inverter configuration and go directly to the user interface (not recommended)
D	Checkbox	Allows you to choose not to have the displayed page displayed again when the user interface is called up again
E	Configuration options	Provides a selection of the various configuration options

Procedure:

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

- Adoption of configuration from a file

- Configuration with the installation assistant (recommended)
- Manual configuration

i Accepting the settings

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

Adopting the Configuration from a File

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

Procedure:

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

Configuring the Installation Assistant (Recommended)

Figure 15 : Layout of the installation assistant (example)

Position	Designation	Description
A	Configuration steps	Overview of the installation assistant steps. The number of steps depends on the type of device and the additionally installed modules. The current step is highlighted in blue.

Position	Designation	Description
B	User information	Information about the current configuration step and the setting options of the configuration step.
C	Configuration field	You can make settings in this field.

Procedure:

1. Select the configuration option **Configuration with Installation Assistant**.
 - ☒ The installation assistant will open.
2. Follow the installation assistant steps and make the settings appropriate for your system.
3. For every setting made in a step, select **[Save and next]**.
 - ☒ In the last step, all made settings are listed in a summary.
4. To save the settings to a file, select **[Export a summary]** and save the file on your computer, tablet PC or smartphone.
5. To export all parameters and their settings, select **[Export all parameters]**. This exports all parameters and their settings into an HTML file.
6. To correct settings you made, select **[Back]**, navigate to the desired step, correct settings and select **[Save and continue]**.
7. Once all settings are correct, select **[Next]** in the summary.
 - ☒ The start page of the user interface opens.

Manual configuration

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

Procedure:

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

8 Disconnecting the Inverter from Voltage Sources

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.

DANGER

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

When exposed to sunlight, the PV array generates dangerous direct voltage. Even if the DC load-break switch of the inverter is in the **O**, position, there will be dangerous direct voltage present in the DC conductors and on the **DC-in** terminal block in the Connection Unit. Touching live DC conductors results in death or lethal injuries due to electric shock.

- If an external DC disconnecting switch is available, open the external DC disconnecting switch.
- Leave the **DC-in** terminal block plugged into the Connection Unit and only touch it on the black enclosure.

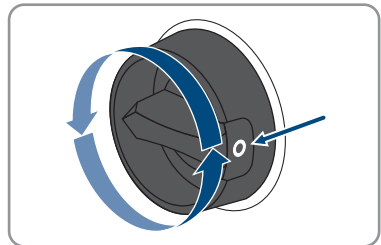
NOTICE

Destruction of the measuring device due to overvoltage

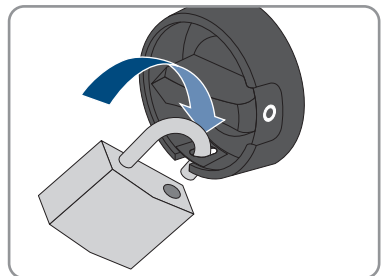
- Only use measuring devices with a DC input voltage range of 600 V or higher.

Procedure:

1. Disconnect the AC circuit breaker and secure it against reconnection.
2. Set the DC load-break switch of the inverter to **O**.

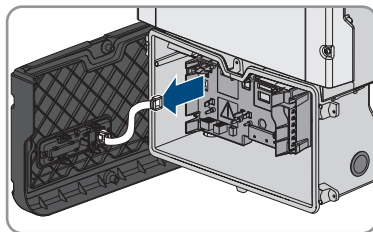


3. Secure the DC load-break switch against reconnection using a suitable padlock.



4. If the multifunction relay is used, switch off any supply voltage to the load.
5. Wait until the LEDs have gone out.

6. Unscrew all six screws of the enclosure lid of the Connection Unit and remove the enclosure lid carefully towards the front (TX25). When doing so, note that the LED assembly in the enclosure lid and the communication assembly in the inverter are connected via a ribbon cable.
7. Pull the ribbon cable connecting the LED assembly in the enclosure lid to the communication assembly out of the jack located on the communication assembly.



8. Use a current clamp to ensure that no current is present in the DC conductors.
9. Ensure there is no voltage on the **AC-out** terminal block between **L1** and **N** and **L2** and **N** using a suitable measuring device. To do this, stick the test probe in each rectangular opening of the terminal.
10. Ensure there is no voltage on the **AC-out** terminal block between **L1** and the equipment grounding conductor and **L2** and the equipment grounding conductor using a suitable measuring device. To do this, stick the test probe in each rectangular opening of the terminal.

9 Decommissioning the Inverter

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

CAUTION

Risk of injury due to weight of product

Injuries may result if the product is lifted incorrectly or dropped while being transported or when attaching it to or removing it from the wall mounting bracket.

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

Procedure:

1.

DANGER

Danger to life due to high voltages

- Disconnect the inverter from all voltage sources (see Section 8, page 61).

- Remove the DC conductors from the **DC-in** terminal block. To release the conductors from the terminals, open the terminals with a flat-blade screwdriver (blade width: 3.5 mm (0.14 in)). While doing so, only touch the terminal block on the black enclosure.
- Screw out the screws from the **DC-in** terminal block using a flat-blade screwdriver (blade width: 3.5 mm (0.14 in)) and pull the terminal block out of the slot. While doing so, only touch the terminal block on the black enclosure.
- Remove the AC conductor L1, L2 and, if necessary, N from the **AC-out** terminal block. To release the conductors from the terminals, open the terminals with a flat-blade screwdriver (blade width: 3.5 mm (0.14 in)).
- Screw out the screws from the **AC-out** terminal block using a flat-blade screwdriver (blade width: 3.5 mm (0.14 in)) and pull the terminal block out of the slot.
- Remove all equipment grounding conductors from the equipment grounding terminals. To do this, remove each screw (TX 25) and remove the equipment grounding conductor from the inverter; screw each screw back in (TX 25).
- Remove the ribbon cable connecting the communication assembly to the Power Unit and plug the ribbon cable into the **COM** slot in the Power Unit.
- Remove all connection cables from the communication assembly. Tip: To release the cables from the plugs, open the conduit entries using a suitable tool.
- Remove all conduits with conductors from the inverter. To do this, screw the sleeves out of the enclosure openings from the inside.
- Seal all enclosure openings with sealing plugs.
- Unscrew the two screws on the right and left side of the Power Unit (TX25) and retain them for later use. As a result, the Power Unit and the Connection Unit are not connected to one another.
- Disconnect and remove the Power Unit from the Connection Unit.

13. Unscrew all the screws that are attached to the Connection Unit.
14. Remove the Connection Unit.
15. Connect the Connection Unit to the Power Unit. Make sure that the screw holes on the left and right sides of the Power Unit are directly over those of the Connection Unit; and the cables protruding from the Power Unit must not be pinched.
16. Tighten the two screws on the right and left side of the Power Unit (TX25) (torque: $6 \text{ Nm} \pm 0.3 \text{ Nm}$ ($53 \text{ in-lb} \pm 2.65 \text{ in-lb}$)).
17. Lead the enclosure lid to the Connection Unit and plug the display cable into the socket on the communication assembly.
18. Ensure that the display cable is securely plugged into the sockets at both ends.
19. Position the enclosure lid of the Connection Unit on the enclosure and tighten all 6 screws crosswise (TX 25, torque $3 \text{ Nm} \pm 0.3 \text{ Nm}$ ($26.55 \text{ in-lb} \pm 2.65 \text{ in-lb}$)).
20. If the inverter is to be stored or shipped, pack the inverter. Use the original packaging or packaging that is suitable for the weight and dimensions of the inverter and secure the packaging with tension belts, if necessary.
21. Dispose of the inverter in accordance with the locally applicable disposal regulations for electronic waste.

10 Technical Data

10.1 DC/AC

10.1.1 Sunny Boy 3.0-US / 3.8-US / 5.0-US

DC input

	SB3.0-1SP-US-41	SB3.8-1SP-US-41	SB5.0-1SP-US-41
Maximum PV array power	4800 W _p	6080 W _p	8000 W _p
Maximum input voltage	600 V	600 V	600 V
MPP voltage range	100 V to 550 V	100 V to 550 V	100 V to 550 V
Rated input voltage	155 V to 480 V	195 V to 480 V	220 V to 480 V
Minimum input voltage	100 V	100 V	100 V
Initial input voltage	125 V	125 V	125 V
Maximum input current per input	10 A	10 A	10 A
Maximum short-circuit current per input	18 A	18 A	18 A
Maximum input source reverse current to input source	0 A	0 A	0 A
Number of independent MPP inputs	2	2	3

AC output

	SB3.0-1SP-US-41	SB3.8-1SP-US-41	SB5.0-1SP-US-41
Rated power at 208 V	3000 W	3328 W	5000 W
Rated power at 240 V	3000 W	3800 W	5000 W
Maximum apparent AC power at 208 V	3000 VA	3328 VA	5000 VA
Maximum apparent AC power at 240 V	3000 VA	3800 VA	5000 VA
Rated grid voltage	208 V / 240 V	208 V / 240 V	208 V / 240 V
AC voltage range at 208 V	183 V to 229 V	183 V to 229 V	183 V to 229 V

	SB3.0-1SP-US-41	SB3.8-1SP-US-41	SB5.0-1SP-US-41
AC voltage range at 240 V	211 V to 264 V	211 V to 264 V	211 V to 264 V
Nominal AC current at 208 V	14.4 A	16 A	24 A
Nominal AC current at 240 V	12.5 A	15.8 A	21 A
Maximum output current at 208 V	14.5 A	16 A	24 A
Maximum output current at 240 V	12.5 A	15.8 A	21 A
Total harmonic factor of output current	<4 %	<4 %	<4 %
Maximum residual output current	30.4 A	30.4 A	30.4 A
Duration of the maximum residual output current	250 ms	250 ms	250 ms
Line synchronization characteristics/inrush current	Method 2/2.4 A	Method 2/2.4 A	Method 2/2.4 A
Rated power frequency	60 Hz	60 Hz	60 Hz
Operating range at AC power frequency 60 Hz	59.3 Hz to 60.5 Hz	59.3 Hz to 60.5 Hz	59.3 Hz to 60.5 Hz
Output power at +60°C (+140°F)	> 3300 W	> 3300 W	> 3300 W
Power factor at rated power	1	1	1
Range of the 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}
Feed-in phases	1	1	1
Phase connection	2	2	2
Overvoltage category in accordance with UL 1741	IV	IV	IV

Efficiency

	SB3.0-1SP-US-41	SB3.8-1SP-US-41	SB5.0-1SP-US-41
Maximum efficiency at 208 V, $\eta_{\max}$	97.2 %	97.2 %	97.2 %
CEC efficiency at 208 V, η_{CEC}	96 %	96.5 %	96.5 %
Maximum efficiency at 240 V, $\eta_{\max}$	97.6 %	97.5 %	97.5 %
CEC efficiency at 240 V, η_{CEC}	96.5 %	96.5 %	97.0 %

10.1.2 Sunny Boy 6.0-US / 7.0-US / 7.7-US**DC input**

	SB6.0-1SP-US-41	SB7.0-1SP-US-41	SB7.7-1SP-US-41
Maximum PV array power	9600 Wp	11200 Wp	12320 Wp
Maximum input voltage	600 V	600 V	600 V
MPP voltage range	100 V to 550 V	100 V to 550 V	100 V to 550 V
Rated input voltage	220 V to 480 V	245 V to 480 V	270 V to 480 V
Minimum input voltage	100 V	100 V	100 V
Initial input voltage	125 V	125 V	125 V
Maximum input current per input	10 A	10 A	10 A
Maximum short-circuit current per input	18 A	18 A	18 A
Maximum input source reverse current to input source	0 A	0 A	0 A
Number of independent MPP inputs	3	3	3

AC output

	SB6.0-1SP-US-41	SB7.0-1SP-US-41	SB7.7-1SP-US-41
Rated power at 208 V	5200 W	6650 W	6650 W
Rated power at 240 V	6000 W	7000 W	7680 W

	SB6.0-1SP-US-41	SB7.0-1SP-US-41	SB7.7-1SP-US-41
Maximum apparent AC power at 208 V	5200 VA	6650 VA	6650 VA
Maximum apparent AC power at 240 V	6000 VA	7000 VA	7680 VA
Rated grid voltage	208 V / 240 V	208 V / 240 V	208 V / 240 V
AC voltage range at 208 V	183 V to 229 V	183 V to 229 V	183 V to 229 V
AC voltage range at 240 V	211 V to 264 V	211 V to 264 V	211 V to 264 V
Nominal AC current at 208 V	25 A	32 A	32 A
Nominal AC current at 240 V	25 A	29.2 A	32 A
Maximum output current at 208 V	25 A	32 A	32 A
Maximum output current at 240 V	25 A	29.2 A	32 A
Total harmonic factor of output current	<4 %	<4 %	<4 %
Maximum residual output current	30.4 A	30.4 A	30.4 A
Duration of the maximum residual output current	250 ms	250 ms	250 ms
Line synchronization characteristics/inrush current	Method 2/2.4 A	Method 2/2.4 A	Method 2/2.4 A
Rated power frequency	60 Hz	60 Hz	60 Hz
Operating range at AC power frequency 60 Hz	59.3 Hz to 60.5 Hz	59.3 Hz to 60.5 Hz	59.3 Hz to 60.5 Hz
Output power at +60 °C (+140 °F)	> 3300 W	> 6700 W	> 6700 W
Power factor at rated power	1	1	1

	SB6.0-1SP-US-41	SB7.0-1SP-US-41	SB7.7-1SP-US-41
Range of the 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}
Feed-in phases	1	1	1
Phase connection	2	2	2
Overvoltage category in accordance with UL 1741	IV	IV	IV

Efficiency

	SB6.0-1SP-US-41	SB7.0-1SP-US-41	SB7.7-1SP-US-41
Maximum efficiency at 208 V, $\eta_{\max}$	97.2 %	97.1 %	97.1 %
CEC efficiency at 208 V, η_{CEC}	96.5 %	96.5 %	96.5 %
Maximum efficiency at 240 V, $\eta_{\max}$	97.6 %	97.5 %	97.5 %
CEC efficiency at 240 V, η_{CEC}	97.0 %	97.0 %	97.0 %

10.2 AC Output, Secure Power Supply Operation

Maximum AC power	2000 W
Nominal AC voltage	120 V
AC voltage range	109 V to 132 V
Maximum output current	16 A
Minimum load	1 W

10.3 Multifunction Relay

Maximum DC switching voltage	30 V
Maximum AC switching current	1.0 A
Maximum DC switching current	1.0 A
Minimum load	0.1 W
Minimum electrical endurance when the maximum switching voltage and maximum switching current are complied with*	100000 switching cycles

* Corresponds to 20 years at 12 switching operations per day

10.4 Triggering Thresholds and Tripping Time

Rated power frequency	Triggering threshold	Triggering frequency	Tripping time	
60 Hz	> 60.5 Hz	60.45 Hz to 60.55 Hz	max. 0.1602 s	
	< 57 Hz to 59.8 Hz (Standard: 59.3 Hz)	56.95 Hz to 59.85 Hz (Standard: 59.25 Hz to 59.35 Hz)	Adjustable: 0.16 s to 300 s (Standard: max. 0.1602 s)	
	< 57.0 Hz	56.95 Hz to 57.05 Hz	max. 0.1602 s	
Rated grid voltage	Triggering threshold - Triggering voltages	Triggering voltage - Neutral conductor	Triggering voltage - L1 and L2	Tripping time
208 V	50%	57.6 V to 62.4 V	99.8 V to 108.2 V	max. 0.1602 s
	88%	103.2 V to 108.0 V	178.9 V to 187.2 V	max. 2.002 s
	110%	129.6 V to 134.4 V	224.6 V to 233.0 V	max. 1.001 s
	120%	141.6 V to 146.4 V	245.4 V to 253.8 V	max. 0.1602 s
240 V	50%	57.6 V to 62.4 V	115.2 V to 124.8 V	max. 0.1602 s
	88%	103.2 V to 108.0 V	206.4 V to 216.0 V	max. 2.002 s
	110%	129.6 V to 134.4 V	259.2 V to 268.8 V	max. 1.001 s
	120%	141.6 V to 146.4 V	283.2 V to 292.8 V	max. 0.1602 s

Measuring precisions:

- Triggering threshold: $\pm 2\%$ of the rated grid voltage
- Tripping time: $\pm 1\%$ of the nominal tripping time
- Triggering frequency: $\pm 0.2\%$ of rated power frequency

10.5 General Data

Width x height x depth	535 mm x 730 mm x 198 mm (21.1 in x 28.7 in x 7.8 in)
Weight	26 kg (57.32 lbs)

Length x width x height of the packaging	800 mm x 600 mm x 300 mm (31.5 in x 23.6 in x 11.8 in)
Transport weight	29 kg (63.93 lbs)
Operating temperature range	-25°C to +60°C (-13°F to +140°F)
Non-operating temperature range	-40°C to +60°C (-40°F to +140°F)
Maximum permissible value for relative humidity, non-condensing	95 %
Maximum operating altitude above mean sea level (MSL)	3000 m (9843 ft)
Typical noise emission for SB3.0-1SP-US-41 / SB3.8-1SP-US-41 / SB5.0-1SP-US-41 / SB6.0-1SP-US-41	39 dB(A)
Typical noise emission for SB7.0-1SP-US-41 / SB7.7-1SP-US-41	45 dB(A)
Power loss in night mode	<5 W
Maximum data volume per inverter with Speed-wire/Webconnect	550 MB/month
Additional data volume when using the Sunny Portal live interface	600 kB/hour
Topology	Transformerless
Cooling method for SB3.0-1SP-US-41 / SB3.8-1SP-US-41 / SB5.0-1SP-US-41 / SB6.0-1SP-US-41	Convection
Cooling method for SB7.0-1SP-US-41 / SB7.7-1SP-US-41	Fans
Enclosure type rating in accordance with UL50	NEMA 3R
Protection class	1
Grid configurations	208 V delta connection, 240 V delta connection, 208 V delta connection : 120 V wye connection, 240 V : 120 V split-phase system
Approvals and national standards, as per 04/2018	UL 1741, IEEE 1547

10.6 Fan (only with Sunny Boy 7.0-US / 7.7-US)

Width x height x depth	60 mm x 60 mm x 25.4 mm (2.36 in x 2.36 in x 1 in)
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Maximum operating altitude	3000 m (9843 ft)
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Air flow rate	≥ 40 m³/h
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10.7 Protective Devices

DC reverse polarity protection	Short-circuit diode
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AC short-circuit current capability	Current control
-------------------------------------	-----------------

Grid monitoring	SMA Grid Guard 4.0
-----------------	--------------------

Maximum overcurrent protection	50 A
--------------------------------	------

Ground fault monitoring SB3.0-1SP-US-41	Insulation monitoring: $R_{iso} > 600 \text{ k}\Omega$
---	--

Ground fault monitoring SB3.8-1SP-US-41	Insulation monitoring: $R_{iso} > 600 \text{ k}\Omega$
---	--

Ground fault monitoring SB5.0-1SP-US-41	Insulation monitoring: $R_{iso} > 600 \text{ k}\Omega$
---	--

Ground fault monitoring SB6.0-1SP-US-41	Insulation monitoring: $R_{iso} > 500 \text{ k}\Omega$
---	--

Ground fault monitoring SB7.0-1SP-US-41	Insulation monitoring: $R_{iso} > 429 \text{ k}\Omega$
---	--

Ground fault monitoring SB7.7-1SP-US-41	Insulation monitoring: $R_{iso} > 391 \text{ k}\Omega$
---	--

All-pole sensitive residual-current monitoring unit	Available
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Arc fault detection AFCL, type 1, listed according to UL 1699B	Available
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Rapid Shutdown Equipment	Self discharge at all DC and AC connection lines < 30 V
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10.8 Torques

Screw M5x60 for securing the inverter to the wall mounting bracket	1.7 Nm ± 0.3 Nm (15.05 in-lb ± 2.65 in-lb)
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Screws for attaching the enclosure lid of the Connection Unit	3 Nm ± 0.3 Nm (26.55 in-lb ± 2.65 in-lb)
---	--

Screws for grounding at equipment grounding terminals	6 Nm ± 0.3 Nm (53.10 in-lb ± 2.65 in-lb)
---	--

Screws for SPS terminal block for connecting the outlet for secure power supply operation	0.3 Nm (2.65 in-lb)
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Screws for AC-out terminal block for AC connection	0.3 Nm (2.65 in-lb)
Screws for DC-in terminal block for DC connection	0.3 Nm (2.65 in-lb)

10.9 Data Storage Capacity

Energy yields in the course of the day	63 days
Daily yields	30 years
Event messages for users	1024 events
Event messages for installers	1024 events

11 Compliance Information

FCC Compliance

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

Operation is subject to the following two conditions:

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

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

L'exploitation est autorisée aux deux conditions suivantes :

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

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

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

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

IC Compliance

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

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

12 Contact

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

- Device type
- Serial number
- Firmware version
- Event message
- Mounting location and mounting height
- Type and number of PV modules
- Optional equipment, e.g. communication products
- Use the name of the system in Sunny Portal (if available)
- Access data for Sunny Portal (if available)
- Special country-specific settings (if available)
- Operating mode of the multifunction relay

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Canada	SMA Solar Technology Canada Inc. Mississauga	Toll free for Canada / Sans frais pour le Canada : +1 877-MY-SMATech (+1 877-697-6283)
México	SMA Solar Technology de México Mexico City	Internacional: +1 916 625-0870