



Solar Inverter

# **SUNNY BOY / SUNNY MINI CENTRAL**

**User Manual**





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# 1 Notes on this Manual

This manual contains instructions on how to operate the SMA inverters Sunny Boy and Sunny Mini Central. Store this manual where it will be accessible at all times.

## 1.1 Area of Validity

This manual applies to the following SMA inverters:

<b>Sunny Boy</b>	<b>Sunny Mini Central</b>
SB 1100	SMC 4600A
(discontinued model)	SMC 5000A
SB 1200	SMC 6000A
(available on request)	SMC 6000TL
SB 1700SB 1700	SMC 7000HV
SB 2100TL	SMC 7000HV-11
SB 2500	(available on request)
SB 3000	SMC 7000TL
SB 3300TL HC	SMC 8000TL
SB 3300	SMC 9000TL-10
SB 3800	SMC 9000TLRP-10
	SMC 10000TL-10
	SMC 10000TLRP-10
	SMC 11000TL-10
	SMC 11000TLRP-10

## 1.2 Target Group

This manual is for the user of the inverter types listed in the section "Area of Validity".






## 1.3 Additional Information

For information on assembly, installation, commissioning and servicing of the inverter, as well as for the device-specific technical data, please refer to the attached installation guide.

You will find further information on special topics, such as details of the operating parameters, in the download area at [www.SMA.de/en](http://www.SMA.de/en).

## 1.4 Symbols Used

The following types of safety instructions and general information are used in this manual:

	<b>DANGER!</b>
DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.	
	<b>WARNING!</b>
WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.	
	<b>CAUTION!</b>
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.	
	<b>NOTICE!</b>
NOTICE indicates a situation that can result in property damage if not avoided.	
	<b>Information</b>
Information provides tips that are valuable for the optimum installation and operation of your product.	

## 2 Safety

### 2.1 Appropriate Usage

The Sunny Boy / Sunny Mini Central is a solar inverter which converts the DC current of the PV generator to AC current and feed it into the public grid.

More precise information on this subject and on your device can be found in the installation guide. The operational limits specified in the installation guide for the particular inverter must be observed.

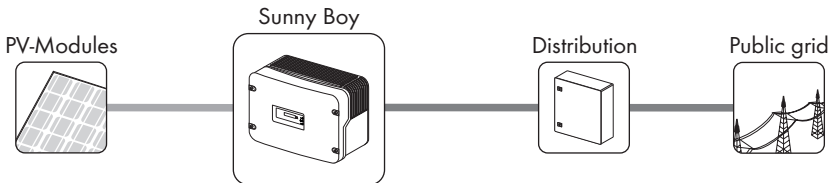
All inverters may only be operated with PV generators (modules and cabling) of Protection Class II rating. Do not connect any sources of energy other than PV modules to the inverter.

Do not use the inverter for purposes other than those described here. Alternative uses, modifications to the inverter or the installation of components not expressly recommended or sold by the manufacturer void the warranty claims and operating permission. If you have questions regarding the proper usage of the inverters, please contact the SMA Solar Technology Serviceline.

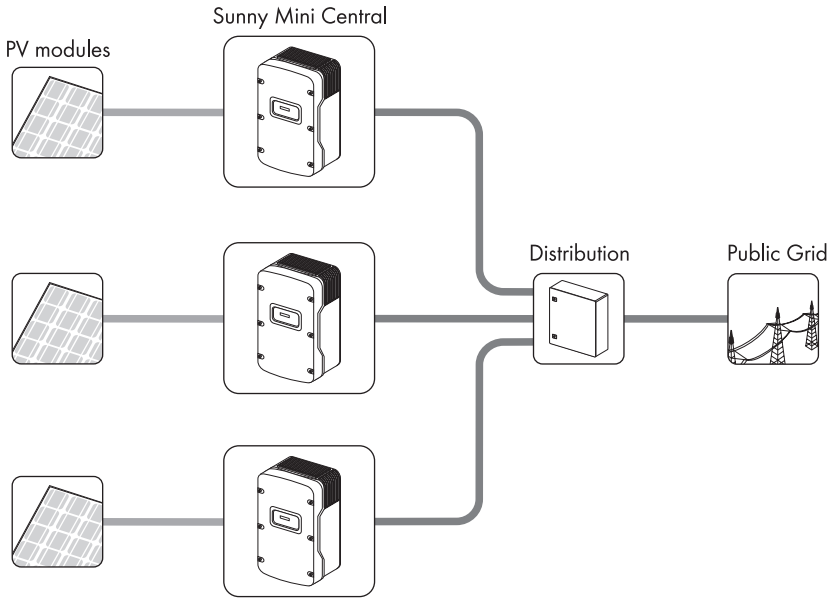
#### Principle of the string inverter

The string inverter is used to connect a small number of series-connected solar modules (strings) to the public supply grid. This way, even a large PV generator can be constructed from a large number of individual strings, each having its own string inverter. The energy is then combined on the AC side.

#### Principle of a grid-connected PV system with a Sunny Boy



### Principle of a grid-connected PV system with a Sunny Mini Central



## 2.2 Safety Precautions

**DANGER!**

**High voltages in the inverter. Death resulting from electric shock and burns.**

The following work on the inverter must be carried out by a qualified personnel only.

- Electrical installation
- Repairs
- Modifications

Even when no external voltage is applied, high voltages can still be present in the device. These high voltages can result in death or serious injury.

**CAUTION!**

**Enclosure body can get hot during operation. Risk of burn injuries. Do not touch.**

The temperature of some parts of the inverter enclosure – in particular the temperature of the heatsinks – can reach over 60 °C in normal operation.

- Only touch lid and display during operation.

**NOTICE!**

**Overvoltages in the inverter Destruction of the inverter and voiding of warranty claims.**

- Please contact your installer whenever the inverter reports an error.

### 2.3 Identifying the product

You can identify the inverter by the type plate. The type plate is usually located on the right side of the enclosure.

The type plate specifies among other things the device type (Type / Model), the serial number (Serial No.) and the device-specific key data of the product.

The type plate illustrated here is a typical example showing the Sunny Boy 3800.

SMA Solar Technology AG  
www.SMA.de

**Sunny Boy®**  
Photovoltaic string inverter \* Made in Germany

Type  
**SB 3800**

Serial No.  
**2000165882**

	V <sub>DC max</sub>	500 V
	V <sub>DC MPP</sub>	200-400 V
	I <sub>DC max</sub>	20 A
	V <sub>AC nom</sub>	230 V
	f <sub>AC nom</sub>	50/60 Hz
	P <sub>AC nom</sub>	3800 W
	I <sub>AC nom</sub>	16.5 A
	cos φ	1

XXX

outdoor

CE

No disposal

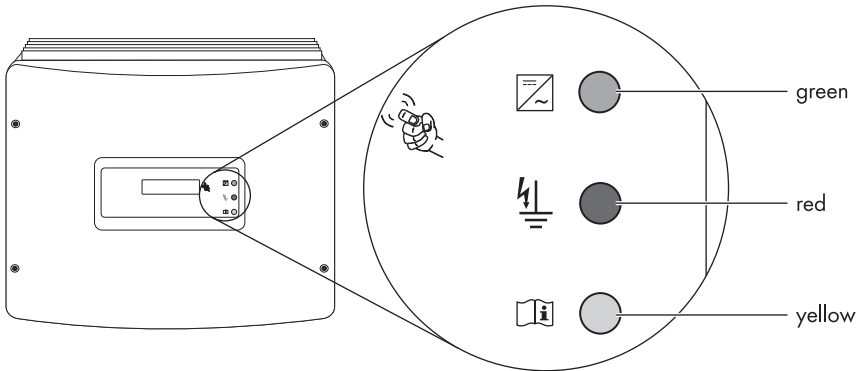
RAL

\*2000165882\*

### 3 Operating Modes

The different operating modes are indicated by 3 light-emitting diodes (LEDs) on the inverter lid, and also via the integrated display (see Section 4 "Information on the Display" (page 24)). To allow the device to signal its operating mode via the 3 integrated LEDs, the inverter must be connected to the DC side of the system. The level of solar irradiation must be high enough to supply the inverter with sufficient DC voltage.

The following diagram shows the 3 LEDs, as exemplified by the Sunny Boy 3800.



LED	Meaning	Inverter
<b>Green</b>	In operation	All Sunny Boys / Sunny Mini Centrals
<b>Red</b>	Ground fault or varistor defective	For the Sunny Boy models SB 1100, SB 1200, SB 1700, SB 2100TL, SB 2500, SB 3000, SB 3300, SB 3300TLHC, SB 3800  and Sunny Mini Central models SMC 4600A, SMC 5000A, SMC 6000A, SMC 7000HV, SMC 6000TL, SMC 7000TL, SMC 8000TL.
	Ground fault, varistor defective or string fuse defective	For Sunny Mini Central models SMC 9000TL-10, 10000TL-10, 11000TL-10 and SMC 9000TLRP-10, 10000TLRP-10, 11000TLRP-10
<b>Yellow</b>	Disturbance	All Sunny Boys / Sunny Mini Centrals



#### LED Display

If you do not have any means of plant communication, it is advisable, particularly during the first year of operation, to keep a close eye on this display at different times of day and under varying solar irradiation conditions. This will enable you to recognize errors at an early stage.

A detailed description of the possible LED signals and blink codes is given in the following section.

### 3.1 Activating the Display Illumination

The background illumination is switched on by tapping on the enclosure lid. Tapping again switches the display on to the next message.

After 2 minutes, the illumination switches off automatically.

### 3.2 Initial Phase

#### 3.2.1 All LEDs are on

##### Initialization

The inverter's on-board computer is now in the initializing phase. The on-board power supply is present, but there is insufficient energy for feeding the grid. Data transmission is also not possible yet.



##### All LEDs are blinking

If during the initialization phase the energy fed into the inverter is not sufficient to power the on-board computer, all LEDs are extinguished. After this, initialization restarts. If there is very weak solar irradiation, the LEDs appear to blink. This apparent blinking indicates a normal operating mode. No fault has occurred in the system.

### 3.3 Normal Operation

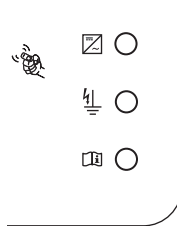
If no LED, or only the green LED is on or blinking, the inverter is operating normally. If all 3 LEDs are lit up simultaneously, this is also an indication of normal operation ("initialization"). All other signals are a sign of faulty operation.

#### 3.3.1 All LEDs are off

##### Overnight Shutdown

The inverter is in the so-called overnight shutdown mode. This situation occurs if the inverter's input voltage is too low both for feeding into the grid and for satisfying the on-board voltage requirements.

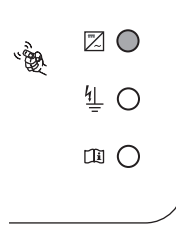
If this operating mode occurs during a sunny day with good irradiation, have the PV voltage checked by your installer.



### 3.3.2 The green LED is continuously on

#### Feeding Operation

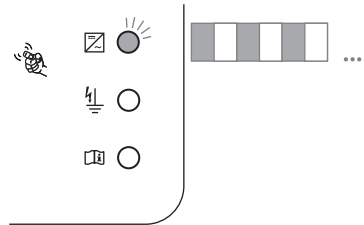
The inverter has passed the self-tests of the measurement electronics and grid monitoring, and is now in normal grid-feed operation.



### 3.3.3 The green LED is blinking slowly

#### Waiting, Grid Monitoring

The inverter is checking if the start conditions necessary for feeding the grid (e.g. start voltage, start time) are fulfilled, and then begins monitoring the grid. The PV voltage must reach the specified minimum value at least once before the inverter begins feeding into the grid.

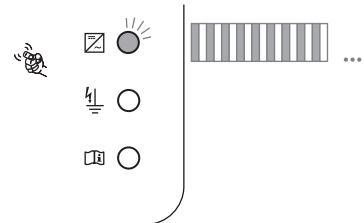


### 3.3.4 The green LED is blinking rapidly

#### Stop

The inverter is in "Stop" mode. This occurs, for instance, when the measurement electronics are being calibrated. After this, the device switches to "Waiting" mode.

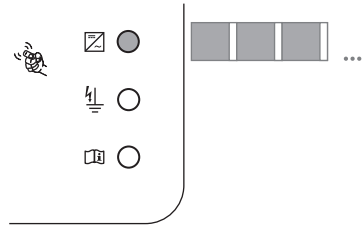
The "Stop" mode can be manually pre-set by the installer via an appropriate communications product. In this case the inverter remains in "Stop" mode until a new operating mode ("MPP mode", "Constant voltage mode", "Turbine mode") has been set.



### 3.3.5 The green LED goes out briefly

#### Derating

The "Derating" mode is a normal operating mode which may occur occasionally and can have several causes:



- **Temperature derating**

The temperature monitoring of the inverter has reduced the output power to prevent the device from overheating. The inverter switches to the "Temperature derating" mode. If the Sunny Boy / Sunny Mini Central frequently switches to this mode, please check the heat dissipation (see Section 5.1 "Checking Heat Dissipation" (page 27)). For all Sunny Mini Centrals, as well as the Sunny Boy models SB 3300 / SB 3800, check whether the fans are soiled.



#### Maintenance and Cleaning of the Fans

The fan cleaning procedure is described in the respective installation guide.

- **Current derating**

Due to the type of module or the output and wiring of the generator, the PV-side input current exceeds the maximum possible input current. The inverter switches to the "Current derating" mode in order to protect itself against overload.

- **Output derating**

This operating mode only occurs in systems which are operated using the Sunny Mini Central with integrated SMA Power Balancer set to "PowerGuard".

- **Frequency-dependent output derating P(f)**

This operating mode occurs when the function which limits active power, P, is activated as a function of grid frequency  $f_{AC}$ .

You will find more detailed information on this function in the installation guide for Sunny Mini Central 9000TL / 10000TL / 11000TL with Reactive Power Control.

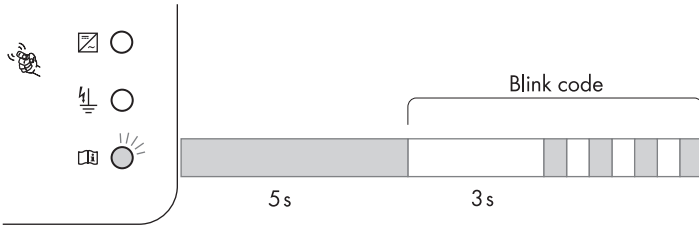
### 3.4 Failures

A distinction is made between critical and non-critical failure messages.

Thanks to a comprehensive safety concept the number of critical conditions that can occur has been reduced to one single situation:

PV generator voltage is too high.

This is indicated by the following blink code on the yellow LED:



The yellow fault LED lights up for 5 seconds when the fault occurs, and then starts emitting the following blink code: 3 seconds off and then 4 brief consecutive blinks. This code is emitted 3 times in succession. If this fault is still present, the fault signal starts over again.



#### NOTICE!

**DC input voltage too high. Destruction of the inverter.**

- Contact your installer, who will immediately disconnect the PV generator from the inverter and check the DC voltage, as described in the inverter's installation guide.



#### Generator Failure

The same blink code is generated when a generator failure occurs. This falls into the category of a non-critical failure which is dealt with in more detail in Section 3.4.6 "The yellow LED blinks 4 times" (page 20).

#### Non-Critical Failure Conditions

All other display codes indicate some form of fault condition which is not usually dangerous to people or equipment, but which should nevertheless be investigated and corrected without delay.

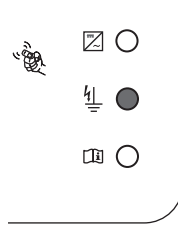
Despite all precautions, it is possible that other faults may occur which cannot be signaled (e.g. failure of the status display). In order to detect such faults, the system operator should use the explanations in the following section to check the plausibility of the displayed mode (e.g. an illuminated green LED in the dead of night indicates a defect, just as does a non-illuminated LED on a sunny day).

More detailed diagnoses are possible using the communications options detailed in Section 6 "Measurement Channels and Messages" (page 28).

### 3.4.1 The red LED is continuously on

#### Insulation Fault or Defective Varistor

The red LED on the Sunny Boy / Sunny Mini Central is permanently on. With this blink code it is irrelevant whether the green or yellow LEDs are on or blinking. A grounding error has occurred, or one of the thermally monitored varistors on the DC input side is defective as a result of overvoltage or ageing.



#### **Sunny Mini Central 9000TL / 10000TL / 11000TL**

#### **Sunny Mini Central 9000TL / 10000TL / 11000TL with Reactive Power Control.**

When the red LED lights up continuously, the inverter has detected a ground fault. A separate blink code indicates a defective varistor or string fuse (see Section 3.4.2 "The Red LED is blinking" (page 17)).



#### **Inverter equipped with integrated grounding set**

If the inverter is equipped with a "grounding set", a continuously lit red LED signals an unwanted ground fault in the PV generator or a defect in the grounding set itself.

Further information on this subject can be found in the installation guide of the grounding set.



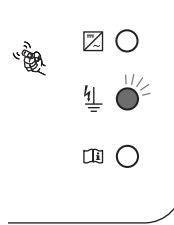
#### **Correction of error by installer**

Contact your installer to have the error corrected. Instructions on correction errors can be found in the inverter installation guide.

## 3.4.2 The Red LED is blinking

### Fault on the DC side

Red LED blinking. This blink code overrides any signals on the green or yellow LEDs.



This blink code can only occur in the following device types:

- **SMC 9000TL-10 / 10000TL-10 / 11000TL-10**
- **SMC 9000TLRP-10 / 10000TLRP-10 / 11000TLRP-10**

Possible causes:

- At least one of the varistors is defective. Display message <Check Varistor>
- At least one of the string fuses is defective. Display message: <DC fuse>

In both cases the inverter continues feeding into the grid.



#### Correction of error by installer

Contact your installer to have the error corrected. Instructions on correction errors can be found in the inverter installation guide.

## 3.4.3 The yellow LED is continuously on

### Permanent Disable

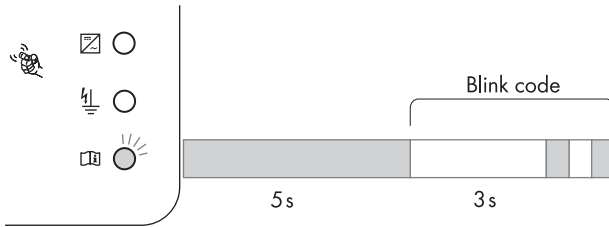
In the event of a recurring fault the inverter switches from operating mode to "Permanent Disable" mode and ceases grid feed.

A fault may have occurred that cannot be resolved on-site. If the inverter is equipped with a communications interface, the installer can try to rectify the problem with the help of a communications product. Should this be unsuccessful, please contact the SMA Solar Technology Serviceline (see Section 8 "Contact" (page 45)) to discuss further action to solve the problem.



### 3.4.4 The yellow LED blinks twice

#### Grid fault



The yellow fault LED lights up for 5 seconds when the fault occurs, and then starts emitting the following blink code. 3 seconds off and then 2 brief consecutive blinks. This code is emitted 3 times in succession. If this fault is still present, the fault signal starts over again.

With this fault signal the inverter indicates a grid fault which can have the following causes:

- Grid undervoltage (voltage drop protection)
- Grid overvoltage (voltage rise protection)
- Grid underfrequency (frequency decrease protection)
- Grid overfrequency (frequency increase protection)
- Grid frequency change ("dFac")
- Voltage increase protection activated
- Faulty grid connections, e.g. N and L swapped or PE not connected  
(SMC 9000TL(RP) / 10000TL(RP) / 11000TL(RP): Display message <Check L-N-PE>)
- In systems which consist of 3 or more Sunny Mini Centrals, the Power Balancer has detected a fault.



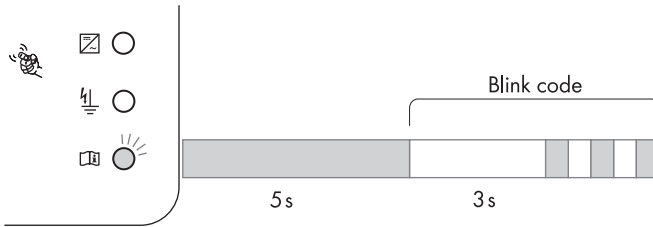
#### Correction of error by installer

Contact your installer to have the following points checked:

- Check whether there is a general power failure (check function of other energy consumers).
- Check the fuse of the inverter power supply.
- Check whether the circuit breaker is switched on.
- Check the inverter's grid connection.

### 3.4.5 The yellow LED blinks 3 times

#### Grid impedance



The yellow fault LED lights up for 5 seconds when the fault occurs, and then starts emitting the following blink code. 3 seconds off and then 3 brief consecutive blinks. This code is emitted 3 times in succession. If this fault is still present, the fault signal starts over again.

The inverter has detected a failure relating to unacceptable grid impedance values. If the inverter frequently displays this fault and switches off during grid monitoring, the cause may be that grid impedance is too high.

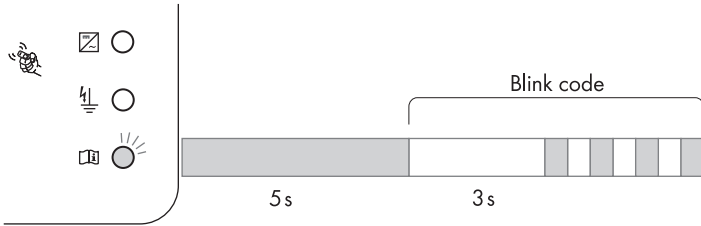
Your installer should be able to correct this problem by increasing the cross-section of the power line. In some cases, tightening the terminal clamps on the connection cable can also help. Other measures can also be taken to correct this fault, but they require the explicit agreement and cooperation of the utility operator.



#### Correction of error by installer

Contact your installer, who will open the inverter, as described in the inverter installation guide, and check the AC connection.

### 3.4.6 The yellow LED blinks 4 times




The yellow fault LED lights up for 5 seconds when the fault occurs, and then starts emitting the following blink code. 3 seconds off and then 4 brief consecutive blinks. This code is emitted 3 times in succession. If this fault is still present, the fault signal starts over again.

This code can be caused by either of the following:

- Input voltage has exceeded the maximal permissible limit.
- or
- Error in the generator (only applies to SMC 9000TL(RP)-10, 10000TL(RP)-10, 11000TL(RP)-10).

#### **Input voltage has exceeded the maximal permissible limit.**

The voltage of the PV generator has exceeded the inverter's permissible input voltage.




**NOTICE!**

**DC input voltage too high. Destruction of the inverter.**

- Please contact your installer, who will immediately disconnect the PV generator from the inverter and check the DC voltage, as described in the inverter installation guide.

#### **Error in the Generator**

In the inverter models Sunny Mini Central 9000TL / 10000TL / 11000TL (with Reactive Power Control) this blink code can occur in combination with the display warning <Disturbance Earthfault>. This signifies that the insulation resistance in the generator is too low.

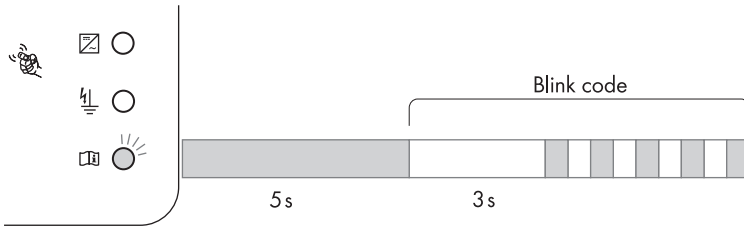


**Correction of error by installer**

Please contact your installer to have the error corrected.

### 3.4.7 The yellow LED blinks 5 times

#### Device fault



The yellow fault LED lights up for 5 seconds when the fault occurs, and then starts emitting the following blink code. 3 seconds off and then 5 brief consecutive blinks. This code is emitted 3 times in succession. If after this the fault is still present, the fault signal starts over again.

For all transformerless devices this blink code can occur in combination with the display warning <Disturbance Earthfault> (with the exception of SMC 9000TL(RP)-10, 10000TL(RP)-10, 11000TL(RP)-10, for which the warning is <Disturbance Earthfault-Sense>) and is caused by a fault in the insulation monitoring system.

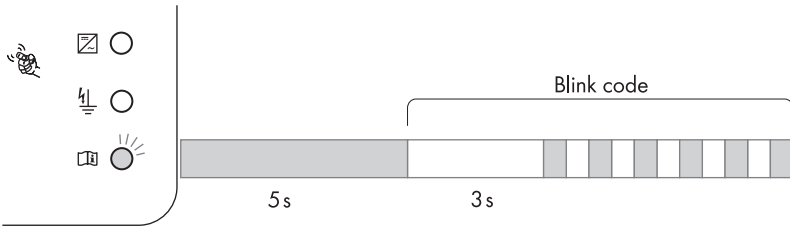


#### Correction of error by installer

If the device failure has a severe negative impact on normal operation, you must contact your installer, who will check the inverter and the entire plant installation. It is essential to ensure that devices without transformers (with "TL" in the device name) are correctly grounded!

### 3.4.8 The yellow LED blinks 6 times

#### Discharge current too high



#### Discharge current

The fault "Discharge current too high" can only occur in transformerless inverters. Transformerless inverters can be identified by their device designation. The "TL" in the name stands for transformerless, e.g. Sunny Mini Central SMC 6000TL.

The yellow fault LED lights up for 5 seconds when the fault occurs, and then starts emitting the following blink code. 3 seconds off and then 6 brief consecutive blinks. This code is emitted 3 times in succession. If this fault is still present, the fault signal starts over again.

The discharge current from the inverter and the PV generator is too high. The Sunny Boy / Sunny Mini Central interrupts grid feeding immediately after exceeding a threshold value and switches back onto the grid automatically after testing. If necessary, testing will be repeated several times.

Discharge current is dependent on the capacity of the PV generator relative to ground and also depends on the type of modules and manner of installation as well as the weather conditions. Therefore, it is quite normal for this value to vary over time.

However, if the inverter frequently displays this fault, please notify the installer who installed your PV system and clarify the reasons for the high level of discharge current.

This fault message can also be triggered by a PE connection which is not connected to the inverter.

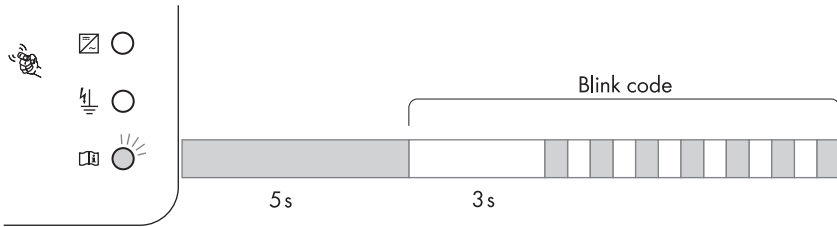


#### Correction of error by installer

Please contact your installer to deal with the fault or get in touch with the SMA Solar Technology Serviceline.

### 3.4.9 The yellow LED blinks 7 times

#### Drastic change in differential current



#### Differential current

The fault "Drastic change in differential current" can only occur in transformerless inverters. Transformerless inverters can be identified by their device designation. The "TL" in the name stands for transformerless, e.g. Sunny Mini Central SMC 6000TL.

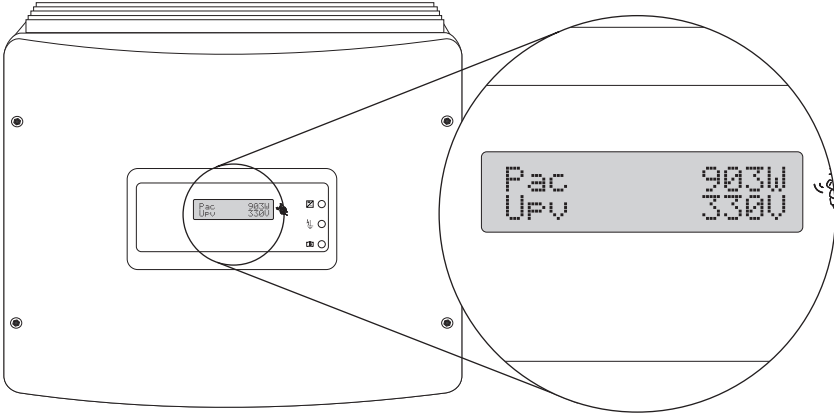
The yellow fault LED lights up for 5 seconds when the fault occurs, and then starts emitting the following blink code. 3 seconds off and then 7 brief consecutive blinks. This code is emitted 3 times in succession.

If this fault is still present, the fault signal starts over again.

The Sunny Boy / Sunny Mini Central has detected a drastic change in differential current and immediately stopped feeding into the grid. The integrated all-pole-sensitive residual current monitoring unit monitors the differential current relative to ground from the inverter supply connection right through to the PV generator. This additional personal protection system reacts to a drastic change in differential current of  $I_{DN} > 30 \text{ mA}$  and disconnects the Sunny Boy / Sunny Mini Central from the grid within 0.2 seconds.

## 4 Information on the Display

Sunny Boy and Sunny Mini Central inverters are supplied with a factory-installed LC display on the enclosure lid.



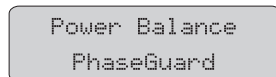
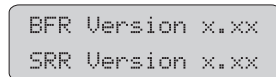
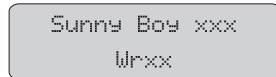
### Display Messages

Detailed explanations of the individual error and fault messages can be found in Section 6 "Measurement Channels and Messages" (page 28).

A description and explanation of the operating parameters can be found in the Technical Information "Operating parameters Sunny Boy / Sunny Mini Central" in the download area at [www.SMA.de/en](http://www.SMA.de/en).

### 4.1 Display Messages in the Startup Phase

- After startup of the inverter, the display first shows the device type.
- After 6 seconds, the firmware versions of the operation control unit (BFR) and the current control unit (SRR) are displayed.
- Inverters that are equipped with the SMA Power Balancer subsequently indicate the operating mode of the SMA Power Balancer.



## 4.2 Display Messages During Operation

The display shows the most important operating data of the inverter in an alternating cycle. The following diagrams serve to clarify the messages. Each message is displayed for 5 seconds. Then the cycle starts over again.

- First of all, the energy generated that day and the current operating mode are displayed.
- Next, the current feed-in power and the voltage of the PV generator (except in the case of SB 3300TLHC) appear.
- In the case of the Sunny Boy 3300TL HC, the momentary feed-in power and the output voltage are displayed.
- The next reading on the display of the Sunny Boy 3300TL HC gives the current input voltage and input power.
- In the case of the Sunny Mini Central with Reactive Power Control, after a further 5 seconds or following another tap, the current reactive power value  $Q_{AC}$  and the displacement factor  $\cos \phi$  (PF) are displayed.
- This is followed by the total energy produced so far and the hours the device has been in operation.

E-today	3.86Wh
Mode	MPP

Pac	903W
Upv	330V

Pac	903W
Vac	230V

Upv	520V
Ppv	1325W

Qac	200var
PF	0.987

$Q_{AC}$  positive = overexcited  
 $Q_{AC}$  negative = underexcited

E-total	724.4kWh
h-total	512h

### 4.2.1 Display Messages when Fault Warnings Occur

If a fault warning occurs, the display immediately switches to "Warning" and the background illumination lights up. When warnings occur, the inverter continues feeding into the grid. The following illustrations give three examples of possible fault warning scenarios.

- This warning appears after the inverter has been in "Derating" mode for 10 minutes.
- This warning means that one of the varistors is defective.
- If this warning appears, it means that one of the string fuses is defective.

Warning
Derating

Warning
Check Varistor

Warning
DC fuse

## 4.2.2 Display Messages for Plant Disturbances

If an operational failure occurs, the display immediately switches to "Disturbance" and the background illumination lights up. In this case the inverter stops feeding into the grid. The following illustrations give examples of possible failure scenarios.

- The cause of the failure is displayed for 5 seconds in the second line of the display.
- If the failure is triggered by a measured value, then the value measured at the time of going into fault is displayed. If a further measurement is possible, the current value is displayed in the second line.
- After another 5 seconds the normal operating data appear. If the fault is still present, the fault display cycle starts over again. An overview of the status and error messages can be found in Section 6 "Measurement Channels and Messages" (page 28) of this documentation.
- "Error ROM" indicates that the inverter has recognized an error in the EEPROM firmware. Please contact SMA Solar Technology to have the error corrected.

```
Disturbance
Vac-Bfr
```

```
at:          261W
Present:     245V
```


```
Error
ROM
```

## 4.2.3 Rapid Blinking of Background Illumination

### DC Overvoltage

If an excessive DC input voltage is present at the Sunny Boy / Sunny Mini Central, this is indicated by rapid blinking of the background illumination and the message shown on the right.

```
!PV-Overvoltage!
!DISCONNECT DC!
```



**NOTICE!**

**DC input voltage too high. Destruction of the inverter.**

- Please contact your installer, who will immediately disconnect the PV generator from the inverter and check the DC voltage, as described in the inverter installation guide.

## 5 Maintenance and Cleaning

Check the correct operation of the inverter at regular intervals. Impurities such as dust or pollen can cause heat accumulation that can lead to yield losses. Also check the inverters and the cables for visible external damage. Have repairs carried out if necessary.

### 5.1 Checking Heat Dissipation

#### 5.1.1 Cleaning the Cooling Fins

**Applies to Sunny Boy models SB 1100, SB 1200, SB 1700, SB 2100TL, SB 2500, SB 3000 and SB 3300TLHC**



**CAUTION!**

**Danger of burn injuries due to hot enclosure parts!**

- Do not touch the inverter's enclosure during operation.

The heat dissipation of the Sunny Boy can be restricted if the cooling fins are dirty.

- Clean the cooling fins with a suitable, soft brush.

#### 5.1.2 Cleaning the Fans

**Applies to Sunny Boy models SB 3300, SB 3800 and Sunny Mini Central**

If the fan guards are only covered in loose dust, they can be cleaned with a vacuum cleaner. If vacuum cleaning does not produce a satisfactory result, please contact your installer, who will dismantle the fans for cleaning.

- The fan cleaning procedure is described in the respective installation guide and may only be carried out by a qualified personnel.

### 5.2 Cleaning the Display

If the display or the status LEDs are so soiled that they can no longer be read, they should be cleaned with a damp cloth.

- Never use solvents, abrasives or corrosive materials for cleaning!

## 6 Measurement Channels and Messages

If your inverter is equipped with a communication component, then numerous measurement channels and messages to aid diagnosis can be transmitted.

The following abbreviations apply:

**BFR:** Operation control unit

**SRR:** Current control unit

### 6.1 Measuring Channels

Measuring channel	Description
<b>Balancer</b>	Displays the currently active operating mode of the Sunny Mini Central, which has been set via the operating parameter "PowerBalancer".
<b>Earthfault / Riso</b>	Insulation resistance of the PV system before grid connection
<b>E-total</b>	Total amount of energy fed into the grid
<b>Error</b>	Identification of the current disturbance / error.
<b>Error-Cnt</b>	Number of errors which have occurred since the last reset
<b>Event-Cnt</b>	Number of events which have occurred
<b>Fac</b>	Grid frequency
<b>Fault current</b>	Differential current of the PV system (inverter and PV generator)
<b>h-On</b>	Total number of operating hours
<b>h-total</b>	Total number of grid-feeding operational hours
<b>Iac</b>	Grid current (active current)
<b>Ipv</b>	DC current
<b>Is</b>	Apparent current (applies only to inverters with Reactive Power Control)
<b>Mode</b>	Display of the current operating mode
<b>Power On</b>	Total number of grid connections
<b>Pac</b>	Generated AC power
<b>Phase</b>	The phase to which the inverter is connected. The phase (L1 - L3) is set via the operating parameter "Grid connection".
<b>PF</b>	Displacement factor $\cos \varphi$ (applies only to inverters with Reactive Power Control)
<b>Qac</b>	Reactive power (applies only to inverters with Reactive Power Control)
<b>Sac</b>	Apparent power (applies only to inverters with Reactive Power Control)
<b>Serial Number</b>	Serial number of inverter
<b>Vac</b>	Grid voltage
<b>Vfan, V-Fan</b>	Fan supply voltage (only in inverters equipped with an active cooling system)

Measuring channel	Description
Vpv	PV input voltage
Vpv-Setpoint	PV target voltage
Zac	Grid impedance

## 6.2 Status Messages

The inverters can be in various operating modes. These are displayed as status messages which can vary according to the method of communication.

Message	Description and corrective measure
<b>Balanced</b>	<p>The Sunny Mini Central has disconnected from the grid, or is limiting its output to 5 kVA over a 10-minute average. The Sunny Mini Central is part of a three-phase system equipped with two further Sunny Mini Centrals and the SMA Power Balancer to avoid unbalanced load. The "Balanced" message is displayed for the following reasons:</p> <p><b>Case 1:</b></p> <p>The operating parameter "PowerBalancer" is set to "PhaseGuard". One of the three Sunny Mini Central inverters in this system has indicated a grid fault and disconnected from the grid. Consequently, the other two Sunny Mini Central inverters also disconnect from the grid to avoid an unbalanced load, and send the message "Balanced".</p> <p><b>Case 2:</b></p> <p>The operating parameter "PowerBalancer" is set to "PowerGuard". One of the 3 Sunny Mini Centrals in this system has detected a device or grid fault and disconnected from the grid. The two remaining Sunny Mini Centrals reduce their output over a 10-minute average to 5 kVA in order to prevent an unbalanced load.</p> <p><b>Case 3:</b></p> <p>The operating parameter "PowerBalancer" is set to "FaultGuard". One of the 3 Sunny Mini Centrals in this system has indicated a device or grid fault and disconnected from the grid.</p> <p>When grid failure occurs, the other two Sunny Mini Centrals also disconnect from the grid to prevent an unbalanced load, and send the message "Balanced".</p> <p>In the event of a device fault, the fault message is sent to the other two devices with a time lapse of 5 minutes. After the 5 minutes have passed, the other two devices disconnect from the grid and send the message "Balanced".</p>

Message	Description and corrective measure
<b>Derating</b>	Overtemperature in the inverter. The inverter reduces its output to prevent the device from overheating.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>In the case of fan devices check heat dissipation, as described in Section 5.1 "Checking Heat Dissipation" (page 27).</li> <li>To avoid unnecessary yield losses, your installer should check the configuration and string size.</li> <li>The installer should also check whether the inverter could be installed in a better position with better ventilation and adequate heat dissipation.</li> </ul>
<b>Derating Idc, derat. Idc, Der. Idc</b>	An overcurrent condition occurs on the DC side of the inverter. The inverter reduces its output power. This status does not damage your system but does result in energy loss.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>If this message occurs repeatedly, please contact your installer to check the system.</li> </ul>
<b>Derating WR, Der. T. WR, Derating DC, Der. T. DC</b>	Overtemperature in inverter („WR“) or in the power electronics. The Sunny Boy / Sunny Mini Central reduces its power to prevent overheating of the device.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>In the case of fan devices check heat dissipation, as described in Section 5.1 "Checking Heat Dissipation" (page 27).</li> <li>To avoid unnecessary yield losses, your installer should check the configuration and string size.</li> <li>The installer should also check whether the inverter could be installed in a better position to enhance ventilation.</li> </ul>
<b>Disturbance</b>	Disturbance. This error is generated for safety reasons and prevents the Sunny Boy / Sunny Mini Central from connecting to the grid.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>Please contact your installer or the SMA Solar Technology Serviceline.</li> </ul>
<b>Earthfault / Riso</b>	Measurement of the insulation resistance of the PV system.
<b>Error</b>	An error has been detected.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>Please contact your installer or the SMA Solar Technology Serviceline.</li> </ul>

<b>Message</b>	<b>Description and corrective measure</b>
<b>grid. mon</b>	Testing the grid status, relay test etc.  This message occurs during the startup phase before the Sunny Boy or Sunny Mini Central has connected to the grid. The message usually appears in the morning and evening when there is little solar irradiation. Grid monitoring is also carried out after a fault has occurred.
<b>MPP</b>	The Sunny Boy / Sunny Mini Central is operating in MPP mode. It extracts the highest possible power output from the PV generator. MPP is the standard display message when operating under normal irradiation conditions.
<b>Mpp Peak</b>	The inverter is operating in MPP mode above its rated capacity.
<b>MPP-Search</b>	The inverter is calculating the MPP (Maximum Power Point)
<b>Off Grid</b>	The inverter is in "Island" mode. This mode has been specially conceived for operation in a stand-alone grid with a Sunny Island as grid controller.
<b>Offset</b>	Offset adjustment of measurement electronics
<b>Stop</b>	Interruption of operation after a disturbance. This status can also be set manually.
<b>Turbine Mode</b>	The inverter is in "Turbine" mode. This mode is specifically conceived for use with wind turbine systems.
<b>V-Const</b>	Constant-voltage operation ("Const. Volt.")  The input voltage of the PV generators is set at a given nominal value and the inverter is not operating in MPP mode. In some cases this mode can be set as the operating mode.
<b>waiting</b>	The switch-on conditions are not (yet) fulfilled.

## 6.3 Error messages

If an error occurs, the Sunny Boy and Sunny Mini Central generate a message which depends on the operating mode and the error detected.

Message	Description and corrective measure
<b>!PV-Overvoltage!</b> <b>!DISCONNECT DC!</b>	Overvoltage at DC input.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer who will immediately disconnect the PV generator from the inverter! Otherwise, the inverter may be damaged.</li> <li>• Your installer should check the DC voltage, as described in the inverter installation guide.</li> </ul>
<b>ACVtgRPro</b>	<p>The 10-minute-average grid voltage is no longer within the permissible range. This can be caused by either of the following:</p> <ul style="list-style-type: none"> <li>• The grid voltage at the connection point is too high.</li> <li>• The grid impedance at the connection point is too high.</li> </ul> <p>The inverter disconnects to assure compliance with the voltage quality of the grid.</p>
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline.</li> </ul>
<b>Bfr-Srr</b>	Internal measurement comparison fault or hardware defect.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>CAN</b>	Internal communication fault.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>Check L-N-PE</b>	L and N are swapped on the AC connection or PE is not connected (only applies for Sunny Mini Central models 9000TL / 1000TL / 11000TL).
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer to check the AC connection.</li> </ul>
<b>Check Varistor</b>	At least one of the varistors is defective (only applies to Sunny Mini Central models 9000TL / 1000TL / 11000TL).
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Have your installer check the function of the varistors, as described in the inverter installation guide.</li> </ul>

Message	Description and corrective measure
<b>DCBFS-Startup</b>	Internal communications fault.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>DC fuse</b>	At least one of the string fuses is defective (only applies to Sunny Mini Central models 9000TL / 1000TL / 11000TL).
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Have your installer check the string fuses and replace them where necessary. Further information is to be found in the inverter installation guide.</li> </ul>
<b>DCBFS Version</b>	DC-BFS has been installed with the wrong firmware version.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline when this problem occurs.</li> </ul>
<b>Delta Bfr-Srr</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline when this problem occurs.</li> </ul>
<b>Derating</b>	Once the inverter enters the "Derating" mode, it will display the "Derating" warning until the next total shutdown of the device (at the end of the day).
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• See Section 3.3.5 "The green LED goes out briefly" (page 14) for more information on this warning.</li> </ul>
<b>dFac-Bfr</b> <b>dFac-Srr</b>	Drastic grid frequency fluctuations exceed the permissible range ("Bfr" or "Srr" are internal messages which are of no relevance to the user). For safety reasons, the inverter disconnects itself from the grid.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Have your installer check the grid frequency and the incidence of major fluctuations. If repeated frequency variations occur and this is causing "dFac-Bfr" or "dFac-Srr" errors, your installer should ask the utility operator to agree to a modification of the operating parameters (dFac-Max).</li> <li>• The installer is responsible for changing the suggested parameters and making the necessary arrangements with the SMA Solar Technology Serviceline.</li> </ul>

Message	Description and corrective measure
<b>dl-Bfr</b> <b>dl-Srr</b>	<p>The inverter has detected a drastic change in the differential current. This fault only occurs in transformerless inverters that have no galvanic isolation from the grid. The integrated differential current monitoring system plays an important part in ensuring personal safety.</p> <p>A drastic change in the differential current can be caused by a sudden grounding fault, residual current or an actual fault in the device. The inverter disconnects from the grid.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If the message „dl-Bfr“ or „dl-Srr“ appears for no obvious reason, please contact your installer to verify whether the plant insulation might have a ground fault, as described in the inverter installation guide.</li> </ul>
<b>dl-Mess-Srr</b> <b>Fault Curr Meas</b>	<p>Deviation in the differential current measurement / differential current</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• If this fault message is displayed repeatedly, it means that inverter operation is permanently disabled. If the inverter is equipped with a communication interface, the installer can try to rectify the fault with the help of a communication product.</li> <li>• Should this be unsuccessful, please contact the SMA Solar Technology Serviceline.</li> </ul>
<b>dl-Test</b>	<p>Error in differential current measurement.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>dZac-Bfr</b> <b>dZac-Srr</b>	<p>Sudden changes in grid impedance exceed the permissible range ("Bfr" or "Srr" are internal messages which are of no relevance for the user). For safety reasons, the inverter disconnects itself from the grid.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Have your installer check the grid frequency and the incidence of major fluctuations. If repeated frequency variations occur and this is causing „dZac-Bfr“ or „dZac-Srr“ errors, your installer should ask the utility operator to agree to a modification of the operating parameters (dZac-Max).</li> <li>• The installer is responsible for changing the suggested parameters and making the necessary arrangements with the SMA Solar Technology Serviceline.</li> </ul>

Message	Description and corrective measure
<b>EEPROM</b>	<p>Transition disturbance during reading or writing of EEPROM data. This data is not essential for safe operation.</p> <ul style="list-style-type: none"> <li>The disturbance has no effect on the performance of the inverter.</li> </ul>
<b>EEPROM dBh</b>	<p>EEPROM data is defective, the device has switched off because the loss of data has disabled important functions of the inverter.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>Please contact your installer or the SMA Solar Technology Serviceline.</li> </ul>
<b>EeRestore</b>	<p>One of the duplicate data sets in the EEPROM is defective and has been reconstructed without loss of data.</p> <ul style="list-style-type: none"> <li>This error message is for information purposes only and has no effect on the performance of the inverter.</li> </ul>
<b>Fac-Bfr</b> <b>Fac-Srr</b> <b>FacFast</b>	<p>The grid frequency is no longer within the permissible range ("Bfr" or "Srr" is an internal message with no relevance for the user). For safety reasons, the Sunny Boy / Sunny Mini Central disconnects itself from the grid.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>Please contact your installer to deal with the fault.</li> <li>If the grid frequency is within the tolerance range, yet "Fac-Bfr," "Fac-Srr" or "FacFast" faults are still being displayed, please contact the SMA Solar Technology Serviceline.</li> </ul>
<b>HW-Signal</b>	<p>Internal measurement fault or hardware defect.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>Iac-DC_Offs-Srr</b>	<p>The DC component of the electricity being fed into the grid has exceeded the permissible range. For safety reasons, the inverter disconnects itself from the grid.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>If the grid current is outside the permissible range due to local grid conditions, contact the local utility operator for assistance.</li> <li>If the grid current is within the tolerance range, yet the "Iac-DC_Offs-Srr" fault is still being displayed, please contact the SMA Solar Technology Serviceline.</li> </ul>
<b>IGBTs</b>	<p>The internal hardware monitoring system has detected a fault in the power electronics.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>Please contact your installer or the SMA Solar Technology Serviceline.</li> </ul>

Message	Description and corrective measure
<b>Imax</b>	Overcurrent on the AC side. This fault code is displayed if the current in the AC grid is greater than specified.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer to have the plant configuration and the grid conditions checked.</li> </ul>
<b>Imax DC</b>	Overcurrent on the DC input side of the Sunny Boy Multi-String. A current exceeding the maximum permissible value has been detected at the input of the inverter.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer to have the plant configuration checked.</li> </ul>
<b>K1-Close</b> <b>K1-Open</b> <b>K2-Open</b>	Fault during relay test.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline when this problem occurs several times in succession.</li> </ul>
<b>Kom DC-BFS</b>	Internal communication fault.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>L&lt;-&gt;N</b>	L and N are swapped on the AC connection.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer to have the plant checked over.</li> </ul>
<b>L-Netz</b> <b>L-WR</b> <b>N-Netz</b> <b>N-WR</b>	A grid relay is faulty. The inverter checks the relays connecting it to the grid before feeding power into the grid. If the grid relays do not function properly, the inverter does not connect to the grid for safety reasons.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault message is displayed repeatedly, it means that inverter operation is permanently disabled. If the inverter is equipped with a communication interface, the installer can try to rectify the fault with the help of a communication product.</li> <li>• Should this be unsuccessful, please contact the SMA Solar Technology Serviceline.</li> </ul>

Message	Description and corrective measure
<b>MWE Defect DC</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>MSD-di</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>MSD-FAC</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>MSD-Vac</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>MSD-Timeout / NUW-Timeout</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>MSD-Zac</b>	Internal measurement comparison fault or hardware defect.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>Offset</b>	Fault in the acquisition of measurement data.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>PowerBalance</b>	The Sunny Mini Central is part of a three-phase system with two further Sunny Mini Centrals. This is equipped with the SMA Power Balancer for preventing unbalanced loads. The operating parameter "PowerBalancer" is set to "PhaseGuard" or "FaultGuard".
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• For more detailed descriptions of the operation modes „PhaseGuard“ and „FaultGuard“ please refer to Section 6.2 "Status Messages" (page 29) under „Balanced“.</li> </ul>

Message	Description and corrective measure
<b>Rechner / MSD-Timeout</b>	Functional fault in one of the two microcontrollers.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline when this problem occurs several times in succession.</li> </ul>
<b>Relais 1 Relais 2 Relais 3 Relais 4</b>	A grid relay is faulty. The inverter checks the relays connecting it to the grid before feeding power into the grid. If the grid relays do not function properly, the inverter does not connect to the grid for safety reasons.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault message is displayed repeatedly, it means that inverter operation is permanently disabled. If the inverter is equipped with a communication interface, the installer can try to rectify the fault with the help of a communication product.</li> <li>• Should this be unsuccessful, please contact the SMA Solar Technology Serviceline.</li> </ul>
<b>REL_INV_CLOSE REL_GRID_CLOSE</b>	A grid relay does not close. The inverter checks the relays connecting it to the grid before feeding power into the grid. If the grid relays do not function properly, the inverter does not connect to the grid for safety reasons.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault message is displayed repeatedly, it means that inverter operation is permanently disabled. If the inverter is equipped with a communication interface, the installer can try to rectify the fault with the help of a communication product.</li> <li>• Should this be unsuccessful, please contact the SMA Solar Technology Serviceline.</li> </ul>
<b>REL_INV_OPEN REL_GRID_OPEN</b>	A grid relay does not open. The inverter checks the relays connecting it to the grid before feeding power into the grid. If the grid relays do not function properly, the inverter does not connect to the grid for safety reasons.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this fault message is displayed repeatedly, it means that inverter operation is permanently disabled. If the inverter is equipped with a communication interface, the installer can try to rectify the fault with the help of a communication product.</li> <li>• Should this be unsuccessful, please contact the SMA Solar Technology Serviceline.</li> </ul>

Message	Description and corrective measure
<b>Riso / Earthfault</b>	The electrical insulation of the PV system to ground is faulty. The resistance between the DC plus and/or DC minus connection and ground is outside the defined limit range.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer to check whether your system is properly insulated or a ground fault has occurred. Further information is to be found in the inverter installation guide.</li> </ul>
<b>Riso-Sense / Earthfault-Sense</b>	The insulation measurement has failed.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>ROM</b>	The inverter firmware is faulty.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>SD-DI-Wandler</b>	The inverter has detected an insulation fault on the DC side.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer to check whether the plant is properly insulated or a ground fault has occurred. Further information is to be found in the inverter installation guide.</li> </ul>
<b>SD-Imax</b>	The inverter has detected an overcurrent on the AC side. It disconnects from the grid for safety reasons and then attempts to reconnect to the grid.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>SD-WR-Bruecke</b>	The inverter has detected a fault in the power electronics. It disconnects from the grid and then attempts to reconnect to the grid.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>Shutdown</b>	Temporary inverter fault.
	<p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline.</li> </ul>

Message	Description and corrective measure
<b>STM-Timeout</b>	Internal program run fault.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>Trafo-Temp-F</b>	Temperatures in the transformer have exceeded the acceptable limit. The inverter stops feeding the grid until the temperature reverts to within the admissible range.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• If this problem recurs, check the heat dissipation of the inverter, as described in Section 5.1 "Checking Heat Dissipation" (page 27).</li> </ul>
<b>Trafo-Temp-W</b>	Temperatures in the transformer have exceeded the acceptable limit. The inverter stops feeding the grid until the temperature reverts to within the admissible range. The Trafo-Temp-W warning is displayed until final shut-down (at the end of the day).
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Check the heat dissipation of the inverter, as described in Section 5.1 "Checking Heat Dissipation" (page 27).</li> </ul>
<b>Vac-Bfr</b> <b>Vac-Srr</b>	The grid current is no longer within the permissible range ("Bfr" or "Srr" is an internal message that has no meaning for the user). This can be caused by any of the following: <ul style="list-style-type: none"> <li>• Grid disconnected (line circuit breaker, fuse),</li> <li>• AC cable is broken or</li> <li>• AC cable is highly resistive</li> </ul> For safety reasons, the inverter disconnects itself from the grid.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer to check the grid voltage and the grid connection at the inverter.</li> <li>• If the grid voltage is outside the acceptable range due to local grid conditions, your installer should ask the utility operator whether the voltage can be adjusted at the feed-in point or whether they would agree to modifications in the monitored operational limits (operating parameters: Vac-Min and Vac-Max).</li> <li>• If the grid frequency is within the tolerable range, yet "Vac-Bfr," or "Vac-Srr" faults are still being displayed, please contact the SMA Solar Technology Serviceline.</li> </ul>
<b>VDiff / UDiff</b>	Disturbance in the intermediate circuit.
	<b>Corrective measures</b> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>

Message	Description and corrective measure
<b>VpvMax</b> <b>Vpv-Max</b>	<p>Overvoltage at DC input.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer who will immediately disconnect the PV generator from the inverter! Otherwise, the inverter may be damaged.</li> <li>• Have your installer check the plant configuration and the DC voltage before reconnecting the inverter to the DC voltage.</li> </ul>
<b>Uzkposneg&lt;10</b>	<p>Disturbance in the intermediate circuit.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>UZWK-Max</b>	<p>The internal hardware monitor has detected an overvoltage condition in the intermediate circuit of the inverter.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>Watchdog</b> <b>Watchdog-Srr</b>	<p>Internal program run fault.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer or the SMA Solar Technology Serviceline if this problem recurs.</li> </ul>
<b>Zac-Bfr</b> <b>Zac-Srr</b>	<p>The grid impedance is no longer within the permissible range ("Bfr" or "Srr" is an internal message that has no meaning for the user). For safety reasons, the inverter disconnects itself from the grid. The impedance is calculated from the grid impedance and the impedance of the grid connection cable (AC cable) of the inverter.</p> <p><b>Corrective measures</b></p> <ul style="list-style-type: none"> <li>• Please contact your installer to check the grid impedance and the grid connection at the inverter. Use a cable with sufficiently large cross-section (= low impedance), as recommended in the installation guide. It may also be possible to rectify this fault by tightening the screws of the AC terminals.</li> <li>• If this fault recurs, please contact the SMA Solar Technology Serviceline.</li> </ul>

## 7 Glossary

### **AC**

Abbreviation for "Alternating Current"

### **DC**

Abbreviation for "Direct Current"

### **Derating**

A controlled reduction in performance, usually dependent on component temperatures. Compared with the (also common) practice of completely shutting down the device, derating has a less drastic effect on the external grid.

### **Grid-connected system**

PV system which is connected to the power supply grid of an external energy supplier.

### **Grid impedance**

The grid impedance is a characteristic grid specification, which is determined both by the grid infrastructure, and by the number of power suppliers and power consumers. If supply to the grid section drops due to a grid shutdown on the part of the adjacent energy suppliers (medium-voltage transformers), the grid impedance changes abruptly. In order to detect this occurrence, and to prevent the formation of an unwanted stand-alone grid, SMA Grid Guard monitors the grid impedance and disconnects the inverter from the grid in the event of a sudden impedance variation.

### **Inverter**

A device for converting the direct current (DC) from the PV generator into alternating current (AC), which is used by most normal household devices, and especially for feeding energy into an existing supply grid.

### **Maximum Power Point "MPP"**

The operating point (current / voltage) of the PV generator at which the highest possible performance under the prevailing conditions is achieved. The actual MPP changes constantly, depending on the level of solar irradiation, cell temperature, etc.

### **MPP tracker**

A device that adjusts the voltage and current of a PV generator so that it operates at its "Maximum Power Point".

### **PV**

Abbreviation for "photovoltaic" describing the conversion of solar energy into electrical energy.

### **PV generator**

Technical device for the conversion of solar energy into electrical energy. This normally refers to all installed and electrically connected solar modules in a PV system.

## **PV module**

A collection of solar cells in an enclosure that protects the sensitive cells from mechanical stress and allows easy installation.

## **Reactive Power Control**

Inverters with Reactive Power Control are inverters capable of utilizing reactive power. By setting a default value for the displacement factor ( $\cos \varphi$ ) they can feed reactive power to the grid.

## **SMA Grid Guard**

The SMA Grid Guard concept monitors, for instance, the voltage and frequency of the connected AC grid according to predefined parameters. This serves to prevent the formation of a stand-alone grid in the event of grid disconnection.

## **SMA Power Balancer**

The SMA Power Balancer is a serial feature of the Sunny Mini Central. The SMA Power Balancer prevents the formation of an unbalanced load during three-phase grid feeding. To this effect, a group made up of 3 Sunny Mini Centrals are each connected via a control line to a 3-phase feeding unit.

## **Solar cell**

An electronic component which generates electrical energy when irradiated with sunlight. Since the voltage produced by a single solar cell is very small (approx. 0.5 V), several solar cells are combined to form a solar module.

## **Solar energy**

"Sun energy", i.e. energy from sunlight (solar irradiation).

## **Solar generator**

See PV generator

## **Solar module**

See PV module.

## **Solar power plant**

Describes the totality of components required for the exploitation and utilization of solar energy. In grid-connected systems this includes not only the PV generator, but also the inverter, e.g. Sunny Boy or Sunny Mini Central.

## **String**

Describes a group of series-connected solar modules.

## **String fuse**

String fuses serve to protect the modules against reverse current.

**String inverter**

In string technology, the PV generator is subdivided into individual module surfaces, or "strings", each of which has an assigned string inverter. This technology reduces system costs while at the same time making installation a lot simpler and increasing the energy yield and system availability.

**Unbalanced load**

The difference between the power fed into the grid at the individual phase conductors. In Germany, it is not permitted to exceed a nominal output of 4.6 kVA (plus 10 % overload, i.e. 5 kVA in total).

**Varistor**

In the Sunny Boy and Sunny Mini Central, varistors protect the electronics from atmospherically coupled energy peaks, such as those that can occur in the conductor loop of the PV generator in the event of nearby lightning strikes. They limit overvoltage by discharging the coupled current to earth. During operation, varistors are subject to a certain degree of ageing. Varistors which have been in service for a long time or have already had to discharge overvoltages, are subject to a decrease in internal resistance and heat up significantly. Thermally monitored varistors recognize this increased temperature and automatically disconnect from the power circuit. If the protective function of the varistor is no longer given, the inverter triggers a fault message.

## 8 Contact

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

- Inverter type
- Communication method
- Type and number of modules connected
- Serial number of inverter
- Blink code or message displayed by the inverter

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