

# SolarMax S series

2000S /3000S /4200S /6000S

Instruction manual



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# 1 About this instruction manual

This instruction manual contains a description of the SolarMax S series string inverters 2000S, 3000S, 4200S and 6000S. It also tells you how to install, commission and operate the inverter. Familiarize yourself with inverter functions and characteristics before you begin the installation work. Carefully read the safety instructions in this manual. Ignoring the safety instructions can result in serious injuries or death.

## 1.1 Target group

This instruction manual is for the fitter (or the responsible electrician) and the operator of the PV plant.

## 1.2 Where to keep this manual

The system operator must ensure that this instruction manual is available to those responsible for the power plant at all times. If this original document is lost, an up-to-date version of this instruction manual can be downloaded from our website at all times ([www.solarmax.com](http://www.solarmax.com)).

## 1.3 Symbols used

From time to time you will see the following symbols when reading this instruction manual:



### **DANGER**

This symbol indicates that ignoring this instruction may directly lead to serious injury or death.



### **CAUTION**

This symbol indicates that ignoring this instruction can lead to damage to your inverter or your PV power plant.



### **NOTE**

This symbol indicates information which is especially important for operating the inverter.

## 2 Safety instructions

The string inverters of the S series contain the latest technological advances and have been built and tested to meet currently valid product safety standards. However, ignoring the safety instructions contained in this instruction manual can endanger the user, a third party or property. The qualified electrician and the operator of the PV plant can minimise these risks by following the safety instructions at all times.



### DANGER

- Only qualified electricians who have already completely read and understood this instruction manual in advance may install SolarMax inverters.
- The qualified electrician is responsible for adhering to the valid local application installation and safety instructions.
- Ignoring the installation and safety instructions shall cancel any and all warranty and liability claims.
- Touching live parts is life-threatening.
- Disconnecting plug-in connectors on the DC end during operation arcs can result in arcs. That is why the MC connectors must remain in place until the DC line has been disconnected.
- The inverters must remain closed at all times during operation.
- The PV generator supplies direct current to the inverter when the PV modules are exposed to sunlight.

### 2.1 Appropriate use

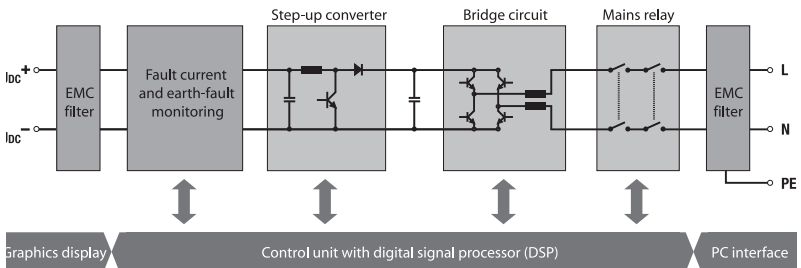
The SolarMax string inverters of the S series are designed exclusively to convert the direct current generated by PV modules into alternating current which conforms to the parameters of the public grid. Any other use is contrary to the purpose for which the inverters were designed. Sputnik Engineering accepts no liability for damages resulting from using inverters for purposes other than this. Any modifications to the inverter performed by the plant operator or the fitter without any review or approval by Sputnik Engineering are prohibited.

## 3 Description

All SolarMax inverters work completely automatically. The DC circuit breaker is always on during normal operation. The inverter starts when there is enough input power and continues to operate until the available input power from the PV generator drops below the necessary minimum.

### 3.1 Technical configuration SolarMax 2000S/3000S

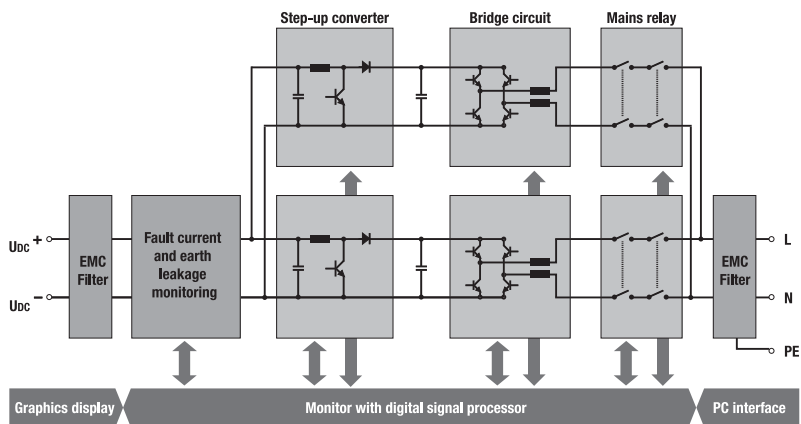
The DC voltage of the PV generator is transferred to a DC bus voltage via a low-loss step-up converter. The IGBT bridge circuit generates the sinusoidal infeed current.



### 3.2 Technical configuration SolarMax 4200S and SolarMax 6000S

The DC voltage of the PV generator is transferred to a DC bus voltage via a low-loss step-up converter. The IGBT bridge circuit generates the sinusoidal infeed current.

The innovative MaxShare concept leads to a tangible boost in efficiency during periods of partial load. MaxShare switches the required power stages on or off according to the current output.



### 3.2.1 Safety functions

In order to ensure a high safety standard, SolarMax inverters feature integrated fault current monitoring on the DC side. If a fault current flows into the earth, the fault current monitoring system detects the differential current and interrupts the mains operation. Accidental human contact triggers a safety mechanism in the fault current monitoring system which shuts down the device. Thereby preventing electric shock.

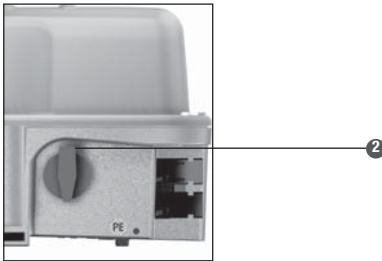
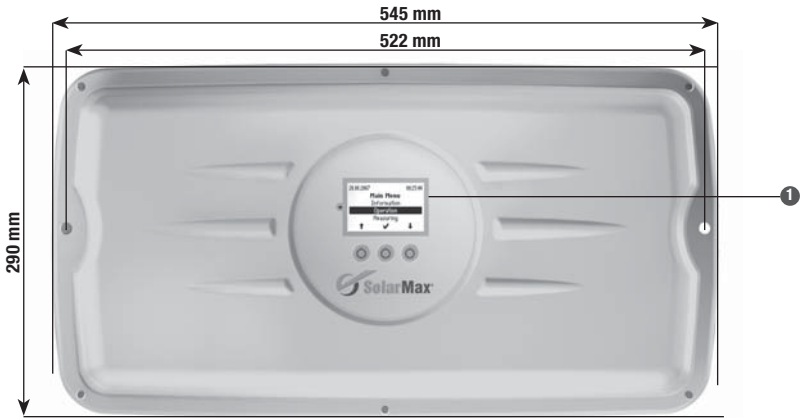
### 3.2.2 Control functions

SolarMax features state-of-the-art measuring and control electronics. A digital signal processor (DSP) generates the PWM signals and offers the following inverter control functions:

- Automatic on/off-switching
- Grid monitoring (overvoltage, undervoltage, mains frequency, detection of stand-alone operation)
- Mains synchronisation and sinusoidal current control
- Maximum power point tracking (MPPT, searching for the optimum operating point)
- Output limitation for oversized PV generators
- Input and output current limitation

- Monitoring of the power electronics
- Monitoring of the heat sink temperature
- Control of the graphics display
- External communication via RS485 and/or Ethernet

### 3.3 External operating elements and dimensions



- 1 Graphics display with operation      2 DC insulation switch

## 4 Installation

### 4.1 Transport and storage

#### 4.1.1 Transport

During transport and any interim storage period you must ensure that the ambient conditions (temperature and humidity) are always within the tolerance limits specified in the technical data. Any longer term, unattended, and unprotected interim storage of the inverter in the open must be avoided.

#### 4.1.2 Storage conditions

Store the inverter in a dry, enclosed space.



#### CAUTION

Possible damage to the device! Never store the inverter outdoors.

### 4.2 Site selection and operating conditions

#### 4.2.1 Specifications and instructions for site selection

Choosing a suitable location for the inverter is decisive for its operating safety as well as its expected service life and efficiency. When you select an installation site for the inverter please follow these instructions:



#### DANGER

- The inverter may only be operated in an overvoltage category 2 AC installation! If this is not the case, additional overvoltage-limiting elements (varistors) must be installed at the network connection point.
- The inverter and all feed lines must be installed out of reach of children or pets (especially rodents).
- Do not store any highly inflammable liquids near the inverter and do not expose the inverter to any highly inflammable gases or vapours.



## CAUTION

- To simplify the installation of the DC and AC feed lines there should be a 0.5 m clearance all around the inverter in relation to other inverters and/or walls. This step also prevents the hot exhaust air of the ventilation system from having a negative thermal impact when several inverters are installed beside each other. Multiple inverters should be installed above each other, if possible.
- Make sure there is sufficient ventilation if the inverter is installed inside a building or plant room. The inverters must not be installed in cabinets or enclosed recesses.
- If different Solar Max models of the S series are installed, the following sequence must be adhered to from left to right: SolarMax 2000S, SolarMax 3000S, SolarMax 4200S, SolarMax 6000S.
- The area of the air intake and outlet must not be covered or blocked in any other way at any time whatsoever. Free air circulation is absolutely necessary to permit the inverter to function properly.
- The ambient air should be dust-free to avoid excessive dirt on the heat sink and fans. Rooms with heavy concentrations of dust (e.g., in cabinetmaking or metal working shops, hay storage buildings) are not suitable installation locations.
- The installation underground must be firm and non-inflammable.
- The casing of the SolarMax S series inverter conforms with protection type IP54. This enables it to be installed outdoors, but the stated IP protection is only ensured if the included AC connector, an appropriate DC connector (MultiContact series 4) and the RJ45 connectors recommended in section 4.7.8 are used.
- When installing outdoors do not expose the inverter to direct sunlight.
- The inverter must be installed in a location protected from rain and snow.



## NOTE

Due to possible noise emissions the device should not be installed in a residential space.

## 4.2.2 Operating conditions at the site

- Ambient temperature range for maximum power:
  - SM2000S: -20 °C to +55 °C
  - SM3000S, SM4200S and SM6000S: -20 °C to +45 °C
- Relative humidity of the site: 0 to 98 % (no condensation)
- The installation location must meet the requirements related to electromagnetic emissions (EN 61000-6-4).

## 4.3 Cooling system

Notwithstanding the high efficiency of the SolarMax inverter, approx. 5 % of the power has to be dissipated in the form of heat. To this end the base of the device is made from cast aluminium, which ensures adequate cooling via convection and an additional fan.

For safety reasons the temperature of the heat sink is limited to 80 °C. At ambient temperatures of more than 45 °C the heat sink temperature may reach 75 °C. In this event the maximum inverter output is reduced temporarily. But if the temperature still runs as high as 80 °C the device is shut down to prevent a thermal overload.

## 4.4 Lightning protection

The requirements for appropriate lightning protection for a PV power plant depend on many different factors (plant size, how the cables are run, the modules used, the surroundings, etc.).

A project-specific protection concept must be developed by a qualified person. Information on the built-in over-voltage is contained in section 4.7.3.

## 4.5 Scope of delivery

Make sure the delivery is complete. If the delivery is incomplete please contact Sputnik Engineering.

- SolarMax inverters
- Instruction manual and installation primer for an installation
- Mounting rail and Hardware
  - 2 screws 6 x 50 mm
  - 2 washers  $\varnothing$  18 mm

- 2 wall plugs
- 3 screws M6 x 12 mm
- 1 AC connector (Wieland)
- 1 M6 cable lug for the earthing cable and the hardware:
  - 1 Flat washer M6
  - 1 Spring lock washer M6
  - 1 serrated washer

## 4.6 Installation

The inverter can be easily installed using the included installation plate and installation material on a level installation base. You will find more information about how to properly install the inverter in the quick guide included in the delivery.

### Procedure

1. Drill two holes,  $\varnothing$  8 mm in diameter and to a depth of 60 mm in a distance of 370 mm.
2. Insert the dowels.
3. Attach the installation plate using the two 6 x 50 screws and washers.
4. Install the inverter as follows:
  - Slide the inverter onto the mounting rail from the left
  - push it rightwards up to the limit stop. Push the right-hand side of the inverter against the wall
  - slide it along the rail leftwards up to the limit stop
  - Attach the SolarMax inverter with screws

### Use of other mounting rails

If you mount the inverter on the mounting rails other than those included in the delivery the result is frequently too much distance between the inverter and the wall. This distance restricts effective air cooling (reduced canal effect across the heat sink). There may be no wall at all, a situation which nearly cancels any effective air cooling at all. This requires you to mount an appropriate metal plate between the mounting rail and the inverter.

## 4.7 Electrical connection

### 4.7.1 Guidelines for electrical installation



#### DANGER

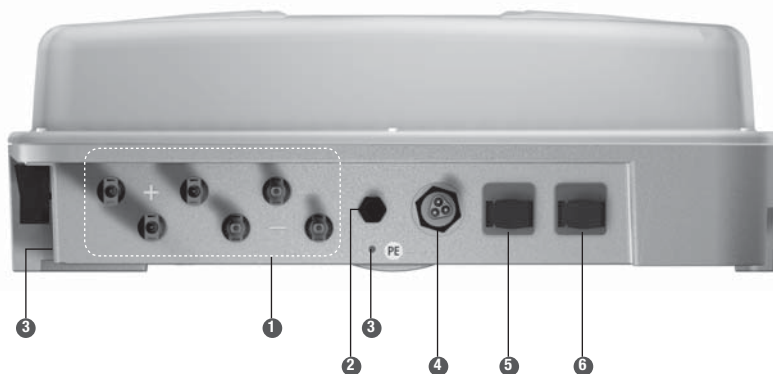
- Only qualified electricians may install and start-up S series inverters.
- The local regulations and guidelines for the installation of electrical devices must be followed.
- All the feed lines to the inverter must be appropriate for the expected voltages, currents and ambient conditions (temperature, UV load, etc.).
- Make sure that all lines are laid tension-free.

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### 4.7.2 Overview of the electrical connections

Sputnik Engineering supplies the SolarMax inverters prewired and ready for connection. All connections are pluggable. The device therefore does not have to be opened.

The following connections are available:



① DC-connection

② Status signalling contact

③ M6 earthing connections

④ AC-connection (Wieland Flanschstecker)

⑤ RS485/RJ45 socket

⑥ RS485 & LAN Ethernet RJ45 socket

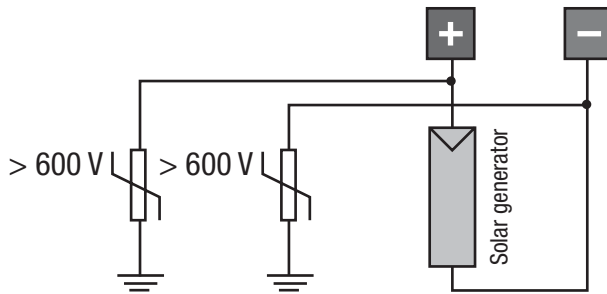
### 4.7.3 Specifications of the built-in overvoltage protection

SolarMax inverters feature integrated surge protectors at the input and output. On the DC side 2 surge arresters (varistors) for the plus and minus terminal to earth are installed. On the AC side a surge arrester (varistor) is installed between the phase and neutral. All surge arresters meet the requirements of class D according to VDE 0675-6 or Type 3 according to EN 61643-11. (no lightning protection, see also section 4.4).

- Note the following if the overvoltage protection on the DC is to be increased:

For inverters without galvanic isolation the DC terminals have a potential relative to earth that may be higher than the peak value of the mains voltage. For this reason, the response voltage of the surge arrester must be higher than  $600 V_{\text{peak}}$ .

The following diagram shows the connection of additional overvoltage conductors on the DC end.



### 4.7.4 Earthing of the inverter

The inverter's stray current to earth can reach values greater than 3.5 mA (AC) or 10 mA (DC) during operation. In this case, a second secure protective conductor connection is required according to EN 50178.

The cross-section of the second protective earth conductor should have at least the same cross-section as that of the main terminal. The position of two additional earthing connections on the casing is shown in section 4.7.2, "Overview of the electrical connections".

## 4.7.5 External fault interrupter (RCD)

The inverters in the SolarMax S series have an integrated AC/DC sensitive fault current sensor. This sensor is able to distinguish between the operational capacitive stray currents (caused by capacities of the PV modules to the earth) and leakage currents (caused by touching a pole of the PV generator). The inverter disconnects immediately from the mains as soon as an overstepping of the absolute limit value (300 mA, important in relation to fire safety) or a sudden increase in the DC-end fault current (30 mA, important to protect against personal injury) has been detected.



### NOTE

When selecting an additional external earth leakage circuit breaker (ELCB), you must remember that during operation the leakage currents can be as high as several 10mA per inverter. That is why the rated differential current of an external RCD must be at least 100 mA, for very large PV plants with several S series inverters it may also be necessary to use a 300 mA-RCD. Since the inverters in the S series are designed not to cause direct current fault currents on the AC end, an external type A RCD can be used.

## 4.7.6 Connecting the inverters to the mains



### DANGER

Make sure that all the DC and AC feed lines to the inverter are dead before you start the installation work.

### Connecting conditions

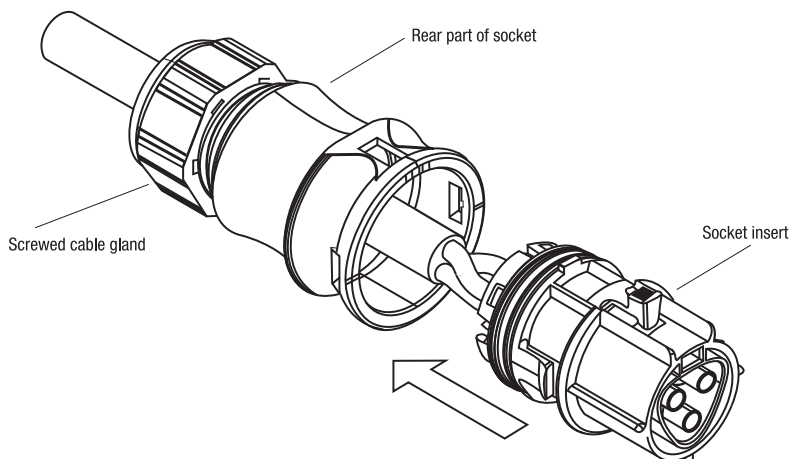
- Each inverter must be protected separately! No consumers may be connected between the fuse and the inverter!
- The following table contains recommended mains fuses and minimum line cross-sections necessary for the AC feed line:

	2000S	3000S	4200S	6000S
Mains fuses (C characteristic)	10A	13A	20A	25A
Minimum line line cross-section AC	1.5 mm <sup>2</sup>	1.5 mm <sup>2</sup>	2,5 mm <sup>2</sup>	4 mm <sup>2</sup>

- We recommend using larger conductor cross-sections in order to minimise line losses.
- The flexible cable is connected to a junction box with a maximum length of one metre. From here the installation may be continued with a rigid TT cable.

### Confectioning the AC connector

- Ensure that the cable is de-energised.
- Connect the AC cable socket with a flexible cable according to EN 60309-2 / VDE 0623.
- Connection of strands with a max. cross-section of 4 mm<sup>2</sup> can be connected.



1. Push the rear part of the socket over the cable.
2. Press wire end sleeves onto the stripped strands.
3. Connect the strands with the socket insert as follows:
  - Protective earth conductor PE with the screw terminal with earthing symbol
  - Neutral conductor N on screw terminal with the label N
  - Phase L on screw terminal with the label L
  - Tightening torque 0.8 – 1.0 Nm

4. Ensure that the strands are connected properly.
5. Snap the rear part of the socket onto the socket insert.
6. Tighten the screwed cable gland.

### Connecting the AC feed line

The AC feed line can now be connected to the AC connection of the inverter. As soon as the correct position is reached, the connector slips onto the AC connection.

The inverter is now firmly connected to the AC grid.



#### NOTE

As soon as the closure of the AC connector has slipped in, the AC connection can only be re-opened using a tool (slotted screwdriver size 2).

## 4.7.7 Connecting the inverters to the PV plant

You can connect as many as three strings directly to the inverter.



#### DANGER

Make sure that all the DC and AC feed lines to the inverter are dead before you start the installation work.

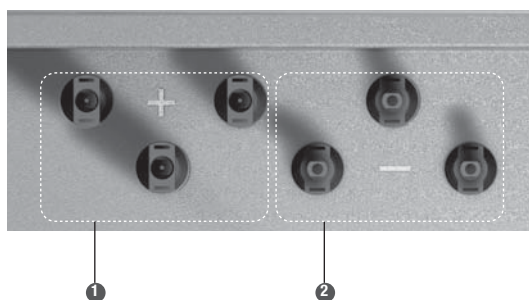
### Connecting conditions

- Maximum DC input current SM2000S and SM3000S: 11 A
- Maximum DC input current SM4200S and SM6000S: 22 A
- Maximum DC input voltage (SM2000S-SM6000S): 600 V
- Select cable cross-sections on the DC end corresponding to your plant configuration and in conformance with the valid installation regulations.
- Ensure that the DC cable is installed so as to avoid short-circuits and earth leakage all the way to the MC connections.
- Use only connectors from the MC4 series made by MultiContact for connecting the DC feed lines to the inverters.
- Due to the earth leakage monitoring neither the minus nor the plus pole may be earthed. Otherwise, the integrated insulation monitoring will prevent a mains connection.

## Procedure

1. Make sure that the DC isolating switch is switched off.
2. Remove the protective caps on the MC sockets.
3. Connect the DC feed lines to the inverter. Make sure the polarity is correct.

## DC connection



① DC + connection

② DC - connection

## 4.7.8 Connecting status signalling contact (optional)

The S series string inverters are equipped with a status signalling contact for remote monitoring as a standard. The inverter status can be detected with the potential-free relay contact. The contact is located on the front of the device between the DC and AC connections (see 4.7.2 “Overview of the electrical connections”). How the status signalling contact works can be set in the “Settings” menu (see section 6.4.2.6).

Setting	Functionality
Off	The status signalling contact is deactivated (remains idle).
Mains	The status signalling contact NO closes immediately during mains operation and is opened again when the set delay time expires, as soon as the device ceases to feed.
Error	The status signalling contact closes when the set delay time expires as long as a malfunction, an error or an alarm is activated during this time. The relay opens immediately as soon as the error no longer exists.  Events which could trigger the status signalling contact are listed in the section 10.2 “Diagnosis & corrective steps”.

Setting	Functionality
On	This setting is designed for controlling an external motorised AC disconnect, for example. When the inverter is switched on (sufficiently high DC input voltage), the status signalling contact closes. The status signalling contact will only re-open when the inverter is switched off (DC input voltage too low).



#### NOTE

At night and when the DC end is shut down, the status signalling contact is idle.

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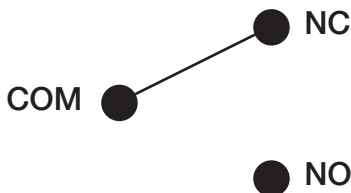
### Specifications of the status signalling contact

- M12-Stecker; den Stecker für das Kabel können Sie über das SolarMax Service Center beziehen.
- max. Schaltspannung: 250 V<sub>AC</sub> / 30 V<sub>DC</sub>
- max. Schaltstrom: 1 A

### Pinout

Pin	Contact
1	NO (normally open: open when idle)
2	COM
3	NC (normally closed: closed when idle)
4	Not used

### Contact diagram



## 4.7.9 Connecting the cable for data communications

The inverters in the SolarMax S series have two RJ45 sockets for data communications within a MaxComm network:

- The left-hand RJ45 socket (Pos. 5 in section 4.7.2) is only a RS485 interface. The RS485 interface is used for connections with other SolarMax inverters or accessories with the MaxComm interface.
- The right-hand RJ45 socket (Pos. 6 in section 4.7.2) can be used both as a RS485 and as an Ethernet interface, the desired function can be toggled in the “Settings” menu. The Ethernet interface is used for connecting an inverter directly to a PC or to MaxWeb xp. However, if both sockets are configured as RS485 interfaces, a network containing several RS485 nodes can be set up.

### Connection recommendations

If the RJ45 sockets are used and the inverter is exposed to the weather, please use products from the VARIOSUB-RJ45 range with IP67 protection from Phoenix Contact. This ensures that the installation meets the requirements of IP54.

- RJ45 connector, 8-pin, quick connector system (art. no. 1658493)
- Pre-assembled Ethernet cable, 8-pin RJ45/IP67 on RJ45/IP67 (art. no. 1658480)  
Available from [www.phoenixcontact.com](http://www.phoenixcontact.com).

### Procedure

Open the protective cap of the RJ45 sockets. Connect the cable and check that the connector plug is firmly in place.

# 5 Commissioning

## 5.1 Inspections prior to commissioning

Check the following points before you start up the inverter:

- All the necessary earth lines have been connected (see 4.7.4 “Earthing the inverter”).
- Make sure the polarity of the PV generator connection is correct.

## 5.2 Commissioning

If the inverter is being commissioned the initial setup will start automatically. This procedure must only be carried out once as part of the commissioning process. I

### Requirements

- Correctly connected DC supplies (AC connection is not required)
- Sufficient solar irradiation



#### NOTE

- Thoroughly read the manual before starting initial start-up. Contact your grid operator or the SolarMax Service Centre if you have any doubt regarding the settings you must select.
- You can restart initial start-up on the graphics display by pressing **X** at any time.


### Procedure

1. Switch on the DC disconnecter. The “Initial Setup” menu will be displayed on the graphics display.
  - Select the display language.
  - Select the country setting.



#### CAUTION

Entering the country incorrectly may lead to problems regarding inverter operation and to the withdrawal of the operating license by the respective grid operator.


- Enter today’s date. The inverter saves the date entered as the initial start-up date.
- Enter the current time.
- Click  to confirm the entries.

### Step 2: only for country settings “Germany”, “Great Britain” and “Italy”:

2. Determine the “Plant type” and/or the “Standard”.

Menu “Plant type” for country setting “Germany”:

Setting	Description
<= 3.68 kVA	The maximum plant system rating is 3.68 kVA.
> 3.68 – 13.8 kVA	The plant system rating is higher than 3.68 kVA and/or is maximally 13.68 kVA.
> 13.8 kVA – 30 kVA	The plant system rating is higher than 13.68 kVA and/or is maximally 30 kVA.
> 30kVA	The plant system rating is higher than 30 kVA.
VDE 0126-1-1	Required setting if the inverter is commissioned within a PV plant connected to the grid before 1 January 2012. Note: The setting "VDE 0126-1-1" is inadmissible for PV plants connected to the grid after 31 December 2011.

- Press  to confirm your entry.
- With the “VDE 0126-1-1” setting, the “Confirmation” menu appears afterwards (step 4).
- In the settings for the plant system rating, the “cosφ(P)” menu appears afterwards (step 3).

Menu “Standard” for country setting “Great Britain”.

Setting	Description
G83/1-1	Inverter settings according to standard G83/1-1
G83/2	Inverter settings according to standard G83/2 (available only for SM2000S, SM3000S and SM4200S)
G59/2	Inverter settings according to standard G59/2 (available only for SM4200S and SM6000S)

- Press  to confirm your entry. The “Confirmation” menu appears (step 4).

Menu “Standard” for country setting “Italy”:

Setting	Description
DK 5940	Required setting if the inverter is commissioned within a PV plant connected to the grid before 1 July 2012.
CEI 0-21: <= 3 kW	The maximum plant system rating is 3 kW.
CEI 0-21: > 3 kW – 6 kW	The plant system rating is higher than 3 kW and/or is maximally 6 kW.


- Press  to confirm your entry. The “Confirmation” menu appears (step 4).

**Step 3: only for country setting “Germany”:**

3. In the “cosφ(P)” menu, select the specification for the reactive power feed-in required by the grid operator:

Setting	Description
On	Standardised reactive power feed-in
Inactive	No reactive power feed-in (cosφ=1)

- Press  to confirm your entry.

4. In the “Validation” menu, check your entries. You can complete initial start-up afterwards by pressing . The main menu will then be displayed (see 6.3.2 Main menu).

## 6 Operation

All SolarMax S series inverters work completely automatically and maintenance-free. The electrical isolating switch between the PV generator, inverter and the 230 V mains always remain activated. If enough irradiance is present, the inverter starts operating and feeds the output into the 230 V mains; otherwise, the device goes into a wait mode and in this way is ready to feed the mains at any time. The electronics are separated from the mains during the night.

### 6.1 How the DC isolating switch works

Switching off the DC isolating switch disconnects the inverter from the PV generator.



#### DANGER

Even when the DC isolating switch is switched off, the components and connections of the inverter are still live!

### 6.2 Switching on the inverter

#### Procedure

Action	Reaction
1. Switch on the DC insulation switch.	After several seconds the Overview menu is displayed. The message "Startup..." appears in the "Status" line.  The status LED blinks green.
2. Switch on any external AC isolating switches/fuses (if present)	After 30 seconds, the inverter is in mains operation. In the "Overview" display, the "Mains operation" device status is shown.  The status LED glows green.



#### NOTE

When the inverter is commissioned, instead of the "Overview" menu, an "Initial Set-up" menu appears; see section 5 "Startup".

## 6.3 Switching off the inverter



### DANGER

- Even when the DC isolating switch is switched off, the components and connections of the inverter are still live!
- After disconnecting the inverter wait at least 5 minutes before opening the device to permit internal capacitors to discharge.
- The MC connector (DC input), may only be separated from the inverter if the DC isolating switch is open. Otherwise, disconnecting the DC feed lines during operation can result in dangerous arcs.

### Procedure

Action	Reaction
1. Switch off any external AC isolating switches/fuses (if present)	The graphics display shows the device status “No mains”. The status LED glows orange.
2. Switch off the DC insulation switch	The inverter shuts itself off after a few seconds

## 6.4 Operating the graphics display

The graphic display on the front of the inverter shows the system dimensions, status information and the inverter’s malfunction messages. The display allows you to learn the current device status, access the integrated data logger, and enter various settings for the inverter. Navigate the various menus using the three buttons under the display.

The display is backlighted to improve readability when lighting is poor. Activate the backlight by pressing any of the buttons. The backlight remains active for 180 seconds after the buttons were last used.

To the left of the graphics display there is a status LED indicating the device status, see 9.1 “Status messages and status LED”.



## NOTE

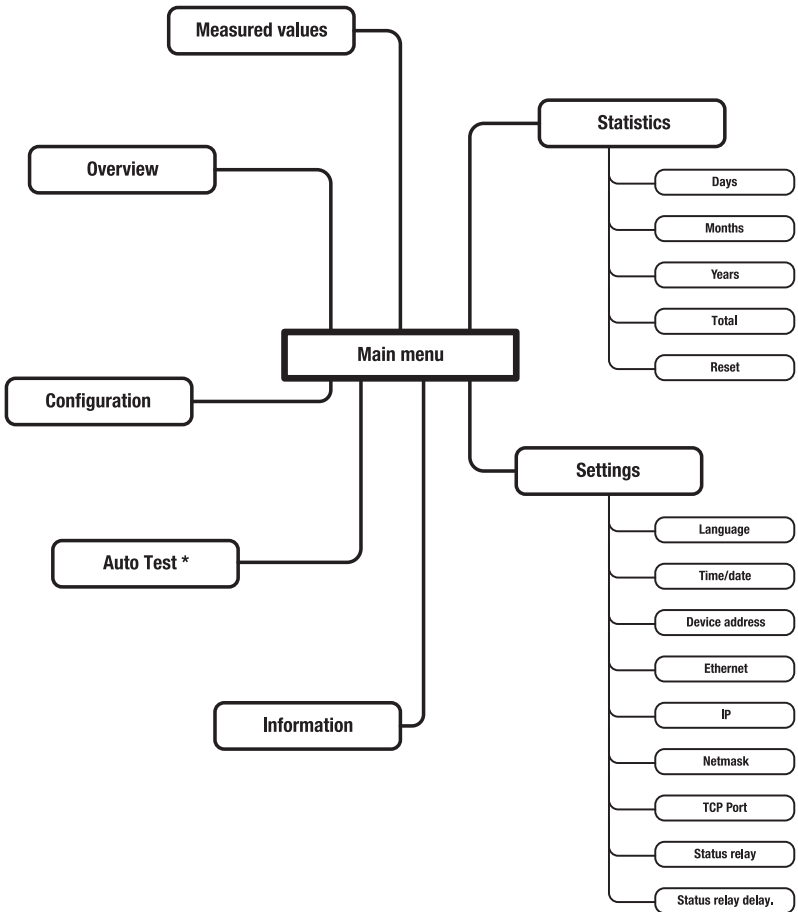
The whole measurement, control and communications electronics of the inverter is powered completely by the PV generator. That is why the use of the display unit and communications with the inverter are not possible at night or when there is too little irradiance.

### 6.4.1 Menu button symbols

With the help of the symbols shown here you can navigate the various menus and functions visible in the display. The current button function may change from one menu to the next and corresponds to the symbol appearing directly over the button in each case:

Symbol	Function
	Scroll up, increase number or next element
	Scroll down, or previous element
	Back to higher level menu
	Select next number
	Display selected submenu or confirm changes
	Launch edit mode for selection
	Abort

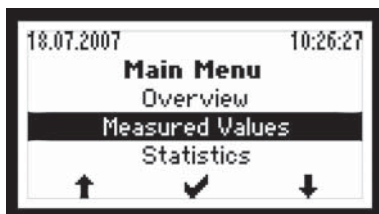
## 6.4.2 Menu structure



\* Only for country setting "Italy".

### 6.4.2.1 Main menu

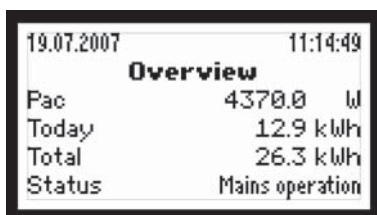
The main menu is the starting point for all the submenus and displays, see 6.4.2 “Menu structure”. Use the arrow keys **↑** and **↓** to select a menu. Click **✓** to confirm your selection.



en

### 6.4.2.2 Overview

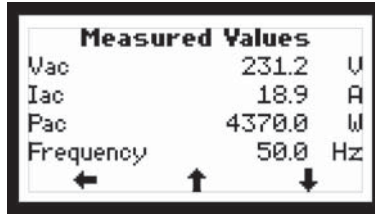
If none of the buttons are pushed for 120 seconds, the display returns automatically to the Overview menu which shows the three most important values as well as the current operating status.



Operating parameters	Description
19.07.2007 (example)	Current date
11:14:49 (example)	Momentary time
Pac	Momentary effective output
Today	Total energy fed into the mains on the current date and as of the momentary time.
Total	Total energy fed into the mains since the inverter's commissioning.
Status	For the display of the warnings and status messages, see 9. Operating status.

### 6.4.2.3 Measured values

The current inverter measured values can be accessed in the “Measured values” menu.



Use the arrow buttons **↑** and **↓** to navigate the measured values. Press the left button **←** to return to the Main menu.

The following measured values can be accessed:

Measured value	Description
Vdc	current PV generator voltage
Idc	current PV generator current
Vac	current mains voltage
Iac	current infeed current
Pac	current inverter output
Q	Reactive power (+: overexcited / -: underexcited)
Cosφ	Power factor (OEX: overexcited / UEX: underexcited)
Frequency	Mains frequency
Temperature	Heat sink temperature
Fan	Fan switched on or off



#### NOTE

The inverter measured values are not suitable for billing purposes or calculating efficiency. The measuring error may amount to up to  $\pm 5\%$  depending on the measured value. Only the measured values of a calibrated electricity meter are decisive for billing purposes.

## 6.4.2.4 Statistics

In the Statistics menu you can access the inverter's internal data logger. The accessible statistics are for the most recent 31 days, 12 months or 10 years. The "Total" sub-menu contains the accumulated yield and operating data since initial start-up of the inverter.

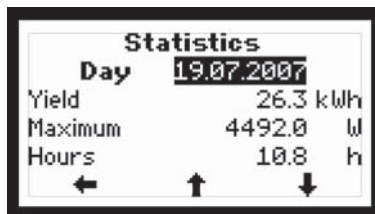


Use the **↓** button to highlight a statistic category. Select a category by pressing the **✓** button.

Press the left button **←** to return to the Main menu.

### Daily statistics

This menu provides access to the data from the most recent 31 days.

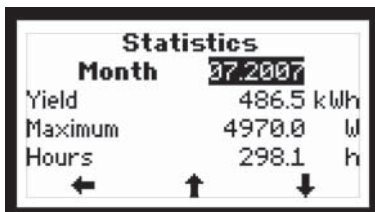


Use the buttons **↓** and **↑** to select a daily statistic. Press the left button **←** to return to the Statistics menu.

Parameter	Description
Yield	Daily yield
Maximum	Peak value of the output fed into the mains
Hours	Total operating hours during device status "mains operation"

### Monthly statistics

This menu provides access to the data from the most recent 12 months.



The screenshot shows a menu titled "Statistics" with the following data:

Parameter	Description
Yield	486.5 kWh
Maximum	4970.0 W
Hours	298.1 h

Use the ↓ and ↑ buttons to select a monthly statistic. Press the left button ← to return to the Statistics menu.

Parameter	Description
Yield	Monthly yield
Maximum	Peak value of the output fed into the mains
Hours	Total operating hours during device status "mains operation"

### Yearly statistics

This menu provides access to the data from the most recent 10 years.



The screenshot shows a menu titled "Statistics" with the following data:

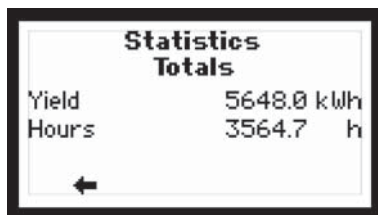
Parameter	Description
Yield	5648.0 kWh
Maximum	5060.0 W
Hours	3564.7 h

Use the ↓ and ↑ buttons to select a yearly statistic. Press the left button ← to return to the Statistics menu.

Parameter	Description
Yield	Annual yield
Maximum	Peak value of the output fed into the mains
Hours	Total operating hours during device status "mains operation"

## Total

This menu lists the total yield and the total number of operating hours of the inverter since initial start-up.



Press the left button ← to return to the Statistics menu.

## Reset

In this menu you can delete all the entries in the Statistics menu.



### NOTE

Once deleted this data is irretrievably lost!



Press the ✓ button to confirm the deletion of all the statistics entries. Use the X button to enter the Statistics menu without deleting the statistics entries.

## 6.4.2.5 Configuration

All available operating parameters and advanced functions of the inverter are listed in the Configuration” menu. The settings displayed for the limit values and the functions depend on the country selected during initial start-up.



### NOTE

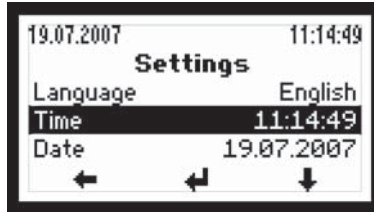
MaxTalk 2 Pro, the extension to the standard MaxTalk 2 software, allows authorised skilled workers to individually adjust the operating parameters. The required “S series parameter configuration using MaxTalk 2 Pro” instruction manual can be found on our website [www.solarmax.com](http://www.solarmax.com) (Downloads area). You can request MaxTalk 2 Pro from the SolarMax Service Centre. The contact details can be found overleaf.


Parameter	Description	Unit
Country	Country setting at the time of commissioning	-
Plant type	Plant type for the initial commissioning.	-
Standard	Operating standard for the initial commissioning.	-
Vac min 1	Minimum admissible mains voltage (first limit)	V
t Vac min 1	Release time for minimum admissible mains voltage	ms
Vac max 1	Maximum admissible mains voltage (first limit)	V
t Vac max 1	Release time for maximum admissible mains voltage	ms
Vac min 2	Minimum admissible mains voltage (second limit)	V
t Vac min 2	Release time for minimum admissible mains voltage	ms
Vac max 2	Maximum admissible mains voltage (second limit)	V
t Vac max 2	Release time for maximum admissible mains voltage	ms
Vac 10min max	Maximum admissible average value of the mains voltage over the last 10 minutes	V
f min 1	Minimum admissible mains frequency (first limit)	Hz
t f min 1	Release time for minimum admissible mains frequency	ms
f max 1	Maximum admissible mains frequency (first limit)	Hz
t f max 1	Release time for maximum admissible mains frequency	ms
f min 2	Minimum admissible mains frequency (second limit)	Hz
t f min 2	Release time for minimum admissible mains frequency	ms
f max 2	Maximum admissible mains frequency (second limit)	Hz
t f max 2	Release time for maximum admissible mains frequency	ms
df/dt max	Maximum permissible mains frequency variation per second	Hz/s

Parameter	Description	Unit
lac max	Maximum admissible mains current (per shift)	A
lac mean max	Maximum permissible DC-ratio of the fed-in system current	A
Pac max	Maximum effective power to be fed	W
S max	Maximum apparent power to be fed.	VA
Island detection	Immediate grid disconnection when island operation detected	Inactive/on
Restart delay	Delay time before grid reconnection upon previous failure-related grid disconnection.	s
Pac progression	Maximum increase of the effective power during grid reconnection upon previous failure-related grid disconnection.	%/min
Mains check	Additional monitoring before connecting to the grid	Inactive/on
- Vac MC max	Maximum admissible mains voltage at mains check	V
- Vac MC min	Minimum admissible mains voltage at mains check	V
- f MC max	Maximum admissible mains frequency at mains check	Hz
- f MC min	Minimum admissible mains frequency at mains check	Hz
- t MC monitoring	Duration of mains check	s
lerr max	Maximum permissible fault current (effective value) on the DC end	mA
P(f)-Mode	Mode of the frequency-dependent power reduction 2: Operation on the nominal line / 3: Power increase according to parameter Re-increase / Off: P(f) mode is switched off	2/3/Off
- Reduction	Reduction of effective power Pac in P(f) mode	%/Hz
- f start	Starting frequency of the P(f)-Mode	Hz
- Re-increase	Maximum increase to the maximum effective power Pac max after the P(f) mode was exited.	%/min
Q-Mode	Selected reactive power mode: off, $\cos\phi$ , $\cos\phi(\text{Pac})$ , Q, or Q(Uac)	-
- Vac Lock	Switch with hysteresis behaviour for the Q-Mode. When the switch is activated, the selected reactive power mode is switched on and/or off according to the limit values Vac Lock-In and Vac Lock-Out.	Inactive/on
- Vac Lock-In	Upper limit value of the mains voltage for Vac Lock. Vac Lock switches on the selected reactive power mode.	V
- Vac Lock-Out	Lower limit value of the mains voltage for Vac Lock. Vac Lock switches off the selected reactive power mode ( $\cos\phi = 1$ ).	V




## 6.4.2.6 Settings

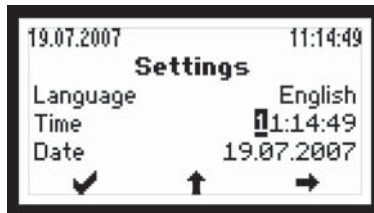
The “Settings” menu allows you to edit various parameters:






Press the left button  to return to the Main menu.

### How to change the parameter values in the editing mode

1. Select parameters with the  key; for example, Time.
2. Push the  button to switch into the editing mode.
3. Push the  button to get to the desired position of the parameter:



4. Push the  button to increase the figure.
5. Select the next position using the  button or
6. Push the  button to confirm the value and exit the editing mode.

Parameter	Description
Language	Selecting the display language (German, English, French, Italian or Spanish)
Time	Setting the internal clock
Date	Setting the display date
Device address	Define a device address between 1 and 249
Ethernet	Switches the Ethernet interface on or off

Parameter	Description
IP address	Configuration of the Ethernet interface (see also Section 7.1 “Configuration of the data communications interfaces”)
Netmask	
TCP Port	
Status relay	Definition how the status signalling contact functions (see section 4.7.8 “Status signalling contact (optional)”)
Status relay delay	Setting the switching delay of the status signalling contact






#### NOTE

- The selection of the display language is independent of the selected country setting.
- If you link several inverters and accessory components into one MaxComm communications network you must assign a unique address to each device in the network.

### 6.4.2.7 Information

This menu shows the following information:

- Device type (SM2000S, SM3000S, SM4200S, SM6000S)
- Firmware version
- Date of commissioning
- Webadresse ([www.solarmax.com](http://www.solarmax.com))

Use the  and  keys to move through the menu. Press the left button  to return to the Main menu.

### 6.4.2.8 Auto Test


During the Auto Test procedure in mains mode the trigger threshold for AC voltage and frequency monitoring is varied linearly with a ramp of  $\leq 0.05$  Hz/s and  $\leq 0.05$  Vn/s ( $V_n = 230$  Vac, only available for country setting “Italy”). At some point during the test the threshold will coincide with the current measured value, leading to triggering of the monitoring intervention. After each test step the values of the trigger thresholds, delay times, current measured frequency and AC voltage values, and the standard threshold trigger value are displayed.



## NOTE

- The Auto Test can be activated only if there is sufficient irradiance and the inverter is connected to the mains and is in feed mode.
- If a fault occurs during the tests or the irradiance is too low the Auto Test is aborted and the message “Auto Test aborted” appears in the display together with an associated error message.

## Procedure

1. Wait until the inverter has connected to the grid.
2. Select the “Auto Test” menu item in the Main menu.
3. Start the self-test press the  button to confirm. The Auto Test now runs automatically:

### Maximum voltage

- The set voltage monitoring threshold Vac max is displayed.
- The threshold value is decremented linearly until it reaches the current mains voltage value and mains monitoring is triggered.
- The trigger value, the delay time, the current value and the default voltage monitoring value (Vac max) are displayed.

### Minimum voltage

- The set voltage monitoring threshold Vac min is displayed.
- The threshold value is incremented linearly until it reaches the current mains voltage value and mains monitoring is triggered.
- The trigger value, the delay time, the current value and the default voltage monitoring value (Vac min) are displayed.

### Maximum average value of the mains voltage

- The set voltage monitoring threshold Vac 10 min max is displayed.
- The threshold value is incremented linearly until it reaches the current mains voltage value and grid monitoring is triggered.
- The trigger value, the delay time, the current value and the default voltage monitoring value (Vac 10 min max) are displayed.

### Maximum frequency (first limit)

- The set frequency monitoring threshold f max 1 is displayed.
- The threshold value is decremented linearly until it reaches the current mains frequency value and mains monitoring is triggered.
- The trigger value, the delay time, the current value and the default frequency monitoring value (f max 1) are displayed.

toring value (f max 1) are displayed.

- The condition of the frequency monitoring f max 1 is displayed.

#### **Minimum frequency (first limit)**

- The set frequency monitoring threshold f min 1 is displayed.
- The threshold value is incremented linearly until it reaches the current mains frequency value and mains monitoring is triggered.
- The trigger value, the delay time, the current value and the default frequency monitoring value (f min 1) are displayed.
- The condition of the frequency monitoring f max 1 is displayed.

#### **Maximum frequency (second limit)**

- The set frequency monitoring threshold f max 2 is displayed.
- The threshold value is decremented linearly until it reaches the current mains frequency value and grid monitoring is triggered.
- The trigger value, the trigger time, the current value, and the default value of frequency monitoring (f max 2) are displayed.
- The condition of the frequency monitoring f max 2 is displayed.

#### **Minimum frequency (second limit)**

- The set frequency monitoring threshold f min 2 is displayed.
- The threshold value is incremented linearly until it reaches the current mains frequency value and grid monitoring is triggered.
- The trigger value, the trigger time, the current value, and the default value of frequency monitoring (f min 2) are displayed.
- The condition of the frequency monitoring f min 2 is displayed.

Display after successful self-test:



After the Auto Test is complete the inverter returns to normal operation.

## 7 Data communication

For PV plants equipped with SolarMax inverters, Sputnik Engineering offers the MaxComm communications platform. This provides many ways of recording data and monitoring your PV plant. Below is an overview of the current products.



### NOTE

You can find detailed information on our website at [www.solarmax.com](http://www.solarmax.com).

### MaxTalk

If you only need to access the data of your inverters occasionally or modify your inverter's settings, the MaxTalk PC software is ideal for you. MaxTalk can be downloaded at no charge from our website.

### MaxMonitoring

Using the cost-free MaxMonitoring software, you can display the performance data of your photovoltaic plant at any time in your home. On the one hand, MaxMonitoring is available as an App for iPhone, iPad, iPod touch, Android smartphones, and, as of now, for Android tablets as well in the corresponding store. On the other hand, versions to be installed on your PC or MAC are available.

### MaxWeb xp

MaxWeb xp is a data logger, monitoring unit and web server in one. For all those who want to have their PV plant monitored and checked reliably and professionally, MaxWeb xp is the ideal solution. On the Internet you can access your PV power plant from any PC with an internet connection to check current measured values and yields or to edit the settings of your inverters. The data logger records operating parameters, yield values, and events and communicates them automatically to the MaxWeb portal.

If there is a failure, MaxWeb xp sends out alarm messages by email or SMS.

### MaxWeb portal

The MaxWeb portal is the ideal complement to the MaxWeb xp data logger. When using the MaxWeb portal, you can access the data of your PV plant from anywhere on the Internet. The MaxWeb portal provides a wide variety of graphic and chart display options for the evaluation of your PV plant's operating parameters.

## 7.1 Configuration of the data communication interfaces

In order to use the Ethernet communications interfaces, you must enter the following settings in the “Settings” display menu:

### Device address

If you connect several inverters into one network, you must assign each device its own address.



#### NOTE

- You can assign addresses between 1 and 249. It is very important to remember to give a unique address to each individual device in the network!
- Start the device address numbering with the lowest numbers possible (if possible with 001).

When connecting to a LAN network, the following settings are required in addition to the device address:

### IP address

If you want to access your inverter from a local area network (LAN), enter an unassigned IP address from your LAN here.

### Netmask

Please enter the pertinent subnet mask for your IP address here.

### TCP Port

Enter the desired TCP port for communications with the inverter. Remember that the TCP port must be greater than 1023 since this range is reserved for predefined applications (referred to as “well known services”).



#### NOTE

You will find more details about data communication in the technical information “MaxComm network”. This document can be downloaded from our website at: [www.solarmax.com; downloads/data communication/MaxComm](http://www.solarmax.com/downloads/data%20communication/MaxComm).

# 8 Options

## 8.1 Accessory components

Below you will find a list of other available accessory components.

- **MaxMeteo**  
Unit recording irradiation data and cell temperature of PV modules
- **MaxCount**  
Unit recording meter figures with S0 interface
- **MaxDisplay**  
Interface for large display to visualise PV power plant data

## 9 Operating status

### 9.1 Status messages and status LED

The status message in the graphics display describes the current operating status of the inverter. Each inverter status message belongs to one of the five possible operating statuses. The status LED always displays one of these operating statuses through a variety of colours. In addition to the status messages, the inverter can also display warnings. Warnings result from device errors or external failures which, however, do not affect the mains operation of the inverter. Losses of yield are possible, however.

Warnings have no relation to the operating status and are displayed on the graphics display alternately with the current status message.

The status messages of the “Failure”, “Error”, and “Blocked” operating statuses, as well as the warnings, usually require certain measures to be taken, see 10 “Troubleshooting”.

LED status	Operating status	Description
Off	-	Inverter is switched off > grid disconnection
Flashing green ---	Booting	Inverter starts > grid disconnection
Green —	Mains operation	Grid feed-in (normal operation)
Flashing orange ---	-	Warning > no grid disconnection
Orange —	Failure	External failure > grid disconnection
Red —	Error	Internal device error > grid disconnection
Flashing red ---	Blocked	Inverter is blocked > grid disconnection

### 9.2 Booting

#### Status LED: blinks green

Status message	Description / Cause
Irradiance too low	There is too little solar radiation and infeed is not possible.
Startup...	In this mode, the inverter checks all the conditions which must be fulfilled to ensure secure infeed.
Restart delay	After a shutdown this value indicates the number of seconds after which feed mode will resume.



## 9.2 Mains operation

### Status-LED: Green

Status message	Description / Cause
Maximum power	The inverter limits the output to the maximum power of the device. This may happen if the solar generator is oversized.
Mains operation	The inverter is connected to the mains and is operating in feed mode.
Idc limitation	The inverter limits the solar generator current to the maximum permissible value. This may occur if the solar generator is designed such that the current at MPP exceeds the maximum permissible input current of the inverter.
Iac limitation	The inverter limits the mains current to the maximum permissible value. This can happen when there are strong fluctuations in irradiance or with an oversized solar generator.
Restart limitation	The inverter increases the active power after the conclusion of an external limitation with a defined progression (Pac progression).
Frequency limitation	The inverter temporarily limits the active power due to an active frequency-dependent reduction in power - P(f)-Mode.
External limitation	The output power of the inverter is limited by a remote command.

## 9.3 Display of the communications activity

The inverter's communications activity is indicated by the glowing of two different symbols in the upper part of the display.

Symbol	Description
	This symbol is displayed when the inverter sends or receives data (via RS485 or Ethernet).
	This symbol appears when there is an Ethernet connection (corresponds with the "Link" display on network cards).

# 10 Troubleshooting

Sputnik Engineering delivers only SolarMax inverters which have stood up to our extensive testing regime. Moreover, each inverter is subjected to several hours of endurance testing under full-load conditions.

This section describes in several tables all the possible error messages, their possible causes and suggestions on how to remedy them.

If despite this your PV power plant suffers a malfunction or an error we recommend these procedures:

1. Check whether the inverter and PV generator have been installed correctly.
2. Check the cable connections and follow the points described in section 4, "Installation".
3. Determine the cause of the failure by checking the message in the graphics display. Section 10.2, "Diagnosis & corrective steps" explains possible ways of correcting malfunctions.
4. If you cannot correct the malfunction using the recommended procedures, or you are not sure what sort of fault is involved, please contact our SolarMax Service Centre.

## 10.1 SolarMax Service Centre

If you have technical questions or difficulties our Service Centre would be happy to help you. If you have questions about string inverter malfunctions we need from you the following details:

- Device type
- Serial number S/N
- Installation location
- Information about the failure you are experiencing (status message, etc.)

### Availability

Monday to Friday from 8.00 am to 5.00 pm (CET)

The contact details of the SolarMax Service Center can be found overleaf.

Sputnik Engineering AG  
Länggasse 85  
CH-2504 Biel/Bienne

## 10.2 Diagnosis & corrective steps

The following tables describe possible measures for remedying failures. If the measures suggested do not correct the failure, please contact the SolarMax Service Centre immediately.

### 10.2.1 General troubleshooting

Problem	Cause	Steps
<b>The display remains blank</b>	DC insulation switch switched off	Switch on the DC insulation switch.
	Irradiance too low	Wait until irradiance is high enough.
	Strings disconnected.	Check PV generator and correct disconnection.
	Internal failure.	Notify the SolarMax Service Centre.
<b>Graphics display flashes periodically</b>	Irradiance too low	Wait until irradiance is high enough.

### 10.2.2 Warnings

#### Status LED: flashes orange

Warning	Cause	Steps
<b>Temperature limitation</b>	The feed-in power has been temporarily reduced to limit the temperature of the inverter.	Clean the fan grids and improve ventilation in the operations room.
<b>Failure fan</b>	A fan is defective or dirty.	Contact the SolarMax Service Centre.
<b>Failure temp. sensor</b>	A temperature sensor in the inverter has ceased functioning.	Contact the SolarMax Service Centre.

## 10.2.3 Failures

### Status LED: orange

Status message	Cause	Steps
<b>Vdc too high</b>	The DC input voltage of the inverter is too high.	Immediately disconnect the DC insulation switch. Check module configuration.
<b>Ierr too high</b>	The DC leakage current has exceeded the admissible absolute limit value Ierr max.	Check the PV generator.
<b>No mains</b>	There is no mains voltage	Check the AC feed line.
<b>Frequency too high</b>	The mains frequency is outside of the $f_{max 1}$ or $f_{max 2}$ limit values.	If this problem continues to occur, contact the responsible grid operator.
<b>Frequency too low</b>	The mains frequency is outside of the $f_{min 1}$ or $f_{min 2}$ limit values.	
<b>Mains error</b>	Stand-alone operation was detected	
<b>Vac too high</b>	The mains voltage is outside of the $V_{ac}^{max 1}$ or $V_{ac}^{max 2}$ limit values.	
<b>Vac too low</b>	The mains voltage is outside of the $V_{ac}^{min 1}$ or $V_{ac}^{min 2}$ limit values.	
<b>Uac 10min too high</b>	The maximum 10-minute average value of the mains voltage ( $V_{ac 10 min max}$ ) is too high.	
<b>df/dt too high</b>	The change in the mains frequency per second has exceeded the maximum admissible value $df/dt max$ .	
<b>Insulation fault DC</b>	The insulation resistance of the PV generator against earth is too low.	
	Phase and neutral conductor are interchanged.	Connect phase and neutral conductor in the AC coupling connector correctly.

## 10.2.4 Error

### Status LED: red

Status message	Cause	Step
Device error (+ error code)	An internal fault has occurred in the inverter.	Note the displayed, two-digit error code and contact the SolarMax Service Centre.

## 10.2.5 Blockings

### Status LED: flashes red

Status message	Cause	Step
External blocking	There is a 0% command from MaxRemote (coming from the grid operator).	None. Wait until the grid operator suspends the blocking of the inverter via MaxRemote.

## 10.2.6 Error messages during the initialisation phase

The following faults occur only during the inverter initialisation phase and indicate a defect in the inverter (device fault).

### Display status LED: does not glow

Error message	Steps
SUPPLY FAULT	Notify the SolarMax Service Centre.
ADC REFERENCE ERROR	
ERROR EEPROM	
CONFIGURATION ERROR	
IRRADIANCE TOO LOW	Wait until irradiance is high enough.

# 11 Maintenance

SolarMax inverters are basically maintenance-free. However, to ensure perfect operation over the course of several years, in addition to regular controls of the operating and yield data via the inverter display or remote monitor we also recommend having the simple maintenance work described below performed at regular intervals. The maintenance intervals must be set keeping the ambient conditions in mind (especially exposure to dust).

## Inspections by the plant operator

The following checks can be performed by the plant operator. If you discover problems while performing these checks, contact the electrician in charge of maintenance or our SolarMax Service Centre.

- Functional check of the inverter using the graphics display
- On-site check of visible traces of wear and tear (damage, rain, snow, rodents, etc.)
- Cleaning and check of plant room
- Cleaning the fan screen

# 12 Removal

The device does not have to be opened for demounting.

## Procedure



### DANGER

- The PV generator supplies direct current to the inverter when the PV modules are exposed to sunlight.
  - The inverter's heat sink (the base of the device) can reach temperatures as high as 80 °C.
1. First disconnect the device from the mains on the AC side via the AC line protection breaker or the fuse.
  2. Then open the DC insulation switch in order to disconnect the inverter from the PV generator field. Now remove the connectors.
  3. After disconnecting the inverter wait at least 5 minutes before opening the device to permit internal capacitors to discharge.

4. Pull out the MC4 connector and fasten the protective covers of the plug-in connectors.
5. Check whether the heat sink (device base) has cooled off enough.
6. Remove the two screws left and right and remove the inverter from the mounting rail.

## 13 Disposal

Please dispose of the inverter at the end of its service life in compliance with the disposal regulations currently valid where it is installed.

Please dispose of the inverter at the end of its service life in compliance with the disposal regulations currently valid where it is installed. (address as stated in the section on “Troubleshooting”).

# 14 Specifications

## 14.1 Specifications

		SM 2000S	SM 3000S	SM 4200S	SM 6000S
<b>Input values</b>	MPP voltage range	100 V...550 V			
	Minimum voltage for rated power	190V	260V	200V	220V
	Maximum DC voltage	600V			
	Maximum DC current	11A		22 A	
	Connection type	MC4			
<b>Output values</b>	Rated output power at $\cos\varphi = 1$	1'980 W	2'750 W	4'180 W	5'060 W
	Maximum apparent output power	1'980 VA	2'750 VA	4'180 VA	5'060 VA
	Nominal mains voltage / range	230 V / 184 V...300 V			
	Maximum AC current	12 A		19 A	22 A
	Mains nominal frequency / range	50Hz / 45Hz...55Hz			
	Power factor $\cos\varphi$	Adjustable from 0.8 overexcited to 0.8 underexcited			
	Distortion factor at rated output power	< 1.5 %			
	Connection type	Wieland			
	Grid connection	Single phase (1 / N / PE)			
<b>Efficiency</b>	Max. efficiency	97 %			
	European efficiency	95.4 %	95.5 %	95.8 %	96.2 %
<b>Power input</b>	Own consumption night	0 W			
<b>Ambient conditions</b>	Protection type compliant with EN 60529	IP54			
	Ambient temperature range for maximum power	-20 °C...+55 °C	-20 °C...+45 °C		
	Relative humidity	0...98% (no condensation)			

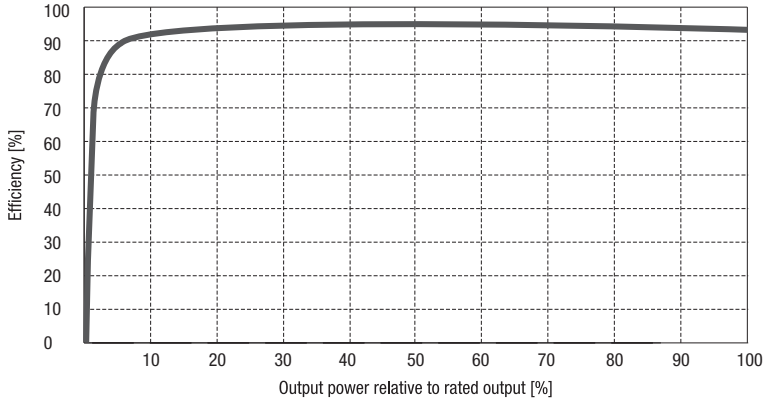
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		SM 2000S	SM 3000S	SM 4200S	SM 6000S
<b>Configuration</b>	Display	Graphic LC display with backlight and status LED			
	Circuit type	two-stage, transformerless (no galvanic isolation)			
	Data logger	Data logger for energy yield, peak output and operating duration for the last 31 days, 12 months and 10 years			
	Leakage current monitoring	Internal, AC/DC sensitive			
	Casing	Aluminium, cover powder-coated			
	Surge arrester DC	Requirement class D (VDE 0675-6) and/or type 3 (EN 61643-11)			
	Surge arrester AC	Requirement class D (VDE 0675-6) and/or type 3 (EN 61643-11)			
<b>Standards &amp; guidelines</b>	CE-compliant	Yes			
	EMC	EN 61000-6-2 / EN 61000-6-3 / EN 61000-3-2 / EN 61000-3-3 / EN 61000-3-11 / EN 61000-3-12			
	Standard / guideline compliance	VDE-AR-N 4105 / VDE 0126-1-1 / CEI 0-21 / DK 5940 Ed. 2.2 / RD 661 / RD 1699 / G83/1-1 / G59/2 <sup>1)</sup> / PPC Guide / C10/11 / EN50438 <sup>2)</sup> / AS 4777			
	Device safety	VDE "GS - certified safety" compliant with 50178 / AS 3100			
<b>Interfaces</b>	Data communication	RS485 / Ethernet via two RJ45 sockets			
	Status signalling contact	M12 connector with relay as NC contact / NO contact			
<b>Weight &amp; dimensions</b>	Weight	13 kg		15 kg	
	Dimensions in mm (L x H x W)	545 x 290 x 185			
<b>Warranty</b>		Standard 5 years / extension to 10, 15, 20, or 25 years possible			

1) only the inverters SolarMax 4200S and SolarMax 6000S

2) Portugal

## 14.2 Efficiency curve



### Efficiency SolarMax 2000S

$P_{AC}$ [W]	$P_{relative}$ [%]	$\eta(250 V_{DC})$ [%]	$\eta(300 V_{DC})$ [%]	$\eta(400 V_{DC})$ [%]
90	5	85.2	85.8	87.1
180	10	89.8	90.2	93.2
360	20	93.2	93.5	94.8
540	30	94.6	94.7	95.6
900	50	95.4	95.6	96.1
1800	100	95.2	95.4	96.0
<b>European efficiency</b>		<b>94.4</b>	<b>94.6</b>	<b>95.4</b>

### Efficiency SolarMax 3000S

$P_{AC}$ [W]	$P_{relative}$ [%]	$\eta(250 V_{DC})$ [%]	$\eta(300 V_{DC})$ [%]	$\eta(400 V_{DC})$ [%]
125	5	87.0	87.5	89.7
250	10	91.5	91.8	93.6
500	20	94.2	94.5	95.5
750	30	94.9	95.3	95.6
1250	50	95.2	95.6	96.1
2500	100	94.4	95.1	95.5
<b>European efficiency</b>		<b>94.4</b>	<b>94.9</b>	<b>95.5</b>

### Efficiency SolarMax 4200S

$P_{AC}$ [W]	$P_{relative}$ [%]	$\eta(250 V_{DC})$ [%]	$\eta(300 V_{DC})$ [%]	$\eta(400 V_{DC})$ [%]
190	5	90.8	91.0	92.8
380	10	93.6	93.8	94.5
760	20	94.6	95.1	95.8
1140	30	94.8	95.4	96.1
1900	50	95.0	95.5	96.2
3800	100	94.4	95.0	95.6
<b>European efficiency</b>		<b>94.6</b>	<b>95.1</b>	<b>95.8</b>

### Efficiency SolarMax 6000S

$P_{AC}$ [W]	$P_{relative}$ [%]	$\eta(250 V_{DC})$ [%]	$\eta(300 V_{DC})$ [%]	$\eta(400 V_{DC})$ [%]
230	5	91.0	92.1	93.4
460	10	94.1	94.5	95.5
920	20	95.1	95.7	96.2
1380	30	95.2	95.8	96.4
2300	50	95.3	95.9	96.5
4600	100	94.5	95.2	96.1
<b>European efficiency</b>		<b>94.9</b>	<b>95.5</b>	<b>96.2</b>

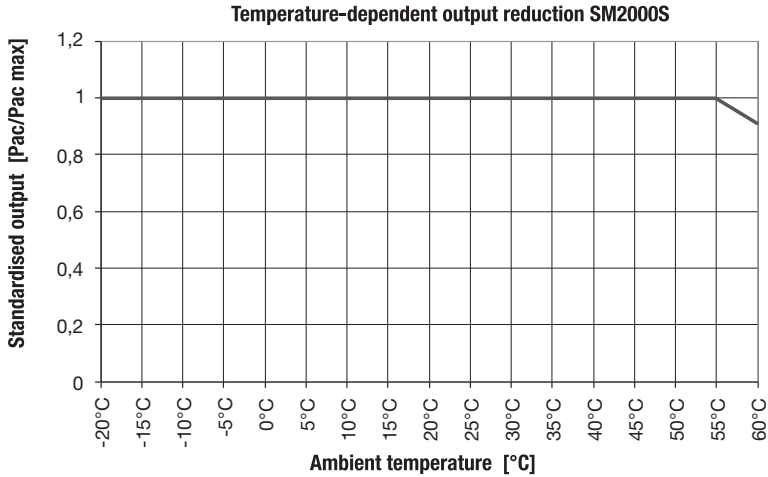
#### Legend:

- $P_{AC}$  output power [W]  
 $P_{relative}$  ratio of output power and rated output [%]  
 $\eta(V_{DC})$  efficiency at associated input voltage [%]

## 14.3 Temperature-dependent output reduction (power derating)

### 14.3.1 SM2000S

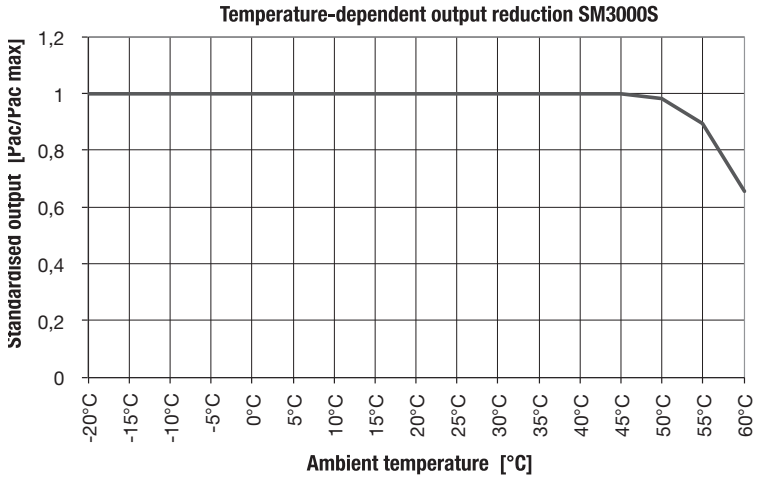
The SM2000S inverter can feed maximum power up to an ambient temperature of 55 °C. At an ambient temperature of 60 °C, 90 % of maximum power continues to be fed in. For this reason ambient temperatures over 55 °C must be strictly avoided.



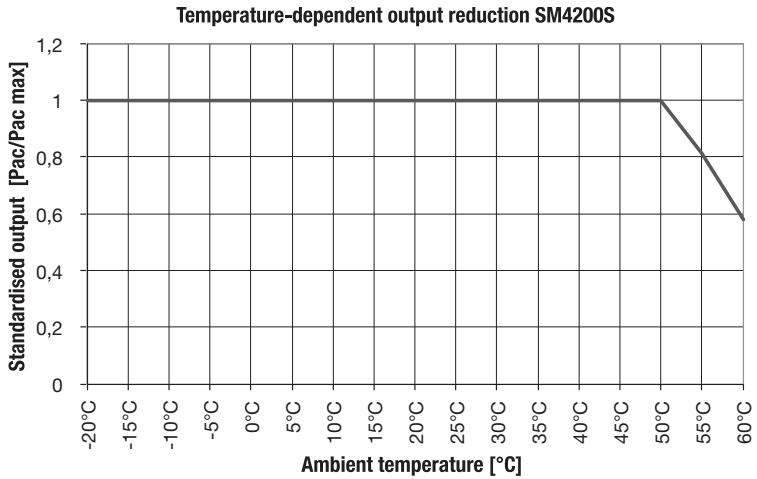
### 14.3.2 SM3000S, SM4200S and SM6000S

The SM3000S, SM4200S and SM6000S inverters can feed maximum power up to an ambient temperature of 45 °C. Losses of output occur in the range between 45 °C and 50 °C. The SM6000S inverter continues to feed 80 % of maximum power at 50 °C. At 55 °C the SM3000S inverter continues to deliver 90 % of maximum power, the SM4200S inverter, 80 %. For this reason ambient temperatures over 45 °C must be strictly avoided.

## SM3000S

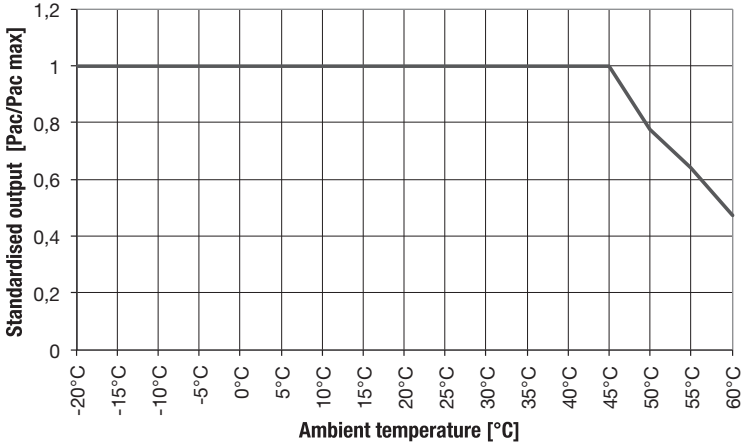


## SM4200S



## SM600S

Temperature-dependent output reduction SM600S



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## 14.4 Country specific settings

Parameter (FW.Rel.6.1)	Unit	Germany					Spain
		<= 3.68 kVA	> 3.68 – <= 13.8 kVA	> 13.8 – <= 30 kVA	> 30kVA	VDE 0126-1-1	
Vac min 1	V	184	184	184	Off	184	196
t Vac min 1	ms	200	200	200	0	200	1500
Vac max 1	V	264	264	264	Off	264	253
t Vac max 1	ms	200	200	200	0	200	1500
Vac min 2	V	Off	Off	Off	Off	Off	Off
t Vac min 2	ms	0	0	0	0	0	0
Vac max 2	V	Off	Off	Off	Off	Off	264
t Vac max 2	ms	0	0	0	0	0	200
Vac 10min max	V	253	253	253	Off	253	Off
f min 1	Hz	47.5	47.5	47.5	Off	47.5	48
t f min 1	ms	200	200	200	0	200	3000
f max 1	Hz	51.5	51.5	51.5	Off	51.5	50.5
t f max 1	ms	200	200	200	0	200	500
f min 2	Hz	Off	Off	Off	Off	Off	Off
t f min 2	ms	0	0	0	0	0	0
f max 2	Hz	Off	Off	Off	Off	Off	Off
t f max 2	ms	0	0	0	0	0	0
df/dt max	Hz/s	Off	Off	Off	Off	Off	Off
Ierr max	mA	300	300	300	300	300	300
Iac mean max	mA	1000	1000	1000	1000	1000	0.5% of Iac max
Restart delay	s	0	0	0	0	0	0
Mains check	On/Off	On	On	On	Off	On	On
- Vac MC max	V	253	253	253	280	253	253

Parameter (FW.Rel.6.1)	Unit	Germany					Spain
		<= 3.68 kVA	> 3.68 – <= 13.8 kVA	> 13.8 – <= 30 kVA	> 30kVA	VDE 0126-1-1	
- Vac MC min	V	196	196	196	161	184	196
- f MC max	Hz	50.05	50.05	50.05	54.5	50.2	50.5
- f MC min	Hz	47.5	47.5	47.5	45.5	47.5	48
- t MC monitoring	s	60	60	60	0	30	180
Island Detection	On/Off	On	On	On	On	On	On
Pac progression	%/min	10	10	10	10	Off	Off
P(f)-Mode	2/3/Off	2	2	2	2	2	Off
- f start	Hz	50.2	50.2	50.2	50.2	50.2	50.2
- Reduction	%/Hz	40	40	40	40	40	40
- Re-increase	%/min	10	10	10	10	10	10
Q-Mode		Off	cosφ(Pac)	cosφ(Pac)	cosφ(Pac)	Off	Off
- Vac Lock	On/Off	Off	Off	Off	Off	Off	Off
- Vac Lock-In	V	253	253	253	253	253	253
- Vac Lock-Out	V	207	207	207	207	207	207
S max SM2000S	VA	1980	1980	1980	1980	1980	1980
S max SM3000S	VA	2750	2750	2750	2750	2750	2750
S max SM4200S	VA	-	4180	4180	4180	4180	4180
S max SM6000S	VA	-	4600	4600	4600	5060	5060
Pac max SM2000S	W	1980	1980	1980	1980	1980	1980
Pac max SM3000S	W	2750	2750	2750	2750	2750	2750
Pac max SM4200S	W	-	4180	4180	4180	4180	4180
Pac max SM6000S	W	-	4600	4600	4600	5060	5060
lac max SM2000S	A	12	12	12	12	12	12
lac max SM3000S	A	12	12	12	12	12	12
lac max SM4200S	A	-	19	19	19	19	19
lac max SM6000S	A	-	22	22	22	22	22

Parameter	Unit	Italy			France	Belgium	Czech Republic
		DK 5940	CEI 0-21: <= 3 kW	CEI 0-21: > 3 kW – 6 kW			
Vac min 1	V	184	196	196	184	184	207
t Vac min 1	ms	200	400	400	200	120	500
Vac max 1	V	276	264	264	264	264	253
t Vac max 1	ms	100	200	200	200	120	500
Vac min 2	V	Off	Off	Off	Off	Off	184
t Vac min 2	ms	0	0	0	0	0	100
Vac max 2	V	Off	Off	Off	Off	Off	276
t Vac max 2	ms	0	0	0	0	0	100
Vac 10min max	V	Off	253	253	253	253	Off
f min 1	Hz	49	47.5	47.5	47.5	47.5	49.8
t f min 1	ms	100	100	100	200	120	500
f max 1	Hz	51	51.5	51.5	50.2	51.5	50.2
t f max 1	ms	100	100	100	200	120	500
f min 2	Hz	Off	49.5	49.5	Off	Off	49.5
t f min 2	ms	0	100	100	0	0	100
f max 2	Hz	Off	50.5	50.5	Off	Off	Off
t f max 2	ms	0	100	100	0	0	0
df/dt max	Hz/s	Off	Off	Off	Off	Off	Off
lerr max	mA	300	300	300	300	300	300
lac mean max	mA	0.5% of lac max	0.5% of lac max	0.5% of lac max	1000	1% of lac max	1000

Parameter	Unit	Italy			France	Belgium	Czech Republic
		DK 5940	CEI 0-21: ≤ 3 kW	CEI 0-21: > 3 kW – 6 kW			
Restart delay	s	0	0	0	0	0	0
Mains check	On/Off	Off	On	On	On	On	On
- Vac MC max	V	280	253	253	253	253	253
- Vac MC min	V	161	196	196	184	196	207
- f MC max	Hz	54.5	50.1	50.1	50.2	50.05	50.2
- f MC min	Hz	45.5	49.9	49.9	47.5	47.5	49.8
- t MC monitoring	s	0	300	300	30	60	30
Island Detection	On/Off	On	Off	Off	On	On	On
Pac progression	%/min	Off	20	20	Off	10	Off
P(f)-Mode	2/3/Off	Off	3	3	Off	2	Off
- f start	Hz	50.2	50.3	50.3	50.2	50.2	50.2
- Reduction	%/Hz	40	83	83	40	40	40
- Re-increase	%/min	10	5	5	10	10	10
Q-Mode		Off	Off	cosφ(Pac)	Off	Off	Off
- Vac Lock	On/Off	Off	Off	On	Off	Off	Off
- Vac Lock-In	V	253	253	242	253	253	253
- Vac Lock-Out	V	207	230	230	207	207	207
S max SM2000S	VA	1980	1980	1980	1980	1980	1980
S max SM3000S	VA	2750	2750	2750	2750	2750	2750
S max SM4200S	VA	4180	-	4180	4180	4180	4180
S max SM6000S	VA	5060	-	5060	5060	5000	5060
Pac max SM2000S	W	1980	1980	1980	1980	1980	1980
Pac max SM3000S	W	2750	2750	2750	2750	2750	2750
Pac max SM4200S	W	4180	-	4180	4180	4180	4180
Pac max SM6000S	W	5060	-	5060	5060	5000	5060
Iac max SM2000S	A	12	12	12	12	12	12
Iac max SM3000S	A	12	12	12	12	12	12
Iac max SM4200S	A	19	-	19	19	19	19
Iac max SM6000S	A	22	-	22	22	22	22

Parameter	Unit	Greece	Greek Islands	Portugal	Great Britain		
					G83/1-1	G83/2	G59/2
Vac min 1	V	184	184	196	211	200	212
t Vac min 1	ms	500	500	1500	5000	3000	2500
Vac max 1	V	264	264	264	259	262	259
t Vac max 1	ms	500	500	200	5000	1500	1000
Vac min 2	V	Off	Off	Off	Off	184	196
t Vac min 2	ms	0	0	0	0	1000	500
Vac max 2	V	Off	Off	Off	Off	274	271
t Vac max 2	ms	0	0	0	0	1000	500
Vac 10min max	V	253	253	253	Off	Off	Off
f min 1	Hz	49.5	47.5	47	47	47.5	47.5
tf min 1	ms	500	500	500	5000	20500	20500
f max 1	Hz	50.5	51	51	50.5	51.5	51.5
tf max 1	ms	500	500	500	5000	90500	90500
f min 2	Hz	Off	Off	Off	Off	47	47
tf min 2	ms	0	0	0	0	1000	500
f max 2	Hz	Off	Off	Off	Off	52	52
tf max 2	ms	0	0	0	0	1000	500

Parameter	Unit	Greece	Greek Islands	Portugal	Great Britain		
					G83/1-1	G83/2	G59/2
df/dt max	Hz/s	Off	Off	Off	Off	Off	Off
Ierr max	mA	300	300	300	300	300	300
Iac mean max	mA	0.5% of Iac max	0.5% of Iac max	1000	0.25% of Iac max	0.25% of Iac max	0.25% of Iac max
Restart delay	s	0	0	0	0	0	0
Mains check	On/Off	On	On	On	On	On	On
- Vac MC max	V	253	253	253	259	262	259
- Vac MC min	V	184	184	196	211	200	212
- f MC max	Hz	50.5	51	51	50.5	51.5	51.5
- f MC min	Hz	49.5	47.5	47	47	47.5	47.5
- t MC monitoring	s	180	180	20	180	20	180
Island Detection	On/Off	On	On	On	On	On	On
Pac progression	%/min	Off	Off	Off	Off	Off	Off
P(t)-Mode	2/3/Off	Off	Off	Off	Off	Off	Off
- f start	Hz	50.2	50.2	50.2	50.2	50.2	50.2
- Reduction	%/Hz	40	40	40	40	40	40
- Re-increase	%/min	10	10	10	10	10	10
Q-Mode		Off	Off	Off	Off	Off	Off
- Vac Lock	On/Off	Off	Off	Off	Off	Off	Off
- Vac Lock-In	V	253	253	253	253	253	253
- Vac Lock-Out	V	207	207	207	207	207	207
S max SM2000S	VA	1980	1980	1980	1980	1980	-
S max SM3000S	VA	2750	2750	2750	2750	2750	-
S max SM4200S	VA	4180	4180	4050	4180	3680	4180
S max SM6000S	VA	5060	5060	5060	5060	-	5060
Pac max SM2000S	W	1980	1980	1980	1980	1980	-
Pac max SM3000S	W	2750	2750	2750	2750	2750	-
Pac max SM4200S	W	4180	4180	4050	4180	3680	4180
Pac max SM6000S	W	5060	5060	5060	5060	-	5060
Iac max SM2000S	A	12	12	12	12	12	-
Iac max SM3000S	A	12	12	12	12	12	-
Iac max SM4200S	A	19	19	19	16	16	19
Iac max SM6000S	A	22	22	22	22	-	22

Parameter	Unit	Switzerland	Slovenia	Bulgaria	Romania	Croatia	Turkey
Vac min 1	V	184	196	184	184	184	184
t Vac min 1	ms	200	1500	200	200	200	200
Vac max 1	V	264	255	264	264	264	264
t Vac max 1	ms	200	1500	200	200	200	200
Vac min 2	V	Off	161	Off	Off	Off	Off
t Vac min 2	ms	0	200	0	0	0	0
Vac max 2	V	Off	264	Off	Off	Off	Off
t Vac max 2	ms	0	200	0	0	0	0
Vac 10min max	V	253	0	253	253	253	253
f min 1	Hz	47.5	47	47.5	47.5	47.5	47.5
t f min 1	ms	200	200	200	200	200	200
f max 1	Hz	50.2	51	50.2	50.2	50.2	50.2
t f max 1	ms	200	200	200	200	200	200
f min 2	Hz	Off	Off	Off	Off	Off	Off
t f min 2	ms	0	0	0	0	0	0
f max 2	Hz	Off	Off	Off	Off	Off	Off
t f max 2	ms	0	0	0	0	0	0
df/dt max	Hz/s	Off	Off	Off	Off	Off	Off

Parameter	Unit	Switzerland	Slovenia	Bulgaria	Romania	Croatia	Turkey
I <sub>err</sub> max	mA	300	300	300	300	300	300
I <sub>ac</sub> mean max	mA	1000	1000	1000	1000	1000	1000
Restart delay	s	0	0	0	0	0	0
Mains check	On/Off	On	On	On	On	On	On
- Vac MC max	V	253	255	253	253	253	253
- Vac MC min	V	184	196	184	184	184	184
- f MC max	Hz	50.2	51	50.2	50.2	50.2	50.2
- f MC min	Hz	47.5	47	47.5	47.5	47.5	47.5
- t MC monitoring	s	30	20	30	30	30	30
Island Detection	On/Off	On	On	On	On	On	On
Pac progression	%/min	Off	Off	Off	Off	Off	Off
P(f)-Mode	2/3/Off	Off	Off	Off	Off	Off	Off
- f start	Hz	50.2	50.2	50.2	50.2	50.2	50.2
- Reduction	%/Hz	40	40	40	40	40	40
- Re-increase	%/min	10	10	10	10	10	10
Q-Mode		Off	Off	Off	Off	Off	Off
- Vac Lock	On/Off	Off	Off	Off	Off	Off	Off
- Vac Lock-In	V	253	253	253	253	253	253
- Vac Lock-Out	V	207	207	207	207	207	207
S max SM2000S	VA	1980	1980	1980	1980	1980	1980
S max SM3000S	VA	2750	2750	2750	2750	2750	2750
S max SM4200S	VA	4180	4180	4180	4180	4180	4180
S max SM6000S	VA	5060	5060	5060	5060	5060	5060
Pac max SM2000S	W	1980	1980	1980	1980	1980	1980
Pac max SM3000S	W	2750	2750	2750	2750	2750	2750
Pac max SM4200S	W	4180	4180	4180	4180	4180	4180
Pac max SM6000S	W	5060	5060	5060	5060	5060	5060
I <sub>ac</sub> max SM2000S	A	12	12	12	12	12	12
I <sub>ac</sub> max SM3000S	A	12	12	12	12	12	12
I <sub>ac</sub> max SM4200S	A	19	19	19	19	19	19
I <sub>ac</sub> max SM6000S	A	22	22	22	22	22	22

Parameter	Unit	China	Israel	Australia	Others
Vac min 1	V	187	207	207	196
t Vac min 1	ms	2000	2000	2000	1500
Vac max 1	V	242	264	264	264
t Vac max 1	ms	2000	2000	2000	200
Vac min 2	V	110	Off	Off	Off
t Vac min 2	ms	100	0	0	0
Vac max 2	V	297	Off	Off	Off
t Vac max 2	ms	50	0	0	0
Vac 10min max	V	-	Off	Off	253
f min 1	Hz	49.5	45.5	45.5	47
t f min 1	ms	200	2000	2000	500
f max 1	Hz	50.5	54.5	54.5	51
t f max 1	ms	200	2000	2000	500
f min 2	Hz	-	Off	Off	Off
t f min 2	ms	-	0	0	0
f max 2	Hz	-	Off	Off	Off
t f max 2	ms	-	0	0	0
df/dt max	Hz/s	-	Off	Off	Off
I <sub>err</sub> max	mA	300	300	300	300
I <sub>ac</sub> mean max	mA	0.5% of I <sub>ac</sub> max	0.5% of I <sub>ac</sub> max	0.5% of I <sub>ac</sub> max	1000
Restart delay	s	0	0	0	0

Parameter	Unit	China	Israel	Australia	Others
Mains check	On/Off	On	On	On	On
- Vac MC max	V	242	264	264	253
- Vac MC min	V	187	207	207	196
- f MC max	Hz	50.5	54.5	54.5	51
- f MC min	Hz	49.5	45.5	45.5	47
- t MC monitoring	s	60	300	60	30
Island Detection	On/Off	On	On	On	On
Pac progression	%/min	Off	Off	Off	Off
P(f)-Mode	2/3/Off	Off	Off	Off	Off
- f start	Hz	50.2	50.2	50.2	50.2
- Reduction	%/Hz	40	40	40	40
- Re-increase	%/min	10	10	10	10
Q-Mode		Off	Off	Off	Off
- Vac Lock	On/Off	Off	Off	Off	Off
- Vac Lock-In	V	253	253	253	253
- Vac Lock-Out	V	207	207	207	207
S max SM2000S	VA	1980	1980	1980	1980
S max SM3000S	VA	2750	2750	2750	2750
S max SM4200S	VA	4180	4180	4180	4180
S max SM6000S	VA	5060	5060	5060	5060
Pac max SM2000S	W	1980	1980	1980	1980
Pac max SM3000S	W	2750	2750	2750	2750
Pac max SM4200S	W	4180	4180	4180	4180
Pac max SM6000S	W	5060	5060	5060	5060
Iac max SM2000S	A	12	12	12	12
Iac max SM3000S	A	12	12	12	12
Iac max SM4200S	A	19	19	19	19
Iac max SM6000S	A	22	22	22	22

# 15 Guarantee

Sputnik Engineering AG (hereafter: Sputnik) guarantees full function and lack of defects of its technical devices for a guarantee period specifically defined for each type of device. This guarantee period starts to run at the moment the goods leave Sputnik's factory. Exceptionally, in case of sale of goods to natural persons for non-commercial / private purposes, the guarantee period starts to run only from the time of delivery to the end-buyer.

Duration of guarantee:

- Two years for all central inverters and accessor;
- Five years for all string inverters.

In case a different guarantee period is defined in the device's data sheet, the content of the data sheet precedes these G CBD.

This guarantee applies only in case of malfunctions/defects which have been discovered and notified to Sputnik within the guarantee period. The original invoice and/or the delivery note serve as proof for shipment and/or delivery. In all guarantee cases, Sputnik must be notified of the non-conformity clearly and in writing within the guarantee period.

In guarantee cases, the corresponding device will be repaired or replaced by Sputnik service personnel within a reasonable time, in either case free of charge, unless this is impossible or disproportionate.

Replacement or repair shall be deemed to be disproportionate if it imposes costs on Sputnik which, in comparison with the alternative remedy, are *unreasonable*, taking into account:

- the value the goods would have if there were no lack of conformity,
- the significance of the lack of conformity, and
- upon consideration of the question whether an alternative remedy option could be used without substantial inconveniences for the purchaser, would be unreasonable when compared to the alternative remedy option completed without significant inconvenience to the buyer.

*Free provision of the warranty services:*

- The guarantee covers only the costs for labour and materials used by Sputnik to bring the devices back to full function *either in Sputnik's factory or on-site by Sputnik-service personnel*. All other costs, especially shipping costs, travel and hotel expenses for on-site repairs by Sputnik-service personnel, as well as costs of repairs by the buyer himself or other persons are not covered by the guarantee and go to the expense of the buyer or the distributor, unless otherwise specified in a written agreement.
- In case of sale of devices to natural persons for non-commercial/private purposes within the EU and Switzerland, shipping costs, *as well as travel and hotel expenses for on-site repairs by Sputnik-service personnel* are also covered by the guarantee. However, Sputnik covers only the shipping and travel expenses for the distance between Sputnik and the official Sputnik distributor, from which the defective/malfunctioning device was bought. Furthermore, Sputnik will not cover shipping costs, travel and hotel expense if the sales point of this official Sputnik distributor is located in overseas territories of the EU or outside of the EU / outside of Switzerland.

In any case, guarantee-services of Sputnik are only free of charge if Sputnik has been contacted in advance and has agreed to the services to be provided.

In a guarantee case, the buyer may require an appropriate reduction of the price or have the contract rescinded:

- if the buyer is entitled to neither repair nor replacement, or
  - if Sputnik has not completed the remedy within a reasonable time, or
  - if Sputnik has not completed the remedy without significant inconvenience to the buyer.
- The buyer is not entitled to have the contract rescinded if the lack of conformity is minor.

**Especially in the following cases, this guarantee does not apply and any liability of Sputnik is excluded:**

- **unauthorised technical intrusions, modifications, or repairs of the devices by the buyer himself;**
- **use of devices for purposes they are not intended for, incorrect or unreasonable manipulation, incorrect or unreasonable installation, especially if the installation is made by non-authorised electricians;**
- **influence of foreign substances/bodies or force majeure (lightning strike, overvoltage, floods, etc.);**
- **transport damage and other damage, which has occurred after the point of time in which the risk has passed to the buyer, as well as damage caused by incorrect packaging by the buyer.**

This guarantee is in accordance with “*Directive 1999/44/EC of the European Parliament and of the Council from 25. May 1999 on certain aspects of the sale of consumer goods and associated guarantees*”. Any legal consumer rights under applicable national legislation within the personal, objective, or geographic scope of this directive are not affected by the guarantee.

#### **Service and guarantee extensions**

With a warranty extension of 5 or 7 years, the overall warranty period can be extended up to 10 or 12 years. The warranty extension can be concluded within the 5 year standard warranty with a separately concluded agreement.

#### **Limitation of Liability and Warranty**

To the maximum extent legally possible, any further liability of and/or alternative claims of warranty/guarantee against Sputnik are excluded. For commercial users, compensatory claims for loss of yield are also excluded.

#### **Applicable Law**

Unless explicitly agreed upon otherwise in writing, and as far as not in conflict with compulsory law, the material provisions of the UN-Convention on Contracts for the International Sale of Goods (CISG) apply.

#### **Competent court**

Unless explicitly agreed upon otherwise in writing, and as far as not in conflict with compulsory law, the exclusive place of jurisdiction for all conflicts with Sputnik based on contractual, non-contractual, and/or other types of claims lies in Biel, Switzerland.

21. January 2010

# Certificate

## EC Declaration of Conformity

for grid-connected photovoltaic inverters

**SolarMax 2000S / 3000S / 4200S / 6000S**

made by  
**Sputnik Engineering AG**  
 Höheweg 85  
 CH-2502 Biel/Bienne

This Declaration is our confirmation that the products specified above conform to the following directives:

- EMC Directive 2004/108/EC
- Low Voltage Directive 2006/95/EC

The products comply with the following standards:

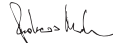
	SM2000S	SM3000S	SM4200S	SM6000S
<b>EMC Emission</b>				
EN 61000-6-3: 2007	x	x	x	x
EN 61000-6-4: 2007	x	x	x	x
<b>EMC Immunity</b>				
EN 61000-6-1: 2007	x	x	x	x
EN 61000-6-2: 2005	x	x	x	x
<b>Utility Interference</b>				
EN 61000-3-2: 2006 + A1: 2009 + A2: 2009	x	x		
EN 61000-3-12: 2005			x	x
EN 61000-3-3: 2008	x	x		
EN 61000-3-11: 2000			x	x
<b>Equipment safety</b>				
EN 50178: 1997	x	x	x	x

The products specified above hence bear the CE mark.

The Declaration of Conformity loses its validity if the product is misused or modified without proper authorisation.

Biel/Bienne, 26.5.2011

**Sputnik Engineering AG**



Andreas Mader



201103en

Country-specific certification and conformities can be found and downloaded at [www.solarmax.com](http://www.solarmax.com).

## SolarMax Service Center

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España	+34 902 160 626
Benelux	+32 2 535 77 32
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United Kingdom	+44 208 973 2556
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