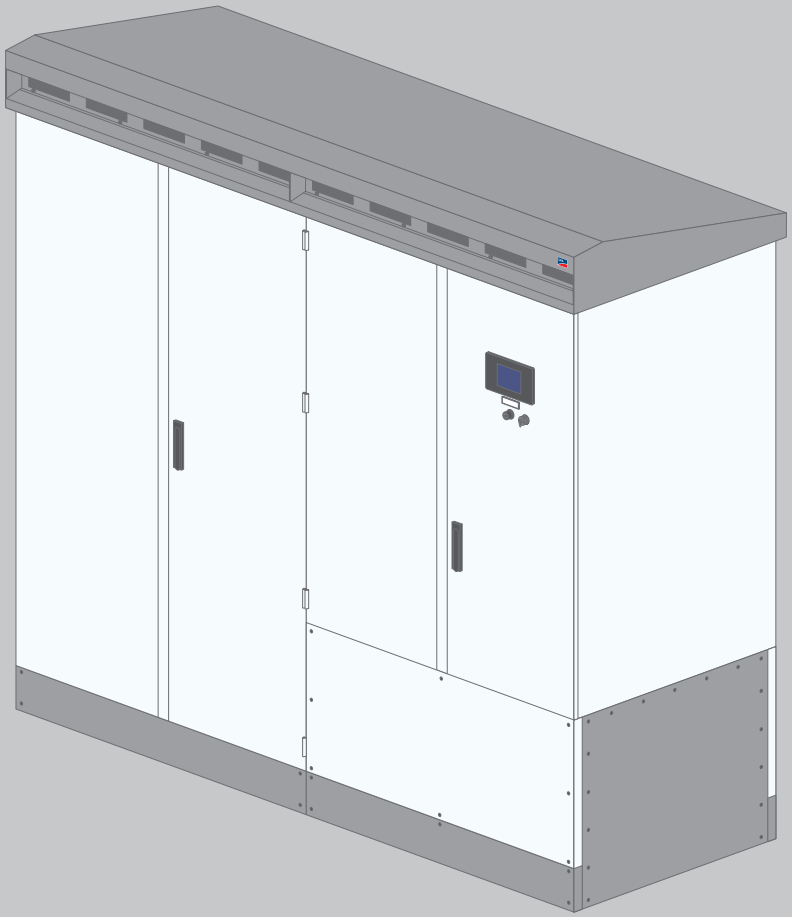
User Manual

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



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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	01.80.00.R	01.80.00.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 and using electrical devices and systems
- Training in the installation and commissioning of electrical devices and systems
- Knowledge of all applicable standards and directives
- Knowledge of and adherence to this manual and all safety precautions

1.3 Additional Information

Links to additional information can be found at www.SMA-Solar.com.

1.4 Symbols

Symbol	Explanation
⚠ 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, can result in death or serious injury
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, can result in minor or moderate injury
NOTICE	Indicates a situation which, if not avoided, can result in property damage

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

1.5 Typographies

Typographies	Use	Example
bold	• Display messages • Elements on a user interface • Terminals • Slots • Elements to be selected • Elements to be entered	• Set parameter **WGra** to **0.2**.
>	• Connects several elements to be selected	• Select **PV system > Detect**.
[**Button/Key**]	• Button or key to be selected or pressed	• Select [**Start detection**].

1.6 Nomenclature

Complete designation	Designation in this document
Sunny Central	Inverter
Sunny Central Communication Controller	SC-COM or communication unit

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: ±1,450 V
- For the Sunny Central 850CP XT/900CP XT/1000CP XT the maximum voltage to ground is: ±1,600 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 usually void the operating license. SMA Solar Technology AG shall not be held liable for any damage caused by such changes.

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

The enclosed documentation is an integral part of this product. Keep the documentation in a convenient 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 5.2, page 51).

⚠ DANGER

Danger to life from electric shock due to live DC cables

DC cables connected to PV modules that are exposed to sunlight carry live voltage. Touching live cables results in death or serious injury due to electric shock.

- Prior to connecting the DC cables, ensure that the DC cables are voltage-free.
- Wear suitable personal protective equipment for all work on the device.

⚠ DANGER

Danger to life from electric shock due to ground fault

If a ground fault has occurred, parts of the PV power plant that are supposedly grounded may in fact be live. Touching incorrectly grounded parts of the PV power plant results in death or serious injuries from electric shock.

- Before working on the PV power plant, ensure that no ground fault is present.
- Wear suitable personal protective equipment for all work on the device.

⚠ 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 disconnection unit 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 kΩ.
- 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 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.

⚠ WARNING

Risk of fire due to failure to observe torque specifications on live bolted connections

Failure to follow the specified torques reduces the ampacity of live bolted connections so that the contact resistances increase. This can cause components to overheat and catch fire.

- Ensure that live bolted connections are always tightened with the exact torque specified in this document.
- When working on the device, use suitable tools only.
- Avoid repeated tightening of live bolted connections as this may result in inadmissibly high torques.

⚠ 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.
- Temperature at the storage location must be in the specified range. The temperature range is: −25°C to +70°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 Personal Protective Equipment

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

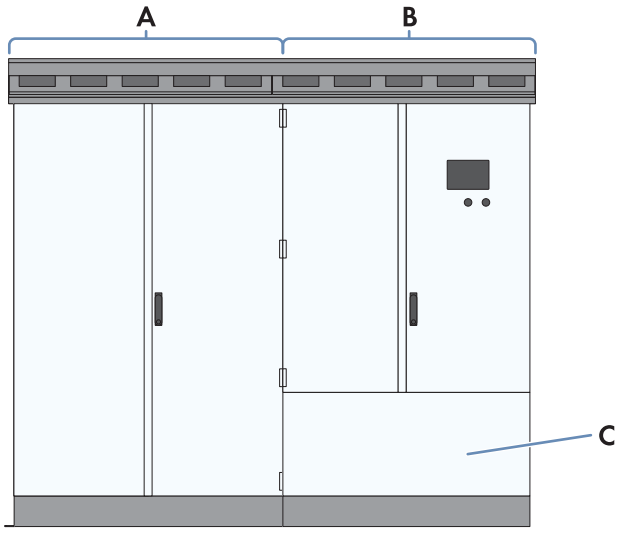


Figure 1: Design of the Inverter

Position	Designation
A	Inverter cabinet
B	Interface cabinet
C	Connection area

3.2 Devices of the Inverter

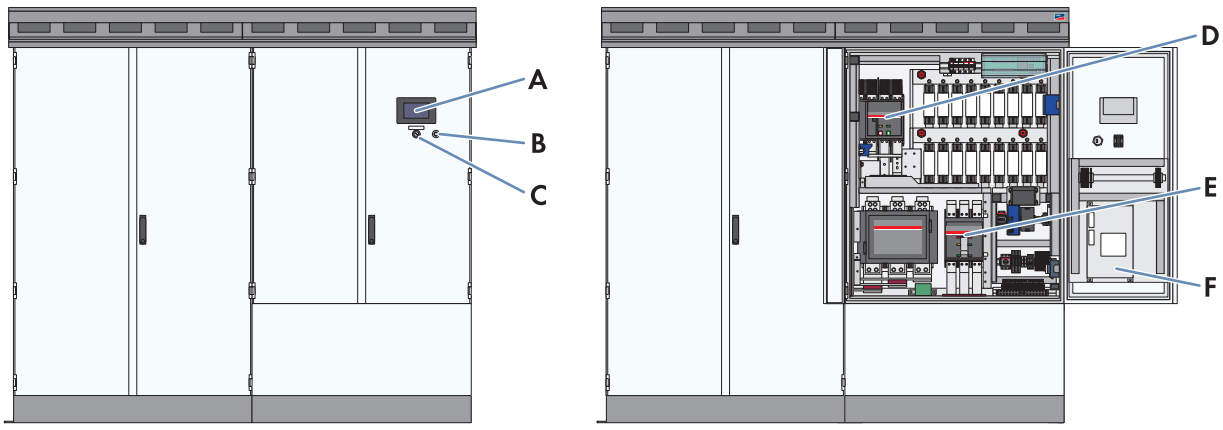


Figure 2: Devices of the inverter

Position	Device	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.

Position	Device	Description
D	DC switchgear	The DC switchgear disconnects the inverter from the PV array.
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	The AC disconnection unit disconnects the inverter from the MV transformer.

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.

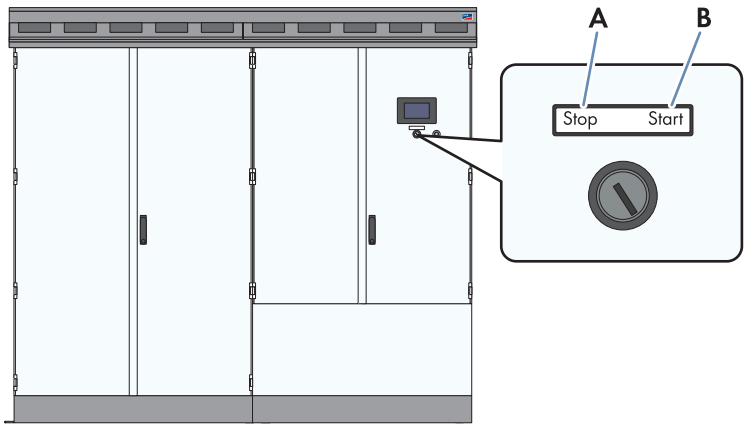


Figure 3: Switch positions of the key switch

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 disconnection unit 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.

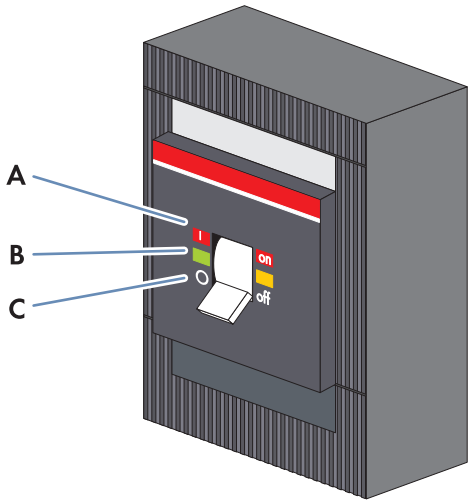


Figure 4: Switch positions of the AC disconnection unit from ABB

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.

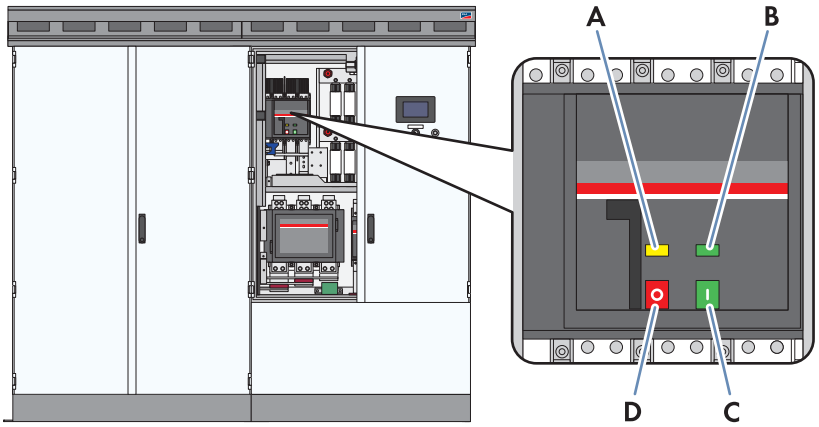


Figure 5: Indicators on the DC load-break switch

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.

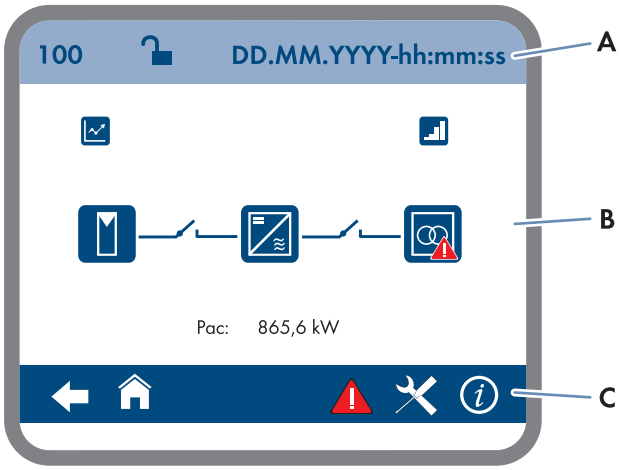


Figure 6: Design of the touch display

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 • PV power in W • Insulation resistance in Ω • PV current in A • PV voltage in V • Diagram of string-current monitoring – Diagram 132 and 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 disconnection unit 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 disconnection unit 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 disconnection unit is unknown.
	Inverter data	Representation of the following inverter data: • 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: • Active power in W • Reactive power in VAr • Power frequency in Hz • AC current in A • AC voltage in V
	grid	First menu page: • Active mode of active power limitation • Target active power in kW • Actual active power in kW Second menu page • Active mode of reactive power setpoint • Target reactive power in VAr • Target displacement power factor cos φ • Target excitation type of the displacement power factor • Actual reactive power in VAr • Actual displacement power factor cos φ • 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	• Language selection • Brightness setting • Time setting • Format selection • Password entry
	Information	• 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	• ErrNo: error number • TmsRmg: time until reconnection • Msg: error message • Dsc: corrective measure
 	Service	• Telephone receiver: Contact Service. • Tool: Contact your installer.

3.3.3 LEDs of the SC-COM

3.3.3.1 LEDs on the Enclosure

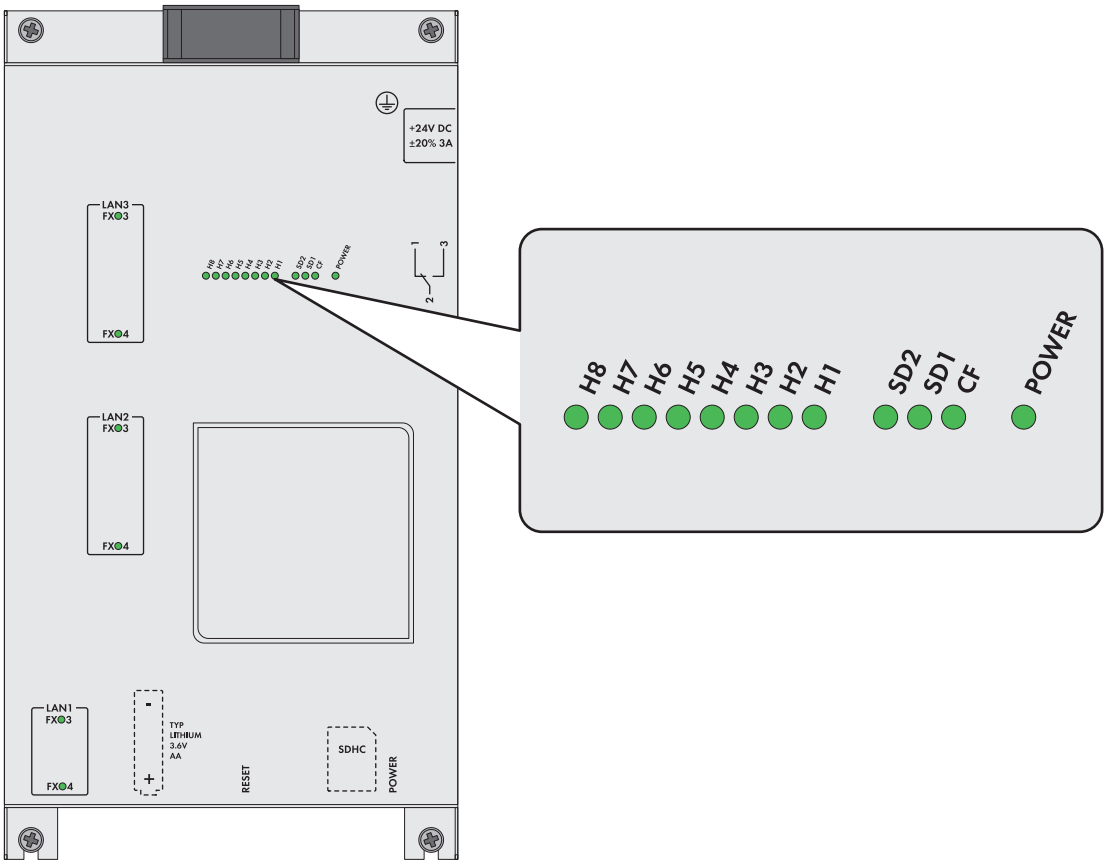


Figure 7: LEDs on the enclosure

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

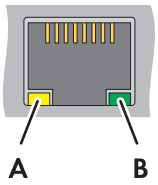


Figure 8: LEDs on the network port

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.

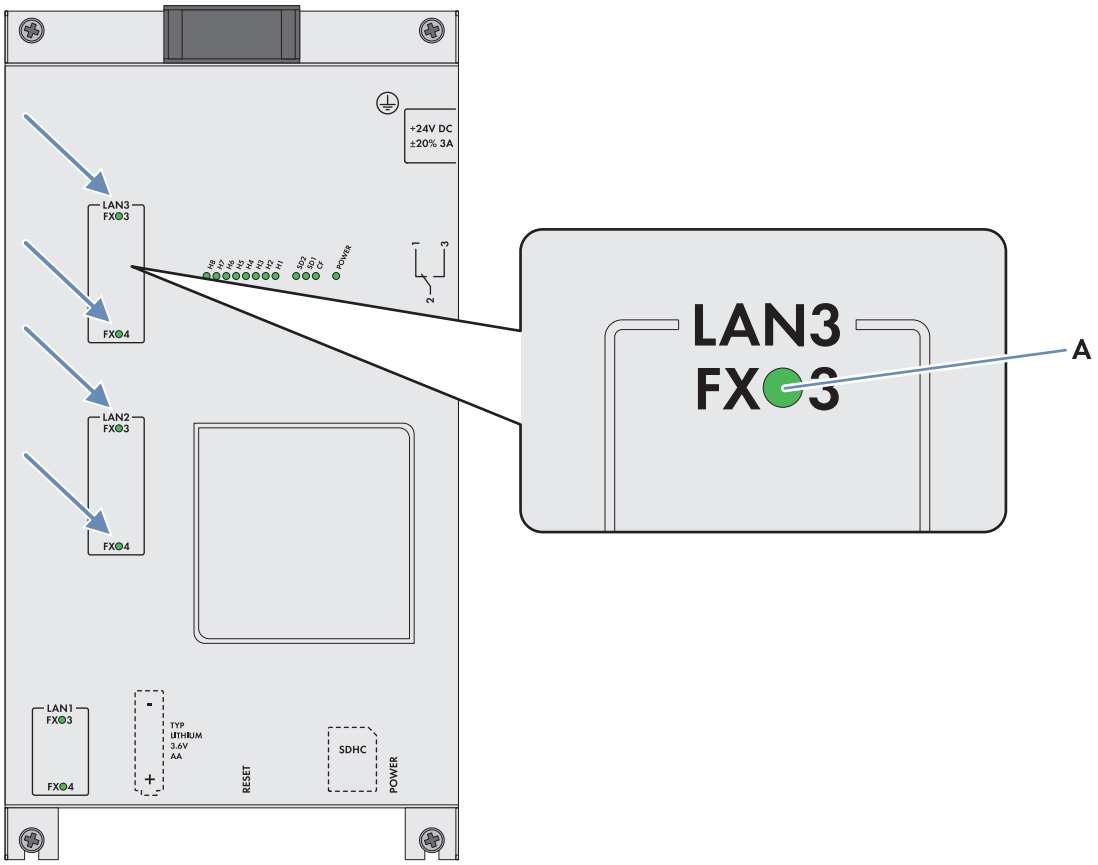


Figure 9: LEDs for the status of the optical fiber connection

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.

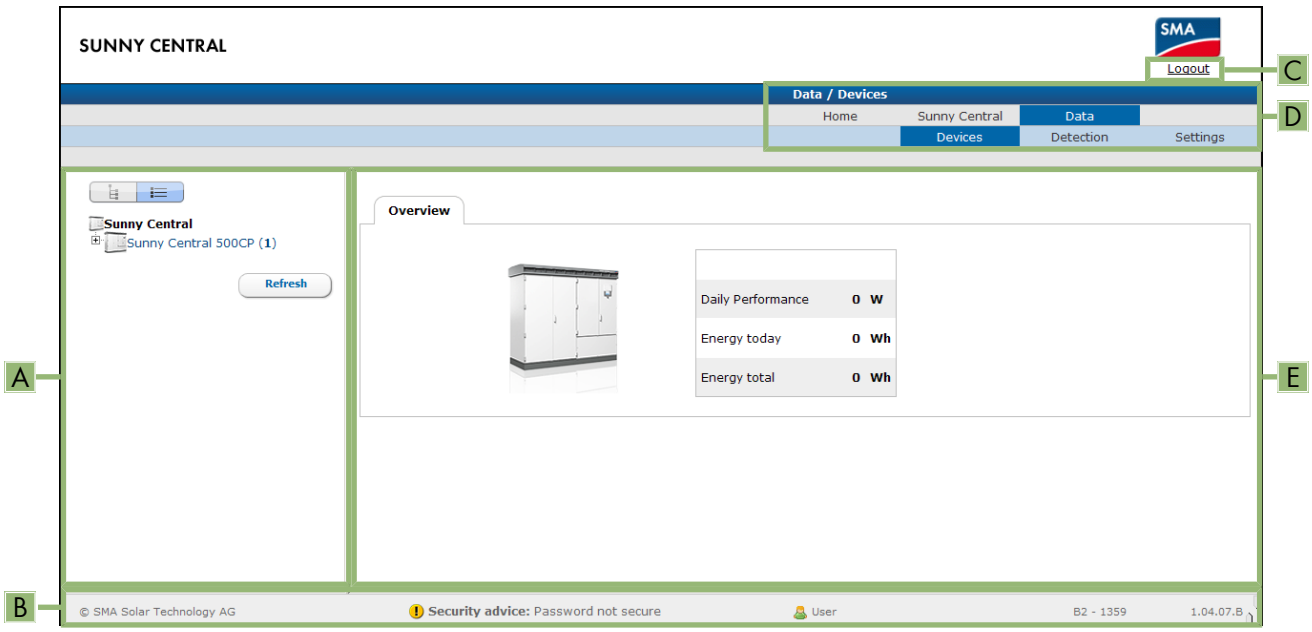
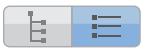


Figure 10: Design of the user interface (example)

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.

Symbol	Explanation
	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 Commissioning

4.1 Safety during Commissioning

⚠ 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 5.2, page 51).

⚠ DANGER

Danger to life from electric shock due to ground fault

If a ground fault has occurred, parts of the PV power plant that are supposedly grounded may in fact be live. Touching incorrectly grounded parts of the PV power plant results in death or serious injuries from electric shock.

- Before working on the PV power plant, ensure that no ground fault is present.
- Wear suitable personal protective equipment for all work on the device.

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.
- Temperature at the storage location must be in the specified range. The temperature range is: −25°C to +70°C .

4.2 Requirements for Commissioning

☐ None of the devices must display any damage.

☐ All devices must be correctly installed.

☐ All devices must be properly grounded.

☐ All transport locks and desiccant bags must be removed.

☐ All cables of the inverters must be correctly routed and connected.

☐ All doors and locks must function properly.
☐ All documentation must be available.
☐ All labels must be in place.

4.3 Visual Inspection and Mechanical Test

4.3.1 Sequence for Visual Inspection and Mechanical Test

Procedure		See
1.	Ensure that the minimum clearances are complied with.	Section 12.1.1, page 147
2.	Ensure that the grounding busbar has been professionally connected to the external grounding system.	
3.	Ensure that the cables for communication, control, supply voltage and monitoring are correctly connected.	Section 4.3.2, page 29
4.	Ensure that the high-current contacts made on the installation site are correctly connected.	Section 4.3.3, page 30
5.	Ensure that the high-current contacts made at the factory are correctly connected.	Section 4.3.4, page 30
6.	Ensure that the connection busbars do not show any discoloration. If the connection busbars show any discoloration, please contact us (see Section 13 "Contact", page 155).	
7.	Ensure that the settings of the switching units are made correctly.	Section 4.3.5, page 30
8.	Ensure that all connectors are correctly connected.	Section 4.3.6, page 31

4.3.2 Checking the Connections of the Cables for Communication, Control Supply Voltage and Monitoring

Test Point	Tasks
Cables	Ensure that the cable type and cross-section, the number of cables and the labeling comply with the specifications in the schematic diagram.
Cable connection	Ensure that the cable connection complies with the specifications in the schematic diagram. If no external fast stop is to be installed, ensure that the terminals are wired with a jumper wire in accordance with the schematic diagram.
Cable insulation	Make sure that the insulation of the cables is correctly stripped. The insulation must not prevent the contact with the terminal.
Bootlace ferrules	Ensure that the bootlace ferrules are correctly crimped and that no stranded wires are visible.
Cable support rails	Ensure that the cables are adequately attached to the cable support rails.
Shield clamping saddles	Ensure that the contact between the cable shield and the shield bus is intact.

4.3.3 Checking the High-Current Contacts Made at the Installation Site

Test point	Tasks
Cables	Ensure that the cable type and cross-section, the number of cables and the labeling comply with the specifications in the schematic diagram.
High-current contact	Check whether the high-current contacts established at the installation site are tightened to the correct torque. If the torque is not correct, release and clean the high-current contact and tighten with the required torque.
Terminal lugs	Ensure that the terminal lugs are crimped edge to edge.
Cable support rails	Ensure that the cables are adequately attached to the cable support rails.

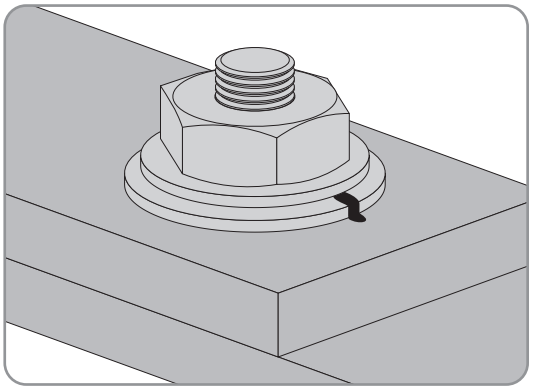
4.3.4 Checking the High-Current Contacts Made at the Factory

High-current contacts made at the factory

High-current contacts made at the factory are marked off. Providing that the marking is not damaged and runs across the bolted connection as shown in the figure, this means that the torque complies with the specifications.

Procedure:

- Check whether the high-current contacts made at the factory are correctly marked off.



If a high-current contact is not correctly marked off, release the high-current contact, tighten with the required torque and mark off again.

4.3.5 Checking the Settings of the Switching Units

Test Point	Tasks
AC circuit breaker	Ensure that the settings comply with the specifications in the schematic diagram.
GFDI	
Hygrostat	

4.3.6 Checking the Connectors

Test Point	Tasks
Connectors on the CAN bus	Ensure that all connectors are securely in place.
Connectors on the SC20cont	
Connectors on the inverter bridge	
Connectors on the communication unit	
Connectors on the hub	
Connectors on the router	

4.4 Connection and Measurement

4.4.1 Sequence for Connection and Measurement

1. Use the tap changer on the MV transformer to adjust the voltage of the utility grid (see documentation of the MV transformer).
2. Switch the transformer field and the ring circuit of the medium-voltage switchgear on (see documentation of the medium-voltage switchgear).
3. Measure the voltages on the primary and secondary sides of the MV transformer and record the values in the commissioning report.
4. Ensure that the supply voltage is within the permissible voltage range of the inverter of −10% to +15%.
5. Check the output voltage of the inverter (see Section 4.4.2, page 31).
6. Check the DC voltage (see Section 4.4.3, page 32).
7. Mount the protective covers (see Section 9.1.2, page 80).
8. Mount the panels (see Section 9.1.1, page 79).
9. Switch on the supply voltage and the AC disconnection unit (see Section 4.4.4, page 32).

4.4.2 Checking the Output Voltage of the Inverter

1. Use a rotating field instrument to measure whether a right-hand rotating magnetic field is connected at the AC connection brackets.

   If a left-hand rotating magnetic field is detected, two line conductors must have been wrongly connected.

   - Swap the connections L1 and L3.

2. Check whether the AC voltage is approximately the same as the nominal voltage of the inverter. Measure the AC voltage between the terminals at the AC connection brackets and record in the commissioning report.

   If the AC voltage differs significantly from the nominal voltage of the inverter, the transformation ratio of the MV transformer must be adjusted by a duly authorized person.

4.4.3 Checking the DC Voltage

⚠ DANGER

Danger to life due to electric arcs if measuring device is not connected correctly

If the measurement points are incorrectly contacted, this can cause an electric arc. Electric arcs can result in death or serious injury.

- Select the appropriate measurement range on the measuring device.
- Wear suitable personal protective equipment for all work on the device.
- Select correct measurement points.

NOTICE

Damage to the inverter due to excessive DC voltages

The DC voltage of the PV array must not exceed the maximum voltage of the inverter.

- Make sure the maximum voltage is no more than 1,000 V.

Procedure:

1. Measure the DC voltage for each input and record it in the commissioning report. Use the DC+ and DC– connection brackets as measuring points.
2. Check that the DC voltages do not exceed the maximum DC voltage of the inverter.

   If the DC voltages differ from one another or exceed the maximum DC voltage, make sure that the cabling of the PV modules has been configured in accordance with the circuit diagram.
3. Make sure that the polarity of each input is correct.
4. Measure the DC voltage for each non-grounded pole to ground and record in the commissioning report. Use the connection brackets of the ungrounded terminal and the grounding busbar as check points.

   ☑ There is a measurable voltage drop.

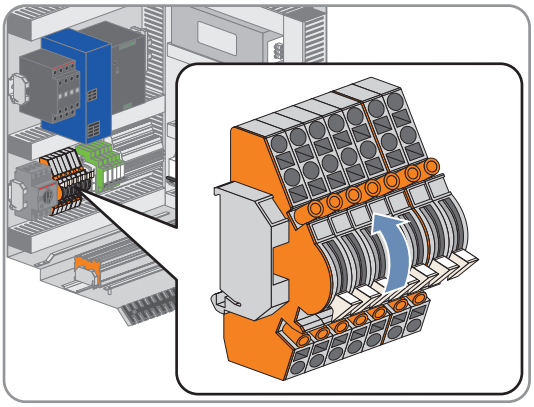
   ✖ There is no measurable voltage drop?

   A ground fault is present.

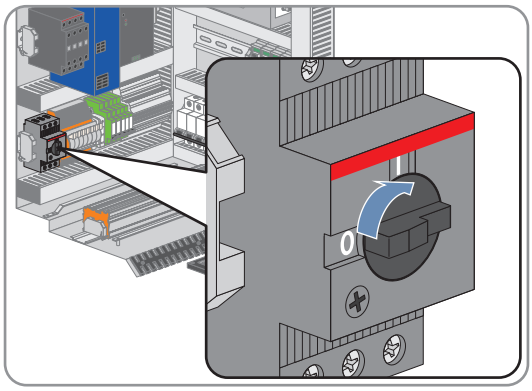
   - Eliminate the ground fault.

4.4.4 Switching On the Supply Voltage and the AC Disconnection Unit

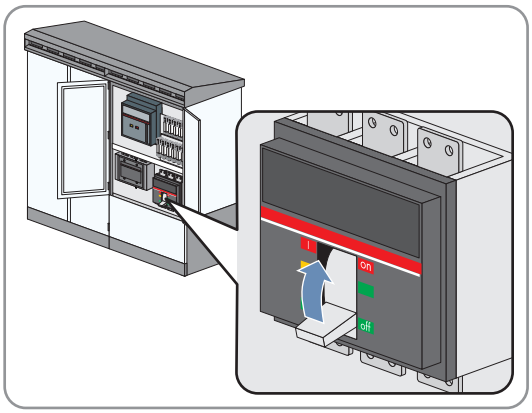
1. Close the measurement and disconnect terminals.



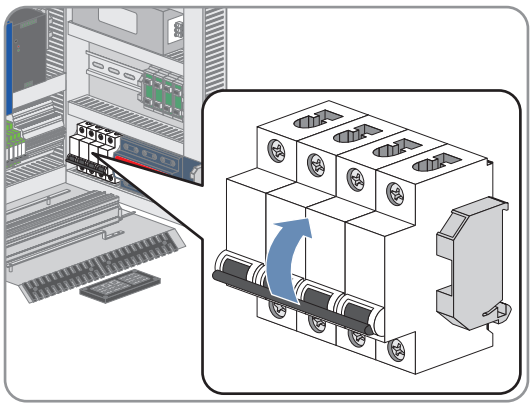
2. Switch on the motor-protective circuit-breaker of the grid monitoring.



3. Switch on the AC circuit breaker.



4. Switch the supply voltage circuit breaker on.



☑ The electronic components of the inverter switch on.

☑ The fans switch on and start drawing air in through the air intake vents.

✖ The fans do not switch on?

- Contact the Service (see Section 13, page 155).

4.5 Function Test

4.5.1 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 5, page 51).

Procedure:

1. Switch the inverter to **Stop**.
2. Connect the supply voltage (see Section 5.3.1, page 53).

☑ The fans start to run for a few moments.

✖ The fans do not start up?

- Contact SMA Service Line.

4.5.2 Checking the Heating Elements and Hygrostat

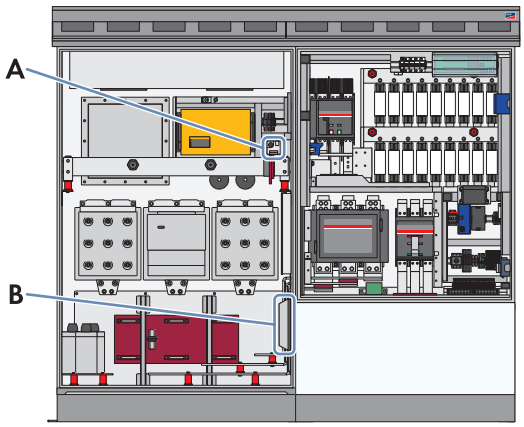


Figure 11: Position of the heating element and the hygrostat

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 5, page 51).

⚠ 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** (see Section 5.2.1, page 51).
2. Connect the supply voltage (see Section 5.3.1, page 53).

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 13 "Contact", page 155).

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.

4.6 Configuration

4.6.1 Configuring the Network Settings on the Computer

Before your computer can communicate with the inverter, you must set the computer to the network settings of the inverter. The network settings include the IP address, subnet mask, gateway and DNS server address.

The communication interface of the inverter has three LAN interfaces to the connected nodes. The IP address to be configured in your computer depends on whether the computer is connected to the service interface of the inverter, the control network or the monitoring network.

Network	Default IP address
LAN1: Service interface of the inverter	192.168.100.2*
LAN2: Control network	172.24.1.51
LAN3: Monitoring network	172.16.1.51

* This IP address cannot be changed.

Administrator rights in the operating system

To commission the communication unit, you need to have the appropriate administrator rights to change the network settings of the computer.

- Contact your network administrator if you are uncertain about administrator rights.

Procedure:

1. Note down the IP address of the computer.
2. Adapt the IP address of the computer to the address range of the communication unit.

4.6.2 Information on Integrating the Inverter into a Local Network

Protecting the local network from cyber attacks

- If the local network is to be accessible via the Internet, you can set up port forwarding via your router or configure a VPN. Using a VPN is recommended.
- Protect the local network from cyber attacks by means of suitable safety measures such as setting up a firewall and allocating secure passwords.

Using a static IP address is recommended. You can select the IP address yourself. Use the address range which is available to your router. If necessary, refer to the router manual.

If you are using a Power Plant Controller for the automatic control of your PV power plant, a dynamic IP address with DHCP is not possible.

For further information on this subject, see the Technical Information "System Communication in Large-Scale PV Power Plants" at www.SMA-Solar.com.

4.6.3 Configuring the Inverter for a Static Network

You can configure the IP address of the inverter for the control network and the monitoring network via the user interface. Alternatively, you can also change the network settings of the inverter via the XML file **custom.xml** (see Section 4.6.14, page 48).

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > Network**.
3. In the field **IP address**, enter the static IP address that you want to use to access the inverter in the local network.
4. Enter the subnet mask of your network in the field **Subnet mask**.
5. Enter the gateway IP address of your network in the field **Gateway address**. Usually, the IP address of the router has to be entered here.
6. Enter the IP address of the DNS server (Domain Name System) in the field **DNS server address**. Usually, the IP address of the router has to be entered here.
7. Select the button [**Save**].
8. Select the button [**Confirm**].

4.6.4 Adjusting Network Ports

If you wish the inverter to be accessible via the Internet so that you can access it, for example, directly from Sunny Portal, you must configure port forwarding in your router. This may require adjustment of the network ports.

For the various services, the communication unit of the inverter uses four network ports. If these ports are reserved for other applications in your network, you can adjust the ports.

i Adjusting the network ports

Check your access to the user interface before you change the setting **Public virtual HTTP port** on the user interface. In most cases, the settings do not have to be changed manually, as the router automatically forwards the queries to the correct ports via the network. Before adjusting the ports, contact your network administrator.

i Unauthorized access to the inverter

If you activate the Modbus protocol, unauthorized access to the inverter will be possible. In this case, even users without a password will be able to view the instantaneous values of supported devices or perform actions such as changing the system time. Using a VPN is recommended.

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > Network**.
3. In the field **Virtual public HTTP port**, enter the port enabled in the router for HTTP access. Via this port, you can access the user interface from the Internet.
4. In the field **Webserver port**, enter the port via which the user interface can be accessed.
5. In the field **Webservice port**, enter the port via which the data of the inverter is to be transmitted to Sunny Portal and firmware updates are to be uploaded.
6. If you would like to use the Modbus protocol, activate the box **Use Modbus**.
7. In the field **Modbus port**, enter the port to be used by the inverter when communicating via the Modbus protocol. The default setting is port **502**.
8. If you would like to use a proxy server, activate the box **Use proxy server**.
9. Enter the IP address and the port of the proxy server in the field **Proxyserver address**.
10. If you would like to use the authentication of the proxy server, activate the box **Use authentication**.

11. Enter the data of your proxy server in the fields **User name** and **Password**.
12. Select the button [**Save**].

4.6.5 Detecting New Devices

During commissioning of a PV power plant, all devices must be detected. If multiple interfaces (e.g. COM2 and COM3) are used in the inverter, detection of new devices must be carried out separately for all interfaces.

Devices will need to be redetected if you have:

- replaced devices in your PV power plant
- removed devices from your PV power plant
- added devices to your PV power plant

i Detection of the PV power plant may take several minutes

Depending on the number of devices in your PV power plant, the duration of the detection process may vary.

- If there is no indication of progress on the communication unit after three minutes, cancel the search.
- Make sure the data cable of each device is properly connected and repeat the search.

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Data** > **Detection**.
3. In the field **Total number of devices to be detected**, enter the number of devices connected to the communication unit. Hint: If you do not know the number, enter **1**.
4. Select the button **[Start detection].**
   ☑ The communication unit starts detecting all inverters and displays its progress. Once all devices have been detected, the message **### Device detection finished ###** is displayed.
5. Select the button [**OK**].

4.6.6 Setting the Power Limitation

4.6.6.1 Setting the Active Power Ramp-Up

i Parameter block

Some parameters must only be changed in the operating state "Stop". The entry will not be accepted in any other operating state.

The inverter works up to its maximum feed-in power via a ramp. This means that the inverter gradually increases the ratio of feed-in power per second by the value set in the parameter **WGra**.

Procedure:

1. Make sure the inverter is in the operating state "Stop".
2. Call up the parameter overview (see Section 9.3.1, page 81).
3. Set the parameter **WGra** to the required value.
4. Save the parameter changes (see Section 9.3.2, page 81).

4.6.6.2 Setting the Frequency-Dependent Active Power Limitation

i Parameter block

Some parameters must only be changed in the operating state "Stop". The entry will not be accepted in any other operating state.

Procedure:

1. Make sure the inverter is in the operating state "Stop".
2. Call up the parameter overview (see Section 9.3.1, page 81).
3. If necessary, set the parameter **WCtlHzMod** to **CurveHys**.
4. Change the parameters **P-HzStr**, **P-HzStop** and **P-WGra** and save (see Section 9.3.2, page 81).
5. Save the parameter changes (see Section 9.3.2, page 81).

4.6.6.3 Setting the Frequency-Independent Active Power Limitation

NOTICE

Operation failure of the PV power plant due to incorrectly set parameters

If the parameter settings for grid management services are incorrect, the PV power plant may not be able to meet the requirements of the grid operator. This can involve yield losses and the inverter may have to be disconnected by the grid operator.

- When setting the modes of grid management services, ensure that the control procedures agreed with the grid operator are parameterized.
- If the inverter is operated with a Power Plant Controller, ensure that the mode **WCtlCom** for active power limitation and the mode **VArCtlCom** for reactive power control are selected in the inverter.

Parameter block

Some parameters must only be changed in the operating state "Stop". The entry will not be accepted in any other operating state.

Procedure:

1. Make sure the inverter is in the operating state "Stop".
2. Call up the parameter overview (see Section 9.3.1, page 81).
3. Set the parameter **P-WMod** to the desired value.
4. Change the parameters belonging to the selected mode (see Section 10.3.2, page 97).
5. Use the parameter **PwrMonErrMod** to select the desired behavior in the absence of setpoint specifications as follows (see Section 10.3.5, page 110).
6. If **SubVal** has been selected, enter the substitute values for normal feed-in operation and for operation outside of normal feed-in operation.
7. In the parameter **PwrMonErrTm** configure the time lapse until recognition of the absence of setpoint specifications.
8. Save the parameter changes (see Section 9.3.2, page 81).

4.6.6.4 Setting Reactive Power Control

NOTICE

Operation failure of the PV power plant due to incorrectly set parameters

If the parameter settings for grid management services are incorrect, the PV power plant may not be able to meet the requirements of the grid operator. This can involve yield losses and the inverter may have to be disconnected by the grid operator.

- When setting the modes of grid management services, ensure that the control procedures agreed with the grid operator are parameterized.
- If the inverter is operated with a Power Plant Controller, ensure that the mode **WCtlCom** for active power limitation and the mode **VArCtlCom** for reactive power control are selected in the inverter.

Avoiding electromagnetic interference emissions in large-scale PV systems

To avoid electromagnetic interference emissions in large-scale PV systems at the changeover from night mode to feed-in operation, it is recommended using Modbus communication for setpoint in feed-in operation and night mode.

For smaller-sized PV systems without farm control, the use of fixed setpoints for reactive power control is recommended.

Validity of parameters in feed-in operation and in "Q at Night" operation

The parameters used for these substitute values are valid in feed-in operation and in "Q at Night" operation.

- Ensure that the settings of the parameters for the substitute values meet the requirements for feed-in operation and "Q at Night" operation.

Procedure:

1. Make sure the inverter is in the operating state "Stop".
2. Call up the parameter overview (see Section 9.3.1, page 81).
3. Set the parameter **Q-VArMod** to the desired value.
4. Change the parameters belonging to the selected mode (see Section 10.3.3, page 98).
5. Use the parameter **PwrMonErrMod** to select the desired behavior in the absence of setpoint specifications as follows (see Section 10.3.5, page 110).
6. If **SubVal** has been selected, enter the substitute values for normal feed-in operation and for operation outside of normal feed-in operation.
7. In the parameter **PwrMonErrTm** configure the time lapse until recognition of the absence of setpoint specifications.
8. Save the parameter changes (see Section 9.3.2, page 81).

4.6.6.5 Setting Q at Night

NOTICE

Operation failure of the PV power plant due to incorrectly set parameters

If the parameter settings for grid management services are incorrect, the PV power plant may not be able to meet the requirements of the grid operator. This can involve yield losses and the inverter may have to be disconnected by the grid operator.

- When setting the modes of grid management services, ensure that the control procedures agreed with the grid operator are parameterized.
- If the inverter is operated with a Power Plant Controller, ensure that the mode **WCtlCom** for active power limitation and the mode **VArCtlCom** for reactive power control are selected in the inverter.

Avoiding electromagnetic interference emissions in large-scale PV systems

To avoid electromagnetic interference emissions in large-scale PV systems at the changeover from night mode to feed-in operation, it is recommended using Modbus communication for setpoint in feed-in operation and night mode.

For smaller-sized PV systems without farm control, the use of fixed setpoints for reactive power control is recommended.

Validity of parameters in feed-in operation and in "Q at Night" operation

The parameters used for these substitute values are valid in feed-in operation and in "Q at Night" operation.

- Ensure that the settings of the parameters for the substitute values meet the requirements for feed-in operation and "Q at Night" operation.

Procedure:

1. Make sure the inverter is in the operating state "Stop".
2. Call up the parameter overview (see Section 9.3.1, page 81).
3. Set the parameter **QoDQ-VarMod** to the desired value.
4. Change the parameters belonging to the selected mode (see Section 10.3.4, page 105).
5. Use the parameter **PwrMonErrMod** to select the desired behavior in the absence of setpoint specifications as follows (see Section 10.3.5, page 110).
6. If **SubVal** has been selected, enter the substitute values for normal feed-in operation and for operation outside of normal feed-in operation.
7. In the parameter **PwrMonErrTm** configure the time lapse until recognition of the absence of setpoint specifications.
8. Save the parameter changes (see Section 9.3.2, page 81).

4.6.7 Setting Grid Monitoring and Grid Limits

4.6.7.1 Setting Grid Voltage Monitoring

Consultation prior to parameter change

The parameters of this mode can only be selected or changed after consultation (see Section 13 "Contact", page 155).

Procedure:

1. Call up the parameter overview (see Section 9.3.1, page 81).
2. Set the parameters for monitoring the grid voltage (see Section 10.1.3.1, page 84).
3. Save the parameter changes (see Section 9.3.2, page 81).

4.6.7.2 Setting Power Frequency Monitoring

Consultation prior to parameter change

The parameters of this mode can only be selected or changed after consultation (see Section 13 "Contact", page 155).

Procedure:

1. Call up the parameter overview (see Section 9.3.1, page 81).
2. Set the parameters for monitoring the power frequency (see Section 10.1.3.2, page 85).
3. Save the parameter changes (see Section 9.3.2, page 81).

4.6.7.3 Activating the Manual Resume Mode

If the inverter is switched off due to a grid limit infringement, you can prevent an automatic restart of the inverter. Only once the error has been acknowledged will the inverter switch back on. You can activate the Manual Resume Mode for individual errors of grid limit infringement. You can read off the reason for the current restart block in the instantaneous value **ManResStt**.

Procedure:

1. Call up the parameter overview (see Section 9.3.1, page 81).
2. To activate the Manual Resume Mode for individual disturbances, set the desired parameters to **On**:

Manual Resume Mode after	Parameter
Disconnection due to overvoltage	**ManResOvrVol**

Manual Resume Mode after	Parameter
Disconnection due to undervoltage	**ManResUndrVol**
Disconnection due to overfrequency	**ManResOvrFrq**
Disconnection due to underfrequency	**ManResUndrFrq**
Disconnection due to passive islanding detection	**ManResPID**
Disconnection due to disturbance in a line conductor	**ManResPLD**

3. Save the parameter changes (see Section 9.3.2, page 81).

4.6.8 Setting the Grid Support

4.6.8.1 Setting Full and Limited Dynamic Grid Support (FRT)

1. Call up the parameter overview (see Section 9.3.1, page 81).
2. Set dynamic grid support with the parameter **FRTEna**.
3. Set operating mode for dynamic grid support with the parameter **FRTMod**.
4. Set deactivation delay for LVRT with the parameter **FRTSwOffTm**.
5. Set the scaling of the k factor for LVRT with the parameter **FRTArGraNom**.
6. Set the upper limit of the voltage deadband with the parameter **FRTDbVolNomMax**.
7. Set the lower limit of the voltage deadband with the parameter **FRTDbVolNomMin**.
8. In operating mode FRT_SDLWindV, set the gradient for the FRT characteristic curve in case of overvoltage with the parameter **FRT2ArGraNomHi**.
9. For the operating mode FRT_SDLWindV, set the gradient for the FRT characteristic curve in case of undervoltage with the parameter **FRT2ArGraNomLo**.
10. Save the parameter changes (see Section 9.3.2, page 81).

4.6.8.2 Setting Enable Islanding Detection

1. Call up the parameter overview (see Section 9.3.1, page 81).
2. Set the islanding detection with the parameter **EnaAid**.
3. Save the parameter changes (see Section 9.3.2, page 81).

4.6.8.3 Setting the Medium Voltage

The line-to-line voltage of the overvoltage side of the MV transformer (parameter **TrfVolExlHi**) has to be adapted to the nominal conductor voltage of the utility grid (parameter **VRtg**). It is important that the transmission ratio of the external MV transformer is adjusted at the same time. The undervoltage side is already preset for the specific device.

Procedure:

1. Call up the parameter overview (see Section 9.3.1, page 81).
2. Set the parameter **TrfVolExlHi**.
3. Set the parameter **VRtg**.
4. Save the parameter changes (see Section 9.3.2, page 81).

4.6.9 Setting Project-Specific Parameters

4.6.9.1 Setting the Remote Shutdown

1. Call up the parameter overview (see Section 9.3.1, page 81).
2. To activate remote shutdown, set the parameter **ExlStrStpEna** to **On** (see Section 10.2.1.2, page 88).
3. To deactivate remote shutdown, set the parameter **ExlStrStpEna** to **Off** (see Section 10.2.1.2, page 88).
4. Save the parameter changes (see Section 9.3.2, page 81).

4.6.9.2 Deactivating the "Fully Hermetic" Transformer Protection

1. Call up the parameter overview (see Section 9.3.1, page 81).
2. Set the parameter **ExlTrfErrEna** to **Off** (see Section 10.2.2.2 "Transformer Protection", page 88)
3. Save the parameter changes (see Section 9.3.2, page 81).

4.6.10 Setting the String Current Monitoring

4.6.10.1 Detecting the Sunny Central String-Monitor Controller and the Inverter

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Data > Detection**.
3. In the field **Total number of devices to be detected**, enter the value **2**.
4. Select the button **[Start detection].**

☑ The communication unit starts detecting all inverters and displays its progress. Once all devices have been detected, the message **### Device detection finished ###** is displayed.

☑ The devices have been detected.

4.6.10.2 Setting the Date and Time of the Sunny Central String-Monitor Controller

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Data > Devices**.
3. Select .
   ☑ A list of the existing device types appears.
4. Select **Sunny Central String-Monitor Controller**.
5. Select the tab **Instantaneous values**.
6. Make sure that the date **SysDt** and time **SysTm** of the Sunny Central String-Monitor Controller are correct.
   If the settings are incorrect, change the parameters **Dt** and **Tm** .

4.6.10.3 Detecting the Sunny String-Monitors via the Sunny Central String-Monitor Controller

It may take several minutes to detect the Sunny String-Monitors, depending on the number of devices and how far apart they are.

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select the tab **Parameters**.
3. Set the parameter **DevFunc** to **AutoDetect_SSMU**.
4. Select the button [**Save**].

5. Select the tab **Instantaneous values**.
6. Select **SSMUNoOf** and check the number of detected Sunny String-Monitors.

   Once all Sunny String-Monitors have been detected, detect them via the communication unit(see Section 4.6.10.5, page 43).

   If only some of the Sunny String-Monitors have been detected, use Sunny Central String-Monitor Controller to redetect them (see Section 4.6.10.4, page 43).

4.6.10.4 Redetecting the Sunny String-Monitors via the Sunny Central String-Monitor Controller

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select the tab **Parameters**.
3. Set the parameter **DevFunc** to **Retry**.
4. Select the button [**Save**].
5. Select the tab **Instantaneous values**.
6. Select **SSMUNoOf** and check the number of detected Sunny String-Monitors.

   Once all Sunny String-Monitors have been detected, detect them via the communication unit(see Section 4.6.10.5, page 43).

   If only some of the Sunny String-Monitors have been detected, contact the Service .

4.6.10.5 Detecting the Sunny String-Monitors via the Communication Unit

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Data > Detection**.
3. In the field **Total number of devices to be detected**, enter the number of Sunny String-Monitors +2.
4. Select the button **[Start detection].**

☑ The communication unit starts detecting all inverters and displays its progress. Once all devices have been detected, the message **### Device detection finished ###** is displayed.

☑ The Sunny String-Monitors have been detected.

4.6.10.6 Adjusting the Identification of the Sunny String-Monitors

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select the first Sunny String-Monitor from the device list.
3. Select the tab **Parameters**.
4. Select the parameter **SSMId** and allocate a unique identification number to the Sunny String-Monitor. Note the identification number.
5. Adjust the identification of the remaining Sunny String-Monitors using the same process.

4.6.10.7 Changing the Communication Period

The communication period is the time for which the Sunny Central String-Monitor Controller communicates with the Sunny String-Monitors. The communication period is set from 10:00 a.m. to 3:00 p.m. by default.

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select the parameter **MoniTmComOn** and set the start of the communication period.
3. Select the parameter **MoniTmComOff** and set the end of the communication period.
4. Select the button [**Save**].

4.6.10.8 Changing the Monitoring Period

The monitoring period refers to the time for which the PV power plant is monitored by the Sunny String-Monitors. The monitoring period is set from 10.00 a.m. to 3.00 p.m. by default.

You can set the monitoring period for all Sunny String-Monitors or allocate a separate monitoring period to each group of Sunny String-Monitors.

The monitoring period must be within the communication period.

Setting the monitoring period for all Sunny String-Monitors

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select the parameter **MoniTmGrAllOn** and set the start of the monitoring period.
3. Select the parameter **MoniTmGrAllOff** and set the end of the monitoring period.
4. Select the button [**Save**].

Setting the monitoring period for individual Groups of Sunny String-Monitors

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select the desired Sunny String-Monitor from the device list.
3. Select the tab **Parameters**.
4. Select the parameter **MoniTmGr1On** and set the start of the monitoring period.
5. Select the parameter **MoniTmGr1Off** and set the end of the monitoring period.
6. Confirm the entry with [**Save**].
7. Repeat steps 2 to 6 for the remaining groups.

4.6.10.9 Assigning Strings to Different Measuring Channels

To simplify monitoring, you can assign the strings to the eight measuring channels.

You can select the number of strings per channel between 1 and 4 for each of the eight measuring channels. The default setting is **1**.

You can use the parameter **No.of Strings** to assign a string number between 1 and 4 to all measuring channels of the Sunny String-Monitor. This avoids having to set the number of strings for individual channels, since this number is automatically adopted for the grouped channels.

Procedure:

1. Select the desired Sunny String-Monitor from the device list.
2. Select the tab **Parameters**.
3. Enter the number of strings per measuring channel in the parameter fields **No.of Strings 1** to **No.of Strings 8**, or the number of strings for all measuring channels in the field **No.of Strings**.
4. Select the button [**Save**].

4.6.10.10 Assigning Strings to Different Groups

In the Sunny Central String-Monitor Controller, the string data is continuously monitored and the group data compared so that potential errors are detected immediately. It is therefore advisable to split the strings into different groups if some strings are shaded, aligned differently or equipped with different modules.

By default, all strings are assigned to Group 1.

Group 0 is not monitored, which means only strings excluded from monitoring should be assigned to this group.

Procedure:

1. Select the desired Sunny String-Monitor from the device list.
2. Select the tab **Parameters**.
3. Select the parameters **Group String 1** to **Group String 8** and assign them to a group . Each group must include at least four measuring channels.
4. Select the button [**Save**].

4.6.10.11 Setting the Tripping Time

You can use the tripping time to set the sensitivity of the string-current monitoring, since the tripping time is a factor in the calculation of the error sum. By default, the tripping time is set to 180 minutes.

Procedure:

1. Select the desired Sunny Central String-Monitor Controller from the device list.
2. Select the tab **Parameters**.
3. Enter the tripping time in minutes in the parameter field **SMU_T_Ausl**.
4. Select the button [**Save**].

4.6.10.12 Setting the Tolerance

You can use the tolerance to set the sensitivity of the string-current monitoring. The tolerance is a factor in the calculation of the error sum.

Since only a significant deviation of a measuring channel from the mean value is an indication of a faulty string, the tolerance value should be set correspondingly high. Minor deviations are considered normal.

Procedure:

1. Select the desired Sunny Central String-Monitor Controller from the device list.
2. Select the tab **Parameters**.
3. Enter the tolerance value in percent for the groups in the parameter fields **SMU_tolerance grp1** to **SMU_tolerance grp3**.
4. Select the button [**Save**].

4.6.11 Configuring the Zone Monitoring

For configuring the Zone Monitoring, enter the maximum input currents for each input and set the tolerance (see Section 10.6, page 115). A tolerance value of 4% or more is recommended.

For activating the error analysis, the parameter **AlarmEna** has to be set to **On**. In this case, an error message is generated, if the input current is lower or higher than the set tolerance value. If the error analysis is deactivated, the communication interface sends the measured value without analysing them. You can activate the alarm under fault conditions in order to receive an e-mail with the error message (see Section 7.2, page 65).

Requirement:

☐ At least two inputs have to be configured in order to activate the Zone Monitoring.

Procedure:

1. Call up the parameter overview (see Section 9.3.1, page 81).
2. In the parameters **DcCfg.AmpMax[1]** to **DcCfg.AmpMax[8]**, enter the maximum input currents in ampere.
3. In parameter **MaxTol**, enter the tolerance value in percent.
4. Set the parameter **AlarmEna** to **On**. Thus, you activate the error analysis.
5. Save the parameter changes (see Section 9.3.2, page 81).

4.6.12 Changing System Settings via Touch Display

4.6.12.1 Selecting the Language

1. Select .
2. Select .
3. Use the country symbol to select the language.
4. Confirm your entry by selecting .

4.6.12.2 Setting the Date, Time and Time Zone

Inverter adopts changes

The inverter will adopt date, time or time zone changes made via the display.

Procedure:

1. Select .
2. Select .
3. To change the date, select the day, month and year in the field . Use the and buttons to change the day, month and year.
4. To change the time, select the hours, minutes and seconds in the field . Use and to change the hours, minutes and seconds.
5. To change the time zone, select a time zone in the field . Use the and buttons to change the time zone.
6. Confirm your entry by selecting .

4.6.12.3 Selecting the Display Format

1. Select .
2. Select .
3. Select the date format.
4. Select the hour format.
5. Select the number format.
6. Confirm your entry by selecting .

4.6.12.4 Setting the Brightness

1. Select .
2. Select .
3. Set the display brightness. Select for a darker screen or for a lighter screen.
4. Confirm your entry by selecting .

4.6.13 Changing the System Settings via the User Interface

4.6.13.1 Selecting the Language

You can also set the language of the user interface via the XML file **custom.xml** (see Section 4.6.14, page 48).

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > System**.
3. Select the desired language in the field **Language**.

4. Select the button [**Save**].
5. To log off from the user interface, select the button [**Logout**].

4.6.13.2 Setting the Date, Time and Time Zone

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > System**.
3. Select [**Change**] in the field **Time zone (UTC offset)**.
4. Select the correct time zone in the **Time zone (UTC offset)** drop-down list.
5. Select an option in the **Automatic change from summer time to winter time** field:

Option	Explanation
yes	Automatic change from daylight saving time to standard time is active.
no	Automatic change from daylight saving time to standard time is not active. Date and time have to be set manually.

6. Enter the current date in the **New date** field.
7. Enter the current time in the **New time** field.
8. Select [**Save**].
9. To log off from the user interface, select the button [**Logout**].

4.6.13.3 Entering the Operator Name

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > System**.
3. Enter the operator name in the **Operator name** field.
4. Select the button [**Save**].
5. To log off from the user interface, select [**Logout**].

4.6.13.4 Changing the Password for the User Groups

The user interface distinguishes between the user groups "user" and "installer" . To change the password for the "installer" user group, you must be logged in as an installer. To change the password for the "user" user group, you can be logged in as a user or an installer.

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.

During entry of the password, the user interface displays information on the security level of the password entered. Passwords are categorized as very unsafe, unsafe, adequate, safe and very safe. Only choose passwords with at least the security level safe. You can also change the password of the "installer" user group via the XML file **custom.xml** (see Section 4.6.14, page 48).

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > Security**.
3. Enter a secure password in the **User password** or **Installer password** field and confirm it in the second field.
4. Select the button [**Save**].
5. To log off from the user interface, select the button [**Logout**].

4.6.14 Configuring System Settings via XML File

4.6.14.1 Uploading the File custom.xml

When you upload the file **custom.xml** to the user interface, the communication unit checks the file to ensure that the values entered are valid and accurate, and adopts the settings at the next reset of the communication unit.

Correct network settings

While uploading, the communication unit checks the XML file **custom.xml** for validity and accuracy of the entered values. The accuracy of the network settings is not checked.

- Ensure that the file **custom.xml** includes the correct network settings.

Procedure:

1. Create the file **custom.xml** with the required settings (see Section 12.3, page 151).
2. Log into the user interface as an installer (see Section 9.4.1, page 81).
3. Select **Sunny Central > Settings > System**.
4. Select [**Browse**] in the field **Upload settings (custom.xml)**.
5. Double-click on the file **custom.xml** in the open dialog box.
6. Select the button [**Upload**].
   - ☑ The message **Do you really want to apply the customer-specific settings** is displayed.
   - ✖ The message **The settings have not been activated because the file has an invalid format or invalid entries.** is displayed?
     - Click on the ⓘ symbol.
     - Read off the error in the open dialog box and correct the file **custom.xml**.
     - Ensure that the file **custom.xml** is valid and correct.
7. Select the button [**Confirm**].
   - ☑ The following message is displayed: **The settings were successfully saved. The settings will become effective by carrying out a reset to default settings**.
8. To enable the settings in the file **custom.xml.**, the communication unit must be reset to the default settings (see Section 4.6.15, page 49).
9. To log off from the user interface, select the button [**Logout**].

4.6.14.2 Downloading the File custom.xml

The file **custom.xml** that you have uploaded can also be downloaded.

Procedure:

1. Log into the user interface as an installer (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > System**.
3. Click on the link **(custom.xml)** in the field **Upload settings (custom.xml)**.
4. Choose a storage location for the file and save it.
5. To log off from the user interface, select the button [**Logout**].

4.6.14.3 Deleting the File custom.xml

You can delete the file **custom.xml** via the user interface. If you have enabled your personal settings via the file **custom.xml** before deleting it, these settings will remain effective.

No confirmation after deleting the file custom.xml

If you perform the following steps, the file **custom.xml** will be deleted immediately without displaying a dialog box confirming the deletion.

- Save the file **custom.xml** before deleting it.

Procedure:

1. Log into the user interface as an installer (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > System**.
3. In the field **Upload settings (custom.xml)**, select the button [**Delete**].
   ☑ The file **custom.xml** is immediately deleted.
4. To log off from the user interface, select the button [**Logout**].

4.6.15 Resetting the Communication Unit

Resetting the communication unit will restore all of its original default settings. If you have uploaded an XML file **custom.xml**, the settings of this file will be adopted (see Section 4.6.14.1 "Uploading the File custom.xml", page 48).

Perform data backup

- Before you reset the communication unit, note down all settings such as network or portal settings.
- To avoid data loss, be sure to back up your operating data.

PV system identifier in Sunny Portal

If you reset all settings, all settings for logging into Sunny Portal will also be deleted. If you restart the communication unit after the reset without changing any settings, the communication unit will create a new PV system with a new PV system identifier in Sunny Portal.

- If the data is to be sent to the existing PV system in Sunny Portal, adjust the identifier of the old PV system (see Section 6.2.2.2, page 56).
- Enter the e-mail address of a user who has Sunny Portal administrator rights for the PV system.

Procedure:

1. Log into the user interface as an installer (see Section 9.4.1, page 81).
2. Select **Sunny Central > Info**.
3. Select the button [**Default setting**].
   ☑ A security prompt opens.
4. Select the button [**Confirm**].
5. To log off from the user interface, select [**Logout**].

4.7 Switching the Inverter On

Requirements:

☐ All electrical connections executed on site must be correct and firmly attached.

☐ The entire PV power plant, including the PV array, must have been tested by the PV system builder in accordance with the applicable standards.

☐ A test protocol of the tests carried out must have been compiled in accordance with the applicable standards.

☐ The ground resistance of the PV system must have been determined.

☐ All values measured must be within the permissible range.

Procedure:

1. Lock the inverter.
2. Turn the key switch to **Start**.

☑ The DC switch switches on with an audible click.

☑ Under conditions of sufficient irradiation, the inverter starts feeding into the utility grid.

✖ Disturbance message on the touch display?

- Eliminate the disturbance (see Section 7, page 65).

5 Disconnecting and Reconnecting

5.1 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 5.2, page 51).

⚠ DANGER

Danger to life from electric shock due to ground fault

If a ground fault has occurred, parts of the PV power plant that are supposedly grounded may in fact be live. Touching incorrectly grounded parts of the PV power plant results in death or serious injuries from electric shock.

- Before working on the PV power plant, ensure that no ground fault is present.
- Wear suitable personal protective equipment for all work on the device.

⚠ 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.

5.2 Disconnecting the Inverter

5.2.1 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.

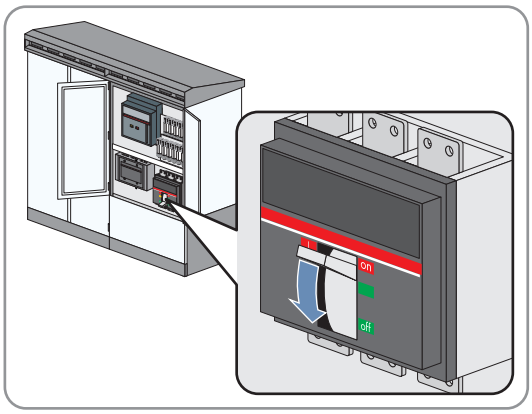
5.2.2 Disconnecting the DC Side

1. Switch off the inverter (see Section 5.2.1, page 51).
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.

5.2.3 Disconnecting the AC Side

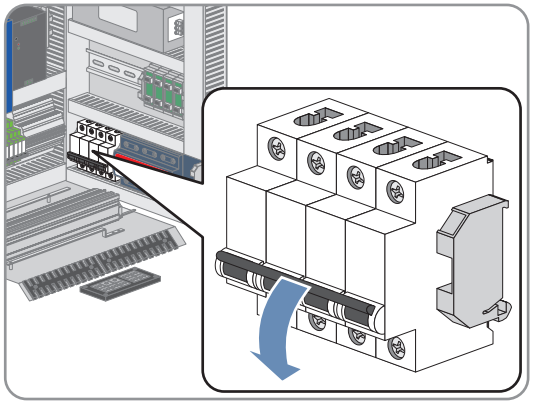
1. Switch off the inverter (see Section 5.2.1, page 51).
2. Disconnect the DC side (see Section 5.2.2, page 51).
3. Externally disconnect the AC voltage of the MV transformer.
4. Switch off the AC disconnection unit in the inverter.



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

5.2.4 Disconnecting the Supply Voltage and External Voltages

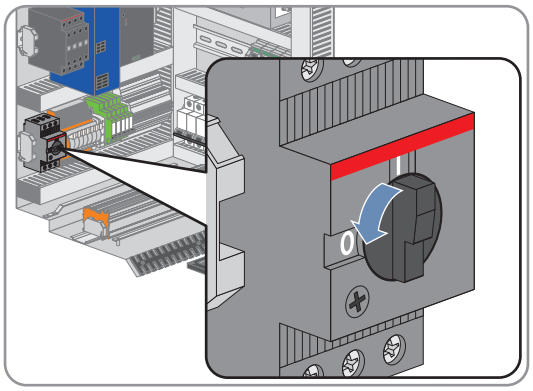
1. If the supply voltage is only to be disconnected upstream from the circuit breaker, switch the circuit breaker of the supply voltage off.



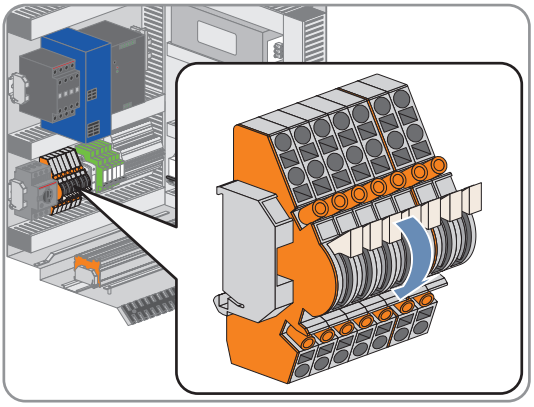
2. If the supply voltage is also to be disconnected downstream from the supply voltage circuit breaker, switch the external circuit breaker of the supply voltage off.

   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.

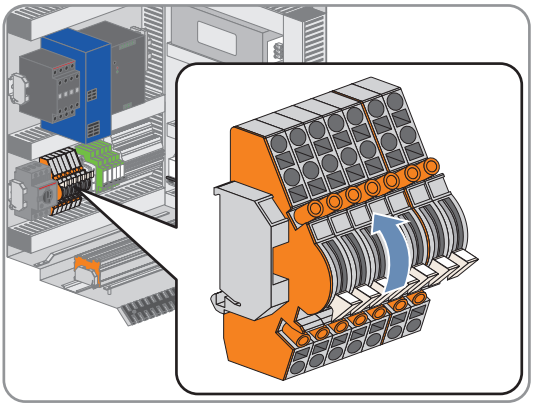


6. Ensure that no voltage is present.
7. Cover or isolate any adjacent live components.

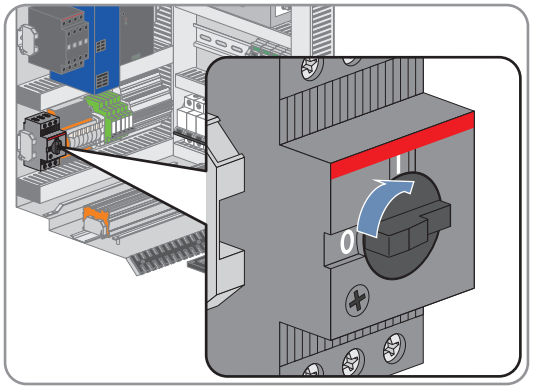
5.3 Reconnecting the Inverter

5.3.1 Reconnecting the Supply Voltage and External Voltages

1. Close the measurement and disconnect terminals.

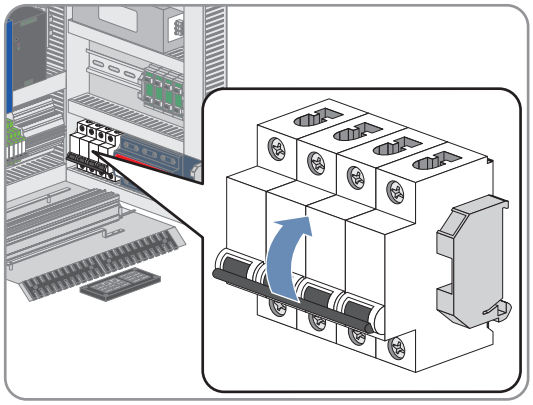


2. Switch on the motor-protective circuit-breakers of the grid monitoring.



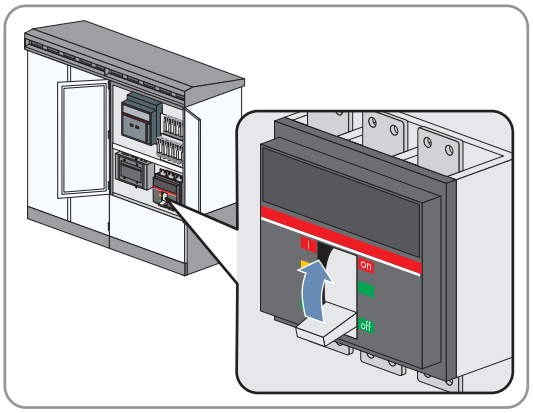
3. Connect any additional external voltage.
4. If the supply voltage has been disconnected downstream from the circuit breaker, switch the external circuit breaker of the supply voltage on.

   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.



5.3.2 Reconnecting the AC Side

1. Reconnect the supply voltage and external voltages (see Section 5.3.1, page 53).
2. Reconnect the AC voltage of the MV transformer.
3. Switch on the AC disconnection unit in the inverter.



5.3.3 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).

5.3.4 Restarting the Inverter

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

6 Operation

6.1 Safety during Operation

NOTICE

Operation failure of the PV power plant due to incorrectly set parameters

If the parameter settings for grid management services are incorrect, the PV power plant may not be able to meet the requirements of the grid operator. This can involve yield losses and the inverter may have to be disconnected by the grid operator.

- When setting the modes of grid management services, ensure that the control procedures agreed with the grid operator are parameterized.
- If the inverter is operated with a Power Plant Controller, ensure that the mode **WCtlCom** for active power limitation and the mode **VArCtlCom** for reactive power control are selected in the inverter.

6.2 Displaying Operating Data

6.2.1 Displaying Operating Data via the User Interface

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Data > Devices**.
3. Select  .
   ☑ A list of the existing device types appears.
4. Select the desired device type.
   ☑ A list appears containing all existing devices of this type.
5. Select the desired device from the list.
6. Select the tab **Instantaneous values**.

6.2.2 Displaying the Operation Data via Sunny Portal

6.2.2.1 Registering the Inverter in Sunny Portal

Automatic PV system identifier

In general, you do not have to change the preset number in the field **PV system identifier**. Sunny Portal uses this number to uniquely identify the PV power plant. If you have not yet registered the PV power plant in Sunny Portal, the predefined PV system identifier will be automatically entered in Sunny Portal after the first successful data upload. Sunny Portal sends the login data to the e-mail address you have entered in the field **Operator e-mail**. After this, your PV power plant is registered in Sunny Portal.

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > Data transmission**.
3. Enter the name of your PV system in the field **PV system name**. This name will be displayed as the name of the PV system in Sunny Portal.
4. Set the data transmission frequency (see Section 6.3.2, page 57).
5. Select **yes** in the field **Use Sunny Portal**.
6. If the PV system is already registered in Sunny Portal, adapt the PV system identifier in the field **PV system identifier** (see Section 6.2.2.2, page 56).

7. Enter your e-mail address in the field **Operator e-mail**. Sunny Portal will send the access data to this e-mail address.
8. Select the button [**Save**].
9. Select **Sunny Central > Info**.
10. Select [**Register**] in the field **Last Sunny Portal registration**. The Sunny Portal password will be sent to the e-mail address you have entered.

6.2.2.2 Adjusting the PV System Identifier for Sunny Portal

Sunny Portal identifies the inverter via the PV system identifier. In the following cases, you will need to adjust the PV system identifier of the inverter:

- Data of the PV power plant has already been sent to Sunny Portal via another communication unit.
- The set PV system identifier of the communication unit has been reset.
- The communication unit has been replaced.

Procedure:

1. Log into Sunny Portal (www.SunnyPortal.com).
2. Select **Configuration > PV system properties**.
3. Copy the PV system identifier to the clipboard.
4. Log into the user interface (see Section 9.4.1, page 81).
5. Select **Sunny Central > Settings > Data transmission**.
6. Delete the content of the **PV system identifier** field.
7. Paste the PV system identifier from the clipboard into the **PV system identifier** field.
8. Select the button [**Save**].

6.2.2.3 Deleting the Sunny Portal Buffer

You can delete the data on the internal ring buffer.

Procedure:

1. Log into the user interface as an installer (see Section 9.4.1, page 81).
2. Select **Sunny Central > Info**.
3. Select the button [**Delete**] in the field **Sunny Portal Buffer Load**.

6.3 Saving Operating Data

6.3.1 Reducing Storage Capacity by Averaging

The communication unit can average the data over a defined time period. This helps to compress the data of the connected devices so that it occupies less memory space in the communication unit.

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Recording**.
3. In the field **Averaging over**, select the time period over which the communication unit is to calculate the average.
4. Select the button [**Save**].

6.3.2 Setting the Data Transmission Frequency

The communication unit can transmit the data to Sunny Portal or an external FTP server. You can set how often and at what interval data will be sent by the communication unit. All data upload settings relate to both data upload to Sunny Portal and data upload to an external FTP server.

If the data transmission to Sunny Portal or the external FTP server fails, the communication unit will make further attempts to transmit the data.

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > Data transmission**.
3. Select the upload frequency and time window in the field **Upload frequency per time window**.
4. Select the maximum number of upload attempts in each time window in the field **Maximum number of upload attempts per time window**.
5. Select the button [**Save**].

6.3.3 Downloading Operating Data Using the FTP Server

6.3.3.1 Defining Read and Write Access Rights

The communication unit is equipped with an integrated FTP server. You can use the FTP server to access the data of the communication unit. The data is available for view and download in CSV or XML format. In order to use the FTP server, you must first assign read and write access rights for the FTP server on the communication unit.

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > Security**.
3. Select an option in the field **FTP server**:

Option	Explanation
Read/write	You have read and write access rights on the integrated FTP server.
Read only	You have read access rights only on the integrated FTP server.
Off	The integrated FTP server is deactivated.

4. Select the button [**Save**].

6.3.3.2 Accessing the FTP Server via the Web Browser

You can log into the FTP server of the communication unit as either "user" or "installer".

i Stored user name and password in the web browser

After you have accessed the FTP server of the communication unit with a web browser, user name and passwords can be saved in the browser cache.

- Clear the web browser cache to prevent unauthorized access to the FTP server of the communication unit.

Procedure:

1. Start your web browser.
2. Enter the FTP address of the communication unit with your user name and password as follows: ftp://[user name]:[password]@[IP address]

Example: entering the FTP address

If you want to log into the communication unit with IP address 192.168.100.2 and your user name is "user" and password "1234", the correct FTP address is ftp://user:1234@192.168.100.2

3. Press the enter key.

6.3.3.3 Activating Automatic Data Transmission via FTP Push

The communication unit is equipped with an FTP push function. With this function, the data collected from your PV power plant can be uploaded as an XML file to a local FTP server.

Option	Explanation
Yes	Authentication is needed for the FTP server.
No	No authentication is required.

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > Data transmission**.
3. In the field **Use FTP-Push service**, select **yes**.
4. In the field **FTP server**, enter the URL and port of the FTP server.
5. In the field **Upload directory**, specify the folder on the FTP server to which the data is to be saved.
6. In the field **Use authentication**, select an option.
7. Enter the data of your FTP server in the fields **User name** and **Password**.
8. Set the data transmission frequency (see Section 6.3.2, page 57).
9. To test the FTP push function, select the button [**testing**] in the field **Test FTP connection**.
   ☑ A test file is sent to the FTP server.
   ✖ No test file is sent to the FTP server?
   - Ensure that the address of the FTP server and the upload directory are correct.
   - Repeat the FTP connection test.
   - If an error occurs, contact your network administrator.
10. Select the button [**Save**].

6.3.4 Downloading Operating Data via HTTP Download

6.3.4.1 Downloading Data in XML Format

You can download the data collected by the communication unit via HTTP download. This function enables manual download of your collected PV system data in CSV or XML format to your computer.

Requirement:

☐ Averaging must be activated (see Section 6.3.1, page 56).

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Recording**.
3. In the field **Format**, select the option **XML**.
4. In the field **Download**, select the required month. The data of the last twelve months is available for download via the user interface.

5. Select the button [**Download**].
6. Choose the save location.
7. Select the button [**Save**].

6.3.4.2 Downloading Data in CSV Format

Data saved in CSV format can be automatically imported into tables (e.g. in Microsoft Excel). The configured separator and end of line characters are used to structure the data.

Requirement:

☐ Averaging must be activated (see Section 6.3.1, page 56).

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Recording**.
3. In the field **Format**, select the option **CSV**.
4. Select [**Configure**].
5. Select the desired format of the file name in the field **Filename format**.
6. In the field **Create column headers**, select an option:

Option	Explanation
Yes	A header is added to the CSV file.
No	No header is added to the CSV file.

7. Select an option in the field **End-of-line character**.

Option	Explanation
CRLF (Windows)	Control character used in Windows to separate lines in a CSV file.
LF (Unix/Linux)	Control character used in Linux to separate lines in a CSV file.
CR (Mac)	Control character used in Macintosh to separate lines in a CSV file.

8. In the field **Separator character** , select the separator character to be used to separate content within the CSV file. Tip: If you intend to import CSV data into Microsoft Excel for evaluation, choose **Comma** as the separator.
9. In the field **Number format**, select the desired number format. Tip: If you intend to import CSV data into Microsoft Excel for evaluation, select **#.##** as the number format.
10. In the field **Timestamp format**, select the desired time format.
11. In the field **Format of the status channels**, select an option:

Option	Explanation
Numeric	Status information on the inverter is displayed in numeric format.
Plain text	Status information on the inverter is displayed as text.

12. Select the button [**Save**].
13. In the field **Download**, select the required month. The data of the last twelve months is available for download via the user interface.
14. Select the button [**Download**].
15. Select the button [**Save**].

16. Choose the save location.
17. Select the button [**Save**].

6.3.5 Saving Operating Data on a Memory Card

6.3.5.1 Information on Saving Data on a Memory Card

You can save all the data collected from the inverter to a memory card. The save-to-memory-card feature is disabled by default. If a memory card is inserted into the slot of the communication unit and data storage on external storage media is enabled, the communication unit will copy all data from the internal ring buffer to the external SD memory card. The communication unit continues to store data on the memory card for as long as the memory card is inserted in the slot. The communication unit creates a folder on the memory card. The name of the folder is "SC-COM_[SerialNumber]". [SerialNumber] designates the serial number of the respective communication unit. In this folder, the communication unit creates a new subfolder for each day. Each subfolder contains all the data collected by the communication unit. When the memory card has reached its capacity, the LED **H5** glows red and the communication unit ceases to store data on the memory card. Replace the memory card or reformat it on the computer.

Data loss if memory card is removed

Do not remove the memory card while the communication unit is in process of storing data. This can damage the file system of the memory card and lead to data loss. Depending on the amount of data, the write process can take some time.

6.3.5.2 Inserting the Memory Card

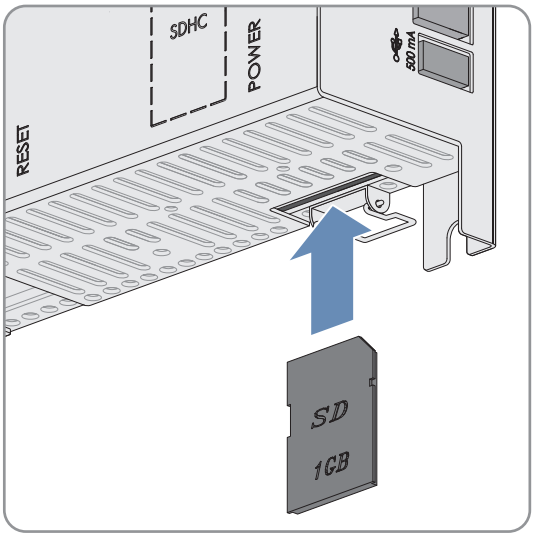
DANGER

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 5, page 51).

Procedure:

- Insert the memory card in the slot of the communication unit.



6.3.5.3 Enabling Data Storage on the Memory Card

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > Security**.

3. To activate data storage to the memory card, select the option **Enabled** in the field **External memory**.
4. To deactivate data storage to the memory card, select the option **Disabled**.
5. Select the button [**Save**].

6.3.5.4 Displaying the Memory Capacity Available on the Memory Card

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Info**.
3. In the field **Sunny Portal Buffer Load**, you can see the space available in the internal ring buffer.
4. In the field **SD card memory capacity**, you can see the space available on the memory card.

6.4 Updating the Firmware

6.4.1 Automatic Update

If the communication unit has access to Sunny Portal, you can select automatic update of the firmware. The communication unit checks whether a new firmware version is available every time data is transmitted to Sunny Portal. If a new firmware update is available, the communication unit will download the firmware update from the Internet and install it at night between 1:00 a.m. and 4:00 a.m (time set on the inverter). The automatic firmware update function is disabled by default.

Requirement:

☐ Connection to Sunny Portal must be established (see Section 6.2.2, page 55).

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > Data transmission**.
3. In the field **Automatic firmware update**, select the option **yes**.
4. Select the button [**Save**].

6.4.2 Update via User Interface

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Info**.
3. Select the button [**Refresh**] in the field **VersionFirmware**.

6.5 Changing the Insulation Monitoring

6.5.1 Insulation Monitoring with GFDI and Insulation Monitoring Device

6.5.1.1 Safety with insulation monitoring with GFDI and insulation monitoring device

⚠ DANGER

Danger to life from electric shock due to live voltage

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

- After switching off the inverter, wait at least 15 minutes before opening it to allow the capacitors to discharge completely.
- Wear suitable personal protective equipment for all work on the product.
- All work must be carried out in accordance with this document. All safety information must be observed.
- Do not touch any live components of the inverter or the medium-voltage grid. Comply with all applicable safety regulations for handling medium-voltage grids.

Ground-fault monitoring with GFDI does not provide protection from personal injury.

The order option "GFDI and insulation monitoring device" allows you to manually switch the PV power plant from grounded operation to insulated operation. To ensure that there is no insulation error on the grounded terminal, an insulation measurement is carried out. After switching to insulated operation, the insulation monitoring device checks all poles of the PV power plant for potential insulation errors. Switching to insulated operation is useful for performing maintenance or service work on or near the PV power plant (e.g. cutting the grass) or for checking the status of the insulation at regular intervals. After completion of the maintenance work, the PV power plant must be switched back to grounded operation.

6.5.1.2 Switching to Insulated Operation

1. Turn the key switch to **Stop**.
2. Wait 15 minutes before opening the inverter. This will ensure that the capacitors are discharged.
3. Disconnect the circuit breaker of the GFDI manually.
4. Close the inverter.
5. Turn the key switch to **Start**.
   - ☑ The insulation monitoring device starts collecting data. If the parameter **IsoErrIgn** is set to **On**, the error **3504 – Insulation failure ignored** is displayed.
   - ✖ After 15 minutes, the displayed error **3504** does not disappear?

     The insulation is defective.
     - Have the insulation checked and, if necessary, repaired by a qualified person.
     - Acknowledge the error.
6. Log into the user interface (see Section 9.4.1, page 81).
7. Wait a few minutes and then call up the instantaneous value **Riso** on the user interface.
   - ☑ The insulation resistance is greater than 45 kΩ. It is safe to enter the PV system.
   - ✖ The insulation resistance is less than 45 kΩ?

     There is an insulation error and you must not enter the PV system.
     - Have the insulation checked and, if necessary, repaired by a qualified person.

6.5.1.3 Switching to Grounded Operation

1. Turn the key switch to **Stop**.
2. Wait 15 minutes before opening the inverter. This will ensure that the capacitors are discharged.
3. Manually switch on the GFDI circuit breaker.
4. Close the inverter.
5. Turn the key switch to **Start**.

6.5.2 Insulation Monitoring with Remote GFDI and Insulation Monitoring Device

6.5.2.1 Information on Insulating PV Modules with Remote GFDI and Insulation Monitoring Device

Ground-fault monitoring does not provide protection from personal injury. Ground-fault monitoring and the insulation monitoring device enable the PV array to be switched automatically from grounded operation to insulated operation. To ensure that there is no insulation error on the grounded terminal, an insulation measurement is carried out. After switching to insulated operation, the insulation monitoring device checks all poles of the PV array for potential insulation errors. Switching to insulated operation is useful for performing maintenance or service work near the PV array (e.g. cutting the grass) or for checking the status of the insulation at regular intervals.

6.5.2.2 Switching to Insulated Operation

1. Log into the user interface (see Section 9.4.1, page 81).
2. Set the parameter **RemMntSvc** to **On**.

☑ The insulation monitoring device starts collecting data. If the parameter **IsoErrIgn** is set to **On**, the error **3504 - Insulation failure ignored** is displayed.

✖ After 15 minutes, the displayed error **3504** does not disappear?

The insulation is defective.

- Have the insulation checked and, if necessary, repaired by a qualified person.
- Acknowledge the error.

6.5.2.3 Switching to Grounded Operation

1. Log into the user interface (see Section 9.4.1, page 81).
2. Set the parameter **RemMntSvc** to **Off**.

6.6 Deleting the Device Description

Whenever you replace a device in your PV power plant, the descriptions of the existing devices need to be deleted so that the communication unit is able to detect new devices.

Procedure:

1. Log into the user interface as an installer (see Section 9.4.1, page 81).
2. Select **Sunny Central > Info**.
3. Select the button [**Delete device descriptions**].

6.7 Sending a ZIP File with Service Information

In order to help you quickly and effectively, a ZIP file containing service information may be required. This ZIP file can be downloaded from the user interface. The files are protected with a service password.

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Info**.
3. Select [**Create service information**].
   ☑ A dialog box for downloading the ZIP file is opened.
4. Save the ZIP file on the computer.
5. Send the ZIP file to us (see Section 13, page 155).

7 Troubleshooting

7.1 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 13 "Contact", page 155).

7.2 Activating Alert in the Event of a Fault

You can be notified by e-mail of events that have occurred. This allows a rapid response to failures in the PV power plant and minimizes downtimes. The alert is deactivated upon delivery.

Communication unit reports an error-type event after two averaging intervals

The communication unit reports error-type events which have persisted twice as long as the time set for averaging.

Example: If the averaging setting is 15 minutes, the communication unit will report an error once it has existed for longer than 30 minutes.

Procedure:

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Settings > Data transmission**.
3. In the field **Notification active**, select **yes**.
4. Select an option in the field **Multiple Notices (24h/48h)**:

Option	Explanation
yes	You will receive an e-mail immediately upon occurrence of an event. If the event persists after 24 hours and 48 hours, the e-mail will be sent again.
no	You will receive an e-mail once when an event occurs. An e-mail with error-type events is sent after two averaging intervals.

5. In the field **E-mail address**, enter the e-mail address. If an e-mail is to be sent to multiple e-mail addresses, separate the e-mail addresses with commas.
6. In the field **E-mail when**, select the desired event type for which the e-mail is to be sent.
7. Enter the required data in the fields **Mail server (SMTP)**, **Sender e-mail**, **User name** and **Password**.
8. Select the button [**Testing**].
   ☑ A test e-mail will be sent to the specified e-mail address.
   ✖ No test e-mail received?
   - Check whether the test e-mail is in the spam folder.
   - Make sure that the network settings of the communication unit are correct.
   - Make sure the settings of the e-mail server are correct.
9. Select the button [**Save**].

7.3 Reading Off Disturbance Messages

7.3.1 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.

7.3.2 Reading Off Disturbance Messages via the User Interface

1. Log into the user interface (see Section 9.4.1, page 81).
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.

7.3.3 Displaying the Event Report

7.3.3.1 Enabling Automatic Read-Out of Events

1. Log into the user interface (see Section 9.4.1, page 81).
2. Select **Sunny Central > Recording**.
3. In the field **Collect automatically fault logs**, select **yes**.
4. Select the button [**Save**].

7.3.3.2 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 9.4.1, page 81).
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**].

7.4 Acknowledging Disturbance Messages

7.4.1 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.

7.4.2 Acknowledging Disturbance Messages via the User Interface

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 9.4.1, page 81).
3. Select the parameter **Ackn** in the device displaying the error, and set to **Ackn**.
4. Select the button [**Save**].

7.5 Remedial Action in Case of Disturbances

7.5.1 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. With certain disturbances, the inverter behavior will 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 disconnection unit 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 disconnection unit and DC switchgear. The inverter does not feed in until the disturbance is acknowledged.

  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 disconnection unit 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 disconnection unit 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.

7.5.2 Explanation of the Error Tables

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

Error no.	Explanation	A S1	A S2	B R	Corrective measures
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 • s / min: waiting time • C: system-specific • D: day change • Q: waiting for acknowledgement • W: warning
B	Reset

7.5.3 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 S1	S2	R	Corrective measures
0103*	Grid voltage is too high. Overvoltage detected by redundant monitoring.	30 s	30 s	–	• Check the grid voltage. • Check grid connections. • Check stability of the utility grid. • Make sure the external fuses work properly. • Make sure the AC cable connections are tight.
0104*	Grid voltage is too high. Overvoltage detected by standard monitoring.	C	C	–	
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*	Grid synchronization not possible	30 s	30 s	–	
0404*	Frequency change per second too high for grid operation	30 s	30 s	–	–

Error no.	Explanation	Inverter behavior			Corrective measures
		S1	S2	R	
0502*	Power frequency is too low. Power frequency disturbance detected by standard monitoring.	30 s	30 s	–	• Check power frequency. • Check the display of the grid monitoring relay. • Make sure the fuses in the load circuit function properly.
0503*	Power frequency is too high. Power frequency disturbance detected by standard monitoring.	30 s	30 s	–	
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	–	• Check power frequency.
0801*	One line conductor of the utility grid has failed.	30 s	30 s	–	• 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	–	• Check 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	–	• Check the power frequency and grid voltage.

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

7.5.4 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	–	• 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	–	
3501	The insulation monitoring device has measured a too low grounding resistance.	C	C	–	• Check the PV array for ground faults.

Error no.	Explanation	Inverter behavior			Corrective measures
		S1	S2	R	
3502	The GFDI has tripped.	C	C	–	• 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	–	• Check the PV array for ground faults.
3507	A ground fault has occurred on the ungrounded terminal of the PV array.	Q	Q	–	• Check the PV array for ground faults.
3510	The inverter has detected an insulation error on the inverter bridge.	Q	Q	–	• Check the PV array for ground faults.
3511	The inverter has detected an insulation error.	W	W	–	• Check the PV array for ground faults.
3512	The Remote GFDI has detected a permanent ground fault.	Q	Q	–	• Check the PV array for ground faults.
3515	A ground fault detected by Soft Grounding has been ignored.	W	W	–	• 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	–	• 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	–	• 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	–	• 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.

7.5.5 Error Numbers 6xx to 9xx - Disturbance on the Inverter

Error no.	Explanation	Inverter behavior			Corrective measures
		S1	S2	R	
6002	Calibration data cannot be loaded.	Q	Q	–	• Contact SMA Service Line.
6113	Data block cannot be loaded from EEPROM or channel list has changed (e.g. after firmware update)	W	W	–	• Contact SMA Service Line.
6115	Setting of hardware thresholds on D/A converters is not possible.	5 min	5 min	x	• Contact SMA Service Line.
6116	Real-time clock has not initialized.	W	W	–	• Contact SMA Service Line.
6117	Device address not recognized.	5 min	5 min	x	• Contact SMA Service Line.
6119	Data structure for communication between operation control unit and digital signal processor is invalid.	5 min	5 min	x	• Contact SMA Service Line.
6120	Watchdog tripping error	30 s	W	–	• Contact SMA Service Line.
6121	No response from watchdog	30 s	W	–	• Contact SMA Service Line.
6122	Ten internal monitoring errors have occurred in succession.	W	5 min	–	• Contact SMA Service Line.
6128	General error	5 min	5 min	x	• Contact SMA Service Line.
6404	Overcurrent at line conductor L1, L2 or L3	C	Q	x	• Contact SMA Service Line.
6405	Overvoltage in the DC link of the inverter bridge	30 s	5 min	–	• Contact SMA Service Line.
6410	24 V supply voltage is invalid.	5 min	5 min	x	• Contact SMA Service Line.
6417	15 V supply voltage is invalid.	5 min	5 min	x	• Contact SMA Service Line.
6418	Overtemperature of the inverter bridge	5 min	15 min	–	• Contact SMA Service Line.
6422	Inverter bridge in undefined state	30 s	5 min	–	• Contact SMA Service Line.
6423	Overtemperature in the switch cabinet	5 min	30 min	–	• Contact SMA Service Line.
6425	Synchronization error with utility grid	30 s	5 min	x	• Contact SMA Service Line.
6427	Sensor error of DC voltage measurement	30 s	C	–	• Contact 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 SMA Service Line.
6443	Unspecified error in digital signal processor	30 s	–	x	• Contact SMA Service Line.
6447	Self-test of inverter bridge failed	Q	Q	–	• Contact 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 SMA Service Line.
6452	Measured AC voltage of the utility grid is less than inverter voltage.	W	W	–	• Contact SMA Service Line.
6453	AC voltage of grid limit monitoring is faulty.	W	W	–	• Contact SMA Service Line.
6454	AC current is faulty.	W	W	–	• Contact SMA Service Line.
6455	AC voltage is faulty.	W	W	–	• Contact SMA Service Line.
6456	Pre-charging circuit of DC link is defective.	W	W	–	• Contact SMA Service Line.
6457	Capacitor self-test has failed.	Q	Q	–	• Contact 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 SMA Service Line.
6472	Endless loop between online and offline capacitor test	Q	Q	–	• Contact 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 SMA Service Line.
6501	Interior temperature of inverter is too high.	30 s	1 min	–	• Check function of the fans. • Clean the fans. • Clean clogged fan inlets and ventilation plates.
6502	Temperature of inverter bridge is too high.	30 s	1 min	–	
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 overtemperature in the switch cabinet.	30 s	1 min	–	• Contact SMA Service Line.
7001	Cable break or short circuit at inverter temperature sensor	W	W	–	• Check the wiring of the temperature sensor. • Contact SMA Service Line.
7002		W	W	–	
7004		W	W	–	
7006		W	W	–	
7501	Interior fan is defective.	W	W	–	• 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	–	• Check cabling between touch display and communication unit. • Contact SMA Service Line.
7601	Internal inverter error	30 s	1 min	x	• Contact SMA Service Line.
7602	Internal communication error has occurred or communication is interrupted.	30 s	1 min	x	• Contact SMA Service Line.
7605		30 s	1 min	x	• Contact SMA Service Line.
7704	Faulty switching status of the DC switchgear	30 s	Q	–	• 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 SMA Service Line.
7706	The AC disconnection unit is open or was tripped.	30 s	Q	–	• Contact SMA Service Line.
7707	Faulty switching status of the AC disconnection unit	30 s	Q	–	• Contact SMA Service Line.
7708	Faulty switching status of Remote GFDI	W	W	–	• Contact SMA Service Line.
7709	90% of switch cycles of the DC switchgear reached	10 s	10 s	–	• Contact SMA Service Line.
7710	100% of switch cycles of the DC switchgear reached	30 s	30 s	–	• Contact 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	–	• Replace GFDI.
7801	The surge arrester is defective or the back-up fuse of the surge arrester was tripped.	W	W	–	• 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	• Contact SMA Service Line.
8004	The inverter starts to derate due to overcurrent at the DC switchgear (SMID).	W	W	–	–
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	–	• Contact SMA Service Line.
8702	Several digital active power setpoints are available.	W	W	–	• Contact SMA Service Line.
8703	Power factor of the external reactive power setpoint is invalid.	W	W	–	• Contact SMA Service Line.
8704	External active and reactive power setpoints are invalid.	W	W	–	• Contact SMA Service Line.
9000	Power electronics self-test is running. This message disappears once the self-test is complete.	W	W	–	–
9008	Doors have been opened during operation.	30 s	1 min	–	• Contact SMA Service Line.
9009	Fast stop has tripped.	30 s	30 s	–	• 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	–	• Eliminate error and switch fast stop back on.
9019	Defective fast stop	30 s	C	–	• Check the fast stop cabling.

7.5.6 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 9.4.1, page 81).
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.
ComFail	The mode **WCtlCom** has been selected and the expected signal with a valid active power limitation has been absent for at least five minutes. **Corrective measures:** • 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	The mode **WCnstNomAnIn** has been selected and the value measured at the analog input is less than 2 mA. **Corrective measures:** • Make sure the cable is correctly connected to the analog input.
ComInvalid	The mode **WCtlCom** has been selected and there is invalid content in the power setpoint information. **Corrective measures:** • Check the power specification settings.

7.5.7 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 9.4.1, page 81).
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	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. **Corrective measures:** • 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.

Display	Cause and corrective measure
AnInFail	The mode **VArCnstNomAnIn** or **PFCnstAnIn** has been selected and the value measured at the analog input is less than 2 mA. **Corrective measures:** • Make sure the cable is correctly connected to the analog input.
ComInvalid	The mode **VArCtlCom** or **PFCtlCom** has been selected and there is invalid content in the power setpoint information. **Corrective measures:** • Check the power specification settings.

8 Disposal

Proper disassembly and disposal

When the inverter has reached the end of its service life, it becomes electronic waste. Electronic waste contains on the one hand valuable materials which can be recycled as secondary raw materials, and on the other, substances which are hazardous to the environment. Contact your local commercial disposal services for information on optimum material utilization.

- Prior to disassembly, perform a visual inspection to ensure that the supporting elements of the inverter are not rusted or unstable.

9 Periodic Actions

9.1 Mounting and Disassembly Work

9.1.1 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 5, page 51).

NOTICE

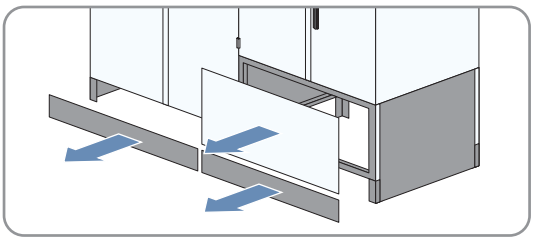
Property damage due to rupture of grounding conductors

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 9.1.2, page 80).

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).

9.1.2 Disassembling and Mounting the Protective Covers

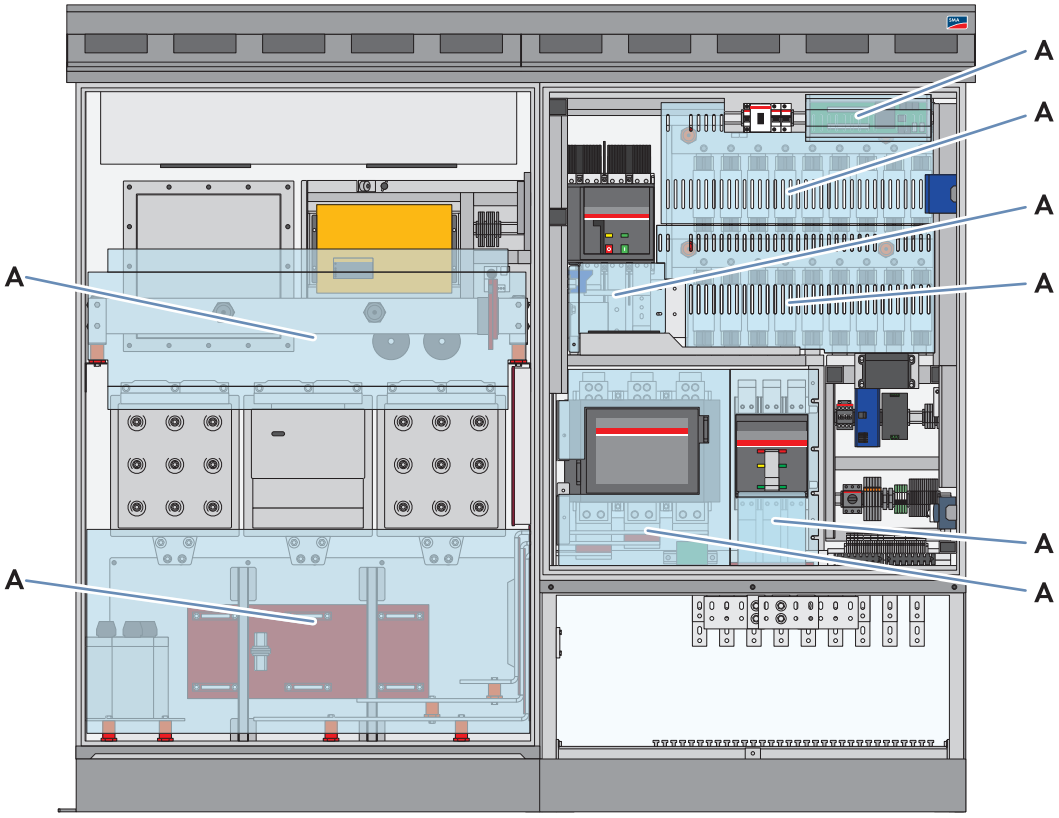


Figure 12: Position of the protective covers

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 5, page 51).

Disassembling the protective covers

Requirements:

☐ The panels must be disassembled (see Section 9.1.1, page 79).

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.

9.2 Entering the Password via the Touch Display

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.

9.3 Parameter Overview

9.3.1 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**.

9.3.2 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**].

9.4 User Interface

9.4.1 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. Enter the password in the field **Password**.
6. Select the button [**Login**].

9.4.2 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**].

10 Function Description

10.1 Operating States

10.1.1 Overview of the Operating States

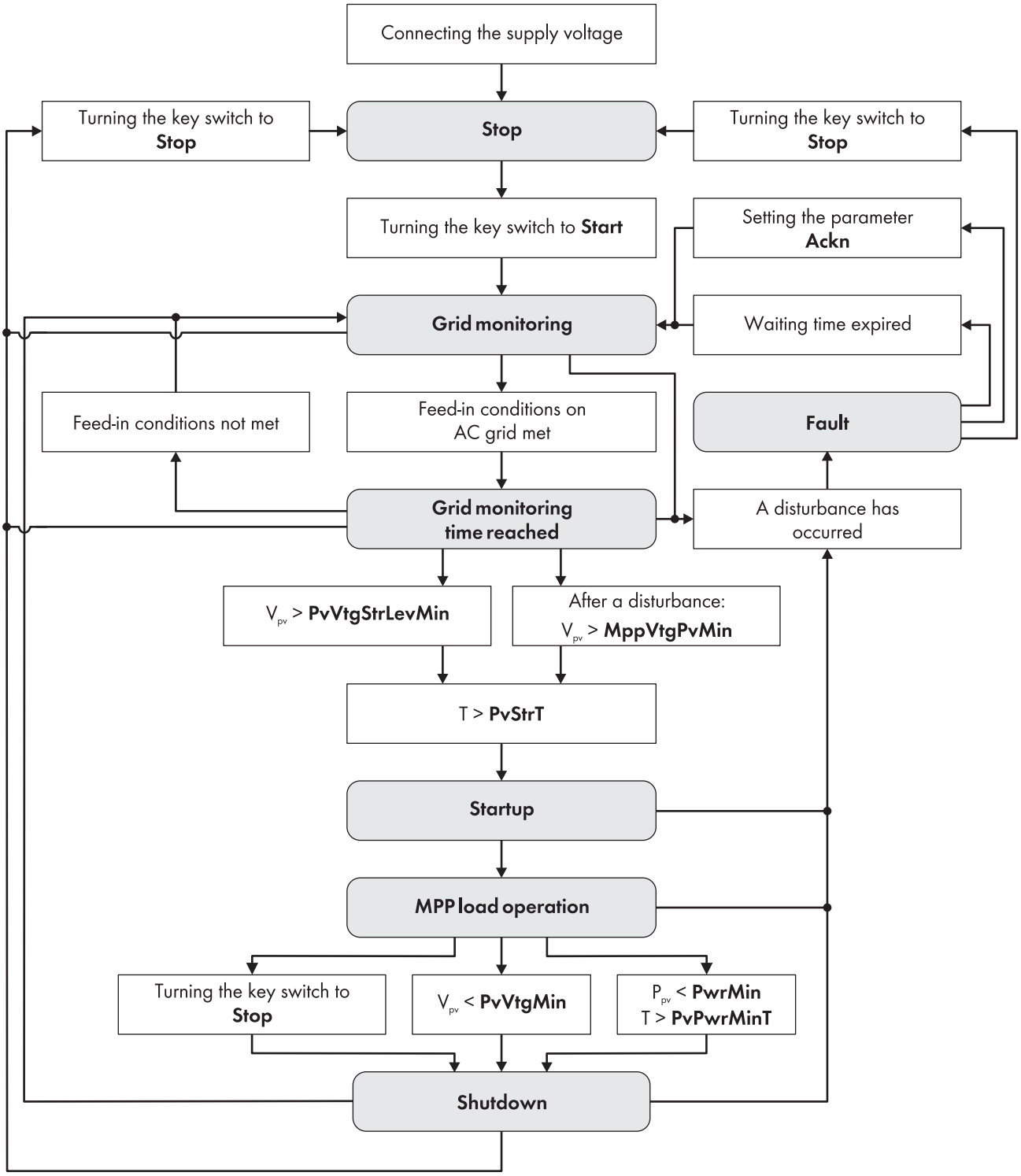


Figure 13: General overview of the operating states of the inverter

10.1.2 Stop

The inverter is switched off. **Stop**, **Fast stop** or **Remote shutdown active** will appear on the touch display. If the key switch is set to **Start**, the inverter switches to the operating state "Grid monitoring".

10.1.3 Grid Monitoring

10.1.3.1 Monitoring the Grid Voltage

In the operating state "Grid monitoring", **Waiting for valid AC grid** appears on the touch display. The grid limits are monitored continuously from now on. If no grid error occurs during the grid monitoring time, the AC disconnection unit closes and the inverter switches to the operating state "Grid monitoring time reached". If the grid limits are exceeded during the monitoring time, the inverter will restart "Grid monitoring".

You can specify the thresholds and the delay time manually. For voltage monitoring, you can set two limits for overvoltage and two limits for undervoltage. If the grid voltage increases above the value defined in the parameter **VCtlhhLim** or **VCtlhLim**, the inverter waits for the time defined in the parameter **VCtlhhLimTm** or **VCtlhLimTm** and disconnects from the utility grid.

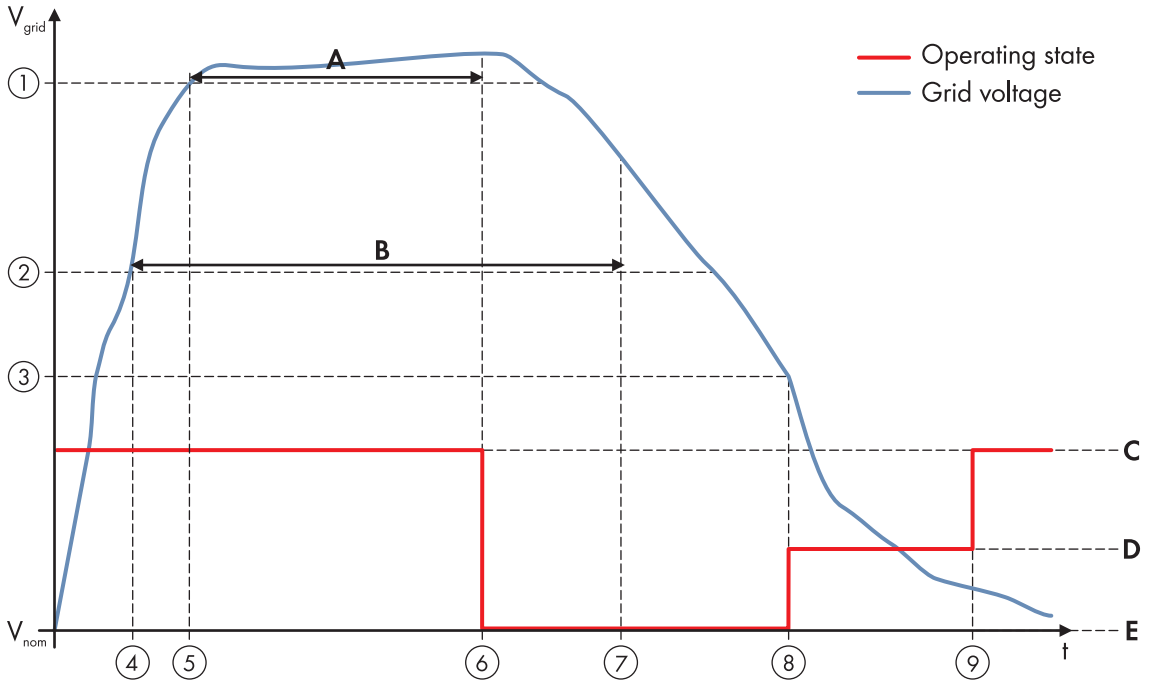


Figure 14: Temporal inverter behavior when the grid limits are exceeded

Position	Parameter	Description
A	VCtlhhLimTm	Delay time for grid limit level 2
B	VCtlhLimTm	Delay time for grid limit level 1
C	–	Startup/MPP load operation
D	–	Grid monitoring
E	–	Disturbance
1	VCtlhhLim	Grid voltage limit level 2
2	VCtlhLim	Grid voltage limit level 1
3	–	Connection limit, maximum nominal voltage deviation

Position	Parameter	Description
4	–	Grid limit level 1 is breached, timer for B starts counting
5	–	Grid limit level 2 is breached, timer for A starts counting
6	–	Grid limit level 2 is breached for delay time level 2 → grid disconnection
7	–	Grid limit level 1 is breached for delay time level 1 → grid disconnection (has already occurred on level 2)
8	–	Connection conditions fulfilled → grid monitoring time starts counting
9	–	Utility grid within valid range during grid monitoring time → grid connection

10.1.3.2 Monitoring the Power Frequency

In the operating state "Grid monitoring", **Waiting for valid AC grid** appears on the touch display. The grid limits are monitored continuously from now on. If no grid error occurs during the grid monitoring time, the AC disconnection unit closes and the inverter switches to the operating state "Grid monitoring time reached". If the grid limits are exceeded during the monitoring time, the inverter will restart "Grid monitoring".

You can specify the thresholds and delay times manually. For frequency monitoring, three thresholds can be configured for both overfrequency and underfrequency. For example, at an overfrequency of 50.5 Hz, tripping can take place after one second, and at an overfrequency of 51.5 Hz already after 0.1 seconds.

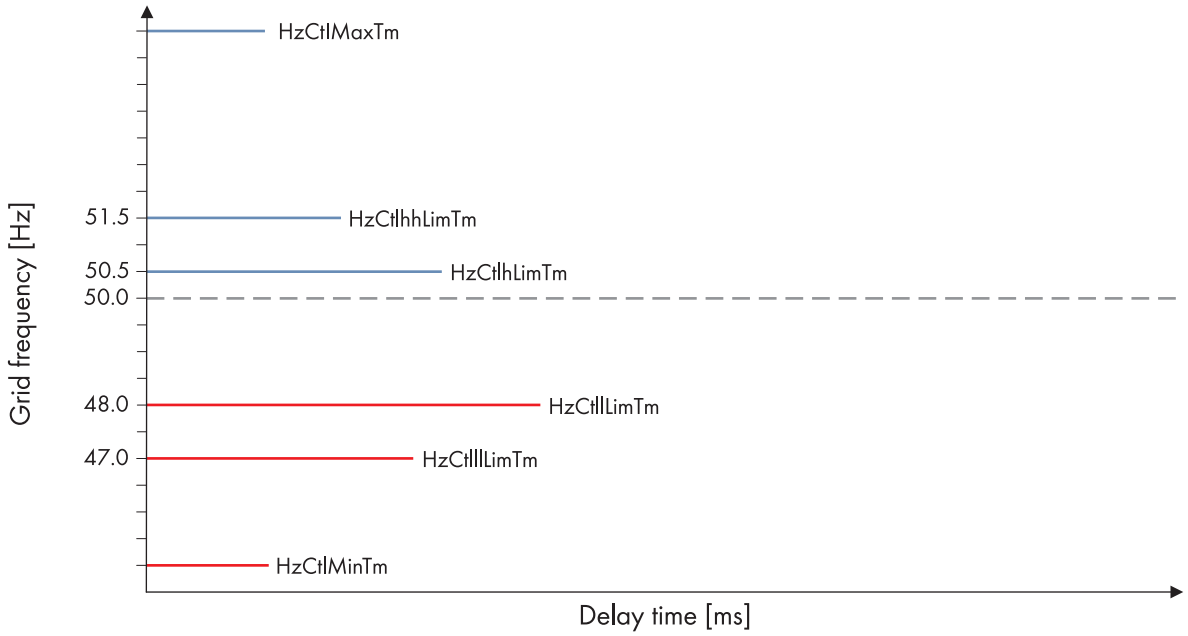


Figure 15: Tripping characteristics and time behavior as exemplified by frequency monitoring with the set parameters

10.1.4 Grid Monitoring Time Reached

The inverter is in the operating state "Grid monitoring time reached". **Waiting for PV voltage** or **Waiting for utilities company** appears on the touch display. If the input voltage V_{PV} exceeds the start voltage **PvVtgStrLevMin**, the inverter waits until the time specified in parameter **PvStrT** has elapsed. If the input voltage V_{PV} does not fall below the start voltage **PvVtgStrLevMin** during this time, the inverter checks whether the utility grid is connected. If a valid AC grid is connected, the inverter switches to the operating state "Startup". The start voltage **PvVtgStrLevMin** must be adjusted to conform with the PV array connected to the inverter.

10.1.5 Startup

10.1.5.1 In Normal Operation: Active Power Ramp-Up

The inverter works up to its maximum feed-in power via a ramp. This means that the inverter gradually increases the ratio of feed-in power per second by the value set in the parameter **WGra**.

10.1.5.2 After Grid Fault: Decoupling Protection Ramp

After a grid fault, the inverter restarts at a maximum of 10% nominal power per minute using a decoupling protection ramp. You have the option of switching this decoupling protection ramp on or off. If you deactivate the decoupling protection ramp, the inverter rapidly reverts to maximum power. If you wish to deactivate the decoupling protection ramp, contact us (see Section 13 "Contact", page 155).

10.1.6 Load Operation

10.1.6.1 MPP

In the MPP operating state, the inverter feeds power into the utility grid and operates permanently at the Maximum Power Point (MPP). **Operation** and the amount of power being fed in appear on the touch display. If the measured power P_{PV} during the time interval **PvPwrMinT** is less than the minimum feed-in power **PvPwrMin** or the key switch is set to **Stop**, the inverter switches to the operating state "Shutdown".

10.1.6.2 Q at Night

With the order option "Q at Night", the inverter can provide reactive power in order to stabilize the utility grid during non-feed-in operation, e.g. at night. This function is independent of normal feed-in operation. Only limited dynamic grid support is available in the operating state "Q at Night".

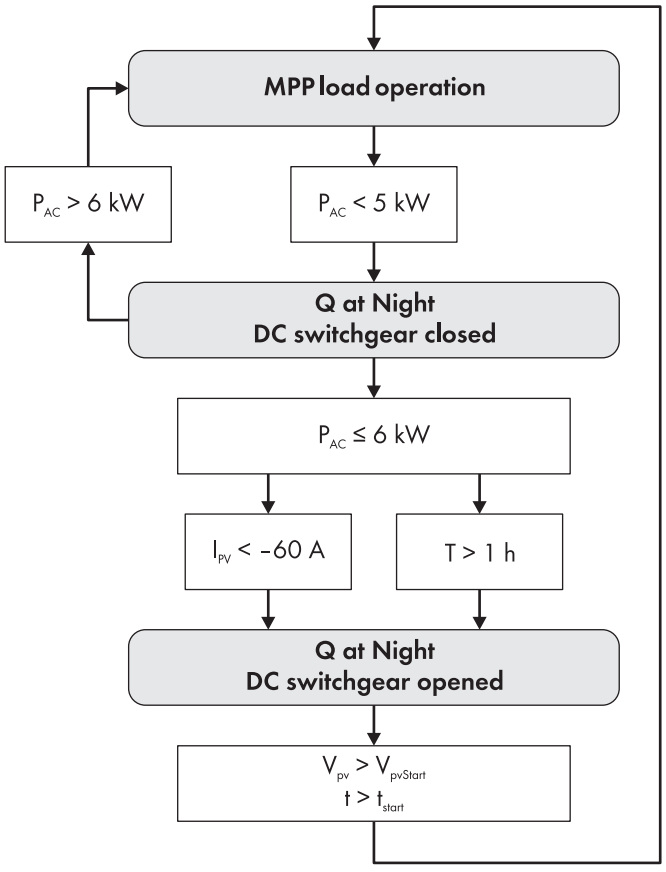


Figure 16: General overview of the operating states of the inverter in the operating state "Q at Night"

If the AC power generated by the inverter falls below 5 kW, the inverter switches from feed-in operation to "Q at Night" operation. The inverter feeds in reactive power in accordance with the parameters set. Since this status can also occur during the day, the DC switchgear initially remains closed in order to avoid unnecessary switching cycles of the DC switchgear. If the inverter is in "Q at Night" operation for one hour or the DC current falls below −60 A, the DC switchgear opens. The inverter continues to feed in reactive power.

If reactive power feed-in is interrupted after a grid fault and the AC disconnection unit is opened while the DC switchgear is open, the DC circuit is initially pre-charged. This reduces the stress on the electronic components. This process takes a maximum of one minute. Once the DC circuit is sufficiently pre-charged, the AC disconnection unit is closed and the inverter monitors the grid limits. If all of the feed-in requirements are met, the inverter will revert to reactive power feed-in within one minute.

While the inverter is feeding in reactive power, the inverter monitors whether the conditions for active power feed-in are met. Once the feed-in requirements are met, the inverter closes the DC switchgear and switches to feed-in operation. To protect the PV array, the amount of reverse current is set by default to −60 A in the parameter **QoDInvCurPv**. This value must be adjusted according to the maximum permissible reverse current of the PV array.

10.1.7 Shutdown

The inverter is in the operating state "Shutdown". **Operation** appears on the touch display. If the key switch has been set to **Stop**, the inverter switches to the operating state "Stop". The AC disconnection unit and the DC switchgear open automatically. If the inverter shuts down because the feed-in conditions are no longer met, the inverter switches to the operating state "Grid monitoring".

10.1.8 Disturbance

If a disturbance occurs during operation, the inverter displays a warning symbol in the touch display. The inverter behavior depends on the type of disturbance. Certain disturbances cause the inverter to shut down.

10.2 Safety Functions

10.2.1 Manual Shutdown Functions

10.2.1.1 External Fast Stop

The inverter comes equipped with a fast stop input. You have the option of connecting an external switch to this fast stop input which is activated via a 24 V signal. The external fast stop disconnects the inverter from the utility grid in less than 100 ms. The inverter has two terminals with a grip range of 0.08 mm to 4 mm for connecting the external fast stop. The inverter is delivered with open terminals.

The following options are available for configuring the external fast stop:

- **External fast stop is deactivated**

  The terminals of the active fast stop are bridged. The fast stop function is thus deactivated. You will need to bridge the terminals if required.

- **External fast stop operated with internal 24 V supply**

  An external switch (break contact) is connected to the inverter terminals via the internal supply voltage in the inverter. When the switch is closed, the relay is activated and the inverter feeds into the grid. If the fast stop is tripped, the switch opens and the relay is deactivated. The inverter is stopped and no longer feeds into the utility grid.

  With a conductor cross-section of 2.5 mm^2, the maximum permissible conductor length is 130 m, and with a conductor cross-section of 1.5 mm^2, the maximum permissible conductor length is 80 m.

- **External fast stop operated with external 24 V supply**

  An external switch (break contact) is connected to the inverter terminals via an external 24 V power supply. When the switch is closed, the relay is activated and the inverter feeds into the grid. If the fast stop is tripped, the switch opens and the relay is deactivated. The inverter is stopped and no longer feeds into the utility grid.

  To use the external fast stop, an external 24 V power supply buffered for three to five seconds must be available.

The external fast stop must be connected in accordance with the circuit diagram. The external fast-stop function must be connected via a shielded cable.

Tripping the fast stop

The fast stop should only be tripped in case of imminent danger. Tripping of the fast stop does not entail fast discharge of the capacitors. If the inverter is to be switched off and properly shut down via an external signal, the remote shutdown input is to be used.

10.2.1.2 Remote Shutdown

By means of remote shutdown, you can selectively shut down and switch off the inverter within approximately six seconds, for example, from a control room. The function of the remote shutdown is similar to the stop function of the key switch.

If the remote shutdown function is activated from the control room while the inverter is in the operating state "Grid monitoring", a motor drive automatically shuts off the DC switchgear and the inverter switches to the operating state "Stop".

If the remote shutdown unit is activated from the control room while the inverter is in the operating state "MPP load operation", the Sunny Central switches to the operating state "Shutdown". Once shutdown is complete, the AC disconnection unit and the DC switchgear are switched off automatically and the inverter switches to the operating state "Stop".

The remote shutdown is designed as an open-circuit fail-safe function and must be connected to an external 24 V supply voltage. If 24 V is present in the remote shutdown, the inverter continues to operate in the current operating state. If the remote shutdown unit is tripped or if a wire-break occurs, 0 V is present in the remote shutdown unit and the inverter switches from the current operating state to the operating state "Stop".

Use of the remote shutdown will only be possible if the parameter **ExlStrStpEna** is set to **On**.

10.2.2 Automatic Shutdown Functions

10.2.2.1 Grid Management Shutdown

If the utility grid becomes unstable, grid management requires that the inverter disconnects from the utility grid immediately to avoid grid overload. In this event a corresponding Modbus signal will be transmitted by the grid operator or the safety system at the point of interconnection. The inverter disconnects from the utility grid immediately and displays error message **9013**. After another signal from the grid operator or the safety system at the point of interconnection, the error will be reset in the inverter.

10.2.2.2 Transformer Protection

A fully hermetic protector can be connected to the inverter. This fully hermetic protector is integrated in the MV transformer. If a fault occurs in the MV transformer, the inverter immediately shuts down. The inverter has two terminals with a grip range of 0.08 mm to 4 mm for connecting the transformer monitoring unit. To use the transformer monitoring unit, an external supply voltage of 230 V ~ must be provided. The transformer monitoring unit must be connected via a shielded cable. To deactivate this function, the associated parameter must be disabled.

10.2.2.3 Active Islanding Detection

The islanding detection function detects the formation of stand-alone grids and disconnects the inverter from the utility grid.

Islanding can occur when at the time of utility grid failure, the load in the shut-down sub-grid is roughly equivalent to the current feed-in power of the PV power plant.

With active islanding detection, the inverter continuously checks the stability of the utility grid. If the utility grid is intact, this has no impact on the utility grid. Only if a stand-alone grid has formed will the inverter disconnect from the utility grid.

To enable the active islanding detection function, contact us (see Section 13 "Contact", page 155).

10.2.2.4 Passive Islanding Detection

The inverter is equipped with passive islanding detection. This function can be activated if required. The islanding detection function detects the formation of stand-alone grids and disconnects the inverter from the utility grid.

Islanding can occur when at the time of utility grid failure, the load in the shut-down sub-grid is roughly equivalent to the current feed-in power of the PV power plant.

Unlike active islanding detection, with passive islanding detection the utility grid is not actively influenced, but simply passively monitored. This involves monitoring the speed of the frequency change.

If the power frequency changes by a certain amount in a certain time, a stand-alone grid is detected and the inverter disconnects from the utility grid. The magnitude of the frequency change and the time in which this change must take place can be configured via parameters on the grid monitoring relay.

10.2.2.5 Behavior in Case of Increasing Temperatures

Sunny Central 500CP XT/630CP XT/720CP XT/760CP XT/800CP XT/850CP XT/900CP XT

At temperatures up to 25°C, the inverter works at 110% nominal power. At temperatures between 25°C and 50°C, the AC power supplied by the inverter decreases to 100% of the nominal power indirectly proportional to the increasing temperature. From 50°C upwards, the AC power of the inverter decreases significantly, only reaching half of the nominal power at 55°C. For example, the inverter with a nominal power of 900 kVA will still supply 450 kVA at 55°C.

At ambient temperatures of 60°C, the inverter will only supply 10% of its nominal power. The inverter switches off at 62°C.

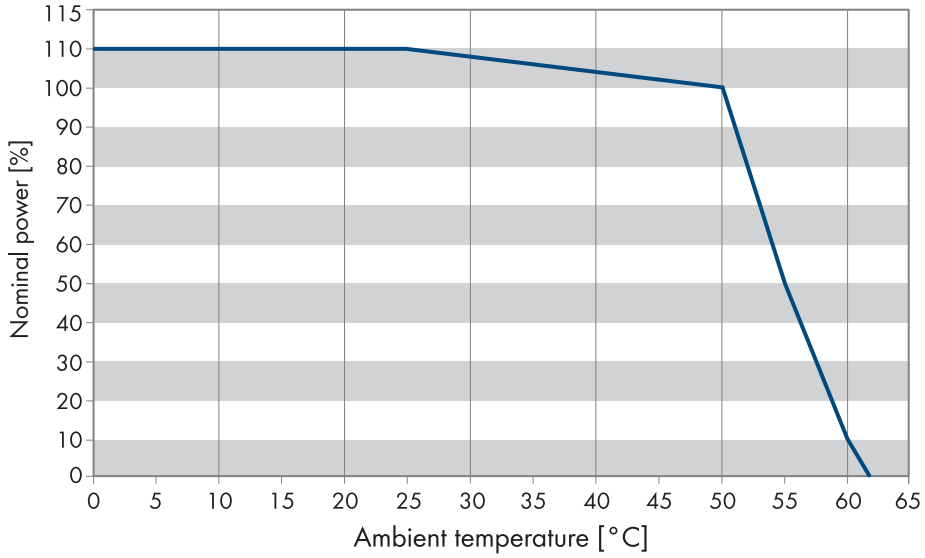


Figure 17: Reduction of AC power with increasing temperature

	25°C	40°C	50°C	55°C	60°C	62°C
Sunny Central 500CP XT	550 kVA	520 kVA	500 kVA	250 kVA	50 kVA	0 kVA
Sunny Central 630CP XT	700 kVA	658 kVA	630 kVA	315 kVA	63 kVA	0 kVA

	25 °C	40 °C	50 °C	55 °C	60 °C	62 °C
Sunny Central 720CP XT	792 kVA	749 kVA	720 kVA	360 kVA	72 kVA	0 kVA
Sunny Central 760CP XT	836 kVA	790 kVA	760 kVA	380 kVA	76 kVA	0 kVA
Sunny Central 800CP XT	880 kVA	832 kVA	800 kVA	400 kVA	80 kVA	0 kVA
Sunny Central 850CP XT	935 kVA	884 kVA	850 kVA	425 kVA	85 kVA	0 kVA
Sunny Central 900CP XT	990 kVA	936 kVA	900 kVA	450 kVA	90 kVA	0 kVA

Sunny Central 1000CP XT

At temperatures up to 25 °C, the inverter works at 110% nominal power. At temperatures between 25 °C and 40 °C, the AC power supplied by the inverter decreases to 100% of the nominal power indirectly proportional to the increasing temperature. At temperatures between 40 °C and 50 °C, the supplied AC power decreases to 90% of the nominal power. From 50 °C upwards, the AC power of the inverter decreases significantly, only reaching 45% of the nominal power at 55 °C.

At ambient temperatures of 60 °C, the inverter will only supply 9% of its nominal power. The inverter switches off at 62 °C.

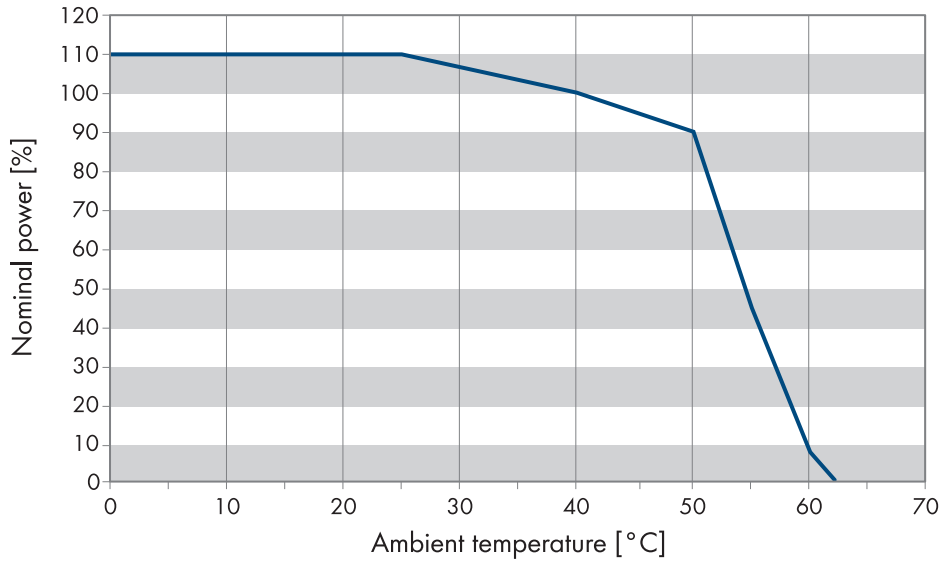


Figure 18: Reduction of AC power with increasing temperature

	25 °C	40 °C	50 °C	55 °C	60 °C	62 °C
Sunny Central 1000CP XT	1,100 kVA	1,000 kVA	900 kVA	450 kVA	90 kVA	0 kVA

10.2.2.6 Switch-Off Function at Low Temperatures

At low temperatures, the inverter operates up to the switch-off threshold in feed-in operation with up to 110% of the nominal power. The temperature of the switch-off threshold is: −25 °C.

If the ambient temperature falls below the switch-off threshold during feed-in operation, the inverter switches to the operating state "Stop". As soon as the temperature exceeds the switch-on threshold, the inverter resumes feed-in operation. The temperature of the switch-on threshold is: −20 °C.

10.2.2.7 Low-Temperature Option

With the "low-temperature option", the operating temperature range is extended to the following range: −40°C to +62°C. The inverter is in feed-in operation until the switch-off threshold is exceeded. The temperature of the switch-off threshold is: −25°C.

If the ambient temperature falls below the switch-off threshold, the inverter switches to the operating state "Stop". In addition, the installed heating elements switch on to protect the components in the interior against too-low temperatures. As soon as the temperature exceeds the switch-on threshold, the inverter resumes feed-in operation. The temperature of the switch-on threshold is: −20°C.

10.2.3 Grounding and Insulation Monitoring

10.2.3.1 Mode of Operation

In grounded PV arrays

The ground-fault monitoring is implemented by means of a residual-current monitoring device. If a ground fault occurs, the residual currents are detected and interrupted.

- **Ground fault on the ungrounded terminal**

  If a ground fault occurs on the ungrounded terminal of the PV array, the normally ungrounded terminal of the PV array is grounded non-specifically by the ground fault and a residual current flows to the grounded terminal. This residual current flows through the ground-fault monitoring device, e.g. the GFDI, and triggers it.

- **Ground fault on the grounded terminal**

  The GFDI is bypassed when a ground fault occurs on the grounded terminal of the PV array. A ground fault on the grounded terminal cannot be reliably detected. If an undetected ground fault occurs on the grounded terminal, this will pose a safety risk. A further ground fault occurring on the ungrounded terminal will lead to high residual currents that cannot be interrupted by the ground-fault monitoring unit.

i Residual current monitoring in grounded systems

In order to ensure the residual current monitoring function in grounded systems, the PV array insulation must be checked at regular intervals. It is therefore advisable to use an additional insulation monitoring device in grounded systems. This will enable the insulation to be checked at regular intervals.

In ungrounded PV arrays

An insulation monitoring device constantly determines the insulation resistance using an active measurement procedure. As soon as the insulation resistance falls below the warning threshold specified in the insulation monitoring device, an insulation warning will appear on the touch display. As a result, preventative measures can be taken before errors such as personal injury due to leakage currents or system failure occur. If the insulation resistance falls below the configured warning threshold, the PV power plant switch off. Use the parameter **IsoErrIgn** to activate or deactivate the disconnection process under fault conditions.

10.2.3.2 GFDI

Depending on the order option, ground-fault monitoring in the inverter may be carried out via ground fault detection and interruption (GFDI). This grounds one terminal of the PV array. GFDI is performed via a high-performance K-type circuit breaker with adjustable operating current. The GFDI is integrated in the inverter and connected between an input busbar and the grounding busbar.

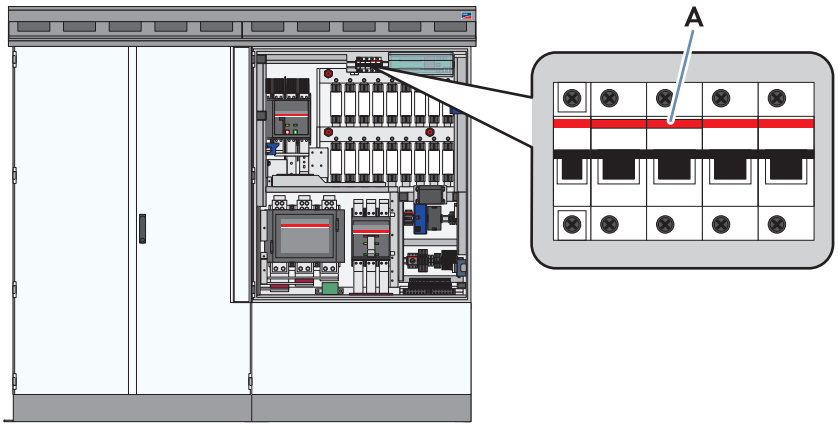


Figure 19: GFDI

Position	Designation
A	GFDI

10.2.3.3 Remote GFDI

Depending on the order option, ground fault monitoring in the inverter may be carried out via ground fault detection and interruption with motor drive, in short "Remote GFDI". This grounds one terminal of the PV array. Remote GFDI also enables automatic error processing. This reduces downtimes and avoids service calls due to temporary insulation errors such as when condensation occurs on the PV modules. Remote GFDI is performed via a high-performance K-type circuit breaker with adjustable operating current. The remote GFDI is integrated in the inverter and connected between an input busbar and the grounding busbar.

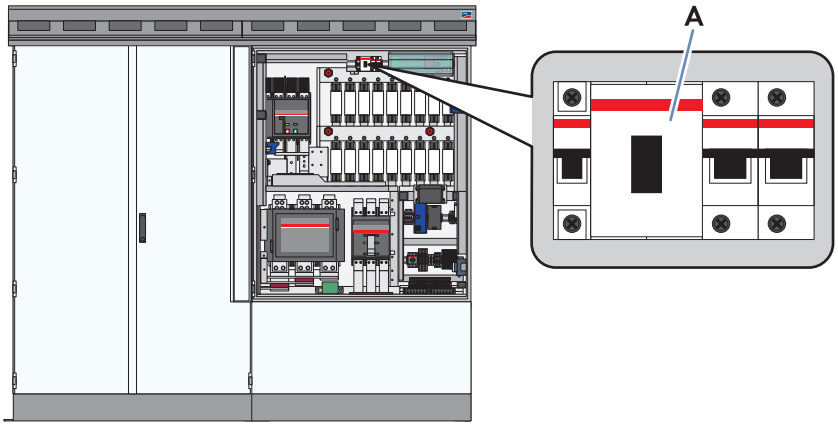


Figure 20: Remote GFDI

Position	Designation
A	Remote GFDI

If the Remote GFDI trips, initially a temporary error will be assumed and a motor drive will close the Remote GFDI after a defined waiting time. No external switch command is required to close the tripped Remote GFDI. The inverter can switch back to feed-in operation after a waiting time. In the default setting of the inverter, the software will attempt to start the Remote GFDI up to three times per day. If the Remote GFDI is tripped on several consecutive days, the software assumes a permanent insulation error and the inverter will no longer switch back on. In this case, a qualified person will need to check and, if necessary, repair the insulation and then acknowledge the error.

10.2.3.4 Insulation Monitoring Device

Depending on the order option, an insulation monitoring device can monitor the insulation resistance of the PV power plant in ungrounded PV arrays.

In the operating state "MPP load operation", the insulation resistance of the entire system, from the PV array to the MV transformer, will be measured.

If the inverter is in the operating state "Grid monitoring", only the insulation resistance from the PV array to the inverter will be measured.

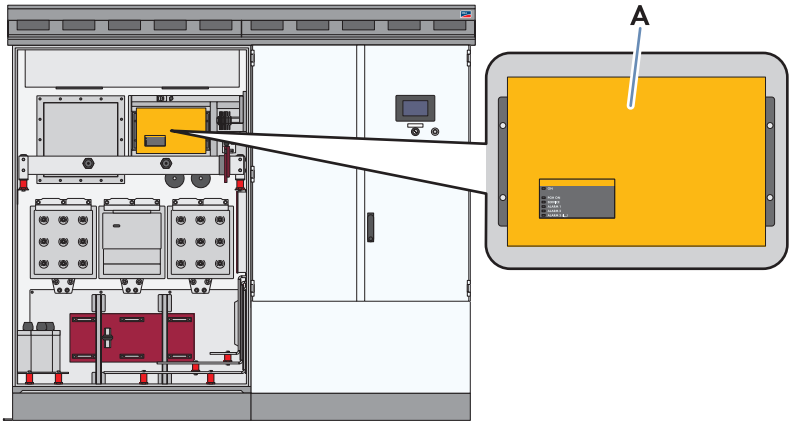


Figure 21: Insulation monitoring device

Position	Designation
A	Insulation monitoring device

A measuring circuit and a relay with a change-over contact are integrated in the insulation monitoring device.

The insulation monitoring device is connected between the PV voltage and the grounding conductor. The contacts of the relay are routed to the customer terminal plate and can be used by the customer to trip a signal light or siren. The characteristics of the relay are indicated in the circuit diagram.

If the insulation resistance falls below the warning threshold specified in the parameter **RisoCtlWarn**, the measuring circuit closes and the LED **ALARM1** on the insulation monitoring device is glowing. The error message **3601 – Warning insulation failure** is generated by the inverter. Simultaneously, the insulation monitoring device activates the relay with change-over contact. This relay is installed in the inverter.

If the insulation resistance falls below the error threshold (1 kΩ), an insulation error has occurred and the LEDs **ALARM1** and **ALARM2** on the insulation monitoring device are glowing. In this case, the operating behavior of the inverter can be set via parameters as follows:

- If the parameter **IsoErrIgn** is set to **Off**, the measuring circuit issues a disturbance when the insulation resistance falls below the error threshold, the inverter switches off and issues the error message **3501 - Insulation Failure**. The LEDs **ALARM1** and **ALARM2** are glowing.
- If the parameter **IsoErrIgn** is set to **On**, the error message from the measuring circuit is ignored when the insulation resistance falls below the error threshold. The inverter continues to feed into the grid and generates the error message **3504 – Insulation failure ignored**.
- If the parameter **IsoErrIgn** is set to **Run** and the insulation resistance falls below the error threshold, the error message from the measuring circuit will only be ignored if the inverter is in feed-in operation. In feed-in operation, the inverter continues to feed into the grid and generates the error message **3504 – Insulation failure ignored**.

  If the insulation resistance falls below the error threshold in another operating state, the error is not ignored and the inverter does not switch to feed-in operation. The error message **3501 – Insulation Failure** appears on the touch display. The LEDs **ALARM1** and **ALARM2** are glowing.

Type of insulation monitoring device used

The insulation monitoring device used is the A-ISOMETER iso-PV1685 device supplied by Bender GmbH & Co. KG.

10.2.3.5 GFDI and Insulation Monitoring Device

With the order option "GFDI and Insulation Monitoring", it is possible to temporarily disable the PV array grounding and to check the insulation via the integrated insulation monitoring device.

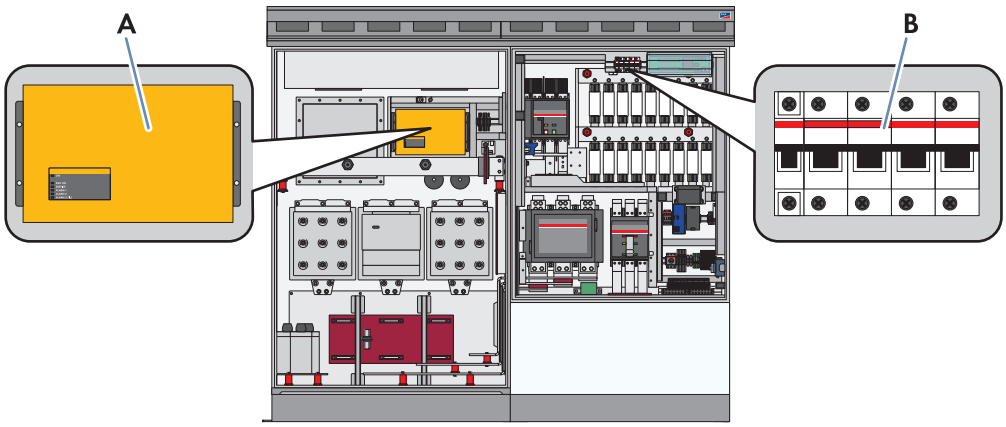


Figure 22: GFDI and insulation monitoring

Position	Designation
A	Insulation monitoring device
B	GFDI

When the GFDI is closed, the PV array is grounded. In this state, the insulation resistance cannot be determined.

When the GFDI is open, grounding is disabled. In this state, the insulation monitoring device continuously measures the insulation resistance. In the operating state "MPP load operation", the insulation resistance of the entire system, from the PV array to the MV transformer, will be measured. If the inverter is in the operating state "Grid monitoring", only the insulation resistance from the PV array to the inverter will be measured.

Insulation monitoring should be performed in the operating state "MPP load operation". This will ensure that all parts of the system are included in the insulation measurement.

Insulation monitoring

The insulation monitoring device will start measuring once the GFDI is open. The insulation monitoring device will initially assume that the insulation is poor. If the parameter **IsoErrIgn** is set to **Off**, the inverter will switch off temporarily.

The insulation monitoring device takes approximately five minutes to detect the correct insulation resistance. The value of the insulation resistance can be read off from the user interface in the instantaneous value **Riso**. If the insulation is intact, the inverter switches back to the operating state "MPP load operation." Once the insulation monitoring process is complete, the GFDI should be closed again, thus enabling the PV array to revert to grounded operation.

If after approximately five minutes one of the errors **3501 – Insulation Failure**, **3504 – Insulation failure ignored** or **3601 – Warning insulation error** is displayed, the insulation is defective. In this case, a qualified person will need to check and, if necessary, repair the insulation and then acknowledge the error.

Type of insulation monitoring device used

The insulation monitoring device used is the A-ISOMETER iso-PV1685 device supplied by Bender GmbH & Co. KG.

10.2.3.6 Remote GFDI and Insulation Monitoring Device

With the order option "Remote GFDI and Insulation Monitoring", it is possible to automatically correct errors which have occurred, to temporarily disable the grounding connection of the PV array and to check the insulation with the integrated insulation monitoring device.

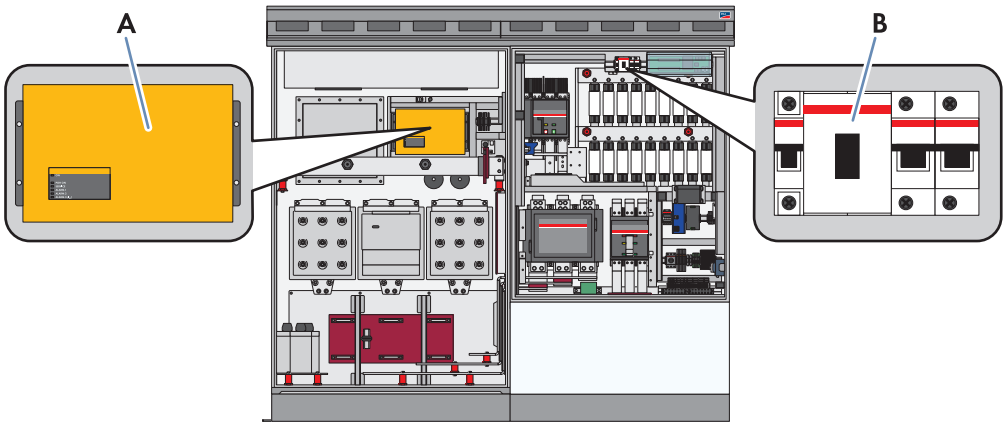


Figure 23: Remote GFDI and Insulation Monitoring Device

Position	Designation
A	Insulation monitoring device
B	Remote GFDI

When the Remote GFDI is closed, the PV array is grounded. In this state, the insulation resistance cannot be determined. If the Remote GFDI trips, initially a temporary error will be assumed and a motor drive will close the Remote GFDI after a defined waiting time. No external switch command is required to close the tripped Remote GFDI. The inverter can switch back to feed-in operation after a waiting time.

In the default setting of the inverter, the software will attempt to start the Remote GFDI up to three times per day.

If the Remote GFDI is tripped on several consecutive days, the software assumes a permanent insulation error and the inverter will no longer switch back on. In this case, a qualified person will need to check and, if necessary, repair the insulation and then acknowledge the error.

When the Remote GFDI is open, the grounding connection is disabled. In this state, the insulation monitoring device continuously measures the insulation resistance. In the operating state "MPP load operation", the insulation resistance of the entire system, from the PV array to the MV transformer, will be measured. If the inverter is in the operating state "Grid monitoring", only the insulation resistance from the PV array to the inverter will be measured.

Insulation monitoring should be performed in the operating state "MPP load operation". This will ensure that all parts of the system are included in the insulation measurement.

Insulation monitoring

To disable the grounding of the PV array, the parameter **RemMntSvc** must be set to **On**. This will open the Remote GFDI by means of a motor drive.

If the Remote GFDI has been opened by a motor drive via the parameter **RemMntSvc**, the insulation monitoring device will start measuring after the waiting time defined in parameter **IsoMeasDly** has elapsed. This allows the insulation monitoring device to determine the insulation resistance without interrupting feed-in operation. If an insulation error is present, this will only be taken into account at the end of the waiting time.

Once the insulation monitoring process is complete, the parameter **RemMntSvc** should be set to **Off**, thus switching the PV array into grounded operation.

If after approximately five minutes one of the errors **3501 – Insulation Failure**, **3504 – Insulation failure ignored** or **3601 – Warning insulation failure** is displayed, the insulation is defective. In this case, a qualified person will need to check and, if necessary, repair the insulation and then acknowledge the error.

Type of insulation monitoring device used

The insulation monitoring device used is the A-ISOMETER iso-PV1685 device supplied by Bender GmbH & Co. KG.

10.3 Power Control

10.3.1 Frequency-Dependent Active Power Limitation

With frequency-dependent active power limitation, the inverter constantly checks the connected power frequency. If the active power is to be limited by a hysteresis, the parameter **WCtlHzMod** must be set to **CurveHys**.

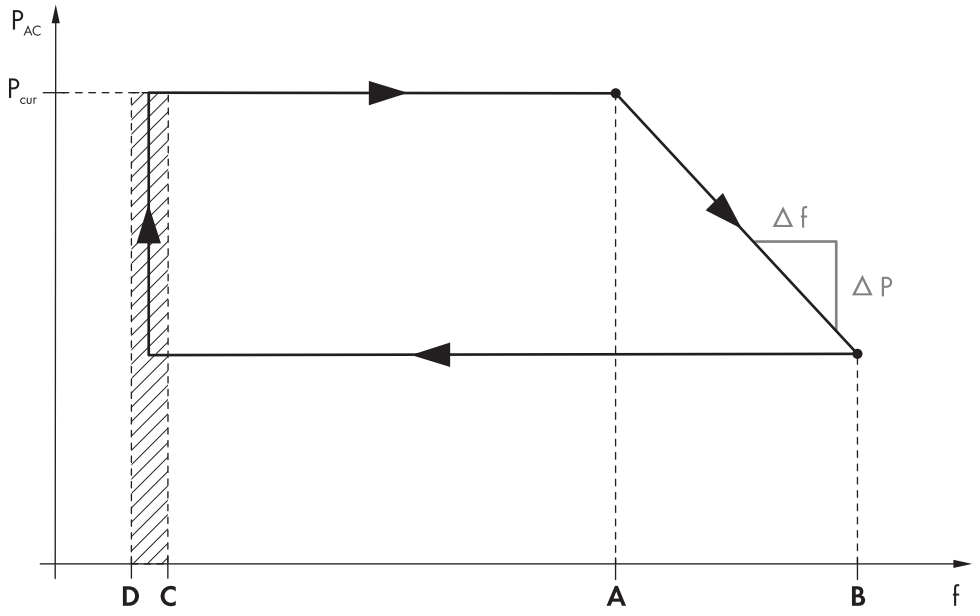


Figure 24: Power behavior of the inverter when the frequency limit P-HzStr is exceeded

If the power frequency exceeds a threshold defined in the parameter **P-HzStr**, shown here at point A, the inverter will store the current feed-in power P_{cur}. The reduced feed-in power is calculated based on this saved value. The reduction of the feed-in power is defined via the parameter **P-WGra**. This parameter indicates the percentage of the saved power P_{cur} by which the power per Hz will be reduced if the power frequency continues to rise. If the power frequency decreases again as shown in point B, the last feed-in power value reached will remain valid. Only when the power frequency falls below the threshold defined in the parameter **P-HzStop**, as shown here at point C, can the feed-in power be increased again. In this case, the saved value P_{mom} forfeits its validity. In addition, a minimum threshold for power frequency shortfall can be defined with the parameter **P-HzStopMin**, shown here at point D. If the power frequency falls below the grid limit, the inverter will shut down and switch to the operating state "Grid monitoring". The inverter will remain in the operating state "Grid monitoring" until all feed-in conditions are fulfilled again.

Calculation of the power limit:

$$P_{max} = P_{cur} - [(f_{AC} - \text{P-HzStr}) \cdot \text{P-WGra} \cdot P_{cur}]$$

P_{max}	Power limit	P_{cur}	Current power
f_{AC}	Power frequency	P-WGra	Gradient for reducing active power
P-HzStr	Selected frequency limit from which feed-in power will be reduced		

Example:

An inverter with 500 kW is feeding 350 kW (P_{cur}) into the utility grid. The frequency will reach up to 51.2 Hz. The difference between the current power frequency and **P-HzStr** (51.2 Hz – 50.2 Hz) multiplied by the gradient **P-WGra** (40%/Hz) results in an active power reduction of 40% of the last available power P_{cur} (350 kW). This results in a power limitation of 140 kW and thus a maximum active power of 210 kW.

Calculation:

210 kW = 350 kW – [(51.2 Hz – 50.2 Hz) · 40%/Hz · 350 kW]

10.3.2 Frequency-Independent Active Power Limitation

10.3.2.1 No Active Power Limitation: Off Mode

The feed-in power is limited to the parameter **Pmax**.

The parameter **Pmax** defines the inverter power at the feed-in point and is adjusted to the local conditions during commissioning. The parameter **Pmax** can only be changed when the device is in the operating state "Stop" and the installer password has been entered.

10.3.2.2 Active Power Limitation with Setpoint Command via Modbus Protocol: WCtlCom Mode

The communication unit receives the setpoint for active power limitation and transmits it to the inverter. If the inverter has received no signal for five minutes, an error message will be displayed in the instantaneous value **P-WModFailStt** .

10.3.2.3 Active Power Limitation with Absolute Value: WCnst Mode

The active power limitation is entered as an absolute value via the parameter **P-W**. The parameter **P-W** defines the active power to be fed in. The parameter **P-W** can be changed in feed-in operation. The parameter **P-W** must not be greater than the parameter **Pmax**.

10.3.2.4 Active Power Limitation as a Percentage of Nominal Power: WCnstNom Mode

The active power limitation is set as a percentage value via the parameter **P-WNom**. The percentage value refers to the parameter **Pmax**. The parameter **P-WNom** indicates what percentage of the maximum possible power is to be fed in. The parameter **P-WNom** can be changed during feed-in operation.

10.3.2.5 Active Power Limitation via Standard Signal: WCnstNomAnIn Mode

The active power limitation is set via an analog signal at the input terminals for the setpoint. This is usually implemented by a ripple control signal. The electrical current strength of the connected signal determines the nominal active power. The analog measured values must be between 4 mA and 19 mA. If the analog signal is less than 2 mA, an error message will be displayed in the instantaneous value **P-WModFailStt**.

Signal	Power limit	Description
< 2 mA	Last valid value or **Pmax** after restart	Signal is in the invalid range.
2 mA to 4 mA	0 kW	No power is fed into the grid.
4 mA to 19 mA	0 kW to **Pmax**	The energy fed into the grid is determined by a characteristic curve.
> 19 mA	**Pmax**	The energy fed into the grid equals **Pmax**.

The analog value is converted to a setpoint for power limitation. Here, the parameter **Pmax** forms the end point of the linear characteristic curve.

10.3.3 Reactive Power Control

10.3.3.1 No Reactive Power Control: Off Mode

The reactive power setpoint is limited to 0 kVAr. This setpoint cannot be controlled.

10.3.3.2 Reactive Power Control with Setpoint Command via Modbus Protocol: VArCtlCom Mode

The reactive power setpoint is received by the communication unit and transmitted to the inverter. The setpoint is transmitted as a percentage value and converted to kVAr in the device. If the inverter has not received any signal for five minutes, the error message **Q-VArModFailStt** will be displayed.

10.3.3.3 Reactive Power Control with Setpoint Command via Modbus Protocol: PFCtlCom Mode

The reactive power setpoint is received by the communication unit and transmitted to the inverter. The setpoint is transmitted as a displacement power factor cos φ. If the inverter has not received any signal for the last five minutes, an error message will be displayed in the instantaneous value **Q-VArModFailStt**.

10.3.3.4 Reactive Power Control with Absolute Value: VArCnst Mode

The reactive power setpoint is set via the parameter **Q-VAr**. The parameter **Q-VAr** is permitted to be within the range from **–Qmax** to **+Qmax**.

10.3.3.5 Reactive Power Control as a Percentage of the Nominal Power: VArCnstNom Mode

The parameter **Q-VArNom** is used to set the reactive power setpoint in %. The parameter **Q-VArNom** refers to **Pmax**. If the calculated amount of reactive power exceeds the predefined value of **Qmax**, the power will be limited to **Qmax**. If the calculated amount of reactive power falls below the predefined value of **–Qmax**, the power will be limited to **–Qmax**.

10.3.3.6 Reactive Power Setpoint via Standard Signal: VArCnstNomAnIn Mode

The reactive power setpoint is set at the input terminals for the setpoints via an analog signal. This is usually implemented by a ripple control signal. The analog value is converted into a reactive power setpoint. The electrical current strength of the connected signal determines the setpoint. The analog measured values must be between 4 mA and 19 mA. If the analog signal is less than 2 mA, an error message will be displayed in the instantaneous value **Q-VArModFailStt**.

Signal	Power limit	Description
< 2 mA	Last valid mean value or 0 kVAr after restart	Signal is in the invalid range.
2 mA to 4 mA	**Qmax** / underexcited	The maximum amount of negatively excited reactive power is fed in.
4 mA	**Qmax** / underexcited	Start point of the characteristic curve The maximum amount of negatively excited reactive power is fed in.

Signal	Power limit	Description
11.5 mA	0 kVAr	Zero-crossing of the characteristic curve No reactive power is fed in.
> 19 mA	**Qmax** / overexcited	End point of the characteristic curve The maximum amount of positively excited reactive power is fed in.

The analog value is converted to a setpoint for power limitation. Here, the parameter **Qmax** forms the end point of the linear characteristic curve.

10.3.3.7 Reactive Power Setpoint via Displacement Power Factor cos φ: PFCnst Mode

The reactive power setpoint is set via the parameters **PF-PF** and **PF-PFExt**. The parameter **PF-PF** indicates the displacement power factor cos φ and the parameter **PF-PFExt** indicates the degree of overexcitation or underexcitation.

10.3.3.8 Displacement Power Factor cos φ via Standard Signal: PFCnstAnIn Mode

The reactive power setpoint is set at the input terminals for the setpoints via an analog signal. This is usually implemented by a ripple control signal. The analog value is converted into a displacement power factor cos φ. The electrical current strength of the connected signal determines the setpoint. The analog measured values must be between 4 mA and 19 mA. If the analog signal is less than 2 mA, an error message will be displayed in the instantaneous value **Q-VArModFailStt**.

Signal	Power limit	Description
< 2 mA	Last valid mean value or 0 kVAr after restart	Signal is in the invalid range.
2 mA to 4 mA	**PFAbsMin**/underexcited	The maximum amount of negatively excited reactive power is fed in.
4 mA	**PFAbsMin**/underexcited	Start point of the characteristic curve The maximum amount of negatively excited reactive power is fed in.
11.5 mA	0 kVAr	Zero-crossing of the characteristic curve No reactive power is fed in.
> 19 mA	**PFAbsMin** / overexcited	End point of the characteristic curve The maximum amount of positively excited reactive power is fed in.

The analog value is converted into a setpoint for the displacement power factor cos φ. Here, the parameter **PFAbsMin** is the starting and end point of the linear characteristic curve.

10.3.3.9 Displacement Power Factor cos φ as a Function of Feed-In Power: PFCtlW Mode

In the **PFCtlW** mode, the displacement power factor cos φ is set as a function of feed-in power. This dependency is depicted by a configurable characteristic curve. The characteristic curve can be configured as increasing or decreasing. The start and end points of the characteristic curve can be configured by means of parameters.

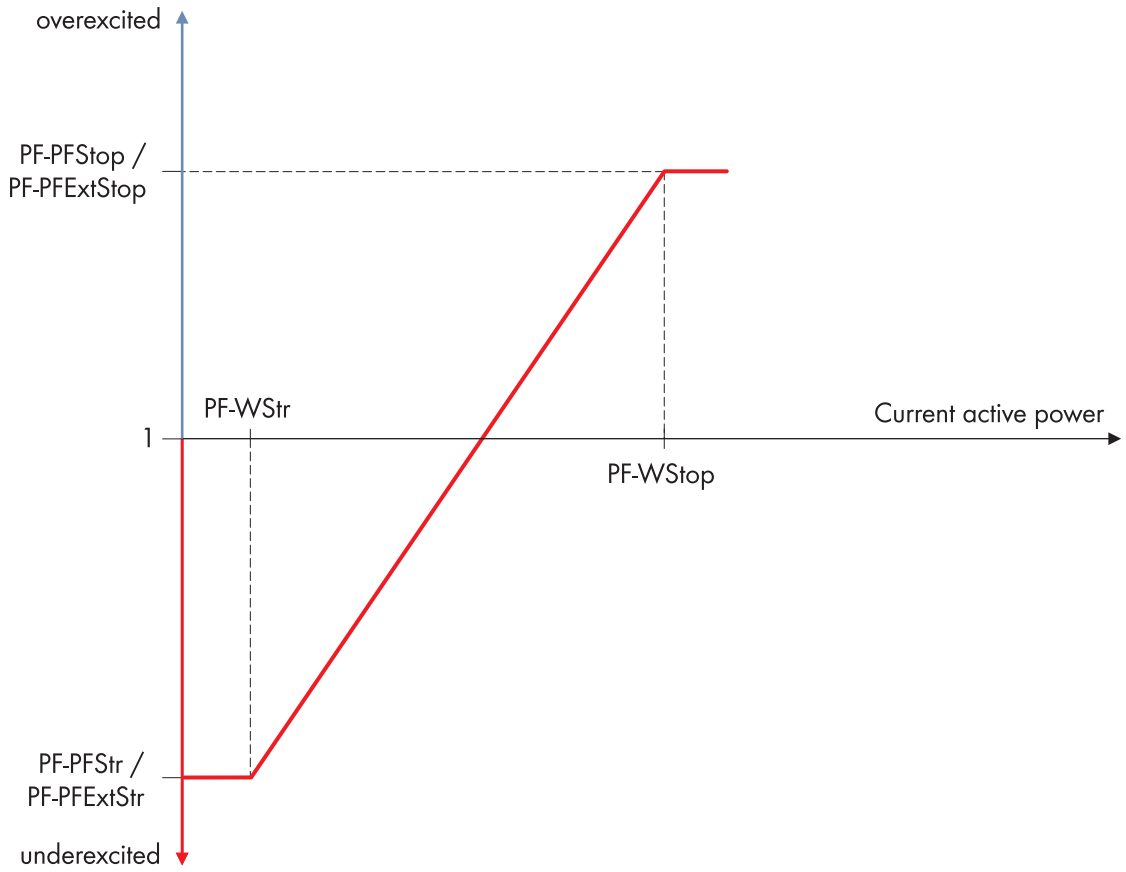


Figure 25: Characteristic curve for reducing reactive power as a function of active power

On the basis of a linear characteristic curve with an upper and lower cap, a displacement power factor cos φ can be regulated depending on the active power currently being fed in. The start and end points of the characteristic curve can be configured by means of parameters. The shape of the characteristic curve is determined by the start and end points.

10.3.3.10 Reactive Power as a Function of the Grid Voltage: VArCtlVol Mode

Consultation prior to parameter change

The parameters of this mode can only be selected or changed after consultation (see Section 13 "Contact", page 155).

The reactive power is set as a function of the grid voltage. The reactive power setpoint is adjusted in stages.

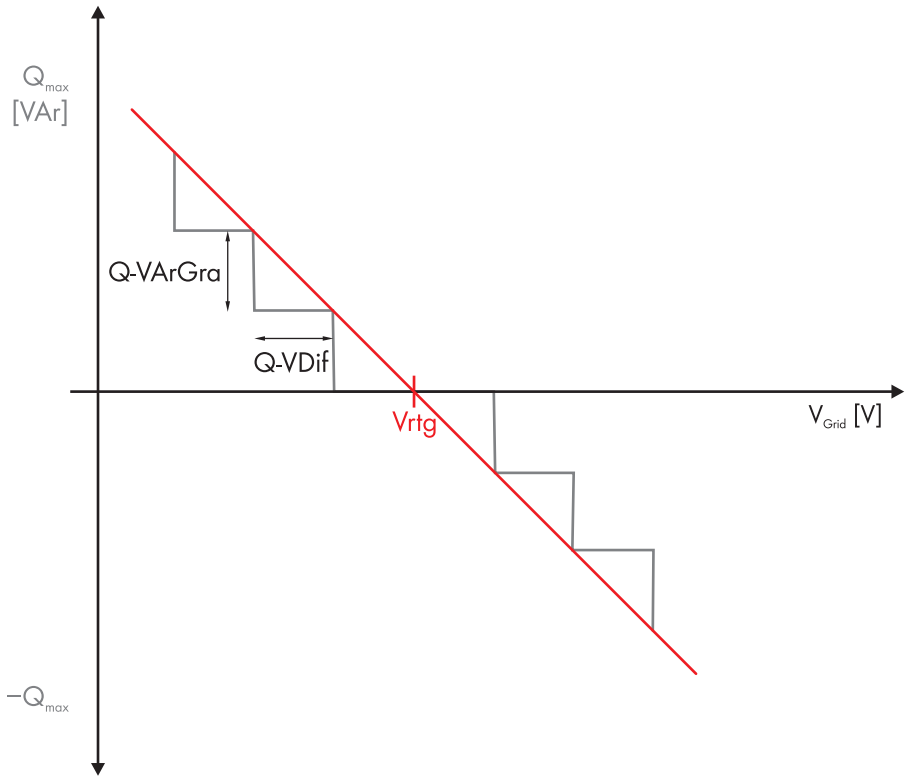


Figure 26: Characteristic curve for reducing reactive power as a function of the grid voltage

If the grid voltage is changed by the configurable voltage difference **Q-VDif** for the configurable duration of **Q-VDifTm**, the reactive power setpoint will be adjusted by the value **Q-VArGra.** The parameterization of this function refers to the medium voltage.

10.3.3.11 Measures for Voltage Support through Parameterization of Reactive Power/ Voltage Characteristic Curve: VArCtlVolHystDb Mode

Consultation prior to parameter change

The parameters of this mode can only be selected or changed after consultation (see Section 13 "Contact", page 155).

By supplying reactive power, the inverter performs voltage-stabilizing measures in the event of overvoltage or undervoltage. The parameterization is carried out by means of a reactive power/voltage characteristic curve. The characteristic curve can be flexibly configured by parameterizing the slope, a type of deadband through two voltage points and a hysteresis.

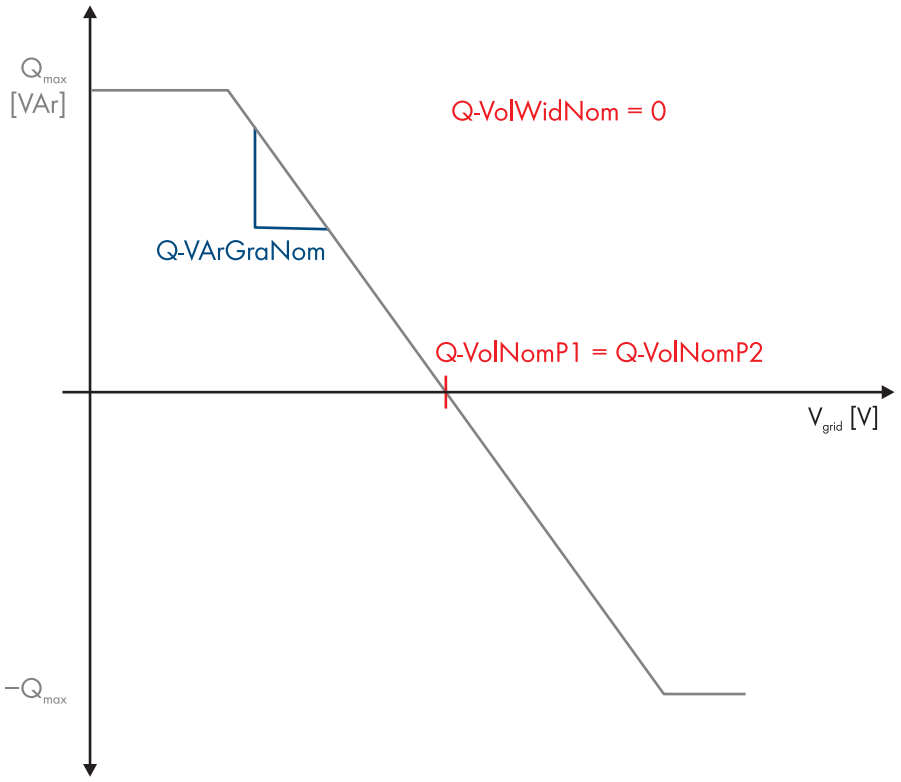


Figure 27: Characteristic curve for reducing reactive power without deadband and without hysteresis

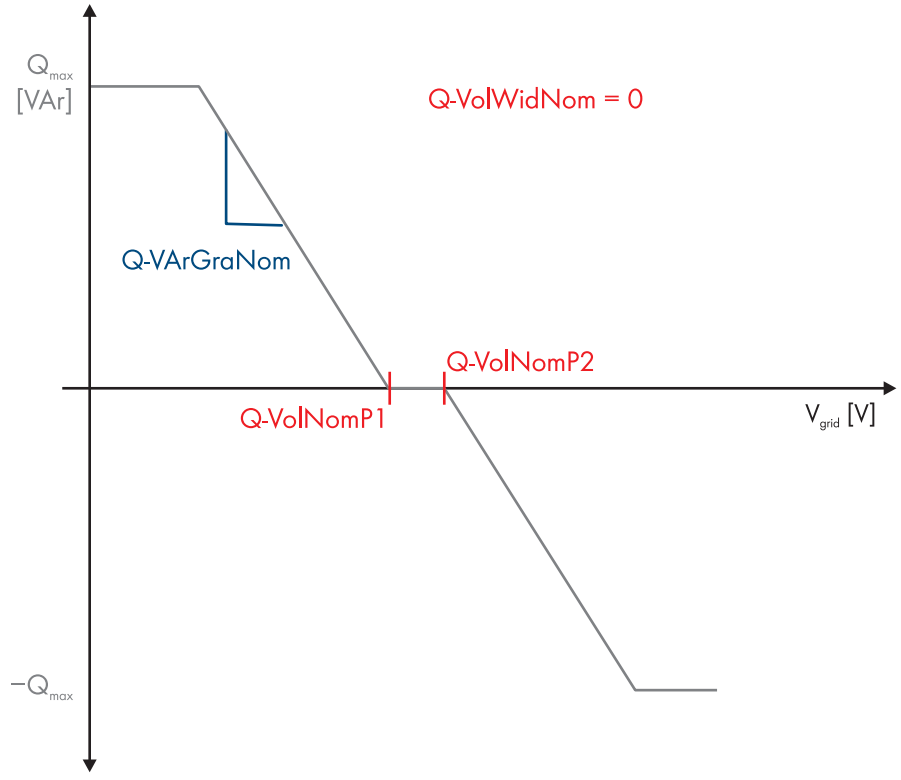


Figure 28: Characteristic curve for reducing reactive power with deadband and without hysteresis

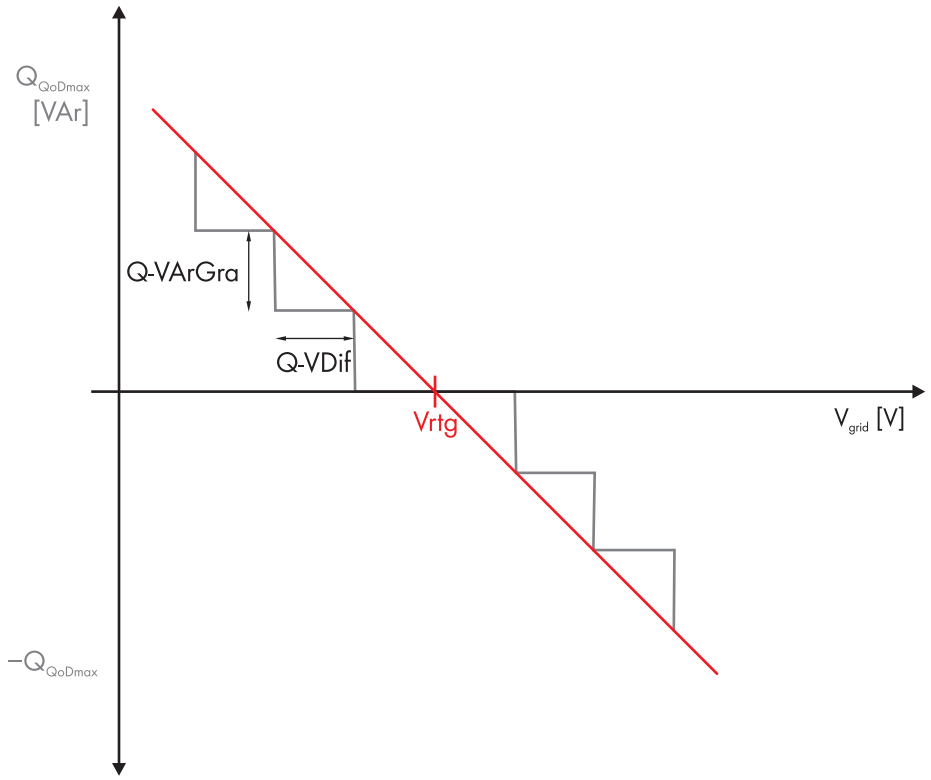


Figure 29: Characteristic curve for reducing reactive power with hysteresis

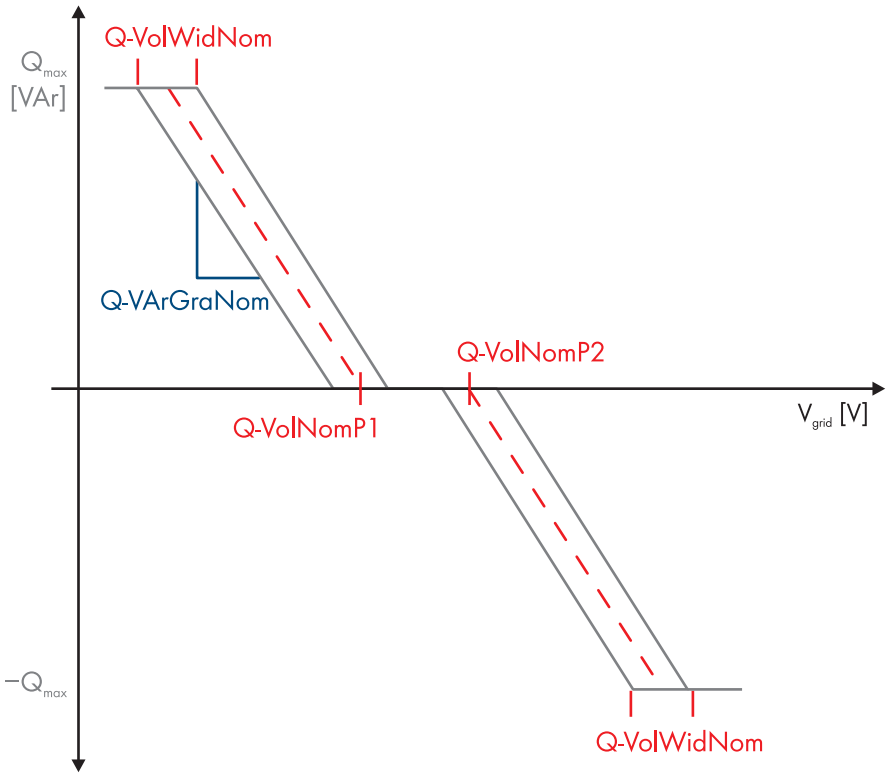


Figure 30: Characteristic curve for reducing reactive power with deadband and hysteresis

The parameter **Q-VArTmsSpnt** determines the delay time which must elapse before the calculated reactive power setpoint is actively used. In order to prevent mutual interference of several systems with this function, the parameter **Q-VArTmsVtg** can be used to set a delay time. This delay time defines how long a voltage change must be pending before a change in reactive power feed-in is triggered. Consequently, control of the grid voltage at the grid feed-in point can be staggered across several systems. You can activate and deactivate the delay time by means of the parameter **Q-EnaTmsVtg**.

10.3.3.12 Measures for Voltage Support through Parameterization of Reactive Power/ Voltage Characteristic Curve: VArCtlVolHystDbA Mode

Parameter block

Some parameters must only be changed in the operating state "Stop". The entry will not be accepted in any other operating state.

By supplying reactive power, the inverter performs voltage-stabilizing measures in the event of overvoltage or undervoltage. The parameterization is carried out by means of a reactive power/voltage characteristic curve. The characteristic curve can be configured flexibly by parameterization of the slopes, a type of deadband through two voltage points, a hysteresis and the thresholds for activation.

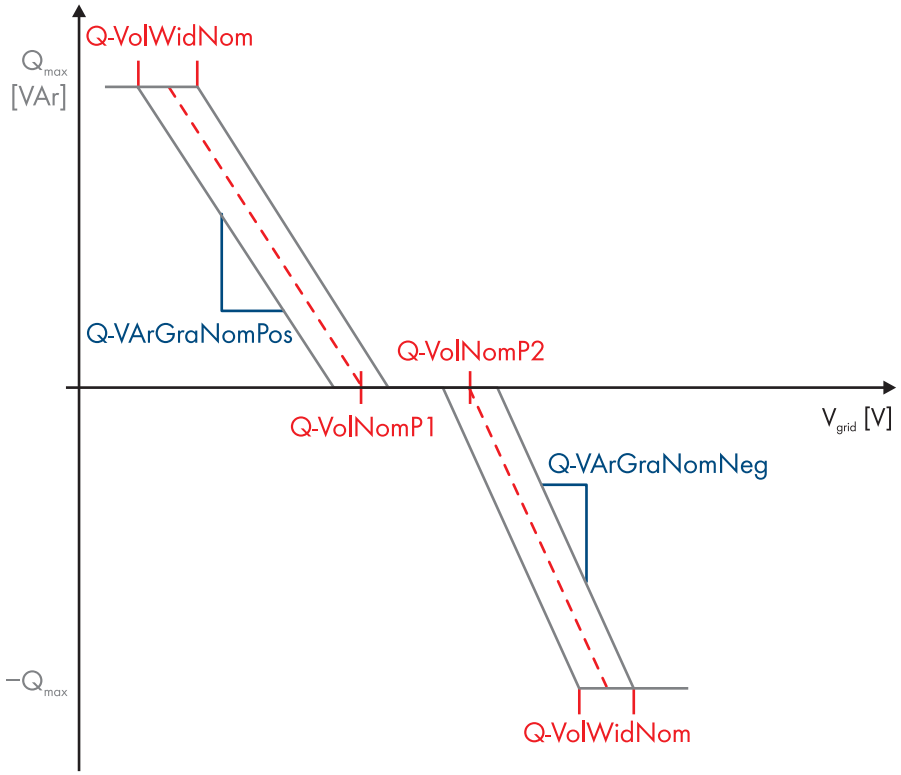


Figure 31: Characteristic curve for reducing reactive power with deadband and hysteresis

The parameter **Q-VArTmsSpnt** determines the delay time which must elapse before the calculated reactive power setpoint is actively used.

In order to prevent mutual interference of several systems with this function, the parameter **Q-VArTmsVtg** can be used to set a delay time. This delay time defines how long a voltage change must be pending before a change in reactive power feed-in is triggered. Consequently, control of the grid voltage at the grid feed-in point can be staggered across several systems.

You can activate and deactivate the delay time by means of the parameter **Q-EnaTmsVtg**.

In addition, the parameter **Q-VLockInW** can be used to define a voltage at which reactive power control will be activated after the time specified in parameter **Q-VLockInTm** has elapsed. If the voltage exceeds the threshold defined in parameter **Q-VLockOutW**, the reactive power control will be deactivated once the time specified in parameter **Q-VLockOutTm** has elapsed.

10.3.4 Q at Night

10.3.4.1 No Q at Night: Off Mode

The reactive power setpoint is limited to 0 kVAr. This setpoint cannot be controlled.

10.3.4.2 Q at Night with Operation Command via Modbus Protocol: VArCtlCom Mode

The reactive power setpoint is received by the communication unit and transmitted to the inverter. The setpoint is transmitted as a percentage value and converted to kVAr in the device. If the inverter has not received any signal for five minutes, the error message **Q-VArModFailStt** will be displayed.

10.3.4.3 Q at Night with Absolute Value: VArCnst Mode

The reactive power setpoint is set via the parameter **QoDQ-VAr**. The parameter **QoDQ-VAr** is permitted to be within the range from **–QoDQmax** to **+QoDQmax**.

10.3.4.4 Q at Night as a Percentage of the Nominal Power: VArCnstNom Mode

The parameter **QoDQ-VArNom** is used to set the reactive power setpoint in %. The parameter **QoDQ-VArNom** refers to **Pmax**. If the calculated amount of reactive power exceeds the predefined value of **QoDQmax**, it will be limited to **QoDQmax**. If the calculated amount of reactive power falls below the predefined value of **–QoDQmax**, it will be limited to **–QoDQmax**.

10.3.4.5 Q at Night via Standard Signal: VArCnstNomAnIn Mode

The reactive power setpoint is set at the input terminals for the setpoints via an analog signal. This is usually implemented by a ripple control signal. The analog value is converted into a reactive power setpoint. The electrical current strength of the connected signal determines the setpoint. The analog measured values must be between 4 mA and 19 mA. If the analog signal is less than 2 mA, an error message will be displayed in the instantaneous value **Q-VArModFailStt**.

Signal	Power limit	Description
< 2 mA	Last valid mean value or 0 kVAr after restart	Signal is in the invalid range.
2 mA to 4 mA	**–QoDQmax** / underexcited	The maximum amount of negatively excited reactive power is fed in.
4 mA	**–QoDQmax** / underexcited	Start point of the characteristic curve The maximum amount of negatively excited reactive power is fed in.
11.5 mA	0 kVAr	Zero-crossing of the characteristic curve No reactive power is fed in.
> 19 mA	**+QoDQmax** / overexcited	End point of the characteristic curve The maximum amount of positively excited reactive power is fed in.

The analog value is converted to a setpoint for power limitation. Here, the parameter **QoDQmax** is the end point of the linear characteristic curve.

10.3.4.6 Q at Night Depending on the Grid Voltage: VArCtlVol Mode

Consultation prior to parameter change

The parameters of this mode can only be selected or changed after consultation (see Section 13 "Contact", page 155).

The reactive power is set as a function of the grid voltage. The reactive power setpoint is adjusted in stages.

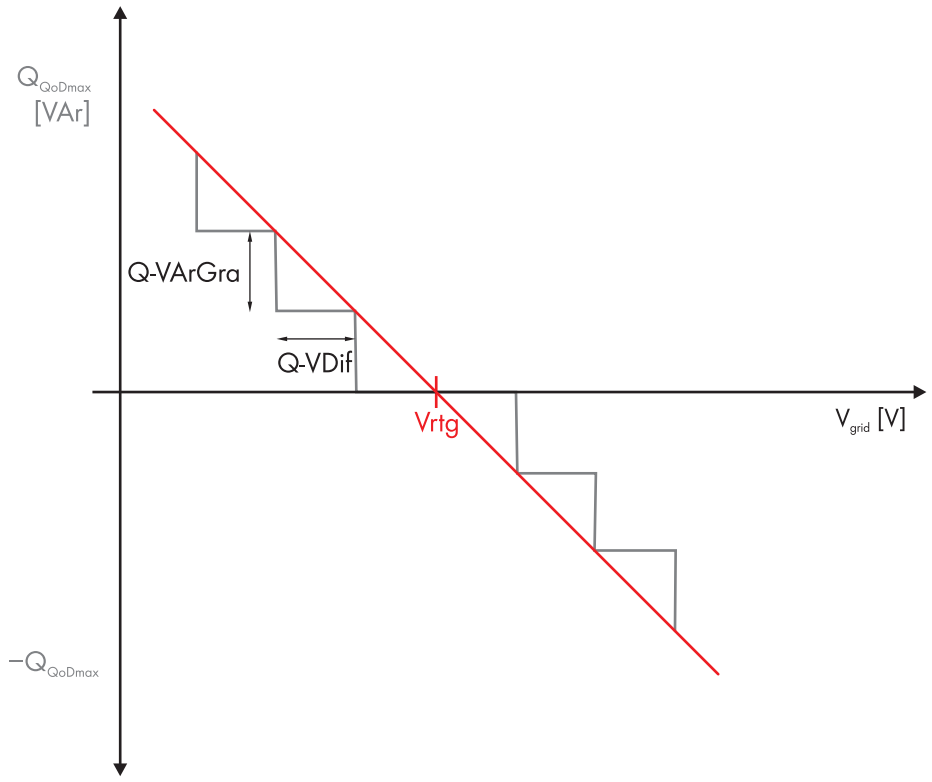


Figure 32: Characteristic curve for reducing reactive power as a function of the grid voltage

If the grid voltage is changed by the configurable voltage difference **Q-VDif** for the configurable duration of **Q-VDifTm**, the reactive power setpoint will be adjusted by the value **Q-VArGra.** The parameterization of this function refers to the medium voltage.

10.3.4.7 Measures for Voltage Support through Parameterization of Reactive Power/ Voltage Characteristic Curve: VArCtlVolHystDb Mode

Consultation prior to parameter change

The parameters of this mode can only be selected or changed after consultation (see Section 13 "Contact", page 155).

By supplying reactive power, the inverter performs voltage-stabilizing measures in the event of overvoltage or undervoltage. The parameterization is carried out by means of a reactive power/voltage characteristic curve. The characteristic curve can be flexibly configured by parameterizing the slope, a type of deadband through two voltage points and a hysteresis.

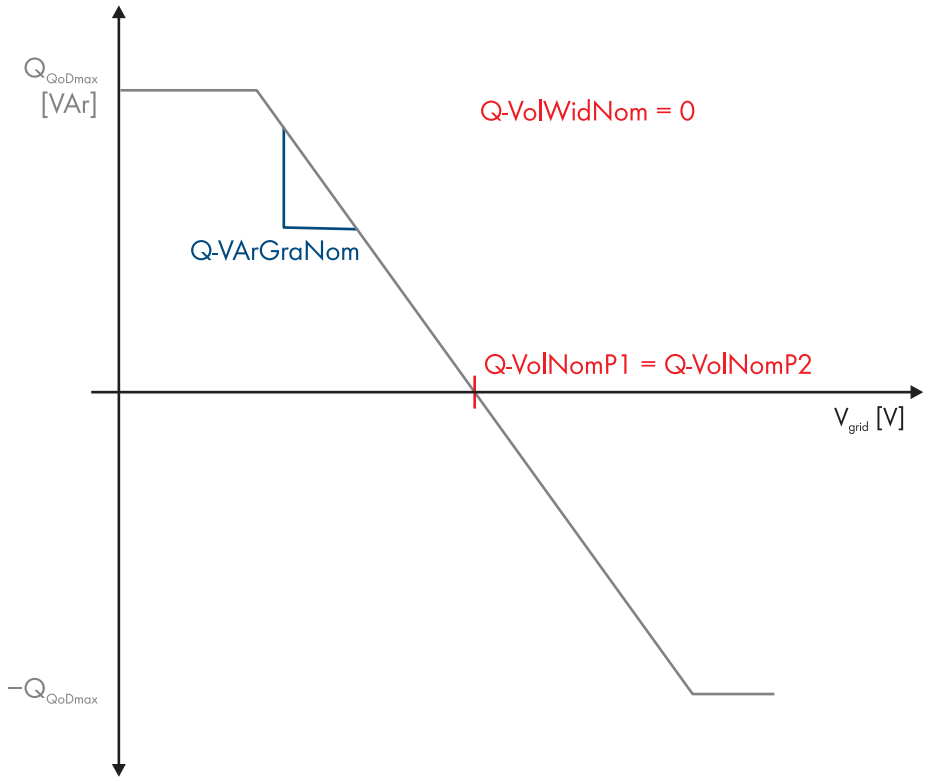


Figure 33: Characteristic curve for reducing reactive power without deadband and without hysteresis

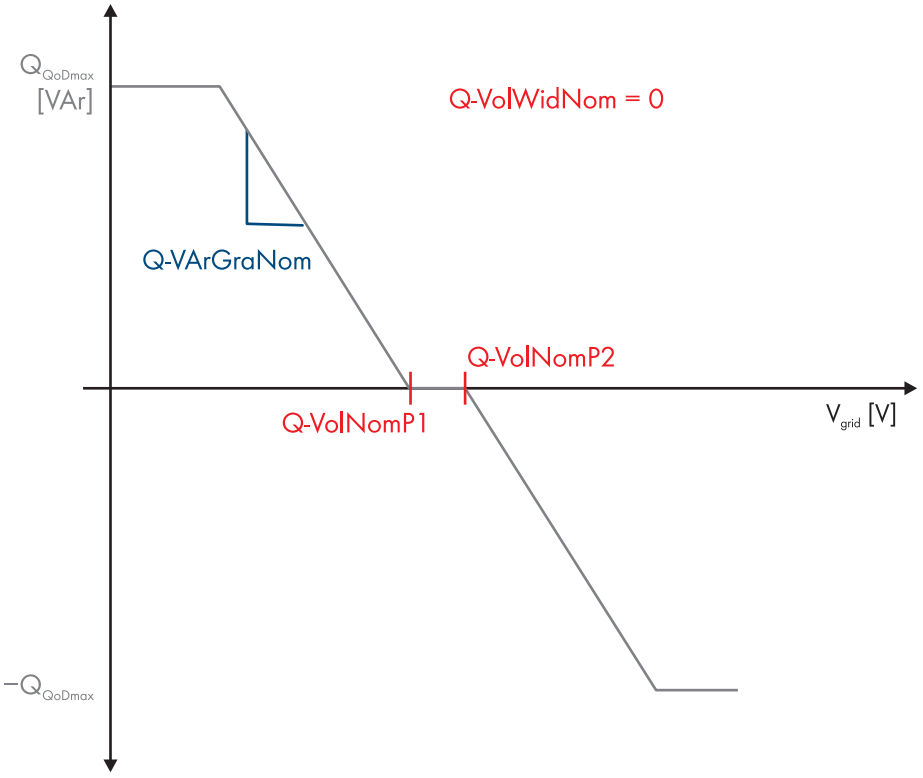


Figure 34: Characteristic curve for reducing reactive power with deadband

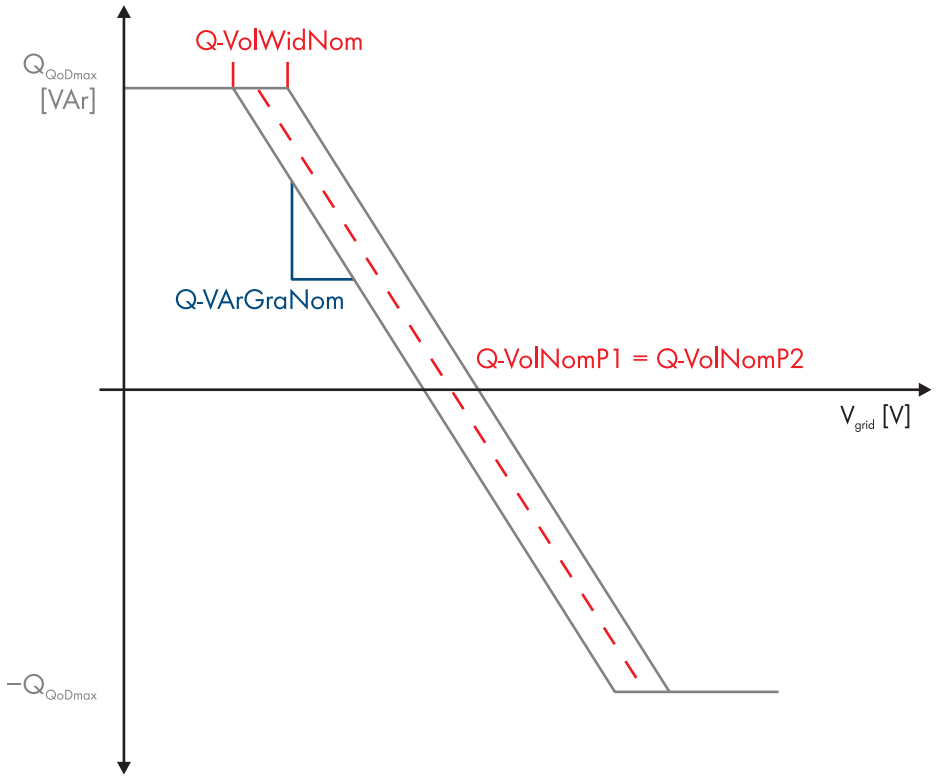


Figure 35: Characteristic curve for reducing reactive power with hysteresis

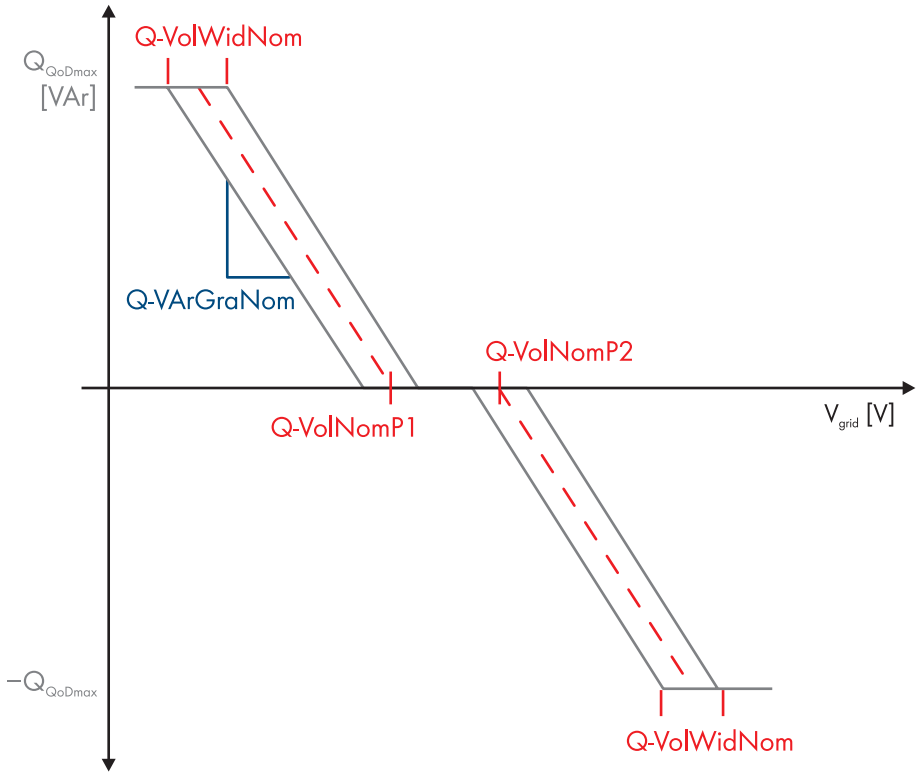


Figure 36: Characteristic curve for reducing reactive power with deadband and hysteresis

The parameter **Q-VArTmsSpnt** determines the delay time which must elapse before the calculated reactive power setpoint is actively used.

In order to prevent mutual interference of several systems with this function, the parameter **Q-VArTmsVtg** can be used to set a delay time. This delay time defines how long a voltage change must be pending before a change in reactive power feed-in is triggered. Consequently, control of the grid voltage at the grid feed-in point can be staggered across several systems.

You can activate and deactivate the delay time by means of the parameter **Q-EnaTmsVtg**.

10.3.4.8 Measures for Voltage Support through Parameterization of Reactive Power/ Voltage Characteristic Curve: VArCtlVolHystDbA Mode

Consultation prior to parameter change

The parameters of this mode can only be selected or changed after consultation (see Section 13 "Contact", page 155).

By supplying reactive power, the inverter performs voltage-stabilizing measures in the event of overvoltage or undervoltage. The parameterization is carried out by means of a reactive power/voltage characteristic curve. The characteristic curve can be configured flexibly by parameterization of the slopes, a type of deadband through two voltage points, a hysteresis and the thresholds for activation.

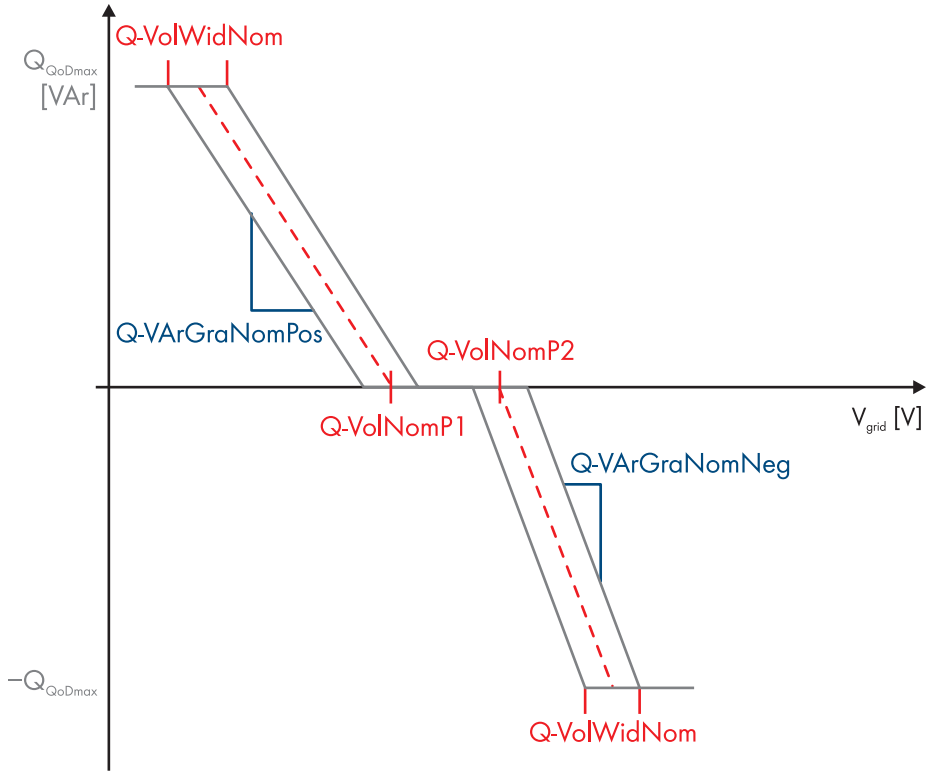


Figure 37: Characteristic curve for reducing reactive power with deadband and hysteresis

The parameter **Q-VArTmsSpnt** determines the delay time which must elapse before the calculated reactive power setpoint is actively used.

In order to prevent mutual interference of several systems with this function, the parameter **Q-VArTmsVtg** can be used to set a delay time. This delay time defines how long a voltage change must be pending before a change in reactive power feed-in is triggered. Consequently, control of the grid voltage at the grid feed-in point can be staggered across several systems.

You can activate and deactivate the delay time by means of the parameter **Q-EnaTmsVtg**.

In addition, the parameter **Q-VLockInW** can be used to define a voltage at which reactive power control will be activated after the time specified in parameter **Q-VLockInTm** has elapsed. If the voltage exceeds the threshold defined in parameter **Q-VLockOutW**, the reactive power control will be deactivated once the time specified in parameter **Q-VLockOutTm** has elapsed.

10.3.5 Behavior in the Absence of Active and Reactive Power Setpoints

In the event of failure of setpoints for active and reactive power control, the inverter is capable of bridging the gap in two ways:

- Use of last default values received:

  As long as the inverter does not receive any updated default values, it will use the last value received (when setpoint takes place via communication) and the last valid mean value (when using analog setpoints).

- Use of substitute values:

  As long as the inverter does not receive any updated default values, it will utilize the specified substitute values for active power limitation, reactive power setpoint and displacement power factor. In this case, different substitute values can be configured for feed-in operation and grid monitoring.

The parameter **PwrMonErrMod** is used to configure whether the last default values (**LastVal**) or the configured substitute values (**SubVal**) are to be used. This setting will be valid for both active and reactive power setpoints. The substitute values are used when the time since receiving the last valid signal for default values as defined in the parameter **PwrMonErrTm** has elapsed.

Setting	Description
LastVal	If specified via communication: utilization of the last value received In case of analog setpoints: utilization of the last valid mean value
SubVal	Use of configured substitute values The use of the substitute values is recommended when setpoints are effected via analog signals. • **P-WSubValRun**: substitute value for active power limitation in feed-in operation • **P-WSubVal**: substitute value for active power limitation outside of feed-in operation • **Q-VArSubValRun**: substitute value for the reactive power setpoint in feed-in operation • **PF-PFSubValRun**: substitute value for the displacement power factor in feed-in operation • **PF-PFExtSubValR**: substitute value for the excitation of the displacement power factor in feed-in operation • **Q-VArSubVal**: substitute value for the reactive power setpoint outside of feed-in operation • **PF-PFSubVal**: substitute value for the displacement power factor outside of feed-in operation • **PF-PFExtSubVal**: substitute value for the excitation of the displacement power factor outside of feed-in operation

10.4 Structure of the Communication Network

In order to connect the inverter to a computer via the service interface or via the Internet, the communication unit must be integrated in a system network. To enable several inverters to be operated in the same network, the communication unit of each inverter must be assigned a unique network address.

Depending on the order option, the inverter may be equipped with a managed switch.

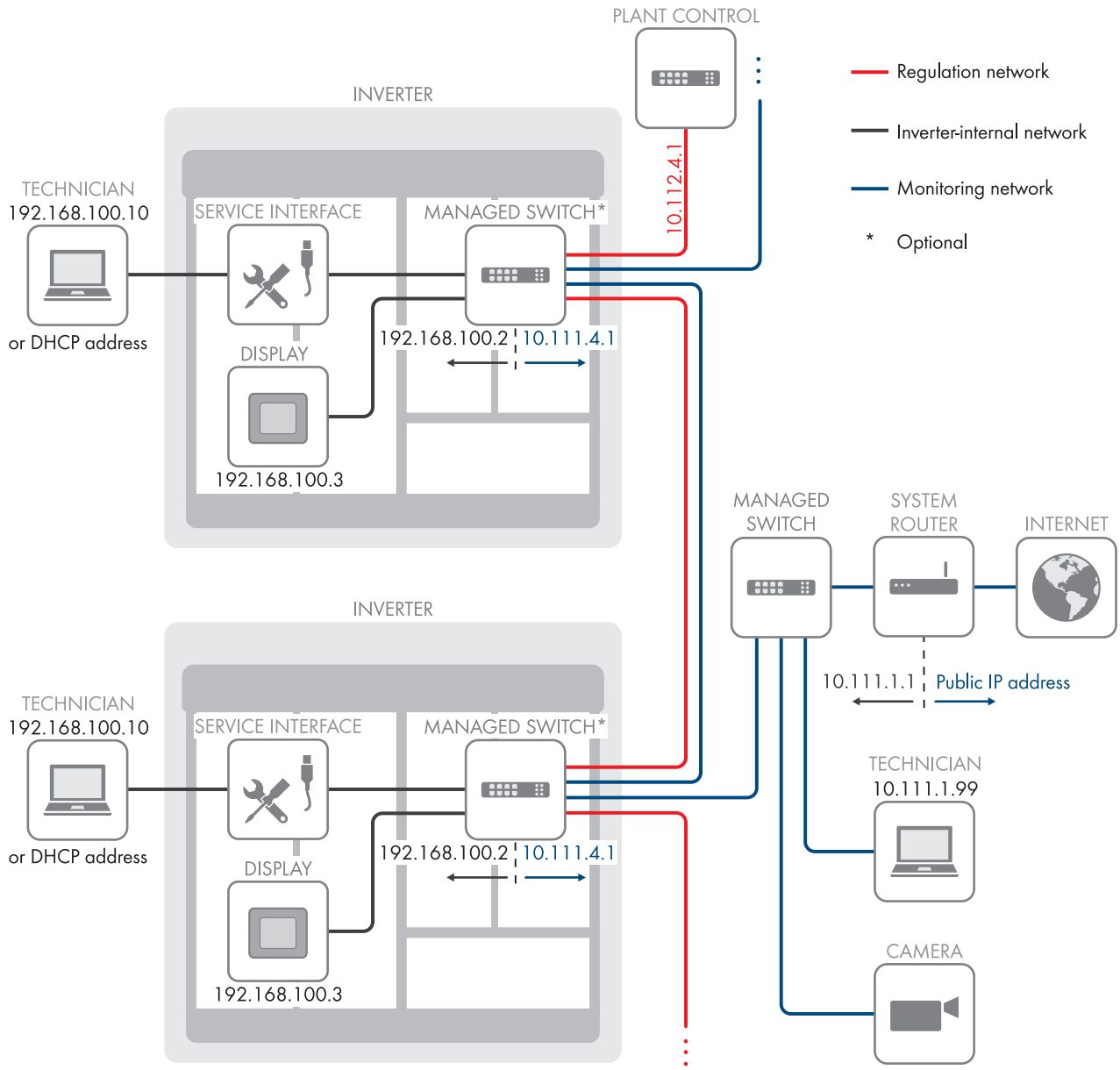


Figure 38: System network of two inverters (example)

Monitoring and control can be organized in two separate networks:

- **Monitoring network**

  This network is used for monitoring, parameterization and remote diagnosis.

- **Control network**

  The grid operator uses this network to transmit grid management specifications to the inverters. The control network is used exclusively for grid management services that need to be transmitted and implemented within a specified time period.

If only a low data transfer rate is required for monitoring, grid operator specifications can also be transmitted via the monitoring network. Only one network is required in this case.

10.5 Grid Management Services

10.5.1 Requirements for Grid Management Services

Due to the growing number of PV power plants feeding into the utility grid, these PV power plants increasingly have to take on feed-in management functions. In Germany, for example, they are obliged to offer grid management services. First and foremost, the grid operator must be able to limit the power of the PV power plant by remote control and temporarily reduce it to zero in critical cases. The relevant control commands of the grid operator must therefore be transmitted to the inverters quickly and reliably and implemented accordingly. The following figure shows how the specifications of the grid operator are implemented. The specifications of the grid operator are sent to the inverters by the Power Reducer Box or the Power Plant Controller.

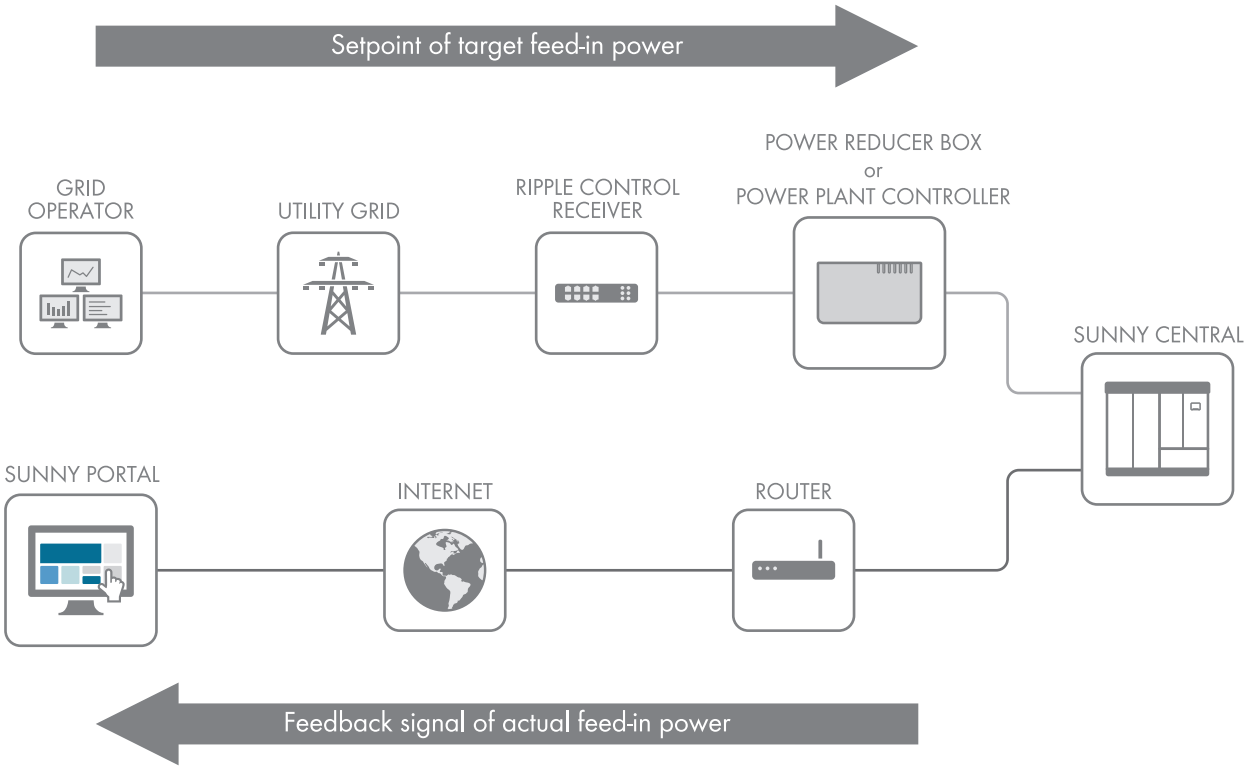


Figure 39: Principle of grid integration

As an alternative to the Power Reducer Box or Power Plant Controller, there are two other ways of enabling grid management services:

- Reception of signals via two analog inputs on the inverter
- Manual adjustment of the specifications via parameters on the inverter

10.5.2 Dynamic Grid Support (FRT)

10.5.2.1 Full and Limited Dynamic Grid Support (FRT)

With dynamic grid support (Fault Ride Through – FRT), the inverter supports the utility grid during a brief grid-voltage dip (Low Voltage Ride Through – LVRT) or during a short period of overvoltage (High Voltage Ride Through – HVRT).

With full dynamic grid support, grid support is ensured by feeding in reactive current.

With limited dynamic grid support, the inverter interrupts grid feed-in during a grid instability without disconnecting from the utility grid.

Q at Night and dynamic grid support

Limited dynamic grid support is available in the operating state "Q at Night".

The dynamic grid support function is activated via the parameter **FRTEna**. The inverter behavior can be controlled via the parameter **FRTMod**. The level of reactive current provided with full dynamic grid support is determined via the parameter **FRTArGraNom**. The grid limits and deactivation delays vary depending on the country.

10.5.2.2 Grid Support in Case of Undervoltage (LVRT)

The inverter can support the utility grid during a brief grid-voltage dip. The behavior of the inverter depends on the percentage ratio of grid voltage V_{grid} to nominal voltage V.

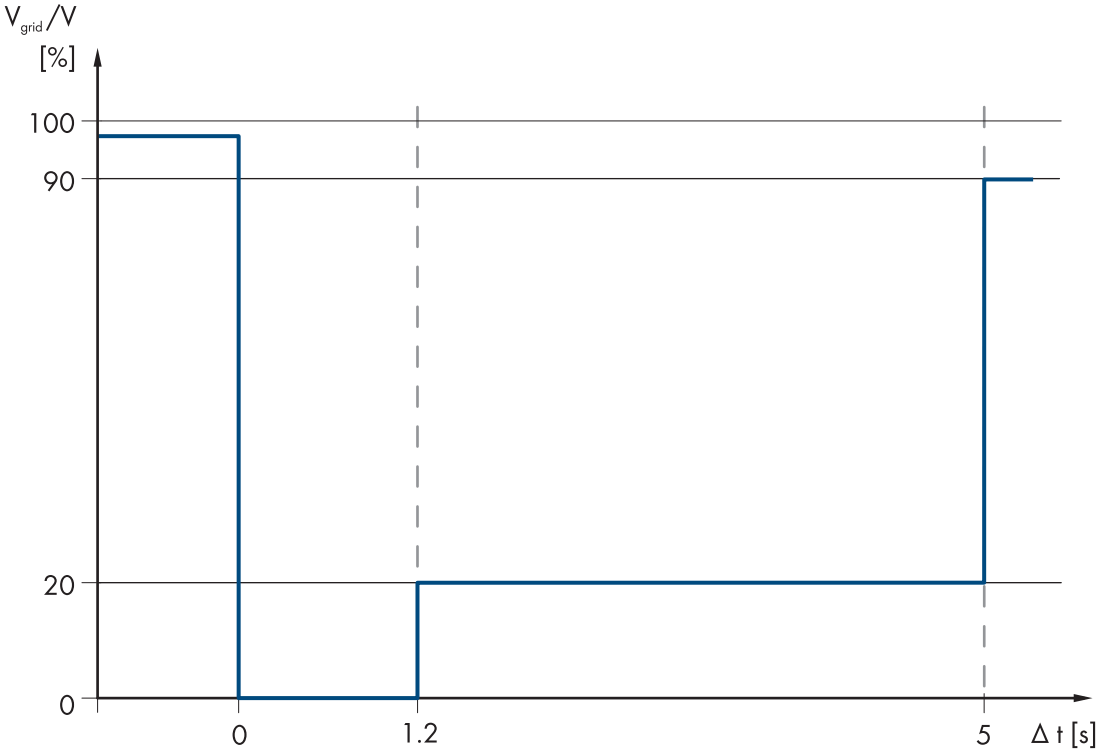


Figure 40: Maximum duration of a voltage dip that the inverter can work through without disconnecting from the utility grid

Ratio V_{grid}/V	Inverter behavior
90% to 100%	The ratio of grid voltage V_{grid} to nominal voltage V is in the normal range and the inverter feeds in without any problems.
20% to 90%	The ratio of grid voltage V_{grid} to nominal voltage V is in the critical range. There is a disturbance in the utility grid. While this disturbance remains present, the inverter supports the utility grid with reactive current. The inverter can bridge disturbances of up to five seconds without disconnecting from the utility grid. If the set grid monitoring time is exceeded during this period, the inverter disconnects from the utility grid.
0% to 20%	The ratio of grid voltage V_{grid} to nominal voltage V is in the critical range. There is a disturbance in the utility grid. While this disturbance remains present, the inverter supports the utility grid with reactive current. The inverter can bridge disturbances of up to 1.2 seconds without disconnecting from the utility grid. The requirement is that the ratio V_{grid}/V was at least 90% before the error occurred. If the set grid monitoring time is exceeded during this period, the inverter disconnects from the utility grid.

The tripping threshold is defined by the parameter **FRTDbVolNomMin**.

10.5.2.3 Dynamic Undervoltage Detection

The dynamic undervoltage detection extends the grid support in the event of undervoltage and changes the switch-off behavior. The grid limits, which are stepped by default, are replaced by a continuous grid-limit function.

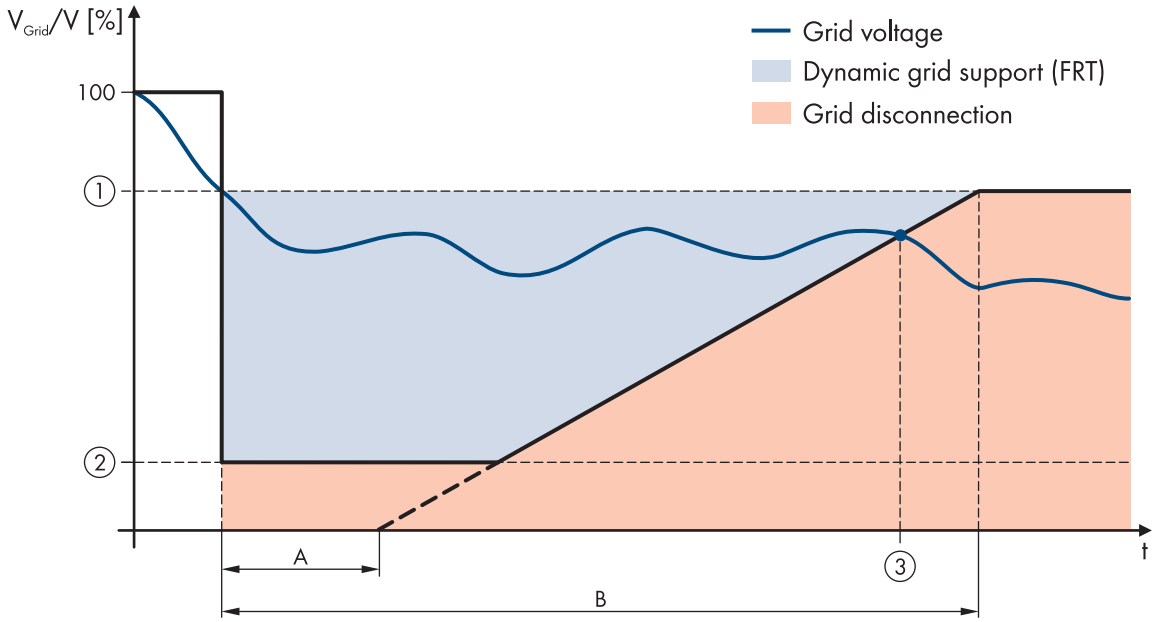


Figure 41: Maximum duration of a voltage dip that the inverter can work through without disconnecting from the utility grid

Position	Parameter	Description
1	VCtlLim	Grid voltage limit level 1
2	VCtllLim	Grid voltage limit level 2
3	–	Time at which the inverter disconnects from the utility grid.
A	VCtlCharTm	The delay time of the dynamic undervoltage detection defines the intersection of the continuous grid-limit function with the time axis.
B	VCtlLimTm	Delay time for grid limit level 1

The function of the dynamic undervoltage detection is activated via the parameter **VCtlCharEna**. The function of the dynamic undervoltage detection is activated by default for Romania.

10.5.2.4 Grid Support in the Event of Overvoltage (HVRT)

In addition to providing grid support in the event of undervoltage, the inverter can support the utility grid in the event of short-term overvoltage. The behavior of the inverter depends on the percentage ratio of grid voltage V_{grid} to nominal voltage V.

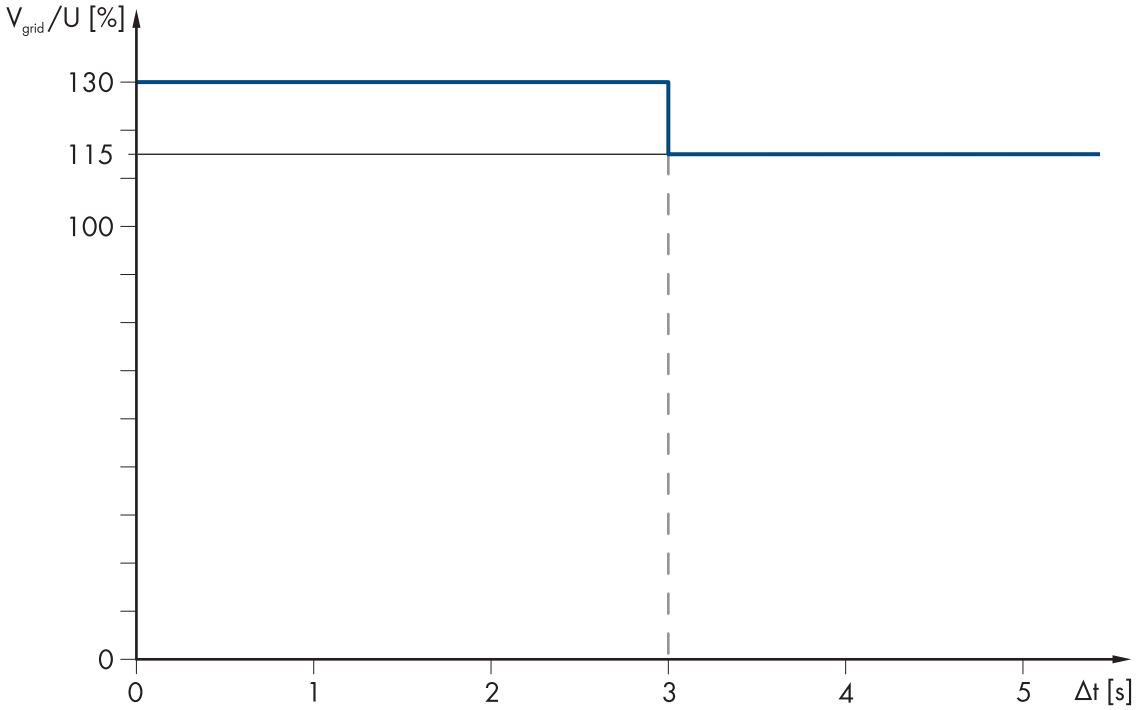


Figure 42: Maximum duration of overvoltage that the inverter can work through without disconnecting from the utility grid (example)

Ratio V_{grid}/V	Inverter behavior
Greater than 130%	The ratio of grid voltage V_{grid} to nominal voltage V is in the critical range. There is a disturbance in the utility grid. The inverter disconnects from the utility grid.
115% to 130%	The ratio of grid voltage V_{grid} to nominal voltage V is in the critical range. There is a disturbance in the utility grid. While this disturbance remains present, the inverter supports the utility grid with reactive current. The inverter can bridge disturbances of up to 3 seconds without disconnecting from the utility grid. If the set grid monitoring time is exceeded during this period, the inverter disconnects from the utility grid.
100% to 115%	The ratio of grid voltage V_{grid} to nominal voltage V is in the normal range and the inverter feeds in without any problems.

The tripping threshold is defined by the parameter **FRTDbVolNomMax**.

10.6 Zone Monitoring

The order option "Zone Monitoring" offers the possibility to monitor up to eight input currents of the inverter as standard, to detect fuse and string failures, and in this way, to minimize the power and yield losses.

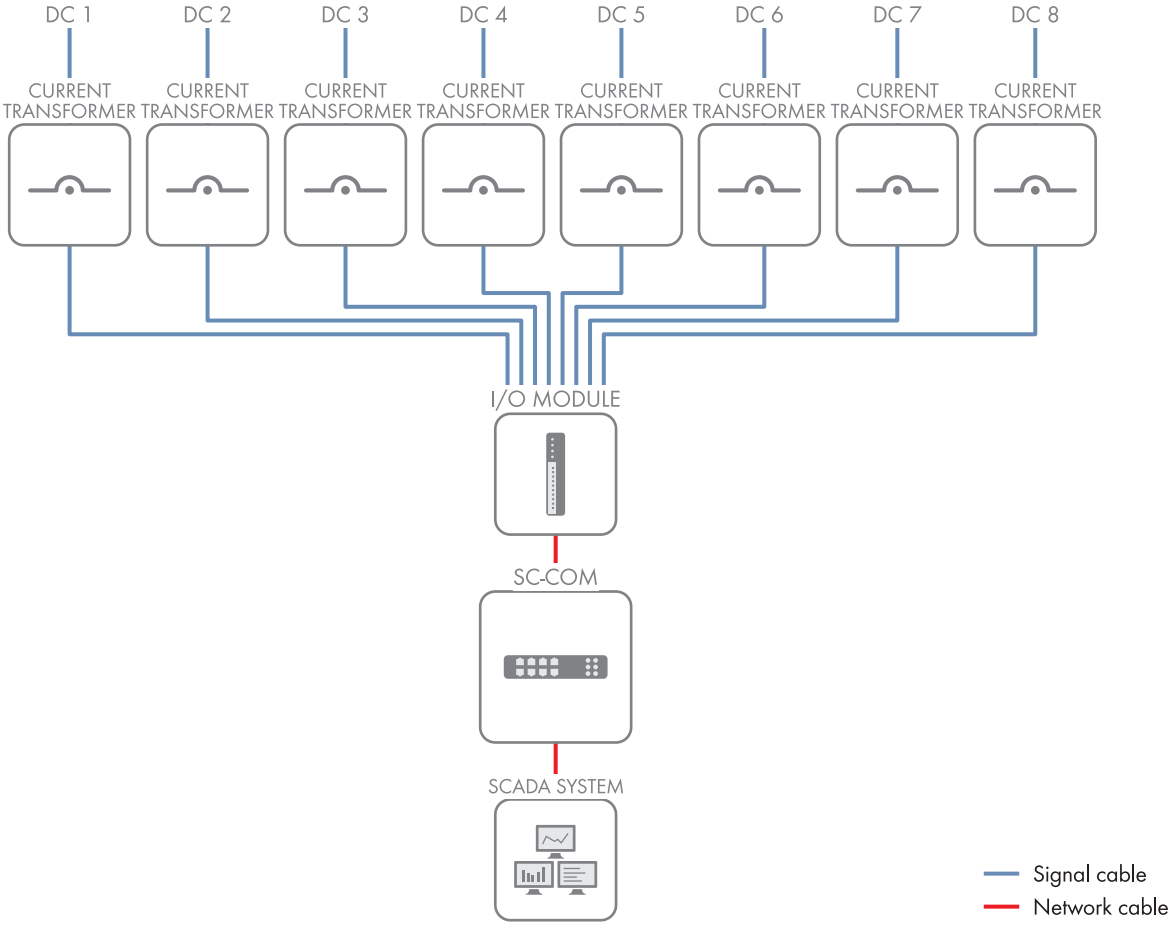


Figure 43: Function principle "Zone Monitoring"

The input currents are monitored by the current transformers installed on the DC rails. The current transformers measure the input currents and forward the measured values via I/O interface to the communication unit. The communication unit continually calculates the mean values of the input currents and compares the current measured values with the mean values. If an input current falls below the mean value by a user-defined tolerance, the communication unit issues a message. For correct analysis of the input currents, the following must be set:

- Maximum input current for each input
- Tolerance in percent by which the input current may deviate from the mean value

When a deviation occurs, the error message is displayed in the event report, if the error analysis is activated. It can also be sent to Sunny Portal or, depending on the settings, it can be forwarded by e-mail.

11 Operating Data and Parameters

11.1 Operating Data

11.1.1 Inverter

11.1.1.1 Power Limitation

Errors and warnings relating to active power limitation

Name	Display	Description
P-WModFailStt	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.
	ComFail	The mode **WCtlCom** has been selected and the expected signal with a valid active power limitation has been absent for at least five minutes.
	AnInFail	The mode **WCnstNomAnIn** has been selected and the value measured at the analog input is less than 2 mA.
	ComInvalid	The mode **WCtlCom** has been selected and there is invalid content in the power setpoint information.

Status messages of active power limitation

Name	Display	Description
P-WModStt	Off	No mode for active power limitation has been selected.
	WMax	Active power is limited by specification of an upper limit. This limit is based on **Pmax**.
	Hz	Active power is limited by a frequency increase.
	Tmp	Active power is limited by temperature derating.
	AmpPv	Active power is limited via a PV current limitation.
	AmpAC	Active power is limited via an AC current limitation.
	SMax	The active power is limited by the maximum apparent power.
	Q-VAr	The active power is limited due to the priority of the reactive power setpoint.
	QEnsure	The active power is limited due to the intermediate storage of reactive power.
	P-Vtg	The active power is limited due to the characteristic curve P(V).
	VdcMax	The active power is increased via the setpoint due to the DC voltage being too high.
	AmpPvOptiprot	For the order option "Optiprotect", the active power is limited due to switch currents being too high.

Errors and warnings relating to the reactive power setpoint

Name	Display	Description
Q-VArModFailStt	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	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.
	AnInFail	The mode **VArCnstNomAnIn** or **PFCnstAnIn** has been selected and the value measured at the analog input is less than 2 mA.
	ComInvalid	The mode **VArCtlCom** or **PFCtlCom** has been selected and there is invalid content in the power setpoint information.

Status messages of the reactive power setpoint

Name	Display	Description
Q-VArModStt	Off	No mode for specifying the reactive power setpoint has been selected.
	VdcMax	The reactive power is limited due to DC voltage being too high.
	VacLimMax	The reactive power is limited due to AC voltage being too high.
	VacLimMin	The reactive power is limited due to the AC voltage being too low.
	SMaxVdcHigh	The maximum apparent power value is reduced. If the maximum DC voltage increases, the reactive power is reduced.
	SMax	The reactive power is limited by the maximum apparent power.
	Tmp	The reactive power is limited by temperature derating.
	AmpAC	The reactive power is limited via an AC current limitation.
	P	The reactive power is limited due to the priority of the active power setpoint.
	FrtLim	The reactive power is limited due to the FRT voltage limit.

Displacement power factor and power setpoint

Name	Display	Description
PF	–	Current displacement power factor cos φ
PFExt	OvExt	Overexcited
	UnExt	Underexcited
P-WSpt	–	Current power specification

11.1.1.2 Error Channels

Name	Description
Prio	Priority of error message
Msg	Error message
Dsc	Measure for error correction
TmsRmg	Time until reconnection
GriSwStt	State of the AC disconnection unit
Mode	Operating state of the inverter
Error	Localization of the error
ErrNo	Error number
ErrNoFirst	Error number of the first error

11.1.1.3 Measured Values

Name	Description
Vac	Grid voltage in V
Iac	Grid current in A
Pac	AC power in kW
Qac	Reactive power in kVAr
Sac	Apparent power in kVA
Fac	Power frequency in Hz
Vpv	PV voltage in V
Ipv	PV current in A
Ppv	PV power in kW
ExlAnaInCur1	External current measurement in mA
ExlAnaInV1	External voltage measurement in V
Riso	Insulation resistance

11.1.1.4 Internal Device Values

Name	Description
DInExlStrStp	Status of the remote shutdown unit
DInKeySwStrStp	Status of key switch
DInGfdi	Status of GFDI
DOutMntSvc	State of the signal light
Firmware	Firmware version of operation control unit

Name	Description
Firmware-2	Firmware version of digital signal processor
Cntry	Country setting or configured standard
Dt	Datum
Tm	Time
Type	Device type

11.1.1.5 Internal Meters

Name	Description
h-On	Operating hours (feed-in time and waiting time) of the inverter, in h
h-Total	Feed-in hours (feed-in time without waiting time) of the inverter, in h
E-Total	Total energy fed into the grid, in kWh
E-Today	Energy fed in during the current day, in kWh
CntFanHs	Operating hours of the heat sink fan, in h
CntFanCab1	Operating hours of the interior fan 1, in h
CntFanCab2	Operating hours of the interior fan 2, in h
CntFanCab3	Operating hours of the interior fan 3, in h
CntHtCab2	Operating hours of the heating element 2, in h
CntGfdiSw	Number of GFDI trippings
h-HighV	Operating hours at high DC voltage

11.1.1.6 Service-Relevant Displays

The following table lists display values containing service information.

Name		
BfrSollrr	CardStt	ExtSollrr
Fb_SVMMode	FeedInStt	Firmware-3
Firmware-4	Firmware-5	Firmware-6
Firmware-7	Firmware-8	Firmware-9
Firmware-CRC	Firmware-2-CRC	Firmware-5-CRC
Firmware-6-CRC	GriSwStt	InfFlgs
LvrtVtgNom	ManResStt	Mode
ParaSetStt	StkErrFirst	StkErrFlgs
SvmMode		

11.1.2 Sunny Central String-Monitor Controller

11.1.2.1 Instantaneous Values

Name	Description
MeanCurGr1	Mean current for group 1; mean value exists for all six groups
SSMUWrnCode	String-failure detection
SSMUNoOf	Number of Sunny String-Monitors found

11.1.2.2 Internal Device Values

Name	Description
h-On	Operating hours of the Sunny Central String-Monitor Controller
SysDt	System date
SysTm	System time

11.1.2.3 Status Values

Name	Description
Error	Error detected by the Sunny Central String-Monitor Controller
Mode	Operating state of the Sunny Central String-Monitor Controller
ParaCfg	Error in parameterization of monitoring time detected
SSMUWrnTxt	Warning message

11.1.3 Sunny String-Monitor

11.1.3.1 Instantaneous Values

Name	Description
IString 1	Mean value of the current of string 1 over the last 30 seconds; mean value exists for all eight measuring channels

11.1.3.2 Internal Device Values

Name	Description
Meldekontakt 1	Status of alarm contact 1
Meldekontakt 2	Status of alarm contact 2
Netz-Adresse	Network address of the Sunny String-Monitor
Seriennummer	Serial number of the Sunny String-Monitor

11.1.3.3 Status Values

Name	Description
Fehler	Error detected by the Sunny String-Monitor
Status	Operating status of the Sunny String-Monitor

11.1.4 Zone Monitoring

11.1.4.1 Instantaneous Values

Name	Description
DcMs.Amp[x]	DC current at input x
ActTol[x]	Deviation of maximum standardized current in percent at input x

11.1.4.2 Status Values

Name	Values	Description
Mode	–	Initialization
	Waiting	Zone Monitoring is activated, but the minimum current for the evaluation is not yet reached.
	Operation	Zone Monitoring is activated and the minimum current for the evaluation is reached.
	Disturbance	Disturbance
	Error	Error
Error	–	There is no warning, disturbance or error to display.
	ConfigFail	Current inputs are not configured. At least two inputs have to be configured.
	ZoneValueLow	At least one input has an input current which is too low.
	ZoneValueFail	For at least one input, the input current is no longer measured (input current ≤ 2 A)
	CalibrationFail	Calibration has failed.
	DevNotReachable	I/O module has not answered for at least 30 seconds.
StatusZone[x]	–	No error
	ZoneValueLow	The input has an input current which is too low.
	ZoneValueFail	For the input, the input current is no longer measured (input current ≤ 2 A).

11.2 Parameters

11.2.1 Inverter

11.2.1.1 Power Limitation

Name	Description	Value/range	Explanation	Default value
Plimit*	Limitation of the nominal device power including apparent power	0 kW to 550 kW	Sunny Central 500CP XT	550 kW
		0 kW to 700 kW	Sunny Central 630CP XT	700 kW
		0 kW to 792 kW	Sunny Central 720CP XT	792 kW
		0 kW to 836 kW	Sunny Central 760CP XT	836 kW
		0 kW to 880 kW	Sunny Central 800CP XT	880 kW
		0 kW to 935 kW	Sunny Central 850CP XT	935 kW
		0 kW to 990 kW	Sunny Central 900CP XT	990 kW
		0 kW to 1,100 kW	Sunny Central 1000CP XT	1,100 kW
Pmax**	Limitation of the nominal power	0 kW to 550 kW	Sunny Central 500CP XT	550 kW
		0 kW to 700 kW	Sunny Central 630CP XT	700 kW
		0 kW to 792 kW	Sunny Central 720CP XT	792 kW
		0 kW to 836 kW	Sunny Central 760CP XT	836 kW
		0 kW to 880 kW	Sunny Central 800CP XT	880 kW
		0 kW to 935 kW	Sunny Central 850CP XT	935 kW
		0 kW to 990 kW	Sunny Central 900CP XT	990 kW
		0 kW to 1,100 kW	Sunny Central 1000CP XT	1,100 kW
P-WMod**	Mode for active power limitation	Off	Limits active power to **Pmax**	Off
		WCtlCom	Limits active power via an external control unit, such as the Power Reducer Box	
		WCnst	Manually limits active power in kW (**P-W**) via communication devices, such as the SC-COM	
		WCnstNom	Manually limits active power in % (**P-WNom**) via communication devices, such as the SC-COM	
		WCnstNomAnIn	Limits active power in % at the analog input	
		WCnstNomDigIn	Limits active power at the digital input. This mode is not supported.	

Name	Description	Value/range	Explanation	Default value
P-W	Active power limit in kW The active power cannot exceed **Pmax**.	0 kW to 1,000 kW	Sunny Central 500CP XT	550 kW
		0 kW to 1,000 kW	Sunny Central 630CP XT	700 kW
		0 kW to 1,000 kW	Sunny Central 720CP XT	792 kW
		0 kW to 1,000 kW	Sunny Central 760CP XT	836 kW
		0 kW to 1,000 kW	Sunny Central 800CP XT	880 kW
		0 kW to 1,000 kW	Sunny Central 850CP XT	935 kW
		0 kW to 1,000 kW	Sunny Central 900CP XT	990 kW
		0 kW to 1,100 kW	Sunny Central 1000CP XT	1,100 kW
P-WNom	Limitation of active power in %	0 % ... 100 %	–	100 %
WCtlHzMod**	Activation of frequency-dependent active power limitation	Off	Deactivated	Country-specific
		CurveHys	Procedure with hysteresis	
		Curve	Procedure without hysteresis	
P-HzStr**	Starting point of frequency control	Country-specific	–	Country-specific
P-HzStop**	End point of frequency control	Country-specific	–	Country-specific
P-HzStopMin**	Minimum frequency at end point of frequency control	Country-specific	–	Country-specific
P-WGra**	Gradient of active power limitation in case of active power limitation dependent on the frequency	1%/Hz to 100%/Hz	–	Country-specific
Qlimit*	Reactive power of device	0 kVAr to 245 kVAr	Sunny Central 500CP XT	245 kVAr
		0 kVAr to 310 kVAr	Sunny Central 630CP XT	310 kVAr
		0 kVAr to 346 kVAr	Sunny Central 720CP XT	346 kVAr
		0 kVAr to 365 kVAr	Sunny Central 760CP XT	365 kVAr
		0 kVAr to 385 kVAr	Sunny Central 800CP XT	385 kVAr
		0 kVAr to 409 kVAr	Sunny Central 850CP XT	409 kVAr
		0 kVAr to 433 kVAr	Sunny Central 900CP XT	433 kVAr
		0 kVAr to 485 kVAr	Sunny Central 1000CP XT	485 kVAr

Name	Description	Value/range	Explanation	Default value
Qmax**	Limitation of reactive power	0 kVAr to 245 kVAr	Sunny Central 500CP XT	245 kVAr
		0 kVAr to 310 kVAr	Sunny Central 630CP XT	310 kVAr
		0 kVAr to 346 kVAr	Sunny Central 720CP XT	346 kVAr
		0 kVAr to 365 kVAr	Sunny Central 760CP XT	365 kVAr
		0 kVAr to 385 kVAr	Sunny Central 800CP XT	385 kVAr
		0 kVAr to 409 kVAr	Sunny Central 850CP XT	409 kVAr
		0 kVAr to 433 kVAr	Sunny Central 900CP XT	433 kVAr
		0 kVAr to 485 kVAr	Sunny Central 1000CP XT	485 kVAr
QoDQmax*	Limitation of reactive power in the operating state "Q at Night". The reactive power cannot exceed **Qlimit**.	0 kVAr to 245 kVAr	Sunny Central 500CP XT	245 kVAr
		0 kVAr to 310 kVAr	Sunny Central 630CP XT	310 kVAr
		0 kVAr to 346 kVAr	Sunny Central 720CP XT	346 kVAr
		0 kVAr to 365 kVAr	Sunny Central 760CP XT	365 kVAr
		0 kVAr to 385 kVAr	Sunny Central 800CP XT	385 kVAr
		0 kVAr to 409 kVAr	Sunny Central 850CP XT	409 kVAr
		0 kVAr to 433 kVAr	Sunny Central 900CP XT	433 kVAr
		0 kVAr to 485 kVAr	Sunny Central 1000CP XT	485 kVAr
QEnsure*	Guaranteed reactive power	0 kVAr to 245 kVAr	Sunny Central 500CP XT	0 kVAr
		0 kVAr to 310 kVAr	Sunny Central 630CP XT	
		0 kVAr to 346 kVAr	Sunny Central 720CP XT	
		0 kVAr to 365 kVAr	Sunny Central 760CP XT	
		0 kVAr to 385 kVAr	Sunny Central 800CP XT	
		0 kVAr to 409 kVAr	Sunny Central 850CP XT	
		0 kVAr to 433 kVAr	Sunny Central 900CP XT	
		0 kVAr to 485 kVAr	Sunny Central 1000CP XT	
PFAbsMin*	Limitation of the displacement power factor cos φ	0.5 ... 1	–	0.9

Name	Description	Value/range	Explanation	Default value
Q-VArMod**	Mode for reactive power control	Off	Sets reactive power to 0 kVAr and displacement power factor cos φ to 1	Off
		VArCtlCom	Specifies reactive power via external control unit, such as the Power Reducer Box	
		PFCtlCom	Specifies the displacement power factor cos φ and the excitation of the displacement power factor via an external control unit such as the Power Reducer Box	
		VArCnst	Specifies reactive power in kVAr via the parameter **Q-VAr**	
		VArCnstNom	Specifies reactive power in % via the parameter **Q-VArNom**	
		VArCnstNomAnIn	The reactive power setpoint is imported via an analog input.	
		PFCnst	Manual specification of the displacement power factor cos φ and excitation of the displacement power factor via the parameters **PF-PF** and **PF-PFExt**.	
		PFCnstAnIn	Specifies the displacement power factor cos φ at the analog input **QExlSpnt** via control unit	
		PFCtlW	Specifies the displacement power factor cos φ depending on the feed-in power	
		VArCtlVol	Specifies reactive power as a function of the grid voltage	
		VArCtlVolHystDb	Specifies reactive power as a function of the grid voltage (Q = f(V) characteristic curve)	
		VArCtlVolHysDbA	Specifies reactive power as a function of the grid voltage with activation power (for Italy)	

Name	Description	Value/range	Explanation	Default value
QoDQ-VArMod**	Reactive power setpoint in the operating mode "Q at Night"	Off	Sets reactive power to 0 kVAr and displacement power factor cos φ to 1	Off
		VArCtlCom	Specifies reactive power via external control unit, such as the Power Reducer Box	
		VArCnst	Specifies reactive power in kVAr via the parameter **QoDQ-VAr**	
		VArCnstNom	Specifies reactive power in % via the parameter **QoDQ-VArNom**	
		VArCnstNomAnIn	The reactive power setpoint is imported via an analog input.	
		VArCtlVol	Specifies reactive power as a function of the grid voltage	
		VArCtlVolHystDb	Specifies reactive power as a function of the grid voltage (Q = f(V) characteristic curve)	
Q-VAr	Reactive power in kVAr	−245 kVAr to +245 kVAr	Sunny Central 500CP XT	0 kVAr
		−310 kVAr to +310 kVAr	Sunny Central 630CP XT	
		−346 kVAr to +346 kVAr	Sunny Central 720CP XT	
		−365 kVAr to +365 kVAr	Sunny Central 760CP XT	
		−385 kVAr to +385 kVAr	Sunny Central 800CP XT	
		−409 kVAr to +409 kVAr	Sunny Central 850CP XT	
		−433 kVAr to +433 kVAr	Sunny Central 900CP XT	
		−485 kVAr to +485 kVAr	Sunny Central 1000CP XT	

Name	Description	Value/range	Explanation	Default value
QoDQ-Var**	Reactive power setpoint in the operating mode "Q at Night"	−245 kVAr to +245 kVAr	Sunny Central 500CP XT	0 kVAr
		−310 kVAr to +310 kVAr	Sunny Central 630CP XT	
		−346 kVAr to +346 kVAr	Sunny Central 720CP XT	
		−365 kVAr to +365 kVAr	Sunny Central 760CP XT	
		−385 kVAr to +385 kVAr	Sunny Central 800CP XT	
		−409 kVAr to +409 kVAr	Sunny Central 850CP XT	
		−433 kVAr to +433 kVAr	Sunny Central 900CP XT	
		−485 kVAr to +485 kVAr	Sunny Central 1000CP XT	
Q-VArNom	Reactive power in %	−100 % ... +100 %	–	0 %
QoDQ-VArNom	Reactive power in % in the operating state "Q at Night"	−100 % ... +100 %	–	0 %
PF-PF	Displacement power factor cos φ The lower limit is defined by the parameter **PFAbsMin**.	0.5 ... 1	–	1
PF-PFExt	Excitation of the displacement power factor cos φ	OvExt	Overexcited	OvExt
		UnExt	Underexcited	
PF-PFStr**	Displacement power factor cos φ at characteristic curve point 1 The lower limit is defined by the parameter **PFAbsMin**.	0.5 ... 1	–	0.9
PF-PFExtStr**	Excitation of the displacement power factor cos φ at characteristic curve point 1	OvExt	Overexcited	OvExt
		UnExt	Underexcited	

Name	Description	Value/range	Explanation	Default value
PF-PFStop**	Displacement power factor cos φ at characteristic curve point 2 The lower limit is defined by the parameter **PFAbsMin**.	0.5 ... 1	–	0.9
PF-PFExtStop**	Excitation of the displacement power factor cos φ at characteristic curve point 2	OvExt	Overexcited	OvExt
		UnExt	Underexcited	
PF-WStr**	Feed-in power in % at characteristic curve point 1	0 % ... 90 %	–	0 %
PF-WStop**	Feed-in power in % at characteristic curve point 2	10 % ... 100 %	–	100 %
PF-WLockInVtg**	Activation voltage of the cos φ(P) characteristic curve, in %, relative to the nominal voltage	0 % ... 110 %	–	0 %
PF-WLockOutVtg**	Deactivation voltage of the cos φ(P) characteristic curve, in %, relative to the nominal voltage	0 % ... 110 %	–	0 %
PF-WLockTm	Waiting time for activation or deactivation of the cos φ(P) characteristic curve	0 s to 100 s	–	2 s
Q-VDif**	Definition of voltage variation leading to a change in reactive power	0.1 % ... 10 %	The value refers to the nominal voltage **VRtg**.	1 %
Q-VArGra**	Definition of the reactive power setpoint change in one voltage step	0 % ... 100 %	The value refers to the nominal power **Pmax**.	1 %
Q-VDifTm**	Time period for which a voltage change must be present before the reactive power setpoint **Q-VArGra** changes.	0 s to 120 s	–	1 s

Name	Description	Value/range	Explanation	Default value
Q-VRtgOfsNom**	Nominal voltage **VRtg** of the voltage-dependent reactive power control This parameter is only active if the parameter **Q-VArMod** is set to **VArCtlCol**.	−10 % ... +10 %	–	0 %
Q-VArGraNom**	Reactive power gradient	0%/V to 40.06%/V	Sunny Central 500CP XT	0%/V
		0%/V to 31.47%/V	Sunny Central 630CP XT	
		0%/V to 27.82%/V	Sunny Central 720CP XT	
		0%/V to 26.35%/V	Sunny Central 760CP XT	
		0%/V to 25.04%/V	Sunny Central 800CP XT	
		0%/V to 23.56%/V	Sunny Central 850CP XT	
		0%/V to 22.25%/V	Sunny Central 900CP XT	
		0%/V to 22.25%/V	Sunny Central 1000CP XT	
Q-VolWidNom**	Voltage range	0 % ... 20 %	–	0 %
Q-VolNomP1**	Voltage at point 1	80 % ... 120 %	–	100 %
Q-VolNomP2**	Voltage at point 2	80 % ... 120 %	–	100 %
Q-VArTmsSpnt**	Time setting of the characteristic curve point	0.2 s to 20 s	–	10 s
Q-VArTmsVtg**	Connection delay of the grid voltage	0.2 s to 20 s	–	10 s
Q-EnaTmsVtg**	Activation of the connection delay of the grid voltage	Off	Deactivated	Off
		On	Activated	
WGra**	Gradient of the active power change for setpoint of active power limitation	0.017%/s to 100%/s	–	Country-specific
WGraEna**	Activation of the active power change gradient	Off	Deactivated	On
		On	Activated	
WGraRecon**	Gradient of active power change for reconnection	0.017%/s to 100%/s	–	Country-specific

Name	Description	Value/range	Explanation	Default value
WGraReconEna**	Activation of the decoupling protection ramp for reconnection	Off	Deactivated	Country-specific
		On	Activated	
P-VtgGraNom**	Active power gradient for voltage-dependent active power limitation	0.017%/s to 100.000%/s	–	0.166%/s
P-VtgEna	Activation of voltage-dependent active power limitation	Off	Deactivated	Off
		On	Activated	
P-VtgNomP1	Voltage at point 1	100 % ... 120 %	–	111%
P-VtgNomP2	Voltage at point 2	90 % ... 120 %	–	110 %
P-VtgAtMin	Minimum active power with voltage-dependent active power limitation	0 % ... 100 %	–	20 %
PwrApLimitPrio***	Prioritization of reactive power or active power	PrioPwrRtPrioPwrRt	Prioritization of reactive power	PrioPwrRtPrioPwrRt
		PrioPwrAt	Prioritization of active power	
SDLimComSrc***	Selection of the SDLimit source	CAN	Interface of the communication unit	UART
		UART	Via SMA Net	
P-WSubVal	Substitute value for active power limitation outside of normal feed-in operation during communication disturbance	0 kW to 550 kW	Sunny Central 500CP XT	550 kW
		0 kW to 700 kW	Sunny Central 630CP XT	700 kW
		0 kW to 792 kW	Sunny Central 720CP XT	792 kW
		0 kW to 836 kW	Sunny Central 760CP XT	836 kW
		0 kW to 880 kW	Sunny Central 800CP XT	880 kW
		0 kW to 935 kW	Sunny Central 850CP XT	935 kW
		0 kW to 990 kW	Sunny Central 900CP XT	990 kW
		0 kW to 1,100 kW	Sunny Central 1000CP XT	1,100 kW

Name	Description	Value/range	Explanation	Default value
P-WSubValRun	Substitute value for active power limitation in normal feed-in operation during communication disturbance	0 kW to 550 kW	Sunny Central 500CP XT	550 kW
		0 kW to 700 kW	Sunny Central 630CP XT	700 kW
		0 kW to 792 kW	Sunny Central 720CP XT	792 kW
		0 kW to 836 kW	Sunny Central 760CP XT	836 kW
		0 kW to 880 kW	Sunny Central 800CP XT	880 kW
		0 kW to 935 kW	Sunny Central 850CP XT	935 kW
		0 kW to 990 kW	Sunny Central 900CP XT	990 kW
		0 kW to 1,100 kW	Sunny Central 1000CP XT	1,100 kW
Q-VArSubVal	Substitute value for reactive power setpoint outside of normal feed-in operation during communication disturbance	−245 kVAr to +245 kVAr	Sunny Central 500CP XT	0 kVAr
		−310 kVAr to +310 kVAr	Sunny Central 630CP XT	
		−346 kVAr to +346 kVAr	Sunny Central 720CP XT	
		−365 kVAr to +365 kVAr	Sunny Central 760CP XT	
		−385 kVAr to +385 kVAr	Sunny Central 800CP XT	
		−409 kVAr to +409 kVAr	Sunny Central 850CP XT	
		−433 kVAr to +433 kVAr	Sunny Central 900CP XT	
		−485 kVAr to +485 kVAr	Sunny Central 1000CP XT	
PF-PFSubVal	Substitute value for cos φ outside of normal feed-in operation during communication disturbance The lower limit is defined by the parameter **PFAbsMin**.	0.5 ... 1	–	1
PF-PFExtSubVal	Substitute value for excitation type during communication disturbance	OvExt	Overexcited	OvExt
		UnExt	Underexcited	

Name	Description	Value/range	Explanation	Default value
Q-VArSubValRun	Substitute value for reactive power setpoint in normal feed-in operation during communication disturbance	−245 kVAr to +245 kVAr	Sunny Central 500CP XT	0 kVAr
		−310 kVAr to +310 kVAr	Sunny Central 630CP XT	
		−346 kVAr to +346 kVAr	Sunny Central 720CP XT	
		−365 kVAr to +365 kVAr	Sunny Central 760CP XT	
		−385 kVAr to +385 kVAr	Sunny Central 800CP XT	
		−409 kVAr to +409 kVAr	Sunny Central 850CP XT	
		−433 kVAr to +433 kVAr	Sunny Central 900CP XT	
		−485 kVAr to +485 kVAr	Sunny Central 1000CP XT	
Q-VLockInW**	Voltage value from which the Q(V) characteristic curve is activated, in % relative to the nominal voltage	0 % ... 100 %	–	0 %
Q-VLockOutW**	Voltage value from which the Q(V) characteristic curve is deactivated, in % based on the nominal voltage	0 % ... 100 %	–	0 %
Q-VLockInTm**	Waiting time for activation of the Q(V) characteristic curve	0 s to 100 s	–	2 s
Q-VLockOutTm**	Waiting time for deactivation of the Q(V) characteristic curve	0 s to 100 s	–	2 s

Name	Description	Value/range	Explanation	Default value
Q-VArGraNomPos**	Reactive power gradient at a positive change of nominal voltage	0%/V to 40.06%/V	Sunny Central 500CP XT	0%/V
		0%/V to 31.47%/V	Sunny Central 630CP XT	
		0%/V to 27.82%/V	Sunny Central 720CP XT	
		0%/V to 26.35%/V	Sunny Central 760CP XT	
		0%/V to 25.04%/V	Sunny Central 800CP XT	
		0%/V to 23.56%/V	Sunny Central 850CP XT	
		0%/V to 22.25%/V	Sunny Central 900CP XT	
		0%/V to 22.25%/V	Sunny Central 1000CP XT	
Q-VArGraNomNeg**	Reactive power gradient at a negative change of nominal voltage	0%/V to 40.06%/V	Sunny Central 500CP XT	0%/V
		0%/V to 31.47%/V	Sunny Central 630CP XT	
		0%/V to 27.82%/V	Sunny Central 720CP XT	
		0%/V to 26.35%/V	Sunny Central 760CP XT	
		0%/V to 25.04%/V	Sunny Central 800CP XT	
		0%/V to 23.56%/V	Sunny Central 850CP XT	
		0%/V to 22.25%/V	Sunny Central 900CP XT	
		0%/V to 22.25%/V	Sunny Central 1000CP XT	
PF-PFSubValRun	Substitute value cos φ in normal feed-in operation during communication disturbance The lower limit is defined by the parameter **PFAbsMin**.	0.5 ... 1	–	1
PF-PFExtSubValR	Substitute value of the excitation type in normal feed-in operation during communication disturbance	OvExt	Overexcited	OvExt
		UnExt	Underexcited	
PwrMonErrMod	Mode used in the event of communication disturbance	LastVal	Use of last default values received	LastVal
		SubVal	Use of substitute values	
PwrMonErrTm	Communication downtime until substitute values are used	1 s to 999 s	–	300 s

Name	Description	Value/range	Explanation	Default value
QoDEna	Activates/deactivates the function "Q at Night"	Off	"Q at Night" function disabled	Off
		On	"Q at Night" function enabled	
QoDDccOffDelay*	Delay time until the DC switchgear opens in the operating state "Q at Night"	0 s to 86,400 s	–	3,600 s

* You can only view this parameter.
** To change this parameter, you must enter the installer password.
*** To view or change this parameter, you must enter the installer password.

11.2.1.2 Grid Monitoring and Grid Limits

To change these parameters, you must enter the installer password.

Name	Description	Range	Explanation	Default value
VRtg	Nominal line-to-line voltage of the utility grid	1 V to 70,000 V	–	20,000 V
VCtlMax	Threshold for overvoltage release level 3	100 % ... 150 %	–	Country-specific
VCtlMaxTm	Delay time for overvoltage level 3	0 ms - to 1,000,000 ms	–	Country-specific
VCtlhhLim	Threshold for overvoltage release level 2	100 % ... 150 %	–	Country-specific
VCtlhhLimTm	Delay time for overvoltage level 2	0 ms - to 1,000,000 ms	–	Country-specific
VCtlhLim	Threshold for overvoltage release level 1	100 % ... 150 %	–	Country-specific
VCtlhLimTm	Delay time for overvoltage level 1	0 ms - to 1,000,000 ms	–	Country-specific
VCtllLim	Threshold for undervoltage release level 1	0 % ... 100 %	–	Country-specific
VCtllLimTm	Delay time for undervoltage level 1	0 ms - to 1,000,000 ms	–	Country-specific
VCtlllLim	Threshold for undervoltage release level 2	0 % ... 100 %	–	Country-specific
VCtlllLimTm	Delay time for undervoltage level 2	0 ms - to 1,000,000 ms	–	Country-specific
VCtlMin	Threshold for undervoltage release level 3	0 % ... 100 %	–	Country-specific
VCtlMinTm	Delay time for undervoltage level 3	0 ms - to 1,000,000 ms	–	Country-specific

Name	Description	Range	Explanation	Default value
VCtlCharEna	Activation of dynamic undervoltage detection	Off	Deactivated	Country-specific
		On	Activated	
VCtlCharTm	Start time of dynamic undervoltage detection	0 ms to 1,000,000 ms	–	77 ms
VCtlOpMinNom	Minimum connection voltage	0 % ... 100 %	–	Country-specific
VCtlOpMaxNom	Maximum connection voltage	100 % ... 200 %	–	Country-specific
HzCtlOpMin	Minimum connection frequency	Country-specific	–	Country-specific
HzCtlOpMax	Maximum connection frequency	Country-specific	–	Country-specific
HzCtlOpMaxRecon	Maximum connection frequency after grid error	Country-specific	–	Country-specific
HzCtlMax	Threshold for overfrequency level 3	Country-specific	–	Country-specific
HzCtlMaxTm	Delay time for overfrequency level 3	0 ms to 1,000,000 ms	–	Country-specific
HzCtlhhLim	Threshold for overfrequency level 2	Country-specific	–	Country-specific
HzCtlhhLimTm	Delay time for overfrequency level 2	0 ms - to 1,000,000 ms	–	Country-specific
HzCtlhLim	Threshold for overfrequency level 1	Country-specific	–	Country-specific
HzCtlhLimTm	Delay time for overfrequency level 1	0 ms - to 1,000,000 ms	–	Country-specific
HzCtllLim	Threshold for underfrequency level 1	Country-specific	–	Country-specific
HzCtllLimTm	Delay time for underfrequency level 1	0 ms - to 1,000,000 ms	–	Country-specific
HzCtlllLim	Threshold for underfrequency level 2	Country-specific	–	Country-specific
HzCtlllLimTm	Delay time for underfrequency level 2	0 ms - to 1,000,000 ms	–	Country-specific
HzCtlMin	Threshold for underfrequency level 3	Country-specific	–	Country-specific
HzCtlMinTm	Delay time for underfrequency level 3	0 ms - to 1,000,000 ms	–	Country-specific

Name	Description	Range	Explanation	Default value
NormVac*	Measuring range end value of AC voltage measurement	1 V to 1,000 V	–	862 V
NormAac*	Measuring range end value of AC current measurement	1 A to 3,000 A	Sunny Central 500CP XT ... Sunny Central 900CP XT	2,958 A
		1 A to 3,500 A	Sunny Central 1000CP XT	
ManResOvrVol	Manual activation after overvoltage	Off	Deactivated	Off
		On	Activated	
ManResUndrVol	Manual activation after undervoltage	Off	Deactivated	Off
		On	Activated	
ManResOvrFrq	Manual activation after overfrequency	Off	Deactivated	Off
		On	Activated	
ManResUndrFrq	Manual activation after underfrequency	Off	Deactivated	Off
		On	Activated	
ManResPID	Manual activation after interruption by passive islanding detection	Off	Deactivated	Off
		On	Activated	
ManResPLD	Manual activation after interruption due to disturbance in a line conductor	Off	Deactivated	Off
		On	Activated	

* You can only view this parameter.

11.2.1.3 Grid Support

Name	Description	Value/range	Explanation	Default value
FRTMod*	Dynamic grid support operating modes	FRT_BDEW	Complete dynamic grid support	Country-specific
		FRT_Partial	Limited dynamic grid support	
		FRT_SDLWindV	Complete dynamic grid support with FRT characteristic curve	
		FRT_Off	Deactivation of dynamic grid support	
FRTSwOffTm*	Deactivation delay of the LVRT	0 ms to 10,000 ms	–	Country-specific
FRTArGraNom**	Scaling of the K factor for LVRT	0 ... 10	Values up to max. 2 are recommended. Values larger than 2 can lead to unstable plant behavior.	Country-specific

Name	Description	Value/range	Explanation	Default value
FRTDbVolNomMax*	Upper limit of the voltage deadband	0 % ... 100 %	–	Country-specific
FRTDbVolNomMin*	Lower limit of the voltage deadband	−100 % ... 0 %	–	Country-specific
FRT2ArGraNomHi**	Gradient of the FRT characteristic curve in the event of overvoltage in the operating mode FRT_SDLWindV	0 ... 10	Values up to max. 2 are recommended. Values larger than 2 can lead to unstable plant behavior.	Country-specific
FRT2ArGraNomLo**	Gradient of the FRT characteristic curve in the event of undervoltage in the operating mode FRT_SDLWindV	0 ... 10	Values up to max. 2 are recommended. Values larger than 2 can lead to unstable plant behavior.	Country-specific
EnaAid	Activation of islanding detection	Off	Deactivated	Off
		On	Activated	
TrfVolExlHi*	Line-to-line voltage on overvoltage side of external transformer	1 V to 70,000 V	–	20,000 V
TrfVolExlLo*	Line-to-line voltage on undervoltage side of external transformer	1 V to 500 V	Sunny Central 500CP XT	270 V
			Sunny Central 630CP XT	315 V
			Sunny Central 720CP XT	324 V
			Sunny Central 760CP XT	342 V
			Sunny Central 800CP XT	360 V
			Sunny Central 850CP XT	386 V
			Sunny Central 900CP XT	405 V
			Sunny Central 1000CP XT	405 V

* To change this parameter, you must enter the installer password.
** To view or change this parameter, you must enter the installer password.

11.2.1.4 Insulation monitoring

Name	Description	Value/range	Explanation	Default value
IsoMod	Hardware selection for insulation monitoring and ground-fault monitoring	–	No insulation monitoring and ground-fault monitoring	–
		Gfdi	GFDI	
		RemGdfi	Remote GFDI	
		IsoMeas	Insulation monitoring	
		IsoMeasGfdi	Insulation monitoring with GFDI	
		IsoMeasRemGfdi	Insulation monitoring with Remote GFDI	
		SoftGndDold	Soft Grounding	
		IsoMeasSoftGndD	Insulation monitoring with Soft Grounding	
		USRemGFDI	Remote GFDI for the U.S.	
		AutoUSRemGFDI	Automatic Remote GFDI for the U.S.	
IsoErrIgn*	Ignore insulation error	Off	Deactivated	Off
		On	Activated	
		Run	Error is only ignored when the inverter is in feed-in operation.	
RemMntSvc	PV array grounding is deactivated.	Off	Deactivated	Off
		On	Activated	
RisoCtlWarn	Warning threshold for the insulation monitoring device iso-PV1685	0 kΩ to 500 kΩ	–	45 kΩ
PvVtgRisoStart	Start voltage of insulation measurement	0 V to 1,200 V	Sunny Central 500CP XT	250 V
			Sunny Central 630CP XT	
			Sunny Central 720CP XT	
			Sunny Central 760CP XT	
			Sunny Central 800CP XT	
			Sunny Central 850CP XT	
			Sunny Central 900CP XT	
			Sunny Central 1000CP XT	

Name	Description	Value/range	Explanation	Default value
PvVtgRisoDif	Differential voltage to **PvVtgStrLevMin** for switching from insulation measurement to feed-in operation	−250 V to +250 V	–	0 V
IsoDev*	Selection of insulation monitoring device	isoPV3	–	isoPV3
		isoPV1685	–	

* To view or change this parameter, you must enter the installer password.

11.2.1.5 Project-Specific Parameters

Name	Description	Value/range	Explanation	Default value
PvPwrMinTr	Threshold for starting the MPP tracker	0 kW to 20 kW	–	20 kW
PvPwrMinTrT	Timeout for starting the MPP tracker	1 s to 1,800 s	–	600 s
PvVtgStrLevMin*	Threshold for switching to feed-in operation	0 V to 1,200 V	Sunny Central 500CP XT	500 V
		0 V to 1,200 V	Sunny Central 630CP XT	610 V
		0 V to 1,200 V	Sunny Central 720CP XT	630 V
		0 V to 1,200 V	Sunny Central 760CP XT	660 V
		0 V to 1,200 V	Sunny Central 800CP XT	705 V
		0 V to 1,200 V	Sunny Central 850CP XT	760 V
		0 V to 1,200 V	Sunny Central 900CP XT	770 V
		0 V to 1,200 V	Sunny Central 1000CP XT	770 V
PVStrT	Once the specified time has elapsed, the inverter switches from the operating state "Grid monitoring" to the operating state "Grid monitoring time reached".	1 s to 655 s	–	90 s
VArGra**	Gradient of reactive power change	0%/s to 200%/s	–	20%/s
QoDInvCurPv***	Maximum allowed reverse current to the PV array	−1,600 A to 0 A	–	−60 A

Name	Description	Value/range	Explanation	Default value
MppFact	Ratio between maximum power P_{MPP} of the PV cell at the maximum power point and the product of open-circuit voltage V_{OC} and short-circuit current I_{SC}	0.5 ... 1	–	0.8
Serial Number ***	Inverter serial number	0 ... 2147483647	–	0
CntrySet*	Selection of country settings	Country-specific	Parameter can only be changed in the operating state "Stop".	Country-specific
CardFunc*	MMC/SD memory card function	ForcedWrite	Eject SD memory card	0
		StoFailStt	Write fault memory to SD memory card	
DtSet	Date	20060101 ... 20991231	yyyymmdd	0
TmSet	Time	0 ... 235959	hhmmss	0
TmZn	Time zone	GMT –12:00 to GMT 12:00	Configurable time zones	Country-specific
ExtSolIrrOfs	Offset of the external irradiation sensor	−5,000 ... 5,000	–	0
ExtSolIrrGain	Amplification of external irradiation sensor	−1,000 ... 1,000	–	1
CntRs*	Meter reset	h-Cnt	Operating hours meter	–
		E-Cnt	Energy meter	
		CntFanHs	All fan runtime meters	
		CntFanCab1	Run time counter of interior fan 1	
		CntFanCab2	Run time counter of interior fan 2	
		CntFanCab3	Run time counter of interior fan 3	
		CntHtCab2	Run time counter of internal heating element	
Ofs_h-On**	Offset for operating hours	0 h to 2,147,482 h	–	0 h
Ofs_h-Total**	Offset for feed-in hours	0 h to 2,147,482 h	–	0 h
Ofs_E-Total**	Offset for total supplied energy	0 kWh to 214,748,267 kWh	–	0 kWh

Name	Description	Value/range	Explanation	Default value
Ofs_CntFanHs*	Offset for operating hours of heat sink fan	0 h to 2,147,482 h	–	0 h
Ofs_CntFanCab1*	Offset for operating hours of interior fan 1	0 h to 2,147,482 h	–	0
Ofs_CntFanCab2*	Offset for operating hours of interior fan 2	0 h to 2,147,482 h	–	0
Ofs_CntFanCab3*	Offset for operating hours of interior fan 3	0 h to 2,147,482 h	–	0
Ofs_CntHtCab2*	Offset for operating hours of internal heating element 2	0 h to 2,147,482 h	–	0
SpntRemEna	Remote activation of the PV power plant	Stop	Deactivated	Run
		Run	Activated	
Ackn	Acknowledges inverter error	Ackn	Acknowledge errors	–
GdErrTm*	Grid monitoring time after grid error	0 s to 10,000 s	–	Country-specific
GdChkTm*	Grid monitoring time during system start	0 s to 10,000 s	–	Country-specific
ExlStrStpEna*	Activation of external shutdown signal/remote shutdown	Off	Deactivated	Off
		On	Activated	
ExlTrfErrEna	Activation of hermetic protection of MV transformer	Off	Deactivated	On
		On	Activated	

* To view or change this parameter, you must enter the installer password.
** To change this parameter, you must enter the installer password.
*** You can only view this parameter.

11.2.2 Sunny Central String-Monitor Controller

Name	Description	Value/range	Explanation	Default value
Serial Number	Display of serial number	–	The value cannot be changed.	–
Firmware	Firmware version of operation control unit	0 to 255	–	–
Firmware2	Firmware version of digital signal processor	0 to 255	–	–
Dt	Entry of current date	20060101 to 20991231	Entered in the format YYYYMMDD	–

Name	Description	Value/range	Explanation	Default value
Tm	Entry of current time	0 to 235959	Entered in the format HHMMSS	–
TolGr1*	Deviation of group 1 currents from mean value	5% to 100%	Parameter exists for all six groups.	13%
MoniTmGr1On*	Start time for monitoring of group 1	07:00 a.m. to 7:00 p.m.	Parameter exists for all six groups.	10:00 a.m.
MoniTmGr1Off*	End time for monitoring of group 1	07:00 a.m. to 7:00 p.m.	Parameter exists for all six groups.	3:00 p.m.
MoniTmGrAllOn*	Start time for monitoring of all groups	07:00 a.m. to 7:00 p.m.	–	10:00 a.m.
MoniTmGrAllOff*	End time for monitoring of all groups	07:00 a.m. to 7:00 p.m.	–	3:00 p.m.
MoniTmComOn*	Start time for monitoring of all groups	07:00 a.m. to 7:00 p.m.	–	10:00 a.m.
MoniTmComOff*	End time for monitoring of all groups	07:00 a.m. to 7:00 p.m.	–	3:00 p.m.
Ackn	Acknowledge errors	quit	–	–
ErrLevGr1*	Sensitivity of error detection for group 1 Parameter exists for all six groups	24 Sensitive	50 min – 10%	32 Regular
		24 Regular	50 min – 14%	
		24 Insensitive	50 min – 18%	
		32 Sensitive	35 min – 10%	
		32 Regular	35 min – 13%	
		32 Insensitive	35 min – 16%	
		64 Sensitive	15 min – 7%	
		64 Regular	15 min – 9%	
		64 Insensitive	15 min – 10%	
ComBaud*	Baud rate	1,200 baud	Parameter can only be changed in the operating state "Stop".	19,200 baud
		4,800 baud		
		9,600 baud		
		19,200 baud		
		38,400 baud		
		57,600 baud		

Name	Description	Value/range	Explanation	Default value
DevFunc*	Manages the Sunny String-Monitors	AutoDetect_SSMU	Searches for all Sunny String-Monitors and deletes previously detected Sunny String-Monitors	0
		DetectSSMU Retry	Searches for undetected Sunny String-Monitors only	
		DelAll_SSMU	Deletes all detected Sunny String-Monitors	
		Factory	Resets all parameters to default settings.	

* To change these parameters, you must enter the installer password.

11.2.3 Sunny String-Monitor

Name	Description	Value/range	Explanation	Default value
TMittelung*	Duration of averaging of current measurements	0 s to 6,000 s	–	30 s
String Anzahl*	Number of detected strings	0 to 8	–	0
SW Version	Current firmware version	1 to 40	Value cannot be changed	
SSM Identifier*	Identification number of Sunny String-Monitor	1 to 99	–	0
Group String 1 *	Assigns strings to their respective group	0 to 3	Parameter exists for all eight groups	0
Group String*	All groups	0 to 3	–	0
No.of String 1*	Number of connected strings in the respective group	1 to 4	Parameter exists for all eight groups If you wish to use this function, contact us (see Section 13, page 155).	–
No.of Strings*	All groups	1 to 4	–	–
Monitoring1 On*	Start of monitoring of strings in group 1	0:00 a.m. to 11:59 p.m.	Parameter exists for all eight groups Configure the string settings preferably via the Sunny Central String-Monitor Controller.	0
Monitoring1 Off*	End of monitoring of strings in group 1	0:00 a.m. to 11:59 p.m.	Parameter exists for all eight groups Configure the string settings preferably via the Sunny Central String-Monitor Controller.	0

Name	Description	Value/range	Explanation	Default value
Monitoring On *	Start of monitoring of strings in all groups	0:00 a.m. to 11:59 p.m.	–	0
Monitoring Off *	End of monitoring of strings in all groups	0:00 a.m. to 11:59 p.m.	–	0
Kommando**		Stop	If you wish to use this function, contact us (see Section 13, page 155).	0
		Mess		
		Offset1		
		Offset2		
		Diag		
		Reset Err.Cnt.		
		StoreCalibData		
		LoadCalibData		
		Watchdog Test		
Surge Arrester1 *	Alarm contact (e.g. theft protection for Sunny String-Monitor)	Activ High	Contact activated when voltage is present	0
		Activ Low	Contact activated when no voltage is present	
		Deactivated	Contact deactivated	
Surge Arrester2 *	Alarm contact	Activ High	Contact activated when voltage is present	0
		Activ Low	Contact activated when no voltage is present	
		Deactivated	Contact deactivated	

* To change these parameters, you must enter the installer password.
** These parameters are only visible after entering the installer password.

11.2.4 Zone Monitoring

Name	Description	Value/range	Explanation	Default value
DcCfg.AmpMax[1]	Maximum current of input 1	0 A to 500 A	–	0 A
DcCfg.AmpMax[2]	Maximum current of input 2	0 A to 500 A	–	0 A
DcCfg.AmpMax[3]	Maximum current of input 3	0 A to 500 A	–	0 A

Name	Description	Value/range	Explanation	Default value
DcCfg.AmpMax[4]	Maximum current of input 4	0 A to 500 A	–	0 A
DcCfg.AmpMax[5]	Maximum current of input 5	0 A to 500 A	–	0 A
DcCfg.AmpMax[6]	Maximum current of input 6	0 A to 500 A	–	0 A
DcCfg.AmpMax[7]	Maximum current of input 7	0 A to 500 A	–	0 A
DcCfg.AmpMax[8]	Maximum current of input 8	0 A to 500 A	–	0 A
MaxTol	Tolerance in percent by which the input current may deviate from the mean value	0.1 % ... 100 %	–	4.0 %
DevFunc	Device function	—	Default, no action	—
		ResetMeasuring	Restarts the algorithm. All measured value are deleted.	
		Factory	Resets all parameters to default settings	
Ackn	Acknowledge errors	—	Default, no action	—
		Quit	Acknowledgment of the present error	
AlarmEna	Activation of the error analysis	—	Default, no action	—
		Off	No error analysis. Only measured value are sent.	
		On	Error analysis activated. Error messages are generated, if deviations occur (see Section 11.1.4.2, page 122).	

12 Appendix

12.1 Information for Installation

12.1.1 Minimum Clearances

12.1.1.1 Minimum Clearances for Outdoor Installation

NOTICE

Damage due to intake of exhaust air or blocked ventilation openings

The supply air is intended to cool the inverter components. Failure to observe the specified minimum clearances can result in warm exhaust air from the inverter being drawn in. This increases the risk of a thermal short circuit. Property damage due to yield loss and damage to the components may result.

- Ensure that no exhaust air can be drawn in through the air inlets.
- Ensure that it is not possible for exhaust air to be drawn into the air intake of other devices.
- Make sure that the air inlets are not obstructed.
- Make sure that the exhaust air vents are not obstructed.
- Make sure that the ventilation openings are accessible for cleaning at all times.
- Ensure that the minimum clearances are complied with.

Installation in closed electrical operating area

The inverter must be installed in a closed electrical operating area.

- Ensure that unauthorized persons have no access to the inverter.

Observe minimum clearances

Observe the minimum clearances to ensure trouble-free operation of the inverter.

Maintain a certain distance between inverters installed back to back. This will facilitate maintenance and cleaning. Recommended clearance: 800 mm

Minimum clearances for one inverter

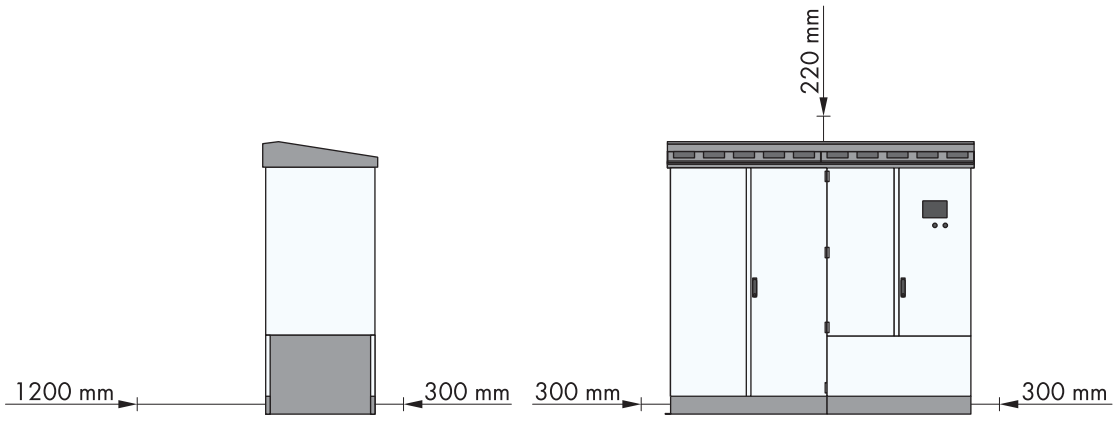


Figure 44: Minimum clearances for one inverter

Minimum clearances between two inverters and transformer

Version 1: Rear to rear

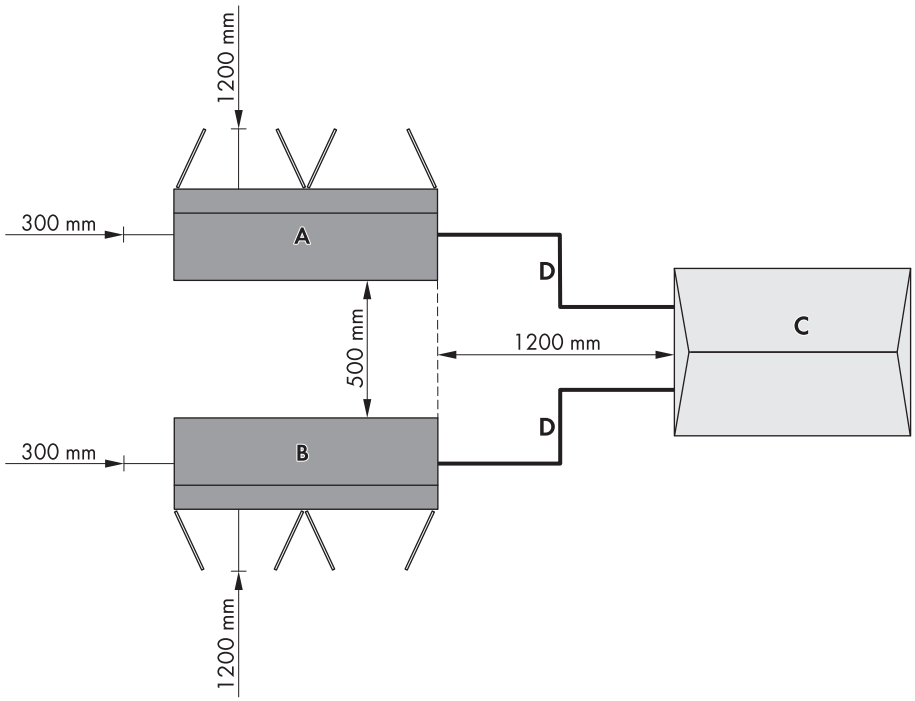


Figure 45: Minimum clearances between two inverters and transformer

Position	Designation
A	Inverter 1
B	Inverter 2
C	MV transformer and medium-voltage switchgear
D	Cable route between inverter and MV transformer

Minimum clearances between two inverters and transformer

Version 2: Front to front

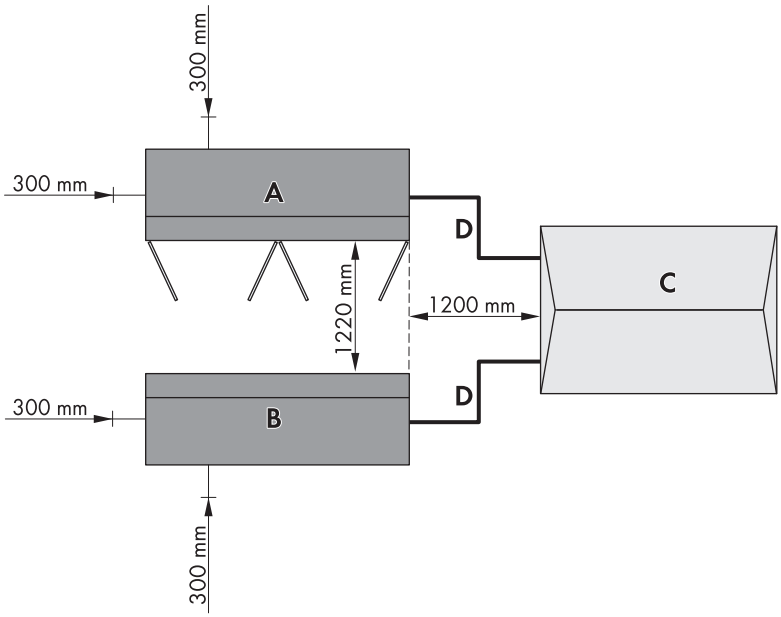


Figure 46: Minimum clearances between two inverters and transformer

Position	Designation
A	Inverter 1
B	Inverter 2
C	MV transformer and medium-voltage switchgear
D	Cable route between inverter and MV transformer

Recommended clearances for the facilitation of service work

In order to facilitate service work, minimum clearances to the rear and sides of 1,000 mm are recommended. If you are using a service tent during installation and service work, maintain 5,000 mm clearance to the inverter.

12.1.1.2 Minimum Clearances in Electrical Equipment Rooms

NOTICE

Damage due to intake of exhaust air or blocked ventilation openings

The supply air is intended to cool the inverter components. Failure to observe the specified minimum clearances can result in warm exhaust air from the inverter being drawn in. This increases the risk of a thermal short circuit. Property damage due to yield loss and damage to the components may result.

- Ensure that no exhaust air can be drawn in through the air inlets.
- Ensure that it is not possible for exhaust air to be drawn into the air intake of other devices.
- Make sure that the air inlets are not obstructed.
- Make sure that the exhaust air vents are not obstructed.
- Make sure that the ventilation openings are accessible for cleaning at all times.
- Ensure that the minimum clearances are complied with.

Minimum clearances for one inverter to be installed in electrical equipment rooms

The minimum passage width between the open door of the inverter and the next fixed obstacle must be maintained. The minimum passage width must comply with national standards.

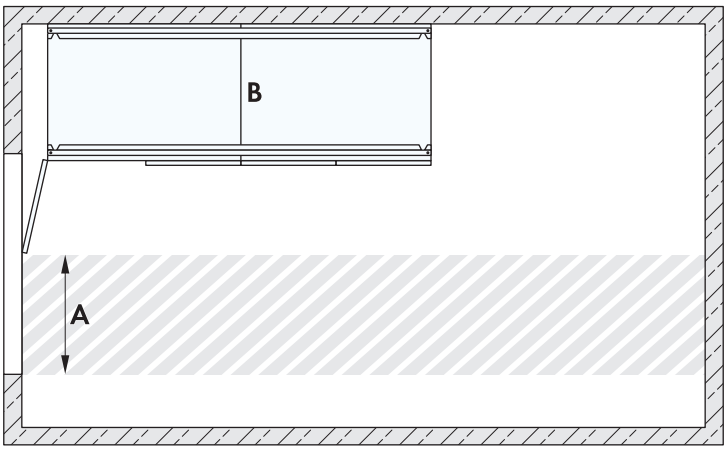


Figure 47: Minimum clearances for one inverter in an electrical equipment room

Position	Designation
A	Minimum passage width
B	Inverter

Minimum clearances for two inverters to be installed in electrical equipment rooms

⚠ 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.

The minimum passage width between the open door of the inverter and the next fixed obstacle must be maintained. The minimum passage width must comply with national standards.

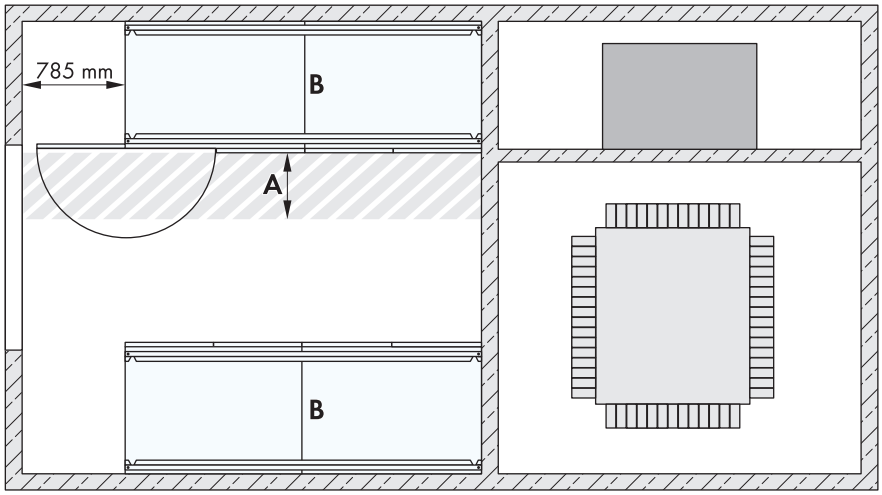


Figure 48: Minimum clearances for two inverters in an electrical equipment room

Position	Designation
A	Minimum passage width
B	Inverter

12.2 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.

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.

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.

12.3 XML File custom.xml

12.3.1 Structure of the XML File custom.xml

You can upload your personal system and network settings via the XML file **custom.xml**. The communication unit checks the file to ensure that the values entered are valid and accurate, and adopts the settings upon the next reset of the communication unit.

Elements of the XML file	Explanation
<?xml version="1.0" encoding="utf-8" standalone="yes"?>	Required element of the XML file.
<WebBox xmlns:msdata="urn:schemas-microsoft-com:xml-ms-data" xmlns:xsi="http://www.w3.org/2001/ XMLSchema-instance" xsi:noNamespaceSchemaLocation="config_100.xsd">	Required element of the XML file. Terminated with the tag at the end of the XML file.
<Info> <Version>**my config V1.01**</Version> </Info>	Required element of the XML file. You must enter the name and the version for your settings between the version tags. This information is displayed in the header of the user interface.

Elements of the XML file	Explanation
<Config> <Key>**NetworkSettings_DhcpUsage1**</Key> <Value>**False**</Value> </Config>	Here, you can set the parameters and their corresponding values (see Section 12.3.2, page 152).
<Loader> <Settings> <PowerFail>**2500**</PowerFail> </Settings> </Loader>	Here, you can set the time period in ms which must expire before the communication unit will shut down after the UPS of the inverter has signaled a failure of the supply voltage to the communication unit. The value must be greater than or equal to 2,500. This setting is immediately adopted once the file is uploaded.

Example: XML file for setting the Czech language on the user interface

<?xml version="1.0" encoding="utf-8" standalone="yes"?>

<WebBox xmlns:msdata="urn:schemas-microsoft-com:xml-msdata" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="config_100.xsd">

<Info>

<Version>**my config V1.01**</Version>

</Info>

<Config>

<Key>**NativeSettings_Language**</Key>

<Value>**cs**</Value>

</Config>

</WebBox>

12.3.2 Parameters and Values for the File custom.xml

Parameter	Explanation	Values	Default values
NetworkSettings_DhcpUsage1	Activates DHCP for LAN2. With the **True** value, all other settings of the IP addresses for LAN2 will be ignored.	True	False
		False	
NetworkSettings_DnsIpAddr1	Sets the first IPv4 address of the DNS server for LAN2	–	–
		0.0.0.0	
		A valid IPv4 address	
NetworkSettings_Dns2IpAddr1	Sets the second IPv4 address of the DNS server for LAN2	–	0.0.0.0
		0.0.0.0	
		A valid IPv4 address	
NetworkSettings_Gateway1	Sets the gateway address for LAN2	0.0.0.0	0.0.0.0

Parameter	Explanation	Values	Default values
NetworkSettings_IpAddr1	Sets the IPv4 address for LAN2	A valid IPv4 address	172.24.1.51
NetworkSettings_SubnetMask1	Sets the subnet mask for LAN2	255.255.0.0	255.255.0.0
NetworkSettings_DhcpUsage2	Activates DHCP for LAN3. With the **True** value, all other settings of the IP addresses for LAN3 will be ignored.	True	False
		False	
NetworkSettings_DnsIpAddr2	Sets the first IPv4 address of the DNS server for LAN3	–	–
		0.0.0.0	
		A valid IPv4 address	
NetworkSettings_Dns2IpAddr2	Sets the second IPv4 address of the DNS server for LAN3	–	0.0.0.0
		0.0.0.0	
		A valid IPv4 address	
NetworkSettings_Gateway2	Sets the gateway address for LAN3	0.0.0.0	0.0.0.0
NetworkSettings_IpAddr2	Sets the IPv4 address for LAN3	A valid IPv4 address	172.16.1.51
NetworkSettings_SubnetMask2	Sets the subnet mask for LAN3	255.255.0.0	255.255.0.0
NetworkSettings_ModbusPort	Sets the Modbus port. Do not use the following ports: 21 / 23 / 8081 / 30100	–	502
NetworkSettings_ModbusUsage	Activates use of the Modbus protocol	True	True
		False	
NetworkSettings_WebserverPort	Sets port of the web server. Do not use the following ports: 21 / 23 / 502 / 8081 / 30100	–	80

Parameter	Explanation	Values	Default values
NativeSettings_Language	Sets the language of the user interface:		en
	English	en	
	Czech	cs	
	German	de	
	Greek	el	
	Spanish	es	
	French	fr	
	Italian	it	
	Korean	ko	
	Dutch	nl	
	Portuguese	pt	
Security_InstallerPassword	Sets the installer password	–	sma

13 Contact

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

- Device type
- Serial number
- Type and number of PV modules connected
- Type of communication
- Error number and error message

Australia	SMA Australia Pty Ltd. Sydney Toll free for Australia: 1800 SMA AUS (1800 762 287) International: +61 2 9491 4200	Belgien Belgique België Luxemburg Luxembourg Nederland	SMA Benelux BVBA/SPRL Mechelen +32 15 286 730
Argentina Brasil Chile Perú	SMA South America SPA Santiago +562 2820 2101	Česko Magyarország Polska România Slovensko	SMA Central & Eastern Europe s.r.o. Praha +420 235 010 417
Danmark Deutschland Österreich Schweiz	SMA Solar Technology AG Niestetal SMA Online Service Center: www.SMA.de/Service Sunny Boy, Sunny Mini Central, Sunny Tripower: +49 561 9522-1499 Monitoring Systems (Kommunikationsprodukte): +49 561 9522-2499 Fuel Save Controller (PV-Diesel-Hybridsysteme): +49 561 9522-3199 Sunny Island, Sunny Backup, Hydro Boy: +49 561 9522-399 Sunny Central: +49 561 9522-299	France	SMA France S.A.S. Lyon +33 472 22 97 00
España Portugal	SMA Ibérica Tecnología Solar, S.L.U. Barcelona +34 935 63 50 99	India	SMA Solar India Pvt. Ltd. Mumbai +91 22 61713888
South Africa	SMA Solar Technology South Africa Pty Ltd. Cape Town 08600SUNNY (78669) International: +27 (0)21 826 0600	Ελλάδα Κύπρος	SMA Hellas AE Αθήνα +30 210 9856666

Italia	SMA Italia S.r.l. Milano +39 02 8934-7299	United Kingdom	SMA Solar UK Ltd. Milton Keynes +44 1908 304899
ไทย	SMA Solar (Thailand) Co., Ltd. กรุงเทพฯ +66 2 670 6999	대한민국	SMA Technology Korea Co., Ltd. 서울 +82-2-520-2666
United Arab Emirates	SMA Middle East LLC Abu Dhabi +971 2 234-6177	Other countries	International SMA Service Line Niestetal Toll free worldwide: 00800 SMA SERVICE (+800 762 7378423)

14 Revision History

In this section, you will find an overview of the content changes in the new version of this document.

Removed operating data and parameters

- CntFanTrf1, CntFanTrf2
- Ofs_CntFanTrf1, Ofs_CntFanTrf1

New operating data and parameters

- FeedInStt ▸ 120
- IsoMod ▸ 139

New device class

- Sunny Central 1000CP XT ▸ 9, 11, 117

New error messages

- 3520 ▸ 70
- 6486, 6487, 6512 ▸ 72

Revised warning message

- Risk of burns due to hot components ▸ 12, 34, 51

Revised content

- Unlocking of the touch display ▸ 19

Revised functions

- Switch-off function at low temperatures▸ 90

Revised contact details

- Revised contact details ▸ 155

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