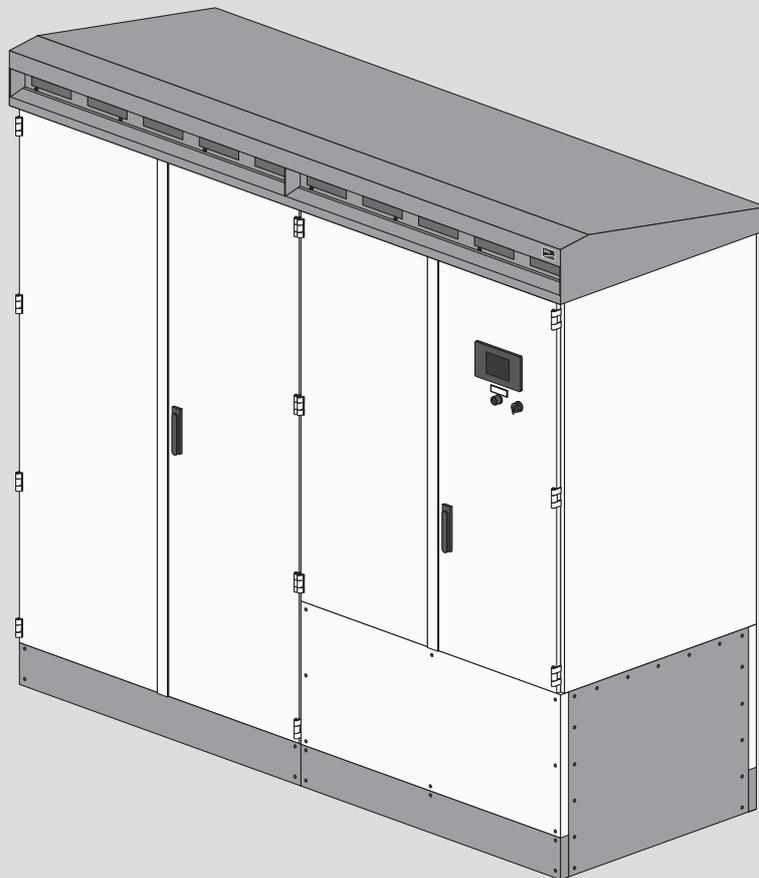


Maintenance Manual



**SUNNY CENTRAL 500CP XT / 630CP XT /
720CP XT / 760CP XT / 800CP XT / 850CP XT /
900CP XT / 1000CP XT**



Legal Provisions

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

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

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

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

SMA Warranty

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

Trademarks

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

SMA Solar Technology AG

Sonnenallee 1

34266 Niestetal

Germany

Tel. +49 561 9522-0

Fax +49 561 9522-100

www.SMA.de

Email: info@SMA.de

As of: 6/18/2020

Copyright © 2020 SMA Solar Technology AG. All rights reserved.

Table of Contents

1	Information on this Document	6
1.1	Validity	6
1.2	Target Group	6
1.3	Levels of Warning Messages	6
1.4	Symbols in the Document	7
1.5	Typographical Elements in the Document	7
1.6	Designations in the Document	7
1.7	Additional Information	7
2	Safety	9
2.1	Intended Use	9
2.2	Safety Information	10
2.3	Cyber Security	13
2.4	Personal Protective Equipment	13
3	Product Overview	14
3.1	Design of the Inverter	14
3.2	Devices of the Inverter	14
3.3	Operating and Display Elements	15
3.3.1	Function of the Switches	15
3.3.1.1	Key Switch	15
3.3.1.2	AC Disconnection Unit	16
3.3.1.3	DC Switchgear	16
3.3.2	Touch Display	17
3.3.2.1	Design	17
3.3.2.2	Explanation of Symbols	17
3.3.3	LEDs of the SC-COM	21
3.3.3.1	LEDs on the Enclosure	21
3.3.3.2	LEDs on the Network Port	22
3.3.3.3	LEDs on the Optical Fiber Terminals	23
3.3.4	User Interface	24
3.3.4.1	Design of the User Interface	24
3.3.4.2	Tree View and Device View	24
3.3.4.3	Status Symbols	25
3.4	Symbols on the Product	25
4	Disconnecting and Reconnecting	26
4.1	Safety When Disconnecting and Reconnecting Voltage Sources	26
4.2	Disconnecting the Inverter	26
4.2.1	Switching off the Inverter	26
4.2.2	Disconnecting the DC Side	26
4.2.3	Disconnecting the AC Side	27
4.2.4	Disconnecting the Supply Voltage at the Inverter from Voltage Sources	27
4.3	Reconnecting the Inverter	28
4.3.1	Reconnecting the Supply Voltage at the Inverter	28
4.3.2	Reconnecting the AC Side	29
4.3.3	Reconnecting the DC Side	29
4.3.4	Restarting the Inverter	29
5	Troubleshooting	30
5.1	Safety during Troubleshooting	30

5.2	Reading Off Disturbance Messages	30
5.2.1	Reading Off Error Messages via Touch Display	30
5.2.2	Reading Off Disturbance Messages via the User Interface	31
5.2.3	Displaying the Event Report.....	31
5.2.3.1	Enabling Automatic Read-Out of Events.....	31
5.2.3.2	Displaying and Downloading the Event Report.....	31
5.3	Acknowledging Disturbance Messages.....	31
5.3.1	Acknowledging Disturbance Messages via the Key Switch	31
5.3.2	Acknowledging Disturbance Messages via the User Interface.....	32
5.4	Remedial Action in Case of Disturbances	32
5.4.1	Inverter Behavior in Case of Disturbances	32
5.4.2	Content and structure of the error tables.....	34
5.4.3	Error Numbers 01xx to 13xx - Disturbance on the Utility Grid	34
5.4.4	Error Numbers 34xx to 40xx - Disturbance on the PV Array	35
5.4.5	Error Numbers 6xxx to 9xxx - Disturbance on the Inverter.....	37
5.4.6	Displaying Disturbance Messages for Active Power Limitation	40
5.4.7	Displaying Disturbance Messages for the Reactive Power Setpoint	41
6	Maintenance.....	42
6.1	Safety during Maintenance	42
6.2	Maintenance Schedule and Consumables	43
6.2.1	Notes on Maintenance Work	43
6.2.2	Maintenance Work Every 24 Months.....	43
6.3	Repair Schedule and Spare Parts.....	44
6.3.1	Information on Repair Work.....	44
6.3.2	Demand-Based Annual Repairs	45
6.3.3	Repairs every 10 Years	45
6.3.4	Repairs every 12 Years	45
6.4	Maintenance Work	45
6.4.1	Maintenance work with supply voltage present	45
6.4.1.1	Checking the Fans.....	45
6.4.1.2	Checking the Heating Elements and Hygostat	46
6.4.1.3	Inverter with Low-Temperature Option: Cleaning the Heating Elements	47
6.4.1.4	Inverter with Low-Temperature Option: Checking the Heating Elements	48
6.4.1.5	Checking the Function of the UPS.....	50
6.4.2	Maintenance Work in Disconnected State.....	51
6.4.2.1	Performing the Visual Inspection	51
6.4.2.2	Analyzing the Temperature Indicators.....	51
6.4.2.3	Cleaning the Ventilation Plate	53
6.4.2.4	Cleaning the Air Duct, Ventilation Grids and Air Intake.....	53
6.4.2.5	Cleaning the Interior	55
6.4.2.6	Checking the Seals	56
6.4.2.7	Checking the Latches, Door Stops and Hinges.....	56
6.4.2.8	Checking the Inverter Surface	57
6.4.2.9	Checking the Fuses/Disconnection Blades	58
6.4.2.10	Checking the Bolted Connections of the Power Cabling	58
6.4.2.11	Checking the Labels.....	59
6.5	Repair Work.....	61
6.5.1	Reading off the Replacement Interval Meter.....	61
7	Periodic Actions	62
7.1	Mounting and Disassembly Work.....	62
7.1.1	Disassembling and Mounting the Panels.....	62
7.1.2	Disassembling and Mounting the Protective Covers.....	63
7.1.3	Disassembling and Mounting the Ventilation Grids.....	64

7.2	Entering the Password via the Touch Display	65
7.3	Parameter Overview.....	65
7.3.1	Accessing the Parameter Overview	65
7.3.2	Saving Parameter Changes.....	66
7.4	User Interface.....	66
7.4.1	Logging Into the User Interface	66
7.4.2	Logging Out of the User Interface	66
8	Appendix	67
8.1	Installation Information	67
8.1.1	Torques	67
8.2	Type Label.....	67
9	Contact	68

1 Information on this Document

1.1 Validity

This document is valid for the following device types:

Device type	Production version	OCU firmware version	DSP firmware version
SC 500CP-10 (Sunny Central 500CP XT)	E7	02.00.01.R	02.00.01.R
SC 630CP-10 (Sunny Central 630CP XT)			
SC 720CP-10 (Sunny Central 720CP XT)			
SC 760CP-10 (Sunny Central 760CP XT)			
SC 800CP-10 (Sunny Central 800CP XT)			
SC 850CP-10 (Sunny Central 850CP XT)			
SC 900CP-10 (Sunny Central 900CP XT)			
SC 1000CP-10 (Sunny Central 1000CP XT)			

The production version is indicated on the type label.

The firmware version can be read off from the user interface.

Illustrations in this document are reduced to the essential and may deviate from the real product.

1.2 Target Group

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

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

1.3 Levels of Warning Messages

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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

1.4 Symbols in the Document

Symbol	Explanation
	Information that is important for a specific topic or goal, but is not safety-relevant
<input type="checkbox"/>	Indicates a requirement for meeting a specific goal
<input checked="" type="checkbox"/>	Desired result
x	A problem that might occur
	Example

1.5 Typographical Elements in the Document

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

1.6 Designations in the Document

Complete designation	Designation in this document
Medium-voltage transformer	MV transformer
Sunny Central Communication Controller	SC-COM, communication unit
Sunny Central CP XT	Sunny Central or inverter

1.7 Additional Information

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

Title and information content	Type of information
"Requirements for medium-voltage transformers and transformers for internal power supply for SUNNY CENTRAL and SUNNY CENTRAL STORAGE"	Technical Information
"PUBLIC CYBER SECURITY - Guidelines for a Secure PV System Communication"	Technical information

For information on maintenance activities of the DC switchgear and AC disconnect unit please visit www.abb.com:

Component	Document number
DC switchgear, AC disconnection unit: T-Max	1SDH000707R0001
DC switchgear: E-Max	1SDH000460R0003

2 Safety

2.1 Intended Use

The Sunny Central is a PV inverter which converts the direct current generated in the PV modules into grid-compliant alternating current. An external MV transformer fitted downstream feeds the generated alternating current into the utility grid.

The product is suitable for indoor and outdoor use.

The enclosure complies with degree of protection IP54. The inverter is classified under Class 4C2 as per EN 60721-3-4 and is suitable for operation in a chemically active environment.

The maximum permissible DC input voltage of the inverter must not be exceeded.

The inverter must only be operated in conjunction with a suitable MV transformer.

- The MV transformer must be designed for voltages that arise during pulsed mode of the inverter.
- For the Sunny Central 500CP XT/630CP XT/720CP XT/760CP XT/800CP XT the maximum voltage to ground is: ± 1450 V
- For the Sunny Central 850CP XT/900CP XT/1000CP XT the maximum voltage to ground is: ± 1600 V
- Do not connect more than one inverter to one winding of the MV transformer.
- The neutral conductor on the low-voltage side of the MV transformer must not be grounded.

You can find further information on suitable transformers in the technical information "Requirements for Medium-Voltage Transformers and Transformers for Internal Power Supply for the SUNNY CENTRAL".

Do not deactivate or modify settings that affect grid management services without first obtaining approval from the grid operator.

Use this product only in accordance with the information provided in the enclosed documentation and with the locally applicable standards and directives. Any other application may cause personal injury or property damage.

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

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

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

All work on the product must only be performed using appropriate tools and in compliance with the ESD protection regulations.

Suitable personal protective equipment must be worn by all persons working on or with the product.

Unauthorized persons must not operate the product and must be kept at a safe distance from the product.

The product must not be operated with open covers or doors.

The product must not be opened when it is raining or when humidity exceeds 95%.

The product must not be operated with any technical defects.

The type label must remain permanently attached to the product.

2.2 Safety Information

This section contains safety information that must be observed at all times when working on or with the product. To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and observe all safety information at all times.

DANGER

Danger to life from electric shock due to live voltage

High voltages are present in the live components of the product. Touching live components results in death or serious injury due to electric shock.

- Wear suitable personal protective equipment for all work on the product.
- Do not touch any live components.
- Observe all warning messages on the product and in the documentation.
- Observe all safety information of the module manufacturer.
- After switching off the inverter, wait at least 15 minutes before opening it to allow the capacitors to discharge completely (see Section 4.2, page 26).

DANGER

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

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

- Do not touch non-insulated parts or cables.

DANGER

Danger to life due to electric shock in case of a ground fault

If there is a ground fault, components that are supposedly grounded may in fact be live. Touching live parts will result in death or serious injury due to electric shock.

DANGER

Danger to life from electric shock due to damaged product

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

- Only operate the product when it is in a flawless technical condition and safe to operate.
- Check the product regularly for visible damage.
- Make sure that all external safety equipment is freely accessible at all times.
- Make sure that all safety equipment is in good working order.
- Wear suitable personal protective equipment for all work on the product.

⚠ DANGER**Danger to life from electric shock even if the inverter is disconnected on the AC and DC sides**

The precharge unit of the order option "Q at Night" will carry live voltage even if the AC contactor and the DC switchgear are open. Touching live components results in death or serious injury due to electric shock.

- Do not touch any live components.
- Switch off the inverter.
- After switching off the inverter, wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Ensure that no voltage is present.
- Do not remove protective covers.
- Observe the warning messages.
- Wear suitable personal protective equipment for all work on the product.

⚠ WARNING**Danger to life from electric shock when entering the PV field**

Ground-fault monitoring does not provide protection from personal injury. PV modules which are grounded with ground-fault monitoring discharge voltage to ground. Entering the PV field can result in lethal electric shocks.

- Ensure that the insulation resistance of the PV field exceeds the minimum value. The minimum value of the insulation resistance is: 1 k Ω .
- Before entering the PV field, switch the PV modules to insulated operation.
- Configure the PV power plant as a closed electrical operating area.

⚠ WARNING**Danger to life due to electric arc if there are tools inside the product**

When reconnecting or during operation, an electric arc can occur if there are tools in the product creating a conductive connection between the live components. This can result in death or serious injury.

- Before commissioning or reconnection, verify that no tools are inside the product.

⚠ WARNING**Danger to life from electric shock if the product is not locked**

If the product is not locked, unauthorized persons will have access to live components carrying lethal voltages. Touching live components can result in death or serious injury due to electric shock.

- Always close and lock the product.
- Remove the keys.
- Store the keys in a safe place.
- Ensure that no unauthorized persons have access to the closed electrical operating area.

⚠ WARNING**Danger to life due to blocked escape routes**

In hazardous situations, blocked escape routes can lead to death or serious injury. Opening the doors of two products located opposite each other can block the escape route. It is imperative that the escape route is freely accessible at all times.

- An escape route must be available at all times. Make sure the minimum passage width of the escape route meets local standards.
- Do not place any objects in the escape route area.
- Remove all tripping hazards from escape routes.

⚠ CAUTION**Risk of burns due to hot components**

Some components of the product can get very hot during operation. Touching these components can cause burns.

- Observe the warnings on all components.
- During operation, do not touch any components marked with such warnings.
- After switching off the product, wait until any hot components have cooled down sufficiently.
- Wear suitable personal protective equipment for all work on the product.

NOTICE**Property damage due to dust intrusion and moisture penetration**

Dust or moisture intrusion can damage the product and impair its functionality.

- Do not open the enclosure during rainfall or when humidity exceeds the specified thresholds. The humidity thresholds are: 15% to 95%.
- Only perform maintenance work when the environment is dry and free of dust.
- Operation of the product is only permitted when it is closed.
- Connect the external supply voltage after mounting and installing the product.
- If the installation or commissioning process is interrupted, mount all panels.
- Close and lock the enclosure.
- The product must always be closed for storage.
- Store the product in a dry and covered location.
- The temperature at the storage location must be in the specified range. The temperature range is: -25°C to $+70^{\circ}\text{C}$.

NOTICE**Damage to electronic components due to electrostatic discharge**

Electrostatic discharge can damage or destroy electronic components.

- Observe the ESD safety regulations when working on the product.
- Wear suitable personal protective equipment for all work on the product.
- Discharge electrostatic charge by touching grounded enclosure parts or other grounded elements. Only then is it safe to touch electronic components.

2.3 Cyber Security

Most operating activities such as monitoring and control of systems can be done locally by the PV system operator or service personnel without the need for data communication via public Internet infrastructure. These operating activities, including data communication between PV system operator/service personnel and data logger, inverter or additional equipment, can be accessed by using local displays, keypads or using local access of the webserver of a device in the LAN of the PV system or of the building.

In other use cases of systems, the PV systems are also part of the global communication system, which is based on Internet infrastructures.

The data communication via Internet is an up-to-date, economically viable and customer-friendly approach in order to enable easy access for the following modern applications such as:

- Cloud platforms (e.g. Sunny Portal)
- Smartphones or other mobile devices (iOS or Android apps)
- SCADA systems, which are remotely connected
- Utility interfaces for grid management services

Alternatively, selected and secured communication interfaces may be used. These solutions are no longer state of the art and are very expensive to use (special communication interfaces, separate wide area networks and more).

When using the Internet infrastructure, the systems connected to the Internet are entering a basically unsecure area. Potential attackers constantly seek vulnerable systems. Usually, they are criminally motivated, have a terrorist background or aim to disrupt business operations. Without taking any measures to protect systems and other systems from such misuse, a data communication system should not be connected to the Internet.

You can find the current recommendations by SMA Solar Technology AG on the topic of Cyber Security in the Technical Information "PUBLIC CYBER SECURITY - Guidelines for a Secure PV System Communication" at www.SMA-Solar.com.

2.4 Personal Protective Equipment

i Always wear suitable protective equipment

When working on the product, always wear the appropriate personal protective equipment for the specific job.

The following personal protective equipment is regarded to be the minimum requirement:

- In a dry environment, safety shoes of category S3 with perforation-proof soles and steel toe caps
- During precipitation or on moist ground, safety boots of category S5 with perforation-proof soles and steel toe caps
- Tight-fitting work clothes made of 100% cotton
- Suitable work pants
- Individually fitted hearing protection
- Safety gloves

Any other prescribed protective equipment must also be used.

3 Product Overview

3.1 Design of the Inverter

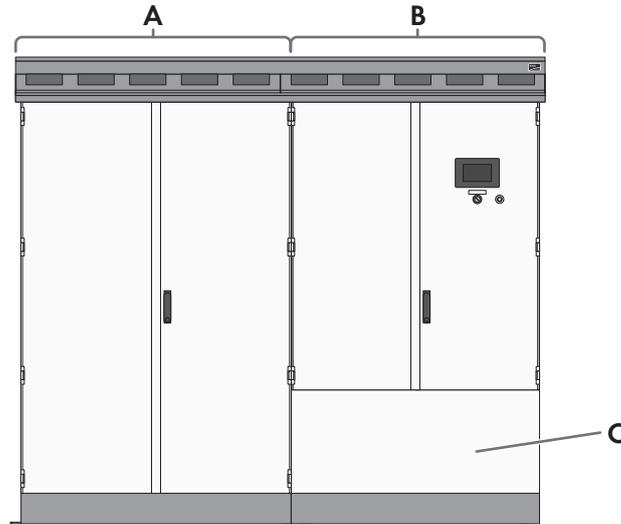


Figure 1: Design of the Inverter

Position	Designation
A	Inverter cabinet
B	Interface cabinet
C	Connection area

3.2 Devices of the Inverter

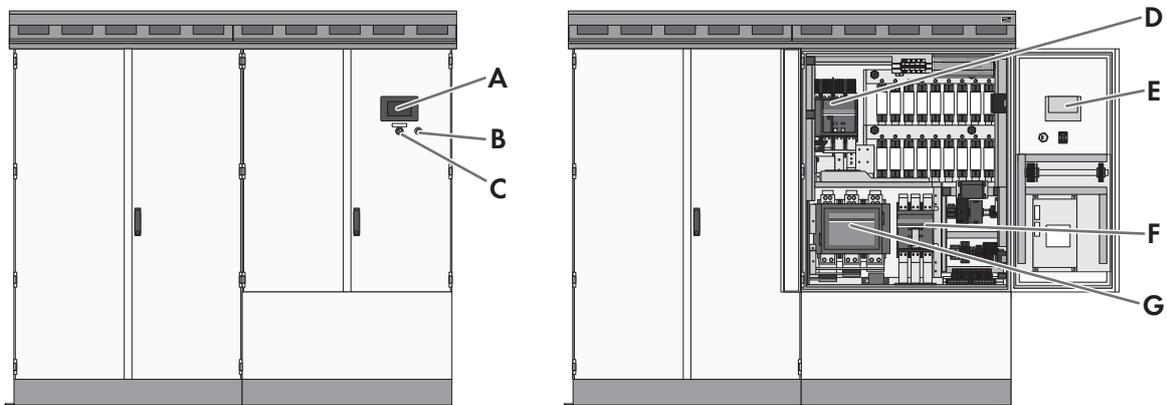


Figure 2: Inverter Components

Position	Component	Description
A	Touch Display	Different kinds of inverter data can be viewed on the touch display. The touch display is only used to view data. The display screen is activated by touching the touch display.
B	Service interface	The service interface allows access to the user interface.
C	Key switch	The key switch is used to switch the inverter on and off.
D	DC switchgear	The DC switchgear disconnects the inverter from the PV array.

Position	Component	Description
E	SC-COM	The SC-COM is the communication unit of the inverter. The SC-COM establishes the connection between the inverter and the system operator.
F	AC disconnection unit	With the AC disconnection unit, the electrical connection between the inverter and MV transformer can be disconnected manually. In the event of residual current, the AC disconnection unit disconnects the connection between the inverter and MV transformer automatically.
G	AC contactor	The AC contactor disconnects the electrical connection between the inverter and MV transformer automatically.

3.3 Operating and Display Elements

3.3.1 Function of the Switches

3.3.1.1 Key Switch

The key switch is used to switch the inverter on and off.

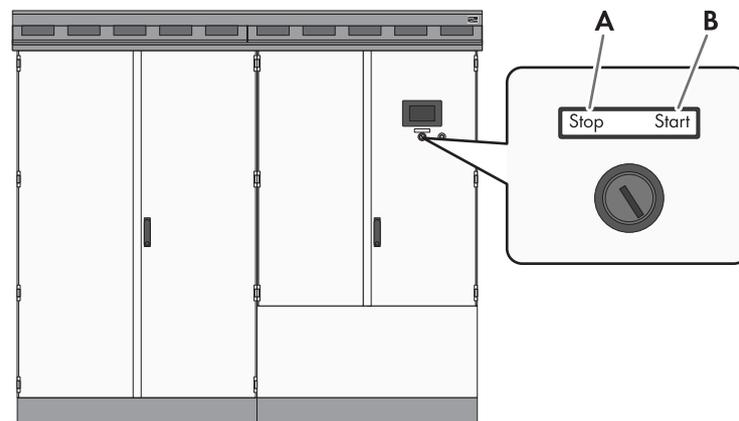


Figure 3: Switch positions of the key switch

Position	Designation
A	Switch position Stop
B	Switch position Start

Switch position **Start**

If the key switch is turned to **Start**, a motor drive switches the DC switchgear on and the inverter switches from the operating state "Stop" to the operating state "Grid monitoring". Provided that there is sufficient irradiation and a valid utility grid connection, the inverter switches to feed-in operation. If there is insufficient irradiation and the input voltage is therefore too low, the inverter remains in the operating state "Grid monitoring".

Switch position **Stop**

If the key switch is turned to **Stop** while the inverter is in the operating state "Grid monitoring", a motor drive switches the DC switchgear off. The inverter switches to the operating state "Stop". If the key switch is turned to **Stop** while the inverter is in the operating state "MPP load operation", the inverter switches to the operating state "Shutdown". Once shutdown is complete, the AC contactor and the DC switchgear are opened automatically and the inverter switches to the operating state "Stop".

3.3.1.2 AC Disconnection Unit

The AC disconnection unit disconnects the inverter from the MV transformer.

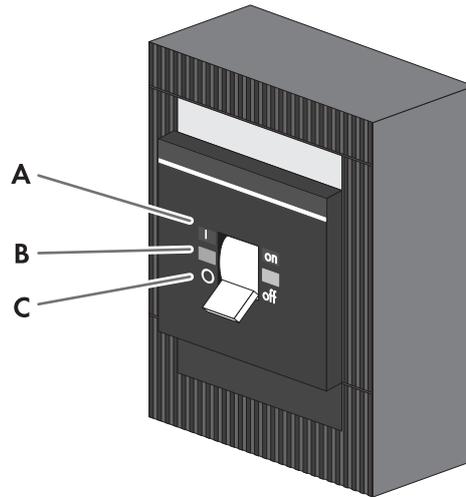


Figure 4: Switch positions of the AC disconnection unit from ABB

Position	Designation	Explanation
A	Switch position on	The AC disconnection unit is closed.
B	Central switch position	The AC disconnection unit was tripped and is open.
C	Switch position off	The AC disconnection unit is open.

3.3.1.3 DC Switchgear

The DC switchgear disconnects the inverter from the PV power plant.

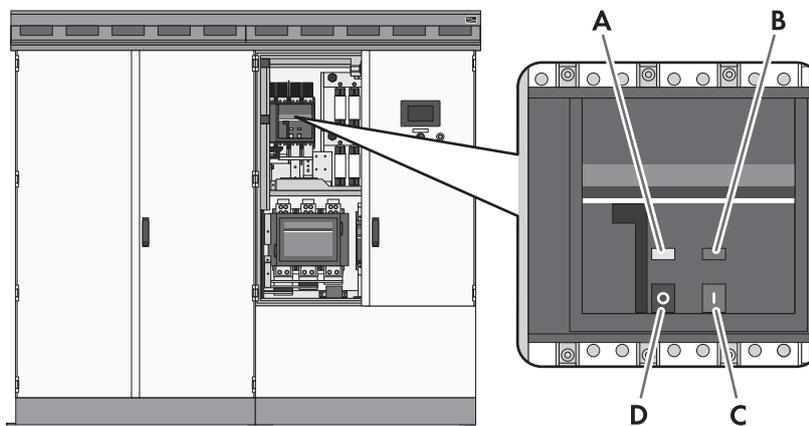


Figure 5: Indicators on the DC load-break switch

Position	Designation
A	Spring status indicator
B	Position indicator
C	ON button
D	OFF button

3.3.2 Touch Display

3.3.2.1 Design

The touch display is used to display instantaneous values and parameter settings. Tapping the symbols on the touch display activates the corresponding functions. If the touch display has not been touched for five minutes, the display is locked and the logged-in user will be logged out. By tapping the characters "S", "M" or "A", you can unlock the display again.

The touch display is divided into three areas.

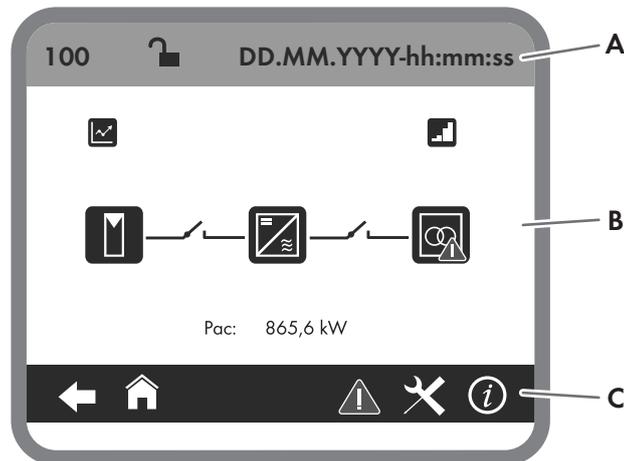


Figure 6: Design of the touch display

Position	Designation	Explanation
A	Status info line	Number of the active menu, login status and time
B	Information field	Area of the main menu
C	Navigation line	Navigation area

3.3.2.2 Explanation of Symbols

Information field

You can access the following sub-menus and screens from the information field:

Symbol	Designation	Explanation
	E-today line graph	Diagram 103: Representation of energy fed in during the current day in kWh.
	Bar chart	Diagram 104: Representation of energy fed in during the last 14 days in kWh.

Symbol	Designation	Explanation
	DC side	Representation of the instantaneous values <ul style="list-style-type: none"> • PV power in W • Insulation resistance in Ω • PV current in A • PV voltage in V • Diagram of string-current monitoring <ul style="list-style-type: none"> - Diagram 132 to 133: Group currents of the individual Sunny String-Monitors - Diagram 140 to 146: String currents of the individual Sunny String-Monitors
	String-current monitoring of the DC side	Representation of the instantaneous values of the string-current monitoring of the individual Sunny String-Monitors
	Switch on DC or AC side closed	If you see this symbol between the "DC side" symbol and the "Inverter data" symbol, the DC switchgear is closed. If you see this symbol between the symbol "Inverter data" and the symbol "AC side", the AC contactor is closed.
	Switch on DC or AC side open	If you see this symbol between the "DC side" symbol and the "Inverter data" symbol, the DC switchgear is open. If you see this symbol between the symbol "Inverter data" and the symbol "AC side", the AC contactor is open.
	Status of switches on DC or AC side unknown	If you see this symbol between the "DC side" symbol and the "Inverter data" symbol, the switch status of the DC switchgear is not known. If you see this symbol between the symbol "Inverter data" and the symbol "AC side", the switch status of the AC contactor is unknown.
	Inverter data	Representation of the following inverter data: <ul style="list-style-type: none"> • Device type • Operating state • Symbol for utility grid menu • Symbol for temperature display • Symbol for fan display

Symbol	Designation	Explanation
	AC side	Representation of the following instantaneous values: <ul style="list-style-type: none"> • Active power in W • Reactive power in VAr • Power frequency in Hz • AC current in A • AC voltage in V
	grid	First menu page: <ul style="list-style-type: none"> • Active mode of active power limitation • Target active power in kW • Actual active power in kW Second menu page <ul style="list-style-type: none"> • Active mode of reactive power setpoint • Target reactive power in VAr • Target displacement power factor $\cos \varphi$ • Target excitation type of the displacement power factor • Actual reactive power in VAr • Actual displacement power factor $\cos \varphi$ • Actual excitation type of the displacement power factor

Settings Menu

Symbol	Designation	Explanation
	Language selection	Select this symbol to open the language selection menu.
	Brightness setting	Select this symbol to open the brightness setting menu.
	Time setting	Select this symbol to open the time setting menu.
	Format selection	Select this symbol to open the format selection menu.
	Password entry	Select this symbol to open the password entry menu.

Navigation line

Symbol	Designation	Explanation
	Back	Select this symbol to go back to the previous page.
	Homepage	Select this symbol to go to the homepage.

Symbol	Designation	Explanation
	Settings	<ul style="list-style-type: none"> • Language selection • Brightness setting • Time setting • Format selection • Password entry
	Information	<ul style="list-style-type: none"> • OS: version of the operating system • App.: version of the application software • SC-COM version: SC-COM software version • Ser.No.: inverter serial number • Hardware: hardware version and serial number of the SC-COM
	Error	<ul style="list-style-type: none"> • ErrNo: error number • TmsRmg: time until reconnection • Msg: error message • Dsc: corrective measure
 	Service	<ul style="list-style-type: none"> • Telephone receiver: Contact Service. • Tool: Contact your installer.

3.3.3 LEDs of the SC-COM

3.3.3.1 LEDs on the Enclosure

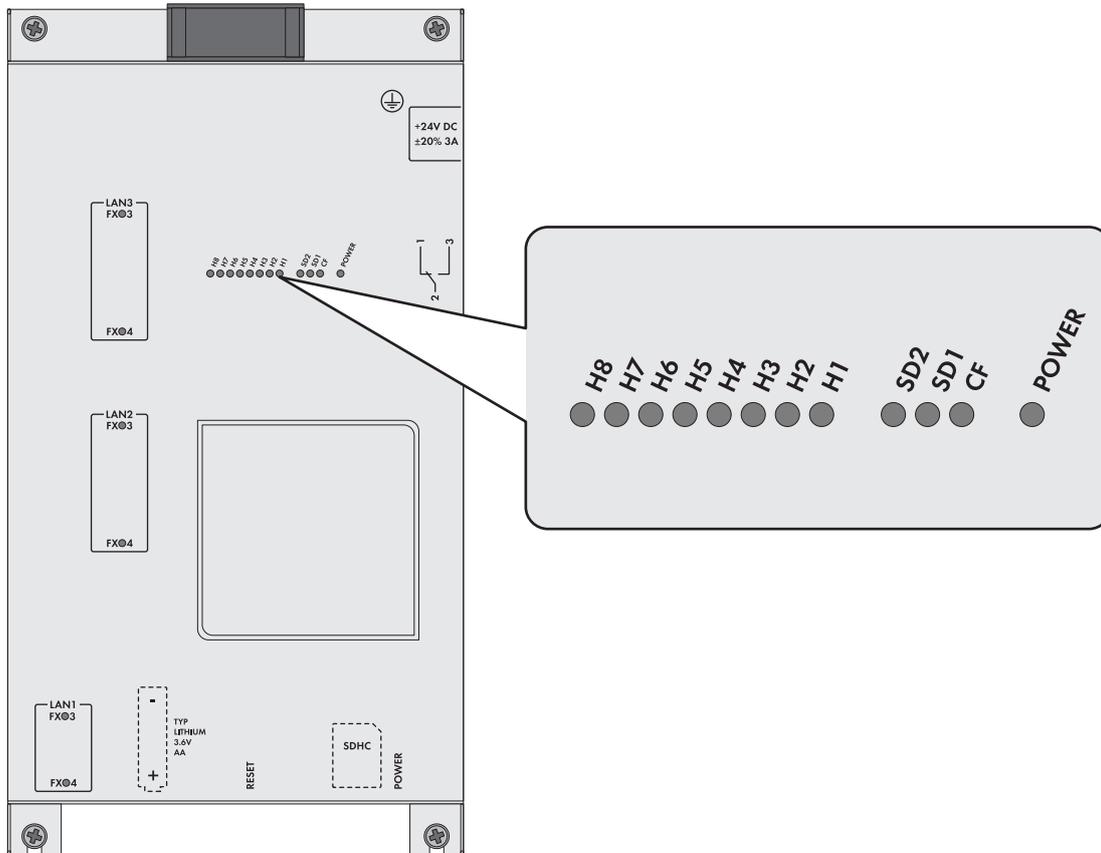


Figure 7: LEDs on the enclosure

LED designation	Status	Explanation
POWER	glowing green	The SC-COM is supplied with voltage.
	off	The SC-COM is not supplied with voltage.
SD1	flashing green	Read or write access to system drive
SD2	flashing green	Read or write access to internal data drive
CF	flashing green	Read or write access to external SD memory card
H1	flashing green	The SC-COM is transmitting data to Sunny Portal/FTP server.
	glowing green	The most recent data transmission to Sunny Portal/FTP server was successful.
	glowing red	The most recent data transmission to Sunny Portal/FTP server has failed.
	off	Data transmission to Sunny Portal/FTP server is deactivated.

LED designation	Status	Explanation
H2	flashing green	The SC-COM is communicating with the devices connected within the system.
	glowing green	Internal communication has taken place in the last five minutes.
	glowing red	An error has occurred in the internal communication.
	off	No internal communication for more than five minutes.
H3	flashing red	The SC-COM is starting up.
	glowing red	An error has occurred in the SC-COM.
	glowing green	The SC-COM is ready for use.
H4	glowing green	An internal memory card exists and less than 92% of its storage capacity is used.
	glowing red	The internal memory card is full and the oldest saved data is being overwritten.
	flashing red	92% of the storage capacity of the internal memory card is used.
H5	glowing green	An external memory card exists and less than 92% of its storage capacity is used.
	glowing red	The external memory card is full.
	flashing red	92% of the storage capacity of the external memory card is used.
	off	There is no external memory card.
H6	-	Not assigned
H7	-	Not assigned
H8	flashing green	Application is running.

3.3.3.2 LEDs on the Network Port

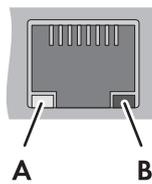


Figure 8: LEDs on the network port

Position	LED	Color	Status	Explanation
A	Speed	yellow	on	100 MBit data transfer rate
			off	10 MBit data transfer rate
B	Link/Activity	green	on	Connection (Link) established.
			flashing	The SC-COM is transmitting or receiving data (Activity).
			off	No connection established.

3.3.3.3 LEDs on the Optical Fiber Terminals

The SC-COM is also available with pre-wired optical fiber connections. If the optical fibers are connected to the splice box of the inverter, the status of the connection will be indicated by the LEDs of the SC-COM.

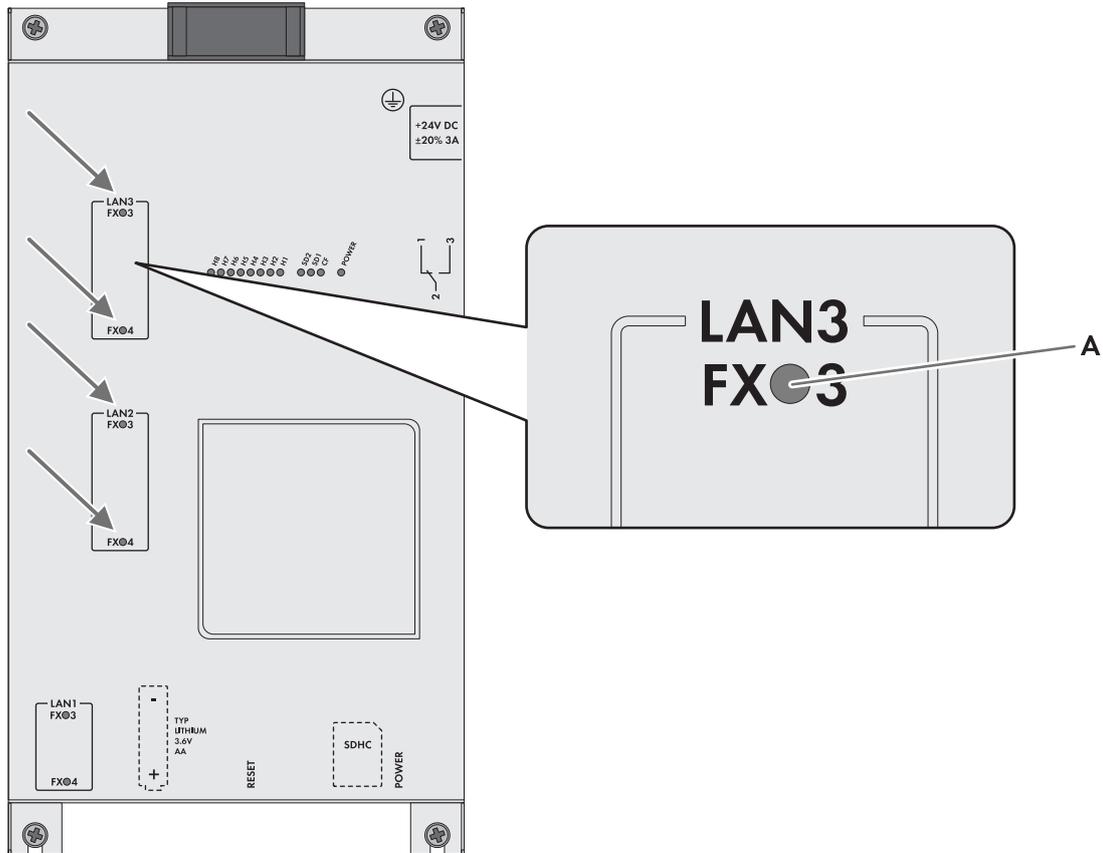


Figure 9: LEDs for the status of the optical fiber connection

Position	LED	Color	Status	Explanation
A	Link / Activity	green	on	Connection (Link) established.
			flashing	The SC-COM is transmitting or receiving data (Activity).
			off	No connection established.

3.3.4 User Interface

3.3.4.1 Design of the User Interface

Via the user interface, you can set the communication of the devices of your PV power plant, configure the inverter parameters and read off error messages and operating data.

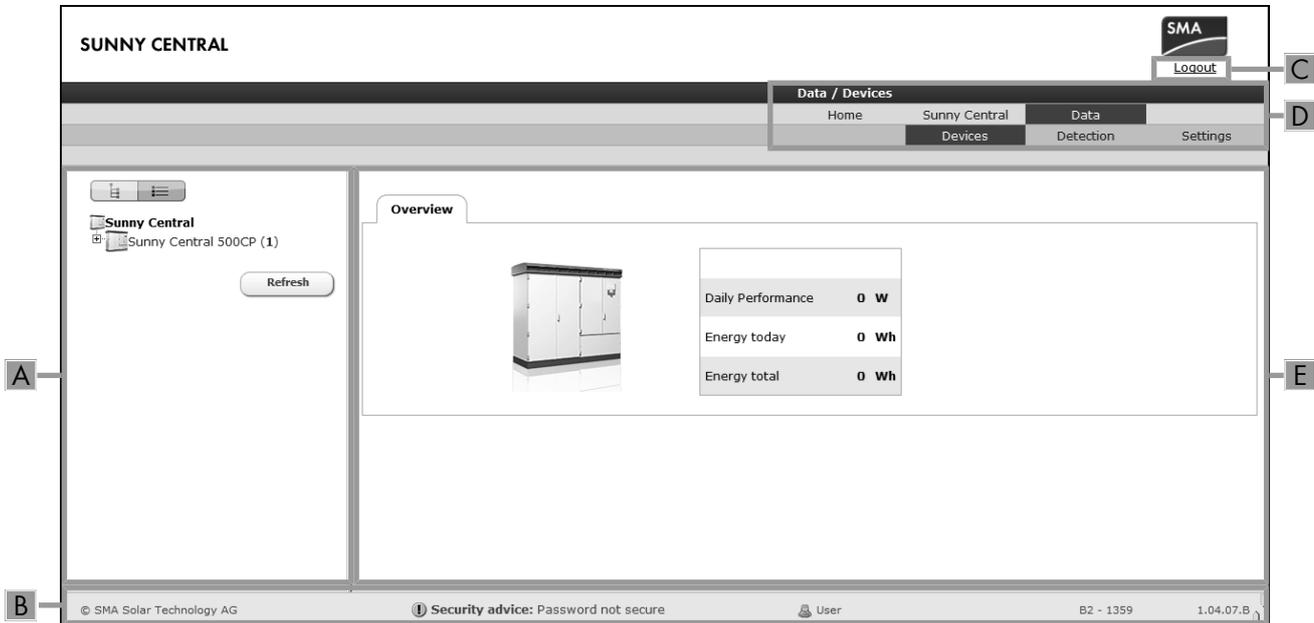


Figure 10: Design of the user interface (example)

Position	Designation
A	Tree view or device view
B	Status bar
C	Logout button
D	Navigation bar
E	Content area

3.3.4.2 Tree View and Device View

You can call up data of the individual devices of your PV power plant in the tree view or the device view. Depending on which view you have selected, the devices are sorted differently.

Symbol	Designation	Explanation
	Tree view	In the tree view, the user interface shows the devices in the order in which they are connected to the data bus.
	Device view	In the device view, the user interface shows all devices sorted by device type. The number shown in parentheses indicates the number of devices of a device type.

3.3.4.3 Status Symbols

Depending on the status of the device communication, the device symbols are displayed in the tree or device view with various status symbols.

Symbol	Explanation
	The inverter is ready for operation.
	There is an error in the inverter.
	An error has occurred in the communication with the inverter.

3.4 Symbols on the Product

The following gives an explanation of all the symbols found on the inverter and on the type label.

Symbol	Designation	Explanation
	CE marking	The product complies with the requirements of the applicable EU directives.
	Protection class I	All electrical equipment is connected to the grounding conductor system of the product.
	Degree of protection IP54	The product is protected against interior dust deposits and splashing water from all angles.
	Beware of a danger zone	This warning symbol indicates a danger zone. Be particularly vigilant and cautious when working on the product.
	Beware of dangerous voltage	The product operates at high voltages. All work on the product must be carried out by qualified persons only.
	Beware of hot surface	The product can get 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.
	Use hearing protection.	The product generates loud noises. When working on the product, wear hearing protection.
	Observe the documentation.	Observe all documentation supplied with the product.

4 Disconnecting and Reconnecting

4.1 Safety When Disconnecting and Reconnecting Voltage Sources

⚠ DANGER

Danger to life from electric shock due to live voltage

High voltages are present in the live components of the product. Touching live components results in death or serious injury due to electric shock.

- Wear suitable personal protective equipment for all work on the product.
- Do not touch any live components.
- Observe all warning messages on the product and in the documentation.
- Observe all safety information of the module manufacturer.
- After switching off the inverter, wait at least 15 minutes before opening it to allow the capacitors to discharge completely (see Section 4.2, page 26).

⚠ DANGER

Danger to life due to electric shock in case of a ground fault

If there is a ground fault, components that are supposedly grounded may in fact be live. Touching live parts will result in death or serious injury due to electric shock.

⚠ CAUTION

Risk of burns due to hot components

Some components of the product can get very hot during operation. Touching these components can cause burns.

- Observe the warnings on all components.
- During operation, do not touch any components marked with such warnings.
- After switching off the product, wait until any hot components have cooled down sufficiently.
- Wear suitable personal protective equipment for all work on the product.

4.2 Disconnecting the Inverter

4.2.1 Switching off the Inverter

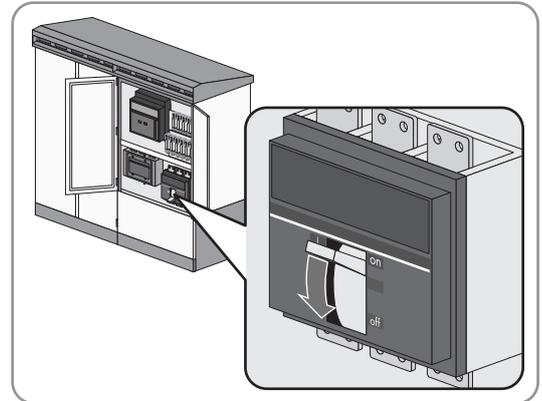
1. Turn the key switch to **Stop**.
2. Remove the key. This will protect the inverter from inadvertent reconnection.
3. Wait 15 minutes before opening the doors. This allows the inverter capacitors to discharge.

4.2.2 Disconnecting the DC Side

1. Switch off the inverter (see Section 4.2.1, page 26).
2. Disconnect all poles of the DC voltage in the DC main distribution or DC subdistribution (see documentation of the main or subdistribution).
3. Ensure that the DC switchgear in the inverter is open.
4. Ensure that no voltage is present on the load side of the DC switchgear.
5. Cover or isolate any adjacent live components.
6. Remove the protective covers over the fuses.
7. Remove all fuses and disconnection blades from all fuse holders of the inverters. Use an LV/HRC fuse extractor.

4.2.3 Disconnecting the AC Side

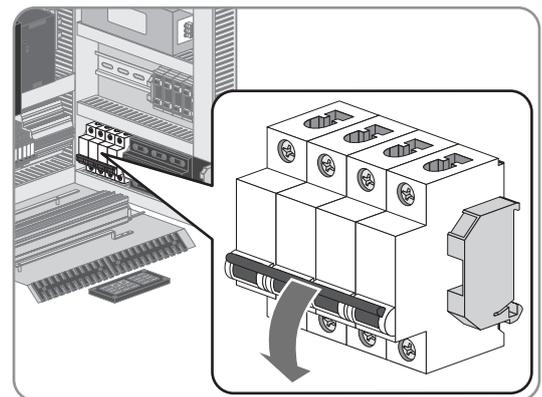
1. Switch off the inverter (see Section 4.2.1, page 26).
2. Disconnect the DC side (see Section 4.2.2, page 26).
3. Externally disconnect the AC voltage of the MV transformer.
4. Switch off the AC disconnection unit in the inverter.



5. Ensure that no voltage is present.
6. Cover or isolate any adjacent live components.

4.2.4 Disconnecting the Supply Voltage at the Inverter from Voltage Sources

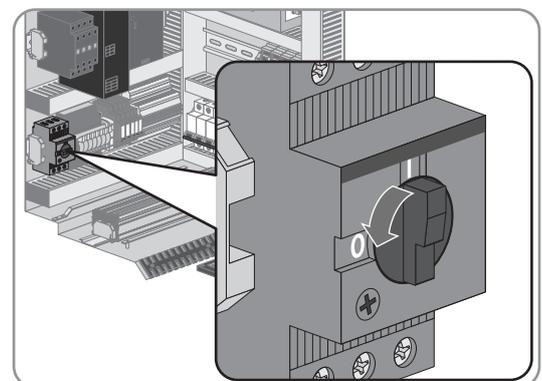
1. If the supply voltage is only to be disconnected upstream from the circuit breaker, switch the circuit breaker of the supply voltage off.



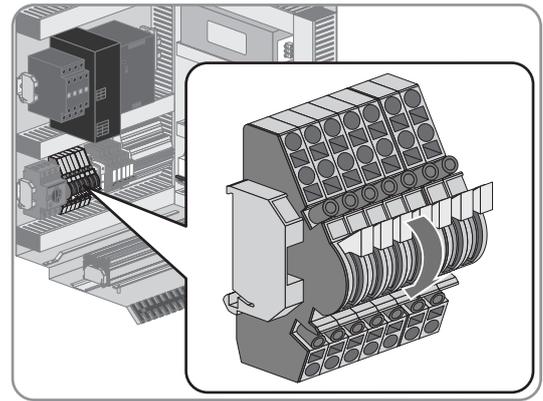
2. If the supply voltage is also to be disconnected downstream from the supply voltage circuit breaker, switch the external circuit breaker of the supply voltage off.

Tip: The external circuit breaker of the supply voltage is usually located in a subordinate distribution station.

3. Disconnect any additional external voltage.
4. Switch the motor-protective circuit-breakers of the grid monitoring off.



5. Open the measurement and disconnect terminals.

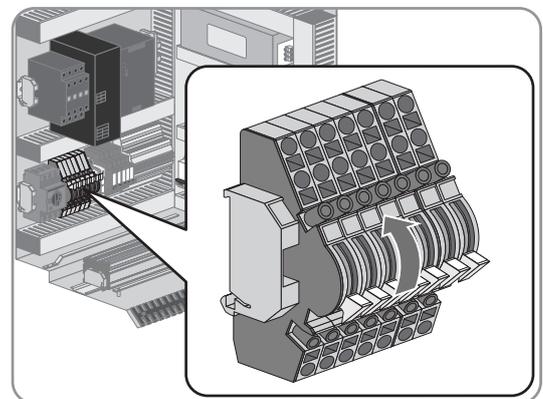


6. Ensure that no voltage is present.
7. Cover or isolate any adjacent live components.

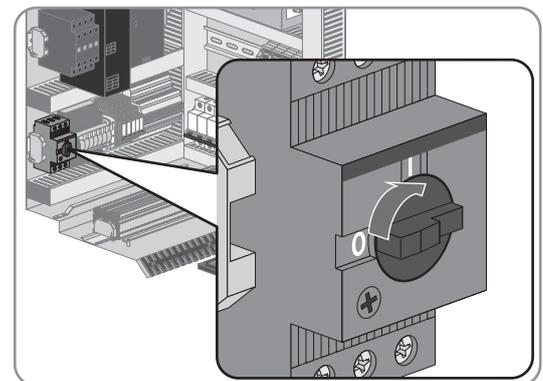
4.3 Reconnecting the Inverter

4.3.1 Reconnecting the Supply Voltage at the Inverter

1. Close the measurement and disconnect terminals.



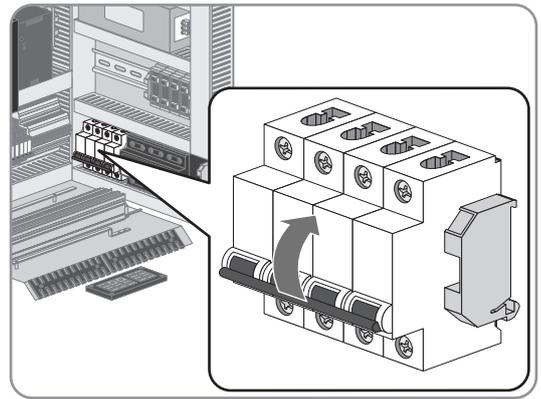
2. Switch on the motor-protective circuit-breakers of the grid monitoring.



3. Connect any additional external voltage.
4. If the supply voltage has been disconnected downstream from the circuit breaker, switch the external circuit breaker of the supply voltage on.

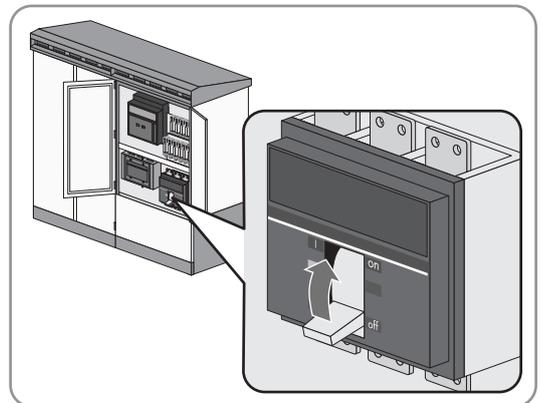
Tip: The external circuit breaker of the supply voltage is usually located in a subordinate distribution station.

5. If the supply voltage has been disconnected upstream from the circuit breaker, switch the circuit breaker of the supply voltage on.



4.3.2 Reconnecting the AC Side

1. Reconnect the supply voltage and external voltages (see Section 4.3.1, page 28).
2. Reconnect the AC voltage of the MV transformer.
3. Switch on the AC disconnection unit in the inverter.



4.3.3 Reconnecting the DC Side

1. Insert all fuses and disconnection blades into all fuse holders of the inverter. Use an LV/HRC fuse extractor.
2. Screw on the protective covers over the fuses (torque: 5 Nm).
3. Switch on the DC voltage in the DC main distribution or DC subdistribution (see documentation of the main or subdistribution).

4.3.4 Restarting the Inverter

- Turn the key switch to **Start**.

5 Troubleshooting

5.1 Safety during Troubleshooting

⚠ DANGER

Danger to life from electric shock due to high voltages on the product

High voltages can be present on the product under fault conditions. Touching live components results in death or serious injury due to electric shock.

- Observe all safety information when working on the product.
- Wear suitable personal protective equipment for all work on the product.
- If you cannot remedy the disturbance with the help of this document, contact the Service (see Section 9 "Contact", page 68).

⚠ WARNING

Danger to life from electric shock due to live external supply voltage

When using an external supply voltage, even after disconnecting the inverter, there may still be lethal voltages present in cables. Touching live components can result in death or serious injury due to electric shock.

- Disconnect the external supply voltage.

⚠ WARNING

Hearing impairment due to high-frequency noises of the product

The product generates high-frequency noises during operation. This can result in hearing impairment.

- Wear hearing protection.

⚠ CAUTION

Risk of burns due to hot components

Some components of the product can get very hot during operation. Touching these components can cause burns.

- Observe the warnings on all components.
- During operation, do not touch any components marked with such warnings.
- After switching off the product, wait until any hot components have cooled down sufficiently.
- Wear suitable personal protective equipment for all work on the product.

⚠ CAUTION

Danger of crushing and collision when carelessly working on the product

Carelessly working on the product could result in crushing injuries or collisions with edges.

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

5.2 Reading Off Disturbance Messages

5.2.1 Reading Off Error Messages via Touch Display

If an error occurs, a warning symbol is shown on the touch display.

Procedure:

- Select the  warning symbol.
- The touch display lists the error number, waiting time, error message and the necessary corrective measure to eliminate the disturbance.

5.2.2 Reading Off Disturbance Messages via the User Interface

1. Log into the user interface (see Section 7.4.1, page 66).
2. To display the error number, select the instantaneous value **ErrNo** in the instantaneous value view.
3. To display the delay time, select the instantaneous value **TmsRmg** in the instantaneous value view.
4. To display the error message, select the instantaneous value **Msg** in the instantaneous value view.
5. To display the corrective measure, select the instantaneous value **Dsc** in the instantaneous value view.

5.2.3 Displaying the Event Report**5.2.3.1 Enabling Automatic Read-Out of Events**

1. Log into the user interface (see Section 7.4.1, page 66).
2. Select **Sunny Central > Recording**.
3. In the field **Collect automatically fault logs**, select **yes**.
4. Select the button [**Save**].

5.2.3.2 Displaying and Downloading the Event Report

The event report keeps a log of various events, e.g. errors and warnings. All events can be downloaded in a CSV file. Upon delivery, the automatic transfer of the events is deactivated.

Procedure:

1. Log into the user interface (see Section 7.4.1, page 66).
2. In order to have the event report of the inverter displayed manually, proceed as follows:
 - Select **Sunny Central > Recording**.
 - In the field **Manually requesting fault memory**, select [**Request**].
 - In the field **Manually requesting event memory**, select [**Request**].
3. Select **Sunny Central > Events**.
4. To download the events as CSV file, carry out the following steps:
 - Select the button [**Download**].
 - Choose the save location.
 - Select the button [**Save**].

5.3 Acknowledging Disturbance Messages**5.3.1 Acknowledging Disturbance Messages via the Key Switch**** Dealing with disturbances**

Disturbance messages should only be acknowledged once the underlying causes have been eliminated.

If the causes of the disturbance have not been eliminated, the disturbance will still be detected after acknowledgment and the disturbance message will reappear.

Procedure:

1. If an insulation error has occurred, switch the insulation monitoring device back on.
2. Turn the key switch switch to **Stop** and then back to **Start** after two seconds.

5.3.2 Acknowledging Disturbance Messages via the User Interface

i Dealing with disturbances

Disturbance messages should only be acknowledged once the underlying causes have been eliminated.

If the causes of the disturbance have not been eliminated, the disturbance will still be detected after acknowledgment and the disturbance message will reappear.

You will only be able to acknowledge error messages via the user interface after entering the installer password.

Procedure:

1. If an insulation error has occurred, switch the insulation monitoring device back on.
2. Log into the user interface (see Section 7.4.1, page 66).
3. Select the parameter **Ackn** in the device displaying the error, and set to **Ackn**.
4. Select the button [**Save**].

5.4 Remedial Action in Case of Disturbances

5.4.1 Inverter Behavior in Case of Disturbances

If a disturbance occurs during operation, this may be caused by a warning or an error.

There are two levels assigned to each disturbance which influence the display and system behavior. Only in the case of certain disturbances will the inverter behavior differ depending on the level. The level is increased from 1 to 2 if the disturbance occurs five times within two hours or without interruption for two hours.

Inverter behavior in the disturbance levels 1 and 2:

- **Waiting time**

The inverter switches to the operating state "Disturbance" and opens the AC contactor and DC switchgear. The inverter does not feed into the grid for the defined waiting time.

The waiting time specifies how long the disturbance will be shown on the touch display and saved as a disturbance. Once the waiting time has elapsed, the disturbance is no longer shown on the touch display. The inverter then checks whether the cause of the disturbance has been rectified.

If the cause of the disturbance still exists after the waiting time has expired or the disturbance has been acknowledged, the inverter remains in the operating state "Disturbance."

- **Waiting for acknowledgement**

The inverter switches to the operating state "Disturbance" and opens the AC contactor and DC switchgear. The inverter does not feed in until the disturbance is acknowledged.

The cause of the disturbance must be detected on-site. To this end, read off the fault memory and event messages of the inverter and note down the error numbers.

The cause of the disturbance must be remedied. You will find the corrective measures on the following pages. For further information, contact us (see Section 9, page 68).

It must be ensured that the inverter and its components are in a proper and safe condition. For this purpose, a visual inspection should be carried out with special attention to discolorations, contaminations and signs of wear.

The disturbance may be acknowledged only after the elimination of all causes and the completion of the visual inspection.

Once the disturbance has been acknowledged, it is no longer shown on the touch display. The inverter then checks whether the cause of the disturbance has been rectified.

If the disturbance is no longer pending, it is deleted from the memory. If the cause of the disturbance still exists after the disturbance has been acknowledged, the inverter remains in the operating state "Disturbance."

- **Day change**

The inverter switches to the operating state "Disturbance" and opens the AC contactor and DC switchgear. The inverter does not feed in.

The disturbance is automatically reset when the day changes. Once the disturbance has been reset, it is no longer shown on the touch display. The inverter then checks whether the cause of the disturbance has been rectified.

If the disturbance is no longer pending, it is deleted from the memory. If the cause of the disturbance still exists after the day has changed or the disturbance has been acknowledged, the inverter remains in the operating state "Disturbance".

- **System-specific**

The inverter switches to the operating state "Disturbance" and opens the AC contactor and DC switchgear. The inverter does not feed in. How long the inverter remains in this state depends on the system-specific influencing factors.

Once the time has elapsed, the disturbance is no longer shown on the touch display. The inverter then checks whether the cause of the disturbance has been rectified. If the disturbance is no longer pending, it is deleted from the memory. If the cause of the disturbance still exists after the disturbance has been acknowledged, the inverter remains in the operating state "Disturbance."

- **Warning**

A warning does not affect inverter behavior. The cause of the warning must be determined and remedied.

In the operating state "Disturbance", the touch display shows a warning symbol, error number, waiting time, error message and the required measure to eliminate the disturbance message.

Once the cause of the disturbance has been rectified and the disturbance is no longer displayed, it is deleted from the fault memory. To view previous disturbances after they have been deleted from the fault memory, an event report is filed on the SD memory card. The event report logs the time and type of disturbance. The event report can also be displayed on the user interface.

Depending on the type of disturbance, a reset may be performed. When this happens, the relays are checked and the supply voltage of the control system is switched off. This process takes less than one minute. While the control system is booting, the regular waiting times for grid monitoring are complied with.

5.4.2 Content and structure of the error tables

You will find the following information in the error tables in the following sections:

Error no.	Explanation	A		B		Corrective measures
		S1	S2	R		
1301	Left-hand rotating magnetic field is connected.	30 s	Q	-		• Check phase position.
3803	DC current of PV array is too high.	1 min	D	x		• Check DC input current.
0104	Grid voltage is too high.	W	C	-		• Check grid voltage.

Position	Explanation
A	Behavior of the inverter: disturbance level S1, disturbance level S2 <ul style="list-style-type: none"> • s / min: waiting time • C: system-specific • D: day change • Q: waiting for acknowledgement • W: warning
B	Reset

5.4.3 Error Numbers 01xx to 13xx - Disturbance on the Utility Grid

After a grid failure, the inverter monitors the utility grid for a specific period before reconnecting. When the inverter monitors the utility grid after a grid error, the grid monitoring time is complied with. Certain errors, such as grid errors, cause the inverter to shut down. In this case, the instantaneous value **TmsRmg** indicates the time for which the inverter monitors the utility grid before reconnecting. This grid monitoring time can be defined in parameter **GdErrTm**.

Error no.	Explanation	Inverter behavior			Corrective measures
		S1	S2	R	
0103*	Grid voltage is too high. Overvoltage detected by redundant monitoring.	30 s	30 s	-	<ul style="list-style-type: none"> • Check the grid voltage. • Check grid connections. • Check stability of the utility grid.
0104*	Grid voltage is too high. Overvoltage detected by standard monitoring.	C	C	-	<ul style="list-style-type: none"> • Make sure the external fuses work properly. • Make sure the AC cable connections are tight.
0203*	Grid voltage is too low. Undervoltage detected by redundant monitoring.	30 s	30 s	-	
0204*	Grid voltage is too low. Undervoltage detected by standard monitoring.	30 s	30 s	-	
0205*	Not permitted grid frequency change or grid synchronization not possible	30 s	30 s	-	

Error no.	Explanation	Inverter behavior			Corrective measures
		S1	S2	R	
0404*	Frequency change per second too high for grid operation	30 s	30 s	-	-
0502*	Power frequency is too low. Power frequency disturbance detected by standard monitoring.	30 s	30 s	-	<ul style="list-style-type: none"> • Check power frequency. • Check the display of the grid monitoring relay.
0503*	Power frequency is too high. Power frequency disturbance detected by standard monitoring.	30 s	30 s	-	<ul style="list-style-type: none"> • Make sure the fuses in the load circuit function properly.
0504*	Power frequency is too low. Power frequency disturbance detected by redundant monitoring.	30 s	30 s	-	
0505*	Power frequency is too high. Power frequency disturbance detected by redundant monitoring.	30 s	30 s	-	
0506*	The inverter has detected a stand-alone grid and has disconnected from the utility grid.	W	W	-	<ul style="list-style-type: none"> • Check power frequency.
0801*	One line conductor of the utility grid has failed.	30 s	30 s	-	<ul style="list-style-type: none"> • Check the grid voltage. • Make sure the external fuses work properly. • Make sure the AC cable connections are tight.
0802*					
1301	Left-hand rotating magnetic field is connected.	30 s	Q	-	<ul style="list-style-type: none"> • Check the phase position. • Make sure all fuses are switched on.
1500	The conditions for grid reconnection have not yet been reached after a grid error.	W	W	-	<ul style="list-style-type: none"> • Check the power frequency and grid voltage.

* Depending on the parameterization, the disturbance message may have to be acknowledged manually.

5.4.4 Error Numbers 34xx to 40xx - Disturbance on the PV Array

Error no.	Explanation	Inverter behavior			Corrective measures
		S1	S2	R	
3403	PV array voltage is too high.	15 min	30 min	-	<ul style="list-style-type: none"> • Check the DC voltage. • Check the module wiring and system design.
3404	Open-circuit voltage is too high. Disturbance detected by standard monitoring.	15 min	30 min	-	
3406	The DC voltage is too high.	15 min	30 min	-	

Error no.	Explanation	Inverter behavior			Corrective measures
		S1	S2	R	
3501	The insulation monitoring device has measured a too low grounding resistance.	C	C	-	<ul style="list-style-type: none"> • Check the PV array for ground faults.
3502	The GFDI has tripped.	C	C	-	<ul style="list-style-type: none"> • Check the PV array for ground faults.
3504	The insulation monitoring device has detected an insulation error. If the parameter IsoErrIgn is set to On , this error is ignored.	W	W	-	<ul style="list-style-type: none"> • Check the PV array for ground faults.
3507	A ground fault has occurred on the ungrounded terminal of the PV array.	Q	Q	-	<ul style="list-style-type: none"> • Check the PV array for ground faults.
3510	The inverter has detected an insulation error on the inverter bridge.	Q	Q	-	<ul style="list-style-type: none"> • Check the PV array for ground faults.
3511	The inverter has detected an insulation error.	W	W	-	<ul style="list-style-type: none"> • Check the PV array for ground faults.
3512	The Remote GFDI has detected a permanent ground fault.	Q	Q	-	<ul style="list-style-type: none"> • Check the PV array for ground faults.
3515	A ground fault detected by Soft Grounding has been ignored.	W	W	-	<ul style="list-style-type: none"> • Check the PV array for ground faults.
3517	Insulation measuring is being performed.	W	W	-	-
3520	An insulation fault has occurred and has been fixed.	W	W	-	-
3601	Leakage current to ground has occurred in the PV array or the threshold defined in parameter RisoCtlWarn has been reached.	W	W	-	<ul style="list-style-type: none"> • Check the grounding and equipotential bonding. • Check the module wiring and system design. • Check the parameter RisoCtlWarn.
3803	The PV array current is too high.	1 min	D	-	<ul style="list-style-type: none"> • Check the DC input current. • Check the module wiring and system design.
4003	Reverse currents detected in the PV array or DC connection polarity reversed.	30 s	Q	-	<ul style="list-style-type: none"> • Check the PV modules for short circuits. • Check the module wiring and system design. • Check the DC terminals for correct polarity. • Check the functionality of the entire string.

5.4.5 Error Numbers 6xxx to 9xxx - Disturbance on the Inverter

Error no.	Explanation	Inverter behavior			Corrective measures
		S1	S2	R	
6002	Calibration data cannot be loaded.	Q	Q	-	• Contact the SMA Service Line.
6113	Data block cannot be loaded from EEPROM or channel list has changed (e.g. after firmware update).	W	W	-	• Contact the SMA Service Line.
6115	Setting of hardware thresholds on D/A converters is not possible.	5 min	5 min	x	• Contact the SMA Service Line.
6116	Real-time clock has not initialized.	W	W	-	• Contact the SMA Service Line.
6117	Device address not recognized.	5 min	5 min	x	• Contact the SMA Service Line.
6119	Data structure for communication between operation control unit and digital signal processor is invalid.	5 min	5 min	x	• Contact the SMA Service Line.
6120	Watchdog tripping error	30 s	W	-	• Contact the SMA Service Line.
6121	No response from watchdog	30 s	W	-	• Contact the SMA Service Line.
6122	Ten internal monitoring errors have occurred in succession.	W	5 min	-	• Contact the SMA Service Line.
6128	General error	5 min	5 min	x	• Contact the SMA Service Line.
6404	Overcurrent at line conductor L1, L2 or L3	C	Q	x	• Contact the SMA Service Line.
6405	Overvoltage in the DC link of the inverter bridge	30 s	5 min	-	• Contact the SMA Service Line.
6410	24 V supply voltage is invalid.	5 min	5 min	x	• Contact the SMA Service Line.
6417	15 V supply voltage is invalid.	5 min	5 min	x	• Contact the SMA Service Line.
6418	Overtemperature of the inverter bridge	5 min	15 min	-	• Contact the SMA Service Line.
6422	Inverter bridge in undefined state	30 s	5 min	-	• Contact the SMA Service Line.
6423	Overtemperature in the switch cabinet	5 min	30 min	-	• Contact the SMA Service Line.
6425	Synchronization error with utility grid	30 s	5 min	x	• Contact the SMA Service Line.
6427	Sensor error of DC voltage measurement	30 s	C	-	• Contact the SMA Service Line.
6440	The MV transformer is no longer hermetically sealed.	30 s	5 min	-	• Check the MV transformer.

Error no.	Explanation	Inverter behavior			Corrective measures
		S1	S2	R	
6441	Sensor error during measurement of DC voltage	30 s	30 s	-	• Contact the SMA Service Line.
6443	Unspecified error in digital signal processor	30 s	-	x	• Contact the SMA Service Line.
6447	Self-test of inverter bridge failed	Q	Q	-	• Contact the SMA Service Line.
6448	Insulation monitoring provides non-permitted values	W	W	-	• Check insulation monitoring.
6451	Measured AC voltage of the inverter is less than utility grid voltage.	W	W	-	• Contact the SMA Service Line.
6452	Measured AC voltage of the utility grid is less than inverter voltage.	W	W	-	• Contact the SMA Service Line.
6453	AC voltage of grid limit monitoring is faulty.	W	W	-	• Contact the SMA Service Line.
6454	AC current is faulty.	W	W	-	• Contact the SMA Service Line.
6455	AC voltage is faulty.	W	W	-	• Contact the SMA Service Line.
6456	Pre-charging circuit of DC link is defective.	W	W	-	• Contact the SMA Service Line.
6457	Capacitor self-test has failed.	Q	Q	-	• Contact the SMA Service Line.
6461	Insulation monitoring device has not adopted threshold.	15 min	15 min	x	• Check the insulation monitoring device and cabling.
6471	Online capacitor self-test has failed.	Q	Q	-	• Contact the SMA Service Line.
6472	Endless loop between online and offline capacitor test	Q	Q	-	• Contact the SMA Service Line.
6486	Inadmissible deviations between AC power and DC power has been detected.	W	W	-	-
6487	AC ground fault has been detected.	Q	Q	-	• Check the overvoltage protection. • Contact the SMA Service Line.
6501	Interior temperature of inverter is too high.	30 s	1 min	-	• Check function of the fans. • Clean the fans.
6502	Temperature of inverter bridge is too high.	30 s	1 min	-	• Clean clogged fan inlets and ventilation plates.
6508	Outside temperature is too high.	30 s	1 min	-	
6512	Minimum operating temperature not reached	W	W	-	-

Error no.	Explanation	Inverter behavior			Corrective measures
		S1	S2	R	
6605	The fast stop was tripped due to overtemperature in the switch cabinet.	30 s	1 min	-	<ul style="list-style-type: none"> Contact the SMA Service Line.
7001	Cable break or short circuit at inverter temperature sensor	W	W	-	<ul style="list-style-type: none"> Check the wiring of the temperature sensor. Contact the SMA Service Line.
7002		W	W	-	
7004		W	W	-	
7006		W	W	-	
7501	Interior fan is defective.	W	W	-	<ul style="list-style-type: none"> Check function of the fans. Clean the fans. Clean clogged fan inlets and ventilation plates.
7502		W	W	-	
7503	Inverter bridge fan is defective.	W	W	-	
7507	Motor-protective circuit breaker of fan has tripped.	W	W	-	
7510	Interior fan is defective.	W	W	-	
7600	Communication between touch display and communication unit is interrupted. The error number appears on the display only.	W	W	-	<ul style="list-style-type: none"> Check cabling between touch display and communication unit. Contact the SMA Service Line.
7601	Internal inverter error	30 s	1 min	x	<ul style="list-style-type: none"> Contact the SMA Service Line.
7602	Internal communication error has occurred or communication is interrupted.	30 s	1 min	x	<ul style="list-style-type: none"> Contact the SMA Service Line.
7605		30 s	1 min	x	
7704	Faulty switching status of the DC switchgear	30 s	Q	-	<ul style="list-style-type: none"> When disconnecting the inverter, check that all motor-driven circuit breaker switches are set to the OFF position. If not, set all switches to OFF. Contact the SMA Service Line.
7706	The AC disconnection unit is open or was tripped.	30 s	Q	-	<ul style="list-style-type: none"> Contact the SMA Service Line.
7707	Faulty switching status of the AC disconnection unit	30 s	Q	-	<ul style="list-style-type: none"> Contact the SMA Service Line.
7708	Faulty switching status of Remote GFDI	W	W	-	<ul style="list-style-type: none"> Contact the SMA Service Line.
7709	90% of switch cycles of the DC switchgear reached.	10 s	10 s	-	<ul style="list-style-type: none"> Contact the SMA Service Line.
7710	100% of switch cycles of the DC switchgear reached.	30 s	30 s	-	<ul style="list-style-type: none"> Contact the SMA Service Line.

Error no.	Explanation	Inverter behavior			Corrective measures
		S1	S2	R	
7714	Maximum number of GFDI switch cycles reached.	30 s	30 s	-	<ul style="list-style-type: none"> Replace the GFDI.
7801	The surge arrester is defective or the back-up fuse of the surge arrester was tripped.	W	W	-	<ul style="list-style-type: none"> Check the surge arrester. Check the back-up fuse of the surge arrester.
7901	Reverse current has occurred in PV array.	1 min	D	x	<ul style="list-style-type: none"> Contact the SMA Service Line.
8701	External active power setpoints are smaller than 2 mA and therefore invalid. The last valid value or, after a day change, Pmax is used. Once valid setpoints are available again, these will be used.	W	W	-	<ul style="list-style-type: none"> Contact the SMA Service Line.
8702	Several digital active power setpoints are available.	W	W	-	<ul style="list-style-type: none"> Contact the SMA Service Line.
8703	Power factor of the external reactive power setpoint is invalid.	W	W	-	<ul style="list-style-type: none"> Contact the SMA Service Line.
8704	External active and reactive power setpoints are invalid.	W	W	-	<ul style="list-style-type: none"> Contact the SMA Service Line.
9008	Doors have been opened during operation.	30 s	1 min	-	<ul style="list-style-type: none"> Contact the SMA Service Line.
9009	Fast stop has tripped.	30 s	30 s	-	<ul style="list-style-type: none"> Eliminate error and switch fast stop back on.
9013	This relates to a grid management shutdown. The error is reset by a signal from the grid operator or from the safety system of the grid interconnection point.	30 s	30 s	-	<ul style="list-style-type: none"> Eliminate error and switch fast stop back on.
9019	Defective fast stop	30 s	C	-	<ul style="list-style-type: none"> Check the fast stop cabling.

5.4.6 Displaying Disturbance Messages for Active Power Limitation

The instantaneous value **P-WModFailStt** displays errors or warnings associated with active power limitation.

Procedure:

1. Log into the user interface (see Section 7.4.1, page 66).
2. Select the instantaneous value **P-WModFailStt**.

Display	Cause and corrective measures
Off	No mode for active power limitation has been selected.
OK	A mode for active power limitation has been selected and no error is present.

Display	Cause and corrective measures
ComFail	<p>The mode WCtlCom has been selected and the expected signal with a valid active power limitation has been absent for at least five minutes.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Ensure that the communication units can be accessed via the Internet. • Ensure that the communication units are connected correctly. • Ensure that the cabling between the communication units is ok.
AnInFail	<p>The mode WCnstNomAnIn has been selected and the value measured at the analog input is less than 2 mA.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Make sure the cable is correctly connected to the analog input.
ComInvalid	<p>The mode WCtlCom has been selected and there is invalid content in the power setpoint information.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Check the power specification settings.

5.4.7 Displaying Disturbance Messages for the Reactive Power Setpoint

The instantaneous value **Q-VArModFailStt** displays errors or warnings relating to the reactive power setpoint.

Procedure:

1. Log into the user interface (see Section 7.4.1, page 66).
2. Select the instantaneous value **Q-VArModFailStt**.

Display	Cause and corrective measure
Off	No mode for specifying the reactive power setpoint has been selected.
OK	A mode for specifying the reactive power setpoint has been selected and no error is present.
ComFail	<p>The mode VArCtlCom or PFCtlCom has been selected and the expected signal with a valid reactive power setpoint has been absent for at least five minutes.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Ensure that the communication units can be accessed via the Internet. • Ensure that the communication units are connected correctly. • Ensure that the cabling between the communication units is ok.
AnInFail	<p>The mode VArCnstNomAnIn or PFCnstAnIn has been selected and the value measured at the analog input is less than 2 mA.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Make sure the cable is correctly connected to the analog input.
ComInvalid	<p>The mode VArCtlCom or PFCtlCom has been selected and there is invalid content in the power setpoint information.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> • Check the power specification settings.

6 Maintenance

6.1 Safety during Maintenance

⚠ DANGER

Danger to life from electric shock due to live voltage

High voltages are present in the live components of the product. Touching live components results in death or serious injury due to electric shock.

- Wear suitable personal protective equipment for all work on the product.
- Do not touch any live components.
- Observe all warning messages on the product and in the documentation.
- Observe all safety information of the module manufacturer.
- After switching off the inverter, wait at least 15 minutes before opening it to allow the capacitors to discharge completely (see Section 4.2, page 26).

NOTICE

Property damage due to dust intrusion and moisture penetration

Dust or moisture intrusion can damage the product and impair its functionality.

- Do not open the enclosure during rainfall or when humidity exceeds the specified thresholds. The humidity thresholds are: 15% to 95%.
- Only perform maintenance work when the environment is dry and free of dust.
- Operation of the product is only permitted when it is closed.
- Connect the external supply voltage after mounting and installing the product.
- If the installation or commissioning process is interrupted, mount all panels.
- Close and lock the enclosure.
- The product must always be closed for storage.
- Store the product in a dry and covered location.
- The temperature at the storage location must be in the specified range. The temperature range is: -25°C to $+70^{\circ}\text{C}$.

NOTICE

Damage to electronic components due to electrostatic discharge

Electrostatic discharge can damage or destroy electronic components.

- Observe the ESD safety regulations when working on the product.
- Wear suitable personal protective equipment for all work on the product.
- Discharge electrostatic charge by touching grounded enclosure parts or other grounded elements. Only then is it safe to touch electronic components.

6.2 Maintenance Schedule and Consumables

6.2.1 Notes on Maintenance Work

i Adverse ambient conditions reduce maintenance intervals

Location and ambient conditions influence the maintenance intervals. Note that cleaning and corrosion protection may be required more frequently depending on the conditions at the installation site.

- If the DC subdistribution is subject to adverse ambient conditions, it is recommended to shorten the maintenance intervals.
- SMA recommends an optical inspection every six months to determine the maintenance requirements.

i Maintenance report for maintenance

All maintenance work must be documented in a maintenance report. The maintenance report can be found in the download area at www.SMA-Solar.com.

i Consumables and maintenance materials

Only those consumables and maintenance materials not normally included in the standard equipment of an electrically qualified person are listed. It is taken for granted that standard tools and materials such as torque wrenches, one-contact voltage testers and wrenches will be available for all maintenance operations.

i Spare parts

Only original parts or parts recommended by SMA Solar Technology AG are to be used as spare parts when replacing components.

Spare parts can be identified via the reference designation and the circuit diagram. The spare-parts list includes the article numbers of each spare part. For information on a specific article number, contact us (see Section 9 "Contact", page 68).

6.2.2 Maintenance Work Every 24 Months

Required maintenance materials and tools:

- A suitable water-free, heat-resistant lubricant
- A testing device approved by the manufacturer of the AC disconnection unit, e.g. TT1 by ABB
- Talcum, petroleum jelly or wax for maintaining the seals
- Use touch-up sticks, paint brushes, cans of spray paint or 2K-PUR acrylic paint in the appropriate RAL color to repair small-area surface damage.
- Use touch-up paint or 2K-PUR acrylic paint in the appropriate RAL color to repair large-area surface damage.
- Use zinc plating with thick-layer passivation to repair damage on the zinc-plated steel frame in the base area, e.g. LZ-09. Observe the relevant instructions of the manufacturer.
- Abrasive cloth
- Degreaser
- A surge arrester testing device approved by the surge arrester manufacturer

Maintenance work depending on the condition of the inverter

Maintenance with DC voltage present

Task	See
Reading off error messages and warnings	Section 5.2, page 30
Checking the DC switchgear	Manufacturer documentation (see Section 1.7, page 7)*

Task	See
Checking the AC disconnection unit	Manufacturer documentation (see Section 1.7, page 7)*

* In deviation to the maintenance interval specified by ABB, the maintenance interval of 24 months stated in this documentation applies.

Maintenance under voltage-free conditions

Task	See
Perform the visual inspection	Section 6.4.2.1, page 51
Analyzing the temperature indicators	Section 6.4.2.2, page 51
Cleaning the ventilation plate	Section 6.4.2.3, page 53
Clean the air duct, ventilation grids and air intake.	Section 6.4.2.4, page 53
Checking the interior	Section 6.4.2.5, page 55
Checking the fuses/disconnection blades	Section 6.4.2.9, page 58
Checking the bolted connections	Section 6.4.2.10, page 58
Cleaning the heating elements of the low-temperature range option	Section 6.4.1.3, page 47
Check the labels	Section 6.4.2.11, page 59
Checking the inverter surface	Section 6.4.2.8, page 57

Maintenance work with supply voltage present

Task	See
Checking the DC switchgear	Manufacturer documentation (see Section 1.7, page 7)*
Check the fans	Section 6.4.1.1, page 45
Checking the heating element and the hygrostat	Section 6.4.1.2, page 46
Checking the heating element for low-temperature option	Section 6.4.1.4, page 48
Checking the function of the UPS	Section 6.4.1.5, page 50

* In deviation to the maintenance interval specified by ABB, the maintenance interval of 24 months stated in this documentation applies.

6.3 Repair Schedule and Spare Parts

6.3.1 Information on Repair Work

i Spare parts

Only original parts or parts recommended by SMA Solar Technology AG are to be used as spare parts when replacing components.

Spare parts can be identified via the reference designation and the circuit diagram. The spare-parts list includes the article numbers of each spare part. For information on a specific article number, contact us (see Section 9 "Contact", page 68).

6.3.2 Demand-Based Annual Repairs

Task	Interval
Replace key switch	In case of severe signs of wear
Replace surge arrester	If tripped
Replace labels on the enclosure	If illegible, defective or missing
Replace GFDI / ABB circuit breaker	After 100 trippings due to short circuit or after number of switching cycles: 7000 <ul style="list-style-type: none"> • Contact Service.
Replace Remote Switch Unit of the GFDI	Number of switching cycles: 7000 <ul style="list-style-type: none"> • Contact Service.

6.3.3 Repairs every 10 Years

Task	Comment
Replace 24 V power supply units	<ul style="list-style-type: none"> • Contact the Service (see Section 9, page 68).
Replace 24 V buffer modules	<ul style="list-style-type: none"> • Contact the Service (see Section 9, page 68).
Replace the fans of the AC disconnection unit	<ul style="list-style-type: none"> • Contact the Service (see Section 9, page 68).
Replace exterior key switch, front element and label	<ul style="list-style-type: none"> • Contact the Service (see Section 9, page 68).

6.3.4 Repairs every 12 Years

i Replacement intervals for order option "Q at Night"

The replacement intervals are halved for order option "Q at Night".

Task	Comment
Replace interior fan in the inverter cabinet	<ul style="list-style-type: none"> • Contact Service.
Replace the inverter bridge fan	<ul style="list-style-type: none"> • Contact Service.

6.4 Maintenance Work

6.4.1 Maintenance work with supply voltage present

6.4.1.1 Checking the Fans

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Procedure:

1. Switch the inverter to **Stop**.
 2. Connect the supply voltage (see Section 4.3.1, page 28).
- ☑ The fans start to run for a few moments.
- ✘ The fans do not start up?
- Please contact (see Section 9, page 68).

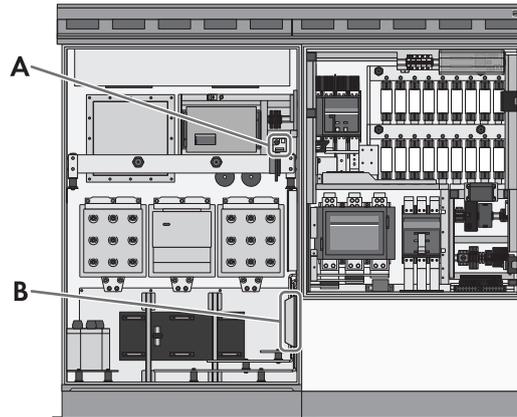
6.4.1.2 Checking the Heating Elements and Hygrostat

Figure 11: Position of the heating element and the hygrostat

Position	Designation
A	Hygrostat
B	Heating element

⚠ DANGER**Danger to life due to electric shock or electric arc if live components are touched**

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

⚠ CAUTION**Risk of burns due to hot components**

Some components of the product can get very hot during operation. Touching these components can cause burns.

- Observe the warnings on all components.
- During operation, do not touch any components marked with such warnings.
- After switching off the product, wait until any hot components have cooled down sufficiently.
- Wear suitable personal protective equipment for all work on the product.

Procedure:

1. Switch the inverter to **Stop**.
 2. Connect the supply voltage (see Section 4.3.1, page 28).
 3. Set the hygrostat to the minimum value. To do this, pull the selector switch out slightly.
- Tip: the hygrostat is adjusted correctly if the relay of the hygrostat emits an audible click.

4. Check whether the heating elements are radiating heat after a delay time of five minutes.
If the heating elements are not radiating heat, contact us (see Section 9 "Contact", page 68).
5. Reset the hygrostat to the initial value. To do this, press the selector switch back towards the hygrostat. The initial value of the hygrostat is indicated on the hygrostat.

6.4.1.3 Inverter with Low-Temperature Option: Cleaning the Heating Elements

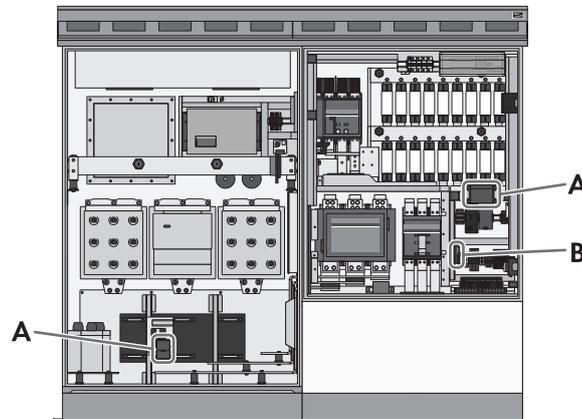


Figure 12: Position of the heating elements and the temperature control

Position	Designation
A	Heating element with low-temperature range option
B	Connection plug of the temperature control

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Procedure:

1. Disassemble the protective covers (see Section 7.1.2, page 63).
2. Remove dirt and dust from the heating elements.
3. Remove moisture.
4. Mount the protective covers (see Section 7.1.2, page 63).

6.4.1.4 Inverter with Low-Temperature Option: Checking the Heating Elements

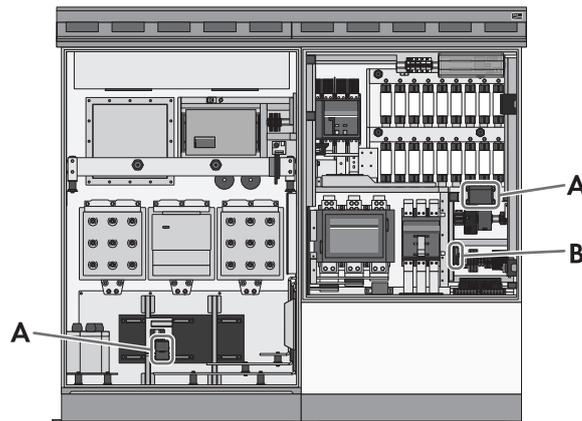


Figure 13: Position of the heating elements and the temperature control

Position	Designation
A	Heating element with low-temperature range option
B	Connection plug of the temperature control

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

⚠ CAUTION

Risk of burns due to hot components

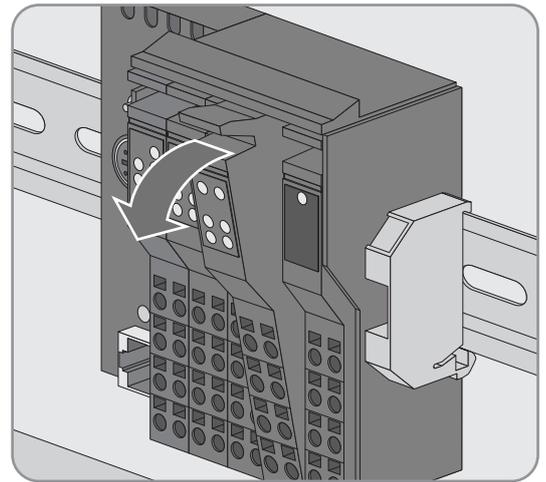
Some components of the product can get very hot during operation. Touching these components can cause burns.

- Observe the warnings on all components.
- During operation, do not touch any components marked with such warnings.
- After switching off the product, wait until any hot components have cooled down sufficiently.
- Wear suitable personal protective equipment for all work on the product.

Procedure:

1. Switch the inverter to **Stop**.
2. Disassemble the protective covers (see Section 7.1.2, page 63).
3. Connect the supply voltage (see Section 4.3.1, page 28).

4. Remove the connection plug of the temperature control.



☑ The inverter switches off with an audible click. After approximately 2 minutes, the inverter audibly switches the supply voltage off.

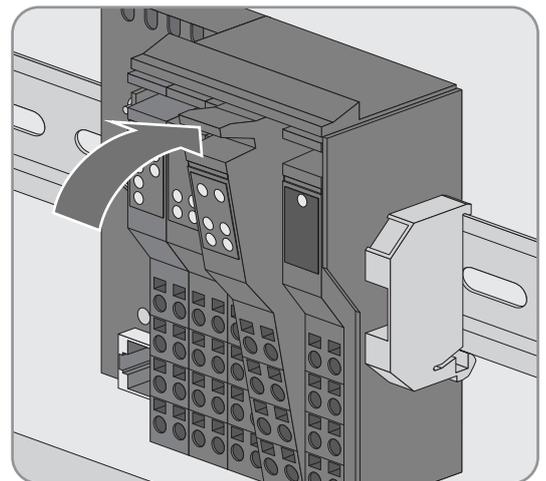
✘ There is no audible switching sound?

- Contact SMA Solar Technology AG.

5. Check whether the heating elements are radiating heat after a delay time of 5 minutes.

If the heating elements are not radiating heat, contact us (see Section 9 "Contact", page 68).

6. Insert the connection plug of the temperature control.



☑ The inverter switches the supply voltage on with an audible click. After approximately 2 minutes, the inverter again emits an audible switching sound.

✘ There is no audible switching sound?

- Contact SMA Solar Technology AG.

7. Mount the protective covers (see Section 7.1.2, page 63).

6.4.1.5 Checking the Function of the UPS

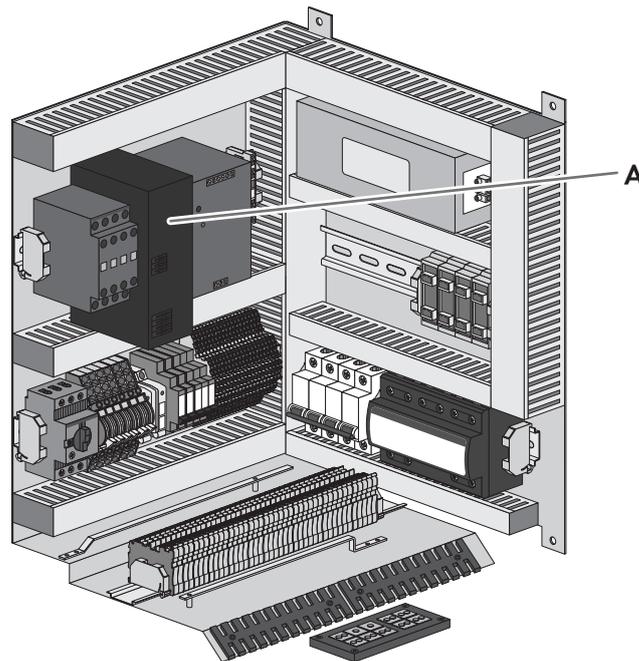


Figure 14: Position of the UPS

Position	Designation
A	Uninterruptible power supply (UPS)

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Procedure:

1. Switch the inverter to **Stop**.
2. Connect the supply voltage (see Section 4.3.1, page 28).
3. Measure the voltage at the supply voltage output between L1 and N.
 - The voltage is approximately 230 V.
 - Voltage deviates significantly?
 - Contact Service.
4. Measure the voltage at the supply voltage output of the UPS at **-X400** terminal 5 and **-X402** terminal 5.
 - The voltage is approximately 24 V.
 - Voltage deviates significantly?
 - Contact Service.

5. Disconnect the supply voltage (see Section 4.2.4, page 27).
6. Measure the time until the communication unit switches off.
 - ☑ The communication unit switches off after 15 seconds at the earliest.
 - ✘ The communication unit switches off earlier?
 - Contact SMA Solar Technology AG.

6.4.2 Maintenance Work in Disconnected State

6.4.2.1 Performing the Visual Inspection

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Procedure:

1. Check the inverter for visual defects such as discoloration, dirt, damage and scratches on the enclosure.
If visual defects are present, repair these immediately.
2. Ensure that there are no objects on or around the inverter that are flammable or that could otherwise endanger operational safety.

6.4.2.2 Analyzing the Temperature Indicators

Depending on the type of inverter bridge, the inverter cabinet contains 8 or 17 temperature indicators which monitor the temperature of the inverter bridges.

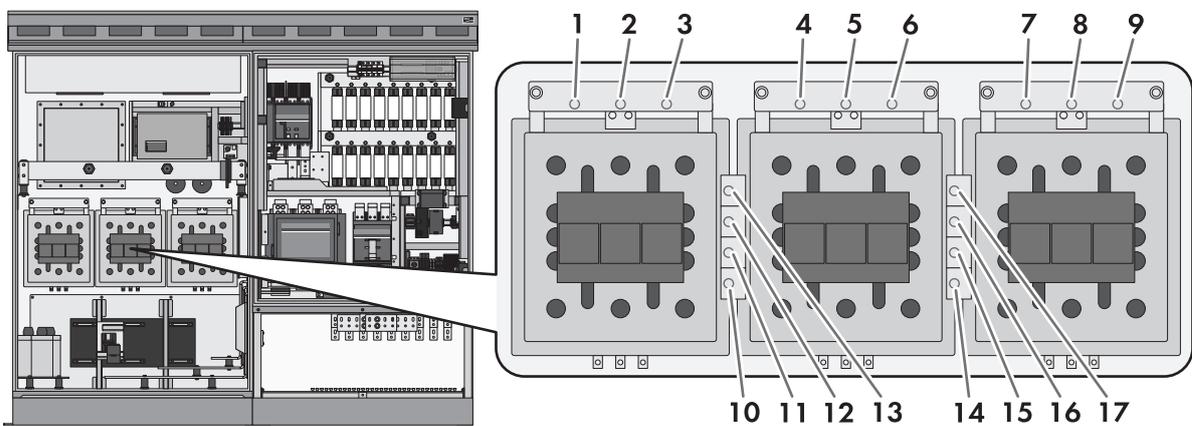


Figure 15: Position of the temperature indicators (example: inverter bridges with connection terminals at the upper end)

Position of the indicators	Type of inverter bridges	Number of indicators
1 to 17	with connection terminals at the upper end	17
10 to 17	without connection terminals at the upper end	8

If the temperature exceeds a value indicated on one of the indicator fields, that field will turn black.

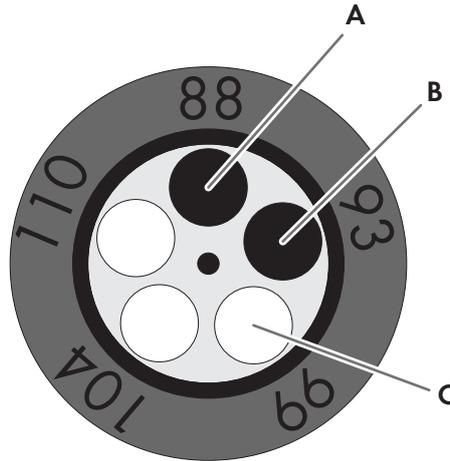


Figure 16: Values on an indicator (example)

Position	Description
A	The indicator field for 88 °C has turned black. The temperature has reached 88 °C.
B	The indicator field for 93 °C has turned black. The temperature has reached 93 °C. The value 93 must be entered in the protocol.
C	The indicator field for 99 °C is white. The temperature has not exceeded 99 °C.

Each time maintenance work is performed, the values of the temperature indicators must be read off and logged. The highest value of the indicators that turned black must be entered in the maintenance report. The interactive protocol "Temperature Indicators Analysis Protocol" can be downloaded at www.SMA-Solar.com.

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

⚠ CAUTION

Risk of burns due to hot components

Some components of the product can get very hot during operation. Touching these components can cause burns.

- Observe the warnings on all components.
- During operation, do not touch any components marked with such warnings.
- After switching off the product, wait until any hot components have cooled down sufficiently.
- Wear suitable personal protective equipment for all work on the product.

Requirement:

- The inverter must have been operated under full load for at least six hours before analyzing the values.

Procedure:

1. Ensure that the inverter is disconnected from all voltage sources.
2. Open the inverter cabinet.

3. Read off and log the values of each temperature indicator.
4. Analyze the results and take action if necessary:

Number of the indicator	Value of the indicator	Action
1 to 9	88	There is no need for action.
	93 or higher	Contact the Service (see Section 9 "Contact", page 68).
10 to 17	88 to 99	There is no need for action.
	104 or higher	Contact the Service (see Section 9 "Contact", page 68).

6.4.2.3 Cleaning the Ventilation Plate

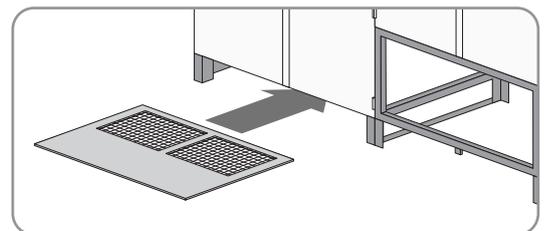
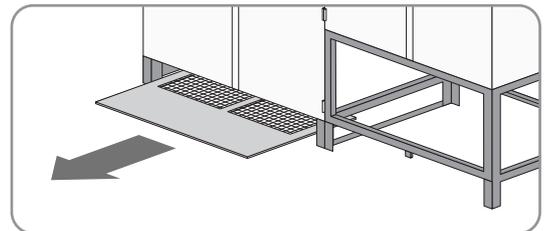
⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Procedure:

1. Disassemble the panels (see Section 7.1.1, page 62).
2. Pull the ventilation plate out of the inverter cabinet. Grip underneath the ventilation plate and press the middle part up while pulling it out.
3. Clean the ventilation plate with a brush or vacuum.
4. Slide the ventilation plate into the inverter cabinet. The ventilation grid in the ventilation plate must face the rear panel.



- The ventilation grid ends up flush with the inverter.
 - The ventilation plate will not go all the way in?
 - Grip the ventilation plate from underneath and press the middle part upwards while sliding it in.
5. Mount the panels (see Section 7.1.1, page 62).

6.4.2.4 Cleaning the Air Duct, Ventilation Grids and Air Intake

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

⚠ CAUTION**Danger of crushing due to heavy, unwieldy roof**

The inverter roof is heavy and bulky. If you try to move the roof on your own, you run a risk of having limbs crushed. Weight of the roof: 30 kg.

- Wear suitable personal protective equipment for all work on the product.
- Always have two persons disassemble and mount the roof.

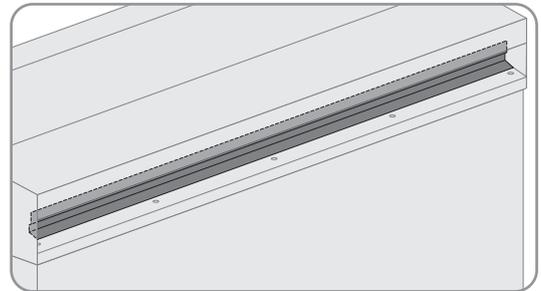
NOTICE**Property damage due to rupture of grounding conductors**

The components are connected to the inverter via the grounding conductor. If the roof is not disassembled correctly, the grounding conductors may be pulled out.

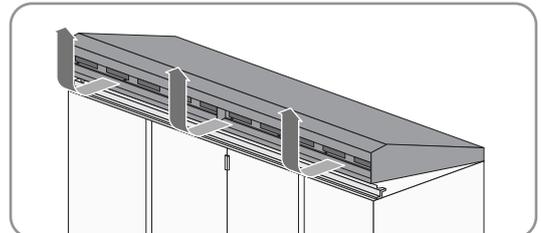
- Take care not to damage the grounding conductors during disassembly.

Procedure:

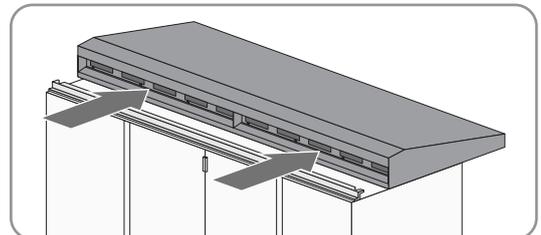
1. Disassemble the ventilation grids (see Section 7.1.3, page 64).
2. Vacuum the air duct from the outside or clean it with a brush.



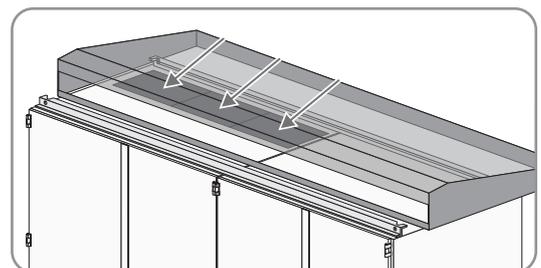
3. Vacuum the ventilation grids or clean them with a brush.
4. Check the ventilation grids for visible damage. Replace the ventilation grids, if required.
5. Pull the front edge of the roof forward and push upward.



6. Gently push the roof to the rear. In doing so, you push the roof out of the guide rails.

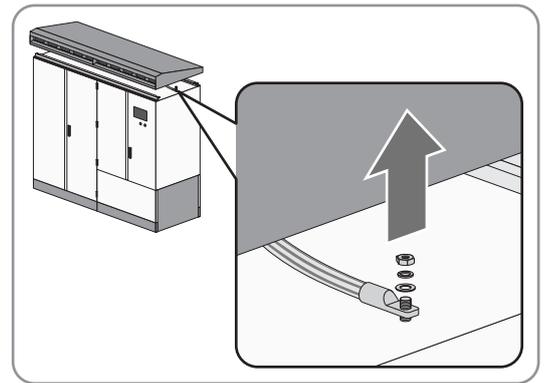


7. Check whether the air intake is soiled.



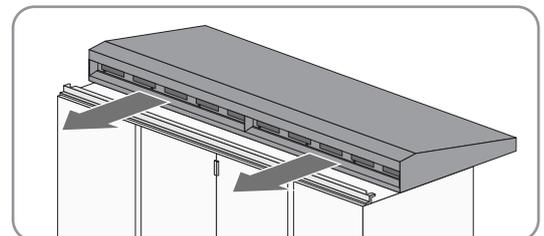
8. Clean air intake if soiled:

- Remove the grounding conductor from the inverter.

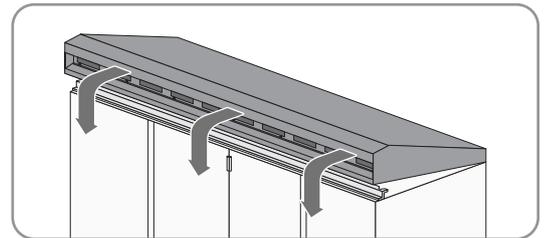


- Remove the roof and set it down on a suitable surface.
- Clean air intake with a vacuum cleaner
- Place the roof on the inverter.
- Screw the grounding conductor to the inverter (torque: 14.2 Nm).

9. Slide the roof into the guide rails on the inverter and pull forward.



10. Press the roof down.



11. Mount the ventilation grids (see Section 7.1.3, page 64).

6.4.2.5 Cleaning the Interior

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Procedure:

1. Remove dirt and dust from the inverter interior and from all devices.
2. Check the inverter for leaks.
If leaks are present, fix them.
3. Remove moisture.

6.4.2.6 Checking the Seals

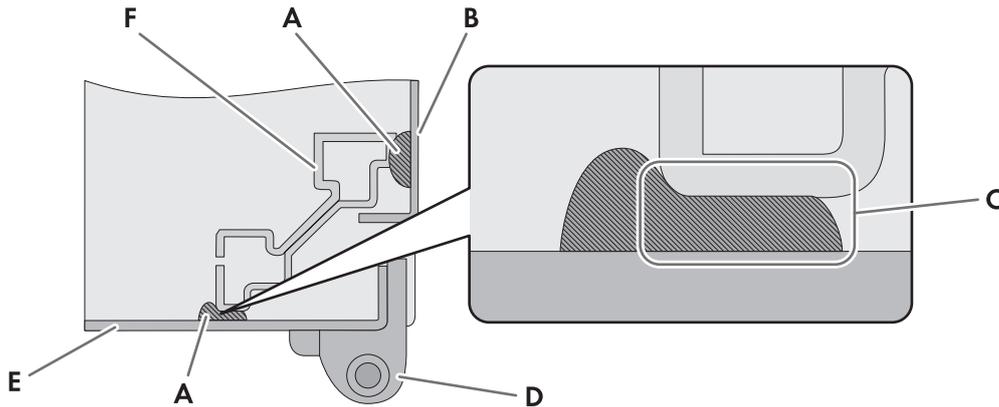


Figure 17: Section drawing with top view of a door seal (example)

Position	Designation
A	Seal
B	Side panel
C	Sealing area
D	Hinge
E	Door
F	Frame construction

Required maintenance material (not included in the scope of delivery):

- A suitable water-free, heat-resistant lubricant
- Talcum, petroleum jelly or wax for maintaining the seals

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Procedure:

1. Check whether the seals in the sealing area show any damage.
If seals are damaged, contact us (see Section 9 "Contact", page 68).
2. Apply talcum, petroleum jelly or wax to seals. This will prevent frost damage.
3. After removing the side panels: check whether the side panel seals display any damage in the sealing area.
If seals are damaged, contact us (see Section 9 "Contact", page 68).

6.4.2.7 Checking the Latches, Door Stops and Hinges

Required maintenance material (not included in the scope of delivery):

- A suitable, water-free and heat-resistant lubricant, e.g. WD40
- Non-greasing antifreeze agent, e.g. PS88

⚠ DANGER**Danger to life due to electric shock or electric arc if live components are touched**

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Procedure:

1. Check whether the doors latch easily. Open and close the doors several times.
If the doors do not latch easily, lubricate all moving parts of the latch.
2. Check whether the stops hold the doors in place.
If the doors cannot be arrested, lubricate the door stops.
3. Check whether the door hinges move easily.
If the door hinges do not move easily, apply lubricant.
4. Lubricate all moving parts and movement points.
5. Tighten any loose screws with the appropriate torque.
6. If the inverter is installed in regions where below-freezing temperatures occur, apply the non-greasing antifreeze to the profile cylinder of the door lock and the key switch in order to protect them from icing up.

6.4.2.8 Checking the Inverter Surface**Required maintenance material (not included in the scope of delivery):**

- Abrasive cloth
- Degreaser
- Use touch-up sticks, paint brushes, cans of spray paint or, alternatively, 2K-PUR acrylic paint in the appropriate RAL color to repair small-area surface damage. Observe the relevant instructions of the paint manufacturer.
- Use touch-up paint or alternatively 2K-PUR acrylic paint in the appropriate RAL color to repair large-area surface damage. Observe the relevant instructions of the paint manufacturer.
- Use zinc plating with thick-layer passivation to repair the damage on the zinc-plated steel frame in the base area, e.g. LZ-09. Observe the relevant instructions of the manufacturer.

Position	RAL color	Color
Roof	RAL 7004	Signal gray
Base	RAL 7004	Signal gray
Enclosure	RAL 9016	Traffic white

⚠ DANGER**Danger to life due to electric shock or electric arc if live components are touched**

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Procedure:

1. Remove dirt.

2. Check surfaces for damage or corrosion.

If the surfaces are damaged or corroded, repair them without delay or within three weeks at the latest.

3. To remove small-area surface damage:

- Sand the surface.
- Clean the surface with degreaser.
- Paint the surface.

4. To remove large-area surface damage:

- Sand the surface.
- Clean the surface with degreaser.
- Paint the entire surface.

6.4.2.9 Checking the Fuses/Disconnection Blades

Required maintenance material (not included in the scope of delivery):

- A high-temperature resistant, chemically inert special grease

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Procedure:

1. Check the fuses/disconnection blades and tension springs for any discoloration or change in appearance.

If they are discolored or changed in any way, replace them.

2. Check insulation and terminals for any discoloration or change in appearance.

If insulation and terminals are discolored or changed, contact us (see Section 9 "Contact", page 68).

3. Remove fuses / disconnection blades one by one from the fuse holders. For this, use fuse extractor. It must be possible to remove the fuse without effort.

4. Check whether the contact surfaces of the fuses / disconnection blades are free from hardened grease. Clean contact surfaces if they are covered with hardened grease. Then apply new grease to the surfaces.

5. Insert all fuses and disconnection blades into the fuse holders. For this, use fuse extractor.

6.4.2.10 Checking the Bolted Connections of the Power Cabling

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

NOTICE

Damage to bolted connections through overtightening

If the permitted torques are exceeded, bolted connections can be damaged. In this case, fault-free operation of the inverter is no longer ensured.

- Only tighten loose bolted connections to the prescribed torque. Torque specifications are indicated in the circuit diagram of the inverter. If there is any information missing, contact (see Section 9 "Contact", page 68).

Procedure:

1. Check that the bolted connections of all assemblies are securely in place.
If bolted connections are loose, tighten them using a torque wrench.
2. Check whether all bolted connections of the power cabling are securely in place.
If bolted connections are loose, tighten them using a torque wrench.
3. Check the insulation and connections for any discoloration or change in appearance.
If insulation and connections are discolored or changed, contact us (see Section 9 "Contact", page 68).
4. Check the bolted connections for damage and contact elements for corrosion.
If bolted connections are damaged or contact elements corroded, replace them.

6.4.2.11 Checking the Labels

Inverter labels can be ordered from us as a complete set.

SMA order number	Languages included
3F1-050-001-001	en, de, es, fr
3F1-050-002-001	en, el, it
3F1-050-003-001	en, ja, ko, zh
3F1-050-004-001	en, ro, tr

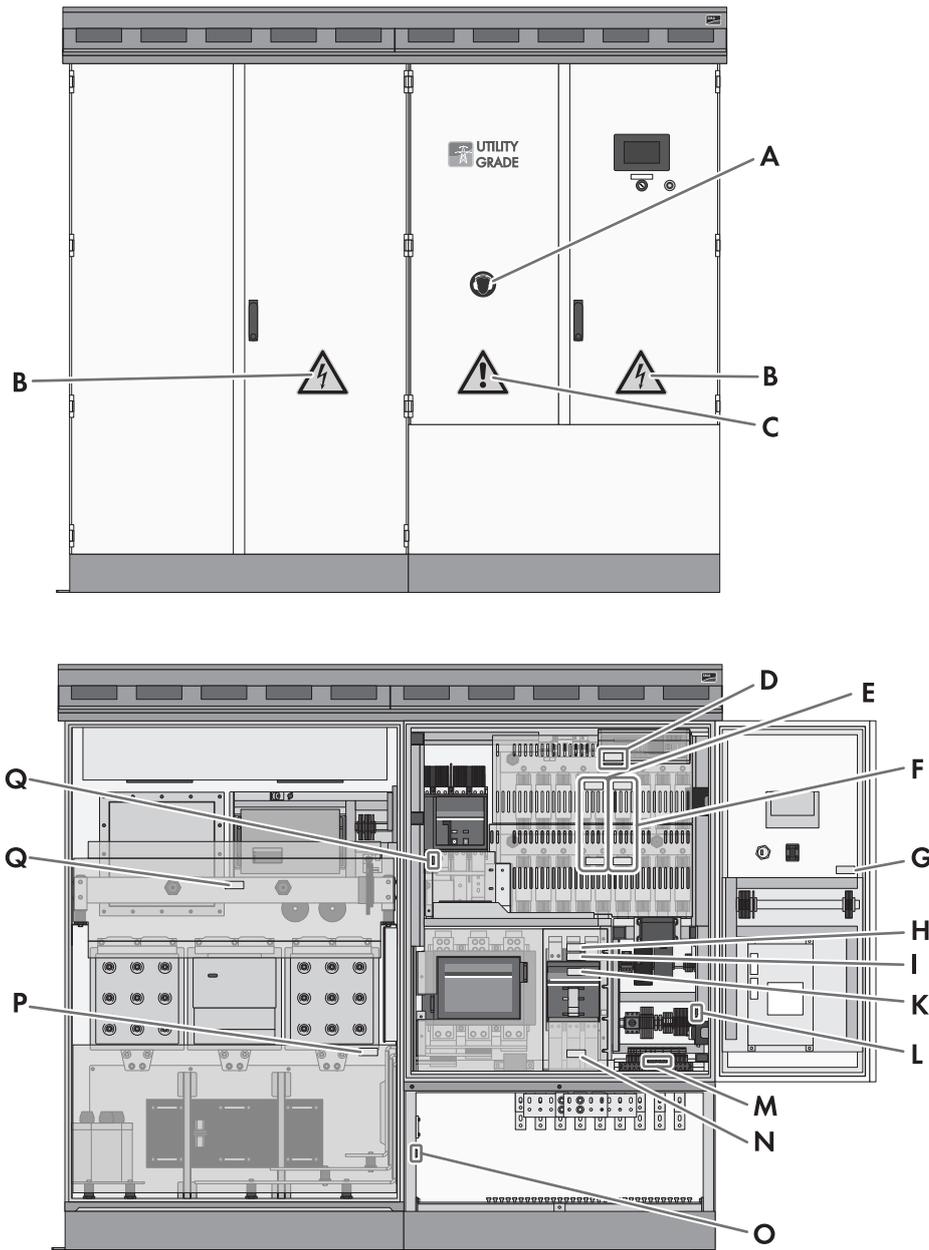


Figure 18: Position of the labels

Position	Material number	Designation
A	86-029687	Use hearing protection
B	86-05200	Beware of dangerous voltage
C	86-79615	Beware of a danger zone
D	86-10867153	Risk of electrical shock even when the device is disconnected.
	86-003307	5 Safety rules
	86-003314	Risk of lethal electric shock due to active power source
E	86-003303	Risk of lethal electric shock due to active power source
F	86-1086701025	Danger of burn injury due to hot fuses below the cover.

Position	Material number	Designation
G	86-0043553	Risk of lethal electric shock due to active power source
H	86-003307	5 Safety rules
I	86-1086701026	The negative pole of the PV generator is grounded in the inverter.
	86-1086701027	The positive pole of the PV generator is grounded in the inverter.
K	86-003304	Unintended tripping due to modified settings.
L	86-003306	Plant protected by conductors.
M	86-003305	Incorrect connection leads to destruction of the device.
N	86-1086701023	Risk of lethal electric shock due to active power source
O	86-0099	Position of grounding
P	86-1086701024	Danger of burn injury due to hot components below the cover.
Q	86-10867153	Risk of electrical shock even when the device is disconnected.

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Procedure:

- Check whether any warning message or label is damaged or missing.
Replace any warning messages and labels which are missing or illegible. If necessary, you can order labels as a complete set. Contact us (see Section 9, page 68).

6.5 Repair Work

6.5.1 Reading off the Replacement Interval Meter

1. Log into the user interface as an installer (see Section 7.4.1, page 66).
2. Select **Data > Devices**.
3. Select the desired device from the list.
4. Select the tab **Instantaneous values**.
5. If the instantaneous value **CntGfdiSw** exceeds 7000, replace the Remote GFDI (see Section 9 "Contact", page 68).
6. If the error message **7714** appears on the touch display, replace the GFDI (see Section 9 "Contact", page 68).

7 Periodic Actions

7.1 Mounting and Disassembly Work

7.1.1 Disassembling and Mounting the Panels

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

NOTICE

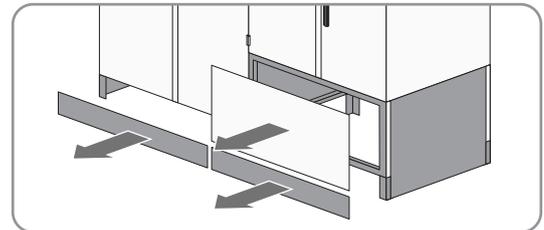
Property damage due to rupture of grounding conductors

The components are connected to the inverter via the grounding conductor. If the roof is not disassembled correctly, the grounding conductors may be pulled out.

- Take care not to damage the grounding conductors during disassembly.

Disassembling the panels

1. Remove the screws of the front panels using a Torx screwdriver (head size T30).
2. Detach the grounding straps from the panels.
3. Remove the panels.



Mounting the panels

Requirement:

- The protective covers in the connection area must be mounted (see Section 7.1.2, page 63).

Procedure:

1. Attach the grounding straps to the panels of the interface cabinet (torque: 8 Nm to 10 Nm).
2. Ensure that the grounding straps are firmly in place.
3. Attach the panels using a Torx screwdriver (torque: 2 Nm to 3 Nm, head size T30).

7.1.2 Disassembling and Mounting the Protective Covers

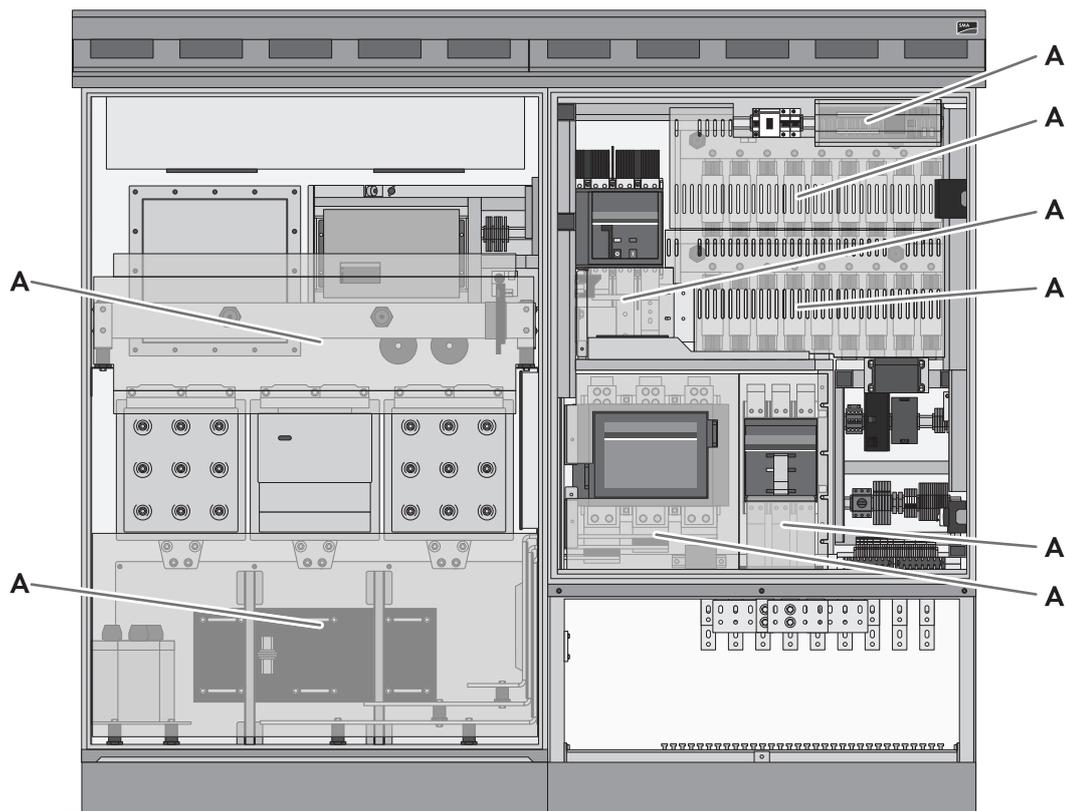


Figure 19: Position of the protective covers

Position	Designation
A	Protective cover

⚠ DANGER

Danger to life due to electric shock or electric arc if live components are touched

- Switch off the inverter and wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Disconnect the inverter (see Section 4, page 26).

Disassembling the protective covers

Requirements:

- The panels must be disassembled (see Section 7.1.1, page 62).

Procedure:

- Disassemble the protective covers.

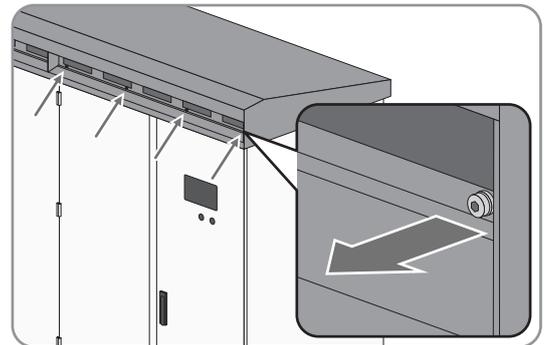
Mounting the protective covers

1. Tighten all protective covers (torque: 5 Nm).
2. Ensure that the protective covers are firmly in place.

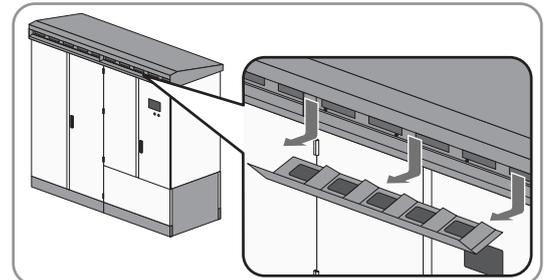
7.1.3 Disassembling and Mounting the Ventilation Grids

Disassembling the ventilation grids

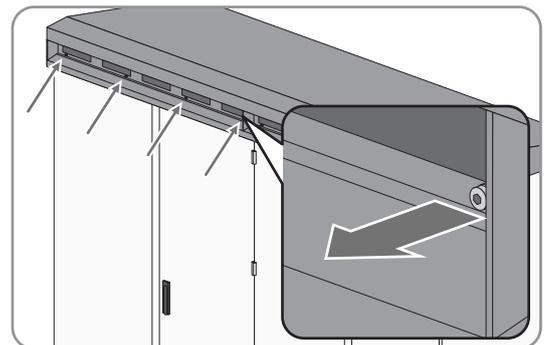
1. Release the screws of the right-hand ventilation grid. (head size:- T40).



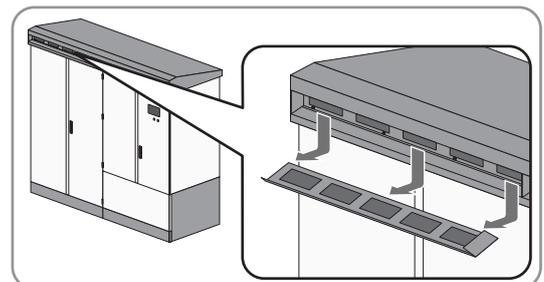
2. Pull the lower side of the right-hand ventilation grid forwards to remove it.



3. Release the screws of the left-hand ventilation grid. (head size:- T40).

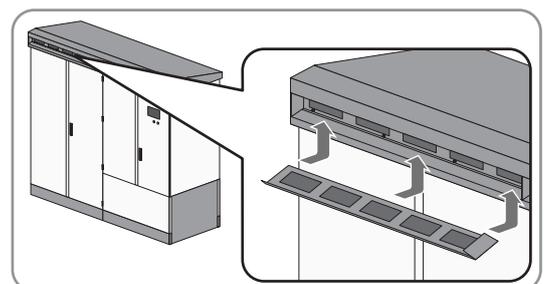


4. Pull the lower side of the left-hand ventilation grid forwards to remove it.

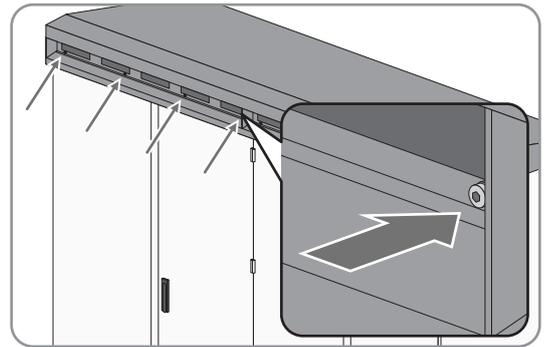


Mounting the ventilation grids

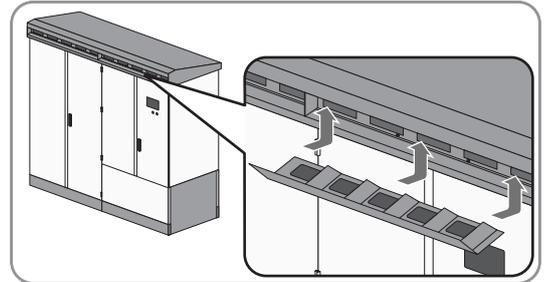
1. Insert the left-hand ventilation grid.



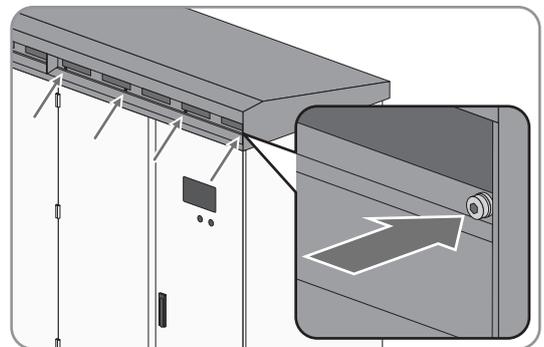
2. Screw the left-hand ventilation grid on (torque: 20 Nm, head size T40).



3. Insert the right-hand ventilation grid.



4. Screw the right-hand ventilation grid on (torque: 20 Nm, head size T40).



7.2 Entering the Password via the Touch Display

i Installer access

The "Installer" access level is activated by entering the installer password. The access level is reset after 15 minutes.

Procedure:

1. Select .
 2. Select .
 3. Confirm your entry by selecting .
- The  symbol appears in the status info line.

7.3 Parameter Overview

7.3.1 Accessing the Parameter Overview

1. Log into the user interface as an installer.
2. Select **Data > Devices**.
3. Select the desired device from the list.
4. Select the tab **Parameters**.

7.3.2 Saving Parameter Changes

Requirement:

- You must be logged in on the user interface.

Procedure:

1. Change the respective parameter via the field **Value**.
2. To adopt this value for all devices of the same type and with the same firmware version, activate the box **Save for all devices of this device type**.
3. Select the button [**Save**].
 - The communication unit adjusts the required value on the device(s).
4. Select the button [**OK**].

7.4 User Interface

7.4.1 Logging Into the User Interface

Default Network Settings for the Service Interface

IP address: 192.168.100.2

Subnet mask: 255.255.255.0

Password for the user groups "installer" and "user": sma

Identical passwords for the user groups

If your "user" password is the same as your "installer" password, you will automatically be logged in as an installer.

Requirement:

- JavaScript must be enabled in your web browser (e.g. Internet Explorer).

Procedure:

1. Connect the laptop to the service interface of the inverter.
2. Start your web browser.
3. Enter the IP address of the communication unit in the address bar and press the enter key.
 - The user interface opens.
4. To change the language, select the desired language in the field **Language**.
5. For registration select the user level in the field **User**.
6. Enter the password in the field **Password**.
7. Select the button [**Login**].

7.4.2 Logging Out of the User Interface

Always log out from the user interface when you have finished your work. If you only close the web browser, you will not be logged out. If the user interface is left idle for 15 minutes, you will be logged out automatically.

Procedure:

- Select the button [**Logout**].

8 Appendix

8.1 Installation Information

8.1.1 Torques

Torques of the power connections:

Type of terminal lug	Torque
Tin-plated aluminum terminal lug on copper bar	37 Nm
Tin-plated copper terminal lug on copper bar	60 Nm
Tin-plated aluminum or copper terminal lug on aluminum bar	37 Nm

Torques at panels, covers and grounding conductor:

Position	Torque
Grounding conductors on the kick plates	8 Nm to 10 Nm
Mounting the kick plates	2 Nm to 3 Nm
Grounding conductor on the roof	14.2 Nm
Mounting the ventilation grids on the roof	20 Nm
Protective covers	5 Nm

8.2 Type Label

The type label clearly identifies the product. One type label is present in the inverter. The type label is located in the right-hand top corner inside the interface cabinet. You will require the information on the type label to use the product safely and when seeking customer support. The type labels must be permanently attached to the product.

i Reading off the serial number

You can identify the serial number without opening the inverter. The serial number can be found on the roof of the inverter at the top left. You can also read off the serial number from the touch display.

i Reading Off the Firmware Version

You can read off the version number of the inverter and touch display firmware via the user interface. You can also read off the version number of the touch display firmware on the touch display.

9 Contact

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

- Device type
- Firmware version
- Event message
- Type of communication
- Type and size of additional energy sources
- Optional equipment, e.g. communication products
- Detailed description of the problem

Deutschland	SMA Solar Technology AG	Belgien	SMA Benelux BVBA/SPRL
Österreich	Niestetal	Belgique	Mechelen
Schweiz	Sunny Boy, Sunny Mini Central, Sunny Tripower, Sunny Highpower: +49 561 9522-1499	België	+32 15 286 730
	Monitoring Systems, SMA EV Charger: +49 561 9522-2499	Luxemburg	for Netherlands: +31 30 2492 000
	Hybrid Controller: +49 561 9522-3199	Luxembourg	SMA Online Service Center: www.SMA-Service.com
	Sunny Island, Sunny Boy Storage, Sunny Backup: +49 561 9522-399	Nederland	
	Sunny Central, Sunny Central Storage: +49 561 9522-299	Česko	SMA Service Partner TERMS a.s +420 387 6 85 111
	SMA Online Service Center: www.SMA-Service.com	Magyarország	SMA Online Service Center: www.SMA-Service.com
		Slovensko	
		Türkiye	SMA Service Partner DEKOM Telekomünikasyon A. Ş +90 24 22430605
			SMA Online Service Center: www.SMA-Service.com
France	SMA France S.A.S. Lyon +33 472 22 97 00	Ελλάδα	SMA Service Partner AKTOR FM.
	SMA Online Service Center: www.SMA-Service.com	Κύπρος	Αθήνα +30 210 8184550
			SMA Online Service Center: www.SMA-Service.com
España	SMA Ibérica Tecnología Solar, S.L.U.	United Kingdom	SMA Solar UK Ltd.
Portugal	Barcelona +34 935 63 50 99		Milton Keynes +44 1908 304899
	SMA Online Service Center: www.SMA-Service.com		SMA Online Service Center: www.SMA-Service.com
Italia	SMA Italia S.r.l. Milano +39 02 8934-7299	Australia	SMA Australia Pty Ltd.
	SMA Online Service Center: www.SMA-Service.com		Sydney
			Toll free for Australia: 1800 SMA AUS (1800 762 287)
			International: +61 2 9491 4200

United Arab Emirates	SMA Middle East LLC Abu Dhabi +971 2234 6177 SMA Online Service Center: www.SMA-Service.com	India	SMA Solar India Pvt. Ltd. Mumbai +91 22 61713888
ไทย	Service Partner for String inverter: Solar Power Engineering Co., Ltd. 333/7,8,9 United Tower Building 4th floor. Soi Sukhumvit 55 (Thonglor 17), Klongton Nua, Wattana, 10110 Bangkok, Thailand +66 20598220 smaservice@spe.co.th Service Partner for Utility: Tirathai E & S Co., Ltd 516/1 Moo 4, Bangpoo Industrial Estate Sukhumvit Road, T. Praksa, A. Muang 10280 Samutprakarn, Thailand +63 1799866 servicepartner.sma@tirathai.co.th	대한민국	Enerone Technology Co., Ltd 4th Fl, Jungbu Bldg, 329, Yeongdong-daero, Gangnam-gu, Seoul, 06188, Korea +82-2-520-2666
		Argentina	SMA South America SPA
		Brasil	Santiago de Chile
		Chile	+562 2820 2101
		Perú	
		South Africa	SMA Solar Technology South Africa Pty Ltd. Cape Town 08600SUNNY (08600 78669) International: +27 (0)21 826 0699 SMA Online Service Center: www.SMA-Service.com
Other countries	International SMA Service Line Niestetal 00800 SMA SERVICE (00800 762 7378423) SMA Online Service Center: www.SMA-Service.com		

**ENERGY
THAT
CHANGES**

