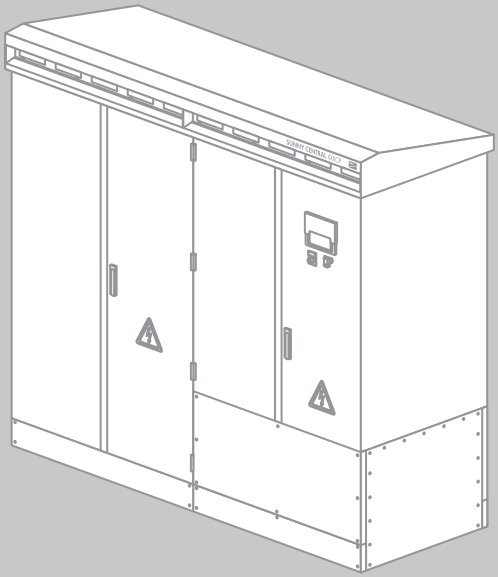
Central Inverter

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

Operating Manual



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1 Information on this Manual

Validity

This manual is valid for the following device types with OCU firmware version 01.18.25.R and DSP firmware version 01.18.43.R or higher:

- SC-500CP-JP
- SC-500CP XT
- SC-630CP XT
- SC-720CP XT
- SC-760CP XT
- SC-800CP XT
- SC-850CP XT
- SC-900CP XT

Target Group

This manual is intended for qualified persons. Only qualified personnel with the appropriate skills are allowed to perform the tasks set forth in this manual (see Section 2.3 "Skills of Qualified Person", page 17).

Additional Information

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

Information	Document type
Installation Requirements - Important information on transportation and installation of Sunny Centrals 500CP-JP/500CP XT/ 630CP XT/720CP XT/760CP XT/800CP XT/850CP XT/ 900CP XT	Technical information
Medium-Voltage Transformers - Important requirements for medium-voltage transformers for Sunny Central of the HE and CP production series	Technical information
Optiprotect - Optimising Yields Through Automatic Error Detection	Technical information
COM-B - Communication Distributor for Large-scale PV Plants with Sunny Central, Sunny Mini Central or Sunny Tripower	Technical information
Communit - Communication Distributor for Large-scale PV Plants	Technical information
Sunny Main Box - Connecting the DC Cabling for PV Inverters	Technical information
Product Details - Features and Mounting Options for SMA String-Combiner	Technical information

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, could result in death or serious injury
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury
NOTICE	Indicates a situation which, if not avoided, could result in property damage
i	Information that is important for a specific topic or goal, but is not safety-relevant
☐	Indicates an essential requirement for achieving a specific goal
☑	Desired result
✖	A problem that might occur

Typographies

Typography	Usage	Example
Bold	• Display messages • Elements of a user interface • Parameters • Connections • Slots • Elements to be selected • Elements to be entered	• Select the **ExlTrfErrEna** parameter and set to **Off.** • Select the **Parameters** tab.
>	• Connects several elements that are to be selected	• Select **Plant > Detect**.
[**Button/Key**]	• Button or key to be selected or pressed	• Select [**Start detection**].

Nomenclature

In this manual, the Sunny Central of the CP XT production series is also referred to as Sunny Central or inverter.

In this manual, the Sunny Central Communication Controller is also referred to as SC-COM.

Abbreviations

Abbreviation	Designation	Explanation
AC	Alternating Current	–
DC	Direct Current	–
EC	European Community	–
FRT	Fault Ride-Through	Dynamic grid support
GFDI	Ground-Fault Detection Interruption	–
IP	Internet Protocol	–
LED	Light-Emitting Diode	–
LVRT	Low-Voltage Ride-Through	Limited dynamic grid support
MPP	Maximum Power Point	–
MSL	Mean Sea Level	–
OF	Optical Fibre	–
PC	Personal Computer	–
PE	Protective Earth	Protective conductor
PV	Photovoltaics	–

2 Safety

2.1 Intended Use

The Sunny Central is a central inverter that converts the direct current from PV modules into alternating current. Note that the maximum permissible DC input voltage must not be exceeded.

The Sunny Central is suitable for outdoor installation provided that the specified safety distances are maintained. The Sunny Central for station installation is suitable exclusively for indoor installation provided that the specified safety distances are maintained. The enclosure conforms with degree of protection IP54. IP54 means that when the inverter is closed it is protected against splash water from all angles and against interior dust deposits. The inverter is classified under Class 4C2 according to EN 60721-3-4 and is suitable for operation in a chemically active environment.

Inverters of the CP production series may only be operated in conjunction with a suitable transformer. The transformer must be designed for the voltages that arise during pulsed mode of the inverter. The voltages can reach a magnitude of maximum ±1,600 V to earth (see the Technical Information "Medium-voltage Transformers" at www.SMA-Solar.com).

Only use the Sunny Central in accordance with the information provided in the enclosed documentation. Any other application may cause personal injury or property damage.

The enclosed documentation is an integral part of this product. Read and follow the documentation in order to ensure proper and optimum use of the Sunny Central. Safely store the documentation in a convenient place for future reference.

Do not disconnect or adjust settings that affect grid management without first obtaining approval from the network operator.

2.2 Safety Precautions

Electric Shock

Risk of electric shock when touching live components

High voltages that can cause electric shocks are present in the conductive components of the inverter. Work on the inverter is only permitted after the power has been switched off and in compliance with the standards and guidelines applicable at the installation location.

- Disconnect the following components:
  - Line voltage for the feed-in
  - Internal power supply
  - DC voltage from the PV array
  - Additional external voltages, e.g. control signals of a control room
- Ensure that the device cannot be reconnected.
- Ensure that no voltage is present.
- Earth and short-circuit.
- Cover or safeguard any adjacent live components.

Hazardous voltages may still be present in the inverter even if the AC and DC main switches are switched off.

- Wait at least 15 minutes after switching off the inverter. This ensures that the capacitors are electrically discharged.

Using a damaged inverter can lead to death or serious injuries through electric shock.

- Only operate the inverter if it is in safe and technically faultless working order.
- Check the inverter regularly for visible damage.
- Ensure that all safety equipment is freely accessible at all times.
- Regularly check that the inverter is in perfect working order.

In the event of a earth fault, assume that earthed plant components are still live.

- Before touching any part of the plant, ensure that no voltage is present.

The insulation monitoring device with GFDI or remote GFDI does not provide protection from injury when GFDI is activated. PV modules that are earthed by GFDI discharge voltage to earth. Entering the PV field can lead to lethal electric shocks.

- Before entering the PV field, switch the PV modules to insulated operation.
- Ensure that the insulation resistance of the PV field is greater than 1 k Ω .

Failure to follow this manual, general instructions, safety precautions and safety messages may lead to severe injury due to electric shock.

- Only perform work as described in this manual. Follow all safety precautions and safety messages.
- Establish all electrical connections in accordance with the circuit diagram.

By touching electronic components, you can cause damage to or destroy the inverter through electrostatic discharge (ESD).

- When working on the inverter or handling assemblies, observe the ESD safety regulations and wear protective gloves.
- Discharge the electrostatic charge by touching uncoated, earthed enclosure parts (e.g. at the PE connection on the doors). This means that you are earthed and it is safe to touch any electronic component parts.

Burn Hazards

Some components, such as fuses, can become hot during operation.

- Wear safety gloves when working on the inverter.

Inverter Damage

Tampering may result in damage to the plant.

- Do not operate the inverter while the door is open.

If the key remains in the door lock, the inverter can be opened by unauthorised persons.

- Remove the keys from the door locks and from the key switch.
- Keep the keys in a safe place.

Penetrating moisture can damage the inverter.

- Do not open the inverter when it is raining or the humidity is greater than 95%.

Danger due to Blocked Escape Route

Opening the doors of 2 inverters located opposite each other blocks the escape route. The escape route must be clear at all times. The minimum passage width must comply with local standards. In Germany, the minimum passage width is 500 mm.

- Only the doors of one inverter may be open at any given time.

2.3 Skills of Qualified Person

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

- Knowledge of how an inverter works and is operated
- Training in how to deal with the dangers and risks involved in installing and operating electrical devices and plants
- Training in the installation and commissioning of electrical devices and plants
- Knowledge of all applicable standards and guidelines
- Knowledge of and adherence to this manual and all the specified safety precautions

3 Product Description

3.1 Plant Overview

The inverter converts the direct current generated in the PV modules into grid-compliant alternating current. An external transformer fitted downstream feeds the alternating current generated into the electricity grid.

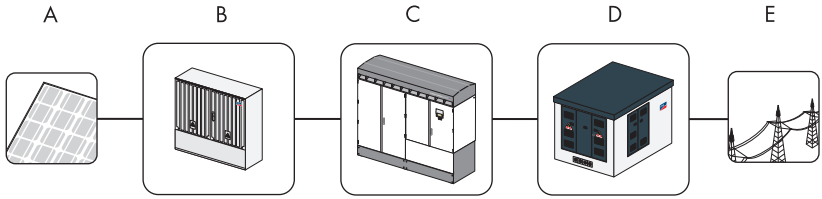


Figure 1: Principle of a grid-tied PV plant with an inverter

Position	Description
A	PV array
B	DC sub-distribution box (e.g. Sunny String-Monitor)
C	Sunny Central
D	External transformer (e.g. Transformer Compact Station)
E	Electricity grid

3.2 Sunny Central

3.2.1 Design and Function of the Sunny Central

The Sunny Central is a PV inverter that converts the direct current from the PV array into grid-compliant alternating current.

The Sunny Central is controlled via the Sunny Central Communication Controller. The grid management instructions from the grid operator can be transferred via a Power Reducer Box or Power Plant Controller.

Depending on which option is ordered, the Sunny Central is equipped with either a touch display or indicator lights.

Sunny Central with Touch Display

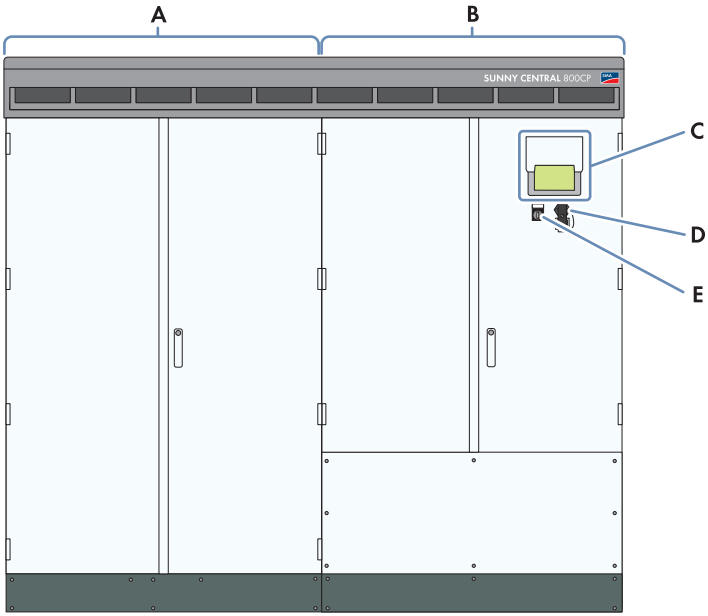


Figure 2: Sunny Central with touch display (example)

Position	Description
A	Inverter cabinet
B	Interface cabinet
C	Touch display
D	Key switch
E	Service interface

Sunny Central with Indicator Lights

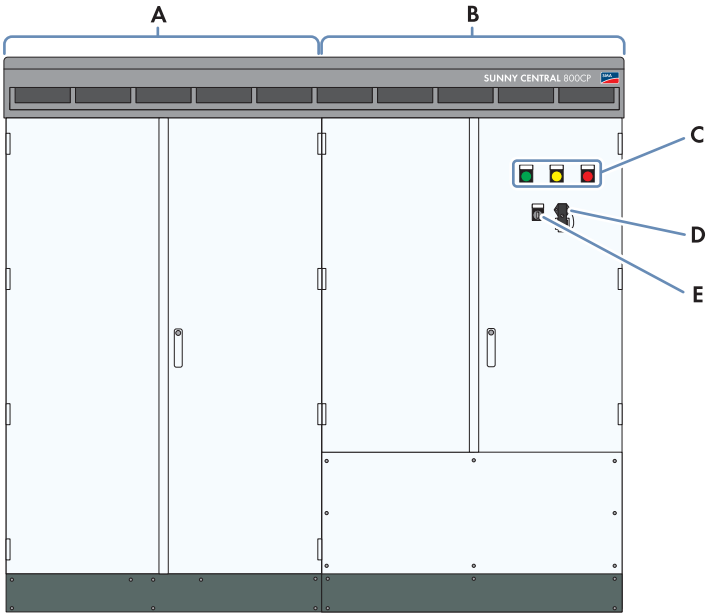


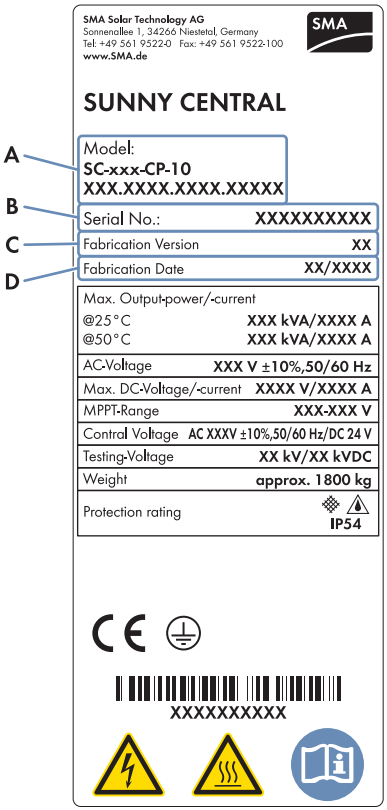
Figure 3: Sunny Central with indicator lights (example)

Position	Description
A	Inverter cabinet
B	Interface cabinet
C	Indicator lights
D	Service interface
E	Key switch

3.2.2 Type Label

You can identify the inverter by the type label. Type labels can be found in the inverter cabinet to the left of the air duct and in the interface cabinet on the left side of the enclosure.

Position	Description
A	Type designation of the Sunny Central
B	Serial number of the Sunny Central
C	Fabrication version
D	Fabrication date



Reading off the serial number

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

Reading off the firmware version

You can read off the firmware version from the inverter and the display via the SC-COM user interface or from the display.

Symbols on the Type Label

You will find explanations of all the symbols found on the Sunny Central and the type label below.

Symbol	Description	Explanation
	CE marking	The Sunny Central complies with all relevant EU directives.
	Protection class I	All electric equipment is connected to the protective conductor system of the Sunny Central.
	Degree of protection IP54	The Sunny Central is protected against interior dust deposits and against splash water from all angles.
	Beware of hazardous voltage	The inverter operates at high voltages. All work on the inverter must be carried out by qualified persons only.
	Beware of hot surface.	The inverter can heat up during operation. Avoid touching the inverter during operation. Allow the inverter to cool down sufficiently before carrying out any work. When carrying out any work on the inverter, always wear your personal protective equipment.
	Observe the documentation	Observe all documentation that is supplied with the inverter.

3.2.3 Sunny Central Operating States

The inverter cycles through various states during operation:

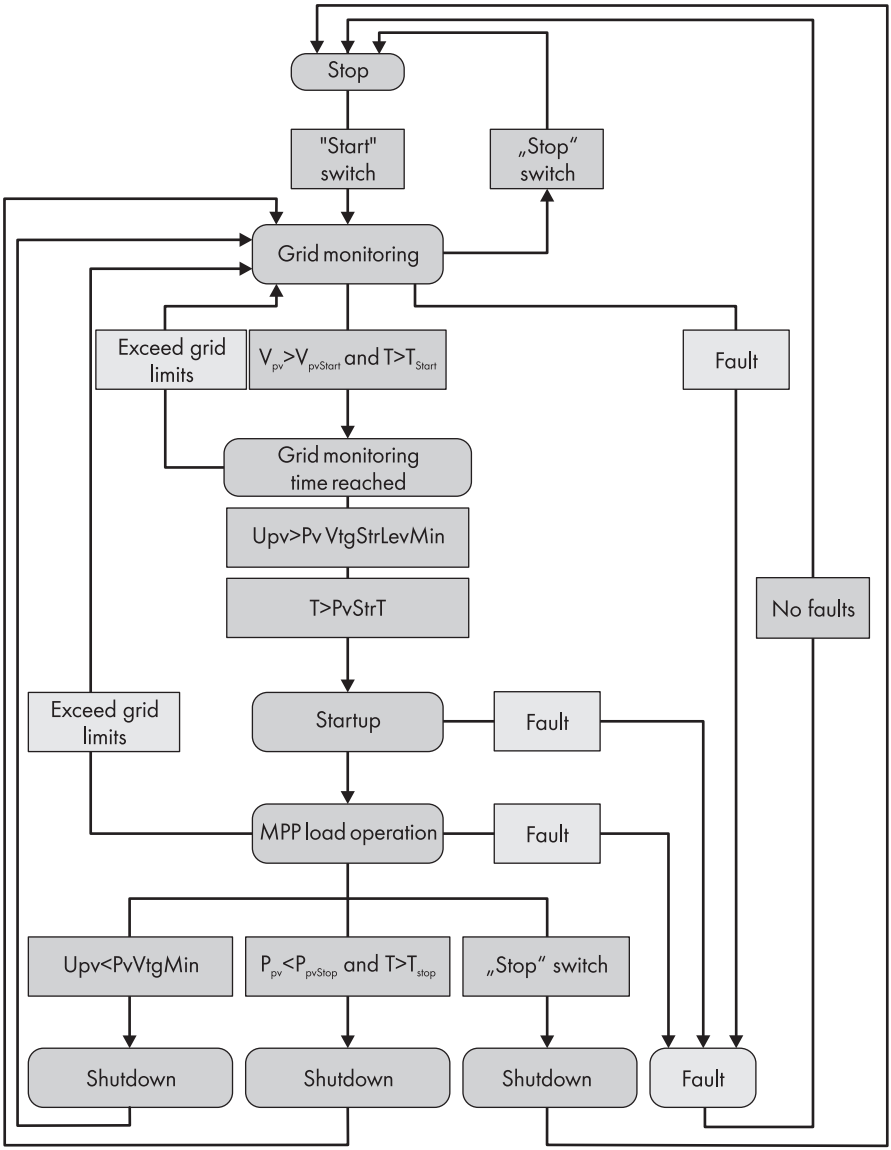


Figure 4: Principle overview of the operating states of the Sunny Central

Stop

The Sunny Central is switched off. **Stop**, **Quick stop** or **Remote control disconnection active** appears on the display.

If the key switch is set to **Start**, the Sunny Central switches to the "Grid monitoring" operating state.

Grid monitoring

The Sunny Central is in the "Grid monitoring" operating state. **Waiting for valid AC grid** appears on the display.

The grid limits will now be monitored continuously. If a grid fault does not occur during the grid monitoring time, the AC contactor closes and the Sunny Central switches to the "Grid monitoring time reached" operating state.

If the grid limits are exceeded during the monitoring time, the Sunny Central will restart "Grid monitoring".

Grid monitoring time reached

The Sunny Central is in the "Grid monitoring time reached" operating state. **Waiting for PV voltage** or **Waiting for utilities company** appears on the display.

If the input voltage V_{PV} exceeds the start voltage **PvVtgStrLevMin**, the Sunny Central waits until the time specified in the **PvStrT** parameter elapses. If the input voltage V_{PV} does not fall below the start voltage **PvVtgStrLevMin** during this time, the Sunny Central checks whether the AC grid is connected. If a valid AC grid is connected, the Sunny Central switches to the "Startup" operating state.

The start voltage **PvVtgStrLevMin** must be adjusted to conform with the PV array connected to the Sunny Central.

Startup

The Sunny Central is in the "Startup" operating state. **Operation** appears on the display.

The Sunny Central moves to its initial operating point and begins feed-in.

MPP load operation

In the MPP operating state, the Sunny Central feeds power into the electricity grid and operates permanently at the Maximum Power Point (MPP). **Operation** and the rate of fed-in power appears on the display.

If the measured power P_{PV} during the time interval **PvPwrMinT** is less than the minimum feed-in voltage **PvPwrMin** or the key switch is set to **Stop**, the Sunny Central switches to the "Shutdown" operating state.

Shutdown

The Sunny Central is in the "Shutdown" operating state. **Operation** appears on the display.

If the key switch is set to **Stop**, the Sunny Central switches to the "Stop" operating state. The AC contactor and the DC contactor open automatically.

If the Sunny Central shuts down because the feed-in conditions are no longer met, the Sunny Central switches to the "Grid monitoring" operating state.

Disturbance

If a disturbance occurs during operation, the Sunny Central switches off and displays **Fault** and the disturbance on the display (see Section 11 "Errors and Warnings", page 92)

3.2.4 Touch Display

Depending on the option ordered, the Sunny Central may be equipped with a touch display.

Different kinds of inverter data can be viewed on the touch display. The touch display is fitted with a cover for protection against weather influences. This cover can be pushed up so that the display can be read.

The touch display is only used as a means for viewing data. If the touch display is not touched for 5 minutes it will shut off. Touching the touch display will activate the display.

3.2.5 Indicator Lights

Depending on the option ordered, the Sunny Central may be equipped with 3 indicator lights.

The indicator lights show the current status of the inverter. If the indicator lights display a warning or a fault, you can call up the message via the SC-COM user interface (see Section 11.1.2 "Viewing Errors and Warnings via the SC-COM User Interface", page 92).

The functions assigned to each status are described below.

Status			Description	Function
		Green indicator light is permanently on	Feed-in operation	The Sunny Central is feeding into the power distribution grid.
		Yellow and green indicator lights are permanently on	Limited operation	The Sunny Central has detected a warning. The warning does not currently affect the operation of the Sunny Central.
		Yellow indicator light is permanently on	Warning	The Sunny Central is not currently feeding in and has detected a warning. The warning will be reset automatically as soon as it is no longer present. This status appears, for instance, when the level of irradiation is low.
		Red indicator light is permanently on	Disturbance	The Sunny Central has detected a disturbance and has switched off.

Status			Description	Function
		All indicator lights are off	No feed-in operation	The key-switch is set to the **Stop** position, the Sunny Central is not feeding in, the Sunny Central is in night operation or is not connected to the supply voltage.

3.2.6 Key Switch

The key switch is used to switch the Sunny Central on and off.

Start switch position

After turning the key switch to the **Start** position, a motor drive switches the DC main switch on and the Sunny Central switches from the "Stop" to the "Grid monitoring" operating state. If there is sufficient irradiation and a valid electricity grid connection, the Sunny Central switches to feed-in operation. If there is insufficient irradiation and the input voltage is therefore too low, the Sunny Central remains in the "Grid monitoring" operating state.

Stop switch position

If the key switch is turned to **Stop** while the Sunny Central is in the "Grid monitoring" operating state, a motor drive automatically switches off the DC main switch. The Sunny Central switches to the "Stop" operating state.

If the key switch is turned to **Stop** while the Sunny Central is in the "MPP load operation" operating state, the Sunny Central switches to the "Shutdown" operating state. Once the shutdown is complete, the AC contactor and the DC main switch are switched off automatically and the Sunny Central switches to the "Stop" operating state.

3.3 Sunny Central Communication Controller

The Sunny Central Communication Controller (SC-COM) is the central communication interface of the inverter. The SC-COM establishes the connection between the inverter and the operator.

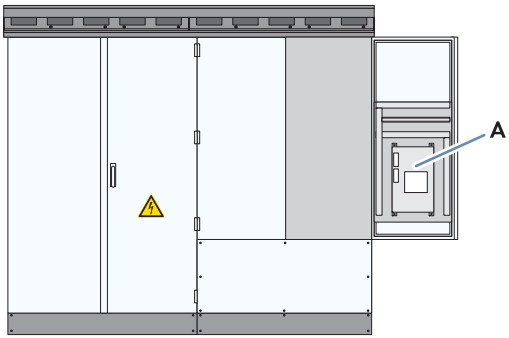


Figure 5: SC-COM

Position	Description
A	SC-COM

The SC-COM collects all data from the connected devices. The SC-COM enables monitoring, the setting of parameters and and remote diagnosis of the inverter via computer, as well as power control by the network operator.

The various tasks performed by the SC-COM can be organised into two separate networks:

- Monitoring network: for performing monitoring, parameterisation and remote diagnosis.
- Control network: enables the Power Reducer Box or Power Plant Controller to transmit grid management instructions from the network operator 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 bandwidth is required for monitoring, the network operator instructions can also be transmitted via the monitoring network. In this case, only one network is necessary.

The operator can access all data stored in the SC-COM via an Ethernet connection.

You can set the parameters of the inverter via the SC-COM.

The networks can be set up using copper cables or optical fibres.

3.4 Sunny Central String-Monitor Controller

Depending on the option ordered, the Sunny Central may be equipped with a Sunny Central String-Monitor Controller for string current monitoring. This Sunny Central String-Monitor Controller allows communication between the Sunny String-Monitors and the Sunny Central.

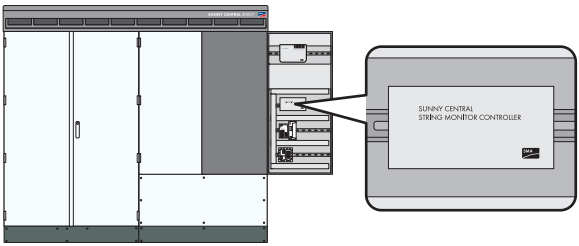


Figure 6: Sunny Central String-Monitor Controller

The Sunny String-Monitors measure the string currents via an integrated measuring circuit board and continuously calculate the average values of the string currents. The measuring circuit board compares the string currents measured with the average values. If a string current exceeds or falls short of the specified tolerance for the average value, a warning or disturbance is generated and displayed via the indicator lights or on the touch display and on the SC-COM user interface.

3.5 Remote Shutdown

By means of the remote shutdown, you can shut down and turn off the Sunny Central selectively within approximately 6 s, from a control room, for example. The function of the remote shutdown unit is similar to the the stop function of the key switch.

If the remote shutdown unit is activated from the control room while the Sunny Central is in the "Grid monitoring" operating state, a motor drive automatically shuts off the main DC switch and the Sunny Central switches to the operating state "Stop".

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

The design of the remote shutdown unit is wire-break safe. If 24 V is present in the remote shutdown unit, the inverter continues to operate in the current operating state. If the remote shutdown unit is triggered 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 "Stop" operating state.

In order to be able to use the remote shutdown unit, the parameter **ExlStrStpEna** must be set to **On**.

3.6 External Quick Stop

The inverter comes equipped with a quick stop input. An external switch that is switched via a 24 V signal can be connected to this quick stop input.

The external quick stop function disconnects the inverter from the electricity grid in under 100 ms.

Options for configuring the external quick stop:

- External quick stop is deactivated

  The terminals of the active quick stop are bridged. The quick stop function is thereby deactivated. You will need to bridge the terminals as necessary.

- External quick stop is operated with internal 24 V supply

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

- External quick stop is operated with an external 24 V supply

  An external latching switch (break contact) is connected to the inverter terminals via an external 24-V voltage supply. When the switch is closed, the switching relay is activated and the inverter feeds into the grid. If the quick stop function is triggered, the switch opens and the relay is deactivated. The inverter is stopped and no longer feeds into the grid.

The inverter is supplied with open terminals and must be connected for the desired function.

Triggering the quick stop function

The quick stop function should only be triggered in the event of immediate danger. Triggering the quick stop will not rapidly discharge the capacitors. If the inverter is to be switched off and correctly shut down via an external signal, the remote control input should be used.

3.7 Insulation Monitoring

3.7.1 How Insulation Monitoring Works

Insulation monitoring is a mechanism for ensuring plant protection in electrical devices. There are different types of insulation monitoring:

- **In earthed PV arrays** the insulation monitoring device can be implemented by means of a residual current monitoring device. If an insulation error occurs, the residual currents will be detected and interrupted.
  - **Earth fault on unearthed pole** If an earth fault occurs on the unearthed pole of the PV array, the normally unearthed pole of the PV array is earthed non-specifically by the earth fault and a residual current flows to the earthed pole. In doing so, the residual current flows through the GFDI and triggers the GFDI.
  - **Earth fault on earthed pole** The GFDI is bypassed when an earth fault occurs on the earthed pole of the PV array. The earth fault on the earthed pole cannot be reliably detected. An earth fault that occurs undetected on the earthed pole poses a safety risk. An additional earth fault on the unearthed pole leads to higher residual currents that cannot be interrupted by the GFDI.

  Note:

  In order to ensure the residual-current monitoring function in earthed systems, the PV array insulation must be checked at regular intervals. We therefore recommend using an additional insulation monitoring device in earthed systems. This will allow the insulation to be checked at regular intervals.
- **In unearthed 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 appears via the indicator lights or on the touch display. This allows measures to be taken to prevent errors before faults occur such as risk of injury to personnel due to leakage current or plant failure. If the insulation resistance falls below the specified warning threshold, the plant can switch itself off. The **IsoErrIgn** parameter can be used to activate or deactivate the shutdown process when a fault occurs.

3.7.2 Ground Fault Detection Interruption (GFDI)

Depending on the order, ground fault monitoring in the Sunny Central is carried out via ground fault detection interruption (GFDI). This process is used to earth one pole of the PV array.

Insulation monitoring via GFDI is not possible with the "Optiprotect" option.

GFDI is performed via a high-performance k-type miniature circuit-breaker with adjustable operating current. The GFDI is integrated in the inverter and connected between an input busbar and the protective conductor bar.

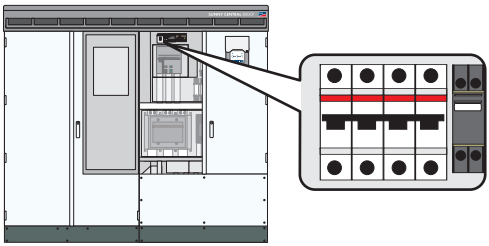


Figure 7: GFDI in the Sunny Central

Earth fault on the unearthed pole

If an earth fault occurs on the unearthed pole of the PV array, the normally unearthed pole of the PV array is earthed non-specifically by the earth fault and a residual current flows to the earthed pole. In doing so, the residual current flows through the GFDI and triggers the GFDI. As a result the residual current is interrupted.

If the GFDI triggers, the inverter is switched off and the insulation fault must be corrected.

Earth fault on the earthed pole

The GFDI is bypassed when an earth fault occurs on the earthed pole of the PV array. The earth fault on the earthed pole cannot be reliably detected. An earth fault that occurs undetected on the earthed pole poses a safety risk. An additional earth fault on the unearthed pole leads to higher residual currents that cannot be interrupted by the GFDI.

3.7.3 Remote GFDI

Depending on the order, earth fault monitoring in the Sunny Central is carried out via Ground Fault Detection Interruption with motor drive, or remote GFDI for short. This process is used to earth one pole of the PV array. Remote GFDI also enables automatic error processing. This reduces downtimes and avoids service calls due to temporary insulation faults such as condensation on the PV modules.

Remote GFDI is performed via a high-performance k-type miniature circuit-breaker with adjustable operating current. The remote GFDI is integrated in the inverter and connected between an input busbar and the protective conductor bar.

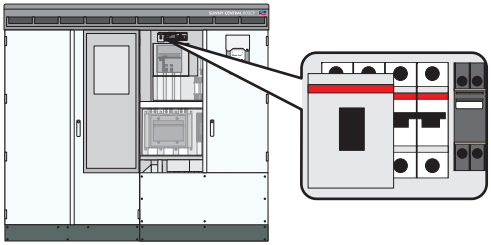


Figure 8: Remote GFDI in the Sunny Central

If the remote GFDI is triggered, a temporary fault is assumed and a motor will close the remote GFDI after a defined period. The triggered remote GFDI can be closed without an external starting command. The inverter can switch back to feed-in operation after a defined period.

In the default setting, the Sunny Central software will attempt to start the remote GFDI up to 3 times per day.

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

3.7.4 Soft Grounding

Depending on the order, the Sunny Central can also monitor for earth faults via soft grounding. This process earths one pole of the PV array through a resistor.

Insulation monitoring via soft grounding is not possible with the "Optiprotect" option.

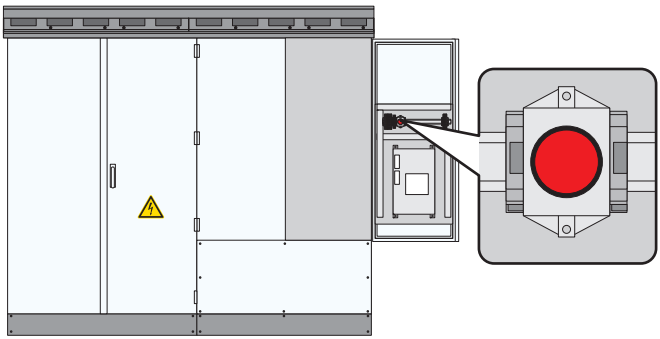


Figure 9: Soft Grounding in the Sunny Central

If an earth fault occurs on the unearthed pole of the PV array, a residual current will occur through the soft grounding resistor. The residual current increases the voltage of the earthed pole to PE. Thus with soft grounding the insulation can be monitored by measuring the voltage between the earthed pole and PE. "VPV+ to PE" is used to determine the DC voltage when the positive pole is earthed or "VPV– to PE" when the negative pole is earthed.

If the measured voltage exceeds a threshold, the earthing of the PV field is overridden and the residual current is interrupted. This threshold can be adjusted.

If a soft grounding fault occurs, the inverter will stop operating. A qualified person is required to check and, if necessary, repair the insulation and reactivate the Sunny Central via the reset button.

It is not possible to detect an insulation fault on the earthed pole.

3.7.5 Remote Soft Grounding

Depending on the order, the Sunny Central can also monitor for earth faults via soft grounding with a high-voltage relay. This process earths one pole of the PV array through a resistor. Remote soft grounding also enables automatic error processing. This reduces downtimes and avoids service calls due to temporary insulation faults such as condensation on the PV modules.

Insulation monitoring via remote soft grounding is not possible with the "Optiprotect" option.

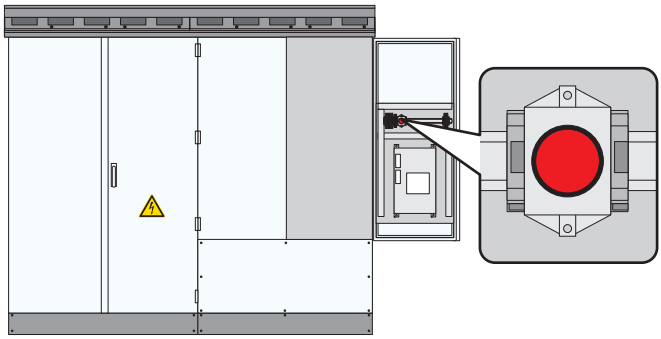


Figure 10: Remote Soft Grounding in the Sunny Central

If an earth fault occurs on the unearthed pole of the PV array, a residual current current will occur through the soft grounding resistor. The residual current increases the voltage of the earthed pole to PE. Thus with remote soft grounding the insulation can be monitored by measuring the voltage between the earthed pole and PE. "VPV+ to PE" is used to determine the DC voltage when the positive pole is earthed or "VPV– to PE" when the negative pole is earthed.

If the measured voltage exceeds a threshold, the earthing of the PV field is overridden and the residual current is interrupted. This threshold can be adjusted.

If the remote soft grounding is triggered, a temporary fault is assumed and the remote soft grounding is closed again by a relay after a defined period. The triggered remote remote soft grounding can be closed without an external starting command. The inverter can switch back to feed-in operation after a defined period.

In the default setting, the Sunny Central software will attempt to start the remote soft grounding up to 3 times per day.

If the remote soft grounding is triggered on consecutive days, the software assumes a permanent insulation fault and the inverter will not switch back on. In this case a qualified person needs to check and, if necessary, repair the insulation and then acknowledge the error.

It is not possible to detect an insulation fault on the earthed pole.

3.7.6 Insulation Monitoring Device

Depending on the order, an insulation monitoring device monitors the insulation resistance of the PV plant in unearthed PV arrays.

In the "MPP load operation" operating state, the insulation resistance of the entire system, from the PV modules to the medium-voltage transformer, will be measured.

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

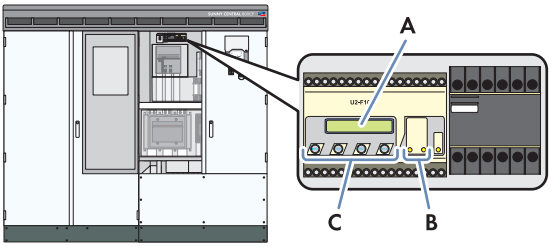


Figure 11: Insulation monitoring device in the Sunny Central

Object	Description
A	Display
B	LEDs
C	Control buttons

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 PE protective conductor. The contacts of the relay are routed on the customer terminal strip and can be used by the customer to control a signal light or siren. The characteristics of the relay are given in the circuit diagram.

If the insulation resistance falls below the specified warning threshold **ALARM2**, the measuring circuit closes and LED 2 on the insulation measuring device lights up. The error message **3601 – Warning insulation failure** appears. In parallel, the insulation monitoring device activates the relay with changeover contact. This relay is integrated in the inverter.

If an insulation fault occurs, the insulation resistance will fall below the **ALARM1** threshold. In this case the operating behaviour of the inverter can be set via parameters:

- If the parameter **IsoErrIgn** is set to **Off**, the measuring circuit issues a disturbance if the insulation resistance falls below the **ALARM1** threshold and the inverter switches off and issues the error message **3501 – Insulation failure**. The LED 1 lights up.
- If the parameter **IsoErrIgn** is set to **On**, the error message from the measuring circuit is ignored when the insulation resistance falls below the **ALARM1** 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**, the error message from the measuring circuit is only ignored in feed-in operation when the insulation resistance falls below the **ALARM1** threshold. In feed-in operation, the inverter continues to feed in and issues the error message **3504 – Insulation failure ignored**.
  If the insulation resistance falls below the **ALARM1** threshold in another operating state, the fault is not ignored and the inverter does not go into feed-in operation. The error message **3501 – Insulation failure** is displayed on the touch display. The LED 1 lights up.

Type of insulation monitoring device used

The insulation monitoring device used is the A-ISOMETER iso-PV3 with AGH-PV device supplied by Bender GmbH & Co. KG.

3.7.7 GFDI and Insulation Monitoring Device

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

Insulation monitoring with GFDI and an insulation monitoring device is not possible with the "Optiprotect" option.

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

If the GFDI is open, the earthing connection is disabled. In this state, the insulation monitoring device continuously measures the insulation resistance. In the "MPP load operation" operating state, the insulation resistance of the entire system, from the PV modules to the medium-voltage transformer, will be measured. If the inverter is in the "Grid monitoring" operating state, only the insulation resistance from the PV modules to the inverter will be measured.

Insulation monitoring should be performed in the "MPP load operation" operating state. This ensures that all plant parts are included in the insulation measurement.

The parameter for insulation monitoring allows you to configure how an error message in the insulation monitoring device will affect the operating behaviour of the Sunny Central:

- If the parameter **IsoErrIgn** is set to **Off**, the measuring circuit issues a disturbance if the insulation resistance falls below the **ALARM1** threshold and the inverter switches off and displays the error message **3501 – Insulation failure**. The LED1 lights up.
- If the parameter **IsoErrIgn** is set to **On**, the error message from the measuring circuit is ignored when the insulation resistance falls below the **ALARM1** 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**, the error message from the measuring circuit is only ignored in feed-in operation when the insulation resistance falls below the **ALARM1** threshold. In feed-in operation, the inverter continues to feed in and issues the error message **3504 – Insulation failure ignored**.
  If the insulation resistance falls below the **ALARM1** threshold in another operating state, the fault is not ignored and the inverter does not go into feed-in operation. The error message **3501 – Insulation failure** is displayed on the touch display. The LED 1 lights up

Insulation monitoring

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

After approximately 5 minutes the insulation monitoring device will have determined the correct insulation resistance and the value of the insulation resistance can be viewed on the insulation measuring device display. If the insulation is intact, the inverter switches back to the "MPP load operation" operating state. The error **3505 – Ground fault ignored** is displayed. This error indicates that the PV array is operating without an earthing connection. If the insulation monitoring process is complete, the GFDI should be closed again thus allowing the PV array to operate with an earthing connection.

If, after approximately 5 minutes, one of the errors **3501 – Insulation failure**, **3504 – Insulation failure ignored** or **3601 – Warning insulation failure** is displayed, then the insulation is defective. In this case a qualified person needs 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-PV3 with AGH-PV device supplied by Bender GmbH & Co. KG.

3.7.8 Remote GFDI and Insulation Monitoring Device

With the "Remote GFDI and Insulation Monitoring" order option it is possible to automatically correct faults occurring and to temporarily disable the earthing connection of the PV array and to check the insulation with the integrated insulation monitoring device.

When the remote GFDI is closed, the PV field is earthed. In this state, the insulation resistance cannot be determined. If the remote GFDI is triggered, a temporary fault is assumed and a motor will close the remote GFDI after a defined period. The triggered remote GFDI can be closed without an external starting command. The inverter can switch back to feed-in operation after a defined period.

In the default setting, the Sunny Central software will attempt to start the remote GFDI up to 3 times per day.

If the remote GFDI is triggered on consecutive days, the software assumes a permanent insulation fault and the inverter will no longer switch back on. In this case a qualified person needs to check and, if necessary, repair the insulation and then acknowledge the fault.

If the remote GFDI is open, the earthing connection is disabled. In this state, the insulation monitoring device continuously measures the insulation resistance. In the "MPP load operation" operating state, the insulation resistance of the entire system, from the PV modules to the medium-voltage transformer, will be measured. If the inverter is in the "Grid monitoring" operating state, only the insulation resistance from the PV modules to the inverter will be measured.

Insulation monitoring should be performed in the "MPP load operation" operating state. This ensures that all plant parts are included in the insulation measurement.

The parameter for insulation monitoring allows you to configure how an error message in the insulation monitoring device will affect the operating behaviour of the Sunny Central:

- If the parameter **IsoErrIgn** is set to **Off**, the measuring circuit issues a disturbance if the insulation resistance falls below the **ALARM1** threshold and the inverter switches off and displays the error message **3501 – Insulation failure**. The LED 1 lights up.
- If the parameter **IsoErrIgn** is set to **On**, the error message from the measuring circuit is ignored when the insulation resistance falls below the **ALARM1** 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**, the error message from the measuring circuit is only ignored in feed-in operation when the insulation resistance falls below the **ALARM1** threshold. In feed-in operation, the inverter continues to feed in and issues the error message **3504 – Insulation failure ignored**.
  If the insulation resistance falls below the **ALARM1** threshold in another operating state, the fault is not ignored and the inverter does not go into feed-in operation. The error message **3501 – Insulation failure** is displayed on the touch display. The LED 1 lights up

Insulation monitoring

To disable the earthing connection of the PV array, the **RemMntSvc** parameter must be set to **On**. This allows a motor to open the remote GFDI.

If the remote GFDI was opened by a motor via the **RemMntSvc** parameter, the insulation monitoring device will start measuring after the period defined by the **IsoMeasDly** parameter. This allows the insulation monitoring device to determine the insulation resistance without interrupting the feed-in operation. If an insulation fault occurs, it will only be considered at the end of the delay.

If the insulation is intact, the error **3505 – Ground fault ignored** appears. This error indicates that the PV array is operating without an earthing connection. If the insulation monitoring process is complete, the **RemMntSvc** parameter should be set to **Off** thus allowing the PV array to operate with an earthing connection.

If, after approximately 5 minutes, one of the errors **3501 – Insulation failure**, **3504 – Insulation failure ignored** or **3601 – Warning insulation failure** is displayed, then the insulation is defective. In this case a qualified person needs 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-PV3 with AGH-PV device supplied by Bender GmbH & Co. KG.

3.7.9 Remote Soft Grounding and Insulation Monitoring Device

With the "Remote Soft Grounding and Insulation Monitoring" order option, it is possible to automatically correct any faults that occur and to temporarily disable the earthing connection of the PV array and to check the insulation with the integrated insulation monitoring device.

Insulation monitoring with remote soft grounding and an insulation monitoring device is not possible with the "Optiprotect" option.

When the remote soft grounding is closed, the PV field is earthed. In this state, the insulation resistance cannot be determined. If the remote soft grounding is triggered, a temporary fault is assumed and the remote soft grounding is closed again by a relay after a defined period. The triggered remote remote soft grounding can be closed without an external starting command. The inverter can switch back to feed-in operation after a defined period.

In the default setting, the Sunny Central software will attempt to start the remote soft grounding up to 3 times per day.

If the remote soft grounding is triggered on consecutive days, the software assumes a permanent insulation fault and the inverter will no longer switch back on. In this case a qualified person needs to check and, if necessary, repair the insulation and then acknowledge the error.

If the remote soft grounding is open, the earthing connection is disabled. In this state, the insulation monitoring device continuously measures the insulation resistance. In the "MPP load operation" operating state, the insulation resistance of the entire system, from the PV modules to the medium-voltage transformer, will be measured. If the inverter is in the "Grid monitoring" operating state, only the insulation resistance from the PV modules to the inverter will be measured.

Insulation monitoring should be performed in the "MPP load operation" operating state. This ensures that all plant parts are included in the insulation measurement.

The parameter for insulation monitoring allows you to configure how an error message in the insulation monitoring device will affect the operating behaviour of the Sunny Central:

- If the parameter **IsoErrIgn** is set to **Off**, the measuring circuit issues a disturbance if the insulation resistance falls below the **ALARM1** threshold and the inverter switches off and displays the error message **3501 – Insulation failure**. The LED 1 lights up.
- If the parameter **IsoErrIgn** is set to **On**, the error message from the measuring circuit is ignored when the insulation resistance falls below the **ALARM1** 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**, the error message from the measuring circuit is only ignored in feed-in operation when the insulation resistance falls below the **ALARM1** threshold. In feed-in operation, the inverter continues to feed in and issues the error message **3504 – Insulation failure ignored**.
  If the insulation resistance falls below the **ALARM1** threshold in another operating state, the fault is not ignored and the inverter does not go into feed-in operation. The error message **3501 – Insulation failure** is displayed on the touch display. The LED 1 lights up

Insulation monitoring

To disable the earthing connection of the PV array, the **RemMntSvc** parameter must be set to **On**. The remote soft grounding is thereby opened via a high-voltage relay.

If the remote soft grounding was opened by a relay via the **RemMntSvc** parameter, the insulation monitoring device will start measuring after the period defined by the **IsoMeasDly** parameter. This allows the insulation monitoring device to determine the insulation resistance without interrupting the feed-in operation. If an insulation fault occurs, it will only be considered at the end of the delay.

If the insulation is intact, the error **3505 – Ground fault ignored** appears. This error indicates that the PV array is operating without an earthing connection. If the insulation monitoring process is complete, the **RemMntSvc** parameter should be set to **Off** thus allowing the PV array to operate with an earthing connection.

If, after approximately 5 minutes, one of the errors **3501 – Insulation failure**, **3504 – Insulation failure ignored** or **3601 – Warning insulation failure** is displayed, then the insulation is defective. In this case a qualified person needs 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-PV3 with AGH-PV device supplied by Bender GmbH & Co. KG.

3.8 Optiprotect

3.8.1 Optiprotect Operation

Depending on the option ordered, the Sunny Central may be equipped with Optiprotect for string current monitoring. Optiprotect is an intelligent string-failure detection system for large PV arrays. The string current monitor is integrated in the inverter. The use of Sunny String-Monitors and a separate communication cable for string monitoring is not required.

Individual string failures are detected safely and reliably in the event of a fault. Protection of the PV strings takes place in the inverter with motor-driven circuit breakers and in the PV plant with the SMA String-Combiner for Sunny Central. The individual DC inputs can be disconnected via the motor-driven circuit breakers.

If earth fault errors occur, the insulation monitoring device triggers. The faulty strings are detected, located and disconnected from the PV array in combination with the motor-driven circuit breakers. The error message **3508– String temporarily deselected due to earth fault** or **3509– String permanently deselected due to earth fault** is displayed via the SC-COM. The other strings remain available.

The inverter is equipped with the assemblies SMIDCont for string current evaluation and SMIDCT for string current measurement. In these assemblies the input current is measured and evaluated respectively.

3.8.2 SMIDCont

With the "Optiprotect" order option the Sunny Central is equipped with an SMIDCont for string current monitoring. The SMIDCont evaluates the string currents measured in the SMIDCT.

After a learning phase of 1 day the SMIDCont recognises total failure of a string input, after completion of the learning process failures of individual substrings will be recognised. If 1 string fails, the inverter issues an error message. You can call up this error message on the touch display or via the SC-COM user interface.

The SMIDCont recognises any earth faults that occur and switches the strings affected by the earth fault off automatically.

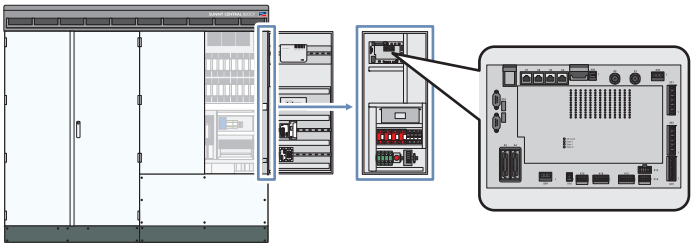


Figure 12: SMIDCont in the Sunny Central

The measured string currents are collected in 1 second intervals. Evaluation of the data takes place at the end of the respective day. In this process the string currents measured are compared with one another. Since the learning process continues over the entire service life of the inverter, systematic deviations of the measured values from the calculated historical values can be saved and included in the learning process. This means that seasonally dependent events (e.g. shading) or the ageing process of the PV modules can be excluded as error sources.

In the event of fundamental changes to the PV array (e.g. expansion of the PV array) you must restart the learning process via a reset.

The status of the SMIDCont is displayed via the LEDs on the assembly (see Section 11.4.1).

3.8.3 SMIDCT

With the "Optiprotect" order option the Sunny Central is equipped with up to 4 SMIDCTs for string current monitoring. The SMIDCT is an assembly for measuring the DC currents of the strings and for controlling the 4 motor-driven circuit breakers assigned to them. The SMIDCT transfers the measured values to the SMIDCont.

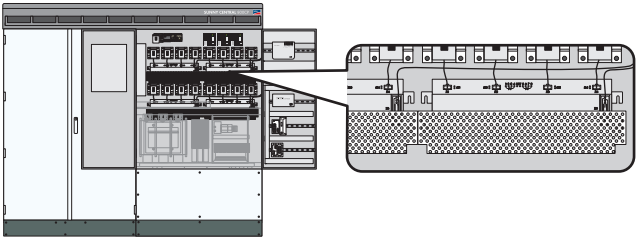


Figure 13: SMIDCT in the Sunny Central

Every SMIDCT has 8 measurement inputs, to each of which 1 main string is connected. Each of these inputs has a current sensor for measuring the DC currents. Two of the main strings are each integrated into a pair and are connected by a motor-driven circuit breaker. In order to be better able to follow the main strings on the SMIDCTs, there are text stickers on the SMIDCTs and on the motor-driven circuit breakers.

The status of each SMIDCT is displayed on the LEDs located on the assemblies (see Section 11.4.2).

3.8.4 Behaviour of the Inverter with Earthed PV Arrays

Depending on the option ordered, the inverter is equipped with a remote GFDI for the detection of earth faults.

If an earth fault occurs, the remote GFDI disconnects. As a result the AC contactor opens and the motor-driven DC circuit breakers are automatically disconnected. The remote GFDI is closed again after a defined period of 15 minutes. The triggered remote GFDI can be closed without an external starting command.

After the remote GFDI has been closed, the inverter is checked for insulation failures. If there are none, the DC circuit breakers of the substrings are connected one after another. If the remote GFDI disconnects at one of the substrings, this substring will be designated as faulty and deselected, i.e. no longer re-connected. Parallel to this, the residual current is measured via remote GFDI. If the residual current rises by more than 500 mA during connection of a substring, this increase is also recognised as a fault and the DC circuit breaker of the affected substring is disconnected. The error message **3508 – String temporarily deselected due to earth fault** is displayed on the touch display.

It will initially be assumed that the insulation failure in the substring is temporary. The system tries to reselect the deselected substring. In this process the first attempt at re-selection is made after 2 operating hours, then daily 2 operating hours after the PV voltage has exceeded 200 V. If the reselection fails a total of 5 times, the system assumes a permanent fault and no longer attempts reselection. The error message **3509 – String permanently deselected due to earth fault** is displayed on the touch display. The inverter continues working with a reduced number of strings. In this case a qualified person needs to check and, if necessary, repair the insulation and then acknowledge the error.

In the default setting, the Sunny Central software will attempt de-selection up to 3 times per day with the remote GFDI. In the event of more than 3 de-selection attempts per day, the inverter disconnects and the error message **3512 – Permanent ground fault** is displayed on the touch display. In this case a qualified person needs to check and, if necessary, repair the insulation and then acknowledge the error.

3.8.5 Behaviour of the Inverter with Insulated PV Arrays

Depending on the option ordered, the inverter is equipped with an insulation monitoring device for the detection of insulation faults.

If an insulation fault occurs, the insulation monitoring device measures a too-low insulation resistance. It opens the AC contactor and the motor-driven DC circuit breakers are automatically disconnected.

If the disconnection in the event of faults is deactivated via the parameter **IsoErrIgn**, the error message **3504 – Insulation failure ignored** is displayed on the touch display. After a defined period of 15 minutes, the inverter is checked for insulation failures. If none are found, the motor-driven DC circuit breakers of the substrings are individually connected. If the measured insulation resistance in one of the substrings is too low, this substring is designated as faulty and is deselected, i.e. no longer connected. The error message **3501 – Insulation failure** is displayed on the touch display.

If the disconnection in the event of faults is activated via the parameter **IsoErrIgn**, the inverter disconnects and the error message **3501 – Insulation failure** is displayed on the touch display. In this case a qualified person needs to check and, if necessary, repair the insulation and then acknowledge the error.

Automatic re-selection does not take place in insulated PV arrays.

Since troubleshooting with automatic activation of the individual substrings takes approx. 3 hours, you can switch this function off via the parameter **IsoSmidOutGrp** (see Section 10.2 "Setting the Automatic Error Processing with Optiprotect and Insulated PV Arrays", page 91).

3.9 Grid Management

3.9.1 Requirements

The growing number of PV plants feeding into the electricity grid means that PV plants are increasingly having to take on a feed-in management function. In Germany, for example, they have to offer grid management. First and foremost, the network operator must be able to limit the power of the PV plant by remote control and temporarily reduce it to zero in critical cases. The relevant control commands of the network operator must therefore be transmitted to the Sunny Central quickly and reliably and implemented accordingly.

The following illustration shows how the instructions of the network operator are implemented. The Power Reducer Box or Power Plant Controller sends the instructions of the network operator to the inverters.

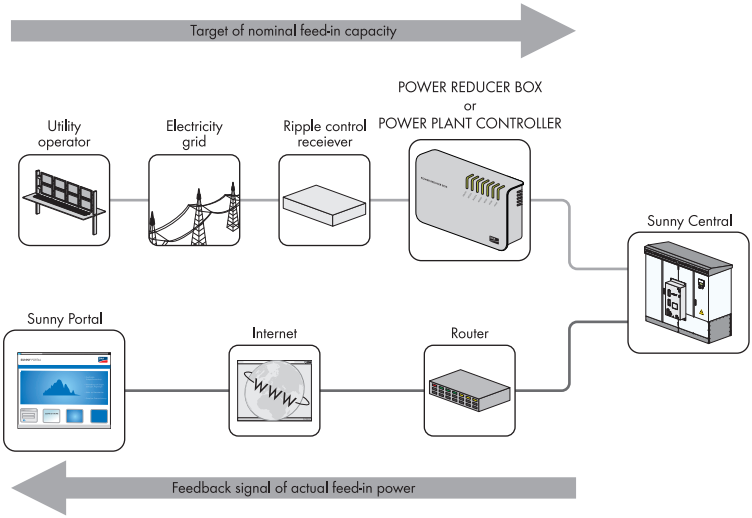


Figure 14: Principle of grid integration

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

- Receiving the signals via 2 analogue inputs on the Sunny Central
- Manually adjusting the instructions via parameters on the Sunny Central

3.9.2 Active Power Limitation

5 methods are available for limiting the active power independent of the power frequency. The limit can be defined using a parameter or supplied by the network operator as an external signal (see Section 7.2 "Active Power Limitation Independent of the Frequency", page 68).

In addition to these methods, the active power can also be limited based on the power frequency.

3.9.3 Reactive Power Setpoint

The Sunny Central can provide reactive power. There are 11 methods for specifying the target value setpoint. They include entering a fixed parameter, processing an external signal from the network operator or specifying the reactive power using adjustable characteristic curve parameters (see Section 8).

3.9.4 Full and Limited Dynamic Grid Support (FRT)

With full dynamic grid support, the Sunny Central supports the electricity grid during a brief grid voltage drop by feeding in reactive current. In this case, the behaviour of the inverter depends on the percentage ratio of line voltage V_{Grid} to nominal voltage V.

With limited dynamic grid support, the Sunny Central interrupts the feed-in during the grid voltage drop.

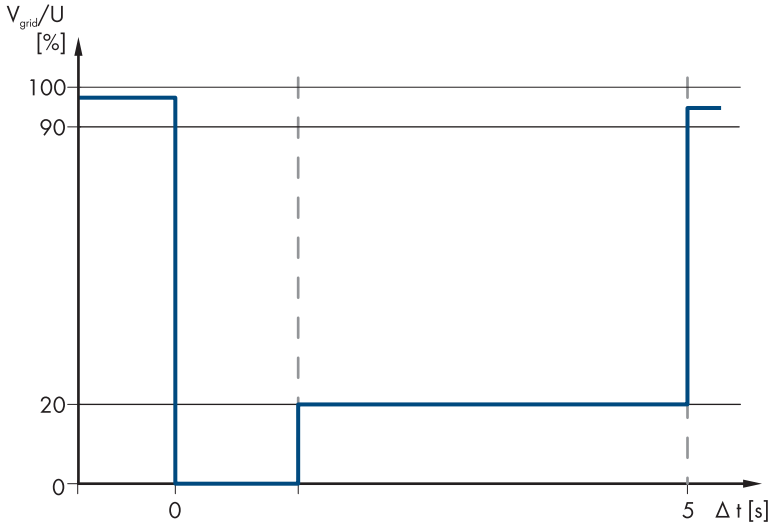


Figure 15: Maximum duration of voltage drop which the Sunny Central has experience without disconnecting from the grid

Ratio V_{Grid}/V	Inverter behaviour
90% ... 100%	The ratio of line voltage V_{Grid} to nominal voltage V is in the normal range and the inverter feeds in without any problem.
20% ... 90%	The ratio of line voltage V_{Grid} to nominal voltage V is in the critical range. There is a disturbance in the electricity grid. While this disturbance remains present, the inverter supports the electricity grid with reactive current. The inverter can bridge disturbances of up to 5 s without disconnecting from the electricity grid. If the set grid monitoring time is exceeded during this period, the inverter disconnects itself from the electricity grid.
0% ... 20%	The ratio of line voltage V_{Grid} to nominal voltage V is in the critical range. There is a disturbance in the electricity grid. While this disturbance remains present, the inverter supports the electricity grid with reactive current. The inverter can bridge disturbances of up to 1.2 s without disconnecting from the electricity grid. This is provided that the V_{Grid}/V ratio was >= 90% before the fault occurred. If the set grid monitoring time is exceeded during this period, the inverter disconnects itself from the electricity grid.

The function of dynamic grid support is set via the parameter **FRTEna**. The level of reactive current provided during complete dynamic grid support is determined via parameter **FRTArGraNom**.

The FRT function cannot be active at the same time as the Active Island Detection function.

3.9.5 Decoupling Protection Ramp

After a grid fault, the Sunny Central restarts at a maximum 10% of nominal power per minute using a decoupling protection ramp. You have the option of switching this decoupling protection ramp on and off.

If you switch the decoupling protection ramp off, the Sunny Central quickly returns to maximum power.

If you want to deactivate the decoupling protection ramp, consult the SMA Service Line.

Compliance with the medium-voltage directive

The decoupling ramp is part of the Medium-Voltage Directive of the German Association of Energy and Water Industries (BDEW) and must not be deactivated in Germany.

3.9.6 Grid Management Shutdown

If the electricity grid becomes unstable and overloaded, grid management requires that the inverter disconnects from the grid immediately. In such a case the relevant Modbus signal will be provided by the network operator or the safety system for the grid transfer point. The inverter disconnects from the electricity grid immediately and displays error message **9013**.

The error will be reset in the inverter after a signal is provided by the network operator or the safety system for the grid transfer point.

3.10 Islanding Detection

3.10.1 Active Islanding Detection

The islanding detection function detects the formation of stand-alone grids and disconnects the Sunny Central from the electricity grid.

Islanding can occur when the load in the shut-down sub-grid is roughly equivalent to the current feed-in capacity of the PV plant when the electricity grid fails.

With of active islanding detection, the inverter continuously checks the stability of the electricity grid by actively attempting to influence the power frequency.

If the electricity grid is intact, this has no impact on the electricity grid. The power frequency can only be influenced if a stand-alone grid is established. The frequency then changes such that the set frequency limits are exceeded and the inverter disconnects from the electricity grid (see Section 9.3 "Setting Power Frequency Monitoring", page 86).

The active islanding detection function cannot be active at the same time as the FRT function. To enable the active islanding detection function, contact the SMA Service Line.

3.10.2 Passive Islanding Detection

The islanding detection function detects the formation of stand-alone grids and disconnects the Sunny Central from the electricity grid.

Islanding can occur when the load in the shut-down sub-grid is roughly equivalent to the current feed-in capacity of the PV plant when the electricity grid fails.

Depending on the order, the Sunny Central may be equipped with passive islanding detection.

Unlike active islanding detection, with passive islanding detection the electricity grid is not actively influenced, simply passively monitored. The speed of change in frequency is monitored. A grid monitoring relay is integrated in the inverter for this purpose. This monitors the electricity grid and sends a signal to the inverter in the event of a fault.

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 electricity grid. The size of the frequency change and the time during which the change in frequency must take place can be set via parameters on the grid monitoring relay.

The response times for passive islanding detection are generally shorter than for active islanding detection.

3.11 Low-Temperature Option

With the "Low-temperature option", the operating temperature range is expanded to − 40°C to +62°C; however, the inverter will only maintain feed-in operation to − 25°C.

If the ambient temperature falls below − 25°C, the inverter switches to the "Stop" operating state and the additionally installed heating unit is activated. As soon as the ambient temperature exceeds − 20°C again, the inverter resumes feed-in operation.

3.12 Schematic Diagram

PDF schematic diagrams contain jump marks. Double-clicking on a jump mark takes you to the corresponding current path or the point referenced in the list of electric equipment.

SMA Solar Technology AG recommends using PDF schematic diagrams for troubleshooting. The PDF schematic diagrams are available on request. Contact the SMA Service Line.

4 Sunny Central Touch Display

4.1 Touch Display Layout

The Sunny Central touch display displays instantaneous values and set parameters.

Tap the symbols on the display to activate the functions.

The touch display is divided into 3 areas.

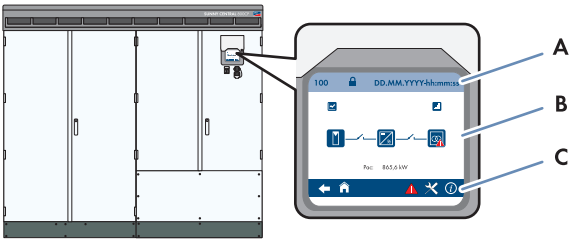


Figure 16: Touch display areas

Object	Description
A	Status info line
B	Information field
C	Navigation line

4.2 Explanation of Symbols

4.2.1 Status Info Line

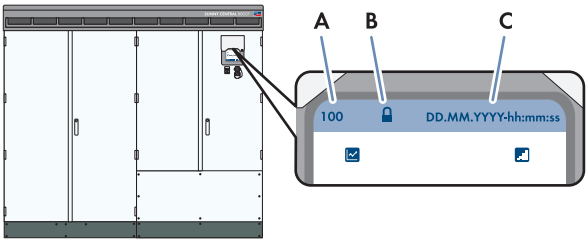


Figure 17: Status info line layout

Object	Description
A	Number of the active menu
B	Symbol indicating whether the inverter is currently password protected or is available for configuration.
C	Display of the date and time

4.2.2 Information Field

Main menu

You can access the following sub-menus and screens from the main menu:

Symbol	Description	Explanation
	**E-today line graph**	Select this symbol to see the energy fed-in during the current day in kWh.
	**Bar chart**	Select this symbol to see the energy fed-in over the last 14 days in kWh.
	**DC side**	Select this symbol to see the following instantaneous values: • PV power in W • Insulation resistance in Ω • PV current in A • PV voltage in V The symbol  also appears on the page that opens. Select this symbol to see the sub-menu level diagrams.
	**DC-side string current monitoring**	Select this symbol to see the following instantaneous values depending on the type of string current monitoring: • DC currents of the individual SMIDCTs • DC currents of the individual Sunny String-Monitors This symbol appears once you have selected the symbol  .

Symbol	Description	Explanation
	**Switch on DC side or AC side closed**	If you see this symbol between the "DC side" symbol and the "Inverter data" symbol, the DC contactor is closed. If you see this symbol between the "Inverter data" symbol and the "AC side" symbol, the AC contactor is closed. If string-current monitoring is carried out using Optiprotect, the switch is shown closed as soon as one of the SMIDCT switches is closed.
	**Switch on DC side or AC side open**	If you see this symbol between the "DC side" symbol and the "Inverter data" symbol, the DC contactor is open. If you see this symbol between the "Inverter data" symbol and the "AC side" symbol, the AC contactor is open. If string-current monitoring is carried out using Optiprotect, the switch is shown open if all SMIDCT switches are open.
	**Status of switches on DC side or AC side not known**	If you see this symbol between the "DC side" symbol and the "Inverter data" symbol, the switch status of the DC contactor is not known. If you see this symbol between the "Inverter data" symbol and the "AC side" symbol, the switch status of the AC contactor is not known.
	**Inverter data**	Select this symbol to see the following data: • Device type • Operating state • Symbol for the electricity grid menu • Symbol for the temperature display • Symbol for the fan display
	**AC side**	Select this symbol to see the following instantaneous values: • Active power in W • Reactive power in VAr • Power frequency in Hz • AC current in A • AC voltage in V

Symbol	Description	Explanation
	**Grid**	Select this symbol to display the following on the 1st page of the menu: • Active procedure for active power limitation (see Section 7.2) • Target active power in kW • Actual active power in kW Select  to display the following on the 2nd page of the menu: • Active procedure for reactive power setpoint (see Section 8). • Target reactive power in VAr • Target displacement factor cos φ • Target displacement power factor excitation type • Actual reactive power in VAr • Actual displacement power factor cos φ • Actual displacement power factor excitation type

Settings menu

To access the settings menu, press the corresponding symbol in the navigation bar.

Symbol	Description	Explanation
	**Language selection**	Select this symbol to open the language selection menu (see Section 4.3).
	**Brightness setting**	Select this symbol to open the brightness setting menu (see Section 4.6).
	**Time setting**	Select this symbol to open the time setting menu (see Section 4.4).
	**Format selection**	Select this symbol to open the format selection menu (see Section 4.4).
	**Password entry**	Select this symbol to open the password entry menu (see Section 4.7).

Diagrams of the main menu level and sub menu level

Number of the active menu	Data displayed
103	Energy fed in by the inverter during the current day
104	Energy fed in by the inverter during the last 14 days
130	Group currents of the individual SMIDCTs
131	String currents of the individual SMIDCTs
132 ... 133	Group currents of the individual Sunny String-Monitors
140 ... 146	String currents of the individual Sunny String-Monitors

4.2.3 Navigation Line

Symbol		Description
	**Back**	Select this symbol to go back to the previous page.
	**Homepage**	Select this symbol to go to the homepage.
	**Settings**	Select this symbol to access the following symbols: •  - Language selection •  - Brightness setting •  - Time setting •  - Format selection •  - Password entry
	**Information**	Select this symbol to see the following information: • OS: Version of the operating system • App.: Version of the application software • Language: Selected language • Ser. No.: Inverter serial number
	**Error**	This symbol appears when an error occurs. The symbol  is displayed in the symbol of the plant section where the error has occurred and in the menu bar. Select this symbol from the menu bar to see the following: • ErrNo: Error number • TmsRmg: Time until re-connection • Msg: Error message • Dsc: Corrective measure

Symbol		Description
	**Service**	The "telephone" symbol appears when you are advised to contact the SMA Service Line. The "tool" symbol appears when you are advised to have the error corrected by your installer. Contact your installer.

4.3 Language Selection

1. Select .
2. Select .
3. Select the language using the country symbols.
4. Confirm the entry by selecting .

4.4 Changing the Date, Time, and Time Zone

SC-COM accepts changes

The SC-COM will accept date, time or time zone changes made on the display.

1. Select .
2. Select .
3. To change the date, select the day, month and year one after the other in the field. Use and to change the day, month and year.
4. To change the time, select the hour, minute and second one after another 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. Change the time zone using and .

4.5 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 the entry by selecting .

4.6 Setting the Brightness

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

4.7 Entering the Installer Password

Access as installer

The "Installer" access level is activated by entering the installer password.

The access level will be reset after 15 minutes.

1. Select .
2. Select .
3. Enter the installer password. Use the keypad for this.
4. Confirm the entry by selecting .

☑ The symbol appears in the status info line.

✖ The status info line does not show the symbol?

An incorrect password was entered.

- Enter the password again.

5 Network Settings

In order to connect the inverter to a computer via the service interface or via the Internet, the Sunny Central Communication Controller must be set up in a plant network. To allow multiple Sunny Central devices to operate on the same network, the SC-COM of each Sunny Central must be assigned a unique network address.

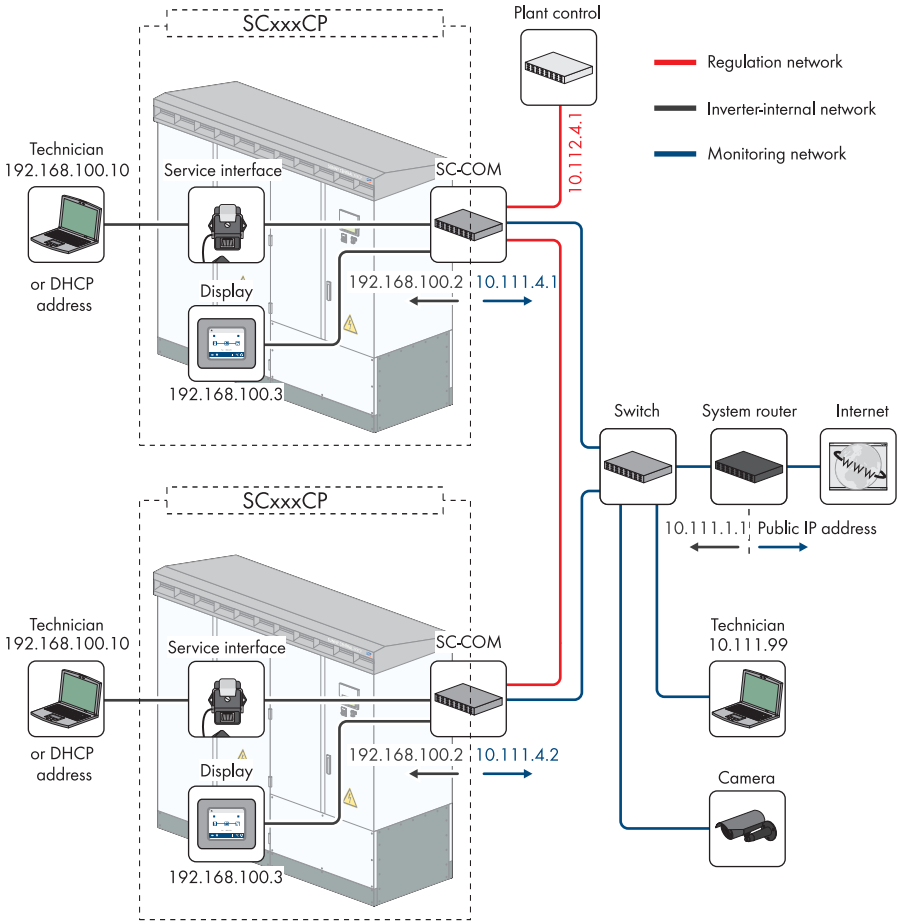


Figure 18: Example of a plant network of 2 inverters with indicator lights

Procedure:

- Set the IP address on the laptop
- Set the IP address of the inverter

Setting the IP address on the laptop

If you are working with a DHCP-enabled laptop, it will automatically be assigned an IP address by the network server.

If your laptop is not DHCP-enabled, you will need to manually enter the IP address.

1. Select **Start > Run** in Windows.
2. Enter **ncpa.cpl** in the box and press [**OK**].
   ☑ The **Network Connections** window opens.
3. Double click on the LAN connection via which the Sunny Central is connected.
4. Select [**Properties**].
   ☑ The **LAN Connection Properties** window opens.
5. Mark **Internet protocol (TCP/IP)** and select [**Properties**].
   ☑ The **Internet Protocol Properties (TCP/IP)** window opens.
6. Note down the network settings so that you can restore the settings in your computer after starting the Sunny Central.
7. Make the following settings and confirm with [**OK**]:
   - "IP address:" **10.100.100.1**
   - "Subnet mask:" **255.0.0.0**
8. In the "**Local Area Connection Properties**" window, select [**OK**]. The settings are now applied.
9. Select [**OK**] in the **Network Connections** window. This closes the window.
   ☑ The computer is set to the network settings of the Sunny Central.

Setting the IP address of the inverter

1. Connect the laptop to the service interface of the Sunny Central using a network cable.
2. Open a web browser (e.g. Windows Explorer).
3. Enter 10.111.4.1 in the address bar of the web browser.
   ☑ The user interface of the SC-COM appears.
4. Enter the installer password in the appropriate field on the homepage and confirm with [**Login**].
5. Select **Sunny Central > Settings > Network**.
6. Depending on the network structure, enter the following values for the monitoring and control networks:
   - "IP address:"
   - "Subnet mask:"
   - "Gateway:"
7. Complete the entries using [**Save**] and [**Confirm**].

6 SC-COM Communication

6.1 Displaying Instantaneous Values

The SC-COM operating manual contains a detailed description of the SC-COM user interface.

1. Access the SC-COM user interface.
2. Enter the installer password in the appropriate field on the homepage and confirm with [**Login**].
3. Select **Data > Devices**.
4. Select  .
   ☑ A list of available device types appears.
5. Select the desired device type.
   ☑ A list appears containing all available devices of this type.
6. Select the desired device from the list.
7. Select the **Instantaneous values** tab.

6.2 Changing Parameters

Parameters are changed via the SC-COM. You can access the SC-COM either on-site via a laptop or remotely via a PC.

1. Access the SC-COM user interface.
2. Enter the installer password in the appropriate field on the homepage and confirm with [**Login**].
3. Select **Plant > Devices**.
4. Select  .
   ☑ A list of available device types appears.
5. Select the desired device type.
   ☑ A list appears containing all available devices of this type.
6. Select the desired device from the list.
7. Select the **Parameters** tab.
8. Change the desired parameter.
9. Confirm the parameter entry with [**Save**].

6.3 Setting the String Current Monitoring of the PV Plant on the Sunny Central String-Monitor Controller

To configure the string current monitoring of the PV plant using the Sunny Central String-Monitor Controller, you must perform the following steps in order:

- Detect the Sunny Central String-Monitor Controller and the Sunny Central
- Set the date and time
- Detect the Sunny String-Monitors via the Sunny Central String-Monitor Controller
- Detect the Sunny String-Monitors again via the Sunny Central String-Monitor Controller
- Use the SC-COM to detect Sunny String-Monitors
- Assign the identification of the Sunny String-Monitors

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

1. Access the SC-COM user interface.
2. Enter the installer password in the appropriate field on the homepage and confirm with [**Login**].
3. Detect the Sunny Central and the Sunny Central String-Monitor Controller.
   - Select **Data > Detect**.
   - In the "Total number of devices to be detected" field, enter **2**.
   - Select [**Start detection**].
   - ☑ The SC-COM starts detecting all devices and displays its progress. Once all devices have been detected, the SC-COM displays **"### Device detection finished ###"**.
   - ☑ The devices have been detected.

Setting the date and time of the Sunny Central String-Monitor Controller

1. Select **Data > Devices**.
2. Select  .
   - ☑ A list of available device types appears.
3. Select **Sunny Central String-Monitor Controller**.
4. Select the **Instantaneous values** tab.
5. Check that the date **SysDt** and time **SysTm** of the Sunny Central String-Monitor Controller are correct. If the settings are incorrect, change the **Dt** and **Tm** parameters (see Section 6.2).

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

Detection of the Sunny String-Monitors can take several minutes.

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

1. Select the **Parameters** tab.
2. Set the parameter **DevFunc** to **AutoDetect_SSMU**.
3. Confirm the entry with [**Save**].
4. Select the **Instantaneous values** tab.
5. Select **SSMUNoOf** and check the number of detected Sunny String-Monitors. If all Sunny Central String-Monitors have been detected, detect the Sunny Central String-Monitors via SC-COM. If only some of the Sunny Central String-Monitors have been detected, use Sunny Central String-Monitor Controller to detect them again.

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

1. Select the **Parameters** tab.
2. Set the parameter **DevFunc** to **DetectSSMURetry**.
3. Confirm the entry with [**Save**].
4. Select the **Instantaneous values** tab.
5. Select **SSMUNoOf** and check the number of detected Sunny String-Monitors. If all Sunny String-Monitors have been detected, detect the Sunny String-Monitors via SC-COM. If only some of the Sunny String-Monitors have been detected, contact the SMA Service Line.

Using the SC-COM to detect Sunny String-Monitors

1. Select **Data > Detect**.
2. In the **Total number of devices to be detected** field, enter the number of Sunny String-Monitors +2.
3. Select [**Start detection**].
   ☑ The SC-COM starts detecting all devices and displays its progress. Once all devices have been detected, the SC-COM displays **"### Device detection finished ###**".
   ☑ The Sunny String-Monitors have been detected.

Assigning the identification of the Sunny String-Monitors

1. Select the first Sunny String-Monitor from the device list.
2. Select the **Parameters** tab.
3. Select the parameter **SSMId** and allocate a unique identification number to the Sunny String-Monitor. Note down the identification number.
4. Assign the identification of the remaining Sunny String-Monitors using the same process.

6.4 Optional Settings for PV Plant Monitoring with Sunny Central String-Monitor Controller

6.4.1 Changing the Communication Period

The communication period is the time during which the Sunny Central String-Monitor Controller communicates with the Sunny String-Monitors. The default setting for communication is from 10:00 hrs until 15:00 hrs.

1. Select the parameter **MoniTmComOn** and specify the start of the monitoring period (see Section 6.2).
2. Select the parameter **MoniTmComOff** and specify the end of the monitoring period.
3. Confirm the entry with [**Save**].

6.4.2 Changing the Monitoring Period

The monitoring period is time period in which the PV plant is being monitored by the Sunny String-Monitors. The default setting for the monitoring period is from 10:00 hrs until 15:00 hrs.

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

The monitoring period must lie within the communication period.

Setting the monitoring period for all sunny string-monitors

1. Select the parameter **MoniTmGrAllOn** and specify the start of the monitoring period (see Section 6.2).
2. Select the parameter **MoniTmGrAllOff** and specify the end of the monitoring period.
3. Confirm the entry with [**Save**].

Setting the monitoring period for individual groups of sunny string-monitors

1. Select the parameter **MoniTmGr1On** and specify the start of the monitoring period (see Section 6.2).
2. Select the parameter **MoniTmGr1Off** and specify the end of the monitoring period.
3. Confirm the entry with [**Save**].
4. Repeat steps 1 to 3 for the remaining groups.

6.4.3 Assigning PV Strings to Various Measuring Channels

You can assign the strings to the 8 measuring channels in order to simplify monitoring.

The number of strings per channel for the 8 measuring channels can be selected from 1 to 4. The default setting is "1".

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

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

6.4.4 Assigning PV Strings to Various Groups

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

All PV strings are placed in Group 1 by default.

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

1. Select the desired Sunny String-Monitor from the device list.
2. Select the **Parameters** tab.
3. Select the parameters **Group String 1** to **Group String 8** and assign them to a group (see Section 6.2). Each group must include at least 4 measuring channels.
4. Confirm the entry with [**Save**].

6.4.5 Setting the Tripping Time

You can set the sensitivity of the string current monitoring via the tripping time, since the tripping time is used in the calculation of the error sum. The tripping time is set to 180 minutes by default.

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

6.4.6 Setting the Tolerance

You can set the sensitivity of the string current monitoring via the tolerance. The tolerance is used in the calculation of the error sum.

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

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

6.5 Setting String Current Monitoring and Automatic Error Processing of the PV Plant with String Current Monitoring with Optiprotect

6.5.1 Detecting SMIDCONT and Sunny Central

1. Access the SC-COM user interface.
2. Enter the installer password in the appropriate field on the homepage and confirm with [**Login**].
3. Detecting SMIDCONT and Sunny Central.
   - Select **Data > Detect**.
   - In the **Total number of devices to be detected** field, enter **2**.
   - Select [**Start detection**].
   - ☑ The SC-COM starts detecting all devices and displays its progress. Once all devices have been detected, the SC-COM displays **"### Device detection finished ###"**.
   - ☑ The devices have been detected.

6.5.2 Setting the Time Zone on the SMIDCONT

Checking the date and time

1. Select **Data > Devices**.
2. Select  .
   - ☑ A list of available device types appears.
3. Select **SMID > SMID4xx**.
4. Select the **Instantaneous values** tab.
5. Check whether the date **Dt** and time **Tm** of the SMIDCONT are correct. If the settings are incorrect, change the time settings in the SC-COM (see the SC-COM operating manual). If only the time zone is incorrect, set the correct time zone.

Changing the time zone

1. Select the **Parameters** tab.
2. Select the parameter **TmZn** and change the time zone.
3. Confirm entry of the change with [**Save**].

6.5.3 Restarting the Learning Algorithm

A restart of the learning algorithm is necessary if changes to the PV array have been made:

- Upon initial start-up of the PV plant
- Replacement, addition or removal of PV modules
- Changes to the tilt angle of PV modules

1. Select the **Parameters** tab.
2. Select the parameter **StrgMonRst** and restart the learning algorithm.
3. Confirm the entry with [**Save**].

6.5.4 Activating the Automatic Error Processing for Insulated PV Arrays

Normally, faulty substrings of the PV plants are not deselected. If de-selection of the faulty strings is desired, you can set the appropriate parameter via the SC-COM user interface.

De-selection of faulty substrings in insulated PV arrays can take up to 3 hours depending on the plant configuration. The inverter does not feed-in during this time.

1. Select the **Parameters** tab.
2. Set the parameter **IsoSmidOutGrp** to **Auto**.
3. Confirm the entry with [**Save**].

6.6 Reading the Measured Values

6.6.1 Reading the Measured Values of the Groups

1. Access the SC-COM user interface.
2. Enter the installer password in the appropriate field on the homepage and confirm with [**Login**].
3. Select the desired Sunny Central String-Monitor Controller or SMIDCont from the device list.
4. Read off the mean values of the groups in the **Instantaneous values** tab.

6.6.2 Reading the Measured Values of the Individual Measuring Channels

1. Access the SC-COM user interface.
2. Enter the installer password in the appropriate field on the homepage and confirm with [**Login**].
3. Select the desired Sunny String-Monitor or SMIDCont from the device list.
4. Read off the mean values of the individual measuring channels in the **Instantaneous values** tab.

6.7 Setting the Remote Shutdown

The inverter can be switched off and shut down via an external signal. Two 24 V terminals are connected to the customer's terminal strip for this purpose (see inverter installation manual).

To use this function, the associated parameters must be activated.

1. Ensure that the inverter is in the "Stop" operating state.
2. Access the SC-COM user interface.
3. Enter the password in the appropriate field on the homepage and confirm with [**Login**].
4. Set the **ExlStrStpEna** parameter on the SC-COM user interface to **On** (see Section 6.2).
5. Confirm the parameter entries with [**Save**].

6.8 Setting the "Fully Hermetic Protector" Transformer Protection

A fully hermetic protector can be connected to the inverter. This fully hermetic protector is integrated in the medium-voltage transformer.

If an error occurs in the medium-voltage transformer, the inverter switches off immediately. Two 230 V/50 Hz terminals are connected to the customer's terminal strip for this purpose (see inverter installation manual).

To turn off this function, the associated parameter must be disabled.

1. Ensure that the inverter is in the "Stop" operating state.
2. Access the SC-COM user interface.
3. Enter the password in the appropriate field on the homepage and confirm with [**Login**].
4. On the SC-COM user interface, set the parameter **ExlTrfErrEna** to **Off** (see Section 6.2).
5. Confirm the parameter entries with [**Save**].

7 Active Power Limitation

7.1 Power Frequency-Dependent Active Power Limitation

7.1.1 Principle of Frequency-Dependent Active Power Limitation

During active power limitation via the power frequency, the Sunny Central constantly checks the connected power frequency.

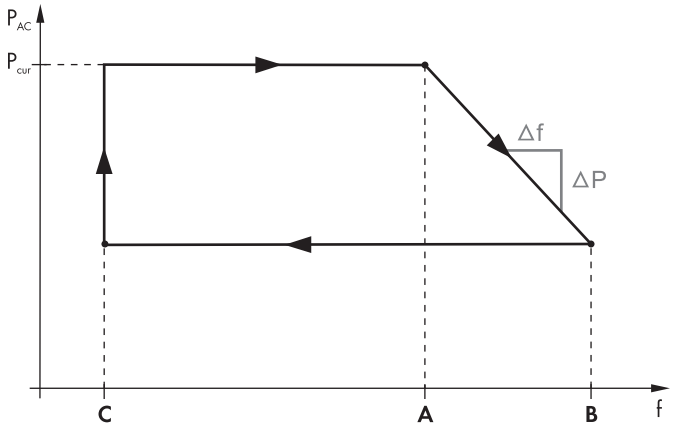


Figure 19: Behaviour of the Sunny Central when the P-HzStr frequency limit is exceeded

If the power frequency exceeds a threshold value defined in the parameter **P-HzStr**, shown here under point A, the Sunny Central will save the current feed-in capacity P_{cur}. The reduced feed-in power is calculated based on this saved value. The reduction of the feed-in power is defined through the parameter **P-WGra**. This parameter indicates by what percentage of the saved power P_{cur} output will be reduced per Hz if the power frequency continues to rise.

If the power frequency decreases again as shown in point B, the last reached feed-in power will remain valid. Only if the power falls below the threshold value defined in the parameter **P-HzStop**, shown here in point C, can the amount of power fed in be increased again. The saved value P_{cur} will be rendered invalid.

If the power frequency exceeds the grid limit, the Sunny Central will shut down and switch over to the "Grid monitoring" operating state. The Sunny Central will remain in the "Grid monitoring" operating state until all feed-in conditions are fulfilled again.

Calculating the power limit:

Formula: $P_{lim} = P_{lim} - ((f_{power} - \text{P-HzStr}) * \text{P-WGra} * P_{cur})$

P_{lim}	Power limit	P_{cur}	Current power
f_{power}	Power frequency	**P-HzStr**	Selected frequency limit at which the feed-in power will be reduced
P-WGra	Gradient for reducing active power		

Example:

A 500 kW Sunny Central feeds in 350 kW (P_{cur}) into the electricity grid. Here, 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% in the last available power P_{cur} (350 kW). This results in a power limitation of 140 kW and a maximum active power of 210 kW.

Calculation:

210 kW = 350 kW – ((51.2 Hz – 50.2 Hz) * 40%/Hz * 350 kW)

7.1.2 Procedure with Power Frequency-Dependent Active Power Limitation and Setting Associated Parameters

1. Ensure that the inverter is in the "Stop" operating state.
2. Access the SC-COM user interface.
3. Enter the password in the appropriate field on the homepage and confirm with [**Login**].
4. Set the **WCtlHzMod** parameter on the SC-COM user interface to **On** (see Section 6.2).
5. Change the parameters belonging to the selected procedure.
6. Confirm the parameter entries with [**Save**].

Parameters used	P-HzStr P-HzStop P-WGra

7.2 Active Power Limitation Independent of the Frequency

7.2.1 Selecting the Procedure with the Parameter P-WMod

You can set the active power limitation via the parameter **P-WMod** (see Section 6.2). This parameter is used to configure how the network operator instructions should be received and implemented. The default value for this parameter is **Off**.

Parameter blocking

The parameter **P-WMod** may only be changed in the "Stop" operating state. The entry will not be accepted in other operating states.

There are 5 different procedures for setting the grid-frequency-independent limitation of active power:

Procedure	Description
Off	The active power is limited to the device nominal power **Pmax**.
WCtlCom	The active power limitation is received by the SC-COM via the Power Reducer Box or the Power Plant Controller and then transmitted to the Sunny Central.
WCnst	The active power limitation is entered as an absolute value via the parameter **P-W**.
WCnstNom	The active power limitation is entered as a percentage value via the parameter **P-WNom**.
WCnstNomAnIn	The active power limitation is set via an analogue signal at the input terminals for the setpoint.

Procedure for setting the active power limitation and associated parameters

1. Ensure that the inverter is in the "Stop" operating state.
2. Access the SC-COM user interface.
3. Enter the password in the appropriate field on the homepage and confirm with [**Login**].
4. Change the parameter **P-WMod** in the SC-COM user interface (see Section 6.2).
5. Change the parameters belonging to the selected procedure.
6. Confirm the parameter entries with [**Save**].

7.2.2 Off Procedure

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

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

Parameters used Pmax

7.2.3 WCtlCom Procedure

The target value for the active power limitation is received by the SC-COM via the Power Reducer Box or the Power Plant Controller and then transmitted to the Sunny Central. If the Sunny Central has received no signal for 5 minutes, the error message will be displayed in the **P-WModFailStt** instantaneous value.

Parameters used none

7.2.4 WCnst Procedure

The active power limitation is entered as an absolute value via the parameter **P-W**.

The **P-W** parameter defines the active power to be fed in. The **P-W** parameter can be changed during feed-in operation. The **P-W** parameter must not be greater than the parameter **Pmax**.

Parameters used P-W

7.2.5 WCnstNom Procedure

Active power limitation is set as a percentage value using the parameter **P-WNom**. The percentage value refers to the parameter **Pmax**.

The **P-WNom** parameter indicates the percentage of maximum possible power to be fed in. The **P-WNom** parameter can be changed during feed-in operation.

Parameters used P-WNom

7.2.6 WCnstNomAnIn Procedure

The active power limitation is set at the input terminals using an analogue signal for specifying the target value (see the inverter installation manual). This is usually accomplished via a radio ripple control receiver.

The current strength of the connected signal determines the rated active power.

The analogue measured values must be between 4 mA and 19 mA. If the analogue signal is less than 2 mA, the error message will be displayed in the instantaneous value **P-WModFailStt** (see Section 7.4).

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

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

Parameters used none

7.3 Displaying the Status of the Active Power Limitation

The **P-WModStt** instantaneous value displays the status of the active power limitation.

- Display the instantaneous value **P-WModStt** on the SC-COM user interface (see Section 6.1).

Display	Description
Off	No procedure for active power limitation has been chosen.
WMax	The active power is limited by specifying an upper limit. This limit is based on Pmax.
Hz	The active power is limited via a frequency increase.
Tmp	The active power is limited due to temperature derating.
AmpPv	The active power is limited via a PV current limitation.
AmpAC	The active power is limited via an AC current limitation.

7.4 Displaying Error Messages and Warnings for Active Power Limitation

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

- Display the instantaneous value **P-WModFailStt** on the SC-COM user interface (see Section 6.1).

Display	Cause and corrective measures
Off	No procedure for active power limitation has been chosen.
Ok	A procedure for active power limitation has been chosen and there are no errors.
ComFail	The **WCtlCom** procedure has been chosen and the expected signal with a valid active power limitation has been absent for at least 5 minutes. Corrective measures: • Ensure that the SC-COM and the Power Reducer Box or Power Plant Controller can be accessed via the Internet. • Ensure that the SC-COM and the Power Reducer Box or Power Plant Controller are connected correctly. • Ensure that the cabling between the SC-COM and Power Reducer Box or Power Plant Controller is OK.
AnInFail	The **WCnstNomAnIn** procedure has been chosen and the value measured at the analogue input is less than 2 mA. Corrective measures: • Ensure that the signal cable is correctly connected to the analogue input.
ComInvalid	The **WCtlCom** procedure has been chosen and the information about the specified power output contains invalid content. Corrective measures: • Check the power specification settings of the SC-COM.

8 Reactive Power Regulation

8.1 Procedure for Regulating the Reactive Power

8.1.1 Selecting the Procedure With the Parameter Q-VArMod

The Sunny Central can supply reactive power if required by the network operator. The network operator defines the procedures to be used and target values for this.

You can set the procedure for reactive power regulation via the parameter **Q-VArMod**. You use the parameter to configure how the network operator instructions should be received and implemented.

There are eleven different procedures for reactive power regulation. The default value for this parameter is **Off**.

If a displacement power factor cos φ of 1 is to be observed permanently, SMA Solar Technology AG recommends using the **PFCnst** procedure.

Procedure	Description
Off	The reactive power target value is limited to 0 kVAr.
VArCtlCom	The reactive power target value is received by the SC-COM via the Power Reducer Box or Power Plant Controller and then transmitted to the Sunny Central.
PFCtlCom	The reactive power target value is received by the SC-COM via the Power Reducer Box or Power Plant Controller and then transmitted to the Sunny Central. A displacement power factor cos φ is transmitted as a target value.
VArCnst	The **Q-VAr** parameter is used to set the reactive power target value in kVAr.
VArCnstNom	The **Q-VArNom** parameter is used to set the reactive power target value in % based on **Pmax**.
VArCnstNomAnIn	The reactive power target value is imported via an analogue input. The analogue value is converted into a reactive power target value.
PFCnst	The reactive power target value is set using a displacement power factor cos φ.
PFCnstAnIn	The reactive power target value is imported through the analogue input for specifying target values. The analogue value is converted into a displacement power factor cos φ.
PFCtlW	The displacement power factor cos φ is set depending on the feed-in capacity. The dependency is depicted by a configurable characteristic curve.
VArCtlVol	The reactive power is set dependent on the line voltage. The parameterization of this function depends on the medium voltage.

Procedure	Description
VArCtlVolHystDb	The supply of reactive power helps perform voltage-stabilising measures in the event of overvoltage or undervoltage. The parameters are configured using a reactive power/voltage characteristic curve.

Parameter blocking

The parameter **Q-VArMod** may only be changed in the "Stop" operating state. The entry will not be accepted in other operating states.

Setting the procedure for regulating reactive power and associated parameters

1. Ensure that the inverter is in the "Stop" operating state.
2. Access the SC-COM user interface.
3. Enter the password in the appropriate field on the homepage and confirm with [**Login**].
4. Change the parameter **Q-VArMod** (see Section 6.2).
5. Change the parameters belonging to the selected procedure.
6. Confirm the parameter entries with [**Save**].

8.1.2 Off Procedure

The reactive power target value is limited to 0 kVAr. This target value cannot be influenced.

Parameters used none

8.1.3 VArCtlCom Procedure

The reactive power target value is received by the SC-COM via the Power Reducer Box or Power Plant Controller and then transmitted to the Sunny Central. The target value is transmitted as a percentage and converted to kVAr in the device.

If the Sunny Central has received no signal for 5 minutes, the **Q-VArModFailStt** error message will be displayed (see Section 8.2).

Parameters used none

8.1.4 PFCtlCom Procedure

The reactive power target value is received by the SC-COM via the Power Reducer Box or Power Plant Controller and then transmitted to the Sunny Central. A displacement power factor cos φ is transmitted as a target value.

If the Sunny Central has received no signal for five minutes, the error message in the instantaneous value **Q-VArModFailStt** will be displayed (see Section 8.2).

Parameters used none

8.1.5 VArCnst Procedure

The reactive power target value is set using the parameter **Q-VAr**. Note that the **Q-VAr** parameter may be within the **–Qmax** ... **+Qmax** range.

Parameters used Q-VAr

8.1.6 VArCnstNom Procedure

The **Q-VArNom** parameter is used to set the reactive power target value in %. The **Q-VArNom** parameter 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**.

Parameters used Q-VArNom

8.1.7 VArCnstNomAnIn Procedure

The reactive power target value is set on the input terminals using an analogue signal for specifying the target value (see the inverter installation manual). This is usually accomplished via a radio ripple control receiver.

The analogue value is converted into a reactive power target value. The current strength of the connected signal determines the target value.

The analogue measured values must be between 4 mA and 19 mA. If the analogue signal is less than 2 mA, the error message will be displayed in the instantaneous value **Q-VArModFailStt** (see Section 8.2).

Signal	Power limit	Description
< 2 mA	Last valid value or 0 kVAr after restart	Signal is in the invalid range.
2 mA ... 4 mA	**–Pmax**	The maximum amount of negatively excited reactive power is fed in.

Signal	Power limit	Description
4 mA	**–Pmax**	Start point of the characteristic curve. Maximum 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	**+Pmax**	End point of the characteristic curve. Maximum positively excited reactive power is fed in.

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

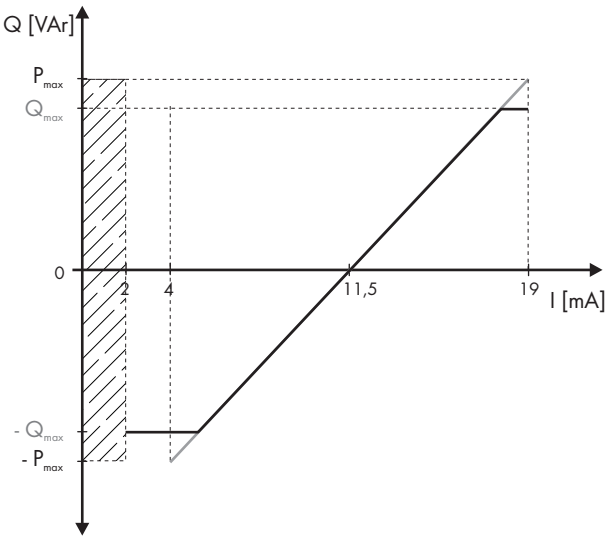


Figure 20: Limiting the parameter **Pmax** to the parameter **Qmax**

If the value of **Pmax** exceeds the value of **Qmax**, the characteristic curve of the value Q_{max} will be limited to **Qmax** and the reactive power value in the range from $+Q_{max}$ to $_{+Pmax}$ will remain constant at **Qmax**.

If the value of –**Pmax** falls below the value of –**Qmax**, the characteristic curve of the value $-Q_{max}$ will be limited to –**Qmax** and the reactive power value in the range from $-P_{max}$ to $-Q_{max}$ will remain constant at –**Qmax**.

Parameters used none

8.1.8 PFCnst Procedure

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.

Parameters used PF-PF
PF-PFExt

8.1.9 PFCnstAnIn Procedure

The reactive power target value is set on the input terminals using an analogue signal for specifying the target value (see the inverter installation manual). This is usually accomplished via a radio ripple control receiver.

The analogue value is converted into a displacement power factor cos φ. The current strength of the connected signal determines the target value.

The analogue measured values must be between 4 mA and 19 mA. If the analogue signal is less than 2 mA, the error message will be displayed in the instantaneous value **Q-VArModFailStt** (see Section 8.2).

Signal	Power limit	Description
< 2 mA	Last valid value, or 1 after restart	Signal is in the invalid range.
2 mA ... 4 mA	**PFAbsMin** / underexcited	The maximum amount of negatively excited reactive power is fed in.
4 mA	**PFAbsMin** / underexcited	Starting point of the characteristic curve. Maximum amount of negatively excited reactive power is fed in.
11.5 mA	1	Zero-crossing of the characteristic curve. No reactive power is fed in.
> 19 mA	**PFAbsMin** / overexcited	End point of the characteristic curve. Maximum positively excited reactive power is fed in.

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

Parameters used PFAbsMin

8.1.10 PFCtlW Procedure

For the procedure **PFCtlW**, the displacement power factor cos φ is set depending on the feed-in capacity. The dependency is depicted by a configurable characteristic curve. The characteristic curve can be set as increasing or decreasing. The start and end points of the characteristic curve can be set via parameters.

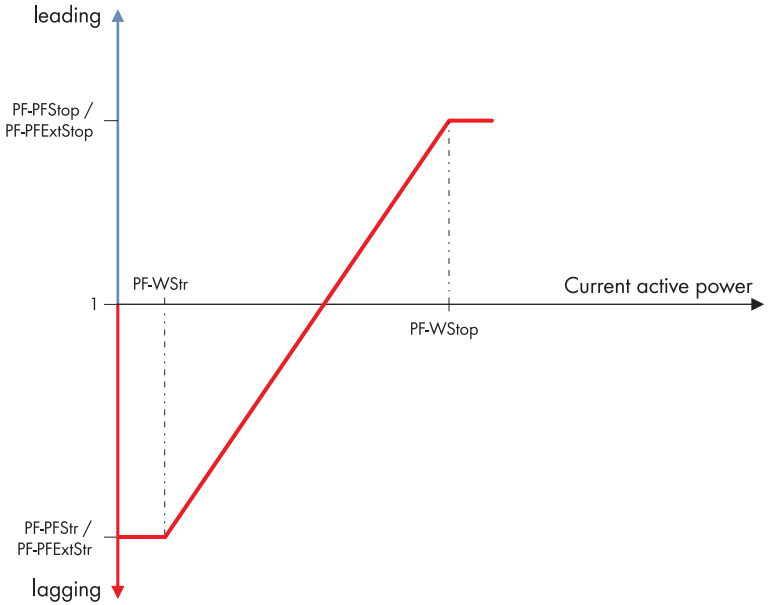


Figure 21: Characteristic curve for reducing reactive power dependent on active power

On the basis of a linear characteristic curve with an upper and lower limit, a displacement power factor cos φ can be regulated according to the active power fed in at the time. The start and end points of the characteristic curve can be set via parameters. The course of the characteristic curve is determined by the setting of the start- and end points.

Parameters used

PF-PFStr
PF-PFExtStr
PF-PFStop
PF-PFExtStop
PF-WStr
PF-WStop

8.1.11 VArCtlVol Procedure

Contact the SMA Service Line before changing any parameters

The **VArCtlVol** procedure may only be selected and configured after consultation with the SMA Service Line.

The reactive power is set dependent on the line voltage. The reactive power target value is adjusted in stages.

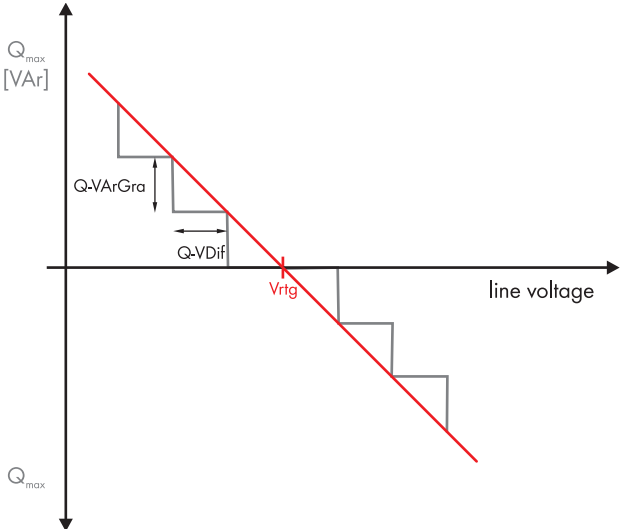


Figure 22: Characteristic curve for reducing reactive power dependent on line voltage

If the line voltage and the configurable voltage difference **Q-VDif** change for the configurable duration of **Q-VDifTm**, the reactive power setpoint is adapted to the **Q-VArGra** value.

The configuration of this function is based on the mean voltage.

Parameters used	Q-VDif Q-VArGra Q-VDifTm Q-VRtgOfsNom

8.1.12 VArCtlVolHystDb Procedure

Contact the SMA Service Line before changing any parameters

The **VArCtlVolHystDb** procedure may only be selected and configured after consultation with the SMA Service Line.

By supplying reactive power, the inverter takes on voltage support functions in the event of overvoltage or undervoltage. The parameters are configured using a reactive power/voltage characteristic curve. The characteristic curve can be flexibly configured by setting parameters for the slope, a type of deadband through 2 voltage points, and a hysteresis.

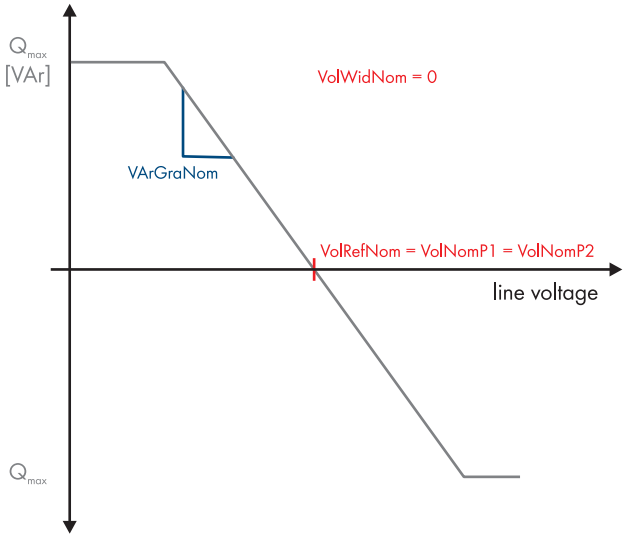


Figure 23: Characteristic curve for reducing reactive power without deadband and without hysteresis

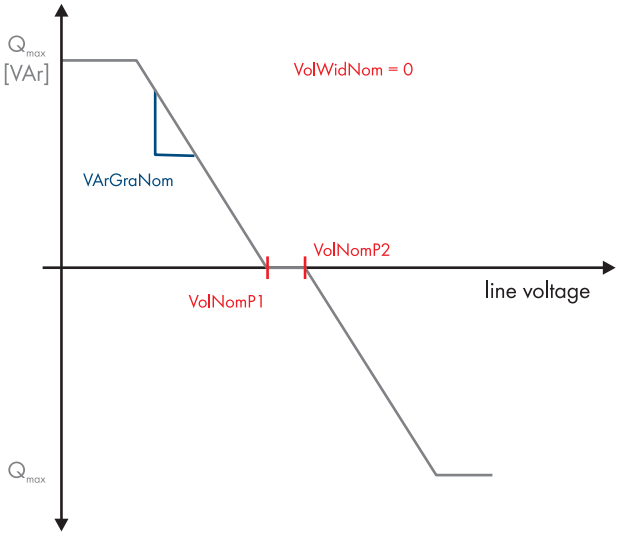


Figure 24: Characteristic curve for reducing reactive power with deadband

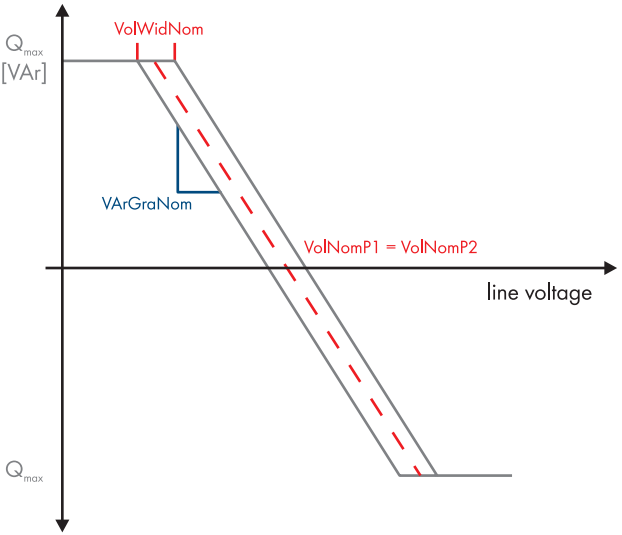


Figure 25: Characteristic curve for reducing reactive power with hysteresis

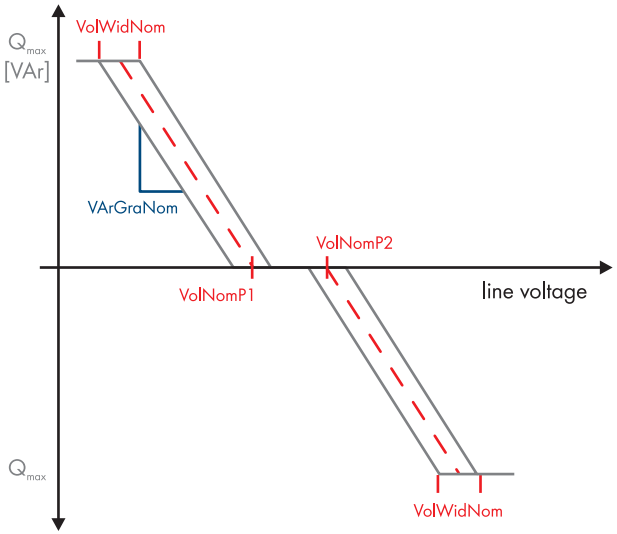


Figure 26: Characteristic curve for reducing reactive power with deadband and hysteresis

The **Q-VArTmsSpnt** parameter determines the delay time after which the calculated reactive power target value is actively used.

In order to prevent several systems with this function from influencing each other, you can use the **Q-VArTmsVtg** parameter to set a delay time. This delay specifies how long a voltage change must be pending before it results in a change to the reactive power supply. This allows several systems to alternately regulate the line voltage at the grid connection joint.

You can activate and deactivate the delay time using the parameter **Q-EnaTmsVtg**.

Parameters used	Q-VolWidNom Q-VolNomP1 Q-VolNomP2 Q-VArGraNom Q-VArTmsSpnt Q-VArTmsVtg Q-EnaTmsVtg

8.2 Displaying Error Messages and Warnings for the Reactive Power Setpoint

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

- Display the instantaneous value **Q-VArModFailStt** on the SC-COM user interface (see Section 6.1).

Display	Description
Off	No procedure for specifying the reactive power setpoint has been chosen.
Ok	A procedure for specifying the reactive power setpoint has been chosen and there are no errors.
ComFail	The **VArCtlCom** or **PFCtlCom** procedure has been chosen and the expected signal with a valid reactive power setpoint has been absent for at least 5 minutes. Corrective measures: • Ensure that the SC-COM and the Power Reducer Box or Power Plant Controller can be accessed via the Internet. • Ensure that the SC-COM and the Power Reducer Box or Power Plant Controller are connected correctly. • Ensure that the cabling between the SC-COM and Power Reducer Box or Power Plant Controller is OK.
AnInFail	The **VArCnstNomAnIn** or **PFCnstNomAnIn** procedure has been chosen and the value measured at the analogue input is less than 2 mA. Corrective measures: • Ensure that the signal cable is correctly connected to the analogue input.
ComInvalid	The **VArCtlCom** or **PFCtlCom** procedure has been chosen and the information about the specified power output contains invalid content. Corrective measures: • Check the power specification settings of the SC-COM.

9 Grid Monitoring

9.1 How Grid Monitoring Works

The Sunny Central monitors the power distribution grid to make sure it stays within a definable range of threshold values. If these threshold values are exceeded or fallen below for a set time period, the Sunny Central will disconnect itself from the electricity grid for safety reasons.

The following threshold values are monitored:

- Drop in voltage
- Increase in voltage
- Drop in frequency
- Increase in frequency

A tripping delay time, stipulating how long the grid failure must be present before the Sunny Central disconnects from the power distribution grid, can be set for each threshold value.

9.2 Setting Line Voltage Monitoring

You can manually specify the threshold values and the tripping time. For voltage monitoring, two limits can be set for overvoltage and two limits for undervoltage.

If the line voltage increases above the value defined in the parameters **VCtlhLim** or **VCtlhhLim**, the Sunny Central waits for the period defined in the parameters **VCtlhLimTm** or **VCtlLimhhTm** before disconnecting from the electricity grid.

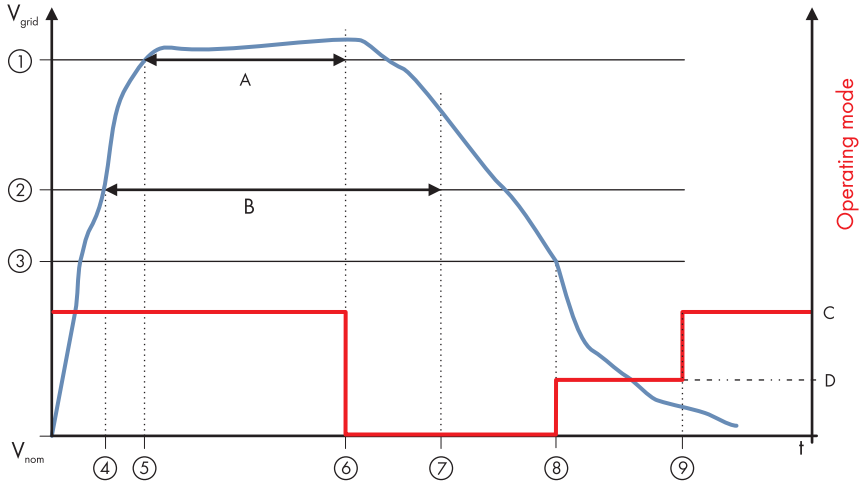


Figure 27: Temporal behaviour of the Sunny Central in the event of grid limits being exceeded

Object	Parameters	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	Line voltage limit level 2
2	VCtlhLim	Line voltage limit level 1
3		Connection limit, maximum nominal voltage deviation
4		Grid limit level 1 is breached, timer for B starts
5		Grid limit level 2 is breached, timer for A starts
6		Grid limit level 2 for delay time level 2 is breached → grid disconnection
7		Grid limit level 1 for delay time level 1 is breached → grid disconnection (already occurred on level 2)
8		Connection conditions fulfilled → grid monitoring time starts
9		Electricity grid within valid range during grid monitoring time → grid connection

Contact the SMA Service Line before changing any parameters

The parameters for grid monitoring may only be selected and configured after consultation with the SMA Service Line.

1. Access the SC-COM user interface.
2. Enter the password in the appropriate field on the homepage and confirm with [**Login**].
3. Change the parameters for grid monitoring (see Section 6.2).
4. Confirm the parameter entries with [**Save**].

9.3 Setting Power Frequency Monitoring

You can manually specify the threshold values and the tripping time. 3 limits each for overvoltage and undervoltage can be set for frequency monitoring.

So, for example, tripping can occur after 1 second in the event of an overfrequency of 50.5 Hz, or even after 0.1 seconds in the event of 51.5 Hz.

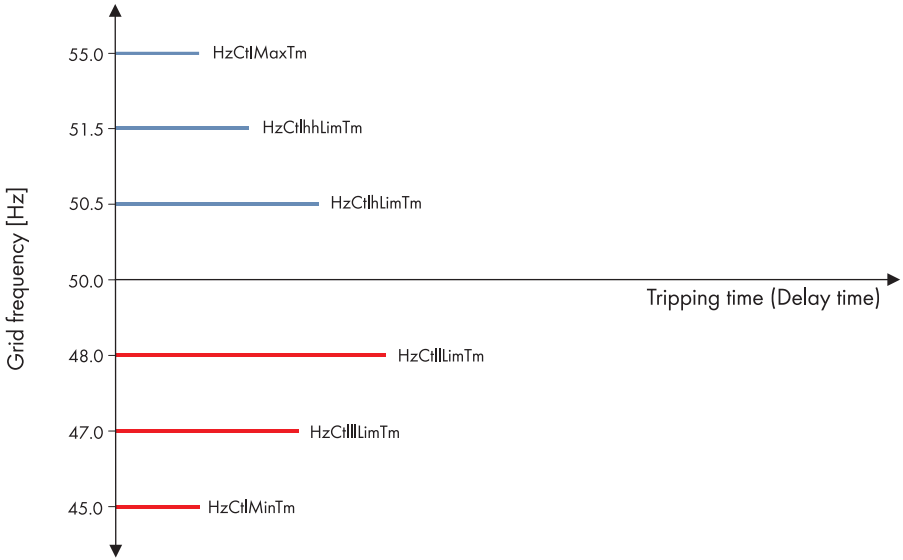


Figure 28: Tripping characteristics and time-dependant performance illustrated based on the frequency monitoring

Contact the SMA Service Line before changing any parameters

The parameters for grid monitoring may only be selected and configured after consultation with the SMA Service Line.

1. Access the SC-COM user interface.
2. Enter the password in the appropriate field on the homepage and confirm with [**Login**].
3. Change the parameters for grid monitoring (see Section 6.2).
4. Confirm the parameter entries with [**Save**].

9.4 Grid Connection after Fault Correction

If a grid fault in the inverter has been corrected, the inverter will only switch on once the line voltage meets certain conditions. For example, the line voltage and the power frequency must remain within the set threshold values for grid connection for the duration of the grid monitoring period. Until the grid connection conditions are met, the error message **1500 - Reconnection fault grid** appears on the touch display.

9.5 Setting the Active Power Ramp-up

During start-up of the inverter, you can set the feed-in capacity to ramp up using the parameter **WGra**. This means that the inverter increases the feed-in capacity step by step with the set percentage value per second.

If you do not set this parameter the inverter will reach its maximum feed-in capacity in 400 ms.

1. Access the SC-COM user interface.
2. Enter the password in the appropriate field on the homepage and confirm with [**Login**].
3. Set the **WGra** parameter to the required value (see Section 6.2).
4. Confirm the parameter entries with [**Save**].

9.6 Setting the Medium Voltage

The medium voltage of the inverter must match the medium voltage of the medium voltage grid.

It is important that the transmission ratio of the external medium-voltage transformer is adjusted at the same time. The undervoltage side is already preset depending on the specific device.

The default value of the parameter **VRtg** is specified in the parameter list (see Section 13.1.2 "Grid Monitoring / Grid Limits", page 122).

1. Access the SC-COM user interface.
2. Enter the password in the appropriate field on the homepage and confirm with [**Login**].
3. Set the **TrfVolExlHi** parameter (see Section 6.2).
4. Set the parameter **VRtg**.
5. Confirm the parameter entries with [**Save**].

10 Behaviour of the Inverter During Insulation Faults

10.1 Switching Insulation Monitoring Between Earthed and Insulated Operation

10.1.1 Insulating PV Modules Equipped with GFDI and Insulation Monitoring Device

⚠ DANGER

Danger to life due to electric shock.

The components in the inverter are live. Touching live components can result in serious injury or death.

- Wait 15 minutes after switching off the inverter before opening it. This ensures that the capacitors are electrically discharged.
- Do not touch live component parts.

The insulation monitoring device with GFDI does not provide protection from injury.

The "GFDI and insulation monitoring device" option allows you to manually switch the PV array from earthed operation to insulated operation. To ensure that there is no insulation fault on the earthed pole, an insulation measurement is carried out. After switching to insulated operation, the insulation monitoring device checks each pole of the PV array for potential insulation faults.

Switching to insulated operation is useful whenever you need to perform maintenance or service work on or near the PV array (e.g. cutting the grass) or to check the status of the insulation at regular intervals.

Switching PV modules from earthed to insulated operation

1. Set the key switch on the inverter to **Stop**.
2. Wait 15 minutes. This ensures that the capacitors are electrically discharged.
3. Open the inverter.
4. Manually switch off the GFDI miniature circuit-breaker.
5. Close the inverter.
6. Set the key switch on the inverter to **Start**.

   ☑ The insulation monitoring device starts collecting data. The error **3505 – Ground fault ignored** appears. This error indicates that the PV array is operating without an earthing connection.

   ✖ The displayed errors **3501** or **3502** do not disappear?

   The insulation is defective.

   - Have the insulation checked and, if necessary, repaired by a qualified person.
   - Acknowledge the error (see Section 11.2).

7. After a few minutes, display the instantaneous value **Riso** on the SC-COM user interface (see Section 6.1).
   ☑ Ensure that the insulation resistance is greater than 45 k Ω . It is safe to enter the plant.
   ✖ The insulation resistance is less than 45 k Ω ?
   There is an insulation fault and the plant must not be entered.
   - Have the insulation checked and, if necessary, repaired by a qualified person.

Switching PV modules from insulated to earthed operation

1. Set the key switch on the inverter to **Stop**.
2. Wait 15 minutes. This ensures that the capacitors are electrically discharged.
3. Open the inverter.
4. Switch on the GFDI miniature circuit-breaker.
5. Close the inverter.
6. Set the key switch on the inverter to **Start**.
   ☑ The inverter is running in earthed operation and the error **3505 – Ground fault ignored** is no longer displayed.

10.1.2 Insulating PV Modules Equipped with Remote GFDI and Insulation Monitoring Device

Earth fault monitoring with remote GFDI does not provide protection from injury.

The "Remote GFDI and insulation monitoring device" option allows for an automatic switching of the PV array from earthed operation to insulated operation. To ensure that there is no insulation fault on the earthed pole, an insulation measurement is carried out. After switching to insulated operation, the insulation monitoring device checks each pole of the PV array for potential insulation faults.

Switching to insulated operation is useful whenever you need to perform maintenance or service work on or near the PV array (e.g. cutting the grass) or to check the status of the insulation at regular intervals.

Switching PV modules from earthed to insulated operation

- Set the parameter **RemMntSvc** to **On** (see Section 6.2).
  ☑ The insulation monitoring device starts collecting data. The error **3505 – Ground fault ignored** appears. This error indicates that the PV array is operating without an earthing connection.
  ✖ The displayed errors **3501** or **3502** do not disappear?
  The insulation is defective.
  - Have the insulation checked and, if necessary, repaired by a qualified person.
  - Acknowledge the error.

Switching PV modules from insulated to earthed operation

- Set the parameter **RemMntSvc** to **Off** (see section 6.2).
  ☑ The inverter is running in earthed operation.

10.1.3 Insulating PV Modules Equipped with Remote Soft Grounding and Insulation Monitoring Device

Earth fault monitoring with remote soft grounding does not provide protection from injury.

The "Remote soft grounding and insulation monitoring device" option permits automatic switching of the PV array from earthed operation to insulated operation. To ensure that there is no insulation fault on the earthed pole, an insulation measurement is carried out. After switching to insulated operation, the insulation monitoring device checks each pole of the PV array for potential insulation faults.

Switching to insulated operation is useful whenever you need to perform maintenance or service work on or near the PV array (e.g. cutting the grass) or to check the status of the insulation at regular intervals.

Switching PV modules from earthed to insulated operation

- Set the parameter **RemMntSvc** to **On** (see Section 6.2).
  ☑ The insulation monitoring device starts collecting data. The error **3505 – Ground fault ignored** appears. This error indicates that the PV array is operating without an earthing connection.
  ✖ Other displayed errors do not disappear?
  The insulation is defective.
  - Have the insulation checked and, if necessary, repaired by a qualified person.
  - Acknowledge the error.

Switching PV modules from insulated to earthed operation

- Set the parameter **RemMntSvc** to **Off** (see section 6.2).
  ☑ The inverter is running in earthed operation.

10.2 Setting the Automatic Error Processing with Optiprotect and Insulated PV Arrays

Since troubleshooting with the automatic switching of the individual substrings takes approx. 3 hours, you can switch this function off using the parameter **IsoSmidOutGrp** via the SC-COM user interface. The inverter does not feed-in during troubleshooting.

1. Select the **Parameters** tab.
2. Set the parameter **IsoSmidOutGrp** to the desired value.

Value	Description
Auto	The system starts troubleshooting automatically.
Man	The troubleshooting does not start automatically. The system only starts deselecting the faulty substrings once the value of this parameter has been set to **Start**. This value is the default value.
Start	If an insulation fault is present and the **Man** value is set, the system only begins troubleshooting once the **Start** value is set. Once troubleshooting is completed, the value is automatically reset to **Man**.

3. Confirm the entry with [**Save**].

11 Errors and Warnings

11.1 Viewing Errors and Warnings

11.1.1 Viewing Errors and Warnings via the Touch Display

If an error occurs, the touch display shows a warning symbol.

- Select the  warning symbol.
  ☑ The display lists the error number, delay time, error message and corrective measure.

11.1.2 Viewing Errors and Warnings via the SC-COM User Interface

You can view errors on a PC or laptop via the SC-COM interface.

The SC-COM operating manual contains a detailed description of the SC-COM user interface.

1. Access the **Instantaneous values** tab on the SC-COM user interface (see Section 6.1).
2. Select **ErrNo** instantaneous value.
   ☑ The error number of the error occurring is displayed.

11.2 Acknowledging Errors and Warnings

11.2.1 Acknowledging Errors and Warnings via the Key Switch

Handling errors

Errors should only be acknowledged once they have been corrected.

1. If there is an insulation fault, switch the insulation monitoring device back on.
2. Turn the key switch to **Stop** and then back to **Start** after 2 seconds.

11.2.2 Acknowledging Errors and Warnings via the SC-COM User Interface

Handling errors

Errors should only be acknowledged once they have been corrected.

You can only acknowledge errors via the SC-COM user interface after the installer password has been entered. The SC-COM operating manual contains a detailed description of the SC-COM user interface.

1. If there is an insulation fault, switch the insulation monitoring device back on.
2. Select the **Ackn** parameter in the device that displayed the error and set to **Ackn** (see Section 6.2).
3. Confirm the entry with [**Save**].

11.3 Displaying the Error Delay Time

Certain errors such as grid faults will cause the Sunny Central to shut down. If this happens, the Sunny Central waits a certain time before restarting. This is the error delay time (**TmsRmg**).

If the Sunny Central has a touch display, it will show the delay time when viewing the error.

1. Access the **Instantaneous values** tab on the SC-COM user interface (see Section 6.1).
2. View the delay time via the **TmsRmg** channel.

11.4 Error Detection by String Current Monitoring with Optiprotect

11.4.1 LED Signals on the SMIDCont

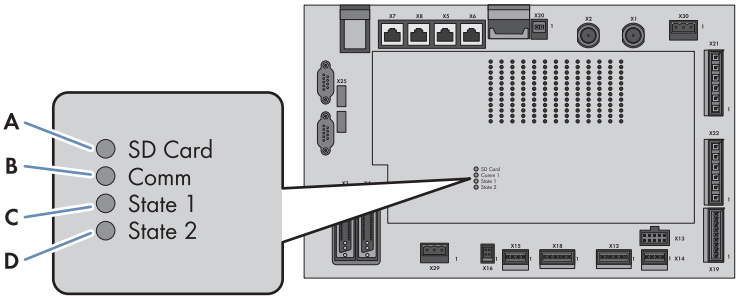


Figure 29: SMIDCont

Position	Description	Explanation
A	SD card	Status of the SD card
B	Comm	Display for SMA Service
C	State 1	Display of diagnostics messages
D	State 2	Display for SMA Service

LED SD CARD

Colour	Status	Explanation
Green	Is lit	SD card inserted
Orange	Flashing	Accessing to the SD card
Orange	Is lit	Error - the SD card is not formatted
Red	Is lit	Error - SD card is full
–	Off	No SD card inserted

LED State 1

Colour	Status	Explanation
Green	Is lit	No error
Orange	Is lit	Warning
Red	Is lit	Error; the inverter is not feeding in

11.4.2 LED Signals on the SMIDCT

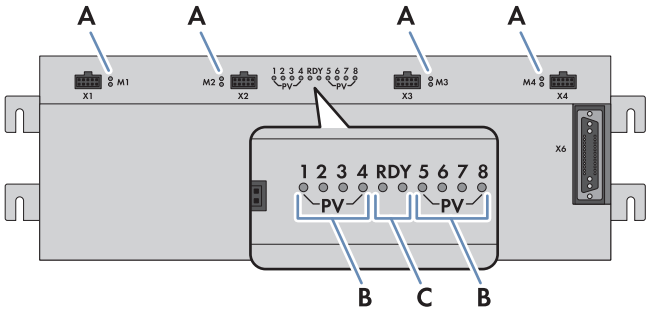


Figure 30: SMIDCT

Position	Description
A	Motor switch LEDs
B	Status LEDs of the PV strings
C	Status LEDs of the assemblies - only for service use

Motor switch LEDs

Colour	Status	Explanation
Red	Is lit	Temporary switch error
Red	Flashing	Permanent switch error
Yellow	Is lit	The motor-driven circuit breakers have made more than 90% of their permitted switching cycles.
Yellow	Flashing	The motor-driven circuit breakers have made more than 100% of their permitted switching cycles. • Replace the circuit breakers
–	Off	No error

Status LEDs of the PV strings

Colour	Status	Explanation
Red	Flashing	Reverse current on this string
Red	Is lit	String breakdown on this string
–	Off	No string breakdown

11.5 Error Messages

11.5.1 Inverter Behaviour in the Event of an Error

If a disturbance occurs during inverter operation, this may be a warning or error.

Each disturbance has two levels that influence the display and system behaviour. The inverter only behaves differently in the two levels with a few disturbances. The disturbance level changes from 1 to 2 if the disturbance occurs five times within two hours or occurs permanently for two hours.

A warning does not affect inverter behaviour. The cause of the warning must be established and remedied.

If operation is interrupted during an error, the inverter switches to the "Disturbance" operating state and opens the DC and AC contactors. "Error", the error number, error message and a symbol are displayed on the touch display (see Section 4.2.3 "Navigation Line", page 52).

If the cause of the error is rectified and the error is no longer displayed, the error is deleted from the fault memory. To view previous errors after they have been deleted from the fault memory, an event and disturbance file is saved on the SD card. The time when an error occurred and the type of error are entered in the event and disturbance file. This file also contains entries of relevance to service.

You will find the following information in the error tables in Section 11.5.2, 11.5.3 and 11.5.4:

Information	Level	Behaviour	Explanation
Error no.	-	-	Clearly identifies the disturbance present
Explanation	-	-	Identifies possible causes of the disturbance
Inverter behaviour			Depends on the severity of the disturbance
	Disturbance level **S1**, disturbance level **S2**	Warning (**W**)	The inverter has issued a warning that has no impact on how the inverter behaves.
		Time	The inverter has detected an error and switches into the "Disturbance" operating state. The DC and AC contactor opens and the inverter does not feed in electricity for the specified time. The time indicates for how long the error is displayed on the touch display and is saved in the inverter as an error. If the time has expired, the error is no longer shown on the touch display. The inverter then checks whether the cause of the error has been rectified. If the cause of the error still exists after the time has expired or the error has been acknowledged, the error occurs again and the inverter remains in the "Disturbance" operating state.
		Acknowledge	The inverter switches into the "Disturbance" operating state, opens the DC and AC contactors and does not feed in electricity until the error has been manually acknowledged. When the error has been acknowledged, it is no longer shown on the touch display. The inverter then checks whether the cause of the error has been rectified. If the error is no longer present, it is deleted from the memory. If the cause of the error still exists after the error has been acknowledged, the error occurs again.

Information	Level	Behaviour	Explanation
		Day change	The inverter switches into the "Disturbance" operating state, opens the DC and AC contactors and does not feed in electricity. The error message is automatically reset when the day changes. If the error has been reset, it is no longer shown on the touch display. The inverter then checks whether the cause of the error has been rectified. If the error is no longer present, it is deleted from the memory. If the cause of the error still exists after the day has changed or after the error has been acknowledged, the error occurs again.
		Plant-spec.	The inverter switches into the "Disturbance" operating state, opens the DC and AC contactors and does not feed in electricity. How long the inverter remains in this state depends on the plant-specific influencing factors. If the time has expired, the error is no longer shown on the touch display. The inverter then checks whether the cause of the error has been rectified. If the error is no longer present, it is deleted from the memory.
	Reset (**R**)	-	The control is restarted. The relays are checked and the control's voltage supply is switched off. This process takes less than one minute. When the control is powered up, the inverter's regular waiting times for grid monitoring are maintained.
Corrective measures	-	-	The corrective measures specify measures that can help you rectify the error.

11.5.2 Error Numbers 01xx ... 13xx – Disturbance on the Electricity Grid

After a grid failure, the inverter monitors the electricity grid for a specific period until it is reconnected.

If the inverter monitors the electricity grid after a grid error, the grid monitoring time is maintained.

Certain errors such as grid faults will cause the Sunny Central to shut down. In this case, the instantaneous value **TmsRmg** indicates the time during which the inverter monitors the electricity grid until it is reconnected. This grid monitoring time can be defined in parameter **GdErrTm**.

Error no.	Explanation	Inverter behaviour			Corrective measures
		S 1	S 2	R	
0103	Line voltage is too high. Overvoltage detected through redundant monitoring.	30 s	30 s	-	• Check the line voltage. • Check the grid connections. • Check the stability of the electricity grid. • Ensure that the external fuses are functioning properly. • Ensure that the AC cable connections are securely connected.
0104	Line voltage is too high. Overvoltage detected through standard monitoring.	30 s	30 s	-	
0203	Line voltage is too low. Undervoltage detected through redundant monitoring.	30 s	30 s	-	
0204	Line voltage is too low. Undervoltage detected through standard monitoring.	30 s	30 s	-	
0205	An electricity grid phase has failed.	30 s	30 s	-	
0502	Power frequency is too low. Grid frequency disturbance detected through standard monitoring.	30 s	30 s	-	• Check power frequency. • Check the grid monitoring relay display. • Ensure that the fuses in the load circuit are functioning properly.
0503	Power frequency is too high. Grid frequency disturbance detected through standard monitoring.	30 s	30 s	-	
0504	Power frequency is too low. Grid frequency disturbance detected through redundant monitoring.	30 s	30 s	-	
0505	Power frequency is too high. Grid frequency disturbance detected through redundant monitoring.	30 s	30 s	-	

Error no.	Explanation	Inverter behaviour			Corrective measures
		S 1	S 2	R	
0506	The inverter has detected a stand-alone grid and disconnected from the electricity grid.	Immed-iately	Immed-iately	-	• Check power frequency.
0801	An electricity grid phase has failed.	30 s	30 s	-	• Check the line voltage. • Ensure that the external fuses are functioning properly. • Ensure that the AC cable connections are securely connected.
1301	Left phase sequence is connected.	Ack-now-ledge	Ack-now-ledge	-	• Check phase position. • Make sure that all fuses are switched on.
1500	The grid engagement conditions are not achieved again after a grid error.	W	W	-	• Check power frequency and line voltage.

11.5.3 Error Numbers 34xx ... 40xx – Disturbance on PV Array

Error no.	Explanation	Inverter behaviour			Corrective measures
		S 1	S 2	R	
3403	The voltage of the PV array is too high.	15 min	30 min	-	• Check the DC input voltage. • Check the module wiring and plant design.
3404	Open-circuit voltage is too high Disturbance detected through standard monitoring.	15 min	30 min	-	
3501	The insulation monitoring device has measured too low an earthing resistance. For the options "GFDI and insulation monitoring device" and "Remote GFDI and insulation monitoring device", the insulation monitoring device is only active when the GFDI or the remote GFDI is open.	Plant-spec.	Plant-spec.	-	• Check the PV array for earth faults.
3502	The GFDI has tripped.	Plant-spec.	Plant-spec.	-	
3504	The insulation monitoring device has detected an insulation failure. Since the parameter **IsoErrIgn** to **On**, this fault is ignored.	W	W	-	
3507	An earth fault has occurred on the unearthed pole of the PV array.	Ack-now-ledge	Ack-now-ledge	-	
3508	String disconnected because of a temporary earth fault.	W	W	-	
3509	String disconnected because of a permanent earth fault.	W	W	-	
3510	The inverter has found an insulation failure on the inverter bridge.	Ack-now-ledge	Ack-now-ledge	-	• Check the PV array for earth faults.
3512	The remote GFDI has detected a permanent earth fault.	Ack-now-edge	Ack-now-ledge	-	
3515	An earth fault detected through soft grounding has been ignored.	W	W	-	

Error no.	Explanation	Inverter behaviour			Corrective measures
		S 1	S 2	R	
3601	Leakage current is present on the PV array to earth.	W	W	-	• Check the earthing and equipotential bonding. • Check the module wiring and plant design.
3803	The current of the PV array is too high.	1 min	Day change	x	• Check the DC input current. • Check the module wiring and plant design.
4003	Reverse currents detected in the PV array or DC connection polarity is reversed.	30 s	Ack-now-ledge	-	• Check the PV modules for short circuits. • Check the module wiring and plant design. • Check the DC connections for correct polarity.
4004	String current monitoring has detected a faulty string.	W	W	-	• Check the functionality of the entire string.

11.5.4 Error Numbers 60xx ... 90xx – Disturbance on the Sunny Central

Error no.	Explanation	Inverter behaviour			Corrective measures
		S 1	S 2	R	
6002	Calibration data cannot be loaded.	W	W	-	• Contact the SMA Service Line.
6113	Data block cannot be loaded from the EEPROM or the channel list has changed (e.g. after a firmware update)	W	W	-	
6115	Hardware threshold values on the D/A converters cannot be set.	5 min	5 min	x	
6116	Real-time clock is not initialised.	W	W	-	
6117	Device address not recognised.	5 min	5 min	x	
6118	Invalid parameter file.	W	W	-	
6119	The data structure for the interchange between the operation control unit and the digital signal processor is invalid.	5 min	5 min	x	
6122	10 internal monitoring failures have occurred in succession.	W	5 min	-	
6404	Overcurrent on the phases L1, L2 or L3.	30 s	Ack-now-ledge	x	
6405	Overvoltage in the intermediate circuit.	30 s	5 min	x	
6410	24 V voltage supply is invalid.	5 min	5 min	x	
6417	15 V voltage supply is invalid.	5 min	5 min	x	
6418	Overtemperature on the inverter bridge.	5 min	5 min	x	

Error no.	Explanation	Inverter behaviour			Corrective measures
		S 1	S 2	R	
6422	The inverter bridge is in an undefined mode.	30 s	5 min	x	• Contact the SMA Service Line.
6423	Overtemperature detected in the switch cabinet.	30 s	5 min	x	
6425	Synchronisation failure with the electricity grid.	30 s	5 min	x	
6427	Sensor error of the DC voltage measurement.	30 s	Plant-spec.	x	
6440	Hermetic protection of the transformer no longer exists.	30 s	5 min	-	• Check external transformer.
6441	Sensor error occurred during measurement of the DC voltage.	30 s	30 s	-	• Contact the SMA Service Line.
6442	SMIDCT current measurement is working incorrectly.	W	W	-	
6443	An unspecified error has occurred in the digital signal processor.	30 s	30 s	x	
6447	Self-test in inverter bridge has failed	Ack-now-ledge	Ack-now-ledge	-	
6448	Insulation monitoring delivers non-permitted values.	W	W	-	• Check insulation monitoring.
6501	The temperature within the inverter is too high.	30 s	1 min	-	• Make sure the fans are working properly. • Clean the fans. • Clean dirty fan inlets and ventilation plates.
6502	The temperature at the power unit is too high.	30 s	1 min	-	
6508	The external temperature is too high.	30 s	1 min	-	
6510	The temperature at the DC connections is too high.	5 min	30 min	-	
6605	Quick stop has triggered.	30 s	1 min	-	• Contact the SMA Service Line.

Error no.	Explanation	Inverter behaviour			Corrective measures
		S 1	S 2	R	
7001	Cable break or short-circuit on the Sunny Central temperature sensor.	W	W	-	• Check temperature sensor wiring. • Contact SMA Service Line.
7002	Cable break or short-circuit at the Sunny Central temperature sensor.	W	W	-	
7006	Cable break or short-circuit at the Sunny Central temperature sensor.	W	W	-	
7501	Internal fan is faulty.	W	W	-	• Make sure the fans are working properly. • Clean the fans. • Clean dirty fan inlets and ventilation plates.
7502	Internal fan is faulty.	W	W	-	
7503	Stack fan is faulty.	W	W	-	
7507	Fan motor-protective circuit-breaker has triggered.	W	W	-	
7601	Internal Sunny Central error.	30 s	1 min	x	• Contact the SMA Service Line.
7602	An internal communication error has occurred.	30 s	1 min	x	
7704	Contactor fault at the DC disconnection point.	30 s	Ack-now-ledge	-	• When disconnecting the inverter, check that all motorised circuit breaker switches are set to the "OFF" position. If they are not, set all the switches to the "OFF" position (see the inverter installation manual). • Contact SMA Service Line.
7706	Error at the digital input of the AC disconnection point.	30 s	Ack-now-ledge	-	• Contact the SMA Service Line.
7707	Contactor fault at the AC disconnection point.	30 s	Ack-now-ledge	-	
7708	No remote GFDI response.	W	W	-	

Error no.	Explanation	Inverter behaviour			Corrective measures
		S 1	S 2	R	
7709	90% of the SMIDCT switch cycles reached.	W	W	-	• Replace the motor drive of the switch in the affected SMIDCT as soon as possible.
7710	100% of the SMIDCT switch cycles reached.	W	W	-	• Replace the motor drive of the switch in the affected SMIDCT.
7801	Surge arrester is faulty.	W	W	-	• Check the surge arrester.
7901	A reverse current has occurred in the PV array.	1 min	Day change	x	• Contact the SMA Service Line.
8701	External active power setpoints are less than 2 mA and therefore invalid. The last valid value is used or **Pmax** is used after the day has changed. Once the valid setpoints are available again, they are used.	W	W	-	
8703	External displacement power factor cos φ is invalid.	W	W	-	
8704	External active and reactive power setpoints are invalid.	W	W	-	
9000	Power electronics self-test is undertaken. This message disappears once the self-test has been run.	W	W	-	• No corrective measures possible.
9009	The quick stop was triggered manually.	30 s	30 s	-	• Switch quick stop on again after correcting the error.
9013	This relates to grid management shutdown (see Section 3.9.6). The error is reset via a signal from the network operator or a grid transfer point safety system signal.	30 s	30 s	-	• No corrective measures possible.

12 Instantaneous Values

12.1 Sunny Central

12.1.1 Power Limitation

Name	Description
P-WModFailStt	Error messages and warnings relating to active power limitation
P-WModStt	Status messages of the active power limitation for data logs
Q-VArModFailStt	Error messages and warnings relating to the reactive power setpoint
PF	Current displacement power factor cos φ
PFExt	Current excitation of the displacement power factor cos φ
P-WSpt	Current specified power output

12.1.2 Error Channels

Name	Description
Prio	Priority of the error message
Msg	Error message
Dsc	Measure for error correction
TmsRmg	Time until reconnection
Mode	Operating state of the inverter
Error	Localisation of the error
ErrNo	Error number
GriSwStt	Status of AC contactor

12.1.3 Measured Values

Name	Description
Vac	Line voltage in V
Iac	Line 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
ExtSollIrr	External irradiation sensor
Riso	Insulation resistance

12.1.4 Device-Internal Values

Name	Description
Firmware	Firmware version of the operation control unit
Firmware-2	Firmware version of the digital signal processor
Cntry	Country setting or specified standard
Dt	Date
Tm	Time
Type	Device type
DInExlStrStp	Status of the remote shutdown
DInKeySwStrStp	Status of the key switch

12.1.5 Internal Counters

Name	Description
h-On	Operating hours of the Sunny Central in h
h-total	Feed-in hours of the Sunny Central in h
E-total	Total feed-in energy in kWh
E-today	Power fed into the grid 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
CntHtCab2 *	Operating hours of the heater in h

* These instantaneous values can only be seen after the installer password has been entered.

12.1.6 Service-Related Displays

Display values that are only relevant to SMA Solar Technology are listed below.

Name	Description
GriSwStt	Service information for SMA Solar Technology AG
StkErrFirst	
StkErrFlgs	
LvrtVtgNom	
BfrSolIrr	
Firmware-3	
Firmware-4	
Firmware-5	
Firmware-6	
Firmware-7	
Firmware-8	
Firmware-9	
Mode	
ParaSetStt	
CardStt	
Fb_SVMMode	

12.2 Sunny Central String-Monitor Controller

12.2.1 Instantaneous Values

Name	Description
MeanCurGr*1*	Mean current for group 1; mean value exists for all 6 groups
SSMUWrnCode	String-failure detection
SSMUNoOf	Number of Sunny String-Monitors found

12.2.2 Device-Internal Values

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

12.2.3 Status Values

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

12.3 Sunny String-Monitor

12.3.1 Instantaneous Values

Name	Description
IString *1*	Mean current of string 1 over last 30 seconds; mean value exists for all 8 measuring channels

12.3.2 Device-Internal Values

Name	Description
Serial number	Serial number of the Sunny String-Monitor
Network address	Network address of the Sunny String-Monitor
Alarm contact 1	Status of alarm contact 1
Alarm contact 2	Status of alarm contact 2

12.3.3 Status Values

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

12.4 SMIDCont

12.4.1 Instantaneous Values

Name	Description
IGfdi	Leakage current of the GFDI
Ipv*1*.*1*.*A*	Measured current of the main string *1* on the SMIDCONT *1*, from the main string at input *A*. There are up to 32 main strings present in the system. There are up to 8 main strings connected to each SMIDCT, where 2 main strings are always consolidated into a pair. The exact spatial assignment can be read from the sticker on the SMIDCTs and on the motor-driven circuit breakers.
Riso*3*.*4*.	Measured insulation resistance of the main string 4 on the SMIDCT 3. There are up to 16 main strings present in the system. There are up to 4 main strings connected to each SMIDCT. The exact spatial assignment can be read from the sticker on the SMIDCTs and on the motor-driven circuit breakers.

12.4.2 Error Channels

Name	Description
Prio	Priority of the error message
Msg	Error message
Dsc	Measure for error correction
TmsRmg	Time until reconnection
Mode	Operating state of the inverter
Error	Localisation of the error
ErrNo	Error number

12.4.3 Device-Internal Values

Name	Description
Serial number	Serial number of the SMIDCont
Serial number *1*	Serial number of the SMIDCT *1*; this value exists for all 4 SMIDCTs.
Firmware	Firmware version of the SMIDCont
CTNoOf	Number of SMIDCTs present
Type	Type of the string current monitoring
Tm	Time
Dt	Date

12.4.4 Status Values

Name	Description	
StrgMonRemLrnTm	Days remaining in the learning phase	
StrgMonRunTm	Duration of the algorithm runtime	
StrgMonLrnStt	Status of the learning phase	
	Lrn	Learning phase not yet complete.
	Done	Learning phase complete.
DcInStt2.2.*B*	Status at input 2 of the SMIDCT 2, from the main string at input *B*. There are up to 32 main strings present in the system. There are up to 8 main strings connected to each SMIDCT, where 2 main strings are always consolidated into a pair. The exact spatial assignment can be read from the sticker on the SMIDCTs and on the motor-driven circuit breakers.	
	Ok	No errors are present.
	EvtStrgPwr	There is an error at the given main string.
	PaEvtStrgError	There is an error on a substring.
	StrgNotConn	No string is connected at the given input.
	EvtEFDcDscon	1 string at the given input was temporarily deselected due to an earth fault. The error will be automatically acknowledged.
	EvtEFDcDsconPmt	1 string at the given input was permanently deselected due to an earth fault.
	EvtRvA	An inverse current has occurred at the given input.
	EvtDcAmpMax	DC overcurrent was detected at the given input, the DC circuit-breaker has tripped.

Name	Description	
DcSwStt*4.4*	Switch status at the main string 4 of the SMIDCT 4. There are up to 16 main strings present in the system. There are up to 4 main strings connected to each SMIDCT. The exact spatial assignment can be read from the sticker on the SMIDCTs and on the motor-driven circuit breakers.	
	On	The switch at the given input is closed
	Off	The switch at the given input is open.
	EvtDcSwTr	The switch at the given input has triggered after overcurrent.
DInPwrSup12VCT*1*	Status of the voltage supply of the SMIDCT *1*; this value exists for all 4 SMIDCTs.	
	Ok	The voltage supply at the given input is ok.
	Error	The voltage supply at the given input is faulty.

12.4.5 Internal Counters

Name	Description
CntDcSwLd*1*.	Number of switch cycles of the SMIDCT*1* under load; this value exists for all 4 SMIDCTs.
CntDcSwNoLd*1*.	Number of switch cycles of the SMIDCT*1* without load; this value exists for all 4 SMIDCTs.
CntRSU3.2	Number of switching cycles of the motor drive of the switch at main string 2 on the SMIDCT3. There are up to 16 main strings present in the system. There are up to 4 main strings connected to each SMIDCT. The exact spatial assignment can be read from the sticker on the SMIDCTs and on the motor-driven circuit breakers.

12.4.6 Service-Related Displays

Name	Description
Firmware→	Service information for SMA Solar Technology AG
CardStt	

13 Parameters

13.1 Sunny Central

13.1.1 Power Limitation

Name	Description	Value / range	Explanation	Default value
Plimit*	Device nominal power	0 kW ... 500 kW	SC 500CP-JP	500 kW
		0 kW ... 550 kW	SC 500CP XT	550 kW
		0 kW ... 700 kW	SC 630CP XT	700 kW
		0 kW ... 792 kW	SC 720CP XT	792 kW
		0 kW ... 836 kW	SC 760CP XT	836 kW
		0 kW ... 880 kW	SC 800CP XT	880 kW
		0 kW ... 935 kW	SC 850CP XT	935 kW
		0 kW ... 990 kW	SC 900CP XT	990 kW
Pmax**	Limitation of the Sunny Central's nominal power	0 kW ... 500 kW	SC 500CP-JP	500 kW
		0 kW ... 550 kW	SC 500CP XT	550 kW
		0 kW ... 700 kW	SC 630CP XT	700 kW
		0 kW ... 792 kW	SC 720CP XT	792 kW
		0 kW ... 836 kW	SC 760CP XT	836 kW
		0 kW ... 880 kW	SC 800CP XT	880 kW
		0 kW ... 935 kW	SC 850CP XT	935 kW
		0 kW ... 990 kW	SC 900CP XT	990 kW

Name	Description	Value / range	Explanation	Default value
P-WMod**	Procedure selection 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 the active power in kW (P-W) via communication devices, such as the SC-COM	
		WCnstNom	Manually limits the active power in % (P-WNom) via communication devices, such as the SC-COM	
		WCnstNomAnIn	Limits active power in % at the analogue input	
		WCnstNomDigIn	Limits active power at the digital input This procedure is not supported.	

Name	Description	Value / range	Explanation	Default value
P-W	Limitation of active power in kW The active power cannot exceed "Pmax".	0 kW ... 1.000 kW	SC 500CP-JP	550 kW
		0 kW ... 1.000 kW	SC 500CP XT	550 kW
		0 kW ... 1.000 kW	SC 630CP XT	700 kW
		0 kW ... 1.000 kW	SC 720CP XT	792 kW
		0 kW ... 1.000 kW	SC 760CP XT	836 kW
		0 kW ... 1.000 kW	SC 800CP XT	880 kW
		0 kW ... 1.000 kW	SC 850CP XT	935 kW
		0 kW ... 1.000 kW	SC 900CP XT	990 kW
P-WNom	Limitation of active power in %	0% ... 100%		100%
WCtlHzMod**	Frequency regulation setpoint	Off	Deactivated	country-specific
		On	Activated	
P-HzStr**	Start point of the frequency regulation	40 Hz ... 70 Hz		country-specific
P-HzStop**	End point of the frequency regulation	40 Hz ... 70 Hz		country-specific
P-WGra**	Gradient of power reduction	1%/Hz ... 100%/Hz		40%/Hz

Name	Description	Value / range	Explanation	Default value
Qlimit*	Device reactive power	0 kVAr ... 220 kVAr	SC 500CP-JP	220 kVAr
		0 kVAr ... 245 kVAr	SC 500CP XT	245 kVAr
		0 kVAr ... 310 kVAr	SC 630CP XT	310 kVAr
		0 kVAr ... 346 kVAr	SC 720CP XT	346 kVAr
		0 kVAr ... 365 kVAr	SC 760CP XT	365 kVAr
		0 kVAr ... 385 kVAr	SC 800CP XT	385 kVAr
		0 kVAr ... 409 kVAr	SC 850CP XT	409 kVAr
		0 kVAr ... 433 kVAr	SC 900CP XT	433 kVAr
Qmax**	Limitation of the Sunny Central's reactive power	0 kVAr ... 220 kVAr	SC 500CP-JP	220 kVAr
		0 kVAr ... 245 kVAr	SC 500CP XT	245 kVAr
		0 kVAr ... 310 kVAr	SC 630CP XT	310 kVAr
		0 kVAr ... 346 kVAr	SC 720CP XT	346 kVAr
		0 kVAr ... 365 kVAr	SC 760CP XT	365 kVAr
		0 kVAr ... 385 kVAr	SC 800CP XT	385 kVAr
		0 kVAr ... 409 kVAr	SC 850CP XT	409 kVAr
		0 kVAr ... 433 kVAr	SC 900CP XT	433 kVAr
PFAbsMin*	Limitation of the displacement power factor cos φ	0.5 ... 1		0.9

Name	Description	Value / range	Explanation	Default value
Q-VArMod **	Procedure selection for the reactive power setpoint	Off	Sets reactive power to 0 kVAr and displacement power factor cos ϕ to 1	Off
		VArCtlCom	Specifies reactive power via an external control unit such as the Power Reducer Box	
		PFCtlCom	Specifies displacement power factor cos φ and 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	Specifies reactive power at the analogue input **QExlSpnt** via the control unit	
		PFCnst	Manually specifies displacement power factor cos φ and the excitation of the displacement power factor via parameters **PF-PF** and **PF-PFExt**	
		PFCnstAnIn	Specifies displacement power factor cos φ at the analogue input **QExlSpnt** via the control unit	

Name	Description	Value / range	Explanation	Default value
		PFCtlW	Specifies displacement power factor cos φ depending on the feed-in power	
		VArCtlVol	Specifies reactive power depending on the line voltage	
		VArCtlVolHystDb	Specifies reactive power depending on the line voltage (Q = f(V) characteristic curve)	
Q-VAr	Reactive power in kVAr	− 220 kVAr ... 220 kVAr	SC 500CP-JP	0
		− 245 kVAr ... 245 kVAr	SC 500CP XT	
		− 310 kVAr ... 310 kVAr	SC 630CP XT	
		− 346 kVAr ... 346 kVAr	SC 720CP XT	
		− 365 kVAr ... 365 kVAr	SC 760CP XT	
		− 385 kVAr ... 385 kVAr	SC 800CP XT	
		− 409 kVAr ... 409 kVAr	SC 850CP XT	
		− 433 kVAr ... 433 kVAr	SC 900CP XT	
Q-VArNom	Reactive power in %	− 100% ... 100%		0
PF-PF	Displacement power factor cos φ The lower limit is defined by parameter **PFAbsMin**.	0.9 ... 1		1
PF-PFExt	Excitation of the displacement power factor cos φ	OvExt	Overexcited	OvExt
		UnExt	Underexcited	

Name	Description	Value / range	Explanation	Default value
PF-PFStr**	Displacement power factor cos φ at characteristic curve point 1 The lower limit is defined by 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	
PF-PFStop**	Displacement power factor cos φ at characteristic curve point 2 The lower limit is defined by 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**	Specification of the feed-in power in % at characteristic curve point 1.	0% ... 90%		0%
PF-WStop**	Specification of the feed-in power in % at characteristic curve point 2.	10% ... 100%		100%
Q-VDif**	Definition of voltage change that causes a change in reactive power.	0.1% ... 10%	The value corresponds to the nominal voltage VRtg.	1%
Q-VArGra**	Definition of change to the reactive power setpoint during a voltage step.	0% ... 100%	The value corresponds to the nominal power Pmax.	1%

Name	Description	Value / range	Explanation	Default value
Q-VDifTm**	Time span during which the voltage change must be present before the reactive power setpoint **Q-VArGra** changes.	0 s ... 120 s		1 s
Q-VRtgOfsNom**	Changes the rated voltage **VRtg** of the voltage-dependent reactive power controller The parameter is active only if parameter **Q-VArMod** is set to **VArCtlVol**	− 10% ... +10%		0%
Q-VArGraNom**	Reactive power gradient	0%/V ... 10%/V		0%/V
Q-VolWidNom**	Voltage width	0% ... 20%		0%
Q-VolNomP1**	Voltage at point 1	0% ... 20%		0%
Q-VolNomP2**	Voltage at point 2	0% ... 20%		0%
Q-VArTmsSpnt**	Time setting of the characteristic curve point	1 s ... 60 s		10 s
Q-VArTmsVtg**	Delay of the line voltage	1 s ... 60 s		10 s
Q-EnaTmsVtg**	Connection delay of the line voltage	Off		Off
		On		
WGra**	Gradient of the active power change	1%/s ... 100%		100%/s
WGraEna**	Activation of the active power change gradient	Off	Deactivated	On
		On	Activated	
WGraReconEna**	Activation of the decoupling protection ramp for reconnection	Off	Deactivated	country-specific
		On	Activated	

Name	Description	Value / range	Explanation	Default value
PwrApLimitPrio***	Prioritisation of active power or reactive power	PrioPwrRt	Prioritisation of reactive power	PrioPwrRt
		PrioPwrAt	Prioritisation of active power	
SDLimComSrc***	Selection of the SDLimit source	CAN	SC-COM interface	UART
		UART	Via SMA Net	

* You can only view this parameter.

** You can only change this parameter after entering the installer password.

*** This parameter can only be viewed and changed after the installer password has been entered.

13.1.2 Grid Monitoring / Grid Limits

Name	Description	Range	Explanation	Default value
VRtg*	Nominal line voltage of the electricity grid	1 V ... 70 000 V		20 000 V
VCtlMax*	Threshold value for overvoltage activation level 3	100% ... 150%		country-specific
VCtlMaxTm*	Tripping time for overvoltage level 3	0 ms ... 1 000 000 ms		country-specific
VCtlhhLim*	Threshold value for overvoltage activation level 2	100% ... 150%		country-specific
VCtlhhLimTm*	Tripping time for overvoltage level 2	0 ms ... 1 000 000 ms		country-specific
VCtlhLim*	Threshold value for overvoltage activation level 1	100% ... 150%		country-specific
VCtlhLimTm*	Tripping time for overvoltage level 1	0 ms ... 1 000 000 ms		country-specific
VCtllLim*	Threshold value for undervoltage activation level 1	0% ... 100%		country-specific
VCtllLimTm*	Tripping time for undervoltage level 1	0 ms ... 1 000 000 ms		country-specific
VCtlllLim*	Threshold value for undervoltage activation level 2	0% ... 100%		country-specific

Name	Description	Range	Explanation	Default value
VCtlllLimTm*	Tripping time for undervoltage level 2	0 ms ... 1 000 000 ms		country-specific
VCtlMin*	Threshold value for undervoltage activation level 3	0% ... 100%		country-specific
VCtlMinTm*	Tripping time for undervoltage level 3	0 ms ... 1 000 000 ms		country-specific
VCtlPeakMax*	Threshold value for overvoltage	120% ... 150%		country-specific
VCtlPeakMaxTm*	Tripping time for overvoltage	0 ms ... 20 ms		country-specific
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 value for overfrequency level 3	country-specific		country-specific
HzCtlMaxTm*	Tripping time for overfrequency level 3	0 ms ... 1 000 000 ms		country-specific
HzCtlhhLim*	Threshold value for overfrequency level 2	country-specific		country-specific
HzCtlhhLimTm*	Tripping time for overfrequency level 2	0 ms ... 1 000 000 ms		100 ms
HzCtlhLim*	Threshold value for overfrequency level 1	country-specific		country-specific
HzCtlhLimTm*	Tripping time for overfrequency level 1	0 ms ... 1 000 000 ms		100 ms
HzCtllLim*	Threshold value for underfrequency level 1	country-specific		country-specific
HzCtllLimTm*	Tripping time for underfrequency level 1	0 ms ... 1 000 000 ms		100 ms

Name	Description	Range	Explanation	Default value
HzCtlllLim*	Threshold value for underfrequency level 2	country-specific		country-specific
HzCtlllLimTm*	Tripping time for underfrequency level 2	0 ms ... 1 000 000 ms		100 ms
HzCtlMin*	Threshold value for underfrequency level 3	country-specific		country-specific
HzCtlMinTm*	Tripping time for underfrequency level 3	0 ms ... 1 000 000 ms		100 ms

* You can only change this parameter after entering the installer password.

13.1.3 Grid Support

Name	Description	Value / range	Explanation	Default value
FRTEna*	Enable dynamic grid support	Off	Deactivated	country-specific
		On	Activated	
FRTArGraNom*	Scaling of k factor for complete dynamic grid support	1 ... 10		country-specific
EnaAid*	Enable island grid detection	Off	Deactivated	Off
		On	Activated	
TrfVolExlHi**	Line-to-line voltage on the overvoltage side of the external transformer	1 V ... 70 000 V		20 000 V
TrfVolExlLo**	Line-to-line voltage on the undervoltage side of the external transformer	1 V ... 500 V	SC 500CP-JP	205 V
			SC 500CP XT	270 V
			SC 630CP XT	315 V
			SC 720CP XT	324 V
			SC 760CP XT	342 V
			SC 800CP XT	360 V
			SC 850CP XT	386 V
			SC 900CP XT	405 V

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13.1.4 Insulation Monitoring

Name	Description	Value / range	Explanation	Default value
IsoErrIgn*	Insulation failure detection, continued operation in the event of failures	Off	Deactivated	country-specific
		On	Activated	
		Run	Error is only ignored if the inverter is in feed-in operation	
RemMntSvc	Earthing of the PV array will be removed.	Off	Deactivated	Off
		On	Activated	
IsoSmidOutGrp*	Automatic troubleshooting after an insulation failure. This parameter is only valid with Optiprotect.	Auto	Troubleshooting starts automatically	Man
		Man	Troubleshooting only starts when this parameter is set manually to **Start**	
		Start	Starts troubleshooting	

* This parameter can only be viewed and changed after the installer password has been entered.

13.1.5 Device-Internal Values

Parameter settings for Japan

The settings relating to power frequency are entered using the parameter **CntrySet**. If the valid power frequency is 50 Hz, the parameter must be set to **J50**. If the valid power frequency is 60 Hz, the parameter must be set to **J60**.

This parameter can only be changed in the "Stop" operating state.

Name	Description	Value / range	Explanation	Default value
PvPwrMinTr	Threshold value for starting the MPP tracker	0 kW ... 20 kW		20 kW
PvPwrMinTrT	Timeout for starting the MPP tracker	1 s ... 600 s		10 s
PvVtgStrLevMin*	Threshold value for switching to feed-in operation	0 V ... 1 200 V	SC 500CP-JP	410 V
		0 V ... 1 200 V	SC 500CP XT	500 V
		0 V ... 1 200 V	SC 630CP XT	610 V
		0 V ... 1 200 V	SC 720CP XT	675 V
		0 V ... 1 200 V	SC 760CP XT	715 V
		0 V ... 1 200 V	SC 800CP XT	760 V
		0 V ... 1 200 V	SC 850CP XT	760 V
		0 V ... 1 200 V	SC 900CP XT	770 V
PVStrT	Timer: once the specified time has elapsed, the inverter switches from the "Grid monitoring" operating state to the "Grid monitoring time reached" operating state	1 s ... 300 s		90 s
VArGra**	Gradient of reactive power change (VAr/s)	0% ... 20%		20%
Serial number***	Inverter serial number	0 ... 2147483647		0
CntrySet*	Specify the country	country-specific	Parameter can only be changed in the "Stop" operating state.	country-specific

Name	Description	Value / range	Explanation	Default value
CardFunc*	MMC/SD card function	ForcedWrite	SD card logout	0
		StoFailStt	Write error memory to SD card	
DtSet	Date	20060101 ... 20991231		0
TmSet	Time	0 ... 235959		0
TmZn	Time zone	GMT –12:00 ... GMT 12:00	Configurable time zones	country-specific
ExtSolIrrOfs	Offset of the external irradiation sensor			0 W/m^2
ExtSolIrrGain	Amplification of the external irradiation sensor			1
CntRs*	Reset meter	h-Cnt	Operating hours meter	0
		E-Cnt	Energy meter	
		CntFanHs	All-fan runtime meter	
		CntFanCab2	Fan runtime meter	
		CntHtCab2	Fan runtime meter	
Ofs_h-On**	Offset for operating hours	0 h ... 2 147 482 h		0
Ofs_h-Total**	Offset for feed-in hours	0 h ... 2 147 482 h		0
Ofs_E-Total**	Offset for total supplied energy	0 kWh ... 214 748 367 kWh		0
Ofs_CntFanHs*	Offset for operating hours of the heat sink fan	0 h ... 2 147 482 h		0
Ofs_CntFanCab1*	Offset for operating hours of internal fan 1	0 h ... 2 147 482 h		0
Ofs_CntFanCab2*	Offset for operating hours of internal fan 2	0 h ... 2 147 482 h		0
Ofs_CntHtCab1*	Offset for operating hours of internal heater 1	0 h ... 2 147 482 h		0
Ofs_CntHtCab2*	Offset for operating hours of internal heater 2	0 h ... 2 147 482 h		0

Name	Description	Value / range	Explanation	Default value
SpntRemEna	Remote plant activation	Stop	Deactivated	Run
		Run	Activated	
Ackn	Acknowledge Sunny Central error	Ackn	Acknowledge the error	–
GdErrTm*	Grid monitoring time	0 s ... 600 s		country-specific
ExlStrStpEna*	Activation of the external shutdown signal / remote shutdown	Off	Deactivated	Off
		On	Activated	
ExlTrfErrEna*	Enable hermetic protection of medium voltage transformer	Off	Deactivated	On
		On	Activated	

* This parameter can only be viewed and changed after the installer password has been entered.

** You can only change this parameter after entering the installer password.

*** You can only view this parameter.

13.2 Sunny Central String-Monitor Controller

Name	Description	Value / range	Explanation	Default value
Serial number	Display of the serial number		Value cannot be changed.	–
Firmware	Firmware version of the operation control unit	0 ... 255.0		–
Firmware2	Firmware version of the digital signal processor	0 ... 255.0		–
Dt	Date entry	20060101 ... 20991231	Entered in the format YYYYMMDD	–
Tm	Time entry	0 ... 235959	Entered in the format HHMMss	–
TolGr*1**	Deviation of the currents in group *1* from the mean value	5% ... 100%	Parameter exists for all 6 groups.	13%
MoniTmGr*1*On*	Time when group *1* monitoring starts	07:00 hrs ... 19:00 hrs	Parameter exists for all 6 groups.	10:00 hrs
MoniTmGr*1*Off*	Time when group *1* monitoring stops	07:00 hrs ... 19:00 hrs	Parameter exists for all 6 groups.	15:00 hrs

Name	Description	Value / range	Explanation	Default value
MoniTmGrAllOn*	Time when monitoring of all groups starts	07:00 hrs ... 19:00 hrs		10:00 hrs
MoniTmGrAllOff*	Time when monitoring of all groups stops	07:00 hrs ... 19:00 hrs		15:00 hrs
MoniTmComOn*	Time when monitoring of all groups starts	07:00 hrs ... 19:00 hrs		10:00 hrs
MoniTmComOff*	Time when monitoring of all groups stops	07:00 hrs ... 19:00 hrs		15:00 hrs
Ackn	Acknowledge the error	quit		–
ErrLevGr1*	Sensitivity of error detection for group 1 Parameter exists for all 6 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	1200 baud	Parameter can only be changed in the "Stop" operating state.	19200 baud
		4800 baud		
		9600 baud		
		19200 baud		
		38400 baud		
		57600 baud		
DevFunc*	Manages the Sunny String-Monitors	AutoDetect_ SSMU	Searches for and deletes Sunny String-Monitors that have already been detected	0
		DetectSSMU Retry	Only searches for undetected Sunny String-Monitors	
		DelAll_SSMU	Deletes all detected Sunny String-Monitors	
		Factory	Resets all parameters to their default settings.	

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13.3 Sunny String-Monitor

Name	Description	Value / range	Explanation	Default value
TMittelung*	Duration for averaging the measured current value	0 s ... 6 000 s		30 s
String number*	Number of detected PV strings	0 ... 8		0
SW version	Version of the latest firmware	1 ... 40	Value cannot be changed	
SSM identifier*	Identification number of the Sunny Central String-Monitor	1 ... 99		0
Group string *1* *	Assigns the PV strings to the respective group	0 ... 3	Parameter exists for all 8 groups	0
Group string*	All groups	0 ... 3		0
No.of string *1* *	Number of connected strings in the respective group	1 ... 4	Parameter exists for all 8 groups Contact the SMA Service Line if you would like to use this function.	–
No.of strings*	All groups	1 ... 4		–
Monitoring*1* on*	Start of the monitoring of PV strings in group 1	00:00 hrs ... 23:59 hrs	Parameter exists for all 8 groups Configuration of the string settings via the Sunny Central String-Monitor Controller is preferable.	0
Monitoring*1* off*	End of the monitoring of PV strings in group 1	00:00 hrs ... 23:59 hrs	Parameter exists for all 8 groups Configuration of the string settings via the Sunny Central String-Monitor Controller is preferable.	0
Monitoring on*	Start of the monitoring of PV strings in all groups	00:00 hrs ... 23:59 hrs		0
Monitoring off*	End of the monitoring of PV strings in all groups	00:00 hrs ... 23:59 hrs		0

Name	Description	Value / range	Explanation	Default value
Command**		Stop	Contact the SMA Service Line if you would like to use this function.	0
		Meas		
		Offset1		
		Offset2		
		Diag		
		Reset Err.Cnt.		
		StoreCalibData		
		LoadCalibData		
		Watchdog Test		
Surge arrester1*	Alarm contact (e.g. anti-theft protection for Sunny String-Monitor)	Active high	Contact is active when voltage is present.	0
		Active low	Contact is active when no voltage is present.	
		Deactivated	Contact deactivated	
Surge arrester2*	Alarm contact	Active high	Contact is active when voltage is present.	0
		Active low	Contact is active when no voltage is present.	
		Deactivated	Contact deactivated	

* You can only change these parameters after entering the installer password.

** You can only see these parameters after entering the installer password.

13.4 SMIDCont

Name	Description	Value / range	Explanation	Default value
TmZn	Time zone	GMT –12:00 ... GMT 12:00	Configurable time zones	GMT +1
ParaLod	Load all default values	Factory	Resets all parameters to their default settings.	–
Ackn	Acknowledge the error	Ackn		–
IsoCtrl	Activation of the automatic deselecting	Enable	Activated	Enable
		Disable	Deactivated	
StrgMonErrLev	Change to error threshold of the string current monitoring	1 ... 7	1: Minimises the risk of incorrect tripping, actual faults will be detected later. 2 ... 6: increments between the threshold values. 7: Even small yield losses will be reported after a few days, there is a high risk of incorrect tripping.	4
CardFunc	MMC/SD card function	ForcedWrite	Card logout	–
		StoFailHis	Write error memory to SD card	

14 Contact

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

- Device type
- Serial number
- Type and number of the modules connected
- Communication type
- Error number and error message

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Legal Restrictions

SMA Factory Warranty

The current warranty conditions come enclosed with your device. These are also available online at www.SMA-Solar.com and can be downloaded and are available on paper from the usual sales channels if required.

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