SolarMax MT-Serie

10MT2 / 13MT2 / 13MT3 / 15MT2 / 15MT3

Gerätedokumentation ■ Instruction manual ■ Documentation d'appareil
■ Documentación del dispositivo ■ Documentazione dell'apparecchio

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1 About this instruction manual

This instruction manual contains a description of the SolarMax string inverters of the MT series. It tells you how to install, commission and operate the inverters.

Familiarize yourself with the 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 written for the operator of the PV power plant and the qualified electrician.

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 manual is lost, an up-to-date version can be downloaded from our website at all times (www.solarmax.com).

1.3 Symbols used in this manual

1.3.1 Symbols in the instruction manual

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

DANGER
This symbol indicates that ignoring this instruction can lead directly 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.

1.3.2 Symbols on the inverter

Protective earth connection

DC disconnector Q1 position OFF
In this position the DC disconnector Q1 is off (open)

DC disconnector Q1 position ON
In this position the DC disconnector Q1 is on (closed)

2 Safety instructions

The solar inverters of the MT 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 power plant can reduce these risks to a minimum 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 and open 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.
- The inverters must remain closed at all times during operation.
- The photovoltaic 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 MT 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 system operator or the electrician without a review and approval by Sputnik Engineering are prohibited.

3 Description

The string inverters of the SolarMax MT series convert the direct current (DC) of a photovoltaic generator into an alternating current (AC) which conforms to mains parameters. The current is inverted by a two-phase, transformerless switching concept. The connection and synchronous feed of the inverted current into the mains are permanently three phase.

The inverter is operated completely automatically and is dependent on the power supplied by the photovoltaic modules. If there is enough power the inverter starts mains operation and feeds the existing output into the mains. If there is not enough output available from the PV generator the inverter disconnects from the mains and shuts down.

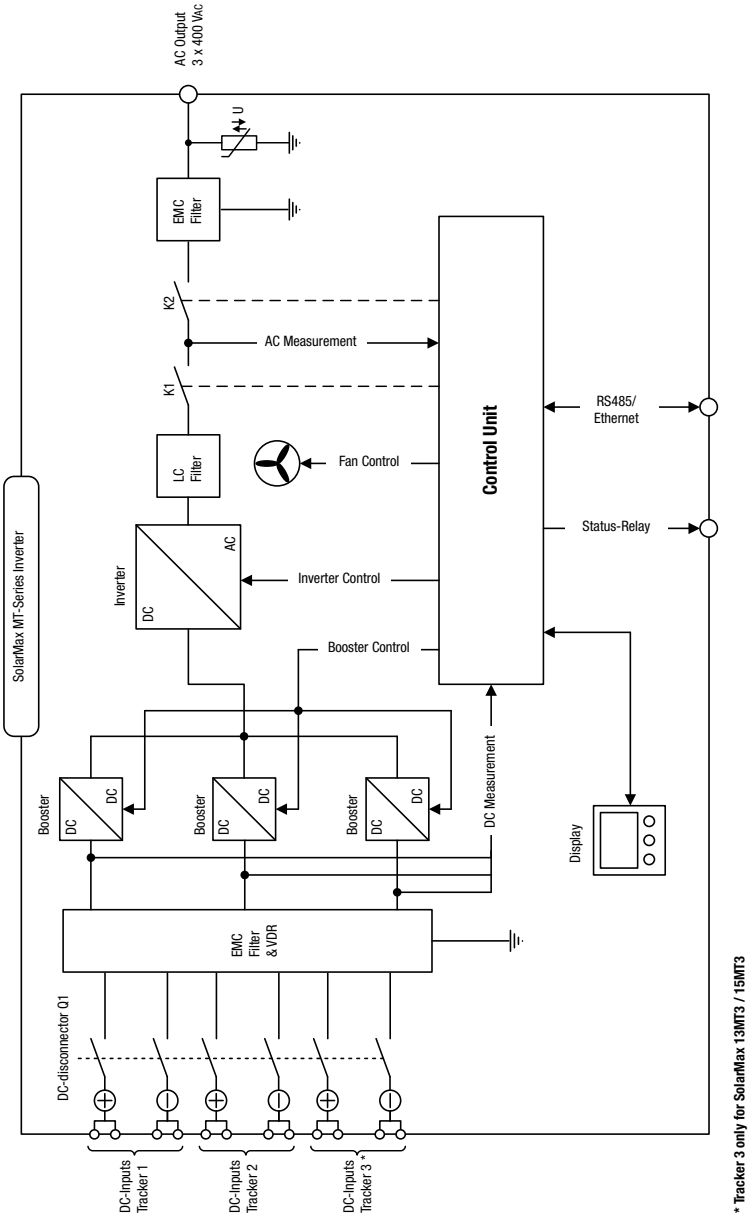
The two (SolarMax 10MT2/13MT2/15MT2) or three (SolarMax 13MT3/15MT3) independent MPP trackers in the MT series are reset with the help of two digital signal processors (DSP) in seconds to a changed energy supply from the PV generator. The completely digital wave regulation ensures the outstanding quality of the current fed into the mains and, as a result, extremely negligible mains feedback.

During mains operation the integrated mains monitoring permanently checks various parameters of the AC mains, the set limit values depend on the installation site selected. The integrated AC/DC sensitive fault current sensor monitors during operation the leakage and fault currents at the generator end. If values exceed or fall short of the set limit values the inverter disconnects from the mains within a pre-set time. A renewed reconnection is attempted after a pre-defined period.

A graphics display with three buttons permits the inverter to be easily operated and all important operating data to be easily read. The integrated data logger allows the recording of the most important operating parameters of the most recent 31 days, 12 months and 10 years.

The built-in temperature sensor monitors the temperature inside the casing, the heat is transported out by cooling fins on the back of the inverter. The heat action with the ambient air is actively supported by two controlled fans which produce a horizontal air flow. If the temperature inside the casing becomes excessive, the inverter gradually reduces its output power.

3.1 Block circuit diagram



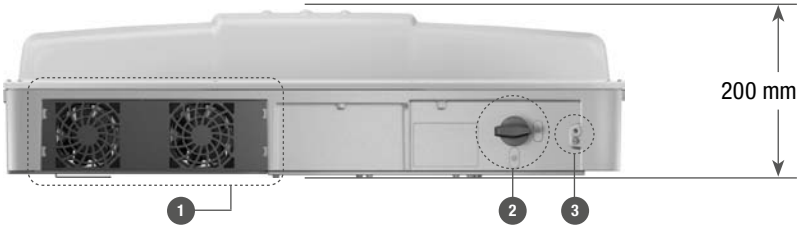
* Tracker 3 only for SolarMax 13MT3 / 15MT3

3.2 External operating elements and dimensions

Front view

1 graphics display with status LED and three buttons

Side view left



1 fan cover (air intake)
2 DC disconnector (Q1)
3 connection option for external protective earth

Side view right

1 fan cover (air outlet)

4 Installation

4.1 Transport and storage

During transport attention must be paid to the following points:

- 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. A longer term, unattended and unprotected interim storage of the inverter in the open must be avoided at all costs.
- Since this is a two-section package, if the inverter is returned or forwarded, you must ensure that the top and the bottom of the package are glued together.

4.2 Siting

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 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.
- The subsurface of the installation must be firm and non-combustible.

CAUTION

- The casing of the SolarMax MT 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 recommended RJ45 communications connector 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.

CAUTION

- When installing several inverters next to each other, you must observe a distance of 0.5 metres between the inverters. This distance prevents the mutual thermal influence due to the exhaust air of the ventilation systems.
- The ventilation inlet and the ventilation outlet must never be covered. Free air circulation is absolutely necessary to permit the inverter to function properly.
- The installation location must meet the requirements related to electromagnetic noise emissions (EN 61000-6-4).

NOTE

- For easy installation of the DC and AC supply lines you should design a freely accessible area of approx. 0.5 metres in height below the inverter.
- Make sure there is sufficient ventilation if the inverter is installed inside a building or plant room. Maximum useful life requires that the ambient temperature is never higher than 30 °C.
- Due to possible noise emissions we do not recommend installation in or near residential rooms or workplaces.
- 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.

4.3 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.

4.4 Scope of delivery

- Inverters
- AC connector
- Installation plate for wall installation
- Instruction manual and installation primer
- By-pack kit (installation material for wall installation and earth connection)

4.5 Installation

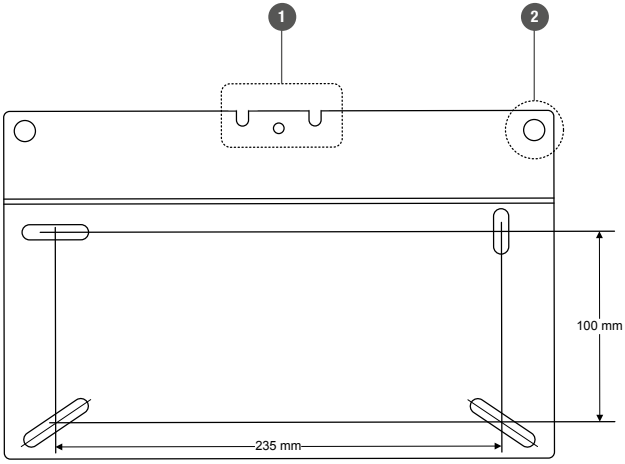
The inverter can be easily installed using the included installation plate and installation material on a level installation base. You can find out more about how to properly install an inverter from the short instruction manual included in the delivery.

1. Drill four holes, Ø 8 mm in diameter and to a depth of 60 mm (drill hole pattern shown in the picture of the installation plate).
2. Insert the wall plugs.
3. Attach the installation plate using the four 6 x 50 screws and washers.
4. Mount the inverter carefully from above into the holder.

NOTE

As soon as the inverter is completely mounted, you can secure it additionally with the included splint or a padlock (not included in the delivery).

Installation plate MT series



1. Recesses for lock with splint
2. Hole Ø 10 mm for padlock (against theft)

4.6 Electrical connection

The inverters in the MT series have the following connection options:

No.	Connection	SM10MT2 / SM13MT2 / SM15MT2	SM13MT3 / SM15MT3
1 - 3	DC	2 x 2 Strings MC4	3 x 2 Strings MC4
4	External protective earth	2 x threaded M6	
5	Status signalling contact	M12 plug with potential-free switch contact	
6	AC	5-pole Amphenol plug-in connector	
7	Communication	2 x RJ45 (sealed tight by protective caps)	

DANGER

- Before you start the installation work make sure that all the provided DC and AC feed lines to the inverter are de-energised. The installation work must be performed by a qualified electrician who adheres to the recognised rules of electrical installations and personal health and safety regulations.
- 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.

CAUTION

- The inverter must be installed in a suitable location (see “Siting” section).
- Make sure that all the lines into the inverter are laid so as to avoid earth leakage or short circuits.

4.6.1 Integrated overvoltage protection

The inverters in the MT series have integrated overvoltage conductors (varistors) on both the DC and AC ends.

- On the DC end each MPP tracker has an overvoltage conductor from the plus and minus pole to the earth. The overvoltage conductors comply with the requirement class C as defined in VDE 0675-6 or Type 2 as defined in EN 61643-11.
- On the AC end each mains phase (L1/L2/L3) has an overvoltage conductor to the earth. The overvoltage conductors comply with the requirement class D as defined in VDE 0675-6 or Type 3 as defined in EN 61643-11.

4.6.2 AC connection

CAUTION

- The inverters in the MT series must be connected to a mains connection point which meets at least the requirements of the overvoltage category 3.

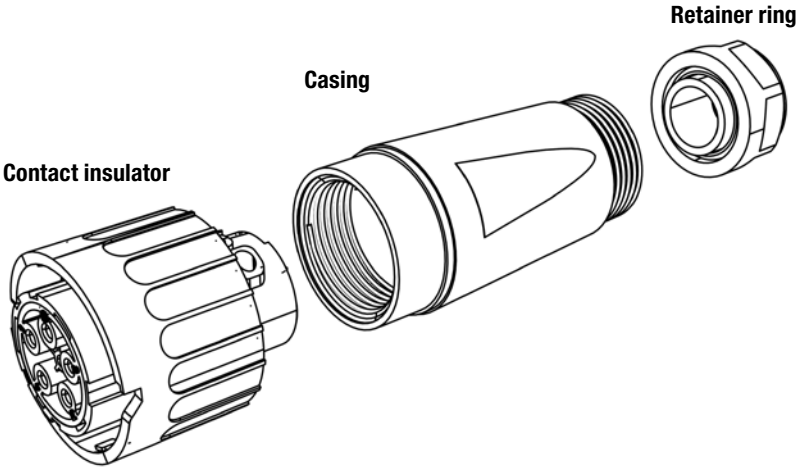
Mains fuses and cable cross-sections

The following table contains recommended mains fuses and minimum line cross-sections necessary for the AC feed line:

	SM10MT2	SM13MT2 / SM13MT3	SM15MT2 / SM15MT3
Mains fuses (characteristic C)	20 A	25 A	25 A
Minimum line cross-section AC	4 mm^2	4 mm^2	4 mm^2

Confectioning the AC connector

The AC feed line is connected to the inverter using the included Amphenol AC connector:



- The AC connector must be connected with a flexible cable compliant with EN 60309-2 / VDE 0623.
- The permissible cable diameter is 11 to 20 mm.
- Cable strands with a maximum cross-section of 6 mm^2 can be connected.

1. If the cable diameter > 16 mm remove the blue inlay in the retainer ring.
2. Slide the retainer ring and the casing over the cable.
3. Press the appropriate cable core end sleeves on the insulated strands.
4. Connect the individual cores one after another to the contact insulator:
   - Phase L1 to the screw terminal with the number 1
   - Phase L2 to the screw terminal with the number 2
   - Phase L3 to the screw terminal with the number 3
   - Neutral conductor N to the screw terminal with the number 4
   - Protective earth PE to the terminal labelled earth

   Tightening torque: 0.7 Nm
5. Check that each individual core is securely connected.
6. Screw the casing onto the contact insulator.
   Tightening torque: 1-2 Nm
7. Screw the retainer ring onto the casing.
   Tightening torque: 5 Nm

The AC feed line can now be connected with a twisting movement to the AC connection of the inverter (bayonet connector with locking pin). As soon as the correct position is reached the connector slips onto the AC connection. The inverter is now firmly connected to the AC mains.

DANGER

- Connect the protective earth as carefully a possible.

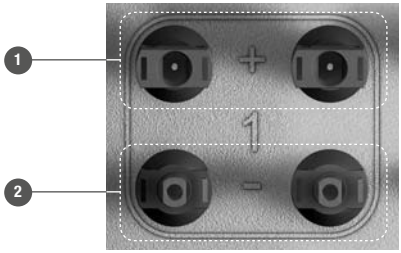
CAUTION

- As soon as the bayonet connector has slipped in, the AC connection can only be re-opened using a tool (slotted screwdriver size 2).
- Open the AC connection carefully by pressing down the locking pin on the contact insulator and turning the AC connector counter-clockwise to break the connection.

4.6.3 DC connection

The inverters in the MT series have 2 (SolarMax 10MT) or 3 (SolarMax 13MT and 15MT) MPP trackers. Each tracker, in turn, has two plus and minus poles for the connection ot two strings per tracker input.

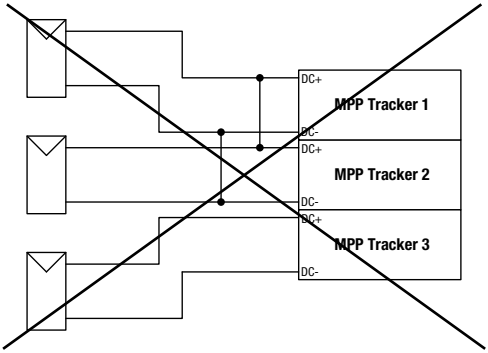
Detailed view of DC connections



1. Plus connections
2. Minus connections

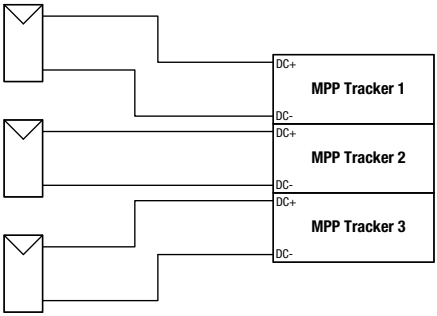
The position of the plus and minus connections is identical for all the DC inputs (1-3).

Trackers 1-3 operate independently from each other, thus enabling the simultaneous connection of strings with different characteristics (orientation, dimensioning, module type) to a shared inverter. The plus and minus connections of different trackers must not be connected to each other:



Wrong connection!

The plus and minus feed lines for trackers 1-3 must be run to the inverter separately from each other:



Correct connection!

CAUTION

- Use only connectors from the MC4 series made by MultiContact for connecting the DC feed lines to the inverter.
- Due to the transformerless switching concept of the MT series inverters the plus or minus pole of the PV generator must not be earthed under any circumstances. Otherwise, the isolation monitoring in the inverter prevents a mains connection.
- Select cable cross-sections for the DC feed lines corresponding to your plant configuration and in conformance with the valid local installation regulations.
- Remember that the shared plus and minus pole of a string must always be connected to the same tracker.
- The position of the DC disconnector Q1 must be “0” (Off).

4.6.4 Status signalling contact

The status signalling contact enables the inverter to be remotely monitored. The inverter status can be recorded with the potential-free relay contact. The contact is located between the DC and AC connections, a suitable M12 mating connector to connect the status signalling contact can be ordered from the SolarMax Service Centre (Tel. No. listed in the section entitled “SolarMax Service Centre”).

The functionality of the status signalling contact is adjustable, see section “Status relay”; page 86.

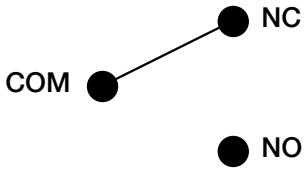
Pin assignment

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

Technical data

- U_{Max} 250 VAC / 30 VDC
- I_{Max} 1.5 A

Contact diagram (idle)



4.6.5 Communications sockets

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

- The left-hand RJ45 socket 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 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 of several RS485 nodes can be set up.

NOTE

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.

4.6.6 External protective earth

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 earth 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.

Connection options for the second protective earth are located beside the DC disconnector Q1 and below the status signalling contact.

DANGER

- Connect the protective earth as carefully a possible.

4.7 External fault interrupter (RCD)

The inverters in the SolarMax MT series have an integrated AC/DC sensitive fault current sensor. This sensor is able to distinguish between the operational capacitive leakage currents (caused by capacities of the PV modules to the earth) and fault 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 you select an additional external fault interrupter (RCD) you must remember that during operation the leakage currents can be as high as several 10 mA 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 MT series inverters it may also be necessary to use a 300 mA-RCD. Since the inverters in the MT series are designed not to cause direct current fault currents on the AC end, an external type A RCD can be used.

5 Commissioning

5.1 Switching on and off

All SolarMax inverters work completely automatically. When the PV generator supplies enough power the inverter switches on and then starts mains feed operation. At night, or when the DC end is shut down, the inverter is disconnected from the mains. Operating the inverter and the ability to communicate via the interfaces are only possible when the inverter is switched on.

Switching on

1. **Switch on the DC disconnector Q1**
   The inverter switches on, after a couple of seconds the graphics display is activated (assuming there is enough power coming from the PV generator)
2. **Switch on the external AC circuit breaker**
   The inverter switches to mains operation after roughly 30 seconds.

Switching off

DANGER

The DC-end MC connectors may only be disconnected from the inverter if the DC disconnector (Q1) is open. If the circuit breaker is not open, disconnecting the DC feed lines during operation can result in dangerous arcs.

1. **Switch off external AC circuit breaker (optional)**
   The inverter is disconnected from the mains
2. **Switch off DC disconnector Q1**
   The inverter shuts itself off after a few seconds

5.2 Commissioning (Initial Setup)

If the inverter is being started up for the first time, initial setup begins automatically. This process only needs to be performed once during initial start up. You can find information on the operation of the graphic display in 6 “Operation”; page 77.

Requirements

- Correctly connected DC supplies (AC connection is not required)
- Sufficient solar irradiation
- When commissioning in Germany, the grid connection (low- or medium-voltage) and the plant system rating (total output of the PV plant), as well as the specification for the reactive power feed-in must be known.

NOTE

- You can restart commissioning on the graphical display by pressing ✕ at any time. Steps 3 (grid connection), 4 (plant system rating), and 5 (reactive power feed-in) are only necessary when installing in Germany.
- The setting “VDE 0126-1-1” (step 4) is inadmissible for PV facilities connected to the grid after 31 December 2011.
- If you are not sure as to which setting you should select, please contact the SolarMax Services Centre or your grid operator before commissioning the inverter and/or the PV facility.

Procedure

1. Switch on the DC disconnector Q1. The “Initial Setup” menu will be displayed on the graphical display (commissioning).
   – Select the display language from the “Language” menu.
   – Enter the current time.
   – Enter today’s date. The inverter saves the date entered as the initial startup date.
   – Click ✔ to confirm the entries.
2. Select the installation country in the “Country” menu.

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.

– Press ✔ to confirm your entry. With all countries except for Germany, the “Confirmation” menu then appears in accordance with step 6.

3. Select either “Low voltage” or “Medium voltage” in the “Grid connection” menu.

Setting	Description
Medium voltage	The inverter is connected to the medium-voltage mains.
Low voltage	The inverter is connected to the low-voltage mains.

– Press ✔ to confirm your entry. With the “Medium voltage” grid connection, the “Confirmation” menu appears in accordance with step 6.

4. Select the correct plant system rating in the “Plant type” menu:

Setting	Description
< 13.8 kVA	The plant system rating is lower than 13.8kVA.
13.8 kVA–30 kVA	The plant system rating is between 13.8kVA and 30kVA.
> 30 kVA	The plant system rating is higher than 30kVA.
VDE 0126-1-1	Required setting if the inverter is commissioned within a PV facility connected to the grid before 1 January 2012.

– Press ✔ to confirm your entry. With the “VDE 0126-1-1” setting, the “Confirmation” menu appears in accordance with step 6.

5. 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 (Cos φ=1)

6. Press ✔ to conclude commissioning. The main menu then appears.

6 Operation

6.1 Graphic 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.

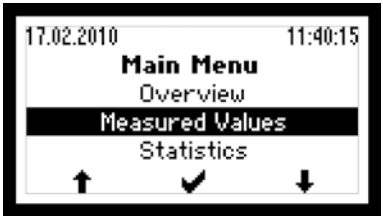
6.2 Menu button symbols

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

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

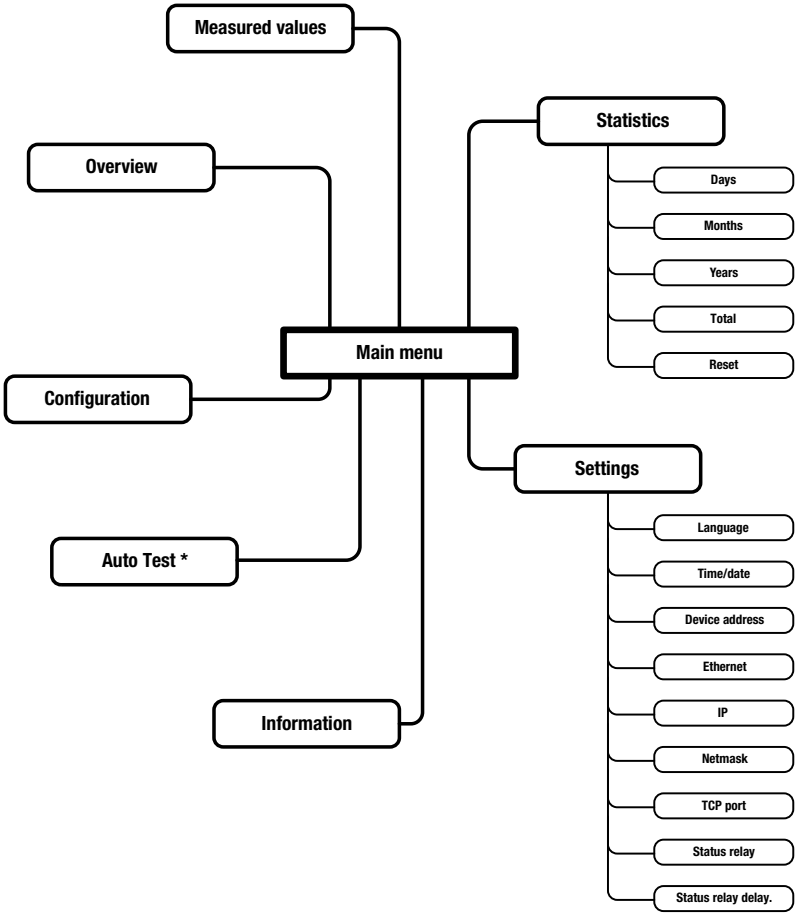
6.3 Menu structure

6.3.1 Main menu



The Main menu provides access to other menu levels. Use the arrow keys ↑ and ↓ to select a menu. Click ✓ to confirm your selection.

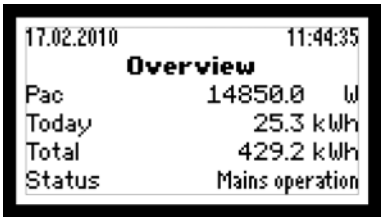
The following schematic overview shows the available menus:



* Only for country setting “Italy”.

6.3.2 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.



6.3.3 Measured values

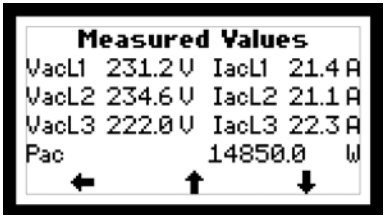
The current inverter measured values can be accessed in the “Measured values” menu.

NOTE

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

The following measured values can be accessed:

Measured value	Description
Vdc 1/2/3	DC input voltage tracker 1, 2 and 3 (SM10MT2, SM13MT2 & SM15MT2: Tracker 1 & 2)
Idc 1/2/3	DC input current tracker 1, 2 and 3 (SM10MT2, SM13MT2 & SM15MT2: Tracker 1 & 2)
Pdc	Input power
Pdc 1,2,3	Input power tracker 1, 2 & 3 (SM10MT2, SM13MT2 & SM15MT2: Tracker 1 & 2)
Vac L1/L2/L3	Mains voltage phases L1, L2 and L3 (voltage to neutral)
Iac L1/L2/L3	AC feed-in current phases L1, L2 and L3
Pac	Feed-in effective power
Q	Reactive power (+: overexcited / –: underexcited)
S	Apparent power
Cos(φ)	Power factor (OEX: overexcited / UEX: underexcited)
Frequency	Mains frequency
Temperature	Temperature of the heat sinks
Fan	Operating conditions of the fans (on/off)



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

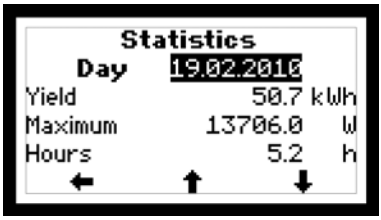
6.3.4 Statistics

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" submenu contains the accumulated yield and operating data since the commissioning of the inverter.

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

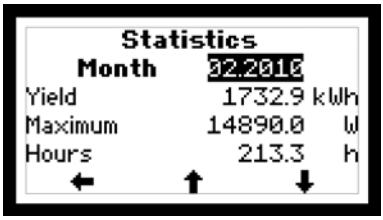
Press the left button ← to return to the Main menu.

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



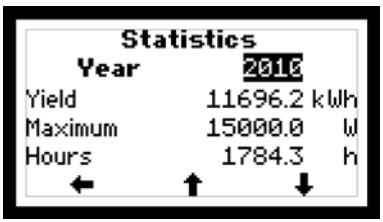
Use the buttons ↓ and ↑ to select a daily statistic. Press the left button ← to return to the Statistics menu.

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



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

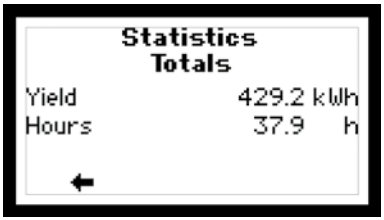
Yearly statistics
This menu provides access to the data from the most recent 10 years.



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

Total

This menu lists the total yield and the total number of operating hours of the inverter since it was commissioned.



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 these data are irretrievably lost!

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

6.3.5 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 “MT series parameter configuration using MaxTalk 2 Pro” instruction manual can be found on our website 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 settings selected for the initial commissioning	-
Grid	Mains connection selected during the initial start-up (low/medium voltage)	-
Plant type	Plant capacity selected during initial commissioning: < 13.8 kVA, 13.8 – 30 kVA or > 30 kVA / VDE 0126-1-1	-
Vac min 1	Minimum admissible mains voltage (first limit)	V
t Vac min 1	Release time for minimum permitted grid voltage	ms
Vac max 1	Maximum admissible mains voltage (first limit)	V
t Vac max 1	Release time for maximum permitted grid voltage	ms
Vac min 2	Minimum admissible mains voltage (second limit)	V
t Vac min 2	Release time for minimum permitted grid voltage	ms
Vac max 2	Maximum admissible mains voltage (second limit)	V
t Vac max 2	Release time for maximum permitted grid voltage	ms
Vac 10 min 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	Tripping time for minimum admissible mains frequency	ms
f max 1	Maximum admissible mains frequency (first limit)	Hz
t f max 1	Tripping time for maximum admissible mains frequency	ms
f min 2	Minimum admissible mains frequency (second limit)	Hz
t f min 2	Tripping time for minimum admissible mains frequency	ms
f max 2	Maximum admissible mains frequency (second limit)	Hz

Parameter	Description	Unit
t f max 2	Tripping time for maximum admissible mains frequency	ms
df/dt max	Maximum admissible change of the mains frequency per second	Hz/s
Iac max	Maximum admissible mains current (per shift)	A
Iac mean max	Maximum admissible DC share of the fed-in mains current	A
Pac max	Maximum effective power to be fed	W
S max	Maximum apparent power to be fed.	VA
OV detection	Immediate grid disconnection with transients to Vac	Inactive/on
Island detection	Immediate grid disconnection when island operation detected	Inactive/on
Monit. ext. input	The status signalling (contacts 2 and 4) is configured for the connection and the monitoring of an external switch.	Inactive/on
Restart delay	Delay time before mains reconnection upon previous failure-related mains disconnection.	s
Pac progression	Maximum increase of the effective power during mains reconnection upon previous failure-related mains disconnection.	%/min
Soft Start	Maximum increase of the effective power at mains connection. This gradient, if activated, is always effective, as opposed to Pac progression (even during restart in the morning).	W/s
Mains check	Additional monitoring before connecting to the mains	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
Ierr max	Maximum admissible leakage current (effective value) on the DC side	mA
P(f) mode	Frequency-dependent power reduction	Inactive/on
- Reduction	Reduction of effective power Pac in P(f) mode	%/Hz
- f start	Starting frequency of the P (f) mode	Hz
- f stop	Stop frequency of the P(f) mode	Hz
- Re-increase	Maximum increase to the currently maximum possible effective power Pac max after the P(f) mode was exited.	%/min
Q mode	Selected reactive power mode Off, cos(φ), cos (φ)(Pac), Q, or Q(Vac)	-
FRT	Fault ride through function for dynamic grid support	Inactive/on
- K factor	Reactive current static factor for voltage support with reactive current During mains drops	-

6.3.6 Settings

This menu can be used to set different communication parameters and monitoring functions. All settings can also be implemented with MaxTalk.

Parameter	Description
Language	Selection of the display language (German, English, French, Italian, or Spanish). The display language can be selected independently of the selected specific country settings.
Time	Setting the internal clock
Date	Setting the displayed date
Device address	Definition of the device address between 1 and 249. If you connect several inverters and accessory components to become one MaxComm communication network, each device within the network must have an individual address.
IP	Configuration of the Ethernet interface. Details see 7.1 “Configuration of the data communication interfaces”; page 91.
Netmask	
TCP Port	
Status relay delay	Setting the switching delay of the status signalling contact
Pinst tot	Rated output of the PV generator (entry only possible in MaxTalk).

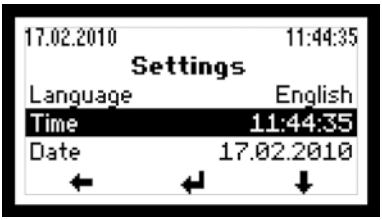
Status relay

The functions of the status relay or the status signalling contact can be adjusted. There are four different functional settings.

Setting	Description
Off	The status signalling contact is always open.
Grid	When the inverter starts mains operations, the status signalling contact connects immediately and remains closed as long as the inverter is feeding in. If the inverter is no longer feeding into the grid, the status signalling contact opens after the adjustable delay time has expired.
Error	If a warning, malfunction or device error occurs with the inverter, the status signalling contact closes after the adjustable delay time has expired (the events are listed in 10.2 “Diagnosis and measures”, page 96). The status signalling contact opens immediately if the error is no longer present.
On	This setting is designed for controlling an external motorised AC circuit breaker, 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).

The monitoring electronics are supplied by the PV generator, in other words during the night and when the DC side is switched off, the status signalling contact is open.

Implementing the settings



Use the ↓ button to select a parameter. Press the ↵ button to select a highlighted parameter and switch into the editing mode to change it.

In the editing mode each individual number is changed.

- Example: Using the ↑ button the highlighted number can be increased. After editing this number use the → button to go to the next number. Use the ↑ button again to increase this number.

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

6.3.7 Information

This menu contains the following information:

- Device type (SM10MT2, SM13MT2, SM13MT3, SM15MT2 or SM15MT3)
- Series number
- Firmware version
- Status message and two-digit number code (if a device error occurs)
- Warning (alternating display if several warnings are active at the same time)
- Date of commissioning
- Accumulated operating hours
- Date
- Time

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

6.4 Auto Test definition according to DK 5940

During the Auto Test procedure according to DK 5940 (only for country setting “Italy”) in mains mode the trigger threshold for AC voltage and frequency monitoring is varied linearly with a ramp of ≤ 0.05 Hz/s and ≤ 0.05 Vn/s (Vn = 230 Vac). 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.

6.4.1 Start Auto Test

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.

1. Wait until the inverter has connected itself to the mains.
2. Select Auto Test in the main menu.
3. Answer the question whether the Auto Test should be executed with YES.
4. The Auto Test now runs automatically.

NOTE

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.

6.4.2 Procedure

Maximum voltage

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

Minimum voltage

1. The set voltage monitoring threshold Vac min is displayed.
2. The threshold value is incremented linearly until it reaches the current mains voltage value and mains monitoring is triggered.

3. The trigger value, the delay time, the current value and the default voltage monitoring value (Vac min) are displayed.

Maximum frequency

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

Minimum frequency

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

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

7 Data communication

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

NOTE

You can find detailed information on our website at www.solarmax.com.

MaxTalk 2.0: For occasional communication and the configuration of the inverters

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.

MaxVisio: For smaller PV power plants without remote monitoring

MaxVisio is the ideal stand-alone display device for smaller PV power plants without remote monitoring. MaxVisio displays and records both the whole system's data as well as the values of the individual devices. The device is operated using a convenient touch screen display.

MaxWeb xp: The gateway to Internet-supported communication

MaxWeb xp is a data logger, monitoring unit and web server in one. For all those who want to have their PV power 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 SolarMax web portal.

If there is a malfunction, MaxWeb xp sends out alarm messages by e-mail or SMS.

SolarMax web portal: For accessible power plant data at any time

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

7.1 Configuration of the data communications interfaces

In order to use the RS485 and 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!

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

Ethernet

If you want to operate the left RJ45 communications socket on the terminal block as an Ethernet interface, enter “on” at this point.

IP

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

Netmask

Please enter here the pertinent sub-netmask for your IP address.

TCP Port

Enter the 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 communications in the technical information “MaxComm network”. This document can be downloaded from our website at: www.solarmax.com; downloads/data communication/MaxComm.

8 Options

8.1 Accessory components

Here is a list of other available accessory components.

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

9 Operating status

9.1 Status message and status LED

The status message in the graphic 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 malfunctions which, however, do not affect the mains opera-tion of the inverter. Losses of yield are possible, however.

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

The status messages of the “Malfunction”, “Error” and “Blocked” operating statuses, as well as the warnings, usually require certain measures to be taken, see 10 “Fixing malfunctions”, page 94.

LED display	Operating status	Description
Off	-	Inverter is switched off > mains disconnection
Flashing green – – –	Booting	Inverter starts > mains disconnection
Green ———	Mains operation	Power supply (normal operation)
Flashing orange– – –	-	Warning > no mains disconnection
Orange ———	Malfunction	External malfunction > mains disconnection
Red ———	Error	Internal device error > mains disconnection
Flashing red – – –	Blocked	Inverter is blocked > mains disconnection

9.2 Booting

Status message	Description
Irradiation too low	The solar irradiation or rather the available output is too low for mains operation.
Start...	The inverter checks the internal hardware and software components before connecting to the mains.
Restart delay	The inverter has disconnected itself from the mains and is delaying re-connection to the mains.

9.3 Mains operation

Status message	Description
Mains operation	The inverter has switched to the mains and is feeding into the mains.
Maximum output power	The inverter limits the fed-in power to the maximum admissible power. Limiting the power can occur when the PV generator has been oversized or in the event of high irradiation.
Idc limitation	The inverter limits the DC input current to the maximum admissible value. This can occur if the PV generator is designed in such a way that the current in the MPP is greater than the maximum admissible DC power of the inverter.
Iac limitation	The inverter limits the fed-in mains current to the maximum admissible value. This can occur with significant variations in irradiation, low mains voltage or oversized PV generators.
Restart limitation	The inverter increases the effective power after the conclusion of an external limitation with a defined progression (Pac progression and/or Soft Start).
Frequency limitation	The inverter temporarily limits the effective power due to an active frequency-dependent reduction in power - P(f) mode.
External limitation	The fed-in effective power of the inverter is limited via remote access.

9.4 Communications activity

The communications activity of the inverter is displayed via two different symbols on the graphic display.

Symbol	Description
	This symbol appears 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.

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

DANGER

Work on the PV plant must be performed solely by qualified electricians.

1. Check whether the inverter and PV generator have been correctly installed. Check the cable connections using the instructions and information contained in the “Installation” section of this manual.
2. Determine the cause of the malfunction by checking the message in the graphic display unit. The “Diagnosis and corrective steps” section explains how malfunctions can be corrected.

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 Center

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

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

Availability

Monday to Friday from 8.00 am to 5.00 pm

Calls from:

Germany	+49 180 276 5 276
Switzerland	+41 32 346 56 06
France	+33 4 72 79 17 97
Italy	+39 0362 312 279
Spain	+34 902 16 06 26
Belgium	+32 2 535 77 32
Czech Republic	+420 222 191 456
Great Britain	+44 208 973 2556
China	+86 21 6182 6799
Greece	+30 210 727 91 61
Bulgaria	+359 2 805 7223
Other countries	+41 32 346 56 06
Fax	+41 32 346 56 26
Email	hotline@solarmax.com

Sputnik Engineering AG
Höheweg 85
CH-2502 Biel-Bienne

SolarMax®
www.solarmax.com

10.2 Diagnosis and corrective steps

The following tables describe how to troubleshoot malfunctions. If the steps suggested do not correct the malfunction please contact the SolarMax Service Centre immediately.

10.2.1 General troubleshooting

	Cause	Steps
The display remains blank	DC disconnector Q1 is switched off.	Switch on DC disconnector Q1.
	Irradiation too low.	Wait until the irradiation is sufficient.
	Strings disconnected.	Correct disconnection.
	Internal malfunction.	Notify the SolarMax Service Centre.
	The PV generator is incorrectly connected (plus and minus connections have been mixed up).	Connect the PV generator properly.

10.2.2 Warnings

Status message	Cause	Measure
Failure fan	A fan is defective or dirty.	Contact the SolarMax service centre.
Temperature control:	The feed-in power has been temporarily reduced to control the temperature of the inverter.	Clean the fan grid and improve ventilation in the operations room.
Failure temperature sensor	A temperature sensor in the inverter has failed.	Contact the SolarMax service centre.
Burst error	The inverter disconnected itself from the mains five times or more on the same day. The warning will be displayed for the rest of the day. The error counter will be reset when the system is restarted in the morning.	Check your plant's status logger in MaxWeb xp (if present) or check the grid parameters. If this problem continues to occur, contact the SolarMax service centre.

Status message	Cause	Measure
RTC error	The RTC (real-time clock) in the inverter is malfunctioning, the date and time have been reset.	If this problem happens frequently, contact the SolarMax service centre. Set the time and date correctly. Contact the SolarMax service centre if this problem continues to occur.
Flash error	A flash error has occurred. Inverter mains operations continue to be guaranteed.	Contact the SolarMax service centre.
Firmware mismatch.	The firmware versions of the inverter controllers do not match.	Contact the SolarMax service centre.

10.2.3 Malfunctions

Status message	Cause	Measure
Vdc too high (VDC3, VDC2, VDC1)	The DC input voltage at the specified inverter DC connection is too high.	Switch off the DC circuit breaker Q1 immediately and disconnect the PV generator from the inverter. Check the dimensioning of the PV generator.
No mains **No mains BP**	There is no mains voltage or the AC supply has been interrupted.	Check the AC supply.
Mains error **Mains error BP**	The network has been switched off.	If this problem continues to occur, contact the responsible network operator.
Frequency too high **Frequency too high BP**	The network frequency is outside of the f max 1 or f max 2 limit values.	
Frequency too low **Frequency too low BP**	The mains frequency is outside of f min 1 or f min 2 limit values.	
Vac too high (L1 L2 L3) **Vac too high BP (L1 L2 L3)**	The mains voltage at the specified phase is outside of Vac max 1 or Vac max 2 limit values.	
Vac too low (L1 L2 L3) **Vac too low BP (L1 L2 L3)**	The mains voltage at the specified phase is outside of Vac min 1 or Vac min 2 limit values.	

Status message	Cause	Measure
Vac 10min too high (L1 L2 L3) **Vac 10min too high BP (L1 L2 L3)**	The maximum 10-minute average value of the mains voltage (Vac 10 min max.) at the specified phase is too high.	If this problem continues to occur, contact the responsible network operator.
df/dt too high	The change in the mains frequency per second has exceeded the maximum admissible value of df/dt.	
Insulation error DC **Insulation error DC BP**	The insulation resistance of the PV generator compared with earth is too low.	Check the PV generator.
Fault current too great **Fault current too great BP**	The DC leakage current has exceeded the admissible absolute limit value Ierr max.	
Lerr step too high **Lerr step too high BP**	The DC leakage current has exceeded the admissible step value.	
L and N interchanged	A phase and the neutral conductor are incorrectly connected (interchanged).	Connect the AC supply correctly.
Error DC polarity	One or more DC connections are incorrectly connected (incorrect polarity).	Connect the DC supplies correctly.
Error ext. input 1	The external NA protection has disconnected the inverter from the grid.	If this problem continues to occur, contact the responsible network operator.

10.2.4 Error

Status message	Cause	Measure
Device error (+ error code)	An internal error has occurred in the inverter.	Check the two-digit error code displayed and contact the SolarMax service centre.

10.2.5 Blockages

Status message	Cause	Measure
External blockage	There is a 0% command from MaxRemote (based on the grid operator).	None. Wait until the grid operator suspends the blocking of the inverter via MaxRemote.
Firmware update	The inverter firmware is currently being updated.	The inverter automatically re-assumes mains operations once the firmware update is complete.

11 Maintenance

All SolarMax inverters work completely automatically. 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).

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.

- A check of the inverter's functions using the graphic display
- On-site check of visible traces of wear and tear (damage, rain, snow, rodents, etc.)
- Cleaning and inspecting the plant room
- Cleaning the fan screen

12 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. You can also return the inverter at your own cost for professional disposal to Sputnik Engineering (address as stated in the section on "Troubleshooting").

13 Specifications

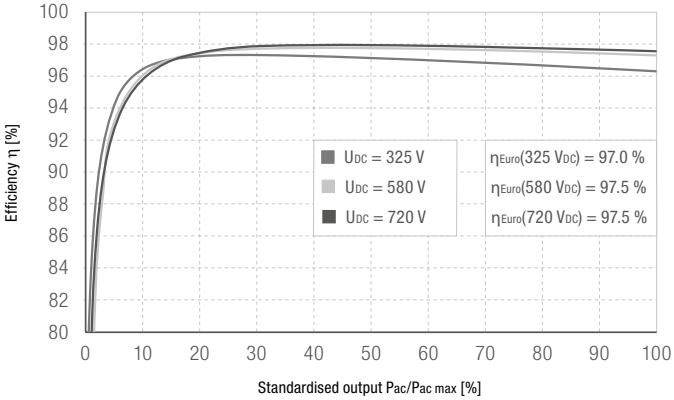
13.1 Specifications

		10MT2	13MT2	15MT2	13MT3	15MT3
Input values	Maximum PV generator output power [1)]	12'000 W	15'000 W	18'000 W	15'000 W	18'000 W
	Max. PV generator output per MPP tracker [2)]	9'000 W	9'000 W	9'000 W	9'000 W	9'000 W
	MPP voltage range	250 … 750 V	250 … 750 V	250 … 750 V	250 … 750 V	250 … 750 V
	Minimum voltage for rated power [3)]	290 V	370 V	430 V	280 V	320 V
	Maximum DC voltage	900 V	900 V	900 V	900 V	900 V
	Maximum DC current	2 x 18 A	2 x 18 A	2 x 18 A	3 x 16 A	3 x 16 A
	Number of MPP-Trackers	2	2	2	3	3
	String connections	2 x 2	2 x 2	2 x 2	3 x 2	3 x 2
	Connection type	MC 4	MC 4	MC 4	MC 4	MC 4
Output values	Rated output power at cos(φ) = 1	10'000 W	13'000 W	15'000 W	13'000 W	15'000 W
	Maximum apparent output power	10'000 VA	13'000 VA	15'000 VA	13'000 VA	15'000 VA
	Nominal mains voltage	3 x 400 V	3 x 400 V	3 x 400 V	3 x 400 V	3 x 400 V
	Maximum AC current	3 x 16 A	3 x 20 A	3 x 22 A	3 x 20 A	3 x 22 A
	Mains nominal frequency / range	50 Hz / 45 Hz…55 Hz				
	Power factor cos(φ)	Adjustable from 0.8 overexcited to 0.8 unterexcited				
	Distortion factor at rated power	< 3 %				
	Connection type	Amphenol				
	Grid connection	Three-phase				
Efficiency	Max. efficiency	98.0 %				
	Europ. efficiency	97.5 %				
Power input	Own consumption (night)	0 W				
Ambient conditions	Protection type compliant with EN 60529	IP54				
	Ambient temperature range	-20 °C…+60 °C				
	Ambient temperature range at rated power	-20 °C…+50 °C				
	Relative humidity	0…98% (no condensation)				
Configuration	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				
	Fault current monitoring	Internal, AC/DC sensitive				
	Casing	Aluminium, cover powder-coated				
	Overvoltage conductor DC	Requirement class C (VDE 0675-6) or type 2 (EN 61643-11)				
	Overvoltage conductor AC	Requirement class D (VDE 0675-6) or type 3 (EN 61643-11)				

		10MT2	13MT2	15MT2	13MT3	15MT3
Standards & guidelines	CE-compliant	Yes				
	EMC	EN 61000-3-2 / EN 61000-3-3 / EN 61000-3-11 / EN 61000-3-12 / EN 61000-6-2 / EN 61000-6-3				
	Standard / guideline compliance	VDE 0126-1-1 / ENEL Guida Connessioni Ed. 1.1 / RD 661 / RD 1699 / G59/2 / VDE-AR-N 4105 / PPC Guide / C10/11 / EN50438 [4] / BDEW MV Guideline				
	Device safety	"GS certified safety" VDE with EN 50178 / IEC 62109-1				
Interfaces	Data communication	RS485 / Ethernet via two RJ45 sockets				
	Status signalling contact	M12 connector with relay as N/C contact / N/O contact				
Weight & dimensions	Weight	39 kg	39 kg	39 kg	42 kg	42 kg
	Dimensions in mm (W x H x D)	550 x 750 x 200				
Warranty		Standard 5 years / extension to 10, 15, 20 or 25 years possible				

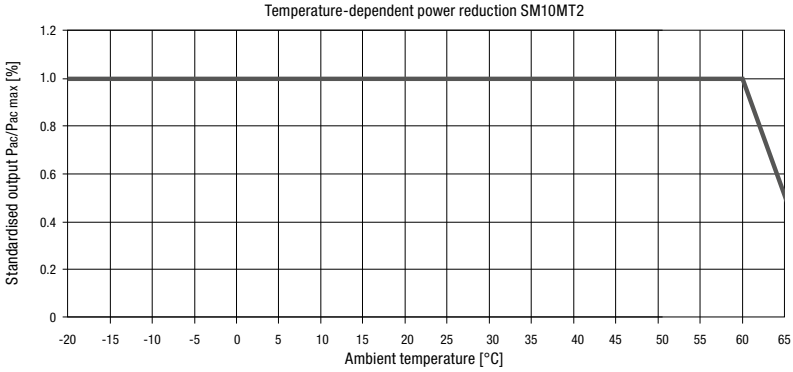
[1] recommended overdimensioning 15 % (ISE Fraunhofer study), varies depending on local requirements (location, system specifications, grid connection guidelines, laws)
[2] Over-dimensioning possible, limited at 9'000 W
[3] with the same generator layout for each tracker
[4] Portugal

13.2 Efficiency curve SolarMax 15MT3

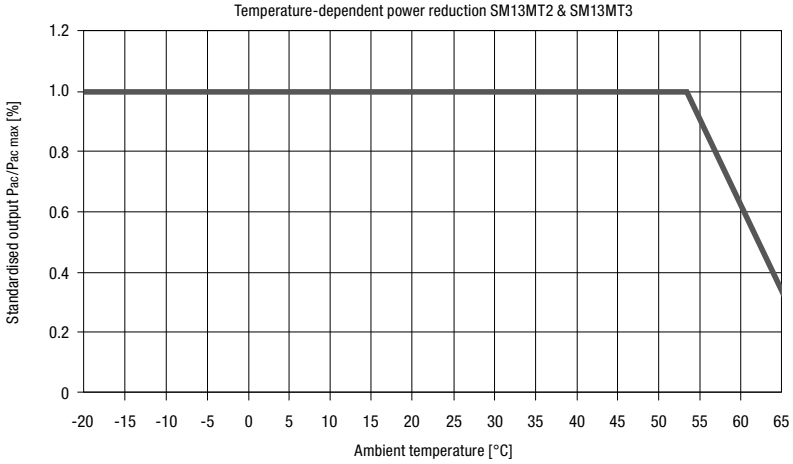


13.3 Temperature-dependent output reduction (power derating)

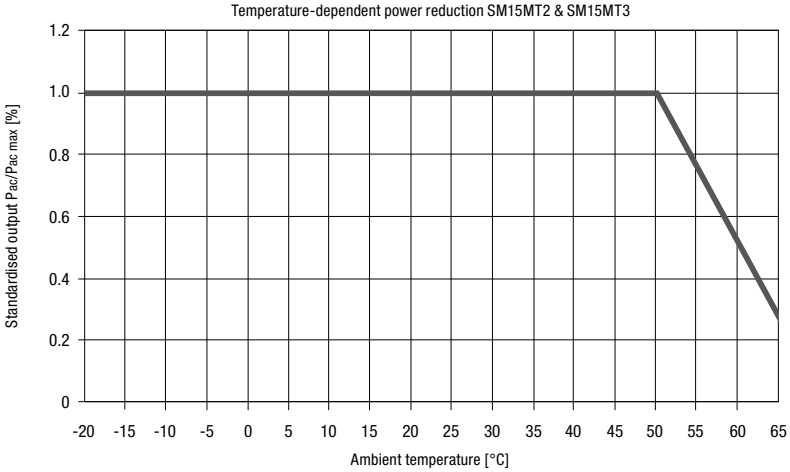
13.3.1 SM10MT2



13.3.2 SM13MT2 & SM13MT3



13.3.3 SM15MT2 & SM15MT3



13.4 Individual country settings

Parameter	Unit	DE					ES
		System ≤ 13.8 kVA	System > 13.8 kVA	System > 30 kVA	VDE 0126-1-1	Medium voltage	
Vac min 1	V	184	184	0	184	184	196
t Vac min 1	ms	200	200	0	200	2000	1500
Vac max 1	V	264	264	0	264	264	253
t Vac max 1	ms	200	200	0	200	100	1500
Vac min 2	V	0	0	0	0	104	0
t Vac min 2	ms	0	0	0	0	1500	0
Vac max 2	V	0	0	0	0	0	264
t Vac max 2	ms	0	0	0	0	0	200
Vac 10 min max	V	253	253	0	253	0	0
Monit. ext. input	On/Off	-	-	Off	-	-	-
f min 1	Hz	47.5	47.5	0	47.5	47.5	48
t f min 1	ms	200	200	0	200	100	3000
f max 1	Hz	51.5	51.5	0	51.5	51.5	50.5
t f max 1	ms	200	200	0	200	100	500
f min 2	Hz	0	0	0	0	0	0
t f min 2	ms	0	0	0	0	0	0
f max 2	Hz	0	0	0	0	0	0
t f max 2	ms	0	0	0	0	0	0
df/dt max	Hz/s	0	0	0	0	0	0
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	Off	On	On	On
- Vac MC max	V	253	253	280	253	280	264
- Vac MC min	V	196	196	161	184	219	196
- f MC max	Hz	50.05	50.05	55	50.2	50.05	50.5
- f MC min	Hz	47.5	47.5	45	47.5	47.5	48
- t MC monitoring	s	60	60	0	30	0	180
Anti-Islanding	On/Off	On	On	On	On	Off	On
Soft Start	W/s	0	0	0	0	0	0
Pac progression	%/min	10	10	10	0	0	0
P(f) mode	On/Off	On	On	On	On	On	-
- f start	Hz	50.2	50.2	50.2	50.2	50.2	-
- f stop	Hz	-	-	-	-	50.05	-
- Reduction	%/Hz	40	40	40	40	40	-
- Re-increase	%/min	10	10	10	10	-	-
Q mode		cos(φ)(Pac)	cos(φ)(Pac)	cos(φ)(Pac)	Off	Off	Off
FRT	On/Off	-	-	-	-	On	-
- K factor		-	-	-	-	2.0	-
S max SM10MT2	VA	10000	10000	10000	10000	10000	10000
S max SM13MT2/3	VA	13000	13000	13000	13000	13000	13000
S max SM15MT2/3	VA	15000	15000	15000	15000	15000	15000
Pac max SM10MT2	W	10000	10000	10000	10000	10000	10000
Pac max SM13MT2/3	W	13000	13000	13000	13000	13000	13000
Pac max SM15MT2/3	W	15000	15000	15000	15000	15000	15000
Iac max SM10MT2	A	16	16	16	16	16	16
Iac max SM13MT2/3	A	20	20	20	20	20	20
Iac max SM15MT2/3	A	22	22	22	22	22	22

Parameter	Unit	IT	FR	B	GR		CZ
					Mainland	Islands	
Vac min 1	V	184	184	196	184	184	207
t Vac min 1	ms	200	200	1500	500	500	500
Vac max 1	V	276	264	264	264	264	253
t Vac max 1	ms	100	200	120	500	500	500
Vac min 2	V	0	0	115	0	0	184
t Vac min 2	ms	0	0	120	0	0	100
Vac max 2	V	0	0	0	0	0	276
t Vac max 2	ms	0	0	0	0	0	100
Vac 10 min max	V	0	253	253	253	253	0
Monit. ext. input	On/Off	-	-	-	-	-	-
f min 1	Hz	49.7	47.5	47.5	49.5	47.5	49.8
t f min 1	ms	100	200	120	500	500	500
f max 1	Hz	50.3	50.2	50.5	50.5	51	50.2
t f max 1	ms	100	200	120	500	500	500
f min 2	Hz	0	0	0	0	0	49.5
t f min 2	ms	0	0	0	0	0	100
f max 2	Hz	0	0	0	0	0	0
t f max 2	ms	0	0	0	0	0	0
df/dt max	Hz/s	0	0	0	0	0	0
Ierr max	mA	300	300	300	300	300	300
Iac mean max	mA	0.5% of Iac max	1000	1% of Iac max	0.5% of Iac max	0.5% of Iac max	1000
Restart delay	s	0	0	0	0	0	0
Mains check	On/Off	Off	On	On	On	On	On
- Vac MC max	V	280	264	253	264	264	253
- Vac MC min	V	161	184	196	184	184	207
- f MC max	Hz	55	50.2	50.5	50.5	50.5	50.2
- f MC min	Hz	45	47.5	47.5	49.5	49.5	49.8
- t MC monitoring	s	0	30	30	180	180	30
Anti-Islanding	On/Off	On	On	On	On	On	On
Soft Start	W/s	0	0	0	0	0	0
Pac progression	%/min	0	0	0	0	0	0
P(f) mode	On/Off	-	-	-	-	-	-
- f start	Hz	-	-	-	-	-	-
- f stop	Hz	-	-	-	-	-	-
- Reduction	%/Hz	-	-	-	-	-	-
- Re-increase	%/min	-	-	-	-	-	-
Q mode		Off	Off	Off	Off	Off	Off
FRT	On/Off	-	-	-	-	-	-
- K factor		-	-	-	-	-	-
S max SM10MT2	VA	10000	10000	10000	10000	10000	10000
S max SM13MT2/3	VA	13000	13000	13000	13000	13000	13000
S max SM15MT2/3	VA	15000	15000	15000	15000	15000	15000
Pac max SM10MT2	W	10000	10000	10000	10000	10000	10000
Pac max SM13MT2/3	W	13000	13000	13000	13000	13000	13000
Pac max SM15MT2/3	W	15000	15000	15000	15000	15000	15000
Iac max SM10MT2	A	16	16	16	16	16	16
Iac max SM13MT2/3	A	20	20	20	20	20	20
Iac max SM15MT2/3	A	22	22	22	22	22	22

Parameter	Unit	PT	UK	CH	BG	RO	HR
Vac min 1	V	196	212	184	184	184	184
t Vac min 1	ms	1500	2500	200	200	200	200
Vac max 1	V	264	259	264	264	264	264
t Vac max 1	ms	200	1000	200	200	200	200
Vac min 2	V	0	196	0	0	0	0
t Vac min 2	ms	0	500	0	0	0	0
Vac max 2	V	0	271	0	0	0	0
t Vac max 2	ms	0	500	0	0	0	0
Vac 10 min max	V	253	0	253	253	253	253
Monit. ext. input	On/Off	-	-	-	-	-	-
f min 1	Hz	47	47.5	47.5	47.5	47.5	47.5
t f min 1	ms	500	20000	200	200	200	200
f max 1	Hz	51	51.5	50.2	50.2	50.2	50.2
t f max 1	ms	500	90000	200	200	200	200
f min 2	Hz	0	47	0	0	0	0
t f min 2	ms	0	500	0	0	0	0
f max 2	Hz	0	52	0	0	0	0
t f max 2	ms	0	500	0	0	0	0
df/dt max	Hz/s	0	0	0	0	0	0
Ierr max	mA	300	300	300	300	300	300
Iac mean max	mA	1000	0.25% of Iac max	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	264	259	264	264	264	264
- Vac MC min	V	196	212	184	184	184	184
- f MC max	Hz	51	51.5	50.2	50.2	50.2	50.2
- f MC min	Hz	47	47.5	47.5	47.5	47.5	47.5
- t MC monitoring	s	20	180	30	30	30	30
Anti-Islanding	On/Off	On	On	On	On	On	On
Soft Start	W/s	0	0	0	0	0	0
Pac progression	%/min	0	0	0	0	0	0
P(f) mode	On/Off	-	-	-	-	-	-
- f start	Hz	-	-	-	-	-	-
- f stop	Hz	-	-	-	-	-	-
- Reduction	%/Hz	-	-	-	-	-	-
- Re-increase	%/min	-	-	-	-	-	-
Q mode		Off	Off	Off	Off	Off	Off
FRT	On/Off	-	-	-	-	-	-
- K factor		-	-	-	-	-	-
S max SM10MT2	VA	10000	10000	10000	10000	10000	10000
S max SM13MT2/3	VA	13000	13000	13000	13000	13000	13000
S max SM15MT2/3	VA	15000	15000	15000	15000	15000	15000
Pac max SM10MT2	W	10000	10000	10000	10000	10000	10000
Pac max SM13MT2/3	W	13000	13000	13000	13000	13000	13000
Pac max SM15MT2/3	W	15000	15000	15000	15000	15000	15000
Iac max SM10MT2	A	16	16	16	16	16	16
Iac max SM13MT2/3	A	20	20	20	20	20	20
Iac max SM15MT2/3	A	22	22	22	22	22	22

Parameter	Unit	TR	CN	IL	AU	ROW	HR
Vac min 1	V	184	187	207	207	196	184
t Vac min 1	ms	200	2000	2000	2000	1500	200
Vac max 1	V	264	242	264	264	264	264
t Vac max 1	ms	200	2000	2000	2000	200	200
Vac min 2	V	0	110	0	0	0	0
t Vac min 2	ms	0	100	0	0	0	0
Vac max 2	V	0	0	0	0	0	0
t Vac max 2	ms	0	0	0	0	0	0
Vac 10 min max	V	253	0	0	0	253	253
Monit. ext. input	On/Off	-	-	-	-	-	-
f min 1	Hz	47.5	49.5	45.5	45.5	47	47.5
t f min 1	ms	200	600500	2000	2000	500	200
f max 1	Hz	50.2	50.2	54.5	54.5	51	50.2
t f max 1	ms	200	120500	2000	2000	500	200
f min 2	Hz	0	48	0	0	0	0
t f min 2	ms	0	200	0	0	0	0
f max 2	Hz	0	50.5	0	0	0	0
t f max 2	ms	0	200	0	0	0	0
df/dt max	Hz/s	0	0	0	0	0	0
Ierr max	mA	300	300	300	60	300	300
Iac mean max	mA	1000	0.5% of Iac max	0.5% of Iac max	0.5% of Iac max	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	264	253	264	264	264	264
- Vac MC min	V	184	196	207	207	196	184
- f MC max	Hz	50.2	50.5	54.5	54.5	51	50.2
- f MC min	Hz	47.5	49.5	45.5	45.5	47	47.5
- t MC monitoring	s	30	60	300	60	30	30
Anti-Islanding	On/Off	On	On	On	On	On	On
Soft Start	W/s	0	1000	0	0	0	0
Pac progression	%/min	0	0	0	0	0	0
P(f) mode	On/Off	-	-	-	-	-	-
- f start	Hz	-	-	-	-	-	-
- f stop	Hz	-	-	-	-	-	-
- Reduction	%/Hz	-	-	-	-	-	-
- Re-increase	%/min	-	-	-	-	-	-
Q mode		Off	Off	Off	Off	Off	Off
FRT	On/Off	-	-	-	-	-	-
- K factor		-	-	-	-	-	-
S max SM10MT2	VA	10000	10000	10000	10000	10000	10000
S max SM13MT2/3	VA	13000	13000	13000	13000	13000	13000
S max SM15MT2/3	VA	15000	15000	15000	15000	15000	15000
Pac max SM10MT2	W	10000	10000	10000	10000	10000	10000
Pac max SM13MT2/3	W	13000	13000	13000	13000	13000	13000
Pac max SM15MT2/3	W	15000	15000	15000	15000	15000	15000
Iac max SM10MT2	A	16	16	16	16	16	16
Iac max SM13MT2/3	A	20	20	20	20	20	20
Iac max SM15MT2/3	A	22	22	22	22	22	22

14 Warranty

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 accessories;
- *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 GCBD.

This guarantee applies only in case of malfunctions/defects which have been discovered and notified to Sputnik within the guarantee period. The original invoice respectively the delivery receipt serve as proof for the relevant point of time. In all cases of guarantee, Sputnik must be notified of the inconformity clearly and in writing within the guarantee period.

In guarantee cases, the malfunctioning/defective 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
- whether the alternative remedy could be completed without significant inconvenience to the buyer.

"Free of charge":

- The guarantee covers only the costs for labor 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:

- **unauthorized 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-authorized electricians;**
- **influence of foreign substances/bodies or superior force (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 compatible with the *„Directive 1999/44/EC of the European Parliament and of the Council of 25 May 1999 on certain aspects of the sale of consumer goods and associated guarantees".* Any legal rights under applicable national legislation within the personal, objective or geographic scope of this directive are not affected.

Servicing- and Guarantee-Extensions

Extended servicing and guarantee performances will - as the case may be - provided by Sputnik according to 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 gain 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.

Jurisdiction

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.

24 May 2011

Certificate

Declaration of conformity

EC Declaration of Conformity

for grid-connected photovoltaic inverters

SolarMax 10MT / 13MT / 15MT

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:

	SM10MT	SM13MT	SM15MT
EMC Emission			
EN 61000-6-3: 2007	X	X	X
EN 61000-6-4: 2007	X	X	X
EMC Immunity			
EN 61000-6-1: 2007	X	X	X
EN 61000-6-2: 2005	X	X	X
Utility Interference			
EN 61000-3-2: 2006 + A1: 2009 + A2: 2009	X		
EN 61000-3-12: 2005		X	X
EN 61000-3-3: 2008	X		
EN 61000-3-11: 2000		X	X
Equipment safety			
EN 50178: 1997	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

SolarMax® by Sputnik Engineering

2011/05 en

Länderspezifische Zertifikate und Konformitäten können im Downloadbereich unter www.solarmax.com eingesehen werden

Country-specific certification and conformities can be found and downloaded at www.solarmax.com

Les certificats et déclarations de conformité spécifiques à chaque pays peuvent être consultés dans la zone de téléchargement, à l'adresse www.solarmax.com

Certificados y documentos de conformidad específicos del país pueden verse en la zona de descarga en www.solarmax.com

I certificati e le dichiarazioni di conformità nazionali si possono consultare nella rubrica „Downloads" del sito www.solarmax.com

SolarMax Service Center

Deutschland	+49 180 276 5 276
Schweiz / Svizzera / Suisse	+41 32 346 56 06
France	+33 4 72 79 17 97
Italia	+39 0362 312 279
España	+34 902 160 626
Benelux	+32 2 535 77 32
Česká Republika	+420 222 191 456
United Kingdom	+44 208 973 2556
中国	+86 21 6182 6799
Ελλάδα	+30 210 727 91 61
България	+359 2 805 7223
Other countries	+41 32 346 56 06
Fax	+41 32 346 56 26
E-Mail	hotline@solarmax.com

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www.solarmax.com