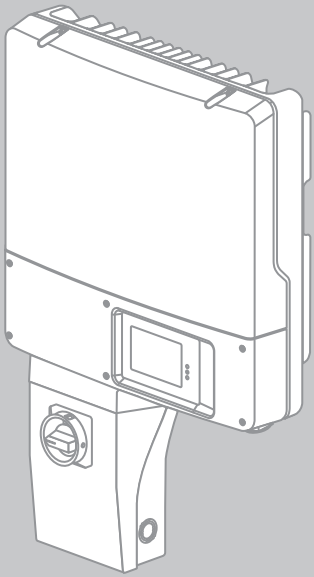
PV Inverter

SUNNY BOY
3000TL-US / 4000TL-US / 5000TL-US

Installation Manual



SB3-5TLUS22-IA-en-10 | IA-SB3-5TLUS-22 | Version 1.0

CA US

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Important Safety Instructions

SAVE THESE INSTRUCTIONS

This manual contains important instructions for the following products:

- Sunny Boy 3000TL-US (SB 3000TL-US-22)
- Sunny Boy 4000TL-US (SB 4000TL-US-22)
- Sunny Boy 5000TL-US (SB 5000TL-US-22)

This manual must be followed during installation and maintenance.

The product is designed and tested in accordance with international safety requirements, but as with all electrical and electronic equipment, certain precautions must be observed when installing and/or operating the product. To reduce the risk of personal injury and to ensure the safe installation and operation of the product, you must carefully read and follow all instructions, cautions and warnings in this manual.

Warnings in this document

A warning describes a hazard to equipment or personnel. It calls attention to a procedure or practice, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the SMA equipment and/or other equipment connected to the SMA equipment or personal injury.

Symbol	Description
⚠ DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	NOTICE is used to address practices not related to personal injury.

Warnings on this product

The following symbols are used as product markings with the following meanings.

Symbol	Description
	**Warning regarding dangerous voltage** The product works with high voltages. All work on the product must only be performed as described in the documentation of the product.
	**Beware of hot surface** The product can become hot during operation. Do not touch the product during operation.
	**Electric arc hazards** The product has large electrical potential differences between its conductors. Arc flashes can occur through air when high-voltage current flows. Do not work on the product during operation.
	**Risk of Fire** Improper installation of the product may cause a fire.
	**Observe the operating instructions** Read the documentation of the product before working on it. Follow all safety precautions and instructions as described in the documentation.

General Warnings

⚠ WARNING

General Warnings

All electrical installations must be made in accordance with the local and *National Electrical Code*® ANSI/NFPA 70 or the *Canadian Electrical Code*® CSA C22.1. This document does not and is not intended to replace any local, state, provincial, federal or national laws, regulation or codes applicable to the installation and use of the product, including without limitation applicable electrical safety codes. All installations must conform with the laws, regulations, codes and standards applicable in the jurisdiction of installation. SMA assumes no responsibility for the compliance or noncompliance with such laws or codes in connection with the installation of the product.

The product contains no user-serviceable parts.
For all repair and maintenance, always return the unit to an authorized SMA Service Center.

Before installing or using the product, read all of the instructions, cautions, and warnings in this manual.

Before connecting the product to the electrical utility grid, contact the local utility company. This connection must be made only by qualified personnel.

Wiring of the product must be made by qualified personnel only.

Table of Contents

1 Information on this Document

Validity

This document is valid for the following device types as of firmware version HP V02.05.00.R, KP V02.50.55.R:

- Sunny Boy 3000TL-US (SB 3000TL-US-22)
- Sunny Boy 4000TL-US (SB 4000TL-US-22)
- Sunny Boy 5000TL-US (SB 5000TL-US-22)

Target Group

This document is intended for qualified persons. Only qualified personnel with the appropriate skills are allowed to perform the tasks described in this document (see Section 2.2 "Skills of Qualified Persons", page 14).

Symbols

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

Typographies

Typography	Use	Example
bold	• Display messages • Parameters • Connections • Slots • Elements to be selected • Elements to be entered	• Select the **Set country standard** parameter and set the required country data set.

Nomenclature

Complete designation	Designation in this document
PV plant	PV Plant
SMA America Production, LLC	SMA
SMA Solar Technology Canada Inc.	SMA
Sunny Boy	Inverter, product

Abbreviations

Abbreviation	Designation	Explanation
AC	Alternating Current	–
DC	Direct Current	–
LED	Light-Emitting Diode	–
MPP	Maximum Power Point	–
MSL	Mean Sea Level	–
PV	Photovoltaics	–
RF	Radio Frequency	–

2 Safety

2.1 Intended Use

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

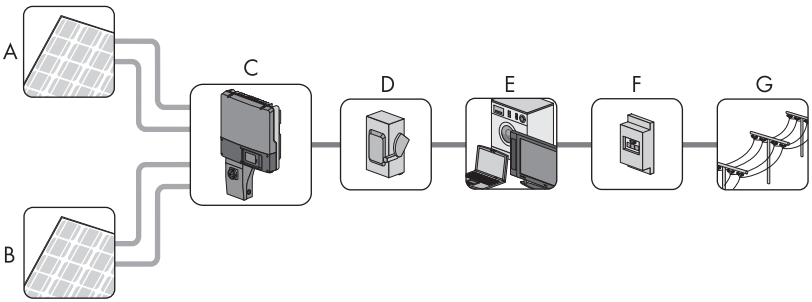


Figure 1: Design of a PV plant with a Sunny Boy

Item	Designation
A	PV modules input A
B	PV modules input B
C	Inverter with DC Disconnect
D	Miniature circuit-breaker
E	Loads
F	Electricity meter
G	Power distribution grid

☑ The following grounding systems are approved.

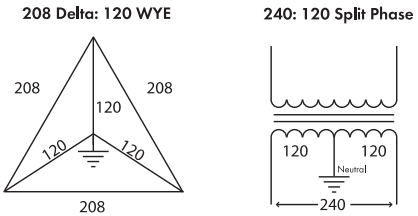


Figure 2: Approved grounding systems for inverter usage

The inverter is suitable for indoor and outdoor use.

- Do not mount the inverter on flammable construction materials.
- Do not mount the inverter in areas where highly flammable materials are stored.
- Do not mount the inverter in a potentially explosive atmosphere.

The inverter may only be operated with PV arrays (PV modules and cabling) that have protective insulation. The PV modules used must be approved by the module manufacturer for use with this inverter. PV modules with large capacities relative to ground may only be used if their coupling capacity does not exceed 1,400 nF.

For safety reasons, it is forbidden to modify the product or install components that are not explicitly recommended for this product or distributed by SMA.

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

The enclosed documentation is an integral part of this product.

- Read and observe the documentation.
- Keep the documentation in a convenient place for future reference.

RF Exposure

The inverter is equipped with a radio interface. This equipment should be installed and operated with a minimum distance of 8 in. (20 cm) between the radiator and your body.

2.2 Skills of Qualified Persons

The tasks described in this document must be performed by qualified persons only. 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 and using electrical devices and plants
- Vocational training in the installation and commissioning of electrical devices and plants
- Knowledge of all applicable standards and directives
- Knowledge of and adherence to this document and all safety precautions

2.3 Safety Precautions

⚠ DANGER

Danger to life from electric shock due to high voltages in the inverter

High voltages that can cause fatal electric shocks are present in the live components of the inverter.

- Any work on the inverter must be carried out by qualified persons only.
- Prior to performing any work on the inverter, disconnect the inverter on the AC and DC sides (see Section 8 "Disconnecting the Inverter from Voltage Sources", page 58).
- Always operate the inverter with the enclosure lid closed.
- Do not open the upper enclosure lid.

Danger to life from electric shock due to damaged devices

Operating a damaged inverter can lead to hazardous situations that result in serious injuries or death due to electric shock.

- Operate the inverter only if it is in safe and full working order.
- Check the inverter regularly for visible damage.
- Operate the inverter only if there is no visible damage.

⚠ CAUTION

Risk of burns from hot surfaces

The surface of the inverter can become very hot. Touching the surface can lead to burns.

- Do not touch hot surfaces.
- Do not touch any parts other than the lower enclosure lid of the inverter during operation.
- Observe the safety messages on the inverter.

NOTICE

Electrostatic discharges can damage the inverter

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

- Ground yourself before touching any components.

i Observe local regulations

All electrical installations must be made in accordance with the electrical standards applicable on-site and the *National Electrical Code*® (ANSI/NFPA 70). Installations in Canada must be carried out in accordance with the applicable Canadian standards.

3 Scope of Delivery

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

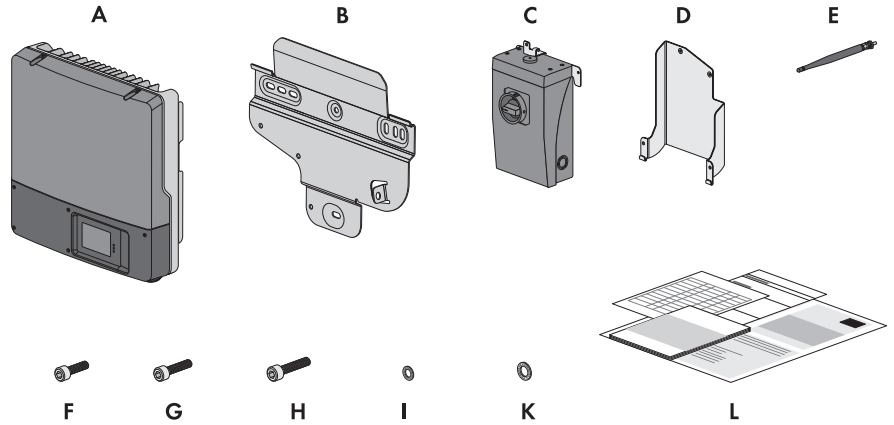


Figure 3: Components included in the scope of delivery

Item	Quantity	Designation
A	1	Inverter
B	1	Wall mounting bracket for the inverter
C	1	DC Disconnect
D	1	Wall mounting bracket for the DC Disconnect
E	1	Antenna for ZigBee® communication*
F	3	M5 x 8 cheese-head screw
G	2	M5 x 12 cheese-head screw
H	1	M6 x 16 cheese-head screw
I	6	M5 conical spring washer (including 1 spare)
K	1	M6 conical spring washer
L	1	Installation manual, user manual, document set with explanations and certificates, supplementary sheet with the default settings

* optional

4 Product Description

4.1 Sunny Boy

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

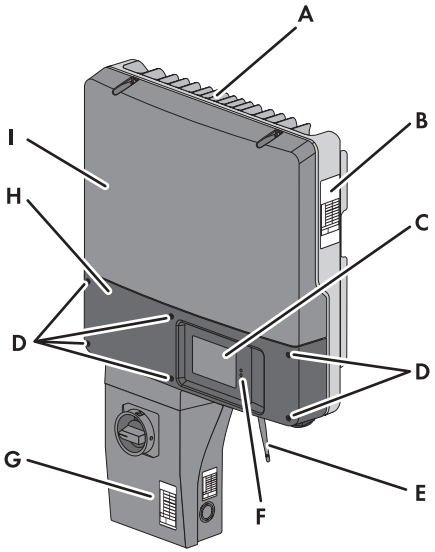


Figure 4: Sunny Boy design

Item	Designation
A	Cooling fins
B	Type label
C	Display
D	Lower enclosure lid screws
E	Antenna for ZigBee® communication*
F	LEDs
G	DC Disconnect
H	Lower enclosure lid
I	Upper enclosure lid

* optional

The Sunny Boy is a multi-string inverter that has two input areas, **A** and **B**, each of which having its own MPP tracker. This permanently determines the maximum power point and controls the voltage on the PV modules accordingly. The two separate MPP trackers make it possible to connect different PV strings to input areas **A** and **B**. The PV strings may vary in the number of PV modules, their orientation to the sun and shading.

Symbols on the Inverter

Symbol	Designation	Explanation
	Inverter	This symbol defines the function of the green LED. The green LED indicates the operating state of the inverter.
	Observe documentation	This symbol defines the function of the red LED. The red LED indicates an error. Read this document for instructions on how to remedy the error.
	Communication	This symbol defines the function of the blue LED. The blue LED indicates the communication state of the inverter.
	Equipment grounding conductor terminal	Connection for the AC equipment grounding conductor

4.2 DC Disconnect

The DC Disconnect is a DC switch-disconnector which safely disconnects the PV array from the inverter.

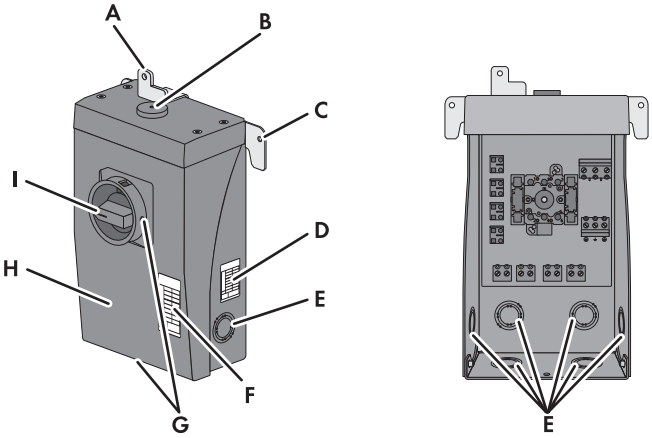


Figure 5: DC Disconnect design

Item	Designation
A	Lug for grounding the DC Disconnect enclosure
B	Enclosure opening
C	Lug for hanging in the retainer
D	Type label 1
E	Knockouts
F	Type label 2
G	Enclosure lid screws
H	Enclosure lid
I	Switch

Symbols on the DC Disconnect

Symbol	Designation	Explanation
	Equipment grounding conductor terminal	Connection for the DC equipment grounding conductor
	Grounding electrode conductor terminal	Connection for the grounding electrode conductor

4.3 Type Labels

4.3.1 Sunny Boy

The type label provides a unique identification of the inverter. The type label is on the right-hand side of the enclosure.

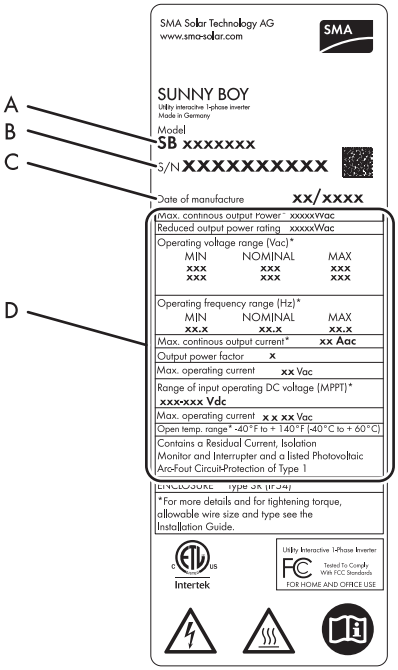


Figure 6: Layout of the type label

Item	Designation	Explanation
A	Model	Inverter device type
B	S/N	Inverter serial number
C	Date of manufacture	Date of manufacture of the inverter (month/year)
D	Device-specific characteristics	–

You will require the information on the type label to use the inverter safely and when seeking customer support from the SMA Service Line. The type label must be permanently affixed to the inverter.

4.3.2 DC Disconnect

The type label provides a unique identification of the DC Disconnect. The type label is on the right-hand side of the enclosure.

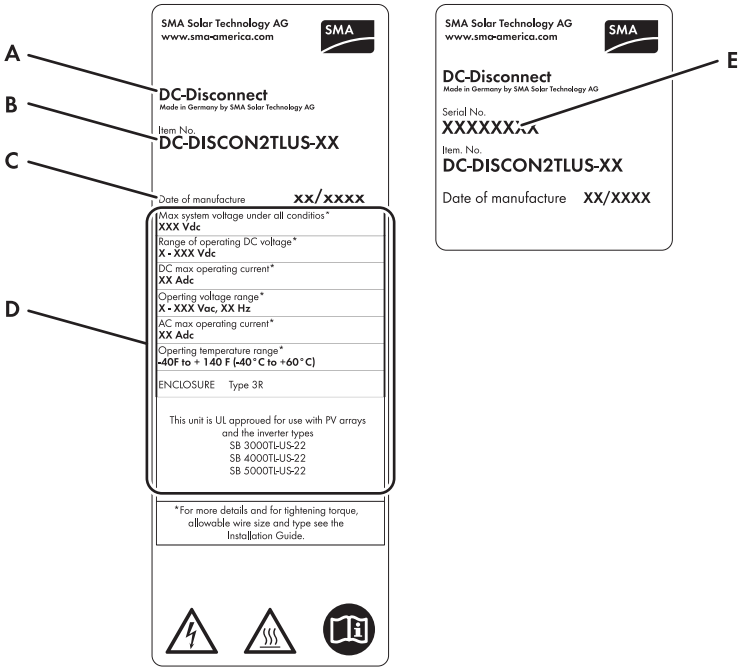


Figure 7: Layout of the type labels

Item	Designation	Explanation
A	–	Product name
B	Item No.	DC Disconnect device type
C	Date of manufacture	Date of manufacture of the DC Disconnect (month/year)
D	Device-specific characteristics	–
E	Serial No.	DC Disconnect serial number

You will require the information on the type label to use the DC Disconnect safely and when seeking customer support from the SMA Service Line. The type label must be permanently affixed to the DC Disconnect.

4.3.3 Symbols on the Type Labels

Symbol	Designation	Explanation
	Danger to life due to high voltages	The product operates at high voltages. All work on the inverter must be carried out by qualified persons only.
	Risk of burns from hot surfaces	The product can become hot during operation. Avoid contact during operation. Allow the product to cool down sufficiently before carrying out any work. Wear personal protective equipment such as safety gloves.
	Observe documentation	Observe all documentation that is supplied with the product.
	ETL seal of approval	The product has been certified by Intertek as being in accordance with the applicable directives.
	FCC seal of approval	The product complies with the requirements of the applicable FCC standards

4.4 Display

The display shows the current operating data of the inverter (e.g., current power, daily energy, total energy) as well as events or error messages. The power and energy are displayed as bars in the diagram.

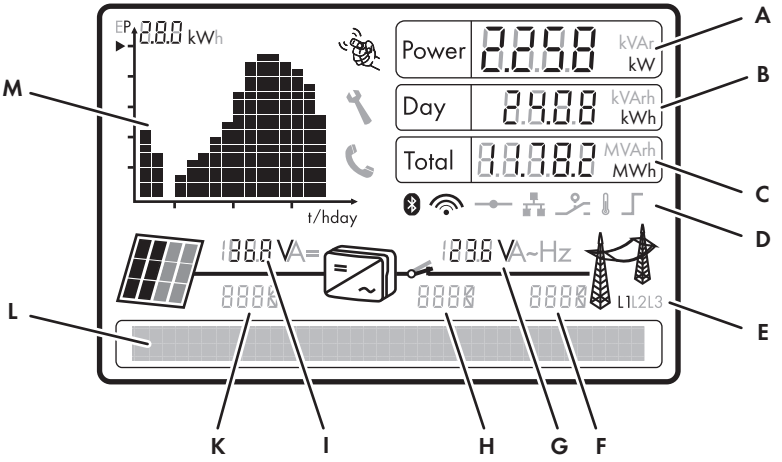


Figure 8: Display layout (example)

Item	Designation	Explanation
A	Power	Current power
B	Day	Daily energy
C	Total	Displays the total amount of energy fed in up until now
D	Active functions	Displays the activated or active functions for communication, network system services or temperature derating
E	Line conductor	Line conductor involved for the values displayed
F	Event number relating to the power distribution grid	Event number of errors relating to the power distribution grid
G	Output voltage/output current	Displays output voltage and output current of a line conductor in alternation
H	Event number relating to the inverter	Event number of errors relating to the inverter
I	Input voltage/input current	Displays input voltage and input current of one input in alternation

Item	Designation	Explanation
K	Event number relating to the PV plant	Event number of errors relating to the PV plant
L	Text line	Displays an event message or error message
M	Power and yield curve	Displays the power curve of the last 16 feed-in hours or the energy yield of the last 16 days • In order to switch between the displays, tap once on the enclosure lid.

Symbols on the Display

Symbol	Designation	Explanation
	Tapping	You can operate the display by tapping it: • Tapping once: to activate the backlight, to scroll to the next text line, to switch between the power graphs of the last 16 feed-in hours and the energy yields of the last 16 days. • Tapping twice: the display shows, in succession, the firmware version, the serial number of the inverter, NetID, the configured country data set and display language.
	Telephone receiver	Indicates a fault that cannot be rectified on site • Contact the SMA Service Line
	Wrench	Indicates a fault that can be rectified on site
	Connection quality	Indicates the quality of the Zigbee® connection to other Zigbee® devices
	Speedwire connection	No function
	Webconnect function	No function
	Multi-function relay	Indicates that the multi-function relay has activated
	Temperature symbol	Indicates that the power of the inverter is limited due to excessive temperature

Symbol	Designation	Explanation
	Power limitation	Indicates that external active power limitation via the Power Reducer Box is active
	PV array	–
	Inverter	–
	Grid relay	Grid relay closed: indicates that the inverter is feeding into the power distribution grid Grid relay open: indicates that the inverter is disconnected from the power distribution grid.
	Power distribution grid	–

4.5 Zigbee®

If an antenna is included in inverter scope of delivery, the inverter is equipped with a Zigbee® interface. Zigbee® is a wireless networking standard that enables the establishment of a connection between SMA inverters and the SolarGuard Gateway. The inverter can therefore transmit data to the SolarGuard gateway, where it can subsequently be read out online via the SolarGuard Internet portal.

4.6 Communication Interface

The inverter can optionally be fitted with an extra communication interface (e.g., RS485 or Speedwire with Webconnect function). This communication interface enables the inverter to communicate with special SMA communication products or other inverters (for information on supported products, see www.SMA-Solar.com). The interface can be retrofitted, installed at the factory if specified in the order, or included in the regular scope of delivery.

You can only set the inverter's parameters using SMA communication products.

Depending on the type of communication, RS485 or Speedwire, the parameters and messages are displayed differently on the communication products.

Example: How the country data set parameter is displayed

For communication with RS485: **CntrySet** parameter

For communication with Speedwire: **Set country standard** parameter

You can adjust the country data set of the inverter before commissioning or within the first ten operating hours via the two rotary switches in the inverter. You can only set all other operating parameters of the inverter via communication products.

4.7 Emergency Power Module

The inverter is equipped with an emergency power module by means of which an external socket-outlet can be connected to the inverter. The socket-outlet provides current from the PV plant on demand in the event of a grid failure. The emergency power module also has a connection for the fan retrofit kit, enabling an external fan to be controlled.

Fan Retrofit Kit

The fan retrofit kit is used for additional inverter cooling at high ambient temperatures (for information on installation and configuration, see the fan retrofit kit installation manual). The fan retrofit kit can be retrofitted, installed at the factory if specified in the order, or included in the regular scope of delivery.

4.8 Arc-Fault Circuit Interrupter (AFCI)

In accordance with the National Electrical Code®, Article 690.11, the inverter has a system for the recognition of electric arc detection and interruption. An electric arc with a power of 300 W or greater must be interrupted by the AFCI within the time specified by UL 1699B. A tripped AFCI can only be reset manually. You can deactivate automatic electric arc detection and interruption (AFCI) via a communication product in "Installer" mode if you do not require this function. The 2011 edition of the National Electrical Code®, Section 690.11, stipulates that newly installed PV plants attached to a building must be fitted with a means of detecting and disconnection of serial electric arcs (AFCI) on the PV side.

4.9 SD Card Slot

The inverter is equipped with an SD card slot. You can use the SD card when required to update the inverter firmware.

4.10 Anti-Islanding Protection

The inverter has an active safety algorithm to protect against islanding. A stand-alone grid occurs when the power distribution grid is switched off and the inverter attempts to continue to feed in to the power distribution grid. For this to happen, the remaining load must be resonant at 60 Hz and exactly match the power of the inverter. The effect of the safety algorithm is that, in the event of the power distribution grid being switched off, the PV plant does not supply any current to a symmetrical load that is resonant at 60 Hz.

4.11 Varistors

Varistors are voltage-dependent resistors that protect the inverter against overvoltage. The inverter is equipped with four thermally monitored varistors on the DC side. It may be necessary under certain circumstances to replace the varistors (see Section 9.6 "Replacing DC Varistors", page 78).

5 Mounting

5.1 Selecting the Mounting Location

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 inverter in areas where highly flammable materials are stored.
- Do not mount the inverter in a potentially explosive atmosphere.

⚠ CAUTION

The inverter can become hot during operation

Potential burn injuries when touching the enclosure.

- Install the inverter in such a way that it cannot be touched accidentally.

☐ The mounting location must be inaccessible to children.

☐ The inverter must be mounted on a solid building ground (e.g., concrete, wall) or at a drywall in front of a stand or post.

☐ In a living area, please make sure that the surface is not made of plasterboard or similar. The inverter makes noises when in use, which can be perceived as a nuisance in a living area.

☐ The mounting location must be suitable for the weight and dimensions of the inverter with DC Disconnect (see Section 11 "Technical Data", page 82).

☐ The mounting location must be clear and have safe access at all times without the use of additional aids being necessary, e.g., scaffolding or lifting platforms. Non-fulfillment of these criteria may restrict servicing.

☐ The mounting location must not be exposed to direct solar irradiation. Direct solar irradiation can overheat the inverter. As a result, the inverter reduces its power output.

☐ The mounting location must not be exposed to direct sources of water spray such as sprinklers or gutters.

☐ Climatic conditions must be met (see Section 11 "Technical Data", page 82).

☐ The ambient temperature must be below 104°F (40°C) to ensure the optimal operation of the inverter.

Dimensions for mounting:

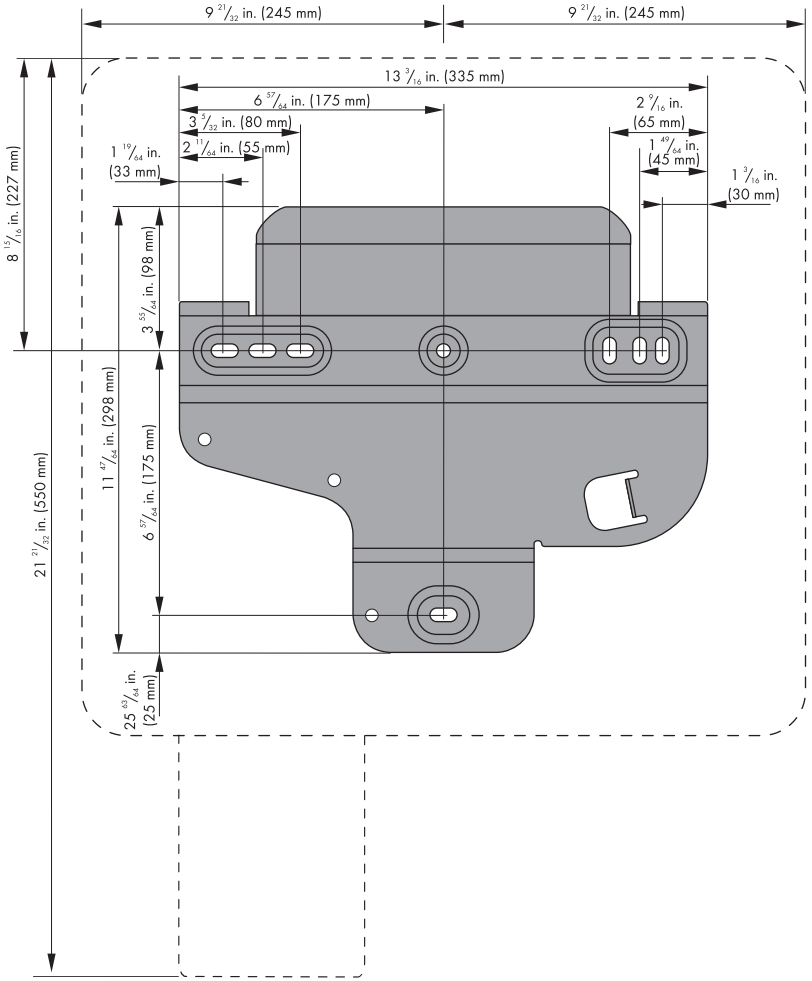


Figure 9: Wall mounting bracket dimensions

Observe recommended clearances:

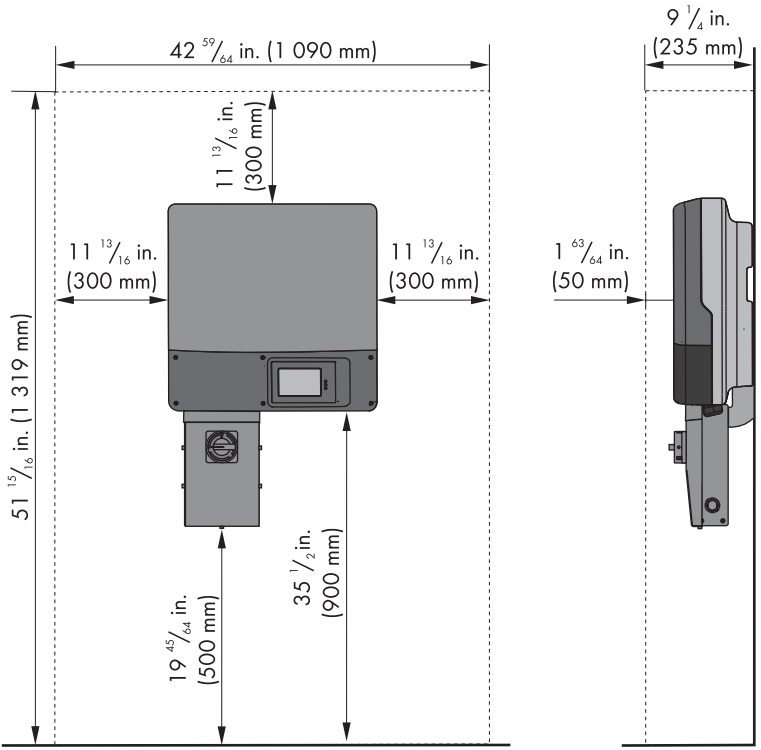


Figure 10: Recommended clearances

- Observe recommended clearances to the walls as well as to other inverters or objects. Thus, you will prevent the inverter's power output from being reduced due to excessive temperatures.
- Do not place or hang any objects on the inverter.
- If multiple inverters are mounted in areas with high ambient temperatures, increase the clearances between the inverters and ensure sufficient fresh-air supply.
- If the inverter is mounted outdoors, the clearance below the inverter must be 3 ft. (900 mm). This prevents the ingress of water spray into the inverter.

Observe permitted mounting position:

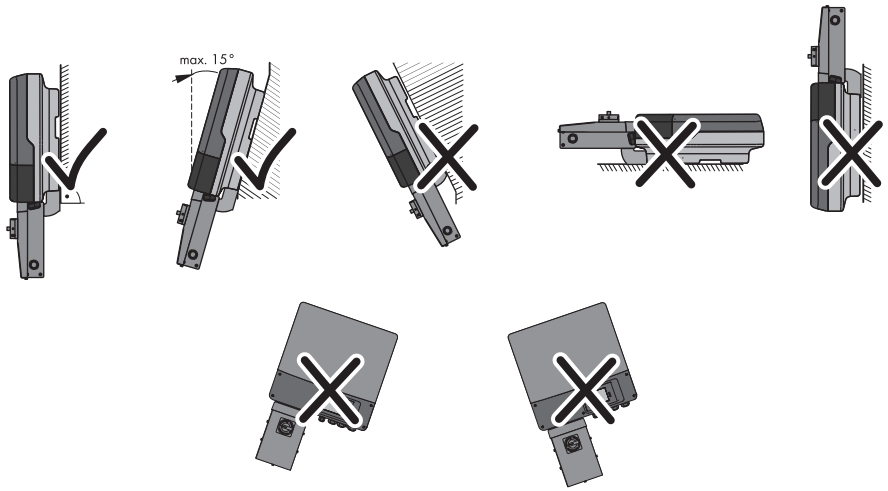


Figure 11: Permitted and prohibited mounting positions

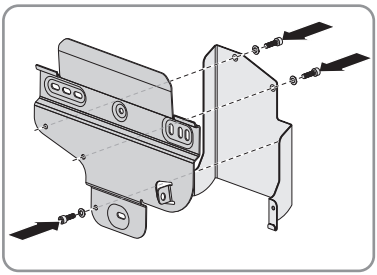
- Mount the inverter in a permitted mounting position with the display at eye level. This ensures that there can be no ingress of moisture into the inverter and you can read out display messages and LED signals without any difficulty.

5.2 Mounting the Wall Mounting Bracket

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

- ☐ 2 or 3 screws (minimum diameter $^{1}/_{4}$ in. (6 mm)) that are suitable for the foundation.
- ☐ 2 or 3 washers (minimum external diameter $^{3}/_{4}$ in. (18 mm)) that are suitable for the screws
- ☐ 2 or 3 screw anchors that are suitable for the foundation. Do not use hollow-wall anchors or toggle bolts for mounting on drywalls.
- ☐ If the inverter is to be protected against theft, 1 padlock (see Section 5.4 "Attaching the Anti-Theft Device", page 35)

1. Screw the DC Disconnect retainer onto the inverter wall mounting bracket using the screws and washers supplied. In doing so, tighten the two upper screws (M5x12) from the rear and the lower (M5x8) from the front.



2. Align the wall mounting bracket horizontally at the mounting site.

3. **⚠ WARNING**

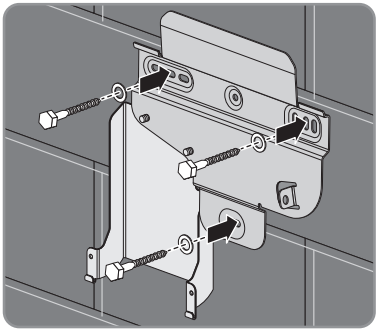
   Danger to life due to electric shock or explosion if you drill into cables

   There may be gas pipes or electric cables behind the mounting points which could be damaged when you drill the holes for the wall mounting bracket.

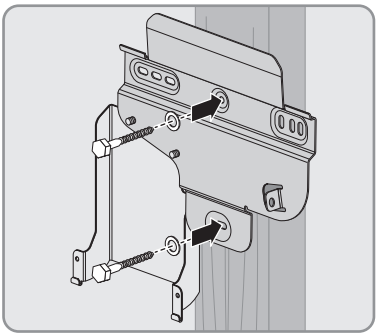
   - Make sure that there are no supply lines behind the mounting points.

4. Mark the position of the drill holes using the wall mounting bracket and screw the wall mounting bracket onto the wall using the screws and washers.

   - For mounting on a stone wall, use 1 hole on the right-hand and left-hand side and the lower hole in the wall mounting bracket.



   - For mounting on a stand or post in a drywall, use the two holes at the center.



5.3 Mounting the Inverter and DC Disconnect

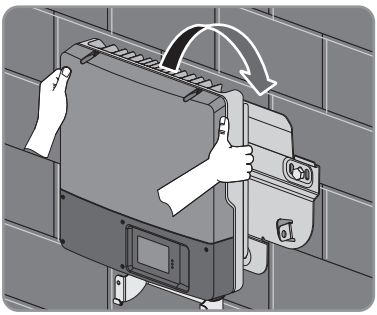
1. **⚠ CAUTION**

   Risk of injury when lifting and from the inverter falling

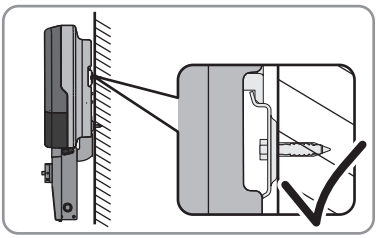
   The inverter is heavy (see Section 11 "Technical Data", page 82). Risk of injury exists through incorrect lifting and through the inverter falling during transport or when hanging in the wall mounting bracket.

   - Lift and transport the inverter horizontally in the mounting position. Use the recessed grips on the sides for this.

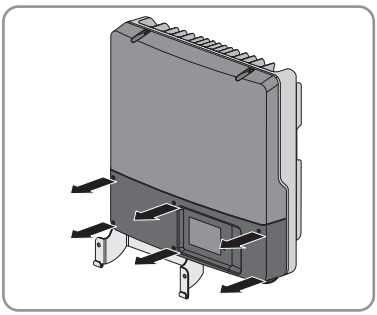
2. Hang the inverter in the wall mounting bracket.



3. Ensure that the inverter is securely seated.

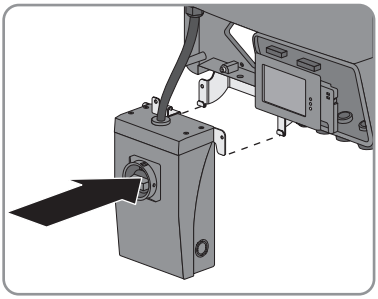


4. Remove the lower lid.

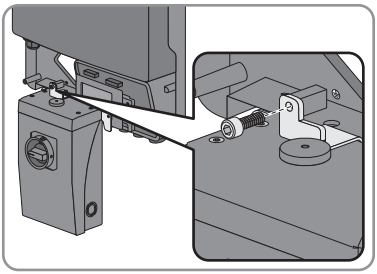


5. Carefully push through the enclosure opening above on the DC Disconnect using a screwdriver.

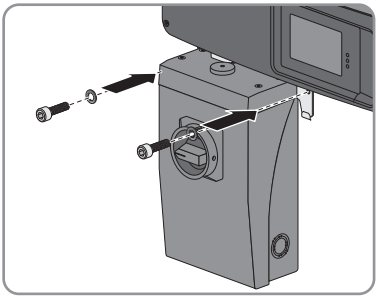
6. Place the DC Disconnect into the retainer from the front. In doing so, lead the lug over the ridge in the inverter.



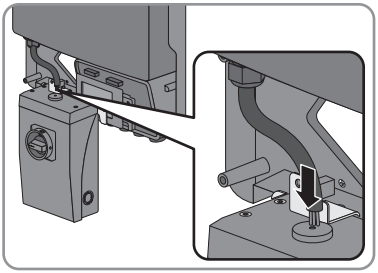
7. Attach the DC Disconnect with anchorage bracket to the screw connection of the inverter (torque: 53 in-lbs. (6 Nm)). This ensures the grounding of the DC Disconnect.



8. Attach the DC Disconnect to the retainer using the supplied M5x8 screws (torque: 44 in-lbs. (5 Nm).



9. Lead the inverter DC cable through the enclosure opening in the DC Disconnect



5.4 Attaching the Anti-Theft Device

You can protect the inverter from theft with a padlock. The padlock locks the inverter to the wall mounting bracket.

The padlock must meet the following requirements:

- ☐ The material must be rust-proof.
- ☐ The lock shackle must be hardened.
- ☐ The lock cylinder must be secured.
- ☐ If it is mounted outdoors, the padlock must be weather-proof.

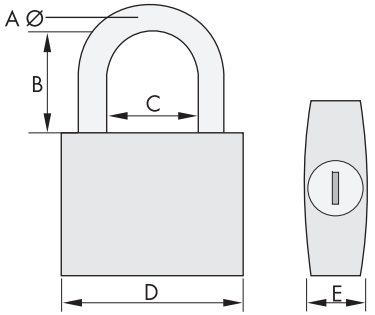
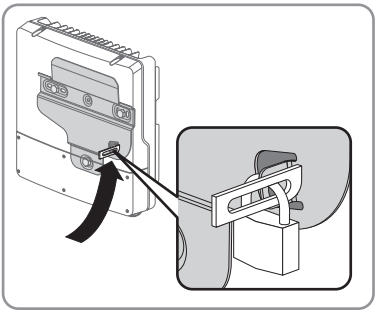


Figure 12: Dimensions of the padlock as anti-theft device

Item	Dimensions
A	6 mm (0.23 in.)
B	21 mm to 33 mm (0.83 in. to 1.30 in.)
C	20 mm to 33 mm (0.79 in. to 1.30 in.)
D	40 mm to 60 mm (1.57 in. to 2.36 in.)
E	13 mm to 21 mm (0.51 in. to 0.83 in.)

1. Place the shackle of the padlock through the metal lug on the wall mounting bracket and through the lug on the rear of the inverter. As you do so, move the shackle outward from the center of the inverter.



2. Close the shackle.

6 Electrical Connection

6.1 Safety during Electrical Connection

⚠ DANGER

Danger to life from electric shock due to high voltages

High voltages are present in the DC cables and later during operations in the conductive components of the inverter. These can cause fatal electric shocks.

- Before all later work on the inverter, always disconnect the inverter from all voltage sources as described in Section 8.
- Do not open the upper enclosure lid.

NOTICE

Electrostatic discharges can damage the inverter

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

- Ground yourself before touching any components.

Damage to the inverter due to moisture penetration

Electronic components in the inverter can be destroyed or damaged as a result of moisture penetration.

- Only use listed conduit fittings for inserting the conduits into the inverter and the DC Disconnect.
- Only use rain-proof or moisture-proof conduit fittings for outdoor installations.

Risk of damage to or failure of the inverter due to the use of Wire Nuts®

The use of Wire Nuts® may cause ground faults or prohibited and high-ohm connections, which can lead to inverter damage or failure.

- Do not use any Wire Nuts® for electrical connections in the PV system

Observe local regulations

All electrical installations must be made in accordance with the electrical standards applicable on-site and the *National Electrical Code*® (ANSI/NFPA 70). Installations in Canada must be carried out in accordance with the applicable Canadian standards.

6.2 Overview of the Connection Area

6.2.1 Connection Area of the Inverter

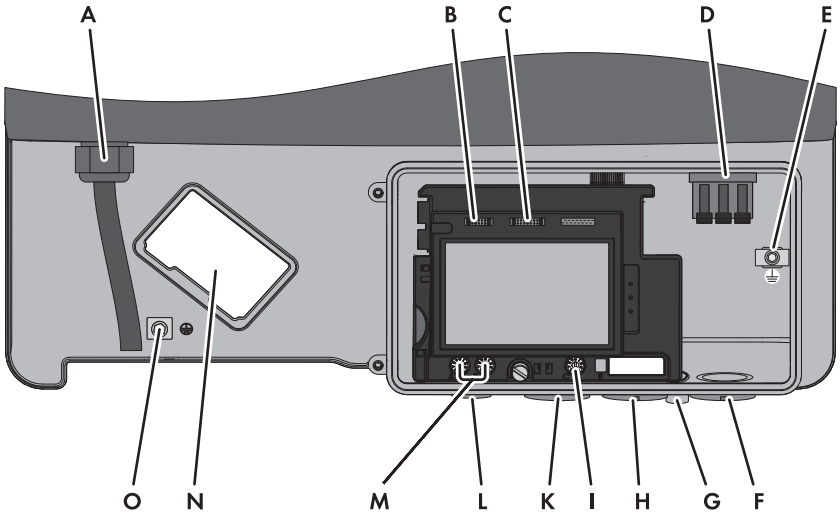


Figure 13: Connection area inside the inverter

Item	Designation	Explanation
A	Cable gland	For leading the connection cable between the DC Disconnect and inverter
B	Jack	For the connection of the emergency power module
C	Jack	For the connection of the communication interface
D	Terminal	For the AC cables
E	Fastening screw	For the equipment grounding conductor
F	Enclosure opening ($^3/_4$ in. (19 mm))	For the conduit fitting for inserting the AC cables
G	Screw connection	For antenna in the case of Zigbee® communication
H	Enclosure opening ($^3/_4$ in. (19 mm))	For the conduit fitting for insertion of the optional data cable
I	Rotary switch	For setting the ZigBee® ID*

Item	Designation	Explanation
K	Enclosure opening ($^3/_4$ in. (19 mm))	For the conduit fitting used to insert the optional connecting cable of an emergency power module
L	Enclosure opening	For the cable gland used to insert the optional connection cable for the fan retrofit kit
M	Rotary switch	For setting the language and country standard
N	Retainer	For the retrofit fan
O	Fastening screw	For the anchorage bracket of the DC Disconnect for grounding

* optional

6.2.2 Connection Area of the DC Disconnect

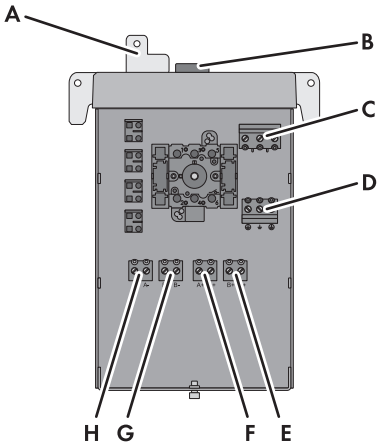


Figure 14: Connection areas of the DC Disconnect

Item	Designation	Explanation
A	Anchorage bracket	For attachment to the grounding screw in the inverter
B	Enclosure opening	For insertion of the connection cable from the inverter
C	Screw terminals	For connection of the connection cable from the inverter
D	Screw terminals	For connection of the DC equipment grounding conductor and of the grounding electrode conductor
E	Screw terminals	For the connection of the PV strings (input B+)

Item	Designation	Explanation
F	Screw terminals	For the connection of the PV strings (input A+)
G	Screw terminals	For the connection of the PV strings (input B–)
H	Screw terminals	For the connection of the PV strings (input A–)

6.3 AC Connection

6.3.1 Conditions for the AC Connection

Cable requirements:

- ☐ Wire size L1, L2 and N: 12 AWG to 6 AWG (3.3 mm² to 13.3 mm²)
- ☐ Wire size equipment grounding conductor: 6 AWG (13.3 mm²)
- ☐ If the ambient temperature is high or there are several cables in one conduit, the wire size must be as large as possible.
- ☐ Stripping length: $^1/_2$ in. (12 mm)
- ☐ Comprising copper in the form of solid or stranded wire, not fine-stranded wire
- ☐ Designed for ambient temperatures of at least +194°F (+90°C).
- ☐ The lines must be dimensioned in accordance with the local and national directives for the dimensioning of lines, from which the requirements of the minimum wire size can be derived. Influencing factors for cable dimensioning are, for example, the nominal AC current, the type of cable, the routing method, cable bundling, ambient temperature, and maximum desired line losses.

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

- ☐ 1 listed conduit fitting ($^3/_4$ in. (19 mm)), for outdoor installation rain-proof or moisture-proof
- ☐ 1 listed conduit ($^3/_4$ in. (19 mm))

Switch-disconnector and cable protection:

NOTICE

Damage to the inverter by using screw-type fuses as switch-disconnectors

Screw-type fuses do not have load disconnection properties and may damage the inverter if disconnected under load.

- Do not use screw-type fuses as switch-disconnectors.
- Use a switch-disconnector or a listed miniature circuit-breaker with load disconnection properties as switch-disconnector.

- In plants with multiple inverters, protect every inverter with a separate miniature circuit-breaker. Observe the maximum permissible fuse protection (see Section 11 "Technical Data", page 82). In doing so you avoid residual voltages being present at the respective cables after a disconnection from the power distribution grid.
- Loads installed between the inverter and the miniature circuit-breaker must be protected separately.

6.3.2 Connecting the Inverter to the Power Distribution Grid

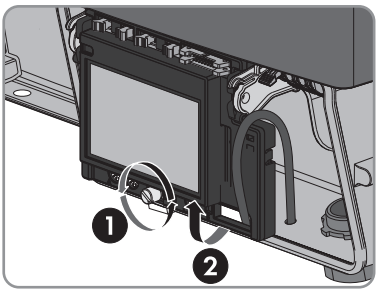
Requirements:

☐ The country data set and the display language must be correctly set (see Section 7.1 "Making Settings via the Rotary Switches", page 52).

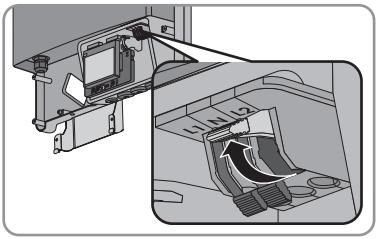
☐ The connection requirements of the grid operator must be met.

☐ The line voltage must be within the permissible range. The exact operating range of the inverter is specified in the operating parameters.

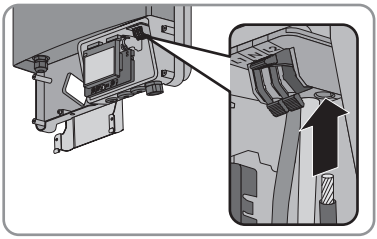
1. Switch off all AC and DC circuit-breakers and miniature circuit-breakers and secure against re-connection.
2. Switch off the main breaker in the fuse box.
3. Ensure that there is no voltage between the fuse output and the grounding busbar.
4. Loosen all 6 screws of the lower enclosure lid using an Allen key (AF 3) and remove the enclosure lid.
5. Loosen the screw on the display and flip the display up until it clicks into place. Do not kink the adjacent cable when doing so.



6. Lead the conduit with the AC cables through the enclosure opening into the inverter and screw the conduit fitting tight.
7. Strip the insulation of L1, L2, N and the equipment grounding conductor each by $^{1}/_{2}$ in. (12 mm).
8. Connect L1, L2 and N to the AC terminals labelled for this purpose:
   - Raise the safety levers on the terminals as far as possible.



   - Lead the conductors fully into the terminals.

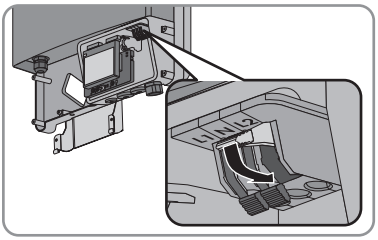


9. **⚠ CAUTION**

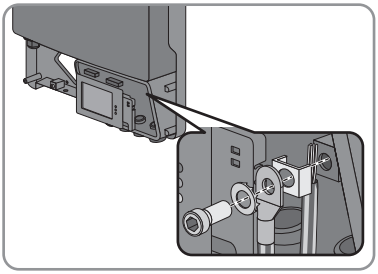
   Danger of crushing when safety levers snap shut

   The safety levers close by snapping down fast and hard.

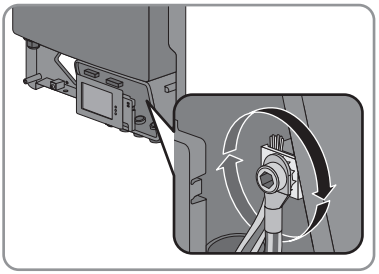
   - Only press the safety levers on the terminals down with your thumb. Do not grasp the entire AC connecting terminal plate and do not place your fingers under the safety levers.



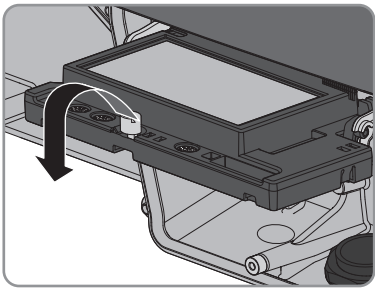
10. Ensure that the conductors are securely in place in the terminals.
11. Move the clamping bracket over the protective ground conductor, positioning the protective ground conductor on the left as you do so.



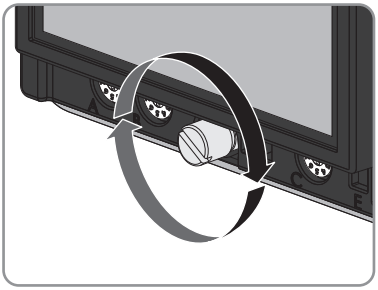
12. Secure the clamping bracket using the cheese-head screw and the conical spring washer (torque: 53 in-lbs. (6 Nm)). The teeth of the conical spring washer must face the clamping bracket.



13. If the display is still raised, lower it again. Do not kink the adjacent cable when doing so.



14. Fasten the screw on the display hand-tight.



6.4 DC Connection

6.4.1 Safety During DC Connection

⚠ DANGER

Danger to life due to high voltages on DC conductors

Risk of death or serious injury due to electric shock from touching a DC conductor.

- Do not touch the DC conductors.

Danger of electric arcs due to reversed-pole DC conductors

Dangerous electric arcs can form when the DC conductors are connected to the incorrect poles on the inverter.

- Only make the DC connection as described in this document.
- Ensure the correct polarity of the DC conductors.

6.4.2 Conditions for the DC Connection

The inverter has two input areas A and B, both of which must be identically configured.

Requirements for the PV modules

- ☐ All modules in one input area must be the same type.
- ☐ The same number of series-connected PV modules must be connected to all strings in one input area.
- ☐ All PV modules in one input area must be aligned identically.
- ☐ All PV modules in one input area must be at the same pitch.
- ☐ The limiting values for the input voltage and the input current of the inverter must be maintained (see Section 11 "Technical Data", page 82).
- ☐ On the statistically proven coldest day of the year the open-circuit voltage of the PV array may not exceed 600 V at full irradiation.

Cable requirements:

- ☐ Comprising copper in the form of solid or stranded wire, not fine-stranded wire.
- ☐ Conductor cross-section: 10 AWG to 6 AWG (5.3 mm^2 to 13.3 mm^2)
- ☐ The DC cables must be designed for ambient temperatures of at least +194°F (+90°C).
- ☐ The DC cables must be designed in accordance with the installation requirements applicable on site.

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

- ☐ Number of rainproof or waterproof conduit fittings required ($^3/_4$ in. (19 mm))
- ☐ Number of rigid conduits required ($^3/_4$ in. (19 mm))
- ☐ Insulated screwdriver, 3.5 mm x 120 mm

6.4.3 Connecting the PV Array

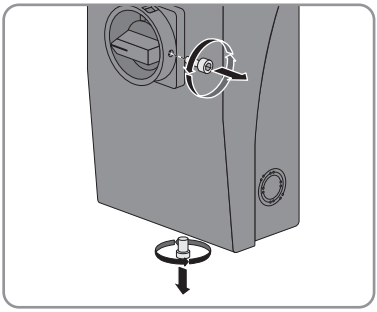
NOTICE

Destruction of the inverter due to overvoltage

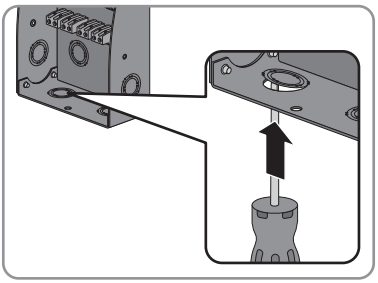
If the open-circuit voltage of the PV modules exceeds the maximum input voltage of the inverter, the inverter can be destroyed by the overvoltage.

- Ensure that the open-circuit voltage of the PV modules does not exceed the maximum input voltage of the inverter.
- Otherwise, do not connect strings to the inverter; check the design of the PV plant.

1. Switch off all AC and DC circuit-breakers and miniature circuit-breakers and secure against re-connection.
2. Undo two screws on the DC Disconnect and remove the switch and lid of the DC Disconnect.



3. Snap out the required number of knockouts on the underside of the DC Disconnect for the installation of the conduit fittings (diameter $^1/_2$ in., $^3/_4$ in. or 1 in.).



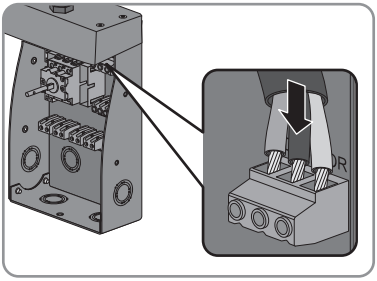
4. **NOTICE**

Damage to the DC Disconnect due to enlarged knockout holes

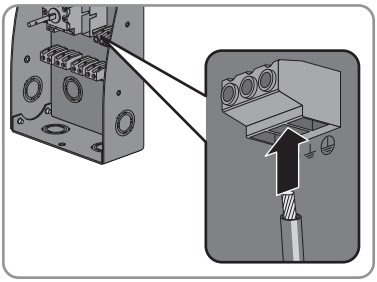
Enlarged knockout holes enable moisture to penetrate the DC Disconnect which could damage electronic components in the DC Disconnect.

- Do not enlarge the knockout holes.

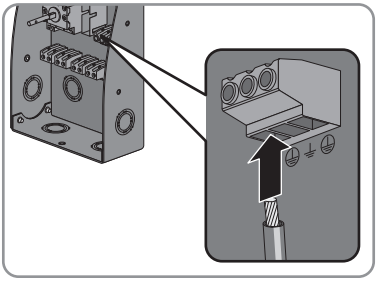
5. Connect the inverter connection cable to the DC Disconnect (torque: 15 in-lb. (1.7 Nm)).
   - Connect the red cable to **RD**.
   - Connect the orange cable to **OR**.
   - Connect the black cable to **BK**.



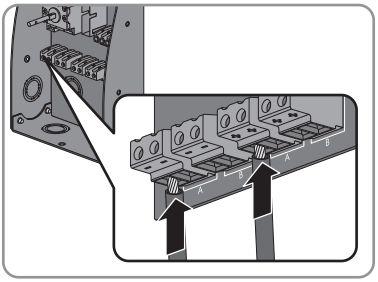
6. Install conduits with conduit fittings in the enclosure openings on the DC Disconnect.
7. Lead the DC cables of the PV strings, the DC equipment grounding conductors and, if specified, the grounding electrode conductor through the conduits into the DC Disconnect.
8. Strip the insulation of the insulated conductors by a length of $\frac{1}{2}$ in. (12 mm).
9. Connect the grounding cable of the PV array to one of the terminals with the grounding symbol with a circle (torque: 15 in-lb. (1.7 Nm)).



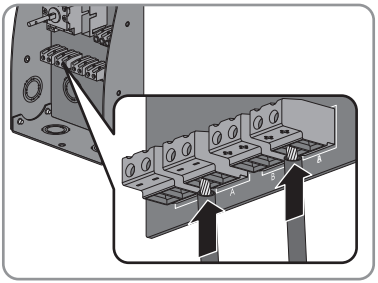
10. If required, connect the grounding electrode conductor to the terminal with the grounding symbol without a circle (torque: 15 in-lb. (1.7 Nm)).



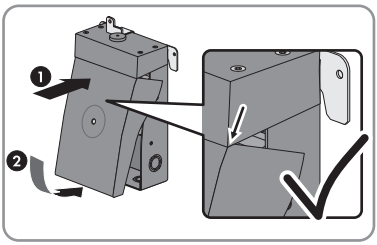
11. Check the PV array for ground faults (see Section 9.5 "Checking the PV Plant for a Ground Fault", page 76).
12. Connect the first string to the terminal blocks for input **A**:
    - Connect the DC+ cable to the screw terminal + (torque: 15 in-lb (1.7 Nm)). Ensure the correct polarity when doing so.
    - Connect the DC- cable to the screw terminal – (torque: 15 in-lb (1.7 Nm)). Ensure the correct polarity when doing so.



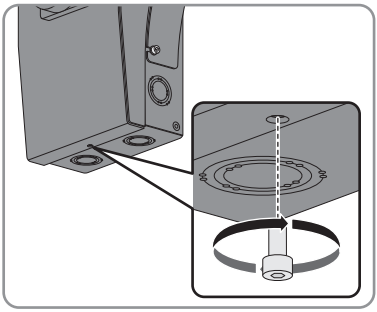
13. If there is another string with an identical rating, connect it in the same way to the terminal blocks for input **A**.
14. Connect a different string to the terminal blocks for input **B**.
    - Connect the DC+ cable to the screw terminal + (torque: 15 in-lb (1.7 Nm)). Ensure the correct polarity when doing so.
    - Connect the DC- cable to the screw terminal – (torque: 15 in-lb (1.7 Nm)). Ensure the correct polarity when doing so.



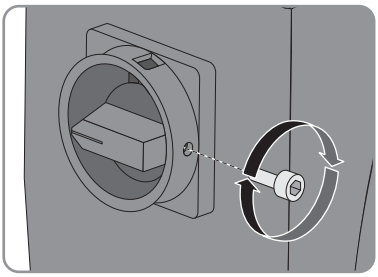
15. If there is another string with an identical rating, connect it in the same way to the terminal blocks for input **B**.
16. Ensure that all screw terminals are correctly connected and that the cables are securely positioned in the screw terminals
17. Push the DC Disconnect lid diagonally under the upper edge of the enclosure and press the lid down. The lid must be flush with the enclosure edge.



18. Screw the DC Disconnect lid into place (torque: 44 in-lb. (5 Nm)).

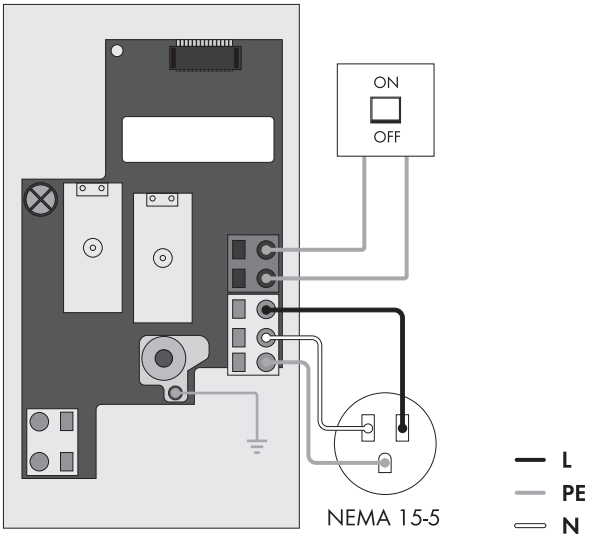


19. Screw the DC Disconnect rotary switch onto the lid hand-tight.



6.5 Connecting the Emergency Power Module

Connection principle



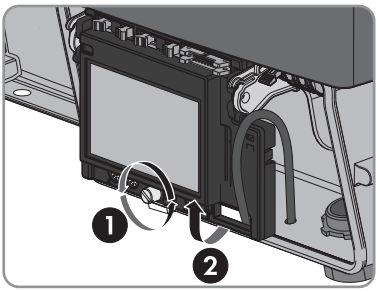
Additionally required mounting material (not included in the scope of delivery):

- ☐ Switch to activate the emergency power socket-outlet designed for at least 120 V (AC) and 10 A
- ☐ Switch to activate the emergency power socket-outlet
- ☐ 1 listed conduit fitting ($^3/_4$ in. (19 mm)), for outdoor installation rain-proof or moisture-proof
- ☐ 1 listed conduit ($^3/_4$ in. (19 mm))

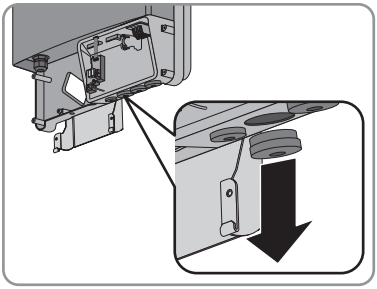
Cable Requirements

- ☐ 5 conductors must be available.
- ☐ The insulated conductors for the switch must be of a different color than the insulated conductors of the socket-outlet.
- ☐ Comprising copper in the form of solid or stranded wire, not fine-stranded wire.
- ☐ Conductor cross-section: 16 AWG to 12 AWG (1.5 mm² to 3.3 mm²)

1. When the inverter is in operation, disconnect it (see Section 8).
2. Loosen the screw on the display and flip the display up until it clicks into place. Do not kink the adjacent cable when doing so.



3. Remove the filler-plugs from the enclosure opening in the inverter.

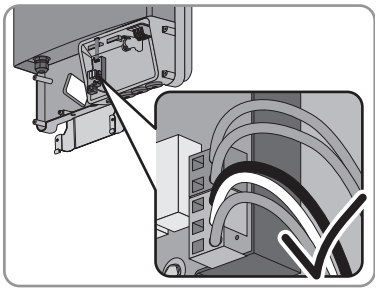


4. Install the conduit with conduit fitting in the enclosure opening.
5. Lead the cable through the conduit to the terminals on the emergency power module.
6. Strip $^{11}/_{32}$ in. (9 mm) off the conductor insulation.
7. **⚠ WARNING**

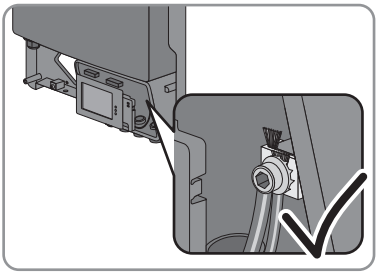
   Danger of fire due to short circuit

   A short circuit can occur in the emergency power mode if the insulated conductors of the socket-outlet and the switch have been swapped. The short circuit can cause a fire in the switch.

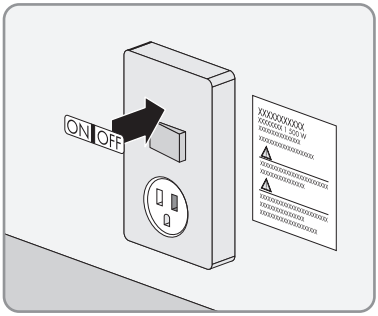
   - Plug the insulated conductors for the connection of the switch into the upper terminals.
   - Plug the insulated conductors for the connection of the socket-outlet into the lower terminals.



8. Connect the grounding cable to the same terminal as the protective grounding conductor from the inverter.



9. Secure the conduit fitting from the inside using the counter nut.
10. Connect the insulated conductors that are connected to the gray terminals on the emergency power module to the socket-outlet.
11. Connect the insulated conductors that are connected to the black terminals of the emergency power module to the switch.
12. Attach the supplied warning label to the emergency power socket-outlet.
13. Label the switch using the supplied sticker. Label the closed switch position with "ON" and the opened switch position with "OFF".

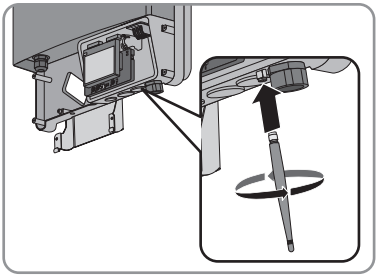


Information on the use of the socket-outlet

You will find further information on the use of the socket-outlet and on the connection conditions in the user manual supplied. Please inform the PV plant operator.

6.6 Connecting the Zigbee® Antenna

- Turn the antenna into the screw connection on the inverter hand-tight.



7 Commissioning

7.1 Making Settings via the Rotary Switches

7.1.1 Overview of the Rotary Switches

The inverter can be configured for different countries and for use in backup and off-grid systems via 2 rotary switches. The rotary switches can also be used to change the display language.

By default, the inverter is set to a specific country data set. You can see which country data set was set by default at the factory in the supplementary sheet provided with the factory settings. If the default country data set of the inverter does not apply to your country, then you must change the country data set and the display language. You can also change the display language independently of the country data set (see Section 7.1.3).

If you use a communication product, you can also change the country data set after commissioning with that communication product (see Section 7.3).

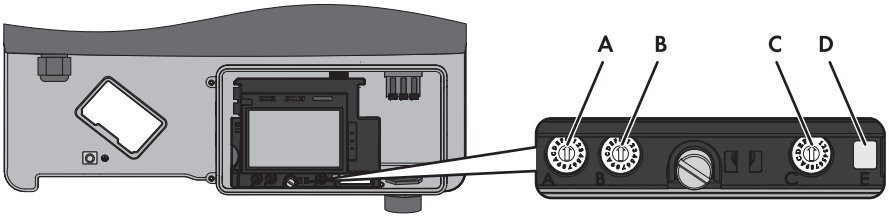


Figure 15: Configuration area inside the inverter

Item	Designation
A	Rotary switch A for setting the country standard
B	Rotary switch B for setting the language
C	Rotary switch C for setting the Zigbee® ID
D	Jumper slot for setting the language to English

Possible settings of the rotary switches

Here, you will find a list of possible rotary switch positions and which country data sets and display languages are behind each position.

Each country data set contains various operating parameters, which can be individually set according to each country data set. The operating parameters can be read out using a communication product.

Rotary switch A position	Rotary switch B position	Country data set	Display language
0	0	Default setting	Default setting
0	1	Retained	English
0	2	Retained	German
0	3	Retained	French
0	4	Retained	Spanish
0	5	Retained	Italian
0	6	Retained	Greek
0	7	Retained	Czech
0	8	Retained	Korean
0	9	Retained	Portuguese
0	A	Retained	Dutch
0	B	Retained	Slovenian
0	C	Retained	Bulgarian
0	D	Retained	Polish
9	8	UL1741*	English
9	9	UL1741*	Spanish
9	A	UL1741*	French
C	0	Other standard	English
C	1	Other standard	German
C	2	Other standard	French
C	3	Other standard	Spanish
C	4	Other standard	Italian
C	5	Other standard	Greek
C	6	Other standard	Czech
C	0	Island mode 60 Hz	English
D	1	Island mode 60 Hz	German

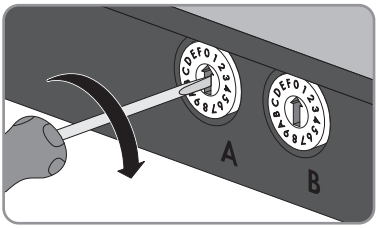
Rotary switch A position	Rotary switch B position	Country data set	Display language
D	2	Island mode 60 Hz	French
D	3	Island mode 60 Hz	Spanish
D	4	Island mode 60 Hz	Italian
D	5	Island mode 60 Hz	Greek
D	6	Island mode 60 Hz	Czech
E	0	Island mode 50 Hz	English
E	1	Island mode 50 Hz	German
E	2	Island mode 50 Hz	French
E	3	Island mode 50 Hz	Spanish
E	4	Island mode 50 Hz	Italian
E	5	Island mode 50 Hz	Greek
E	6	Island mode 50 Hz	Czech

* The country data set is automatically blocked after 10 feed-in hours. You can then only change the country data set by inputting the personal access code you received from SMA on a communication device.

7.1.2 Changing the Country Data Set and the Display Language

If the default country data set of the inverter does not apply to your country, then you must change the country data set and the display language.

1. When the inverter is in operation, disconnect it (see Section 8).
2. Set the rotary switches **A** and **B** to the desired position using a slotted screwdriver (blade width: 2.5 mm) (see Section 7.1.1 "Overview of the Rotary Switches", page 52).



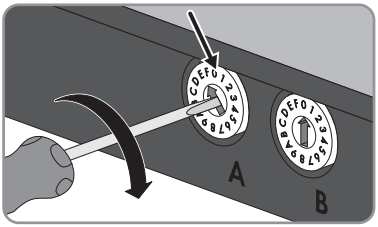
3. Commission the inverter (see Section 7.2).
   ☑ The inverter will adopt the setting after commissioning. This can take up to 5 minutes.

7.1.3 Changing the Display Language

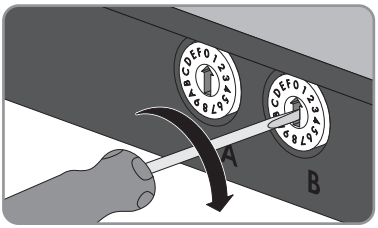
You can change the display language independently of the country data set. This ensures that the country data set remains unchanged.

Hint: If you simply remove the jumper, the display language automatically changes to English.

1. When the inverter is in operation, disconnect it (see Section 8).
2. Set the rotary switch **A** to **0** using a slotted screwdriver (blade width: 2.5 mm). This ensures that the country data set remains unchanged.



3. Set the rotary switch **B** to the desired language using a slotted screwdriver (blade width: 2.5 mm) (see Section 7.1.1 "Overview of the Rotary Switches", page 52).



4. Commission the inverter (see Section 7.2).

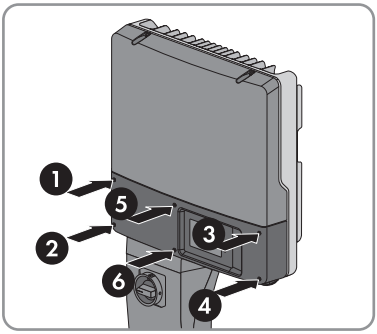
☑ The inverter will adopt the setting after commissioning. This can take up to 5 minutes.

7.2 Commissioning the Inverter

Requirements:

- ☐ The AC miniature circuit-breaker must be correctly rated.
- ☐ The inverter must be correctly mounted and closed.
- ☐ The DC Disconnect must be correctly mounted and closed.
- ☐ All cables must be correctly connected.

1. Place the lower enclosure lid with the 6 screws on the enclosure and tighten them with an Allen key (AF 3) in the order 1 to 6.



2. Switch on the miniature circuit-breaker.
3. Turn the rotary switch of the DC Disconnect to the **On** position.
   - ☑ The inverter carries out an arc-fault circuit interrupter (AFCI) self test.
   - ☑ The green LED is lit and the display shows the device type, the firmware version, the NetID, the country data set and display language. The inverter feeds into the grid.
   - ✖ Green LED flashing?

     Possible cause of error: The DC input voltage is still too low, or the inverter is monitoring the power distribution grid.

     - If the DC input voltage is sufficiently high, the inverter starts to operate.
   - ✖ The red LED is lit and an error message and event number appear in the display?
     - Eliminate the error (see Section 9 "Troubleshooting", page 61).

7.3 Changing the Country Data Set using a Communication Product

By default, the inverter is set to a specific country data set. You can see which country data set was set as default at the factory on the type label and the supplementary sheet provided with the default setting. If the inverter's default country data set does not apply to your country or you want to use the inverter in a backup or off-grid system, then you must change the country data set.

Requirements:

- ☐ A communication product that is appropriate for the type of communication used must be available.
- ☐ The responsible grid operator must approve changes of grid-relevant parameters.
- ☐ An SMA Grid Guard code for changing the grid-relevant parameters must be available (for application for the SMA Grid Guard code, see certificate "Application for a Personal Access Code" at www.SMA-Solar.com).

1. Access the user interface of the communication product.
2. Enter the SMA Grid Guard code.
3. Select the **CntrySet** or **Set country standard** parameter and set the required country data set.
4. Save setting.

8 Disconnecting the Inverter from Voltage Sources

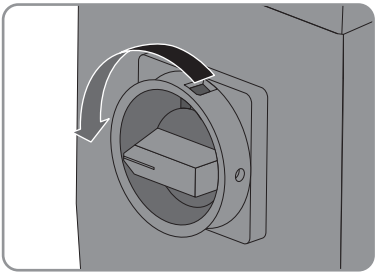
⚠ DANGER

Danger to life due to high voltages in the inverter

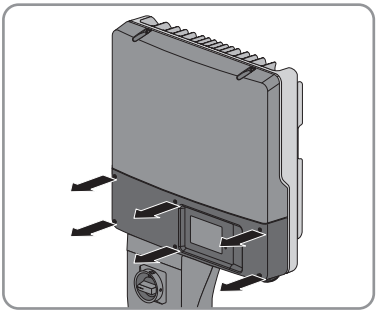
Death or serious injury due to electric shock

- Only open the inverter in the order described here.
- Before performing any tasks, wait five minutes until the residual voltage has been drained.

1. Switch off all external AC and DC circuit-breakers and the miniature circuit-breaker and secure against re-connection.
2. Turn the rotary switch of the DC Disconnect to **Off**.



3. Wait until the LEDs and the display have gone out.
4. Loosen all six screws of the lower enclosure lid using an Allen key (AF 3, metric) and remove the enclosure lid.



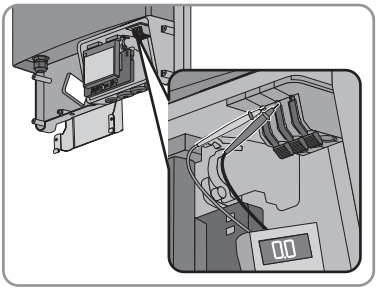
5. ***NOTICE***

   Electrostatic discharges can damage the inverter

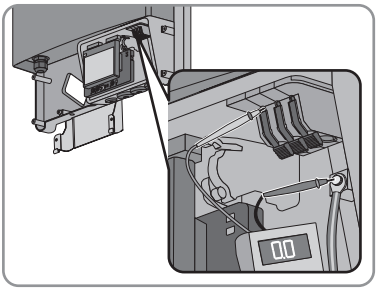
   The internal components of the inverter can be irreparably damaged by electrostatic discharge.

   - Ground yourself before touching any components.
6. Ensure that no voltage is present on the AC connecting terminal plate using a suitable measuring device. Insert the test probe in each round opening of the terminal.

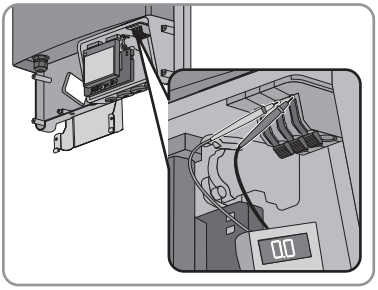
- Ensure that no voltage is present between L 1 and N.



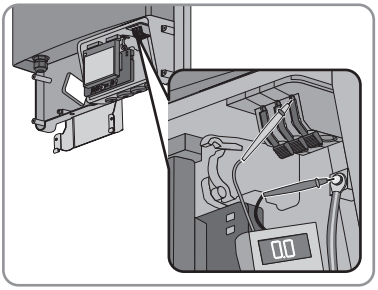
- Ensure that no voltage is present between L 1 and the equipment grounding conductor.



- Ensure that no voltage is present between L2 and N.

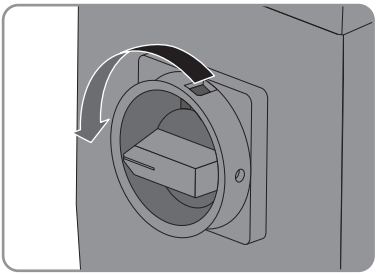


- Ensure that no voltage is present between L 2 and the equipment grounding conductor.

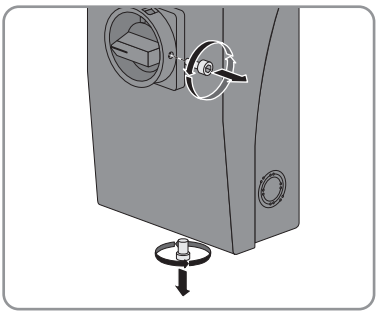


8.1 Disconnecting the DC Disconnect from Voltage Sources

1. Turn the rotary switch of the DC Disconnect to **Off**.



2. Wait until the LEDs and the display have gone out.
3. Undo two screws on the DC Disconnect and remove the switch and lid of the DC Disconnect.



4. **⚠ DANGER**

   Danger to life due to electric shock when touching the DC conductors and DC terminals

   High voltages are present in the DC cables and DC terminals.

   - Before performing any tasks, wait five minutes until the residual voltage has been drained.
   - Do not touch the DC conductors and DC terminals.

5. If a DC disconnecting switch is available, open the the DC disconnecting switch.
6. If there is no DC disconnecting switch available, cover the PV modules with opaque material or disconnect the connectors on the PV modules.
7. Ensure that no voltage is present in the DC terminals.

9 Troubleshooting

9.1 LED Signals

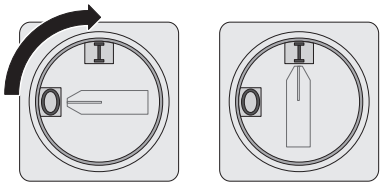
The LEDs indicate the operating state of the inverter.

LED	Status	Explanation
Green	Is lit	Operation If an event occurs, the event message is shown in the display (see Section 9.2).
	Flashing	Conditions for connection to the grid are not fulfilled.
	flashes quickly	The inverter is performing an update.
Red	Is lit	Error The display shows the error message and event number (see Section 9.3).
Blue	Is lit	The inverter has set up a connection to a communication product and data transmission is active.
	Flashing	The inverter is setting up a connection to a communication product but data is not yet being transmitted.

All LEDs have gone out

If all three LEDs have gone out, the inverter is switched off because the switch of the DC Disconnect is set to **Off** or insufficient irradiation is available.

- Set the switch of the DC Disconnect to **On**.



9.2 Event Messages

Display message	Cause
Set parameter	The inverter is setting the parameters.
Parameter set successfully	A new country data set has been configured.
Update file OK	The update file found is valid.
Reading SD card	The inverter is currently reading the SD card.
No new update on the SD card	There are no update files relevant for this inverter on the SD card or the available update has already been carried out.
Update communication	The inverter is updating the communication component.
Update main CPU	The inverter is updating the inverter component.
Update RS485i module	The inverter is updating the RS485i module.
Update Speedwire	The inverter is updating the Speedwire module.
Update Webconnect	The inverter is updating the Webconnect module.
Upd. language table	The inverter is updating the language table.
Update completed	The inverter has successfully completed the update.
Grid param. unchanged	The selected rotary switch position is not assigned or it is not possible to change the grid parameters.
The AFCI self-test was successful	The inverter has successfully performed the electric arc detection self-test.
Grid Guard code valid	The SMA Grid Guard code entered is valid. Protected parameters have now been unblocked and you can adjust the parameters. The parameters will be automatically locked again after 10 feed-in hours.
Self-test	The self-test is being carried out.
Stand-alone Op.	The inverter is operating in the emergency power mode.
Back-up operation on	The inverter is operating in grid parallel operation with adjusted grid monitoring

9.3 Error Messages

Event number	Display message	Cause and corrective measures
101 to 103	Grid fault	The line voltage or grid impedance at the termination point of the inverter is too high. The inverter has disconnected from the power distribution grid. **Corrective measures:** • Check that the line voltage at the termination point of the inverter is permanently in the permissible range. If the line voltage is outside the permissible range due to local grid conditions, contact the grid operator. Ask the grid operator whether the voltage can be adapted at the feed-in point or if it would be acceptable to change the monitored operating limits. If the line voltage is permanently in the permissible range and this message is still displayed, contact the SMA Service Line.

Event number	Display message	Cause and corrective measures
202 to 205	Grid fault	The power distribution grid has been disconnected, the AC cable is damaged or the line voltage at the termination point of the inverter is too low. The inverter has disconnected from the power distribution grid. **Corrective measures:** • Ensure that the miniature circuit-breaker is switched on. • Ensure that the AC cable is not damaged. • Ensure that the AC cable is connected correctly. • Check that the line voltage at the termination point of the inverter is permanently in the permissible range. If the line voltage is outside the permissible range due to local grid conditions, contact the grid operator. Ask the grid operator whether the voltage can be adapted at the feed-in point or if it would be acceptable to change the monitored operating limits. If the line voltage is permanently in the permissible range and this message is still displayed, contact the SMA Service Line.

Event number	Display message	Cause and corrective measures
301	Grid fault	The 10-minute average line voltage is no longer within the permissible range. The line voltage or grid impedance at the termination point is too high. The inverter disconnects from the power distribution grid to comply with the power quality. **Corrective measures:** • Check that the line voltage at the termination point of the inverter is permanently in the permissible range. If the line voltage is outside the permissible range due to local grid conditions, contact the grid operator. Ask the grid operator whether the voltage can be adapted at the feed-in point or if it would be acceptable to change the monitored operating limits. If the line voltage is permanently in the permissible range and this message is still displayed, contact the SMA Service Line.
401 to 404	Grid fault	The inverter is no longer in grid-parallel operation. The inverter has stopped feeding into the power distribution grid. **Corrective measures:** • Check the grid connection for strong, short-term frequency variations.
501	Grid fault	The power frequency is not within the permissible range. The inverter has disconnected from the power distribution grid. **Corrective measures:** • If possible, check the power frequency and observe how often fluctuations occur. If there is a high number of fluctuations and this message is displayed frequently, contact the grid operator and ask whether they approve a change of the operating parameters of the inverter. If the grid operator approves, discuss any changes to the operating parameters with the SMA Service Line.

Event number	Display message	Cause and corrective measures
601	Grid fault	The inverter has detected an excessively high proportion of direct current in the line current. **Corrective measures:** • Check the grid connection for direct current. If this message is displayed frequently, contact the grid operator and check whether it is possible to raise the limiting value for monitoring on the inverter.
701	Frq. not permitted Check parameter	The power frequency is not within the permissible range. The inverter has disconnected from the power distribution grid. **Corrective measures:** • If possible, check the power frequency and observe how often fluctuations occur. If there is a high number of fluctuations and this message is displayed frequently, contact the grid operator and ask whether they approve a change of the operating parameters of the inverter. If the grid operator approves, discuss any changes to the operating parameters with the SMA Service Line.
801	Waiting for grid voltage Grid failure Check fuse	There is no line voltage at the inverter's AC output. **Corrective measures:** • Check the fuse and replace it if necessary. • Check AC installation. • Check whether there is a general power outage.

Event number	Display message	Cause and corrective measures
1501	Reconnection fault grid	The changed country data set or the value of a parameter you have set does not correspond to the local requirements. The inverter cannot connect to the power distribution grid. **Corrective measures:** • Ensure that the country data set has been configured correctly. Check the setting of the rotary switches **A** and **B** or select the parameter **Set country standard** and check the value.
3301 ... 3303	Unstable operation	There is not enough power at the DC input of the inverter for stable operation. This may be caused by snow on the PV modules or insufficient sunlight. The inverter interrupts the feed-in operation. **Corrective measures:** • Wait for greater irradiation. • If this event recurs at medium irradiation levels, check the PV plant design and the correct circuitry of the PV array.
3401 to 3402	DC overvoltage Disconnect generator	Overvoltage at DC input The inverter may be destroyed. When this message is signaled, it is accompanied by rapid flashing of the backlight. **Corrective measures:** • **IMMEDIATELY DISCONNECT** the inverter from voltage sources (see Section 8). • Check the DC voltage to ensure it is below the maximum input voltage of the inverter. If the DC voltage is below the maximum input voltage of the inverter, reconnect the DC connectors to the inverter. • If the DC voltage is above the maximum input voltage of the inverter, ensure that the PV array has been correctly rated or contact the PV array installer. • If this message is repeated frequently, contact the SMA Service Line.

Event number	Display message	Cause and corrective measures
3501	Insulation resist. Check generator	The inverter has detected a ground fault in the PV array. **Corrective measures:** • Check the PV plant for ground faults (see Section 9.5).
3601	High discharge curr. Check generator	The leakage current from the inverter and the PV array is too high. A ground fault, a residual current or a malfunction is present. The inverter interrupts feed-in operation immediately after exceeding a limiting value and then automatically re-connects to the power distribution grid. **Corrective measures:** • Check the PV plant for ground faults (see Section 9.5).
3701	Residual current too high Check generator	The inverter has detected a residual current through brief PV array grounding. **Corrective measures:** • Check the PV plant for ground faults (see Section 9.5).
3801 to 3802	DC overcurrent Check generator	The inverter switches off due to an overcurrent on the DC side. **Corrective measures:** If this event occurs frequently: • Check the design and circuitry of the PV array.
3901 to 3902	Waiting for DC start conditions Start cond. not met	The input power or the input voltage of the PV modules is insufficient for power distribution grid feed-in. **Corrective measures:** • Wait for greater irradiation. • If this event recurs at medium irradiation levels, check the PV plant design and the correct circuitry of the PV array.

Event number	Display message	Cause and corrective measures
4301	Electric arc detected Check generator	The inverter has detected an electric arc. **Corrective measures:** • Disconnect the inverter from voltage sources (see Section 8). • Ensure that there are no defective PV modules, cables or plugs in the PV plant. • Re-commission the inverter (see Section 7).
6001 to 6009	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. **Corrective measures:** • Contact the SMA Service Line.
6101 to 6112	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. **Corrective measures:** • Contact the SMA Service Line.
6202	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. **Corrective measures:** • Contact the SMA Service Line.
6301 to 6314	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. **Corrective measures:** • Contact the SMA Service Line.
6401 to 6438	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. **Corrective measures:** • Contact the SMA Service Line.
6501 to 6502	Self diagnosis Overtemperature	The inverter has switched off due to excessive temperatures. **Corrective measures:** • Clean the cooling fins and air ducts (see Section 9). • Ensure that the inverter has sufficient ventilation.

Event number	Display message	Cause and corrective measures
6603 to 6604	Self diagnosis Overload	The cause must be determined by the SMA Service Line. **Corrective measures:** • Contact the SMA Service Line.
6701 to 6702	Comm. disturbed	A fault has occurred in the internal communication of the inverter. The inverter continues feeding power into the grid. **Corrective measures:** If this event occurs frequently: • Contact the SMA Service Line.
6801 to 6802	Self diagnosis Input A defective	Inverter input A is defective. **Corrective measures:** • Contact the SMA Service Line.
6901 to 6902	Self diagnosis Input B defective	Inverter input B is defective. **Corrective measures:** • Contact the SMA Service Line.
7001 to 7002	Sensor fault	A temperature sensor in the inverter is faulty. The inverter interrupts the feed-in operation. **Corrective measures:** • Contact the SMA Service Line.
7008	Disturbance sensor display temperature	The ambient temperature sensor is faulty. The display is not switched off at temperatures under –25°C and as a result may have been destroyed. The inverter continues feeding power into the grid. **Corrective measures:** • Contact the SMA Service Line.
7101	SD card defective	The SD card is not formatted correctly or is defective. The update failed. The inverter continues feeding power into the grid. **Corrective measures:** • Re-format the SD card. • Re-save the files to the SD card.

Event number	Display message	Cause and corrective measures
7102	Parameter file not found or defective	The parameter file was not found or is defective. The update failed. The inverter continues feeding power into the grid. **Corrective measures:** • Copy the parameter file into the SD card drive:\PARASET directory.
7105	Parameter setting failed	Parameters cannot be set via the SD card. The inverter continues feeding power into the grid. **Corrective measures:** • Check the parameters for valid values. • Ensure change rights via SMA Grid Guard code.
7106	Update file defective	The update file is defective. The update failed. The inverter continues feeding power into the grid. **Corrective measures:** • Re-format the SD card. • Re-save the files to the SD card.
7110	No update file found	No new update file was found on the SD card. The update failed. The inverter continues feeding power into the grid. **Corrective measures:** • Copy the update file into the SD card drive:\UPDATE directory.
7201 to 7202	Data stor. not poss.	Internal device fault, the inverter continues feeding power into the grid. **Corrective measures:** • If this error occurs frequently, contact the SMA Service Line.
7303	Host computer update failed	Internal device fault. The inverter continues feeding power into the grid. In very rare cases, the firmware is damaged and the inverter interrupts the feed-in. **Corrective measures:** • Contact the SMA Service Line.

Event number	Display message	Cause and corrective measures
7305	Update RS485i module failed	Internal device fault, the inverter continues feeding power into the grid. **Corrective measures:** • Re-try update. • If this error occurs again, contact the SMA Service Line.
7316	Speedwire update failed	Internal device fault, the inverter continues feeding power into the grid. **Corrective measures:** • Re-try update. • If this error occurs again, contact the SMA Service Line.
7326	Webconnect update unsuccessful	Internal device fault, the inverter continues feeding power into the grid. **Corrective measures:** • Re-try update. • If this error occurs again, contact the SMA Service Line.
7311	Update language table failed	Internal device fault, the inverter continues feeding power into the grid. **Corrective measures:** • Re-try update. • If this error occurs again, contact the SMA Service Line.
7508	External fan fault	The fan is contaminated or defective. The inverter may reduce its power due to overheating. The inverter continues feeding power into the grid. **Corrective measures:** • Clean the fans • Replace the fans.
7701 to 7712	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. **Corrective measures:** • Contact the SMA Service Line.

Event number	Display message	Cause and corrective measures
8001	Derating occurred	The inverter has reduced its power output for more than 10 minutes due to excessive temperature. **Corrective measures:** • If this message is frequently displayed, clean the cooling fins and air ducts (see Section 9.4 "Cleaning the Inverter", page 76). • Ensure that the inverter has sufficient ventilation.
8101 to 8104	Comm. disturbed	The cause must be determined by the SMA Service Line. **Corrective measures:** • Contact the SMA Service Line.
8204	AFCI self-test failed	The cause must be determined by the SMA Service Line. **Corrective measures:** • Contact the SMA Service Line.
8206	Electric arc detected Please tap to confirm.	The inverter has detected an electric arc and was recommissioned after a disconnection. By tapping, you are confirming that you have repaired any possible damage to PV modules, cables or plugs in the PV plant. **Corrective measures:** • Tap on the display within ten seconds of the display message appearing in order to recommission the inverter.

Event number	Display message	Cause and corrective measures
8801 to 8803	No display	This error message can have three causes, but the inverter continues to feed into the power distribution grid. The ambient temperature is lower than –25°C. The display switched off for protection. The inverter cannot identify the display type. No display is connected to the inverter or the connection is defective. **Corrective measures:** • If the display switched off due to the ambient temperature being too low, wait until the ambient temperature is above –25°C. • If the ambient temperature is above –25°C, contact the SMA Service Line.
9002	Grid Guard code invalid	The SMA Grid Guard code entered is incorrect. The parameters are still protected and cannot be changed. **Corrective measures:** • Enter the correct SMA Grid Guard code.
9003	Grid param. locked	The parameters are now locked. The parameters cannot be changed. **Corrective measures:** • Unlock the parameters with the SMA Grid Guard code.

Event number	Display message	Cause and corrective measures
9005	Changing grid param. not possible Ensure DC supply	This error can have the following causes: • The selected rotary switch setting for the language settings is not programmed. • The parameters to be changed are protected. • DC voltage at the DC input is not sufficient to run the main CPU. **Corrective measures:** • Check setting of the rotary switches(see Section 7.1.2 "Changing the Country Data Set and the Display Language", page 54). • Enter the SMA Grid Guard code. • Ensure that sufficient DC voltage is available (green LED lit or flashing).

9.4 Cleaning the Inverter

- **NOTICE**

  Damage to the display due to the use of cleaning agents

  - If the inverter is dirty, clean the enclosure lid, the display, and the LEDs using only clean water and a cloth.

- If the cooling fins on the rear of the enclosure are dirty, clean them with a soft brush.
- If the air ducts on the top of the inverter are dirty, clean them with a soft brush.

9.5 Checking the PV Plant for a Ground Fault

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

⚠ WARNING

Danger to life due to electric shock

In the event of a ground fault, high voltages can be present in the PV module construction.

- Only touch the cables of the PV modules on their insulation.
- Do not connect DC cables with ground faults to the inverter.

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

1. Disconnect the inverter from the power supply (see Section 9).
2. Measure voltages:
   - Measure the voltages between the positive terminal and the ground potential.
   - Measure the voltages between the negative terminal and the ground potential.
   - Measure the voltages between the positive and negative terminals.

     If the following results are present at the same time, there is a ground fault in the PV plant.

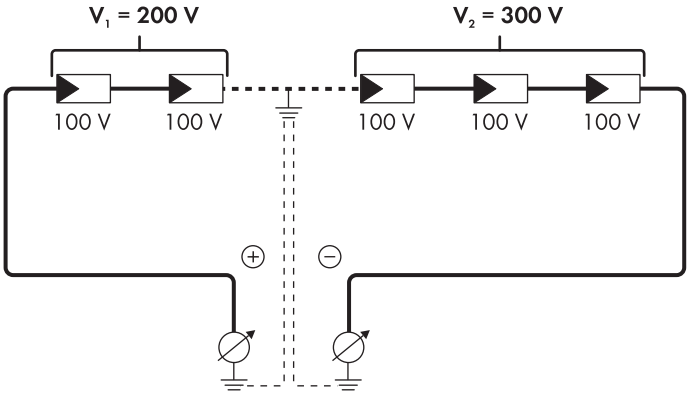
   ☑ All measured voltages are stable.

   ☑ The sum of the two voltages against the ground potential is approximately the same as the voltage between the positive and negative terminals.

3. Determine the location of the ground fault via the ratio of the two measured voltages.

Example: Location of the ground fault

The example shows a ground fault between the second and third PV modules.



4. Eliminate the ground fault.
5. Commission the inverter (see Section 7.2).
6. If there is no ground fault and the message continues to be displayed, contact the SMA Service Line.

9.6 Replacing DC Varistors

In regions where storms or other DC overvoltages frequently occur, the DC varistors lose their functionality if the PV plant is not equipped with additional overvoltage protection. In such cases, SMA recommends replacing DC varistors with new ones after an operating period of 10 years in order to ensure that the functionality of the DC varistors remains at a constant level.

Order new varistors direct from SMA (order numbers (see Section 12 "Accessories", page 89)).

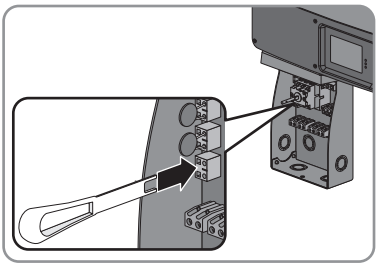
NOTICE

Destruction of the inverter due to overvoltage

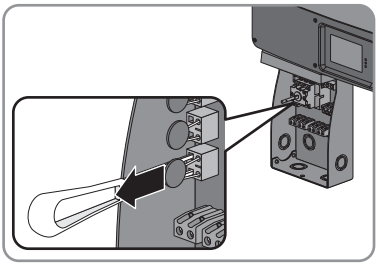
If varistors are missing, the inverter is no longer protected against overvoltage.

- Do not operate the inverter without varistors in plants with a high risk of overvoltages.
- Only re-commission the inverter after you have replaced the defective varistors.

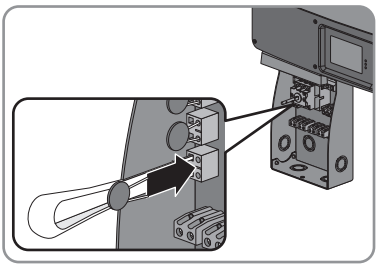
1. Disconnect the inverter and the DC Disconnect from voltage sources (see Section 8).
2. Insert the insertion tool into the clamp contacts of the terminal block.



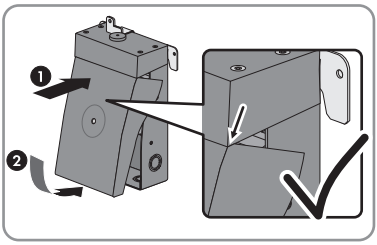
3. Pull the varistor out of the connecting terminal plate.



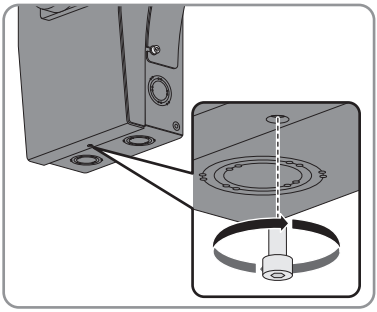
4. Insert the new varistor into the terminal. The labels of the varistor must face to the right to the inside of the inverter.



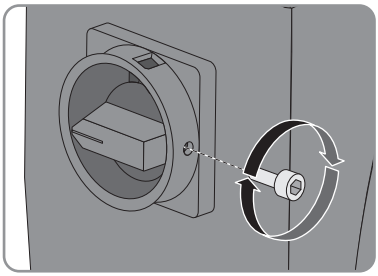
5. Ensure that the wires of the varistors are secure in the terminal.
6. Remove the insertion tool from the contacts of the terminal block.
7. Push the DC Disconnect lid diagonally under the upper edge of the enclosure and press the lid down. The lid must be flush with the enclosure edge.



8. Screw the DC Disconnect lid into place (torque: 44 in-lb. (5 Nm)).



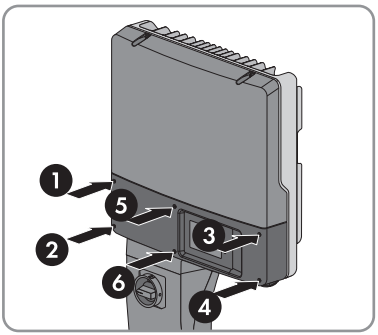
9. Screw the DC Disconnect rotary switch onto the lid hand-tight.
10. Commission the inverter (see Section 7.2).



10 Decommissioning

10.1 Disassembling the Inverter

1. Disconnect the inverter and the DC-Disconnect (see Section 8).
2. Remove the AC cable from the inverter.
3. If the emergency power module is connected, remove the cable from the inverter.
4. If a data cable is connected, remove the data cable from the inverter.
5. If the Zigbee® antenna is connected, unscrew the antenna.
6. Disconnect the DC cable leading from the inverter to the DC Disconnect and pull it back into the inverter.
7. Place the lower enclosure lid with the 6 screws on the enclosure and tighten them using an Allen key (AF 3) in the order 1 to 6.



8. **⚠ CAUTION**

   Risk of burns due to hot enclosure parts

   - Wait 5 minutes for the enclosure to cool down and the residual voltage has been drained.

9. Loosen the screws of the DC Disconnect and remove the DC Disconnect.
10. **⚠ DANGER**

    Danger to life due to electric shock when touching the DC cables and DC terminals

    High voltages are present in the DC cables and DC terminals.

    - Do not touch the DC cables and DC terminals.

    If present, switch off the DC disconnecting switch or disconnect the PV module plugs.

11. Remove all DC cables from the DC Disconnect.
12. Unscrew all conduits and conduit fittings.
13. Secure the lid of the DC Disconnect.
14. If the inverter is protected against theft, open the padlock and remove it.

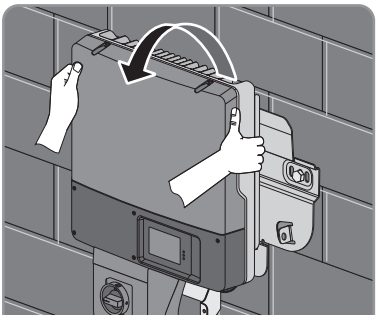
15. **⚠ CAUTION**

Risk of injury when lifting and from the inverter falling

The inverter is heavy (see Section 11 "Technical Data", page 82). Risk of injury exists through incorrect lifting and through the inverter falling during transport or when hanging in the wall mounting bracket.

- Lift and transport the inverter horizontally in the mounting position. Use the recessed grips on the sides or a steel bar for this.

16. Lift the inverter off the wall mounting bracket.



10.2 Packing the Inverter

1. Remove the cable glands from the inverter.
2. Pack the inverter. Use the original packaging or packaging that is suitable for the weight and dimensions of the inverter (see Section 11 "Technical Data", page 82).

10.3 Disposing of the Inverter

- Dispose of the inverter in accordance with the locally applicable disposal regulations for electronic waste.

  or

  Return the inverter to SMA at your own expense (see Section 14 "Contact", page 91). When doing so, label the packaging with the information "FOR DISPOSAL".

11 Technical Data

11.1 DC/AC

11.1.1 Sunny Boy 3000TL-US

DC Input

Maximum DC power at cos φ = 1	3,200 W
Maximum input voltage	600 V
MPP voltage range	175 V to 480 V
Rated input voltage	400 V
Min. input voltage	125 V
Initial input voltage	150 V
Maximum input current	18 A
Maximum input current per string input	15 A
Maximum short-circuit current of the PV array per string input	19 A
Number of independent MPP inputs	2
Strings per MPP input	2

AC output

Rated power at 208 V, 60 Hz	3,000 W
Maximum apparent AC power	3,050 VA
Rated grid voltage	208 V/240 V
Nominal AC voltage	208 V/240 V
AC voltage range at 208 V	183 V to 229 V
AC voltage range at 240 V	211 V to 264 V
Nominal AC current at 208 V	14.5 A
Nominal AC current at 240 V	12.5 A
Maximum output current	15 A
Total harmonic factor of the output current with total harmonic factor of the AC voltage < 2%, and AC power > 50% rated power	≤ 4%
AC power frequency	60 Hz
Operating range at AC power frequency 60 Hz	59.3 Hz to 60.5 Hz
Power factor at rated power	1
Feed-in phases	1
Connection phases	2

Efficiency

Maximum efficiency, η_{max}	97.1%
CEC efficiency, η_{CEC}	97.0%

11.1.2 Sunny Boy 4000TL-US

DC Input

Maximum DC power at cos φ = 1	4,200 W
Maximum input voltage	600 V
MPP voltage range	175 V to 480 V
Rated input voltage	400 V
Min. input voltage	125 V
Initial input voltage	150 V
Maximum input current	24 A
Maximum input current per string input	15 A
Maximum short-circuit current of the PV array per string input	19 A
Number of independent MPP inputs	2
Strings per MPP input	2

AC output

Rated power at 208 V, 60 Hz	4,000 W
Maximum apparent AC power	4,050 VA
Rated grid voltage	208 V/240 V
Nominal AC voltage	208 V/240 V
AC voltage range at 208 V	183 V to 229 V
AC voltage range at 240 V	211 V to 264 V
Nominal AC current at 208 V	19.5 A
Nominal AC current at 240 V	16.7 A
Maximum output current	20 A
Total harmonic factor of the output current with total harmonic factor of the AC voltage < 2%, and AC power > 50% rated power	≤ 4%
AC power frequency	60 Hz
Operating range at AC power frequency 60 Hz	59.3 Hz to 60.5 Hz
Power factor at rated power	1
Feed-in phases	1
Connection phases	2

Efficiency

Maximum efficiency, η_{max}	97.2%
CEC efficiency, η_{CEC}	97.0%

11.1.3 Sunny Boy 5000TL-US

DC Input

Maximum DC power at cos φ = 1	5,300 W
Maximum input voltage	600 V
MPP voltage range	175 V to 480 V
Rated input voltage	400 V
Min. input voltage	125 V
Initial input voltage	150 V
Maximum input current	30 A
Maximum input current per string input	15 A
Maximum short-circuit current of the PV array per string input	19 A
Number of independent MPP inputs	2
Strings per MPP input	2

AC output

Rated power at 208 V, 60 Hz	4,550 W
Rated power at 240 V, 60 Hz	5,000 W
Maximum apparent AC power at 208 V, 60 Hz	4,550 VA
Maximum apparent AC power at 240 V, 60 Hz	5,050 VA
Rated grid voltage	400 V
Nominal AC voltage	208 V/240 V
AC voltage range at 208 V	183 V to 229 V
AC voltage range at 240 V	211 V to 264 V
Nominal AC current at 208 V	22 A
Nominal AC current at 240 V	21 A
Maximum output current	22 A
Total harmonic factor of the output current with total harmonic factor of the AC voltage < 2%, and AC power > 50% rated power	≤ 4%
AC power frequency	60 Hz
Operating range at AC power frequency 60 Hz	59.3 Hz to 60.5 Hz
Power factor at rated power	1

Feed-in phases	1
Connection phases	2

Efficiency

Maximum efficiency, η_{max}	97.1%
CEC efficiency, η_{CEC}	97.0%

11.2 General Data

Width x height x depth, inverter	$19^{5}/_{16}$ in. x $20^{1}/_{2}$ in. x $7^{5}/_{16}$ in. (490 mm x 519 mm x 185 mm)
Width x height x depth, DC-Disconnect	$7^{13}/_{32}$ in. x $11^{45}/_{64}$ in. x $7^{1}/_{2}$ in.(187 mm x 297 mm x 190 mm)
Weight inverter	52.9 lb (24 kg)
Weight DC Disconnect	4.4 lb (2 kg)
Length x width x height of the inverter packaging	$24^{5}/_{16}$ in. x $23^{1}/_{2}$ in. x $10^{1}/_{2}$ in. (617 mm x 597 mm x 266 mm)
Length x width x height of the DC Disconnect packaging	$14^{39}/_{64}$ in. x $9^{13}/_{32}$ in. x 11 in. (370 mm x 240 mm x 280 mm)
Transport weight inverter	59.5 lb (27 kg)
Transport weight DC Disconnect	6.6 lb (3 kg)
Climatic category according to IEC 60721-3-4	4K4H
Operating temperature range	– 40°F to +140°F (– 40°C to +60°C)
Maximum permissible value for relative humidity, non-condensing	100%
Max. operating altitude above mean sea level	3,000 m
Noise emission (typical)	≤ 25 dB(A)
Power loss in night operation	< 1 W
Topology	Transformerless
Cooling concept	Convection
Fan connection	designed for safe disconnection in accordance with DIN EN 50178:1998-04 *(up to 2013 superseded by DIN EN 62109-1)*
Electronics degree of protection	NEMA 3R
Protection class	I
Overvoltage category	IV

11.3 Protective Devices

DC reverse-polarity protection	Short-circuit diode
DC disconnection device	DC Disconnect
DC overvoltage protection	Varistors
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard X
Maximum permissible fuse protection	30 A
Ground-fault monitoring	Insulation monitoring: $R_{iso} \geq 600\ k\Omega$
All-pole sensitive residual-current monitoring unit	available
Arc-fault circuit interrupter	AFCI

11.4 Approvals

National standard, status as of 11/12	
UL 1741	✓
UL 1699B	✓
IEEE 929-2000	✓
IEEE 1547	✓
Canadian Electrical Code® CSA C22.2 N0. 107.1-01	✓

11.5 Climatic Conditions

According to IEC 60721-3-4, installation type C, class 4K4H

Extended temperature range	– 40°F to +140°F (– 40°C to +60°C)
Extended humidity range	0% to 100%
Extended air pressure range	79.5 kPa to 106 kPa

According to IEC 60721-3-2, transport type E, class 2K3

Temperature range	– 40°F to +140°F (– 40°C to +60°C)

11.6 Features

DC connection	Screw terminal
AC connection	Spring clamp terminal
Display	LC graphic display
Zigbee®	optional
RS485, galvanically isolated	optional
Fan retrofit kit	optional
Emergency Power Module	optional*

* only available ex-works

11.7 DC Disconnect

Electrical endurance in the event of a short circuit, with a nominal current of 20 A per string input	Min. 50 switching processes
Maximum switching current per string input	20 A
Maximum switching voltage	600 V
Degree of protection	NEMA 3R

11.8 Torques

Lower inverter lid screws	18 in.-lbs. (2.0 Nm)
DC Disconnect screw	44 in.-lbs. (5.0 Nm)
Screws of the DC Disconnect retainer on the inverter	44 in.-lbs. (5.0 Nm)
screws of the DC Disconnect on the retainer	44 in.-lbs. (5.0 Nm)
Grounding connection in the inverter	53 in.-lbs. (6.0 Nm)
Grounding screw in the anchorage bracket of the DC Disconnect on the inverter	53 in.-lbs. (6.0 Nm)
DC ground terminal	15 in.-lbs. (1.7 Nm)
DC terminals for the PV modules	15 in.-lbs. (1.7 Nm)
Connection cable terminal	15 in.-lbs. (1.7 Nm)

11.9 Grounding Systems

208 Delta: 120 WYE	Suitable
240: 120 Split Phase	Suitable

11.10 Data Storage Capacity

Daily energy yield	63 days
Daily yields	30 years
Event messages for users	250 events
Event messages for installers	250 events

12 Accessories

You will find relevant accessories and spare parts for your product in the following overview. If needed, you can order these from SMA or your specialty retailer.

Designation	Brief Description	SMA order number
DC replacement varistors	Set with 4 varistors incl. insertion tool	SB-VDC-US02
Fan retrofit kit	Retrofit kit for connecting a fan	FANKIT02-10
RS485 module	Module for communication via RS485	DM-485CB-10
Speedwire module with Webconnect function	Module for communication with Sunny Portal via Webconnect	SWDM-10

13 Compliance Information

FCC Compliance

This device complies with Part 15 of the FCC Rules and contains FCC ID: SVF-SCOM31. Operation is subject to the following conditions:

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

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 distance between the equipment and the 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.
- The user is cautioned that changes or modifications not expressly approved by SMA America, Inc. could void the user's authority to operate this equipment.

IC Compliance

This device complies with Industry of Canada licence-exempt RSS standard(s) and contains Model XBee Radio, IC: 9440B-SCOM31.

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.

Operation is subject to the following two conditions:

- This device must not cause interference, and
- This device must accept any interference, including interferences that may cause undesired operation of the device.

The integrator is responsible for its product to comply with IC ICES-003 & FCC Part 15, Sub. B - Unintentional Radiators. ICES-003 is the same as FCC Part 15 Sub. B and Industry Canada accepts FCC test report or CISPR 22 test report for compliance with ICES-003.

14 Contact

If you have technical problems concerning our products, contact the SMA Service Line. We need the following data in order to provide you with the necessary assistance:

- Inverter device type
- Inverter serial number
- Inverter firmware version
- Special country-specific settings of the inverter
- Type and number of PV modules connected
- Mounting location and mounting altitude of the inverter
- 3 or 4-digit event number and display message of the inverter
- Optional equipment, e.g., communication products

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