• 15P0077B100 •

SUNWAY M XS

4600TL – 5000TL – 6000TL – 7500TL

SINGLE-PHASE SOLAR INVERTER

USER MANUAL

-Installation and Programming Instructions-

Issued on 15/02/2012

R.00.1

Applicable from Inverter Software Version 3.00
Applicable from Display Software Version 1.3.3

- This manual is integrant and essential to the product. Carefully read the instructions contained herein as they provide important hints for use and maintenance safety.
- This device is to be used only for the purposes it has been designed to. Other uses should be considered improper and dangerous. The manufacturer is not responsible for possible damages caused by improper, erroneous and irrational uses.
- Elettronica Santerno is responsible for the device in its original setting.
- Any changes to the structure or operating cycle of the device must be performed or authorized by the Engineering Department of Elettronica Santerno.
- Elettronica Santerno assumes no responsibility for the consequences resulting by the use of non-original spare-parts.
- Elettronica Santerno reserves the right to make any technical changes to this manual and to the device without prior notice. If printing errors or similar are detected, the corrections will be included in the new releases of the manual.
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SUNWAY M XS

4600 TL
5000 TL
6000 TL
7500 TL

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1. SCOPE OF THIS MANUAL

Elettronica Santerno is committed to update its User Manuals available for download from santerno.com with the latest software version officially released. Please contact Elettronica Santerno if you require technical documents related to previous software versions.

2. GENERAL INFORMATION

2.1. Description of the Product

The inverters of the SUNWAY M XS series are full-digital devices that convert DC energy produced by photovoltaic (PV) panels – when radiated by sunlight – into AC energy, which is delivered to the grid.

A solar system for the self-generation of electric power is composed of two elements:

- the PV generator, consisting of a set of PV panels;
- the SUNWAY M XS inverter, delivering power supply from the PV generator to the grid.

Operation in parallel to the grid allows consumers to exploit the power supply produced directly by the system when radiated by sunlight, and to deliver power which is not locally consumed to the grid, by conferring it to the Grid Administrator. Therefore, residual power can be used by other consumers connected to the grid, thus allowing the exploitation of the green energy produced by the PV generator, as well as the constant operation of the same PV generator at its max ratings for optimum performance.
At night-time or when sunlight is weak, consumers can exploit the grid to power their loads.
All the parameter values related to the operation of the equipment may be easily programmed through the touchscreen display and the parameter menus and submenus.
The inverters of the SUNWAY M XS series have been designed and manufactured in compliance with the requirements of the “Low Voltage Directive” and the “Electromagnetic Compatibility Directive” and comply with the prescriptions for grid connection applying to self-generation electric plants.

2.2. Benefits

- Wide range of supply voltages: 330 to 845 Vdc;
- Full-digital DC/AC conversion through 32-bit microprocessor obtained with PWM technique and IGBT bridge ensuring high efficiency, high reliability and low distortion of the grid current;
- Transformerless topology;
- Die cast aluminium enclosure for maximum robustness, thermal performance and weight optimization, suitable for outdoor installation (IP65-rated);
- DC disconnect switch ensuring maximum safety when maintaining the inverter (optional);
- Input filters and output filters for the suppression of conducted disturbance and radiated disturbance;
- Testing circuit to check the isolation resistance between the input and the earth;
- Operation in parallel to the grid, power factor=1;
- Fast connection through quick-coupling MC4 connectors for the connection of up to 4 strings;
- User interface based on graphic touchscreen display, 240x320 pixels, 262,000 colours for user-friendly control of the inverter functionality;
- RS485 serial link with Modbus protocol for remote monitoring and programming (optional);
- Wi-Fi connectivity for the access to LANs and interaction via smartphones;
- Remote Technical Support if the inverter is connected to the Internet;
- Power supply from the grid in order to maintain operation even in the event of weak solar radiation.

2.3. Operating Principle

The power conversion system (inverter) is connected directly to the PV field. By using a high-switching frequency IGBT bridge, the DC coming from the PV field is converted into AC at the grid frequency. The transformerless architecture ensures maximum efficiency without affecting safety: the system monitoring current leakage to earth is integrated into the inverter (integrated RCD) and the redundant grid coupling devices ensure proper safety even in the event of single fault.

The EMC filters for the suppression of electromagnetic disturbance, the isolation sensor monitoring the isolation to earth of the PV panels as well as the device controlling the operation in parallel to the grid are integrated into the inverter. Therefore, no additional device external to the inverter is required.

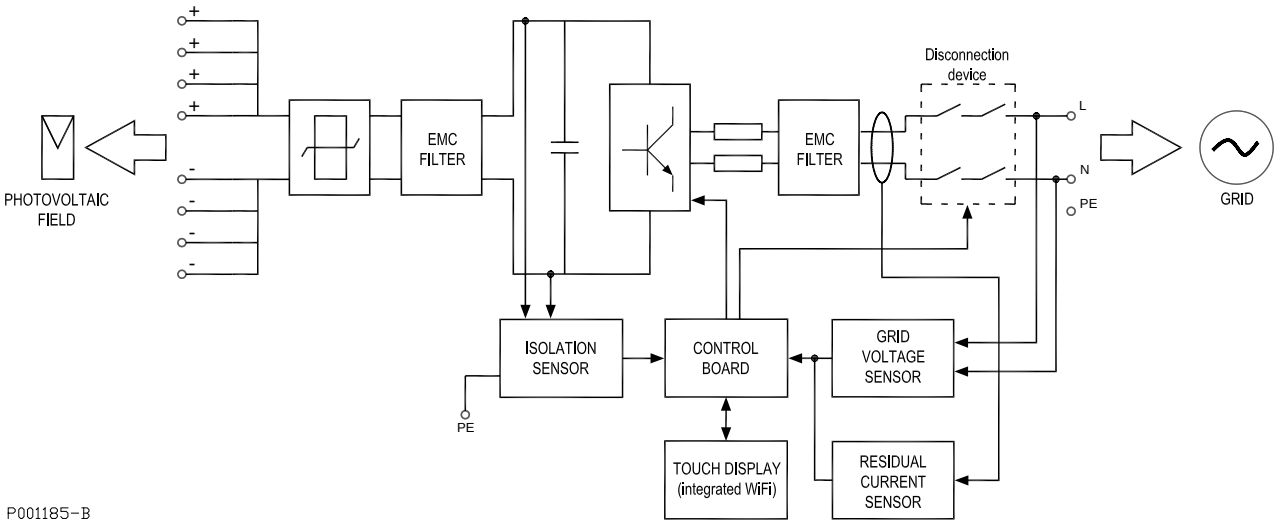


Figure 1: Block diagram of the SUNWAY M XS

2.4. Main Standard Integrated Functions

This section contains a brief description of the equipment functions, to allow users who are not familiar with the operation of PV fields to better understand this manual.

Device for constant isolation control: This is a device which constantly checks the isolation between the earth and the polarities of the PV field and the earth. This function is obtained by measuring the isolation resistance: the equipment is factory-set to detect isolation loss when the isolation resistance between polarity + or polarity – and the earth drops below 850 kΩ.

MPPT (Maximum Power Point Tracking): A sophisticated computing performed by the microprocessor allows the inverter to detect the optimum operating point of the PV field, corresponding to the max power that can be produced by the field depending on current solar radiation conditions.

Automatic Disconnecting Means: This device automatically disconnects the self-generation plant from the grid when parallel operation is no longer possible. This typically occurs when the grid "opens" due to maintenance needs or to safety circuit tripping. This function allows the inverter to instantly disconnect from the grid, thus avoiding unwanted stand-alone operation of the plant and electric shock hazards for the operators working on the grid. Trip times and levels are factory-set according to the applicable safety standards. To modify the factory settings, please refer to the sections relating to the inverter programming. The ratings of this safety function have been certified as prescribed by the Grid Administrator.

When required by the Grid Administrator, a simple self-test procedure performed via the touchscreen display allows checking the efficiency of the grid disconnecting device.

2.5. Attached Documentation

The SUNWAY M XS inverter is supplied complete with the following documents:

- Multilingual "Quick Start Guide", included as a hard copy and available for download from santerno.com;
- "Wi-Fi Connection – Quick Start Guide", included as a hard copy and available for download from santerno.com;
- Multilingual "Certification and Grid Interface File", available for download from santerno.com;
- "User Manual" (this document) available for download from santerno.com.

3. BASIC INSTALLATION

The basic installation consists in connecting the basic elements for system operation (grid and PV generator) in a plant equipped with only one PV generator and one inverter.

Advanced configurations of the SUNWAY M XS inverter are covered in section 4. Fully read the basic installation instructions before carrying out the advanced configurations.

3.1. Caution Statements

This section covers safety statements. The non-observance of the safety instructions below may cause serious injury or death and equipment failure. Carefully read the instructions below before installing, starting and operating the inverter.

Only competent personnel must carry out the equipment installation.

KEY TO SYMBOLS:

	**DANGER**	Indicates operating procedures that, if not correctly performed, may cause serious injury or death due to electric shock.
	**CAUTION**	Indicates operating procedures that, if not respected, may cause serious equipment failure.
	**NOTE**	Indicates important information concerning the operation of the equipment.

SAFETY STATEMENTS TO FOLLOW WHEN INSTALLING AND OPERATING THE EQUIPMENT:

	**NOTE**	Always read this instruction manual thoroughly before starting the equipment.
	**DANGER**	**Always earth the equipment**
	**CAUTION**	The SUNWAY M XS must be powered by a photovoltaic field only, and must be used exclusively for operation in parallel to the grid. Any other use is to be considered as improper.

CONNECTION TO THE PV FIELD – When exposed to solar radiation, the photovoltaic panels produce DC voltage that is applied to the inverter.

DANGER

ELECTRIC SHOCK HAZARD – Do not touch the electric parts of the inverter and do not operate on the inverter when it is powered. Always wait at least 20 minutes from the instant when the DC and AC supply is removed from the inverter before carrying out any operation, because electric energy is accumulated inside the inverter.

Do not operate on the equipment when it is powered.

Before operating on the electric connections, remove both DC and AC voltage from the equipment and wait at least 20 minutes.

EXPLOSION AND FIRE – The risk of explosion and fire may exist if the equipment is installed in presence of flammable fumes. Do not install the equipment where there is a risk of explosion and fire.

Do not connect supply voltages which exceed the rated voltage. If voltage exceeding the rated value is applied, the internal circuits may be damaged.

In the event of installation in presence of flammable and/or explosive substances, please consult the relevant applicable standards.

CAUTION

In the event of an alarm, consult section 4.3.6 Alarms Menu. Only restart the equipment after the problem has been rectified.

Do not carry out isolation tests between the power terminals or between the control terminals.

Make sure that the screws on the connection terminal boards have been properly tightened.

Observe the environmental requirements for installation.

DANGER

Certain parts of the product (side walls, heatsink and reactors) may reach temperatures as high as 100 °C. Take all the necessary precautions to avoid burns.

DANGER

Do not remove the inverter lid during installation. Removing the lid may affect the IP rating of the inverter and may damage the internal parts. **Removing the lid voids the inverter warranty.**

3.2. Checking the Product on Delivery

On receiving delivery of the equipment, make sure that the packaging shows no signs of damage. Check that it complies with your order by referring to the dataplates described below. In the event of any damage, please contact the relative insurance company or the supplier. If the delivery does not match your order, contact the supplier immediately.

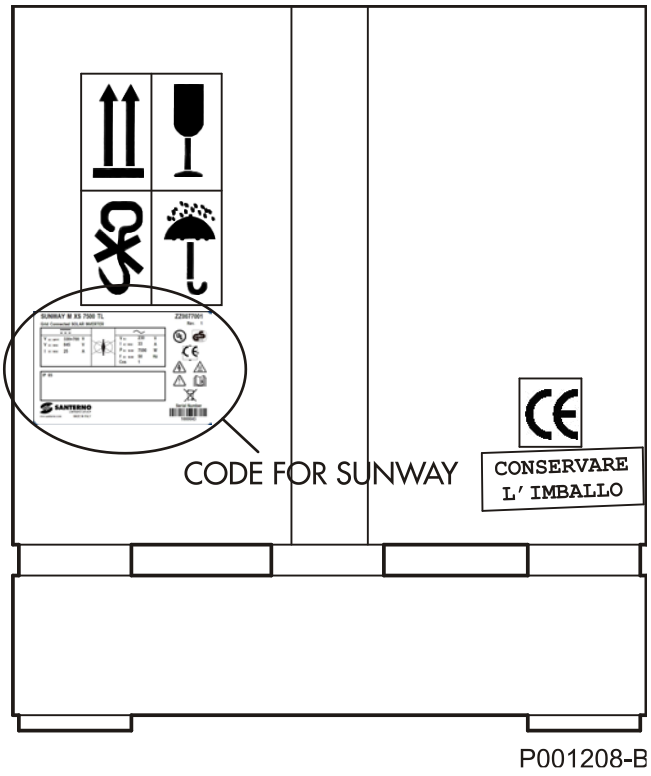


Figure 2: Packaging of the SUNWAY M XS

If the equipment is to be stored before installation, make sure that the ambient conditions in the warehouse meet the necessary specifications (see section 3.4.1). The warranty covers manufacturing defects. The manufacturer shall not be held liable for any damage which may have occurred during transport and unpacking. Under no circumstances shall the manufacturer be held liable for damage or faults caused by incorrect use, misuse, incorrect installation or inadequate temperature or humidity conditions or exposure to corrosives, nor for faults caused by operation outside the rated values. Nor shall the manufacturer be held liable for consequential or accidental damage.

NOTE For the terms of warranty, please refer to the warranty certificate supplied with the product.

3.2.1. Dataplate

The product is described and identified by a dataplate placed on its side.

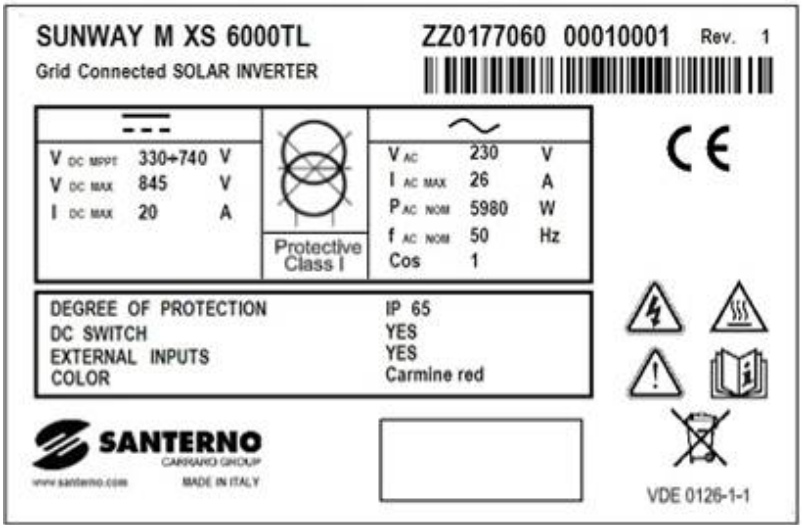


Figure 3: Dataplate of the SUNWAY M XS

The product code is made up of the following elements:

SUNWAY	M	XS	6000	TL
1	2	3	4	5

1	Product line: SUNWAY inverter for the conversion of photovoltaic energy
2	Type of connection to the grid: M = single-phase
3	Product family: XS = new generation of Santerno inverters
4	Size: 4600 = rated output current: 20 A (4600 W rated power for 230 V grid) 5000 = rated output current: 22 A (5060 W rated power for 230 V grid) 6000 = rated output current: 26 A (5980 W rated power for 230 V grid) 7500 = rated output current: 33 A (7590 W rated power for 230 V grid)
5	Grid connection technology: TL = transformerless

Purchase code of the product:

ZZ01770	PP		D	A	C	U	W	X	Y	Z
1	2	3	4	5	6	7	8	9	10	11

1	Fixed elements of the purchase code: ZZ01770 for the SUNWAY M XS
2	Size (two figures): 46 = 4600TL (4600 W rated power for 230 V grid) 50 = 5000TL (5060 W rated power for 230 V grid) 60 = 6000TL (5980 W rated power for 230 V grid) 75 = 7500TL (7590 W rated power for 230 V grid)

3	Blank field
4	DC disconnect switch (optional): 0 = Not fitted 1 = Fitted
5	Unused field: 0 = Default
6	Colour: 0 = Carmine Red (RAL 3002) 1 = Night Blue (RAL 5022) 2 = Traffic Black (RAL 9017) 3 = Traffic White (RAL 9016)
7	Unused field: 0 = Default
8	RS485 (optional) 0 = Not fitted 1 or 3 = Fitted
9	Unused field: 0 = Default
10	Unused field: 0 = Default
11	Unused field: 0 = Default

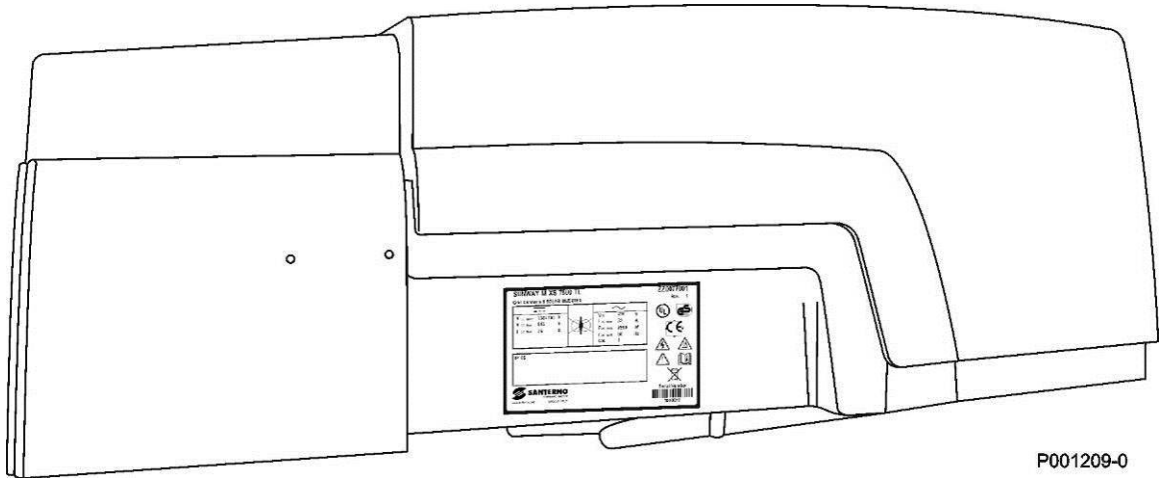


Figure 4: Label placed on the metal enclosure of the product

The basic configuration of the SUNWAY M XS inverter comprises the following:

- N. 1 SUNWAY M XS inverter;
- N. 1 Wall-mounting bracket;
- N. 1 Quick Start Guide;
- N. 1 Authentication form;
- N. 1 Warranty certificate;
- N. 1 Kit for quick-coupling connectors.

The following options are available for the SUNWAY M XS:

Available options	Component	Configuration
DC Disconnect switch	Integrated disconnect switch for the disconnection of the photovoltaic field from the inverter	Integrated into the product
Ambient sensors	Output voltage sensors or output current sensors, single-ended or differential sensors	Integrated into the product
RS485 Link	Connector for RS485 bus communications	Integrated into the product

NOTE Before commissioning the SUNWAY M XS, make sure that all the options required are fitted. Contact the Customer Service of Elettronica Santerno SpA for any clarifications.

3.3. Transport and Handling

State-of-the-art packing is provided when shipping the SUNWAY M XS. Handling should be done using a transpallet or a lift truck with a carrying capacity of at least 100 kg, in order not to damage the product.

Get near the installation place, then unpack following the instructions provided below.

The whole original packing is to be kept for the full duration of the warranty period.

CAUTION

Based on the configuration of the product, the content of the packing may have a maximum weight of 35 kg. The centre of gravity of the SUNWAY M XS does not match with the geometrical centre of the packing. It is therefore recommended that the packing be handled with extreme care by at least three persons. Always use proper handling equipment.

The product packing contains a form stating the password required for accessing the functioning data of the equipment. For details about accessing the inverter functioning data, see section 3.7.2.

1. Unpacking the product:
   a. Cut with pincers the plastic straps that fix the package of the SUNWAY M XS to the pallet;
   b. Cut with a cutter the adhesive tape closing the box on the side where the package orientation symbol in Figure 6 is reproduced.

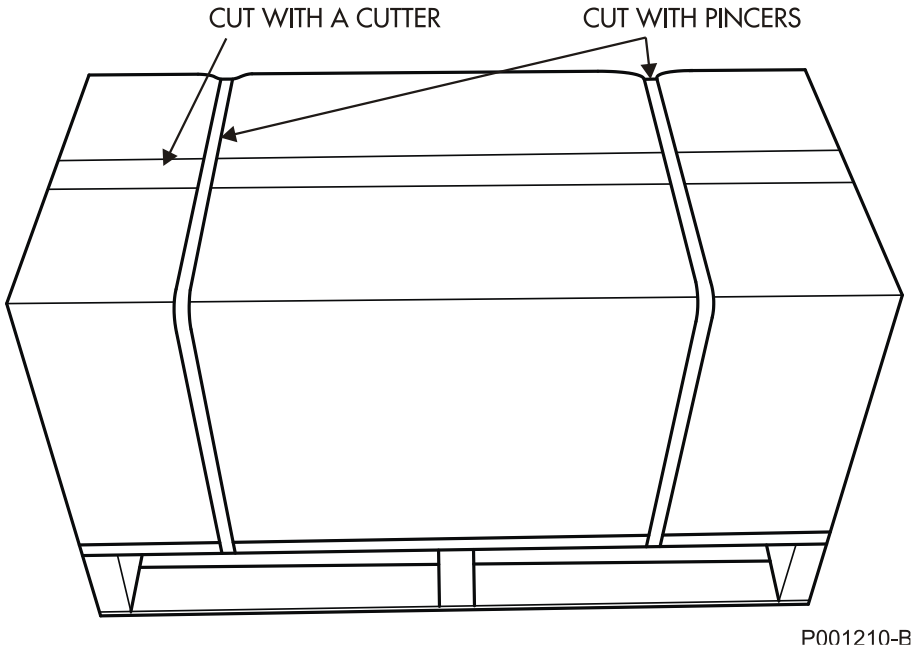


Figure 5: Procedure for opening the package

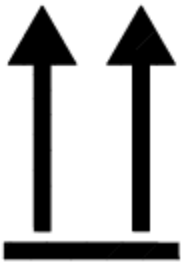


Figure 6: Package orientation symbol

2. Remove the SUNWAY M XS from its packing by lifting it from its sides. To avoid damaging the packing, lift the product keeping it horizontal to the floor (see Figure 7).

Figure 7: Procedure for removing the SUNWAY M XS from its packing

3. Put all the packing elements in the box and store it in a dry environment (see Figure 8).

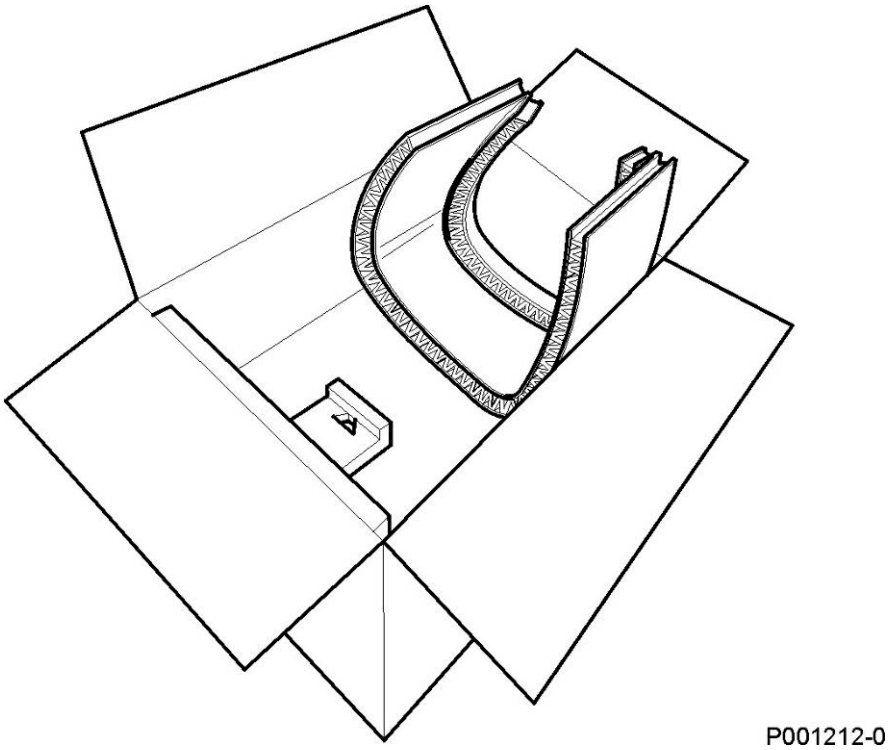


Figure 8: SUNWAY M XS box with packing elements

3.4. Installation

NOTE

Do not remove the inverter lid during installation. Removing the lid may affect the IP rating of the inverter and may damage the internal parts. **Removing the lid voids the inverter warranty.**

3.4.1. Environmental Requirements for the Equipment Storage, Installation and Operation

Model	4600TL	5000TL	6000TL	7500TL
IP Rating (1)	IP65	IP65	IP65	IP65
Mechanical dimensions w x h x d (mm)	414 x 703 x 260			
Weight (kg)	31	31	35	35
Operating ambient temperature (°C)	-25 ÷ +60			
Rated operating temperature (°C) (2)	-25 ÷ +45			
Ambient temperature for storage and transport (°C)	-25 ÷ +70			
Maximum number of packed SUNWAY M XS that can be stacked up	3			
Installation site	Outdoor installation, degree of pollution 3 or better. Do not install the equipment where it is exposed to direct sunlight or where it is exposed to conductive dust, corrosive gases, vibrations. Do not install in salty environments.			
Altitude	Up to 2000m a.s.l. For altitudes ranging from 2000m to 3000m a.s.l. derate the output current by 1% every 100m. For higher altitudes, please contact Elettronica Santerno.			
Operating ambient humidity	0 % to 100 %, 1 g/m^3 to 25 g/m^3, non-condensing and non-freezing (class 3k3 according to EN 50178).			
Storage ambient humidity	0 % to 100 %, 1 g/m^3 to 25 g/m^3, non-condensing and non-freezing (class 1k3 according to EN 50178).			
Ambient humidity during transport	Max. 100%. Up to 60g/m^3, condensation may appear when the equipment is not running (class 2k3 according to EN 50178).			
Operating and storage atmospheric pressure	86 kPa to 106 kPa (class 3k3 and 1k4 according to EN 50178).			
Atmospheric pressure during transport	70 kPa to 106 kPa (class 2k3 according to EN 50178).			

Table 1: Environmental requirements

(1) The external fans are IP54 rated.
(2) Beyond 45 °C, the SUNWAY M XS automatically decreases its output power in order to avoid overheating.

CAUTION

Environmental conditions significantly affect the life-expectancy of the product. Consequently, DO NOT install the product in a location which does not meet the required specifications.

3.4.2. Wall Mounting

The SUNWAY M XS is provided with a bracket that can be used for wall mounting. The inverter is to be installed in upright position. Make sure that the wall can withstand the weight of the product.

CAUTION

Do not install the SUNWAY M XS in direct sunlight or above heat sources.

Based on the configuration of the product, the content of the packing may weigh up to 35 kg (see the product specifications). Make sure that adequate handling measures are taken.

The protective cover of the connector unit is made of plastic and cannot withstand mechanical stress. Avoid using it as a grip point during installation.

Make sure that the surface where the inverter is to be installed on is perfectly flat and is not tilted.

NOTE

The installation place for the SUNWAY M XS is to be chosen based on its degree of protection. It is recommended that the SUNWAY M XS be not installed in environments exposed to direct water jets.

It is recommended that the SUNWAY M XS be installed in a place sheltered from rain and snow.

Do the following to mount the inverter:

1. Find an installation site suitable for the inverter, allowing adequate clearance as mentioned in Figure 9. The clearance below allow easy mounting and proper ventilation.

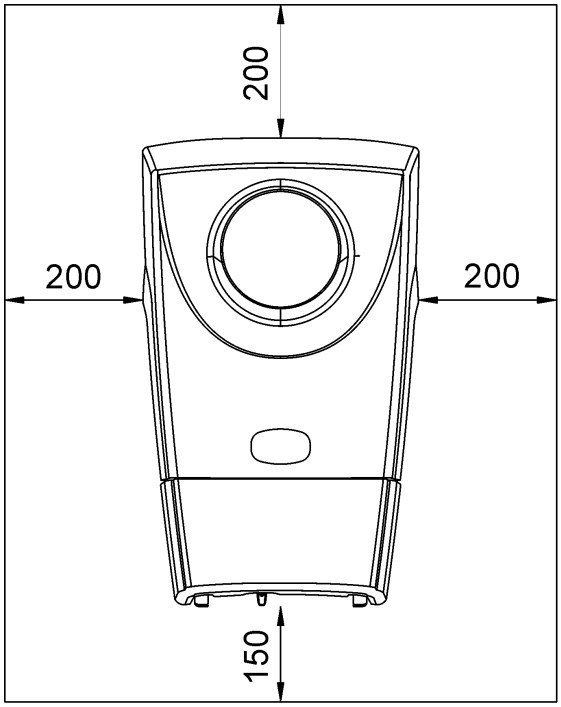


Figure 9: Minimum clearance (in mm) for proper ventilation of the SUNWAY M XS

2. N. 3 (three) 6mm flared-head wall plugs are required to fasten the wall-mounting bracket (plugs are not supplied with the product because different wall materials require different types of fixing devices).

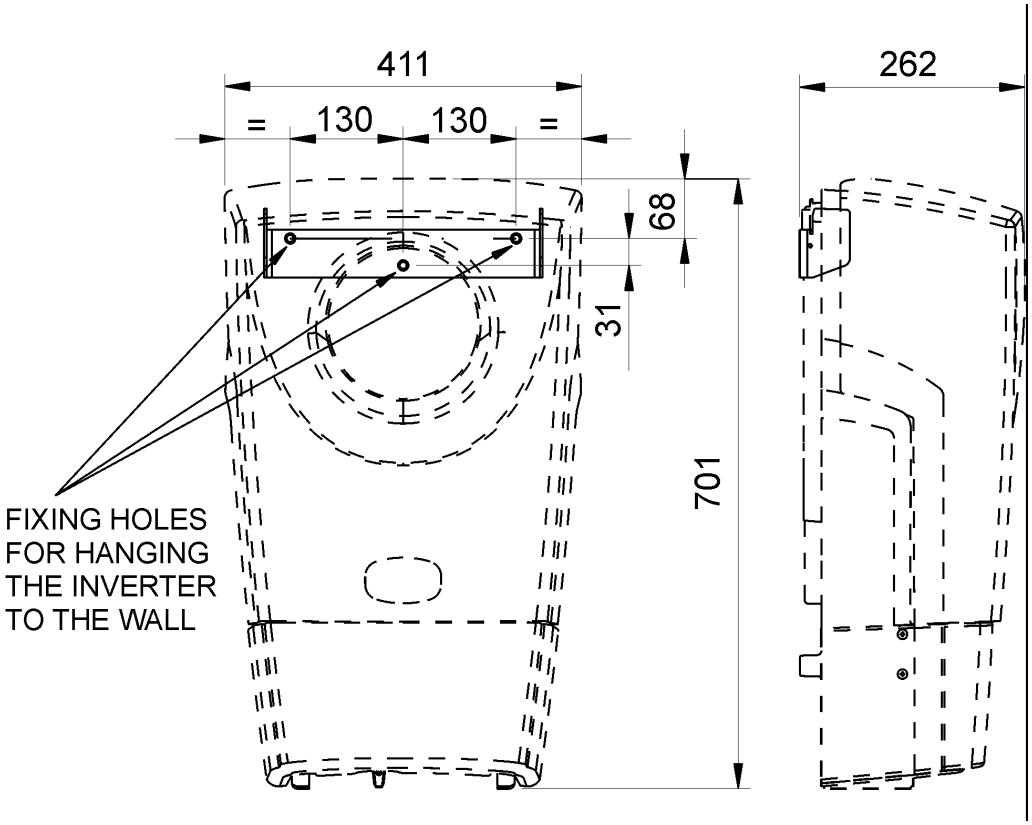


Figure 10: Detail of the SUNWAY M XS bracket with the fixing screws

3. Place the inverter upright in contact with the wall in the proximity of the fixing point. The inverter is equipped with feet for upright installation.

Figure 11: The SUNWAY M XS in upright position

4. Fasten the SUNWAY M XS to the bracket by lifting it from the two side handles.

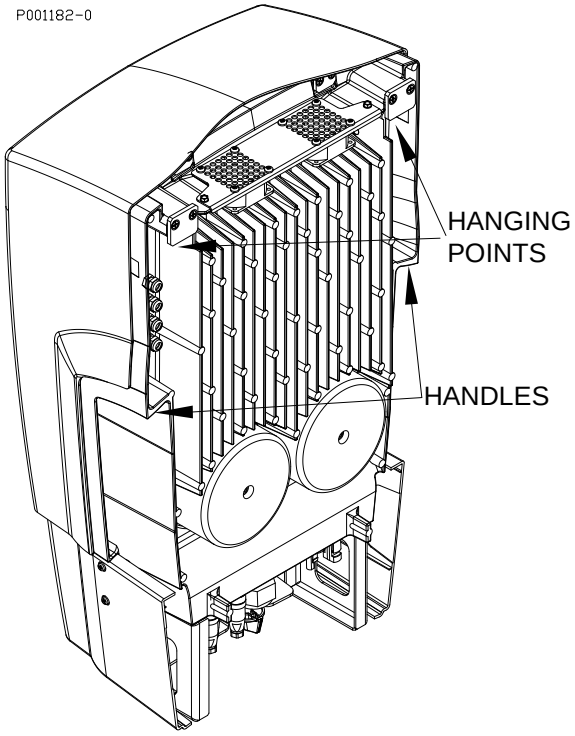


Figure 12: Detail of the SUNWAY M XS with the side handles

DANGER **Make sure that the product is properly fastened to the bracket before loosening your grip on the product.**

5. Assemble the fastening screws onto the sides of the bracket.

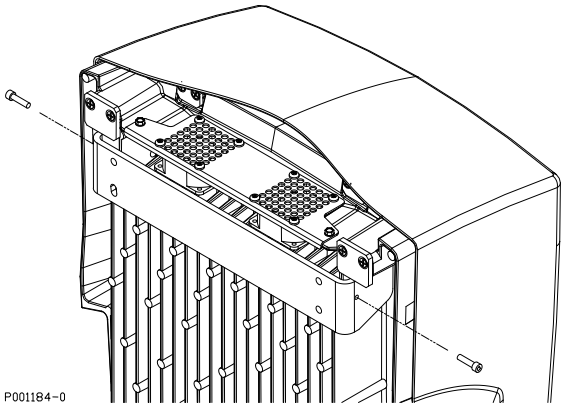


Figure 13: Fastening the SUNWAY M XS to the wall-mounting bracket

6. Make sure that the SUNWAY M XS is firmly fixed to the wall. Make sure that no tilting occurs.

3.4.3. Electrical Connection

3.4.3.1. Removing the Connector Cover

No particular mechanical procedure is required for the electrical connection of the SUNWAY M XS. The connection to the photovoltaic field and to the grid as well as the field disconnect switch, is fitted, do not require any mechanical procedure.

The connector cover, which is fixed by four screws on its sides, may be removed as follows:

1) Remove the four screws from the inverter sides. See Figure 14.
2) Slide the connector protective cover to remove it.

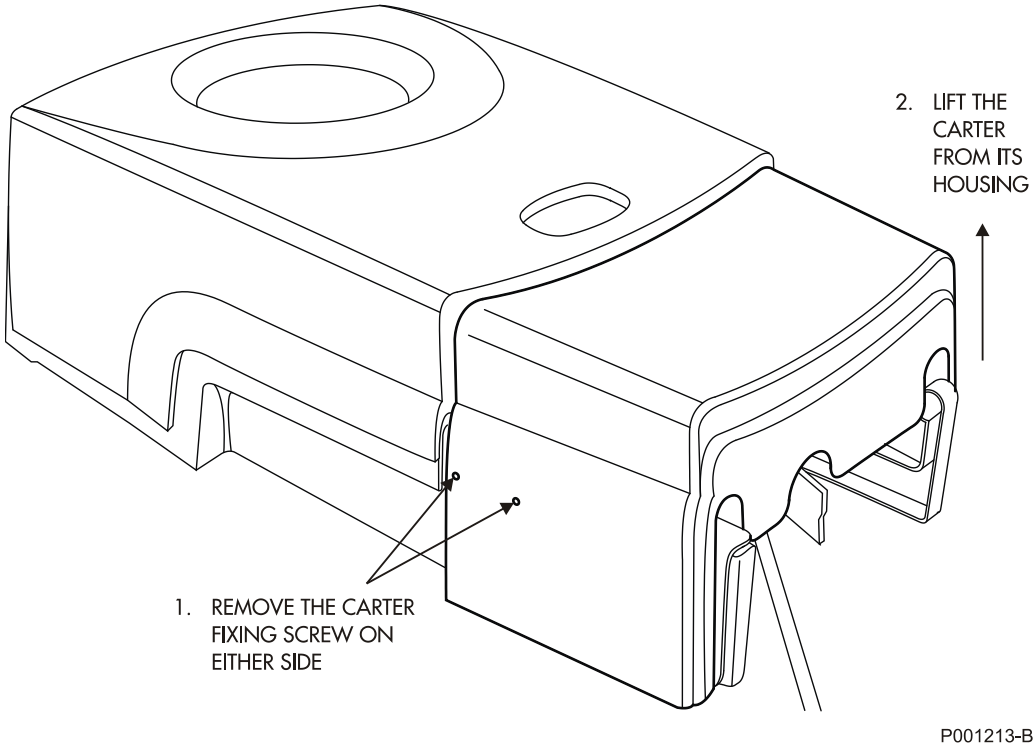


Figure 14: Removing the connector protective cover

After removing the connector cover, the connector panel may be accessed as shown in Figure 15.

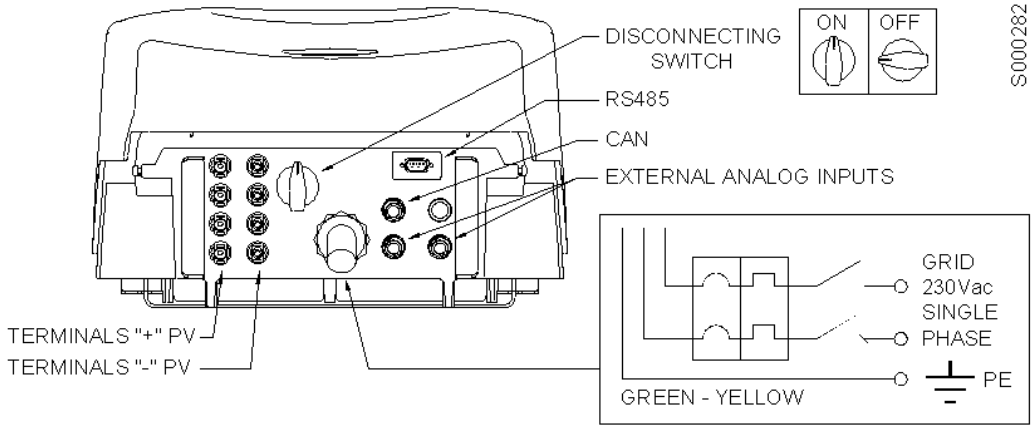


Figure 15: SUNWAY M XS connectors

3.4.3.2. Connection Sequence

DANGER **Always connect the protective earthing (PE).**

CAUTION

Follow the sequence below to carry out the electrical connection of the SUNWAY M XS:

1. Carry out the earth connection of the inverter;
2. Carry out the electrical connection to the grid;
3. Carry out the electrical connection of the inverter to the photovoltaic field.

Carry out the earth connection of the inverter before carrying out any electrical connection. The product is supplied with a three-wire cable for the connection to the grid. First connect the yellow-green wire to the earth of the electrical system external to the inverter. The yellow-green wire is internally connected to the Protective Earth of the circuit.

3.4.3.3. Connection to the Grid

CAUTION

The electrical connection of the SUNWAY M XS must be done following the steps in section 3.4.3.

DANGER

Always remove voltage before operating on the grid. The earth conductor must be connected first.

Do not connect supply voltages exceeding the equipment rated voltage, single-phase, 230 V ±15 % to avoid damaging the internal circuits.

Always install a moulded case circuit breaker (MCCB) to protect the electric circuit.

CAUTION

RESIDUAL CURRENT DEVICE – A residual current device is integrated into the SUNWAY M XS inverters. The RCD provides protection against residual DC and AC currents and is compliant with the safety regulations in force. The efficiency of the RCD is checked when testing the inverter and whenever the inverter is connected to the grid. The integrated RCD provides protection against DC-side faults only. As per AC-side protection, an external RCD of type A is to be provided to protect the line between the inverter and the delivery point.

NOTE

It is recommended that a RCD of type A, minimum 100 mA be installed for each individual inverter. A total rating of at least 300 mA is therefore recommended.

Carry out the electrical connection to the grid using the pre-wired cable internal to the SUNWAY M XS. Connect the protective earth (PE), the line (L) and the neutral (N). The plant must be equipped with a moulded case circuit breaker (MCCB) installed between the grid and the SUNWAY M XS.

The dimensioning of the MCCB and the specifications of the pre-wired cable are given in the table below.

SUNWAY M XS Model (Output)	***4600TL***	***5000TL***	***6000TL***	***7500TL***
Rated output voltage (Vac)	230			
Rated output current (Aac)	20	22	26	33
Rated current of MCCB	25	25	32	40
Cable cross-section (mm²)	6			
Type of cable	Three-pole, double insulation (phase+neutral+earth)			
Outer diameter of wiring cable (mm)	16.8			
Cable stripping (mm)	10			

Table 2: Dimensioning of the MCCB and cable specifications

Proceed as follows:

1) Install the MCCB making sure that no electric load is interposed between the circuit breaker and the SUNWAY M XS. Make sure that the current capacity of the electric system in the installation point of the MCCB is adequate for the connection.
2) Connect the SUNWAY M XS and the MCCB using the cable assembly provided.
3) Once the electrical connection to the grid has been carried out, keep the circuit breaker open.

3.4.3.4. Connection to the Photovoltaic Field

CAUTION The electrical connection of the SUNWAY M XS must be done following the steps in section 3.4.3.

Each string is composed of a given number of series-connected PV modules. The PV generator may consist of a single string or multiple parallel-connected strings. The configuration of the PV field should be defined depending on the voltage range allowed by the SUNWAY M XS and on the power to be installed.

Up to four strings may be connected in parallel to the SUNWAY M XS, with no need to install any additional component. The strings forming the PV field and that are connected to the same SUNWAY M XS must be dimensioned in order to get the same working voltage per string. It is recommended that the same type of solar panels be used for the whole PV field and that all the strings be exposed to exactly the same solar radiation.
The SUNWAY M XS is not compatible with strings comprising PV modules that require earthing one pole.

Quick-coupling connectors are used for the connection of the product to the PV field. The SUNWAY M XS inverters are supplied with the following types of connectors:

- Quick-coupling Multicontact MC4 connectors (panel connectors PV-ADBP4 and PV-ADSP4 and floating connectors PV-KBT4 and PV-KST4). For assembly instructions, please consult the MA231 document available for download from the website of the manufacturer;
- Amphenol Helios 4 connectors (panel connectors H4CFM6DN and H4CMM6DN and floating connectors H4CFC6DN and H4CMC6DN). For assembly instructions, please consult “Assembly Instruction for the Helios H4 PV Connectors” available for download from the website of the manufacturer;

DANGER

Make sure that the MCCB is open and the earth connector (PE) is properly earthed.

CAUTION

Do not connect any photovoltaic generator capable of producing a field voltage exceeding the maximum allowable rating (845 V). If a voltage exceeding the maximum allowable rating is applied to the inverter, failures may occur on the internal circuits.

DANGER

The voltage produced by the photovoltaic generator radiated by sunlight (even weak sunlight) can reach 845 V.

Strictly comply with the national and local safety standards in force in the installation site.

Cable stripping and wiring must be carried out with extreme care using proper tools.

Always take EXTREME CARE to avoid any unintentional contacts with the free pole from the PV generator. Contact with both polarities leads to severe injury or death due to electric shock.

The specifications of the PV field and the wiring cable dimensioning are given in the table below.

SUNWAY M XS Model (Input)	***4600TL***	***5000TL***	***6000TL***	***7500TL***
Peak power (Wp) of the photovoltaic generator	5500	6000	7000	9000
MPPT voltage (Vdc) of the inverter	330 – 740			
Maximum voltage (Vdc) of the PV generator	845			
Maximum input current (A) of the photovoltaic generator	15.5	17	20	25
Cable cross-section (1 string, mm^2)	6			
Type of cable	Unipolar			

Table 3: Specifications of the PV field

NOTE

The maximum peak power of the PV generator should not exceed the value given in the table. Exceeding values do not entail malfunctions to the inverter, as the equipment automatically limits the power fed into the grid. However, in this way the PV generator is not exploited at its best.
The voltage at the maximum power point of the PV generator, under the intended conditions of operation (min/max radiation, min/max temperature of the modules) must be within the **operating voltage range of the PV generator.**

The maximum rated voltage of the PV field must never be exceeded. A higher voltage will damage the equipment in an irreversible manner.

DANGER

When testing the photovoltaic field, do not exceed 500 V for the isolation test in order not to damage the integrated varistors protecting the DC input of the inverter.

Do the following:

1) Make sure that the inverter is uncoupled from the grid.
2) If the DC disconnect switch (optional) is fitted, set it to **OFF** (Figure 15).
3) Check polarity and voltage of each string.
4) Connect the strings of the PV field to the quick-coupling connectors, making sure that polarities are respected. The left-most (female) connectors are for the positive pole, whilst the right-most (male) connectors are for the negative pole.

CAUTION Plug any unused cable glands and quick-coupling connectors of the inverter to maintain the IP rating of the equipment.

3.4.4. Removing the Protective Film from the Display

The SUNWAY M XS inverter is supplied with a film protecting the touchscreen display. See Figure 16.

Once the inverter installation is complete, remove the protective film from the touchscreen display to start using it.

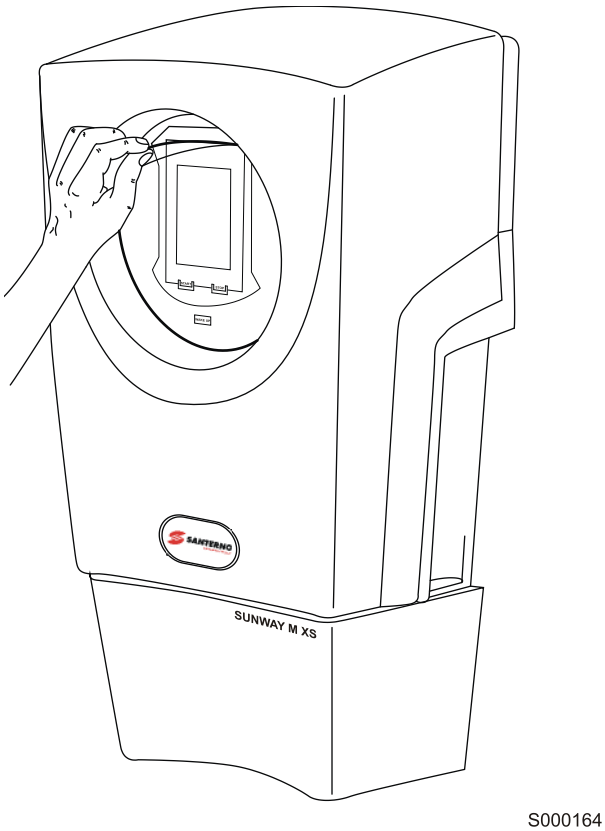


Figure 16: Removing the protective film from the touchscreen display

3.4.5. Fiscal Seal

A fiscal seal may be applied to the inverter, where required. The seal may be applied through the special slots on both sides of the product cover and enclosure. Remove the connector protective cover to gain access to the slots. Figure 17 shows the location of the slots.

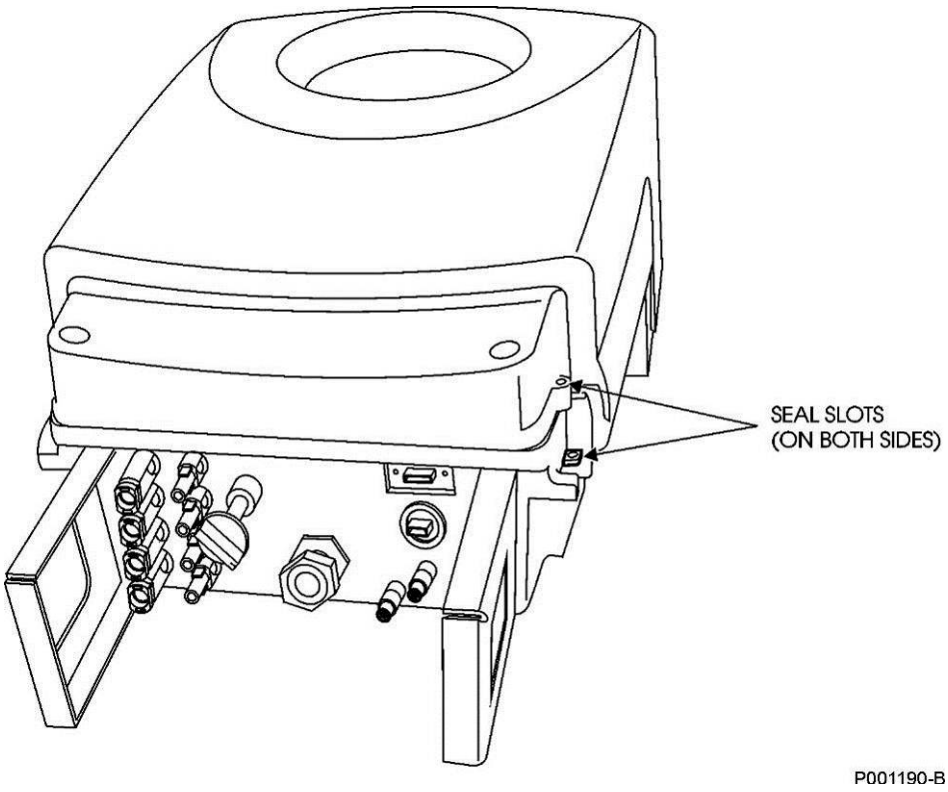


Figure 17: Slots for the application of the fiscal seal

3.5. Commissioning

NOTE

The SUNWAY M XS inverter is factory-set with a set of parameters fitting most applications; therefore, no parameter modification is generally required.

Always carry out the Quick Configuration procedure of the touchscreen display (see section 4.3.5.1).

1) Make sure that the inverter connections to the PV field and the grid are correct.
2) Reassemble the connector protective cover, if previously removed.
3) Connect the inverter to the grid by closing the grid-side switch.

The SUNWAY M XS inverters are supplied from the grid. Once the connection to the grid is complete, press the WAKE UP button to power on the product.

When the loading stage is complete (approx. 1'30''), the display shows a screen similar to the screen below:

Figure 18: Example of the start menu

4) If the DC disconnect switch (optional) is fitted, set it to **ON** (see Figure 15).

5) Carry out the Quick Configuration procedure from the Tools menu by pressing the icon here below.

The Quick Configuration procedure makes it possible to change the grid interface settings as well. Note that the grid interface configuration may be changed only within the first 12 hours after the commissioning of the inverter.

6) Press the **START** button from the graphic interface module.

If the voltage of the PV generator is higher than the value set in parameter **P020** for the timeout set in **P021** (1 minute as a factory setting), the inverter synchronises with the national grid, closes the integrated grid coupling device and forces a perfectly sinusoidal current in phase with the grid voltage. The current amplitude depends on the power made available from the PV generator.
The inverter operating conditions are displayed via the status icon and the status page. More details are given in section 4.1.3.

NOTE

The action of pressing the **START** button is permanently stored; therefore, if voltage is removed from the SUNWAY M XS, its Run status will still be active at next power on. The inverter must be restarted only after resetting an alarm or after pressing the **STOP** button.

NOTE

According to factory setting, the inverter startup conditions are as follows:

1. Grid voltage: 230 Vac +/-15 %.
2. Grid frequency: 50 Hz +/-0.3 Hz.
3. PV field voltage ranging from 370 V (corresponding to **P020**) to 740 V.

CAUTION

GRID INTERFACE CONFIGURATION – The grid interface configuration based on the Country where the inverter is installed may be changed only **within the first 12 hours after the commissioning of the inverter**.

Once started, the SUNWAY M XS operates in full automatic mode. The inverter operating conditions may be constantly monitored via the touchscreen display (see section 4). If not used for 5 minutes, the touchscreen display automatically turns off to minimize self-consumption. Press anywhere on the display to turn it on again.

If solar radiation is absent, the equipment turns off after the time set in parameter **P041** (factory setting: 15 minutes). When solar radiation is present, the SUNWAY M XS automatically restarts and resumes the production of electric power. The inverter may be restarted at any time by pressing the **WAKE UP** button from the graphic interface module. When the inverter is on, you can edit the operating parameters and display production data and fault list, even if no PV field voltage is supplied.

3.5.1. Stopping the Inverter

Press **STOP** from the touchscreen display to stop delivering energy to the grid and to stop the inverter.

DANGER

The STOP button does not power off the inverter; consequently, live parts are dangerous even if the inverter has been stopped.

DANGER

Any operations on the inverter must be performed under safety conditions, after cutting off both the DC power supply and the AC power supply.

DANGER

After turning off the inverter, wait at least 20 minutes before operating on the connections to give the DC-link capacitors time to discharge.

3.6. Quick Configuration

The Quick Configuration in the Tools menu guides the user through preset operations for a quick configuration of the product. The Quick Configuration comprises:

1. **Setting the language.** See section 3.6.1.
2. **Setting the Country.** See section 3.6.2.
3. **Setting the time zone.** See section 3.6.3.
4. **Setting the date and time.** See section 3.6.4.
5. **Setting the currency.** See section 3.6.5.
6. **Setting the feed-in tariff.** See section 3.6.6.
7. **Resetting the history data.** See section 3.6.7.
8. **Resetting the display.** See section 3.6.8.

3.6.1. Setting the Language

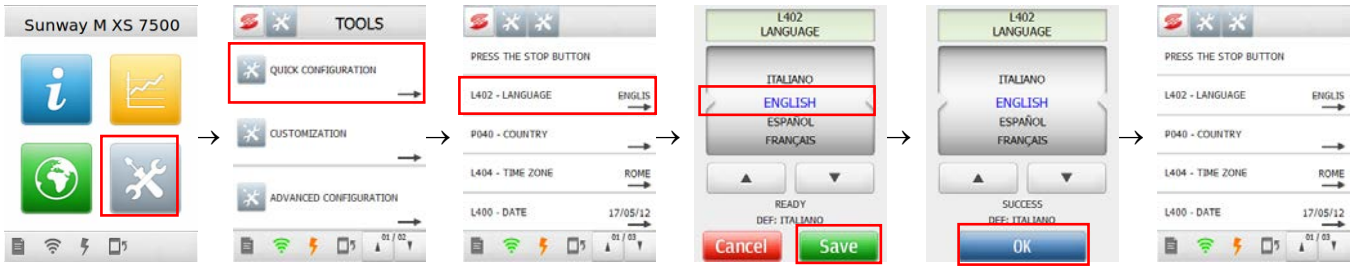
This section describes how to change the dialogue language from the touchscreen display. Do the following:

- From the start menu, select the **Tools** icon ( );
- Select the **Quick Configuration** (QUICK CONFIGURATION) menu. Use the arrows (01 / 02) on the Status Bar to go to the first page of each submenu;
- Select **L402 - Language**; the screen below appears:

Figure 19: Language setting page

- Scroll the list of the available languages using the arrow keys ( ) and select the desired language;
- Activate your choice by pressing the **Save** (Save) button and confirm with OK. The system automatically quits the current page. If you press **Cancel** (Cancel), the previous settings are maintained.

In summary:



*Select the **Tools** icon* → *Select the **Quick Configuration** submenu* → *Select **L402 - Language*** → *Select a language and press **Save*** → *Confirm with **OK***

Figure 20: Setting the dialogue language

3.6.2. Setting the Country

NOTE Changing the Country affects the configuration of the grid interface of the inverter.

NOTE The grid interface configuration based on the Country where the inverter is installed may be changed only **within the first 12 hours after the commissioning of the inverter**. After this time interval, the Country setting may be changed only by the Customer Service of Elettronica Santerno SpA.

This section describes how to change the Country where the inverter is to be installed. Do the following:

- From the start menu, select the **Tools** ( ) icon;
- Select the **Quick Configuration** (QUICK CONFIGURATION) menu. Use the arrows (01 / 02) on the Status Bar to go to the first page of each submenu;
- Select **P040 - Country**; the screen below appears:

Figure 21: Country setting page

- Select the desired Country;
- Activate your choice by pressing the **Save** (Save) button and confirm with OK. The system automatically quits the current page. If you press **Cancel** (Cancel), the previous settings are maintained.

In summary:

*Select the **Tools** icon* → *Select the **Quick Configuration** submenu* → *Select **P040 - Country*** → *Select a value and press **Save*** → *Confirm with **OK***

Figure 22: Setting the Country

During the time interval when the Country may be changed (12h), the start menu shows the name of the Country which is currently selected. After that time interval, the Country is no longer displayed.

Figure 23: Name of the Country displayed in the start menu

3.6.3. Setting the Time Zone

This section describes how to change the time zone. Do the following:

- From the start menu, select the **Tools** ( ) icon;
- Select the **Quick Configuration** (QUICK CONFIGURATION) menu. Use the arrows (01 / 02) on the Status Bar to go to the first page of each submenu;
- Select **L404 – Time zone**; the screen below appears:

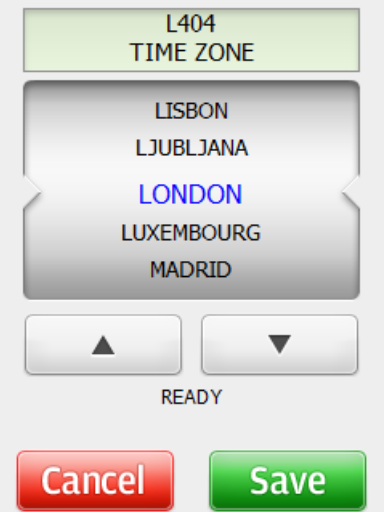


Figure 24: Time zone setting page

- Select the desired time zone;
- Activate your choice by pressing the **Save** (Save) button and confirm with OK. The system automatically quits the current page. If you press **Cancel** (Cancel), the previous settings are maintained.

In summary:

*Select the **Tools** icon* → *Select the **Quick Configuration** submenu* → *Select **L404 – Time zone*** → *Select a value and press **Save*** → *Confirm with **OK***

Figure 25: Setting the time zone

3.6.4. Setting the Date and Time

This section describes how to change the date and time of the inverter. Do the following:

- From the start menu, select the **Settings** ( ) icon;
- Select the **Quick Configuration** (QUICK CONFIGURATION) menu. Use the arrows (01 / 02) on the Status Bar to go to the first page of each submenu;
- Select **L400 - Date**; the screen below appears:

Figure 26: Setting the date

- Enter the date by pressing the buttons;
- Activate your choice by pressing the **Save** (Save) button and confirm with OK. The system automatically quits the current page. If you press **Cancel** (Cancel), the previous settings are maintained;
- Repeat the steps above for **L401 – Time**.

In summary:

*Select the **Tools** icon* → *Select the **Quick Configuration** submenu* → *Select **L400 - Date*** → *Enter the value and press **Save*** → *Confirm with **OK***

Figure 27: Setting the date

NOTE Setting the date and time of the inverter is required to properly view the graphs.

3.6.5. Setting the Currency

This section describes how to change the currency. Do the following:

- From the start menu, select the **Tools** ( ) icon;
- Select the **Quick Configuration** (QUICK CONFIGURATION) menu. Use the arrows (01 / 02) on the Status Bar to go to the second page of the submenus;
- Select **L403 - Currency**; the screen below appears:

Figure 28: Setting the currency

- Scroll the list of the available currencies using the arrow keys (▲ ▼) and select the desired currency;

– Activate your choice by pressing the **Save** (Save) button and confirm with OK. The system automatically quits the current page. If you press **Cancel** (Cancel), the previous settings are maintained.

In summary:

*Select the **Tools** icon* → *Select the **Quick Configuration** submenu* → *Select **L403 - Currency*** → *Select the currency and press **Save*** → *Confirm with **OK***

Figure 29: Setting the currency

3.6.6. Setting the Feed-in Tariff

This section describes how to change the parameters of the inverter net metering. The net-metering function constantly informs the consumers about the economic return of their PV plant. You have to set up the remuneration of the generated energy acknowledged by your Grid Administrator. On the basis of the remuneration and the generated energy, the inverter displays the accumulated gain. See measures **M210** (Total Pay-off) and **M211** (Partial Pay-off) in section 4.3.2.3.
Do the following:

– From the start menu, select the **Tools** ( ) icon;
– Select the **Quick Configuration** (QUICK CONFIGURATION) menu. Use the arrows (01 / 02) on the Status Bar to go to the second page of the submenus;
– Select **P130 – Incentive**; the screen below appears:

Figure 30: Net metering setting page

- Enter the desired value by pressing the buttons;
- Activate your choice by pressing the **Save** (Save) button and confirm with OK. The system automatically quits the current page. If you press **Cancel** (Cancel), the previous settings are maintained.

In summary:

*Select the **Tools** icon* | *Select the **Quick Configuration** submenu* | *Select **P130 - Incentive*** | *Enter the value and press **Save*** | *Confirm with **OK***

Figure 31: Setting the feed-in tariff

3.6.7. Resetting the History Data

The Reset command resets the logs of the display history data and restarts the datalogging function for the integrity of the history data after the date and time have been changed.

Do the following:

- From the start menu, select the **Tools** ( ) icon;
- Select the **Quick Configuration** (QUICK CONFIGURATION) submenu;
- Select **L500 – Reset History**. Use the arrows (01 / 02) on the Status Bar to go to the second page of the submenus. The screen below appears:

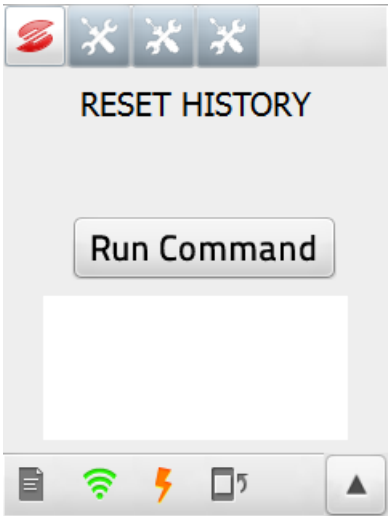
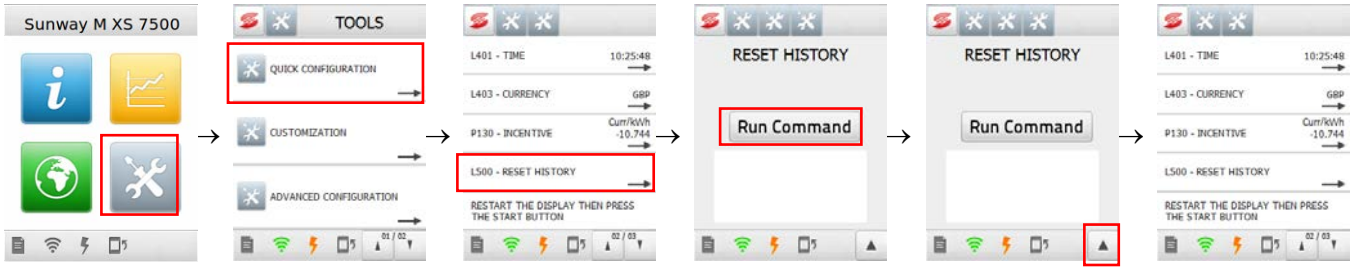


Figure 32: History data resetting page

- Run the command by pressing the Run Command button;
- Wait until the system notifies that the command has been run successfully;
- Quit the active window by pressing the return button (▲) in the bottom-right corner.

In summary:



*Select the **Tools** icon*

*Select the **Quick Configuration** submenu*

*Select **L500 – RESET HISTORY***

*Run the command by pressing the **Run Command** button*

Wait for the success message and quit by pressing the return button

Figure 33: History data resetting page

3.6.8. Resetting the Display

Resetting the display is required to ensure its correct operation after changing the display settings during the Quick Configuration procedure.

Do the following:

- From the start menu, select the **Tools** ( ) icon;
- Select the **Quick Configuration** (QUICK CONFIGURATION) submenu.
- Select **L011 – RESET DISPLAY**. Use the arrows (01 / 02) on the Status Bar to go to the second page of the submenus; the screen below appears:

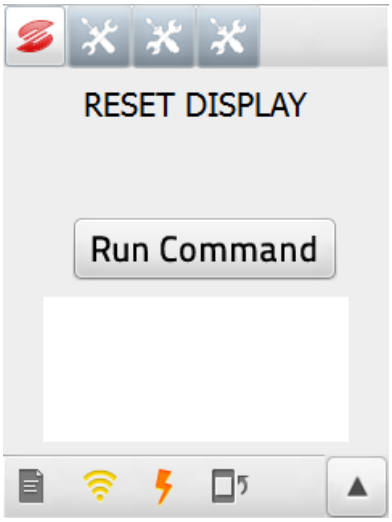


Figure 34: Display resetting page

- Run the command by pressing the Run Command button;
- Wait until the system notifies that the command has been run successfully and wait for the display reset.

In summary:

*Select the **Tools** icon* | *Select the **Quick Configuration** submenu* | *Select **RESTART THE DISPLAY THEN PRESS THE START BUTTON*** | *Run the command by pressing the Run Command button* | *Wait for the success message and the display reset*

Figure 35: Resetting the display

3.7. Connectivity

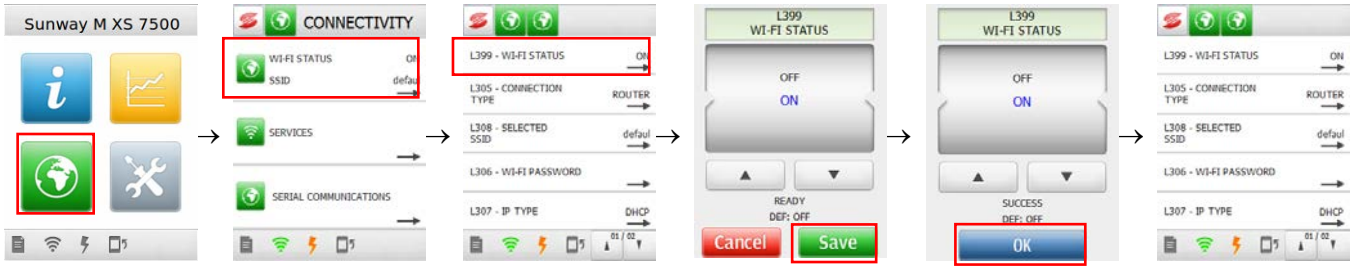
3.7.1. Wi-Fi Connectivity

The SUNWAY M XS features Wi-Fi 802.11 b/g connectivity for *ad hoc* (point-to-point) connection or for the connection of the inverter to a *WLAN* (wireless area network).

NOTE The Wi-Fi connection is to be disabled before changing the Wi-Fi settings.

3.7.1.1. Wi-Fi Activation and Deactivation

The Wi-Fi status may be set up by the user from the Wi-Fi > Wi-Fi Status in the Connectivity menu.



*Select the **Connectivity** icon* | *Select the **Wi-Fi Status SSID** submenu* | *Select **Wi-Fi Status*** | *Select the desired status and press **Save*** | *Confirm with **OK***

3.7.1.2. AD HOC Connection

NOTE

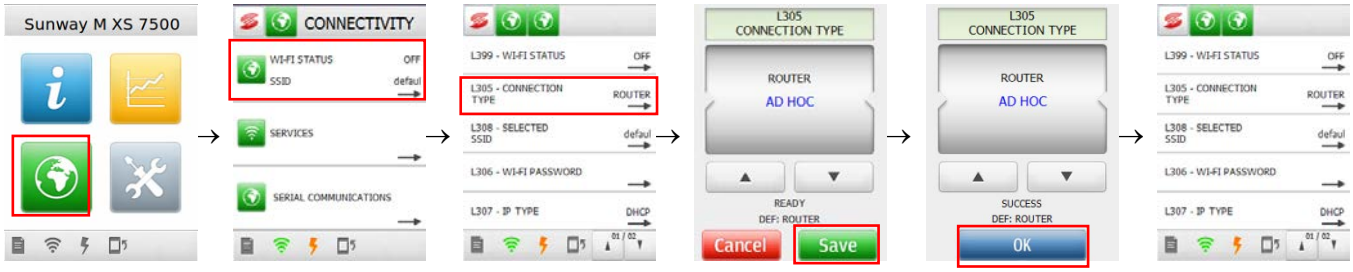
When using the *AD HOC* connection, unencrypted data is transmitted from/to the inverter.

When an *AD HOC* connection is established, the Wi-Fi status icon is green or yellow during data transmit/receive. The red Wi-Fi icon may therefore indicate that a connection is correctly established but no data exchange is occurring.

The *AD HOC* connection enables connecting a PC to a different device allowing using one of the consulting methods in section 3.7.2 for one or more inverters, with no need to exploit an existing wireless network.

Do the following in order to establish an *AD HOC* connection with the inverter:

- Set “AD HOC” as the type of connection (L305);
- By activating the “AD HOC” connection, the inverter will create a network supporting the connection of an external device (e.g. iPhone), identified with the “Santerno_MXS” SSID. In multi-inverter plants, the inverters will automatically assign themselves unique IP addresses within the same “Santerno_MXS” network.



*Select the **Connectivity** icon* → *Select the **Wi-Fi Status SSID** submenu* → *Select **L305 – Connection Type*** → *Select “Ad Hoc” and press **Save*** → *Confirm with **OK***

Figure 36: Setting the *AD HOC* connectivity

- Activate the Wi-Fi connection (3.7.1.1);
- Connect the second device to the *AD HOC* network made available by the inverter.

  For the connection to the *AD HOC* network of devices featuring Wi-Fi connectivity, please refer to the relevant User Manuals.

On completion of this procedure, access the Wi-Fi status window (see Figure 51) to check the connection status. If a screen similar to the one in the figure is displayed, this means that the connection is completed successfully. Some check values for *AD HOC* connection are given below:

- ESSID: Sunway_MXS
- the IP address shall by of type 169.254.xxx.xxx
- Subnet: 255.255.000.000

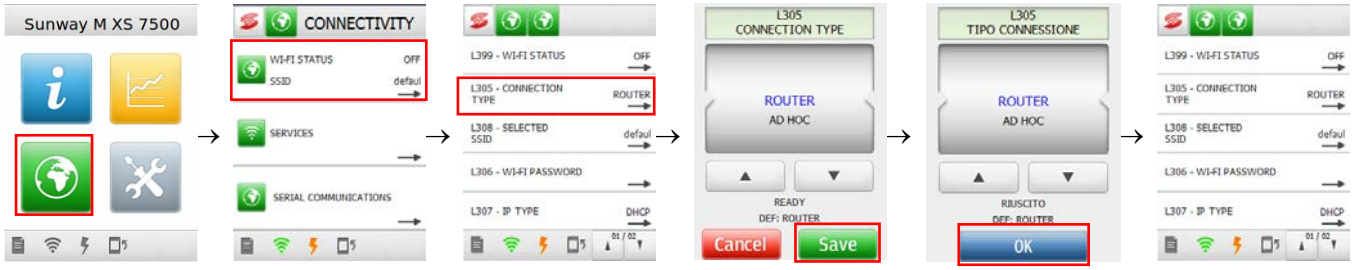
3.7.1.3. Router Connection

CAUTION The SUNWAY M XS inverter may be connected only to WPA encrypted networks by entering an alphanumeric password from 8 to 63 characters.

The *ROUTER* connection allows connecting the inverter to an existing wireless infrastructure, thus allowing the other devices connected to the same network to use the consult methods in section 3.7.2 and allowing the inverter itself to gain access to the Internet in the event of an infrastructure connected to the network.

Do the following to connect the inverter to an existing network:

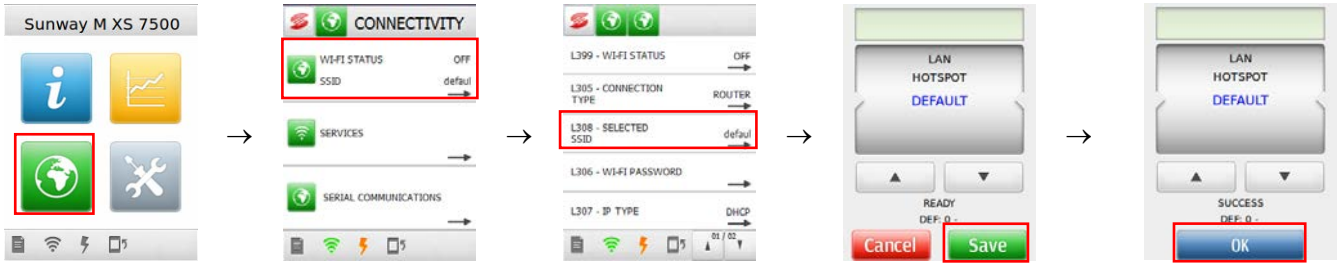
– Set “L305 – Connection Type” to “ROUTER”;



*Select the **Connectivity** icon* | *Select the **Wi-Fi Status SSID** submenu* | *Select **Connection Type*** | *Select “ROUTER” and press **Save*** | *Confirm with **OK***

Figure 37: Setting the *ROUTER* connectivity

– Select the network where the inverter is to be connected to. Select “L308 – SELECTED SSID” to view the networks detected by the inverter and to select the desired network;



*Select the **Connectivity** icon* | *Select the **Wi-Fi Status SSID** submenu* | *Select **L308 – SELECTED SSID*** | *Select the desired network and press **Save*** | *Confirm with **OK***

Figure 38: Selecting the desired network

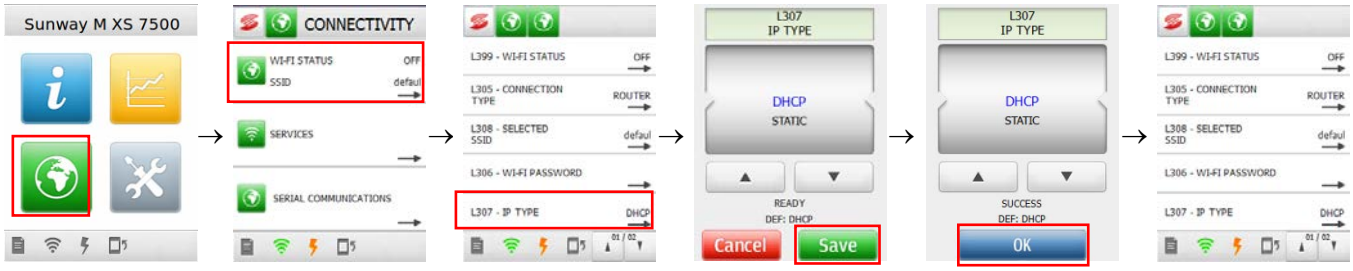
– Set the network access password;

*Select the **Connectivity** icon* | *Select the **Wi-Fi Status SSID** submenu* | *Select **L306 –Wi-Fi Password*** | *Enter the value and press **Save*** | *Confirm with **OK***

Figure 39: Setting the network access password

– Set the IP address assignment mode. Select:

- "DHCP" if you desire that the IP address is assigned by the router or access point (factory setting). By selecting the "DHCP" mode, the additional connection parameters will be set up directly by the router or access point. The IP address, however, may be changed by the router or access point over time;
- "STATIC" if you desire to manually enter the IP address to be assigned to the inverter. By selecting the "STATIC" mode, the IP address will remain unchanged over time. The user is required to know all the specifications of the connection network to avoid conflicts in assigning static IP addresses of other devices. Also, the user is required to set any other connection parameter after selecting the "STATIC" mode.



*Select the **Connectivity** icon* | *Select the **Wi-Fi Status SSID** submenu* | *Select **L307 – IP Type*** | *Select the desired mode and press **Save*** | *Confirm with **OK***

Figure 40: IP address assignment mode

– Set the IP address (only if you chose the “STATIC” method for the IP address assignment). The set up of this parameter requires knowing the network the inverter is to be connected to. The IP address is to be composed of 12 digits, including any zeros.

*Selct the **Connectivity** icon* → *Select the **Wi-Fi Status SSID** submenu* → *Select **L301 –IP address (page 2)*** → *Enter the value and press **Save*** → *Confirm with **OK***

Figure 41: Setting the IP address

– Set the subnet mask (only if you chose the “STATIC” method for the IP address assignment). Setting this parameter requires knowing the network the inverter is to be connected to. A typical value for domestic environments is 255.255.255.000.

*Selct the **Connectivity** icon* → *Select the **Wi-Fi Status SSID** submenu* → *Select **L302 - Subnet mask (page 2)*** → *Enter the desired value and press **Save*** → *Confirm with **OK***

Figure 42: Setting the subnet mask

– Set the gateway (only if you chose the “STATIC” method for the IP address assignment). Setting this parameter requires knowing the network the inverter is to be connected to. A typical value for domestic environments is the IP address of the router or the access point.

*Selct the **Connectivity** icon* → *Select the **Wi-Fi Status SSID** submenu* → *Select **L303 – Gateway (page 2)*** → *Enter the desired value and press **Save*** → *Confirm with **OK***

– Set the DNS (only if you chose the “STATIC” method for the IP address assignment). Setting this parameter requires knowing the network the inverter is to be connected to.

*Select the **Connectivity** icon* → *Select the **Wi-Fi Status SSID*** → *Select **L311 – DNS (page 2)*** → *Enter the desired value and press **Save*** → *Confirm with **OK***

– Activate the Wi-Fi connection (3.7.1.1). If the Wi-Fi status icon is green and the screen is similar to the one in Figure 51, this means that the connection is completed successfully.

NOTE In the event of failures connecting the inverter to an existing network, contact your local Network Administrator.

3.7.2. Accessing the Inverter Data

The SUNWAY M XS may be monitored in wireless mode directly by the user, who can check status information, such as operating measures, alarms tripped and events fired, with no need to implement demanding wiring solutions.

Data exchange with the inverter is made possible via a Wi-Fi connection operating as described above.

NOTE Data access is protected by a password associated with the serial number of the product. The password is given in a form contained in the box of the product.

The consulting modes below are available only when the inverter is powered on. If the PV field voltage is too weak (higher than the value set in **P020 – FIELD REFERENCE**), the inverter stops after the time set in **P041 – POWER OFF TIMEOUT**. Parameter **P041** may be changed by the user to keep the inverter on for the desired time even when the PV field reference is too weak, in order to exploit the functionality described above. Setting parameter **P041** to 0 fully inhibits the inverter shut down.

3.7.2.1. Web Browser

The Web Browser application is compatible with the most popular web browsers, such as Chrome, Firefox, Internet Explorer (version 8 or greater) and Safari. You can establish a connection to the inverter and may consult information about the inverter status and the graphs displayed on a web-like page.
Do the following to consult the information made available by the inverter:

- Open the web browser from the device connected to the same “ROUTER” or “AD HOC” network as the inverter;
- In the address bar of the browser, enter the IP address of the target inverter (e.g. http://192.168.0.3);
- When you are required for authentication, enter the serial number of the product as the username and enter the password received when purchasing the product;
- Navigate through the contents made available from the application. The values on the right of the web page are updated every minute.

If multiple inverters are connected to the same wireless network, the web-like page will display the data relating to all the connected inverters, both as discrete data and as aggregate data, after entering the authentication parameters for all the inverters. The whole listing of the inverters connected to the PV plant may take up to 5 minutes from the inverter start up.
The web-like page displayed by the inverter features on-line Help functionality that can be activated by pressing the  icon in the top-right corner.

NOTE The authentication parameters may be stored by the browser to avoid entering them each time a connection is established. The user is responsible for any implications in terms of information protection.

NOTE Internet Explorer 9 requires disabling the “Compatibility View” function for the correct view of the web-like page.

3.7.2.2. iPhone Application

NOTE The iPhone application is available for iPhone 3 and more recent models.

The iPhone Application developed by Elettronica Santerno for the connection to the SUNWAY M XS inverters may be downloaded from Apple iTunes.

The iPhone Application allows displaying the status info of the inverter as well as the main operating measures, both in local mode and in remote mode—after the first connection in local mode has been established. The inverter is to be enabled for accessing the Internet via the Wi-Fi connection and the Sunwayportal.it service is to be activated (parameter L505).

NOTE The iPhone Application generates data traffic. Costs may vary based on the user's tariff plan. Costs are charged to the user.

Do the following to consult the inverter data from your iPhone:

- Launch the SUNWAY M XS application;

S000198

Figure 43: Icon of the SUNWAY M XS application on the iPhone

- Complete the startup wizard;
- When you are required for authentication, enter the serial number of the product as the username and enter the password received when purchasing the product.
- Navigate through the contents made available from the application.

3.7.3. Sunwayportal.it

The SUNWAY M XS inverters, if connected to the Internet via Wi-Fi, may send the main info about the inverter status and measures to the Sunwaportal.it of Elettronica Santerno SpA. Information may be accessed in remote mode as well.

Sending data to the Sunwayportal.it is a functionality that can be enabled from the Services submenu in the Connectivity menu. Do the following to access the Sunwayportal.it service:

– Activate the Sunwayportal.it functionality:

*Select the **Connectivity** icon* | *Select the **Services** submenu* | *Select **L505 – SUNWAYPORTAL .IT*** | *Select **ENABLE** and press **Save*** | *Confirm with **OK***

Figure 44: Activating the Sunwayportal.it service

Once the Sunwayportal.it functionality is activated, proceed with authentication entering the serial number of the inverter as the username and the password given in the form contained in the box of the product.

3.7.4. Technical Support

The SUNWAY M XS inverters, if connected to the Internet via Wi-Fi, may be remotely accessed by the Customer Service of Elettronica Santerno SpA. Assistance is given via an encrypted communication channel between the inverter and Elettronica Santerno SpA Customer Service, whose staff is allowed to access the measures and programming parameters of the inverter. This functionality allows the Customer Service to promptly operate on the inverter.

The Technical Support functionality may be activated from the Services submenu in the Connectivity menu. Do the following:

– Activate the Technical Support functionality:

*Select the **Connectivity** icon* | *Select the **Services** menu* | *Select **L502 – Technical Support*** | *Select **ENABLE** and press **Save*** | *Confirm with **OK***

Figure 45: Activating the Technical Support Service

– Check if the Technical Support functionality is activated:

*Select the **Wi-Fi Status** icon*

*Wait until the "**Technical support is active**" message appears*

NOTE

The activation of the Technical Support is persistent. The Technical Support functionality is to be deactivated when assistance is finished.

The date and time of the inverter must be correctly set up for the activation of the Technical Support functionality.

3.7.5. Connectivity Troubleshooting

- The desired network is not listed among the available networks
  Possible cause:
  - The router cannot be detected by the inverter because it is too far
  - The router has a hidden wireless network

- No connection is established between the inverter and the selected router
  Possible cause:
  - The router is too far from the inverter and no stable connection may be established
  - Wrong password entered (the password is case-sensitive)
  - The router does not implement WPA cryptography for the network security
  - The inverter is assigning a DHCP IP address and the router DHCP is disabled
  - The inverter is assigning a STATIC IP address and the address being set up is in conflict with the address of a different device connected to the same network

- No connection to the Internet is established from the inverter
  Possible cause:
  - The router is not connected to the Internet
  - The Gateway is set to a wrong value. The typical Gateway IP address displayed on the Wi-Fi status window must be the same IP address of the router. Contact your network administrator for complex networks
  - The DNS is set to a wrong value. The factory setting (8.8.8.8) is to be left unchanged.

- The Technical Support service is not correctly activated
  Possible cause:
  - The inverter fails connecting to the Internet. See the case in point
  - Date and time are not set correctly

- The inverter is connected to the selected network but the web page cannot be accessed
  Possible cause:
  - The device from which you are trying to consult the web page is not connected to the same network as the inverter

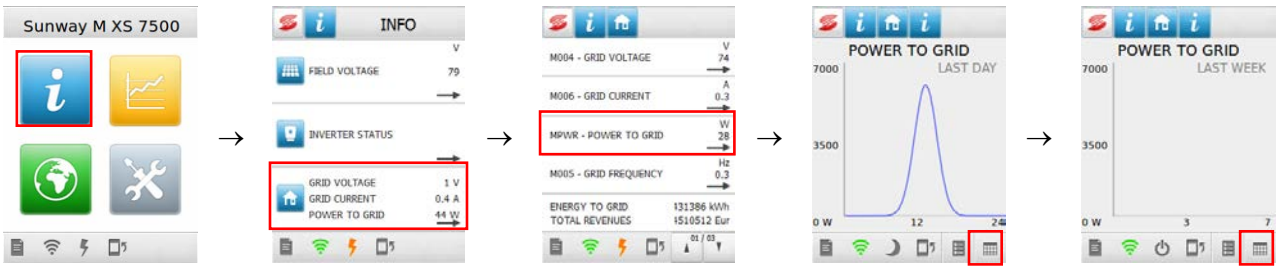
3.8. Datalogging

The SUNWAY M XS inverters may store the measures listed in Table 4.

The user may display the history measures over 4 time intervals:

- the latest day, considered as the latest 24 hours, with a resolution of 1 data item/minute;
- the latest week, considered as the latest 7 days, with a resolution of 1 data item/day;
- the latest month, considered as the latest 30 days, with a resolution of 1 data item/day;
- the latest year, considered as the latest 52 weeks, with a resolution of 1 data item/week.

The stored data may be displayed by selecting the measure inside the desired menu and by accessing the relevant graph. Figure 46 is an example of how to display a measure graph.



*Select the **Info** icon*

*Select the **Grid** submenu*

*Select **MPWR – Power to Grid***

Select the icon to change the time interval

Select the icon again to switch to a different time interval

Figure 46: Displaying a measure graph

The user may also choose 3 measures from Table 4 to customize the Main Graph (4.3.3).

ID	*Function*	*Type*	*Can be graphically represented*
M000	Field Voltage	Measure	Yes
M002	Field Current	Measure	Yes
M004	Grid Voltage	Measure	Yes
M005	Grid Frequency	Measure	Yes
M006	Grid Current	Measure	Yes
M009	Active Power	Measure	Yes
M010	Total Energy	Meter	No
M011	Partial Energy	Meter	No
M016	Grid KO Event Counter	Meter	No
M057	Internal Temperature	Measure	Yes
M059	Heatsink Temperature	Measure	Yes
M089	Inverter Status	Status	No
M090	Alarm Tripped	Status	No
M098	Supply Time	Meter	No
M099	Operation Time	Meter	No
M200	Total Pay-off	Meter	No
M201	Partial Pay-off	Meter	No
MPWR	Power to Grid	Measure	Yes

Table 4: Logged variables

4. GRAPHIC INTERFACE MODULE

The full-colour, graphic touchscreen display is located on the inverter front. The touchscreen display is the HMI of the inverter (see Figure 47).

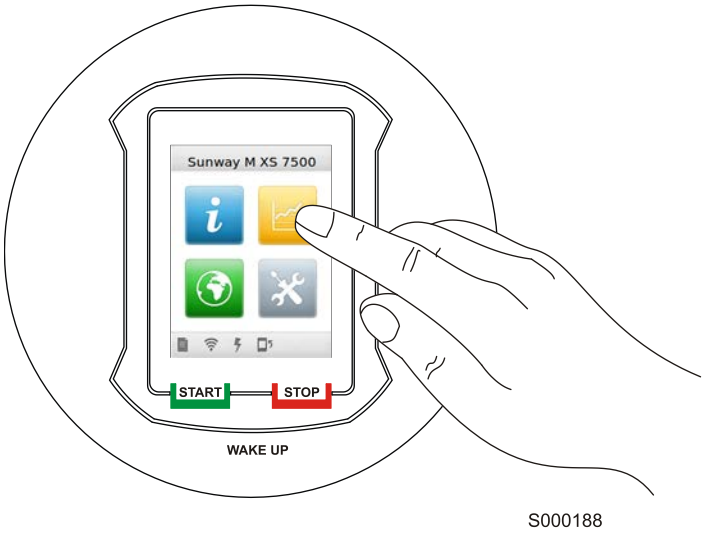


Figure 47: Graphic touchscreen display

The **START** button for the inverter startup and the **STOP** button for the inverter stoppage, due to maintenance reasons, are located in the bottom part of the graphic interface module.

Pressing the **START** button is required only for the inverter commissioning. Once commissioned, the inverter will automatically start up every morning when the required operating conditions are achieved.

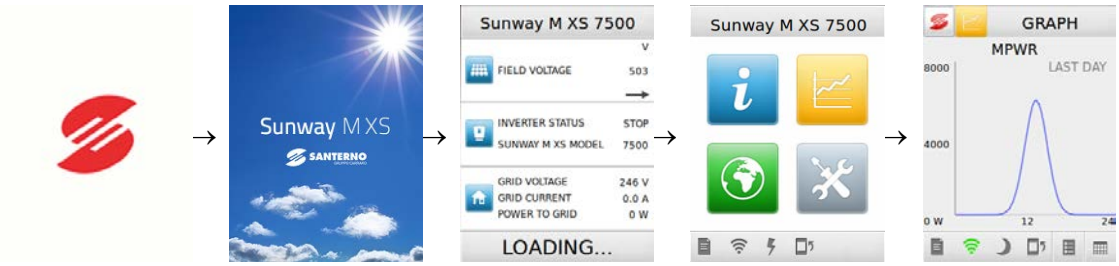
After pressing the **STOP** button, the inverter is kept stopped until the **START** button is pressed again, regardless of the operating conditions.

NOTE

Press **START** after commissioning or maintaining the inverter to restore the normal operation of the inverter. If this is not the case, the inverter will not automatically restart even though the correct operating conditions are restored.

In the absence of solar radiation, the inverter will automatically deactivate. When solar radiation is enough to start the inverter, the SUNWAY M XS will automatically restart and will resume energy generation. The inverter may be restarted at any time by pressing the **WAKE UP** button from the graphic interface module.

When the inverter is started, the touchscreen display shows the following screens in sequence:



Santerno Logo | *Sunway M XS Screen* | *Loading… screen* | *Start menu* | *Default screen (Graph as a factory setting)*

When no input has been received for 5 minutes, the touchscreen display automatically turns off to reduce self-consumption to a minimum. Press anywhere on the display to turn it on again.

4.1. Navigating in the Graphic Interface

The touchscreen display uses a menu and submenu tree to organize the information made available to the user. Menus and submenus are divided into four main areas in the **Menu Area** in the main window (Figure 48). Touch an icon to navigate to its contents.

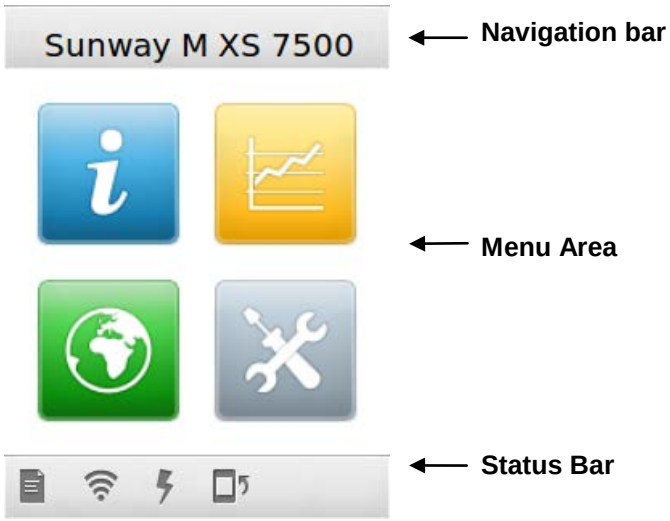


Figure 48: Touchscreen display – Start menu

The graphic layout of the application is divided into 3 main areas:

Area	Description
Navigation Bar	The Navigation Bar is populated by different icons allowing the user to know the navigation position inside the menus. Icons are displayed based on the selected items in the menus.
Menu Area	The Menu Area displays the information about the product as well as all the configuration parameters. These items are divided into some areas identified on the main page by the 4 main buttons below: • Info menu (blue button) • Graphic menu (yellow button) • Connectivity menu (green button) • Tools menu (grey button)
Status Bar	The Status Bar comprises the icons relating to the most important information of the inverter for easy access from any part of the menus. The 4 icons on the left allow navigating to the following: • Alarm and event history data • Wi-Fi status • Inverter status • Default view (4.3.5.2) Additional buttons necessary to navigate inside the menus are viewed if required by the organisation of the active menu.

The areas above are populated by contents varying based on the current position in the menu tree.

Figure 49 shows an example of a screen. The main interactive items are described.

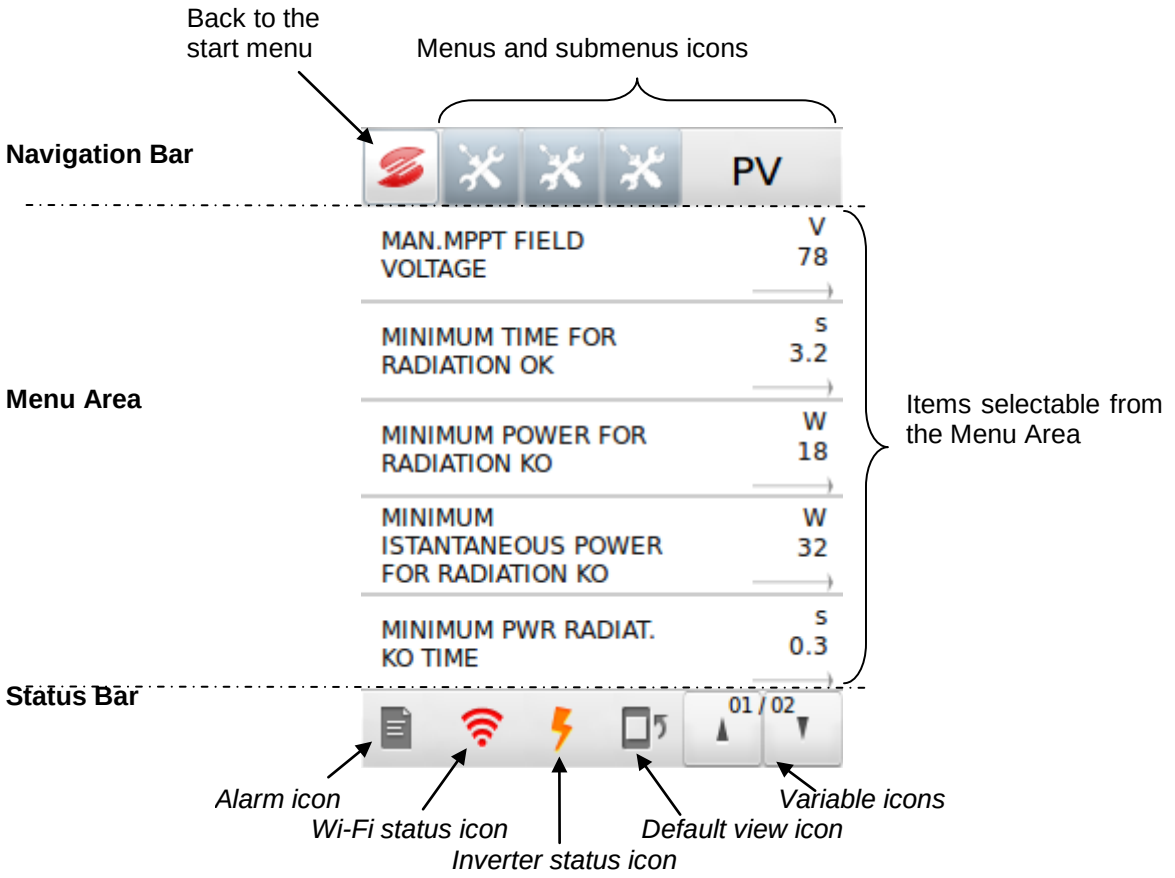


Figure 49: Example of a screen

4.1.1. Navigation Bar

The Navigation Bar displays the icons for easy navigation to the different menus and submenus:

- Back to the start menu icon: allows going back to the **start menu** from any position in the menus.
- Menu and submenu icons: graphically represent the current position in the menus. Select one of the icons preceding the last icon from the right to return to the upper level.

4.1.2. Menu Area

The Menu Area displays the items allowing interaction with the inverter. The items marked with an arrow may be displayed as a graph or may lead to a dialog window (see section 4.3).

4.1.3. Status Bar Area

The Status Bar Area includes four fixed icons and two variable icons depending on the page displayed. The fixed icons are detailed below:

- Alarms icon: allows accessing the Alarms menu from any page in the program. The Alarms menu contains the lists of the alarms and events of the system.
  The icon can have two statuses:

  No alarms tripped.

  Alarm(s) tripped but the user has not yet viewed the relevant details (see section 4.3.6).

The Alarms menu is detailed in section 4.3.6.

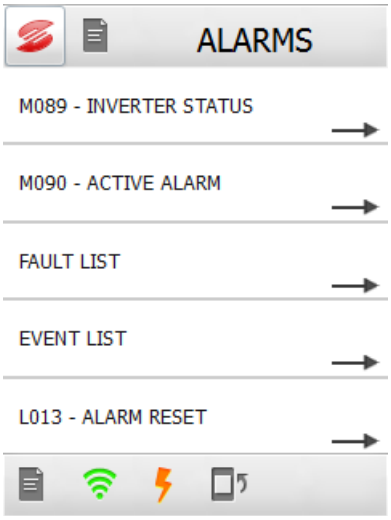


Figure 50: Screen of the Alarms menu

- Wi-Fi Status icon: allows accessing the Wi-Fi Status menu, including Wi-Fi connectivity info, such as the name of the network SSID, the IP address of the inverter and the quality of the Wi-Fi connection.

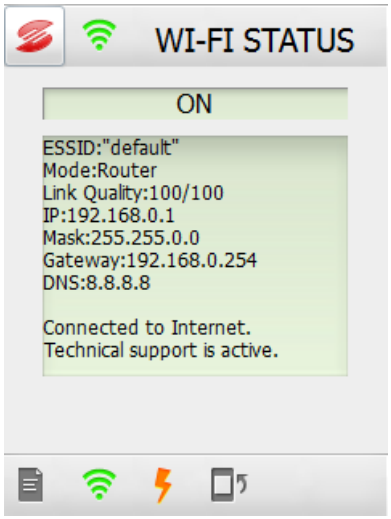


Figure 51: Screen of the Wi-Fi Status menu

The icon can have three statuses:

Hardware not fitted or hardware fault.
If your SUNWAY M XS is provided with an external Wi-Fi connector, make sure that it is correctly inserted into the USB port of the inverter.
If the Wi-Fi functionality is integrated into the product, the grey Wi-Fi icon may indicate that the Wi-Fi connection has been inactive for a while. If the icon is pressed, it will turn to red. This does not indicate any malfunction.
If the problem persists, please contact the Customer Service.

Wi-Fi connection failed.

Wi-Fi connection established, but the connection is poor quality.

Wi-Fi connection established, connection is good quality.

The Wi-Fi Status menu is detailed in section 4.3.8.

- Inverter Status icon: allows accessing the inverter Status menu.

Figure 52: Screen of the inverter Status menu

The Status menu icon represents the operating conditions of the inverter. The icon can have four statuses:

Indicates that the inverter is powered, but the PV field voltage is lower than the value set in parameter P020.

This inverter status normally occurs:

- in the early morning, when the PV field voltage is too weak for energy generation
- in the daytime, when solar radiation is weak
- in the evening, before the inverter shuts off

Indicates that the inverter is in stand-by and is waiting for suitable operating conditions to be resumed:

- if the PV field voltage is sufficient for energy generation and the inverter is waiting for the timeout set in (P021) before starting delivering energy
- if the PV field voltage is sufficient for energy generation, but the STOP button has been pressed
- if the disconnect switch (if fitted) is set to OFF

Indicates that the inverter is correctly operating and is feeding power to the grid.

Indicates that an alarm tripped.

The Status menu is detailed in section 4.3.7.

- Default View icon: allows accessing the default view, that can be set up via the Customization > Display submenu in the Tools menu (see sections 4.3.3.2 and 4.3.5). The default view is displayed by the inverter after no input has been received for a reasonably long time.

4.2. Display Windows and Data Enter Windows

The windows listed below make it possible to display the measures made available from the inverter and to change the system settings:

1. **Graph window**. See section 4.2.1.
2. **Alphanumeric keypad window**. See section 4.2.2.
3. **List window**. See section 4.2.3.
4. **Run Command window**. See section 4.2.4.

4.2.1. Graph Window

The graph window shows the pattern of the selected measure. This window may be accessed from the Menu Area by selecting one of the measures marked with an arrow.

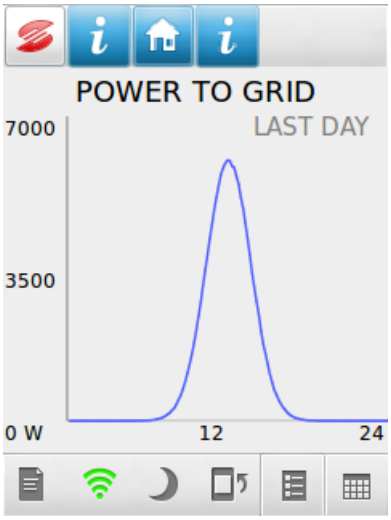


Figure 53: Example of a measure graph

The two right-most icons in the bottom-right corner of the Graph window may vary and allow doing the following:

Accesses the key of the graph. Select the icon to display a list of the measures that are graphically represented, their colour and instant value.
The graph may be customized from the Customization submenu in the Tools menu.

Selection of the time period. The icon allows changing the time period in the graph by selecting one of the 4 time periods: the latest day, the latest week, the latest month or the latest year. Press the icon repeatedly to switch from a time period to the other.

4.2.2. Alphanumeric Keypad Window

The alphanumeric keypad window enables entering alphanumeric values in the selected field, as detailed below:

VALUE FIELD
Displays the alphanumeric value relating to the selected parameter.

MIN: Indicates the minimum allowable value.
DEF: Indicates the DEFAULT value set for the inverter.
MAX: Indicates the maximum allowable value.

CANCEL BUTTON
Cancels the alphanumeric value you have just entered and restores the value which was previously stored to memory.
The programme automatically returns to the previous menu.

KEYPAD
Alphanumeric keys enabling entering the desired value.

STATUS
Message relating to data entering.

WRITE BUTTON
Stores the alphanumeric value you have just entered until the inverter is next started (temporary storage).
The programme returns to the previous menu after pressing the *OK* button that pops up after pressing *Write*.

SAVE BUTTON
Stores to memory the alphanumeric value you have just entered.
The programme returns to the previous menu after pressing the *OK* button that pops up after pressing *Save*.

Figure 54: Example of alphanumeric keypad window

By pressing an alphanumeric key from the keypad, the digit is displayed first, followed by the characters included in the same key.

Some function keys are available:

- Key “1”: if pressed twice, enters a space;
- key “0”:
  - enters 0, -, + when entering digits
  - enters 0 and toggles between CAPS and lower case when entering text messages. The activation of this functionality affects the latest character entered.
- “Delete” key: deletes a character at a time from right to left

NOTE

The BASIC access level features two confirmation buttons:
- **CANCEL** cancels the data entered;
- **SAVE** stores the data entered to permanent memory.

The ADVANCED access level features three confirmation buttons:
- **CANCEL** cancels the data entered;
- **SAVE** stores the data entered to permanent memory;
- **WRITE** stores the data entered until the inverter is next powered on (temporary storage). The previous value is restored at next power on.

4.2.3. List Window

The list window allows entering or changing a parameter chosen from a list, as detailed below:

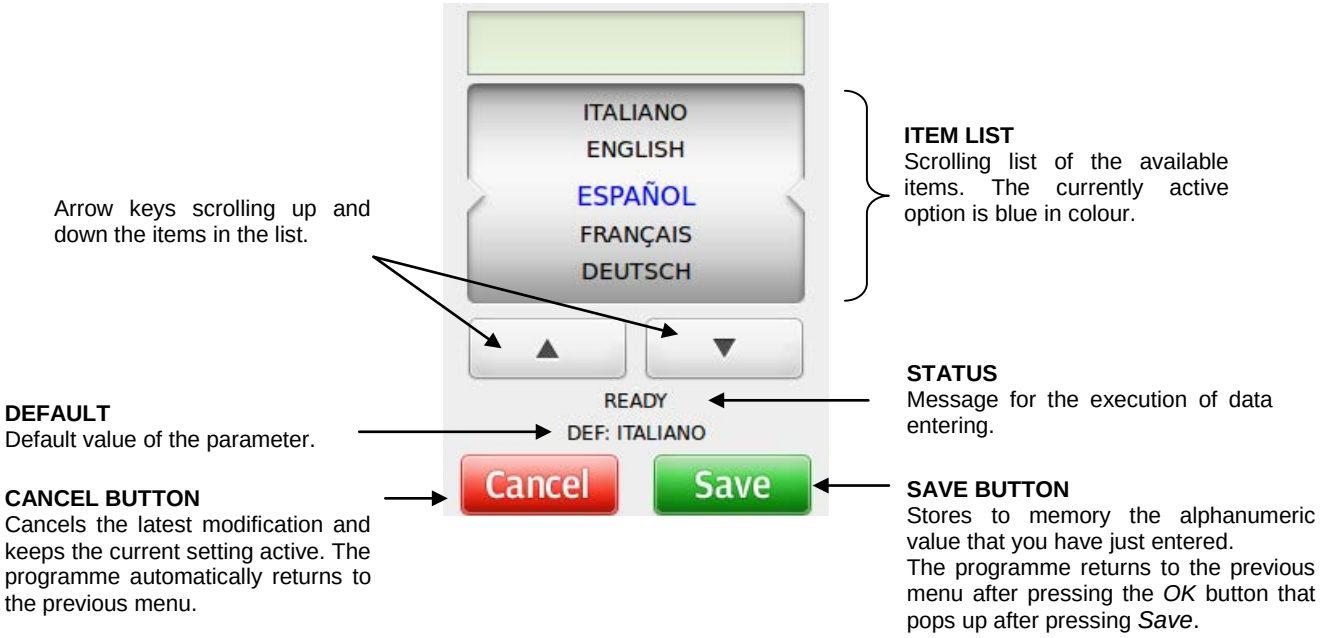


Figure 55: Example of a list window

The BASIC access level features two confirmation buttons:

- **CANCEL** cancels the data entered;
- **SAVE** stores the data entered to permanent memory.

NOTE

The ADVANCED access level features three confirmation buttons:

- **CANCEL** cancels the data entered;
- **SAVE** stores the data entered to permanent memory;
- **WRITE** stores the data entered until the inverter is next powered on (temporary storage). The previous value is restored at next power on.

4.2.4. Command Execution Window

This command execution window allows sending a command to the inverter, as detailed below:

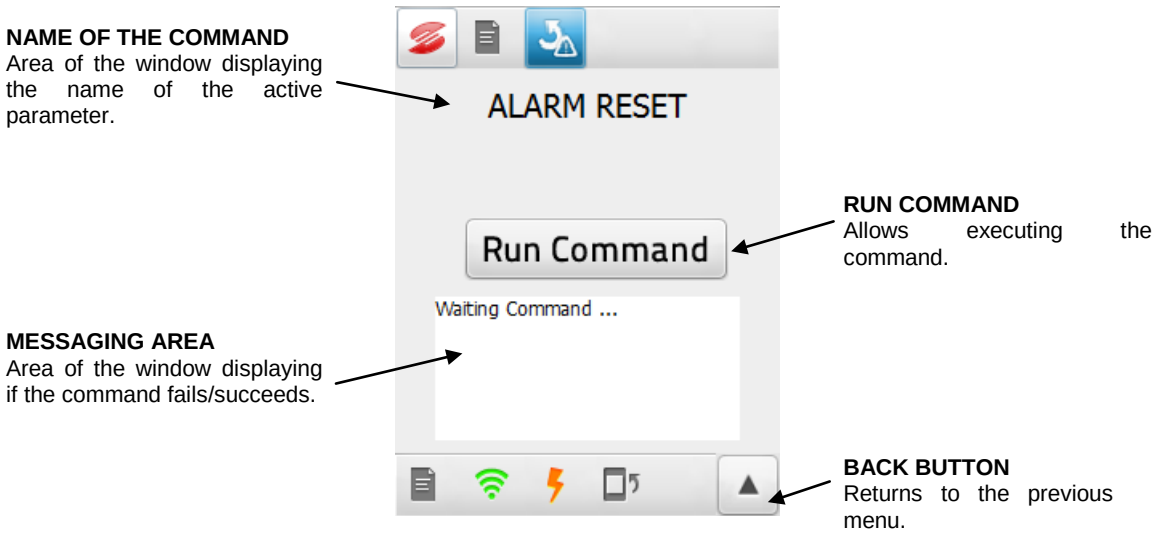


Figure 56: Example of a Run Command window

4.3. Description of the Menus

The menus and submenus of the graphic interface module are divided into the four main areas represented by the four icons in the start menu.

Figure 57: Icons of the Menu Area in the start menu

1. Info Menu

Measures and programming parameters of the inverter. See section 4.3.2 for details.

2. Graph Menu

Graphic display of the measures that can be customized by the user. See section 4.3.3 for details.

3. Connectivity Menu

Provides information about connectivity and relevant setting parameters. See section 4.3.4 for details.

4. Tools Menu

Provides tools and configuration parameters of the inverter. See section 4.3.5 for details.

4.3.1. Organisation of Measures and Parameters

The parameter configuration involves two access levels:

- **BASIC** (factory setting): displays the main measures and parameters;
- **ADVANCED**: displays the advanced measures and enables accessing all the parameters.

The access level may be changed by the user from **Customization > Access Level > User Level** in the Tools menu (see section 4.3.5.2).

The BASIC access level features two confirmation buttons:

- **CANCEL** cancels the data entered;
- **SAVE** stores the data entered to permanent memory.

NOTE

The ADVANCED access level features three confirmation buttons:

- **CANCEL** cancels the data entered;
- **SAVE** stores the data entered to permanent memory;
- **WRITE** stores the data entered until the inverter is next powered on (temporary storage). The previous value is restored at next power on.

NOTE

NOTE Set the ADVANCED level to program the inverter parameters.

The information and configuration variables are grouped as follows:

- Measures. These values may only be displayed and cannot be changed by the user. Each measure is identified by letter **M** followed by 3 digits (e.g. **M001**). Measures are detailed as follows in the sections below:

Mxxx	**Range**	Internal representation	Value displayed on the touchscreen display (may be a decimal figure) plus unit of measure
Name of the measure	**Active**	If present, this field indicates if and when the measure is valid. When this field is not present, the measure concerned is considered as ALWAYS active.	
	Address	Modbus address from which the measure is read (integer).	
	Level	Access level (BASIC / ADVANCED).	
	Function	Description of the measure.	

Table 5: Template of the measure descriptive tables

- Parameters. These values may be changed by the user in order to configure the inverter operation. Each parameter is identified by one of the following letters: **P**, **I**, **C** or **R**. Each letter is followed by 3 digits (e.g. **P020**). Parameters are detailed as follows in the sections below:

Pxxx	**Range**	Internal representation of the device (integer)	Value displayed on the touchscreen display (may be a decimal figure) plus unit of measure
Name of the parameter	**Default**	Factory setting of the parameter (as represented internally).	Factory setting of the parameter (as displayed) plus unit of measure.
	Level	Access level (BASIC / ADVANCED).	
	Active	If present, this field indicates if and when the measure is valid. When this field is not present, the measure concerned is considered as ALWAYS active.	
	Address	Modbus address the parameter is read from or written to (integer).	
	Function	Description of the parameter.	

Table 6: Template of the parameter descriptive tables

- Display variables. These values relate to the display. Some of them may only be displayed, some other may be changed by the user. Each variable is identified by letter **L** followed by 3 digits (e.g. **L001**). Variables are detailed as follows in the sections below:

Lxxx	**Range**	Value displayed on the touchscreen display (may be a decimal figure) plus unit of measure
Name of the variable	**Default**	Factory setting of the parameter (as displayed) plus unit of measure.
	Function	Description of the parameter.

Table 7: Template of the variable descriptive tables

4.3.2. Info Menu

The icons of the menus and submenus in the Info area are blue in colour and allow monitoring the inverter measures. Each measure is identified by letter **M** followed by 3 digits.

Figure 58 shows the Info menu tree, while Table 8, Table 9 and Table 10 describe each submenu belonging to the Info menu.

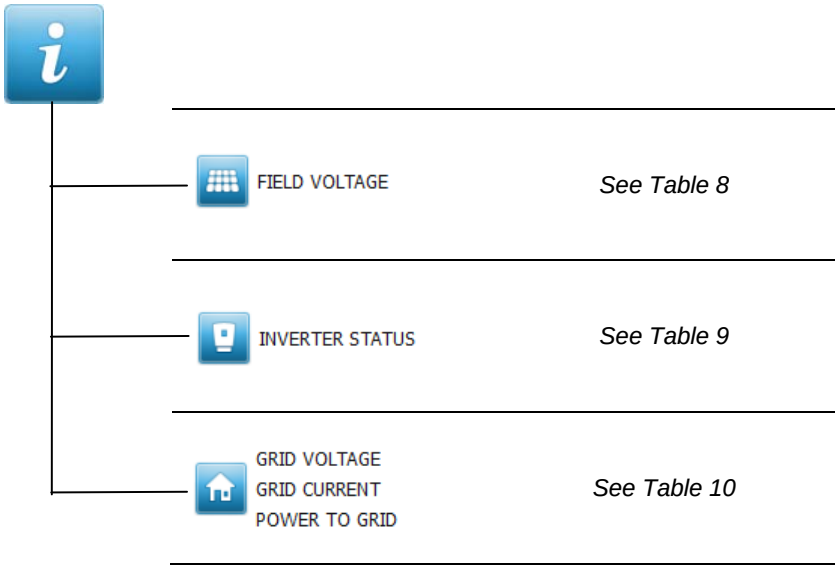


Figure 58: Info menu tree

4.3.2.1. Field Submenu

Menu	 FIELD VOLTAGE	
Submenu	**Access Level**	**Action**
M000 – FIELD VOLTAGE Displays the instant value of the PV field voltage	BASIC	Displays the measure graph.
M002 – FIELD CURRENT Displays the instant value of the PV field current	BASIC	Displays the measure graph.
M001 – MPPT REFERENCE Displays the instant value of the MPPT reference	ADVANCED	None. View-only item.
M017 – POSITIVE POLE INSULATION RESISTANCE Displays the instant value of the insulation resistance of the PV field positive pole	ADVANCED	None. View-only item.
M019 – NEGATIVE POLE INSULATION RESISTANCE Displays the instant value of the insulation resistance of the PV field negative pole	ADVANCED	None. View-only item.
M016 – GRID KO EVENT COUNTER Displays the counter for “weak radiation” events	ADVANCED	None. View-only item.

Table 8: Info menu, Field submenu

M000	Range	0 ÷ 9000	0 ÷ 900.0 V
Field Voltage	Address	1650	
	Level	BASIC	
	Function	Field voltage that has been measured.	

M001	Range	0 ÷ 9000	0 ÷ 900.0 V
MPPT Reference	Address	1651	
	Level	ADVANCED	
	Function	When the inverter is running, this is the measure of the voltage reference generated by the MPPT; when the inverter is *not* running, this is the voltage value of the PV field voltage.	

M002	Range	0 ÷ 3000	0 ÷ 30.00 A
Field Current	Address	1652	
	Level	BASIC	
	Function	Field current that has been measured.	

M016	Range	0 ÷ 32767	0 ÷ 32767
Grid KO Event Counter	Address	1670	
	Level	ADVANCED	
	Function	Counter for “weak radiation” events.	

M017	Range	0 ÷ 65535	0 ÷ 65.535 MΩ
Positive Pole Insulation Resistance	Address	1672	
	Level	ADVANCED	
	Function	Insulation resistance of the positive pole of the PV field.	

M019	Range	0 ÷ 65535	0 ÷ 65.535 MΩ
Negative Pole Insulation Resistance	Address	1673	
	Level	ADVANCED	
	Function	Insulation resistance of the negative pole of the PV field.	

4.3.2.2. Inverter Submenu

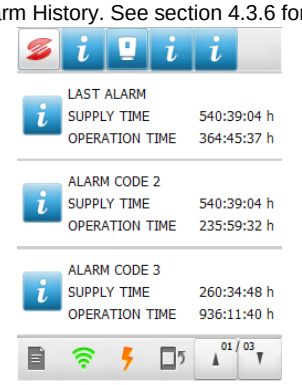
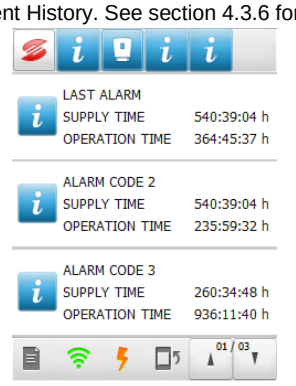
Menu		INVERTER STATUS ACTIVE ALARM
Submenu	**Access Level**	**Action**
INVERTER STATUS ACTIVE ALARM Displays the Event History and the Alarm History	BASIC	Select the icon to display the following items: – **M089 – INVERTER STATUS** – **M090 – ACTIVE ALARM** – **ALARM HISTORY** Displays the Alarm History. See section 4.3.6 for details.  – **EVENT HISTORY** Displays the Event History. See section 4.3.6 for details. 
PRODUCT INFO Displays the information on the product specifications and programming modes	BASIC	Select the icon to display the following items: – **MLBL – SUNWAY M XS MODEL** – **PRSN – SERIAL NUMBER** – **L000 – DISPLAY SOFTWARE** – **User_Texas – INVERTER SOFTWARE T** – **Motorola – INVERTER SOFTWARE M** – **M040 – COUNTRY**
DIAGNOSTICS Displays diagnostic information	BASIC	Select the icon to display the following items: – **M098 – SUPPLY TIME** – **M099 – OPERATION TIME** – **M059 – HEATSINK TEMPERATURE** Displays the measure graph. – **M057 – INTERNAL TEMPERATURE** Displays the measure graph.

Table 9: Info menu, Inverter submenu

M089	Range	See Table 29	See Table 29
Inverter Status	Address	1739	
	Level	BASIC	
	Function	Describes the operating conditions of the inverter.	

M090	Range	See section 4.3.6	See section 4.3.6
Active Alarm	Address	1740	
	Level	BASIC	
	Function	Active alarm.	

MLBL	Range	4600, 5000, 6000, 7500	4600, 5000, 6000, 7500
Sunway M XS Model	Address	1488	
	Level	BASIC	
	Function	Indicates the size of the product.	

PRSN	Range	0 ÷ 9999999	0 ÷ 9999999
Serial Number	Address	1827	
	Level	BASIC	
	Function	Indicates the serial number of the product.	

L000	Range	N/A	
Display Software	Level	BASIC	
	Function	Indicates the software version installed on the touchscreen display.	

Motorola	Range	0 ÷ 3500	0 ÷ 3500.000
Inverter Software M	Address	1487	
	Level	BASIC	
	Function	Indicates the software version installed on the DSP MOTOROLA.	

User Texas	Range	0 ÷ 3500	0 ÷ 3500.000
Inverter Software T	Address	233	
	Level	BASIC	
	Function	Indicates the software version installed on the DSP TEXAS.	

M097	Range	$0 \div 2^{32}$	$0 \div 2^{32}$ in units of 200 ms displayed as hh:min:sec
Operation Time	Address	1933	
	Level	ADVANCED	
	Function	Operation time of the inverter while delivering energy. This measure is expressed in 32bits divided into two 16-bit words: the low part and the high part.	

M098	Range	$0 \div 2^{32}$	$0 \div 2^{32}$ in units of 200 ms displayed as hh:min:sec
Supply Time	Address	1915	
	Level	ADVANCED	
	Function	Time when the inverter is power supplied. This measure is expressed in 32bits divided into two 16-bit words: the low part and the high part.	

M057	Range	-5000 ÷ +15000	-50.00 ÷ +150.00 °C
Internal Temperature	Address	1707	
	Level	ADVANCED	
	Function	Measure of the temperature internal to the inverter.	

M059	Range	-5000 ÷ +15000	-50.00 ÷ +150.00 °C
Heatsink Temperature	Address	1709	
	Level	ADVANCED	
	Function	Measure of the heatsink temperature.	

4.3.2.3. Grid Submenu

Menu		 GRID VOLTAGE GRID CURRENT POWER TO GRID
Submenu	**Access Level**	**Action**
M004 – GRID VOLTAGE Displays the RMS value of the grid voltage	BASIC	Displays the measure graph.
M006 – GRID CURRENT Displays the RMS value of the grid current	BASIC	Displays the measure graph.
MPWR – GRID POWER Displays the value of the power delivered to the grid	BASIC	Displays the measure graph.
M005 – GRID FREQUENCY Displays the value of the grid frequency	BASIC	Displays the measure graph.
M010 – TOTAL ENERGY Displays the total value of the energy delivered to the grid **M210 – TOTAL PAY-OFF** Displays the total pay-off resulting from the produced energy	BASIC	None. View-only item.
M011 – PARTIAL ENERGY Displays the partial value of the energy delivered to the grid **M211 – PARTIAL PAY-OFF** Displays the partial pay-off resulting from the produced energy	BASIC	None. View-only item.
M009 – REACTIVE POWER Displays the value of the reactive power	ADVANCED	Displays the measure graph.
POWER BALANCE Enables accessing diagnostic measures of the Power Balance functionality (5.3)	BASIC	Select the icon to display the items below (ADVANCED access level): **M424 – TOTAL POWER ON PHASE R** **M425 – TOTAL POWER ON PHASE S** **M426 – TOTAL POWER ON PHASE T** **M427 – NUMBER OF INVERTERS DETECTED ON PHASE R** **M428 – NUMBER OF INVERTERS DETECTED ON PHASE S** **M429 – NUMBER OF INVERTERS DETECTED ON PHASE T** **M430 – NUMBER OF TOTAL DETECTED INVERTERS** Each item displays the instant value of the relevant measure.

Table 10: Info menu, Grid submenu

M004	**Range**	0 ÷ 4000	0 ÷ 400.0 V
Grid Voltage	**Address**	1654	
	Level	BASIC	
	Function	Grid voltage that has been measured.	

M005	Range	± 10000	± 100.00 Hz
Grid Frequency	Address	1655	
	Level	BASIC	
	Function	Grid frequency that has been measured.	

M006	Range	4600TL: 0 ÷ 3000 5000TL: 0 ÷ 3000 6000TL: 0 ÷ 3000 7500TL: 0 ÷ 4000	4600TL: 0 ÷ 30.00 A 5000TL: 0 ÷ 30.00 A 6000TL: 0 ÷ 30.00 A 7500TL: 0 ÷ 40.00 A
Grid Current	Address	1656	
	Level	BASIC	
	Function	Current delivered to the grid.	

MPWR	Range	4600TL: 0 ÷ 5000 5000TL: 0 ÷ 6000 6000TL: 0 ÷ 7000 7500TL: 0 ÷ 8000	4600TL: 0 ÷ 5000 W 5000TL: 0 ÷ 6000 W 6000TL: 0 ÷ 7000 W 7500TL: 0 ÷ 8000 W
Grid Power	Address	1658	
	Level	BASIC	
	Function	Active power delivered to the grid.	

M010	Range	0 ÷ 4294967296	0 ÷ 42949672.96 kWh
Total Energy	Address	1661-1662	
	Level	BASIC	
	Function	Total count of the active energy delivered to the grid.	

M011	Range	0 ÷ 4294967296	0 ÷ 42949672.96 kWh
Partial Energy	Address	1663-1664	
	Level	BASIC	
	Function	Partial count of the active energy delivered to the grid. This value is reset when the **I002** command is run (4.3.5.4).	

M200	Range	0 ÷ 4294967296	0 ÷ 429496729.6 Euros
Total Pay-off	Address	1807, 1808	
	Level	BASIC	
	Function	This measure represents the total pay-off resulting from the total count of the energy delivered to the grid (**M010**). The remuneration factor is set via parameter **P130** (4.3.5.1).	

M201	Range	0 ÷ 4294967296	0 ÷ 429496729.6 Euros
Partial Pay-off	Address	1809, 1810	
	Level	BASIC	
	Function	This measure represents the partial pay-off resulting from the total count of the energy delivered to the grid (**M011**). This value is reset when the **I002** command is run (4.3.5.4).	

4.3.3. Graph Menu

The icon of the Graph menu is yellow in colour. The Graph menu displays a graph window (4.2.1) where up to three custom measures may be displayed. Measures may be selected from the **Customization > Display > Graph** submenu (see section 4.3.5.2) in the Tools menu. The **MPWR** (Power to Grid) measure is displayed as a factory setting.

The Graph menu may be set up as the Default View from **Customization > Display > L450 – Default View** (factory setting).

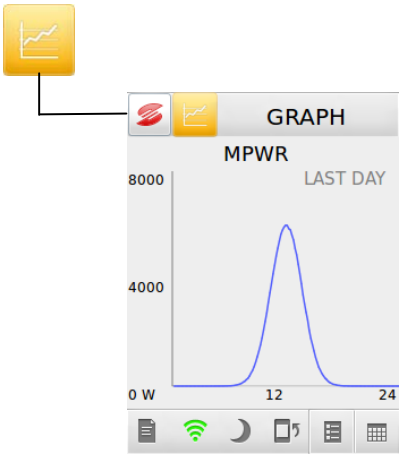


Figure 59: Graph menu

4.3.3.1. Customization of the Measures to be Graphically Displayed

The selection of the measures to be graphically displayed is made from the **Customization > Display** submenu in the Tools menu. Do the following:

- From the start menu, select the **Tools** ( ) icon;
- Selct the **Customization** (CUSTOMIZATION) icon, then the **Display** (DISPLAY) submenu;
- Select **GRAPH**, then select the measure to be customized. The screen below appears:

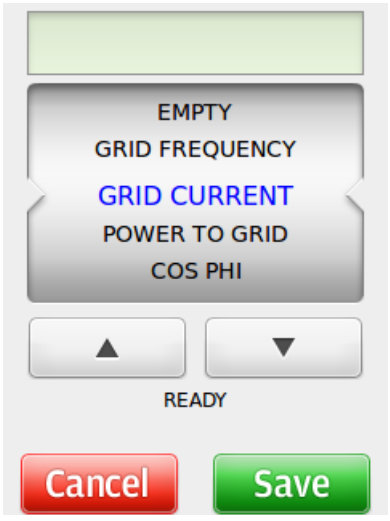
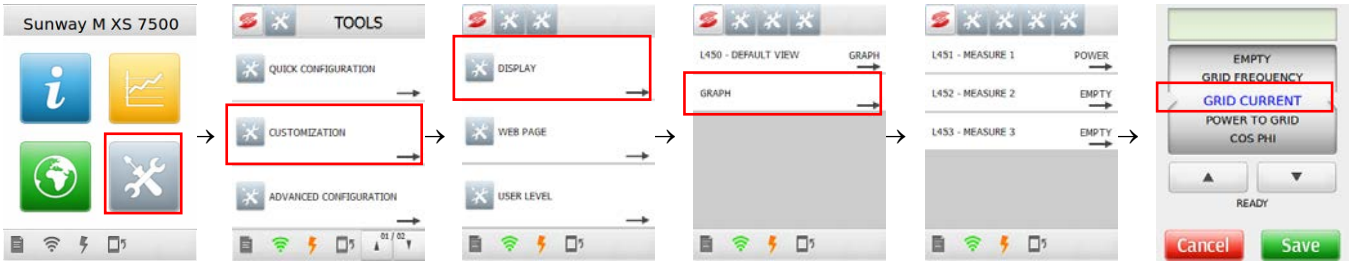


Figure 60: Selection page for the measure to be graphically displayed

- Scroll the list of the available measures with the arrow keys (▲ ▼) and activate the desired measure;

- Activate your choice by pressing the **Save** (Save) button and confirm with OK. The system automatically quits the current page. If you press **Cancel** (Cancel), the previous settings are maintained;
- Repeat the operation for the other measures (if any) to be graphically represented;
- Press to return to the start menu.

In summary:



*Select the **Tools** icon* | *Select the **Customization** submenu* | *Select the **Display** submenu* | *Select the **Graph** item* | *Select one of the three customizable measures* | *Select the variable to be graphically represented, , press **SAVE** and confirm with **OK***

Figure 61: Steps to take for the customization of the measures to be graphically displayed

4.3.3.2. Setting the Graph Menu as the Default View

Setting the Graph menu as the default view is possible from the **Customization > Display** submenu in the Tools menu. Do the following:

- From the start menu, select the **Tools** ( ) icon;
- Select the **Customization** (CUSTOMIZATION) icon, then select the **Display** (DISPLAY) submenu.
- Select **Default View**; the screen below appears:

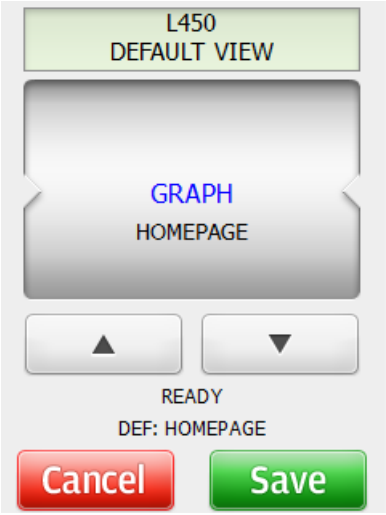
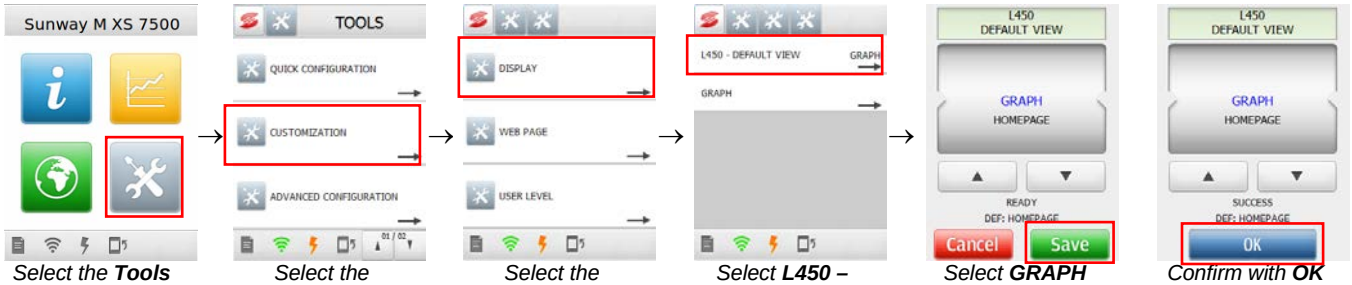


Figure 62: Setting page of the Default View

- Scroll the list of the available measures with the arrow keys (▲ ▼) and activate the desired measure;

- Activate your choice by pressing the **Save** (Save) button and confirm with OK. The system automatically quits the current page. If you press **Cancel** (Cancel), the previous settings are maintained;
- Press to return to the start menu.

In summary:



*Select the **Tools** icon* → *Select the **Customization** submenu* → *Select the **Display** submenu* → *Select **L450 – Default View*** → *Select **GRAPH** and press **SAVE*** → *Confirm with **OK***

Figure 63: Setting the Graph menu as the Default View

4.3.4. Connectivity Menu

The icons of the menus and submenu in the Connectivity area are green in colour and enable doing the following:

- display the information about the connectivity status;
- configure the Wi-Fi connection;
- access the software update and remote assistance functions;
- configure the RS485 serial connection (optional).

The identifier parameter for each item is marked with **L** or **R** followed by three digits.

Figure 64 shows the Connectivity menu tree, while Table 11 to Table 13 describe each parameter relating to the inverter connectivity.

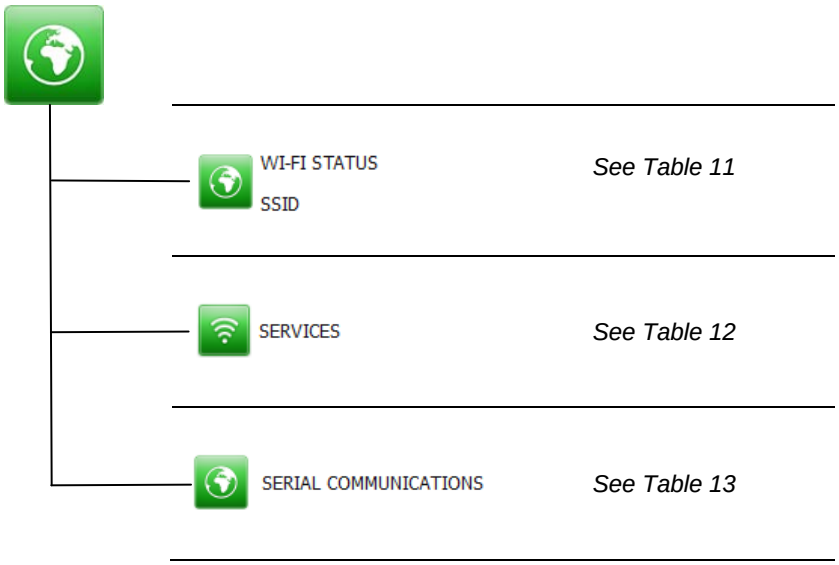


Figure 64: Connectivity menu tree

4.3.4.1. Wi-Fi Submenu

Menu	WI-FI STATUS SSID	
Submenu	**Access Level**	**Action**
L399 – WI-FI STATUS Displays the current setting of the parameter	BASIC	Activates a list window. Select: – OFF – ON
L305 – TYPE OF CONNECTION Displays the current setting of the parameter	BASIC	Activates a list window. Select: – ROUTER: connection via Router or Access Point – AD HOC: direct connection between the inverter and the device (PC or Smartphone).
L308 – SELECTED NETWORK Displays the current setting of the parameter	BASIC	Activates a window containing a list of the available networks. Select the target network for the Wi-Fi connection.
L306 – WI-FI PASSWORD Sets the password for the Wi-Fi connection	BASIC	Activates an alphanumeric keypad window. Set the password of the target network for the Wi-Fi connection.
L307 – IP TYPE Displays the current setting of the parameter	BASIC	Activates a list window. Select: – DHCP – STATIC
L301 – IP ADDRESS Displays the current setting of the parameter	BASIC	Activates an alphanumeric keypad window. Write the desired IP address.
L302 – SUBNET MASK Displays the current setting of the parameter	BASIC	Activates an alphanumeric keypad window. Set the desired value.
L303 – GATEWAY Displays the current setting of the parameter	BASIC	Activates an alphanumeric keypad window. Set the desired value.
L311 – DNS Displays the current setting of the parameter	BASIC	Activates an alphanumeric keypad window. Set the desired value.

Table 11: Connectivity menu, Wi-Fi submenu

L399	**Range**	OFF, ON
Wi-Fi Status	**Default**	OFF
	Level	BASIC
	Function	This variable allows setting the activation status of the Wi-Fi connection.

L307	**Range**	ROUTER, AD HOC
Type of Connection	**Default**	ROUTER
	Level	BASIC
	Function	This variable selects the type of connection to establish.

L308	Range	N/A
Selected Network	Default	Default
	Level	BASIC
	Function	If a Wi-Fi ROUTER connection (section 3.7.1.3) is established, this variable contains the name of the target network for the Wi-Fi connection. The user may choose among a list populated based on the Wi-Fi networks detected by the inverter. If an AD HOC connection is established (see section 3.7.1.2), this variable assumes the “Sunway_MXS” value.

L306	Range	Alphanumeric value ranging from 8 to 63 characters
Wi-Fi Password	Default	Default0
	Level	BASIC
	Function	This variable contains the password enabling accessing the target wireless network for the Wi-Fi connection.

L307	Range	DHCP, STATIC
IP Address Assign Mode	Default	DHCP
	Level	BASIC
	Function	This variable selects the assign mode of the IP address of the inverter when this is connected to an existing network. DHCP = the address is assigned to the inverter by an external agent, such as the reference access point. STATIC = the user sets the IP address of the inverter.

L301	Range	000.000.000.000 ÷ 255.255.255.255
IP Address	Default	N/A
	Level	BASIC
	Function	This variable represents the IP address of the inverter when connected to a communications network. This variable is read-only for the ROUTER connection, with active DHCP and for the AD HOC connection. This variable may be written by the user in ROUTER mode, with inactive DHCP (STATIC IP address assigned). See variable **L307** in Table 11.

L302	Range	000.000.000.000 ÷ 255.255.255.255
Subnet Mask	Default	255.255.248.000
	Level	BASIC
	Function	This variable represents the subnet mask of the inverter when connected to a communications network. This variable is read-only for the ROUTER connection, with active DHCP and for the AD HOC connection. This variable may be written by the user in ROUTER mode, with inactive DHCP (STATIC IP address). See variable **L307** in Table 11.

L303	Range	000.000.000.000 ÷ 255.255.255.255
Gateway	Default	000.000.000.000
	Level	BASIC
	Function	This variable represents the IP address of the network gateway. This variable is read-only for the ROUTER connection, with active DHCP and for the AD HOC connection. This variable may be written by the user in ROUTER mode, with inactive DHCP (STATIC IP address). Setting a wrong variable may compromise the right connection of the PC or the Smartphone to the inverter, thus compromising the inverter access to the Internet.

L311	Range	000.000.000.000 ÷ 255.255.255.255
DNS	Default	8.8.8.8
	Level	BASIC
	Function	This variable represents the IP address of the DNS. Setting a wrong variable compromises the inverter access to the Internet.

4.3.4.2. Service Submenu

Menu	SERVICES	
Submenu	**Access Level**	**Action**
L505 – SUNWAYPORTAL.IT Displays the current setting of the parameter	BASIC	Activates a list window. Select: – DISABLED – ENABLED
L502 – TECHNICAL SUPPORT Displays the current setting of the parameter	BASIC	Activates a list window. Select: – DISABLED – ENABLED
L010 – DISPLAY UPDATE Displays the current setting of the parameter	BASIC	Activates a list window. Select: – DISABLED – ENABLED
L501 – INVERTER UPDATE Enables updating the inverter firmware	BASIC	Activates a "Run command" window. Press the Run Command button. The messages relating to the execution of the command will be displayed.

Table 12: Connectivity menu, Services submenu

L505	Range	DISABLED, ENABLED
Sunwayportal.it	Default	ENABLED
	Level	BASIC
	Function	This variable enables the activation of the Sunwayportal.it service.

L502	Range	DISABLED, ENABLED
Technical Support	Default	DISABLED
	Level	BASIC
	Function	This variable enables the activation of the Technical Support. The Technical Support service enables remote access to the inverter measures and programming parameters by the Customer Service of Elettronica Santerno SpA. The inverter is to be connected to a Wi-Fi network and is to be connected to the Internet for the activation of the service.

L010	Range	DISABLED, ENABLED
Display Update	Default	DISABLED
	Level	BASIC
	Function	This variable enables the update procedure of the software implemented in the touchscreen display.

L501	Range	N/A
Inverter update	Level	BASIC
	Function	This variable enables the update procedure of the firmware implemented in the inverter.

4.3.4.3. Serial Communications Submenu

Menu	SERIAL COMMUNICATIONS	
Submenu	**Access level**	**Action**
R001 – INVERTER MODBUS ADDRESS Displays the Modbus address of the inverter	**A**	Activates an alphanumeric keypad window. Enter the desired value. The value will not take effect until you restart the inverter.
R002 – RESPONSE DELAY Displays the inverter response delay for RS485 communications	**A**	Activates an alphanumeric keypad window. Enter the desired value.
R003 – BAUD RATE Displays the baudrate of RS485 communications	**A**	Activates a list window enabling selecting one of the following items: – 1200 – 2400 – 4800 – 9600 – 19200 – 38400 – 57600
R004 – TIME ADDED TO 4BYTETIME Displays the time added to 4T byte-time on RS485 port	**A**	Activates an alphanumeric keypad window. Enter the desired value.
R005 – WATCHDOG SAFETY TIME Displays the RS485 port watchdog safety time	**A**	Activates an alphanumeric keypad window. Enter the desired value.
R006 – PARITY BIT Displays the parity bit setting of RS485 communications	**A**	Activates a list window enabling selecting one of the following items: – DISABLE 1STOP – DISABLE 2STOP – EVEN – ODD

Table 13: Connectivity menu, Serial Communications submenu

R001	**Range**	1 ÷ 247	1 ÷ 247
Inverter Modbus Address	**Default**	1	1
	Level	ADVANCED	
	Address	588	
	Function	Determines the address of serial link 0, assigned to the inverter connected to the network via RS485. The value will not take effect until you restart the inverter. The reset command may be run from the Commands submenu in the Tools menu.	

R002	**Range**	1 ÷ 1000	1 ÷ 1000 ms
Response Delay	**Default**	5	5 ms
	Level	ADVANCED	
	Address	589	
	Function	Determines the inverter response delay following a query sent by the Master via the serial link.	

R003	**Range**	1 ÷ 7	1: 1200 bps 2: 2400 bps 3: 4800 bps 4: 9600 bps 5: 19200 bps 6: 38400 bps 7: 57600 bps
Baud Rate	**Default**	6	6: 38400 bps
	Level	ADVANCED	
	Address	590	
	Function	Sets the baud rate, expressed in bits per second, for the serial link.	

R004	**Range**	1 ÷ 10000	1 ÷ 10000 ms
Time Added to 4byte–time	**Default**	2	2 ms
	Level	ADVANCED	
	Address	591	
	Function	Sets the limit time after which, if no more characters are received from the serial link, the message sent from the Master to the inverter is considered as finished.	

R005	**Range**	0 ÷ 65000	0 ÷ 6500.0 s
Watchdog Safety Time	**Default**	0	0.0 s
	Level	ADVANCED	
	Address	592	
	Function	This parameter sets the limit time after which, if no more characters are received from serial link 0 (9-pole, male D connector), alarms **A061** (Serial Link n. 0 WDG Alarm) trips. If R005 is set to zero, alarm **A061** is disabled.	

R006	**Range**	0 ÷ 3	0: Disabled 1 Stop–bit 1: Disabled 2 Stop–bit 2: Even (1 Stop–bit) 3: Odd (1 Stop–bit)
Parity Bit	**Default**	1	1: Disabled 2 Stop–bit
	Level	ADVANCED	
	Address	593	
	Function	Sets whether the parity bit is used or not when creating the Modbus message via serial link.	

4.3.5. Tools Menu

The icons of the menus and submenus belonging to this macroarea are grey in colour and enable displaying the operating parameters that can be changed by the user. The identifier parameter for each item is marked with letter **P**, **C**, **I**, **L** and **R** followed by three digits.

The SUNWAY M XS inverter is factory-set with a set of parameters fitting most applications. Therefore, the Quick Configuration settings are normally sufficient for the correct operation of the inverter.

Figure 65 shows the Tools menu tree. The submenus in the Tools menu are detailed in the sections below.

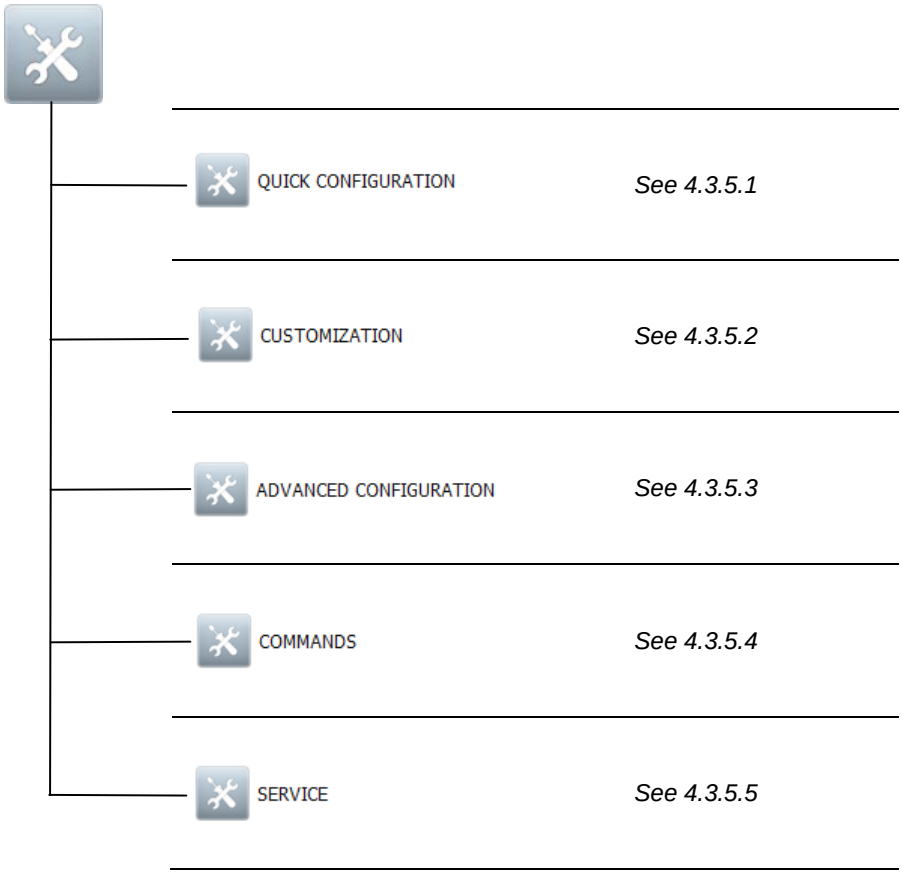


Figure 65: Tools menu tree

4.3.5.1. Quick Configuration Submenu

The Quick Configuration submenu groups the settings to be configured when commissioning the inverter for its correct operation. See section 3.6 for details.

Menu	QUICK CONFIGURATION	
Submenu	**Access Level**	**Action**
L402 – LANGUAGE Displays the current language of the touchscreen display	BASIC	Activates a list window. You can select one of the following: – ITALIAN – ENGLISH – ESPAÑOL – FRANÇAIS – DEUTSCH
P040 – COUNTRY Displays the Country for the grid interface configuration	BASIC	Activates a list window. You can select one of the following: – ITALIA – ESPAÑA – CONT. GREECE – GREEK ISLANDS – FRANCE – BELGIQUE – AUSTRALIA – DEUTSCHLAND – UK – PORTUGAL – EXT. NEUTRAL ENS
L404 – TIME ZONE Displays the time zone set for the inverter	BASIC	Activates a list window. Select the desired time zone.
L400 – DATE Displays the date set for the inverter	BASIC	Activates a list window. Select the desired date.
L401 – TIME Displays the time set for the inverter	BASIC	Activates a list window. Select the desired time.
L403 – CURRENCY Displays the currency set for the inverter	BASIC	Activates a list window. Select the desired currency.
P130 – INCENTIVE Displays the remuneration incentive for the produced energy	BASIC	Activates a list window. Select the desired value.
L500 – HISTORY RESET Resets the alarm history of the touchscreen display	BASIC	Activates a run command window. Press the Run Command button and wait for the success message.
L011 – DISPLAY RESET Resets the touchscreen display	BASIC	Activates a run command window. Press the Run Command button and wait for the success message. When the command is run, the touchscreen display will be shut off and restarted.

Table 14: Tools menu, Quick Configuration submenu

L011	Range	N/A
Display Reset	Default	N/A
	Level	BASIC
	Function	This is a command to reset the touchscreen display.

L400	Range	01/01/1970 ÷ 19/01/2038
Date	Default	01/01/1970
	Level	BASIC
	Function	Sets the date for the inverter. If the inverter is connected to the Internet, the date will be automatically updated.

L401	Range	00:00 ÷ 23:59
Time	Default	00:00
	Level	BASIC
	Function	Sets the time for the inverter. If the inverter is connected to the Internet, the date will be automatically updated based on the time zone set in L404.

L402	Range	ITALIANO, ENGLISH, ESPAÑOL, FRANÇAIS, DEUTSCH
Language	Default	ENGLISH
	Level	BASIC
	Function	Sets the language for the graphic interface programme.

L403	Range	AUD, BRL, CAD, CHF, DKK, EUR, GBP, INR, JPY, NOK, NZD, RMB, RUB, SEK, USD
Currency	Default	EUR
	Level	BASIC
	Function	Sets the currency. The currency is used for **M200** and **M201** (4.3.2.1).

L404	Range	Amsterdam, Andorra, Athens, Belgrade, Berlin, Bratislava, Brussels, Bucharest, Budapest, Chisinau, Copenhagen, Dublin, Gibraltar, Guernsey, Helsinki, Isle of Man, Istanbul, Jersey, Kaliningrad, Kiev, Lisbon, Ljubjana, London, Luxembourg, Madrid, Malta, Mariehamn, Misnk, Monaco, Moscow, Oslo, Paris, Podgorica, Prague, Riga, Rome, Samara, San Marino, Sarajevo, Simferopol, Skopje, Sofia, Stockholm, Tallinn, Tirane, Uzhgorod, Vaduz, Vatican, Vienna, Vilnius, Volgograd, Warsaw, Zagreb, Zaporozhye, Zurich
Time Zone	Default	Rome
	Level	BASIC
	Function	Sets the time zone for the inverter. This setting takes effect if the inverter is connected to the Internet. In that case, the inverter will automatically update its time based on the set time zone.

L500	Range	N/A
History Reset	Default	N/A
	Level	BASIC
	Function	This command resets the history data from the display. This command permanently deletes the history data saved on the display.

P130	Range	0 ÷ 10000	0.0 ÷ 10.000 Units / kWh
Incentive	Default	0	0 Units / kWh
	Level	BASIC	
	Address	676	
	Function	This parameter sets the remuneration per kWh produced. The value is set for **M200** and **M201** (4.3.2.1). The currency may be set via parameter **L403**.	

4.3.5.2. Customization Submenu

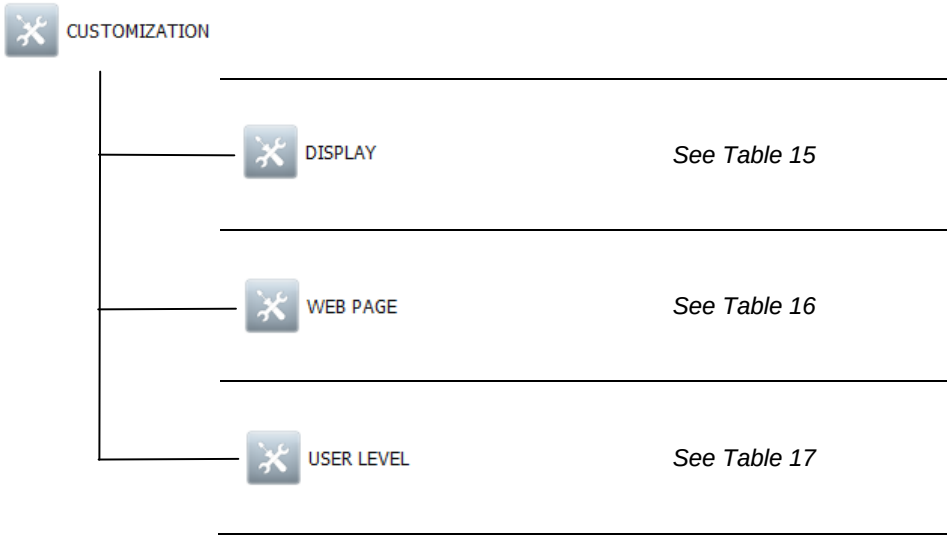


Figure 66: Tools menu, Customization submenu

Menu	DISPLAY	
Submenu	**Access Level**	**Action**
L450 – DEFAULT VIEW Displays the current setting for the Default View	BASIC	Activates a list window. Select one of the following: – GRAPH – HOMEPAGE
GRAPH	BASIC	Displays the following items: – L451 – MEASURE 1 – L452 – MEASURE 2 – L453 – MEASURE 3 Each item activates a list window. You can select one of the Measure values listed in Table 4.

Table 15: Tools menu, Customization > Display submenu

L450	Range	GRAPH, HOMEPAGE
Default View	Default	GRAPH
	Level	BASIC
	Function	Enables the customization of the Default View of the product. The default screen is displayed by the inverter when no input has been received for a reasonably long time.

L451	Range	Table 4
Measure 1	Default	MPWR
	Level	BASIC
	Function	Enables the customization of measure 1 in the main Graph.

L452	Range	Table 4
Measure 2	Default	EMPTY
	Level	BASIC
	Function	Enables the customization of measure 2 in the main Graph.

L453	Range	Table 4
Measure 3	Default	EMPTY
	Level	BASIC
	Function	Enables the customization of measure 3 in the main Graph.

Menu	WEB PAGE	
Submenu	**Access Level**	**Action**
L503 – INVERTER COLOUR Displays the current setting for the inverter colour. This setting affects the colour of the icon displayed on the browser web page (3.7.2.1).	BASIC	Activates a list window. Select one of the following: – BLACK – WHITE – RED – BLUE
L504 – LABEL Displays the current setting for the inverter label. This setting affects the label of the icon displayed on the browser web page (3.7.2.1).	BASIC	Activates an alphanumeric keypad window. Set the inverter identifier on the web page.

Table 16: Tools menu, Customization submenu > Web page

L503	Range	BLACK, WHITE, RED, BLUE
Inverter Colour	Default	N/A
	Level	BASIC
	Function	Selects the colour of the product icon displayed on the browser web page (3.7.2). This parameter is factory set to the colour of the product.

L504	Range	N/A
Label	Default	S/N
	Level	BASIC
	Function	Enables the customization of the product name displayed on the browser web page (3.7.2). This parameter is factory set to the serial number of the product.

Menu	USER LEVEL	
Submenu	**Access Level**	**Action**
P001 – USER LEVEL Displays the current level for the user level.	BASIC	Activates a list window. Select one of the following: – BASIC – ADVANCED
SW0 – SERVICE PASSWORD	ADVANCED	Activates an alphanumeric keypad window. Enter the Service password. This functionality is reserved to the Customer Service of Elettronica Santerno SpA.

Table 17: Tools menu, Customization submenu > Access Level

P001	Range	0 ÷ 1	0: BASIC 1: ADVANCED
User Level	Default	0	0: BASIC
	Level	BASIC	
	Address	514	
	Function	The programming parameters of the inverter are divided into groups based on user access levels, depending on the complexity of their function. Therefore, based on the user level programmed in the touchscreen display, the user is allowed to view only some menus or certain parts of them. By setting the BASIC user level, once the inverter is properly parameterized, navigation is easier, since the user is shown a shorter set of parameters including only the most frequently used parameters. The preset user level is stated in the “Level” field.	

4.3.5.3. Advanced Configuration Submenu

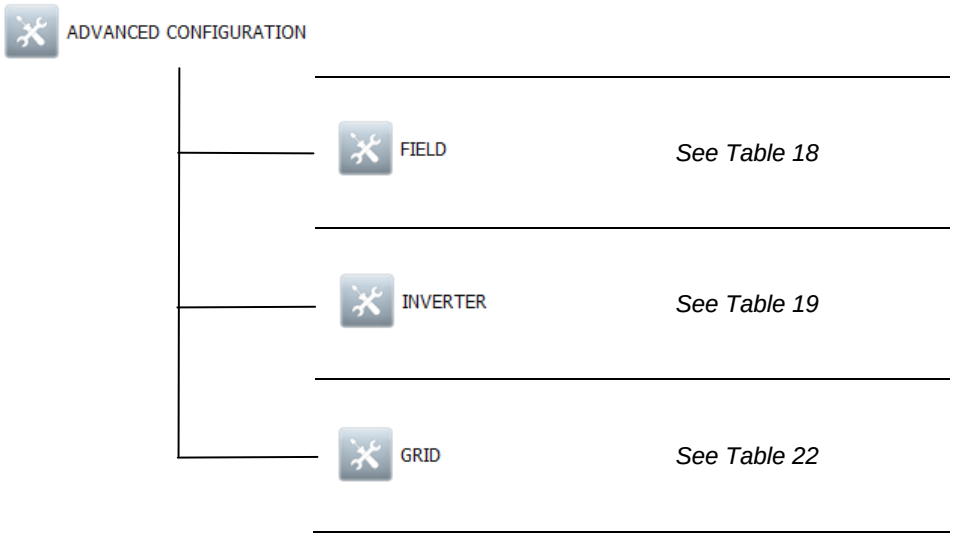


Figure 67: Tools menu, Advanced Configuration Submenu

Menu	FIELD	
Submenu	**Access Level**	**Action**
P026 – MPPT	ADVANCED	Activates a list window. Select one of the following: – INACTIVE – ACTIVE
P020 – FIELD REFERENCE	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value.
P021 – STARTUP DELAY	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value.

Table 18: Tools menu, Advanced Configuration > Field submenu

P020	Range	335 ÷ 740	335 ÷ 740 V
Field Reference	Default	370 V	370 V
	Level	ADVANCED	
	Address	620	
	Function	If the MPPT function is disabled (**P026**=Inactive), **P020** represents the working voltage reference of the PV field: the inverter will try to make the working point of the DC bus match the set value. Regardless of whether the MPPT is enabled or not, the inverter enters the RUN status if the field voltage is higher than or equal to **P020** during the time set in **P021**.	

P021	Range	0 ÷ 6000	0 ÷ 600.0 s
Startup Delay	Default	600	60.0 s
	Level	ADVANCED	
	Address	621	
	Function	Minimum time when the open-circuit voltage of the PV field must be longer than the time set in **P020** to enable the inverter startup.	

P026	Range	0 ÷ 1	0 : Inactive 1: Active
MPPT	Default	1	1: Active
	Level	ADVANCED	
	Address	626	
	Function	MPPT Enable: if **P026** = Active, the MPPT (Maximum Power Point Tracking) is enabled. If **P026** is set to Inactive, the MPPT is in manual mode and the field voltage reference is the one set in **P020**.	

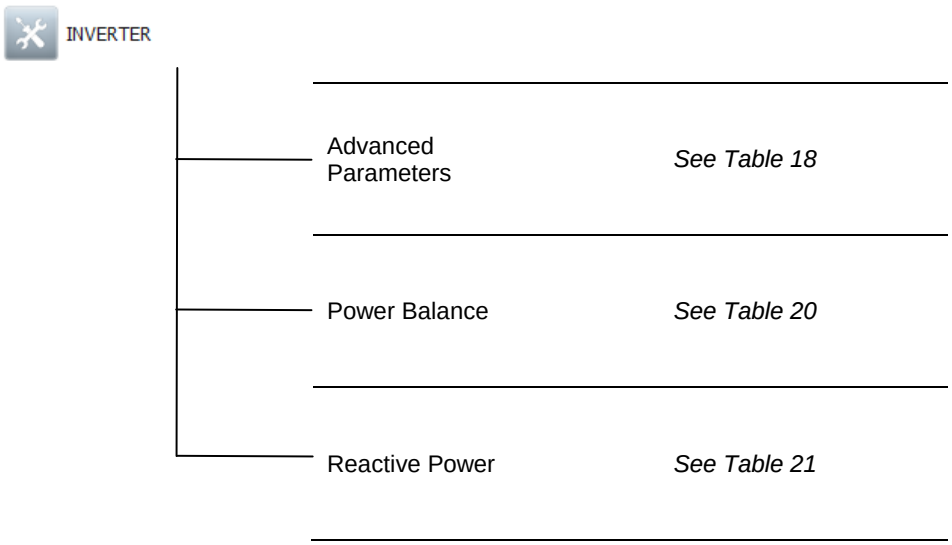


Figure 68:Tools menu, Advanced Configuration > Inverter

Menu	ADVANCED PARAMETERS	
Submenu	**Access Level**	**Action**
P041 – POWER OFF DELAY Displays the value currently set for the power off delay	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value.

Table 19: Tools menu, Advanced Configuration > Inverter > Advanced Parameters submenu

P041	Range	0 ÷ 600	0 ÷ 600 min
Power Off Delay	Default	15	15 min
	Level	ADVANCED	
	Address	641	
	Function	Time when the inverter is waiting for a field voltage value exceeding **P020**; when that time is over, the inverter is powered off.	

Menu	POWER BALANCE	
Submenu	**Access Level**	**Action**
R052 – POWER BALANCE Displays the current status of the Power Balance functionality	ADVANCED	Activates a list window. Select one of the following: – DISABLED – ENABLED
P400 – PHASE Displays the value currently set for the Power Balance function phase	ADVANCED	Activates a list window. Select one of the following: – R – S – T

Table 20: Tools menu, Advanced Configuration > Inverter > Power Balance

R052	Range	0 ÷ 1	0: Disabled 1: Enabled
Power Balance	Default	0	0: Disabled
	Level	ADVANCED	
	Address	190	
	Function	Enables the Power Balance functionality. The Power Balance functionality requires the inverters to be connected to an external CAN bus. Details on the Power Balance functionality are given in section 5.3.	

P400	Range	1 ÷ 3	1: R 2: S 3: T
Phase	Default	1	1: R
	Level	ADVANCED	
	Address	540	
	Function	Phase for the Power Balance algorithm. The phase is to be set up during the commissioning of the product based on the connection of the product to the PV plant. If the phase setting is incorrect, this will adversely affect the Power Balance functionality by tripping the safety devices or reducing the delivered power.	

Menu	REACTIVE POWER	
Submenu	**Access Level**	**Action**
P300 – REACTIVE POWER ADJUSTMENT Displays the current status of the reactive power adjustment functionality	ADVANCED	Activates a list window. Select one of the following: – DISABLED – ACTIVE POWER – ACTIVE POWER AND POWER FACTOR – ACTIVE POWER AND REACTIVE POWER
P301 – CAPACITIVE-INDUCTIVE Displays the current value of the "inductive-capacitive" setting	ADVANCED	Activates a list window. Select one of the following: – CAPACITIVE – INDUCTIVE
P302 – ACTIVE POWER LIMIT Displays the value currently set for the active power limit	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value.
P303 – POWER FACTOR REFERENCE Displays the value currently set for the power factor reference	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value.
P304 – REACTIVE POWER REFERENCE Displays the value currently set for the reactive power reference	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value.

Table 21: Tools menu, Advanced Configuration submenu > Inverter > Reactive Power

P300	**Range**	0 ÷ 3	0: Disabled 1: Active Power 2: Active Power and Power Factor 3: Active Power and Reactive Power
Reactive Power Adjustment	**Default**	2	2: Active Power and Power factor
	Level	ADVANCED	
	Address	900	
	Function	Selects the activation status and the control mode of the reactive power.	

P301	**Range**	0 ÷ 1	0: Capacitive 1: Inductive
Capacitive/ Inductive	**Default**	0	0: Capacitive
	Level	ADVANCED	
	Address	901	
	Function	Type of reactive power delivered by the inverter. This parameter is effective for any value other than 0 set in **P300**.	

P302	**Range**	0 ÷ 100	0 ÷ 100% Pn
Active Power Limit	**Default**	100	100 % Pn
	Level	ADVANCED	
	Address	902	
	Function	Active power limit delivered by the inverter. The value is expressed as a percentage of the rated power. This parameter is effective for any value other than 0 set in **P300**.	

P303	Range	0 ÷ 100	0.80 ÷ 1.00
Power Factor Reference	Default	100	1.0
	Level	ADVANCED	
	Address	903	
	Function	Desired power factor (angle between the grid voltage and the current delivered by the inverter). This parameter is effective when P300 = 2.	

P304	Range	0 ÷ 7590	0 ÷ 7590 Var
Reactive	Default	0	0 Var
	Level	ADVANCED	
	Address	904	
	Function	Desired reactive power. This parameter is effective when P300 = 3.	

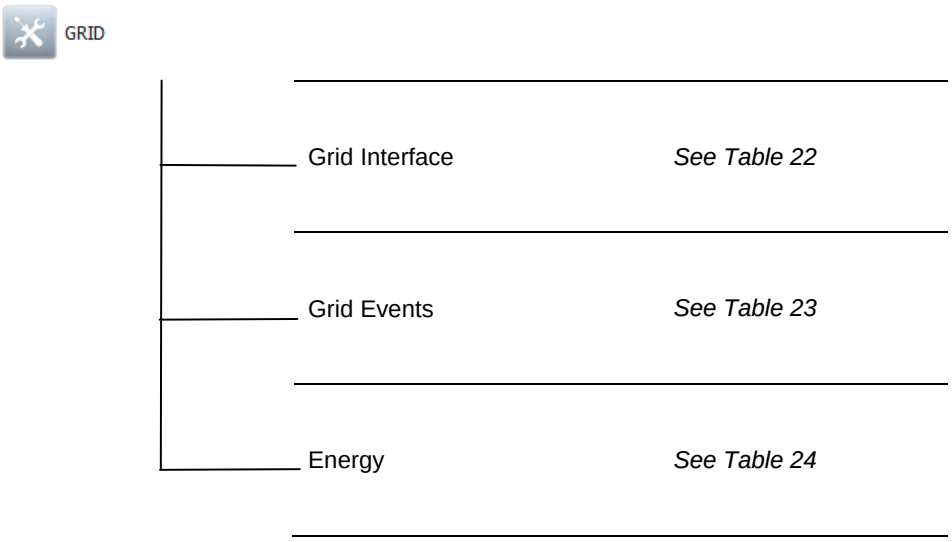


Figure 69: Tools menu, Advanced Settings > Grid

Menu	GRID INTERFACE	
Submenu	**Access Level**	**Action**
C000 – RATED GRID VOLTAGE Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value.
C001 – RATED GRID FREQUENCY Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value.
P079 – PEAK OVERVOLTAGE TRIP TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P080 – INSTANT OVERVOLTAGE THRESHOLD Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P081 – INSTANT OVERVOLTAGE RELEASE RATIO Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P082 – INSTANT OVERVOLTAGE TRIP TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view only parameter. The Service access level is required for parameter modification.
P083 – INSTANT OVERVOLTAGE RESET TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P084 – MAXIMUM VOLTAGE TRIP THRESHOLD Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P085 – MAXIMUM VOLTAGE RELEASE RATIO Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P086 – MAXIMUM VOLTAGE TRIP TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view only parameter. The Service access level is required for parameter modification.
P087 – MAXIMUM VOLTAGE RESET TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P088 – MINIMUM VOLTAGE TRIP THRESHOLD Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view only parameter. The Service access level is required for parameter modification.
P089 – MINIMUM VOLTAGE RELEASE RATIO Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P090 – MINIMUM VOLTAGE TRIP TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.

Menu	GRID INTERFACE	
Submenu	**Access Level**	**Action**
P091 – MINIMUM VOLTAGE RESET TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P092 – INSTANT GRID UNDERVOLTAGE THRESHOLD Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P093 – INSTANT UNDERVOLTAGE RELEASE RATIO Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P094 – INSTANT UNDERVOLTAGE TRIP TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P095 – INSTANT UNDERVOLTAGE RESET TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P096 – MAXIMUM FREQUENCY TRIP THRESHOLD Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P097 – MAXIMUM FREQUENCY RELEASE RATIO Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P098 – MAXIMUM FREQUENCY TRIP TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P099 – MAXIMUM FREQUENCY RESET TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P100 – MINIMUM FREQUENCY TRIP THRESHOLD Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P101 – MINIMUM FREQUENCY RELEASE RATIO Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P102 – MINIMUM FREQUENCY TRIP TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.
P103 – MINIMUM FREQUENCY RESET TIME Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.

Menu	GRID INTERFACE	
Submenu	**Access Level**	**Action**
P114 – MINIMUM PERCENTAGE OF DV606 INSTANT VOLTAGE Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value. This is a view-only parameter. The Service access level is required for parameter modification.

Table 22: Settings menu, Advanced Configuration > Grid > Grid Interface

C000	Range	1000 ÷ 6900	100.0 ÷ 690.0 V
Rated Grid Voltage	Default	2300	230.0 V
	Level	ADVANCED	
	Address	1000	
	Function	This parameter sets the rated value of the grid voltage.	

C001	Range	400 ÷ 700	40.0 ÷ 70.0 Hz
Rated Grid Frequency	Default	50.0 Hz	
	Level	ADVANCED	
	Address	1001	
	Function	This parameter sets the rated value of the grid frequency.	

P079	Range	1 ÷ 1000	1 ÷ 1000 ms
Peak Overvoltage Trip Time	Default	10	
	Level	ADVANCED	
	Address	679	
	Function	This parameter sets the check time of the instantaneous overvoltage and the relevant fault notification.	

P080	Range	130 ÷ 160	[130 ÷ 160] % of Vn
Instant Overvoltage Threshold	Default	140	
	Level	ADVANCED	
	Address	680	
	Function	This parameter, expressed as a percentage of the rated grid voltage, sets the trip threshold of the grid overvoltage fault.	

P081	Range	950 ÷ 1000	0.95 ÷ 1
Instant Overvoltage Release Ratio	Default	970	
	Level	ADVANCED	
	Address	681	
	Function	This parameter sets ratio between the trip threshold of the overvoltage fault and the value at which the overvoltage fault is reset.	

P082	Range	1 ÷ 1000	0.001 ÷ 1.000 s
Instant Overvoltage Trip Time	Default	5	
	Level	ADVANCED	
	Address	682	
	Function	This is the time during which the instantaneous overvoltage trip condition must be maintained to prompt the activation of the grid overvoltage fault.	

P083	Range	1 ÷ 1000	0.001 ÷ 1.000 s
Instant Overvoltage Reset Time	Default	10	
	Level	ADVANCED	
	Address	683	
	Function	This is the time during which the instantaneous overvoltage reset condition must be maintained to prompt the grid overvoltage fault reset.	

P084	Range	105 ÷ 130	[105 ÷ 130] % of Vn
Maximum Voltage Trip Threshold	Default	120 (Italy), 110 (Spain), 115 (Germany)	
	Level	ADVANCED	
	Address	684	
	Function	This parameter is expressed as a percentage of the rated grid voltage; it sets the trip threshold for the grid maximum voltage fault.	

P085	Range	900 ÷ 1000	0.900 ÷ 1.000
Maximum Voltage Release Ratio	Default	950	
	Level	ADVANCED	
	Address	685	
	Function	Sets the ratio between the trip voltage value for the maximum voltage fault and the value at which it is reset.	

P086	Range	20 ÷ 1000	0.020 ÷ 1.000 s
Maximum Voltage Trip Time	Default	50 (Italy), 150 (Spain), 150 (Germany)	
	Level	ADVANCED	
	Address	686	
	Function	This is the time during which the maximum voltage trip condition must be maintained to prompt the activation of the grid maximum voltage fault.	

P087	Range	0 ÷ 32000	0 ÷ 320.000 s
Maximum Voltage Reset Time	Default	10 (Italy), 10 (Spain), 3000 (Germany)	
	Level	ADVANCED	
	Address	687	
	Function	This is the time during which the maximum voltage reset condition must be maintained to prompt the reset of the grid maximum voltage fault.	

P088	Range	60 ÷ 90	[60 ÷ 90] % of Vn
Minimum Voltage Trip Threshold	Default	80 (Italy), 85 (Spain), 80 (Germany)	
	Level	ADVANCED	
	Address	688	
	Function	This parameter, expressed as a percentage of the rated grid voltage, sets the activation threshold of the grid minimum voltage fault.	

P089	Range	1000 ÷ 1200	1.000 ÷ 1.200
Minimum Voltage Release Ratio	Default	1050	
	Level	ADVANCED	
	Address	689	
	Function	Sets the ratio between the trip threshold of the minimum voltage fault and the value at which the minimum voltage fault is reset.	

P090	Range	20 ÷ 1000	0.020 ÷ 1.000 s
Minimum Voltage Trip Time	Default	50 (Italy), 150 (Spain), 150 (Germany)	
	Level	ADVANCED	
	Address	690	
	Function	This is the time during which the minimum voltage trip condition must be maintained to prompt the activation of the minimum voltage fault.	

P091	Range	0 ÷ 32000	0.0 ÷ 320.0 s
Minimum Voltage Reset Time	Default	10 (Italy), 10 (Spain), 3000 (Germany)	
	Level	ADVANCED	
	Address	691	
	Function	This is the time during which the minimum voltage trip condition must be maintained to prompt the grid minimum voltage fault reset.	

P092	Range	50 ÷ 90	[50 ÷ 90] % of Vn
Instant Grid Undervoltage Threshold	Default	60	
	Level	ADVANCED	
	Address	692	
	Function	This parameter, expressed as a percentage of the grid rated voltage, sets the activation threshold of the instant grid undervoltage fault.	

P093	Range	1000 ÷ 1100	1.0 ÷ 1.2
Instant Undervoltage Release Ratio	Default	1060	
	Level	ADVANCED	
	Address	693	
	Function	Sets the ratio between the trip threshold of the instant undervoltage fault and the value at which the instant undervoltage fault is reset.	

P094	Range	1 ÷ 1000	0.001 ÷ 1.000 s
Instant Undervoltage Trip Time	Default	5	
	Level	ADVANCED	
	Address	694	
	Function	Time during which the trip condition of the instant overvoltage must be maintained to prompt the activation of the grid instant undervoltage fault.	

P095	Range	1 ÷ 1000	0.001 ÷ 1.000 s
Instant Undervoltage Reset Time	Default	10	
	Level	ADVANCED	
	Address	695	
	Function	Time during which the trip condition of the instant overvoltage must be maintained to prompt the reset of the grid instant undervoltage fault.	

P096	Range	10 ÷ 300	[0.1 ÷ 3.00] Hz
Maximum Frequency Trip Threshold	Default	30 (Italy), 10 (Spain), 20 (Germany)	
	Level	ADVANCED	
	Address	696	
	Function	This parameter sets the maximum value of the frequency offset in respect to the nominal value at which the grid maximum frequency fault trips.	

P097	Range	995 ÷ 1100	0.995 ÷ 1.1
Maximum Frequency Release Ratio	Default	998	
	Level	ADVANCED	
	Address	697	
	Function	Sets the ratio between the trip frequency of the maximum frequency fault and the value at which the maximum frequency fault is reset.	

P098	Range	40 ÷ 1000	0.040 ÷ 1.000 s
Maximum Frequency Trip Time	Default	50 (Italy), 50 (Spain), 150 (Germany)	
	Level	ADVANCED	
	Address	698	
	Function	Time during which the trip condition of the maximum frequency must be maintained to prompt the activation of the grid maximum frequency fault.	

P099	Range	0 ÷ 32000	0.0 ÷ 320.0 s
Maximum Frequency Reset Time	Default	10 (Italy), 10 (Spain), 3000 (Germany)	
	Level	ADVANCED	
	Address	699	
	Function	Time during which the reset condition of the maximum frequency must be maintained to reset the grid maximum frequency fault.	

P100	Range	-300 ÷ -10	[-3 ÷ -0.1] Hz
Minimum Frequency Trip Threshold	Default	-30 (Italy), -200 (Spain), -250 (Germany)	
	Level	ADVANCED	
	Address	700	
	Function	This parameter defines the maximum value of the frequency offset in respect to the nominal value at which the grid minimum frequency fault trips.	

P101	Range	1000 ÷ 1006	1.000 ÷ 1.006
Minimum Frequency Release Ratio	Default	1002	
	Level	ADVANCED	
	Address	701	
	Function	Sets the ratio between the trip frequency of the minimum frequency fault and the value at which the minimum frequency fault is reset.	

P102	Range	40 ÷ 5000	0.040 ÷ 5.000 s
Minimum Frequency Trip Time	Default	50 (Italy), 3000 (Spain), 150 (Germany)	
	Level	ADVANCED	
	Address	702	
	Function	Time during which the trip condition of the minimum frequency must be maintained to prompt the activation of the grid minimum frequency fault.	

P103	Range	0 ÷ 32000	0.0 ÷ 320.0 s
Minimum Frequency Reset Time	Default	10 (Italy), 10 (Spain), 3000 (Germany)	
	Level	ADVANCED	
	Address	703	
	Function	Time during which the reset condition of the minimum frequency must be maintained to reset the minimum frequency fault.	

P114	Range	0 ÷ 1	0: Inactive 1: Active
Minimum Percentage of DV606 Instant Voltage	Default	15	
	Level	ADVANCED	
	Address	714	
	Function	Threshold percentage for instant voltage fault.	

Menu	GRID EVENTS	
Submenu	**Access Level**	**Action**
P108 – GRID OVERVOLTAGE EVENT MASK Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter 0 or 1 to set the desired status.
P109 – GRID UNDERVOLTAGE EVENT MASK Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter 0 or 1 to set the desired status.
P110 – GRID MINIMUM VOLTAGE EVENT MASK Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter 0 or 1 to set the desired status.
P111 – GRID MAXIMUM VOLTAGE EVENT MASK Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter 0 or 1 to set the desired status.
P112 – GRID RMS EVENT MASK Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter 0 or 1 to set the desired status.
P113 – FREQUENCY KO EVENT MASK Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter 0 or 1 to set the desired status.

Table 23: Tools menu, Advanced Configuration > Grid > Grid Events

P108	**Range**	0 ÷ 1	0: Inactive 1: Active
Grid Overvoltage Event Mask	**Default**	1	1: Active
	Level	ADVANCED	
	Address	708	
	Function	Sets the activation status of the grid overvoltage event.	

P109	**Range**	0 ÷ 1	0: Inactive 1: Active
Grid Undervoltage Event Mask	**Default**	1	1: Active
	Level	ADVANCED	
	Address	709	
	Function	Sets the activation status of the grid undervoltage event.	

P110	**Range**	0 ÷ 1	0: Inactive 1: Active
Grid Minimum Voltage Event Mask	**Default**	1	1: Active
	Level	ADVANCED	
	Address	710	
	Function	Sets the activation status of the grid minimum voltage event.	

P111	**Range**	0 ÷ 1	0: Inactive 1: Active
Grid Maximum Voltage Event Mask	**Default**	1	1: Active
	Level	ADVANCED	
	Address	711	
	Function	Sets the activation status of the grid maximum voltage event.	

P112	**Range**	0 ÷ 1	0: Inactive 1: Active
Grid RMS Event Mask	**Default**	1	1: Active
	Level	ADVANCED	
	Address	712	
	Function	Sets the activation status of the “grid RMS value exceeding the allowable” range.	

P113	**Range**	0 ÷ 3	0: Inactive 1: Active (minimum frequency) 2: Active (maximum frequency) 3: Active (both)
Frequency KO Event Mask	**Default**	3	3: Active (both)
	Level	ADVANCED	
	Address	713	
	Function	Sets the activation status of the “frequency exceeding the allowable range” event.	

Menu	**ENERGY**	
Submenu	**Access Level**	**Action**
P132 – ENERGY MEASURE CORRECTION Displays the value of the energy measure correction parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value.
P135L – FISCAL METER L PRESET Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value.
P135H – FISCAL METER H PRESET Displays the value currently set for the parameter	ADVANCED	Activates an alphanumeric keypad window. Enter the desired value.

Table 24: Tools menu, Advanced Configuration > Grid > Energy

P132	**Range**	750 ÷ 1500	0.75 ÷ 1.50
Energy Measure Correction	**Default**	1000	1
	Level	ADVANCED	
	Address	732	
	Function	The value set in this parameter rectifies the measure of the energy produced by the inverter. This measure is multiplied by the set value. In that way, the energy measure is the same as the measure of the PV plant fiscal meter.	

P135L	Range	0 ÷ 9999	0 ÷ 9999 Wh
Fiscal Meter L Preset	Default	0	0
	Level	ADVANCED	
	Address	735	
	Function	Start value for the computation of the energy produced by the inverter. This parameter is to be matched with P135H to obtain the desired value based on P135H*10000 + P135L formula.	

P135H	Range	0 ÷ 10000	0 ÷ 10000 * 10 kWh
Fiscal Meter H Preset	Default	0	0
	Level	ADVANCED	
	Address	736	
	Function	Start value for the computation of the energy produced by the inverter. This parameter is to be matched with P135L to obtain the desired value based on P135H*10000 + P135L formula.	

4.3.5.4. Commands Menu

Menu	 COMMANDS	
Submenu	**Access Level**	**Action**
AUTOTEST	BASIC	Displays the following: – I030 – TEST VMIN – I031 – TEST VMAX – I032 – TEST FMIN – I033 – TEST FMAX Each item activates a run command window. For any details on the grid interface Autotest commands, see section 5.4.
L500 – HISTORY RESET	BASIC	Activates a run command window. Press the Run Command button and wait for the success message.
RST – INVERTER RESET	ADVANCED	Activates a run command window: – NO COMMAND – RESET INVERTER
L011 – DISPLAY RESET	BASIC	Activates a run command window. Press the Run Command button and wait for the success message.
OFF – INVERTER POWER OFF	ADVANCED	Activates a run command window. Press the Run Command button and wait for the success message.
I002 – PARTIAL ENERGY RESET	ADVANCED	Activates a list window. Select: – INACTIVE – ACTIVE
I004 – WEAK RADIATION EVENTS RESET	ADVANCED	Activates a list window. Select: – INACTIVE – ACTIVE
I012 – EEPROM OPERATION	ADVANCED	– Activates a list window. Select one of the following: – NO COMMAND – RESTORE BACKUP – SAVE WORK – RESTORE DEFAULT

Table 25: Tools menu, Commands submenu

I002	Range	0 ÷ 1	0: Inactive 1: Active
Partial Energy Reset	Default	0	0: Inactive
	Level	ADVANCED	
	Address	1389	
	Function	Resets the partial active energy meter (**M011)**.	

I004	Range	0 ÷ 1	0: Inactive 1: Active
Weak Radiation Events Reset	Default	0	0: Inactive
	Level	ADVANCED	
	Address	1391	
	Function	Resets the Radiation KO events counter (**M016)**.	

I012	Range	0 ÷ 4	0: No Command 1: Restore Backup 3: Save Work 4: Restore Default
EEPROM Operations	Default	This is not a parameter: I012 is set to zero at power on and whenever the command is executed.	
	Level	ADVANCED	
	Address	1399	
	Function	This parameter allows managing the storage and restoration of the whole set of parameters that can be accessed by the user: **1**: **Restore Backup**: The parameters stored in the Backup zone are copied and stored to the WORK zone, where they serve as the new RAM parameterization; the previous data of the Work zone are cleared. **Backup → RAM → Work.** **3**: **Save Work**: The current values of the parameters in the RAM are saved to the non-volatile memory in the Work zone. All parameters are saved at a time. **RAM → Work.** **4**: **Restore Default**: Factory-setting values are restored for all parameters, and the factory-setting values are stored to the non-volatile memory in the Work zone. **Default → RAM → Work.**	

L011	Range	N/A
Display Reset	Default	N/A
	Level	BASIC
	Function	This is a command. Enables restarting the touchscreen display.

I030	Range	0 ÷ 1	0: Inactive 1: Active
Test V Min	Default	0	0: Inactive
	Level	ADVANCED	
	Address	1417	
	Function	This parameter enables testing the activation of the grid minimum voltage threshold as required by the Italian regulations in force governing Low Voltage grids.	

I031	Range	0 ÷ 1	0: Inactive 1: Active
Test V Max	Default	0	0: Inactive
	Level	ADVANCED	
	Address	1418	
	Function	This parameter enables testing the activation of the grid maximum voltage threshold as required by the Italian regulations in force governing Low Voltage grids.	

I032	Range	0 ÷ 1	0: Inactive 1: Active
Test f Min	Default	0	0: Inactive
	Level	ADVANCED	
	Address	1419	
	Function	This parameter enables testing the activation of the grid minimum frequency threshold as required by the Italian regulations in force governing Low Voltage grids.	

I033	Range	0 ÷ 1	0: Inactive 1: Active
Test f Max	Default	0	0: Inactive
	Level	ADVANCED	
	Address	1420	
	Function	This parameter enables testing the activation of the grid maximum frequency threshold as required by the Italian regulations in force governing Low Voltage grids.	

L500	Range	N/A
History Reset	Default	N/A
	Level	BASIC
	Function	This command resets the display history data. This command permanently deletes the history data saved on the display.

OFF	Range	0 ÷ 1	0: Inactive 1: Active
Inverter Power Off	Default	0	0
	Level	ADVANCED	
	Address	1406	
	Function	This parameter powers off the inverter. This parameter may be changed only if the inverter is not delivering energy. Press the WAKE UP button to power on the inverter again. Alternatively, the inverter will automatically power on again when the morning comes.	

RST	Range	0, 34	0: No command 34: Reset inverter
Inverter Reset	Default	0	0
	Level	ADVANCED	
	Address	50	
	Function	This is a command. Resets the control electronics of the inverter without affecting the touchscreen display functionality.	

4.3.5.5. Service Submenu

The **Advanced Configuration > Service** submenu in the Tools menu comprises parameters reserved to the Customer Service of Elettronica Santerno SpA.

4.3.6. Alarms Menu

When a safety device or an alarm trips, the inverter STOPS; the connection to the electric grid of the output power and the current delivery are inhibited.

CAUTION

When an alarm message is displayed, find the cause responsible for the alarm before restarting the equipment.

When a protection or an alarm trips, the inverter operation is disabled.

NOTE

Carefully read the following sections before operating on the inverter.

The alarms that are automatically reset do not let the inverter quit the run mode. Consequently, once the cause responsible for the alarm is reset, alarms are automatically reset and the inverter will run without having to press the **START** button.

The alarm condition is displayed on the touchscreen display of the inverter through a pop up window similar to the screen shown in Figure 70.

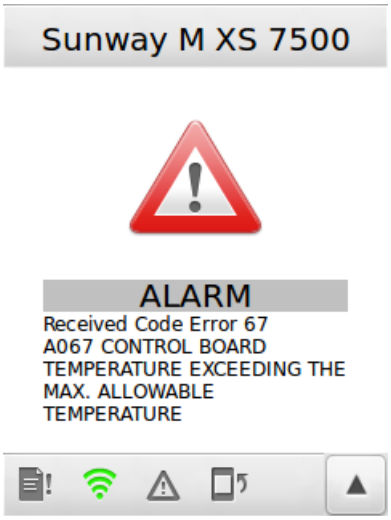


Figure 70: Example of an alarm screen

When an alarm trips, the inverter stores to the “ALARM HISTORY” the instant when the alarm is triggered (supply time and operation time), the inverter status and the value of the most important measures (see Table 27) sampled when the alarm has tripped. Reading and storing those data items may help find the triggering cause and reset the alarm. The alarm history keeps track of the last 6 alarms tripped. The section below describes the alarm conditions that can occur.

The Alarms menu enables resetting the alarms tripped. Press the Alarms icon ( ) from the status bar to access the Alarms menu.

Menu	Alarms	
Submenu	**Access Level**	**Action**
M089 – INVERTER STATUS Displays the current inverter status	BASIC	Displays detailed information.
M090 – ACTIVE ALARM Displays the active alarm (if tripped)	BASIC	Displays detailed information. See section 4.3.6.1 for information on the displayed value.
ALARM HISTORY Displays the alarm history	BASIC	Displays the following: - **LATEST ALARM** - **ALARM 2** - **ALARM 3** - **ALARM 4** - **ALARM 5** - **ALARM 6** - **ALARM 7** - **ALARM 8** Each item displays the measures given in Table 27 pertaining to the selected alarm.
EVENT HISTORY Displays the event history	BASIC	Displays the following: - **LATEST EVENT** - **EVENT 2** - **EVENT 3** - **EVENT 4** - **EVENT 5** - **EVENT 6** - **EVENT 7** - **EVENT 8** Each item displays the measures given in Table 27 pertaining to the selected event.
L013 – ALARM RESET Resets the alarm condition and restores the normal operation of the inverter	BASIC	Activates a run command window. Press the Run Command button. Messages relating to the execution of the command will be displayed.

Table 26: Alarms Menu

Alarm History Measure	Event History Measure	Description
FL0x	**EL0x**	Alarm Code
FL0xa	**EL0xa**	Supply Time
FL0xb	**EL0xb**	Operation Time
FL0xc	**EL0xc**	Inverter Status
FL0xd	**EL0xd**	Field Voltage
FL0xe	**EL0xe**	MPPT Reference
FL0xf	**EL0xf**	Grid Frequency
FL0xg	**EL0xg**	Grid 2 Status
FL0xh	**EL0xh**	Grid Voltage
FL0xi	**EL0xi**	Grid Current
FL0xl	**EL0xl**	Grid 1 Status
FL0xm	**EL0xm**	IGBT Fault Type, Side A
FL0xn	**EL0xn**	Grid PLL Status
FL0xo	**EL0xo**	Voltage between PE and PV-
FL0xp	**EL0xp**	Internal Temperature
FL0xq	**EL0xq**	Heatsink Temperature
FL0xr	**EL0xr**	Field Current
FL0xs	**EL0xs**	Inverter Current
FL0xt	**EL0xt**	Digital Input Status
FL0xu	**EL0xu**	Digital Output Status
FL0xv	**EL0xv**	Power to Grid

Table 27: Measures in the Alarm History

4.3.6.1. List of the Alarms

NOTE

Alarms **A001** to **A032** are triggered by the main microcontroller (DSP Motorola) of the control board when it detects a malfunction of the control board. These alarms are not stored to the alarm history, but may be reset by the **L013 – ALARM RESET** in the **Alarms Menu**.
Alarms **A033** to **A039** trip when incorrect software is loaded to the Flash memory. They may not be reset. The only remedy to these alarms is downloading the correct software.

The SUNWAY M XS alarms are listed in Table 28. The alarm codes in the table are displayed by **M090** in the Alarms menu and may be stored to the first item in every record of the Alarm History.

Alarm	Description
A040	Procedure failure
A041	PWM A failure (control board failure)
A043	False interrupt (control board failure)
A044	Overcurrent detected by the system software
A047	False shutdown
A048	DC Overvoltage detected by the system software
A051	Overcurrent protective device
A053	Hardware failure during PWM A firing (control board failure)
A061	Hardware failure in serial link 0 (control board failure)
A062	Hardware failure in serial link 1 (control board failure)
A063	Motorola microprocessor failure (control board failure)
A067	Internal temperature out of allowable range
A068	PV Field insulation protective device
A071	Interrupt control Hardware failure (control board failure)
A074	Overload power output out of allowable range
A081	Hardware failure in communications between display and control board
A087	Analog power supply failure (control board failure)
A088	ADC Tune failure (control board failure)
A090	PV Field insulation protective device
A091	Interface protection autotest timeout
A092	Incorrect software version
A094	Heatsink temperature out of allowable range
A136	Protection against leakage current instant variations
A137	DC Current injected to the grid out of allowable range
A138	Leakage current protection
A141	Relay test failure
A142	Relay hardware failure during energy delivery
A146	RCD test failure
A149	Control board autotest failure
A150	CAN communication failure
A151	Phase unbalance out of allowable range

Table 28: List of the SUNWAY M XS Alarms

A001÷A032		
	Description	Failure of the control board.
	Event	Multiple causes are possible: the autodiagnostics function of the control board constantly checks its correct operation.
	Possible Causes	Strong electromagnetic conducted disturbance or radiated disturbance. Possible failure of the microcontroller or other circuits in the control board.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A033÷A039	Description	Incompatible Texas software version
	Event	At power on, the Motorola DSP has detected that an incompatible software version has been downloaded to the Texas Flash.
	Possible Causes	A wrong software version has been downloaded.
	Solutions	Download the correct software version. Contact the Customer Service of Elettronica Santerno SpA.

A041	Description	PWM A failure (control board failure)
	Event	Multiple causes are possible: the autodiagnostics function of the control board constantly checks its correct operation.
	Possible Causes	Strong electromagnetic conducted disturbance or radiated disturbance. Possible failure of the microcontroller or other circuits in the control board.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A043	Description	False interrupt (control board failure)
	Event	Multiple causes are possible: the autodiagnostics function of the control board constantly checks its correct operation.
	Possible Causes	Strong electromagnetic conducted disturbance or radiated disturbance. Possible failure of the microcontroller or other circuits in the control board.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A044	Description	Overcurrent detected by the system software.
	Event	Tripping of instant current limiter.
	Possible Causes	Abrupt grid variations. Output short-circuit or earth short-circuit.
	Solutions	Check cable tightening and wiring Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A047	Description	False shutdown failure
	Event	A shutdown command has been sent during energy delivery.
	Possible Causes	Strong electromagnetic conducted disturbance or radiated disturbance. Possible failure of the microcontroller or other circuits in the control board.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A048	Description	DC Overvoltage detected by the system software
	Event	The field voltage has exceeded the maximum allowable threshold (855 V) for the safe operation of the inverter.
	Possible Causes	PV generator incompatible with the amplitude of the SUNWAY M XS input voltage. Failure of the DC-bus voltage measuring circuit. Inverter failure.
	Solutions	Check the value of the measured DC-bus voltage (**M000)**. Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A051	Description	Hardware overcurrent
	Event	The circuit measuring the inverter output current has detected a hardware overcurrent event.
	Possible Causes	Abrupt grid variations. Output short-circuit or earth short-circuit. Strong electromagnetic conducted disturbance or radiated disturbance.
	Solutions	Check that the inverter is properly dimensioned in respect to the power ratings of the PV Field. Make sure that there are no short-circuits between two phases or between one phase and the earth at the inverter output. Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A053	Description	Hardware failure. Impossible to power on IGBT A.
	Event	The Motorola Microcontroller prompted the IGBT to power on, but the request was unsuccessful.
	Possible Causes	Control board failure.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A061	Description	Hardware failure in serial link 0 (control board failure)	Disabled as a factory setting.
	Event	The communications watchdog of the serial link has tripped. Communication is cut-off: no read/write queries have been sent to the serial link for a time longer than the time set for the serial link watchdog time (see 4.3.4.3).	
	Possible Causes	Disconnection from the serial link. Communication cut-off caused by the remote Master. Too short watchdog times.	
	Solutions	Check the serial link. Make sure that the remote Master ensures a continuous sequence of write/read queries with max intervals between two queries shorter than the preset watchdog time. Increase the serial link watchdog times (**R005**). Reset the alarm (4.3.6.2).	

A062	Description	Hardware failure in serial link 1 (control board failure)
	Event	The communications watchdog of the serial link between the touchscreen display and the control board has tripped.
	Possible Causes	Disconnection of the serial link internal to the product. Communication cut-off caused by the touchscreen display. Fault of the touchscreen display.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A063	Description	Motorola microprocessor error (control board failure)
	Event	Multiple causes are possible: the autodiagnostics function of the control board constantly checks its correct operation.
	Possible Causes	Strong electromagnetic disturbance. Possible failure of the microcontroller or other circuits in the control board.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A067	Description	Control board temperature exceeding the max allowable temperature.
	Event	The temperature value measured on the control board is higher than the max allowable temperature.
	Possible Causes	The environment where the inverter is installed is subject to excessively high temperatures. The inverter has been installed in direct sunlight. The inverter cooling fans are faulty.
	Solutions	Check if warnings pertaining to the fan faults are displayed (4.3.7). Check the pattern of the internal temperature (**M057)**. Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A068	Description	Isolation fault of the PV field.
	Event	The circuit measuring the isolation between the PV field and the earth has detected an impedance value lower than the allowable value.
	Possible Causes	Isolation loss between the PV field and the earth.
	Solutions	Decouple the PV field from the inverter and check if short-circuits or low-impedance paths occur between the PV field and the earth. Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A071	Description	Hardware malfunction of the control board.
	Event	Multiple causes are possible: the autodiagnostics function of the control board constantly checks its correct operation.
	Possible Causes	Strong electromagnetic disturbance. Possible failure of the microcontroller or other circuits in the control board.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A074	Description	Overload error. The power delivered by the inverter has exceeded the allowable range.
	Event	The output current has exceeded the max continuous output current for an exceedingly long time.
	Possible Causes	Sudden grid variations. Output short circuit or earth short-circuit.
	Solutions	Reset the alarm (4.3.6.2). Check the current delivered by the inverter (**M006**) during normal operation. If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A081	Description	Hardware failure in communications between the touchscreen display and the control board.
	Event	Communications failure with the touchscreen display.
	Possible Causes	Disconnection of the touchscreen display internal to the product. One of the two connectors of the touchscreen display is faulty. Touchscreen display failure.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A087	Description	Power supply hardware failure (control board malfunction)
	Event	Multiple causes are possible: the autodiagnostics function of the control board constantly checks its correct operation.
	Possible Causes	Strong electromagnetic disturbance. Possible failure of the microcontroller or other circuits in the control board.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A088	Description	ADC calibration error (control board malfunction)
	Event	Multiple causes are possible: the autodiagnostics function of the control board constantly checks its correct operation.
	Possible Causes	Strong electromagnetic disturbance. Possible failure of the microcontroller or other circuits in the control board.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A090	Description	Interface protection autotest error
	Event	The interface protection autotest failed.
	Possible Causes	Grid disturbance during autotest procedure. Failure in the grid frequency and voltage measuring circuits.
	Solutions	Repeat autotest. If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A091	Description	Interface protection autotest timeout
	Event	The interface protection autotest procedure has not been completed.
	Possible Causes	Grid disturbance during autotest procedure. Failure in the grid frequency and voltage measuring circuits.
	Solutions	Repeat autotest. If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A092	Description	Incorrect software version
	Event	Multiple causes are possible: the autodiagnostics function of the control board constantly checks its correct operation.
	Possible Causes	Strong electromagnetic disturbance. Possible failure of the microcontroller or other circuits in the control board.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A094	Description	The temperature detected on the IGBT heatsink is exceedingly high
	Event	Power heatsink overheated.
	Possible Causes	The environment where the inverter is installed is subject to excessively high temperatures. The inverter has been installed in direct sunlight. The inverter cooling fans are faulty.
	Solutions	Check if warnings pertaining to the fan faults are displayed (4.3.7). Check the pattern of the heatsink temperature (**M059)**. Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A136	Description	Protection against leakage current instant variations
	Event	Instant variations of the leakage current exceeding the maximum allowable variations. The leakage current variation has been at the maximum value of 30 mA for 300 ms. The leakage current variation has been at the maximum value of 60 mA for 150 ms. The leakage current variation has been at the maximum value of 150 mA for 40 ms.
	Possible Causes	Sudden variations of the grid. Output short-circuit or earth short-circuit. Accidental contact of foreign matters with the power cables.
	Solutions	Check wiring. Decouple the PV field from the inverter and check if short-circuits or low-impedance paths occur between the PV field and the earth. Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A137	Description	DC Current injected to the grid out of allowable range
	Event	The DC current to grid detected by the inverter is too high.
	Possible Causes	Sudden variations of the grid. Output short-circuit or earth short-circuit.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A138	Description	Leakage current protection
	Event	The leakage current to earth has exceeded the maximum allowable current. The current to earth has exceeded 300 mA (RMS).
	Possible Causes	PV field isolation loss to earth. Increase of the parasitic capacitance of the PV plant due to adverse weather conditions (rain, snow, high humidity).
	Solutions	Reset the alarm (4.3.6.2). Do the following if the alarm persists after energy delivery is restored or alarm **A068** trips: Check if warnings pertaining to the fan faults are displayed (4.3.7). Decouple the PV field from the inverter and check if short-circuits or low-impedance paths occur between the PV field and the earth. Decouple the PV field from the inverter and check if high capacitive values are to be found between each pole of the PV field and the earth. Capacitive values over 10uF normally trigger alarm **A138**. If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A141	Description	Relay test failure
	Event	Relay malfunction detected during the test performed before delivering energy.
	Possible Causes	One or multiple relays faulty. Relay diagnostic circuit failure.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A142	Description	Relay hardware failure during energy delivery
	Event	Relay malfunction detected while the inverter is delivering energy.
	Possible Causes	One or multiple relays faulty. Relay diagnostic circuit failure.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A146	Description	RCD test failure
	Event	Malfunction of the integrated residual current device (RCD) detected during the test performed before delivering energy.
	Possible Causes	Integrated RCD fault. Failure in the integrated RCD diagnostic circuit.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A149	Description	Control board autotest failure
	Event	Multiple causes are possible: the autodiagnostics function of the control board constantly checks its correct operation.
	Possible Causes	Strong electromagnetic disturbance. Possible failure of the microcontroller or other circuits in the control board.
	Solutions	Contact the Customer Service of Elettronica Santerno SpA.

A150	Description	CAN communication failure
	Event	CAN communication failure detected during normal operation.
	Possible Causes	Strong electromagnetic disturbance. Possible cable disconnection.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

A151	Description	Phase unbalance out of allowable range
	Event	Phase unbalance out of allowable range has been detected during normal operation.
	Possible Causes	One string is in the shade and is underproducing energy. One string is faulty and is underproducing energy. One of the inverters if faulty and is not delivering energy.
	Solutions	Reset the alarm (4.3.6.2). If the alarm persists, contact the Customer Service of Elettronica Santerno SpA.

4.3.6.2. What to Do when an Alarm Trips

Read and make a note of the data items displayed for the alarm tripped from the **ALARM HISTORY**.

Those data items are very useful to identify the cause responsible for the alarm and to find possible solutions.

The alarm data items are also required if you need to contact the Customer Service of Elettronica Santerno SpA.

1. The following pages provide a description of the alarms. Look for the section related to the alarm code you noted down and follow the instructions given.
2. Remove the external causes that triggered the protection.
3. Reset the alarm.
4. Press **START**.
5. If the alarm condition persists and no solution can be found, please contact the Customer Service of Elettronica Santerno SpA.

An **ALARM RESET** command is required to reset an alarm tripped by accessing the Alarms menu from the touchscreen display. Do the following:

- Select the **Alarms** ( ) icon from the start menu;
- Select **L013 – ALARM RESET**; the screen below appears:

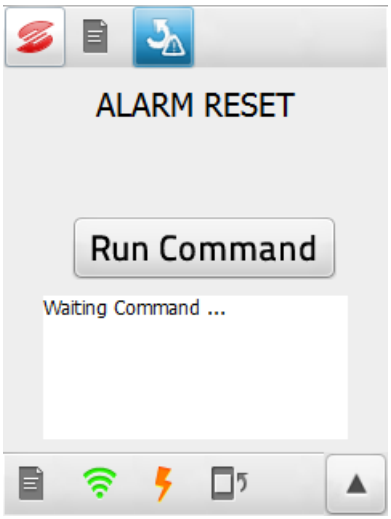


Figure 71: ALARM RESET screen

- Press the Run Command button;
- Wait for the success message;
- Quit the run command window by pressing the return button in the bottom-right corner ( ).

In summary:

*Select the **Alarms** icon* | *Select **L013 – ALARM RESET*** | *Press the **Run Command** button* | *Wait for the success message and quit by pressing the return button*

The SUNWAY M XS inverters implement the Autoreset function; this means that the inverter tries to automatically restart when an alarm trips. The factory setting is four restart attempts. If the alarm persists even after 4 restart attempts, the inverter enters an emergency condition that requires being reset by the user. Multiple identical records may be stored to the Alarm History, because the alarms tripped are stored even when the Autoreset function is activated.

4.3.7. Status Menu

The Status Menu displays the information on the inverter operating conditions.

An example of a Status window is shown below.

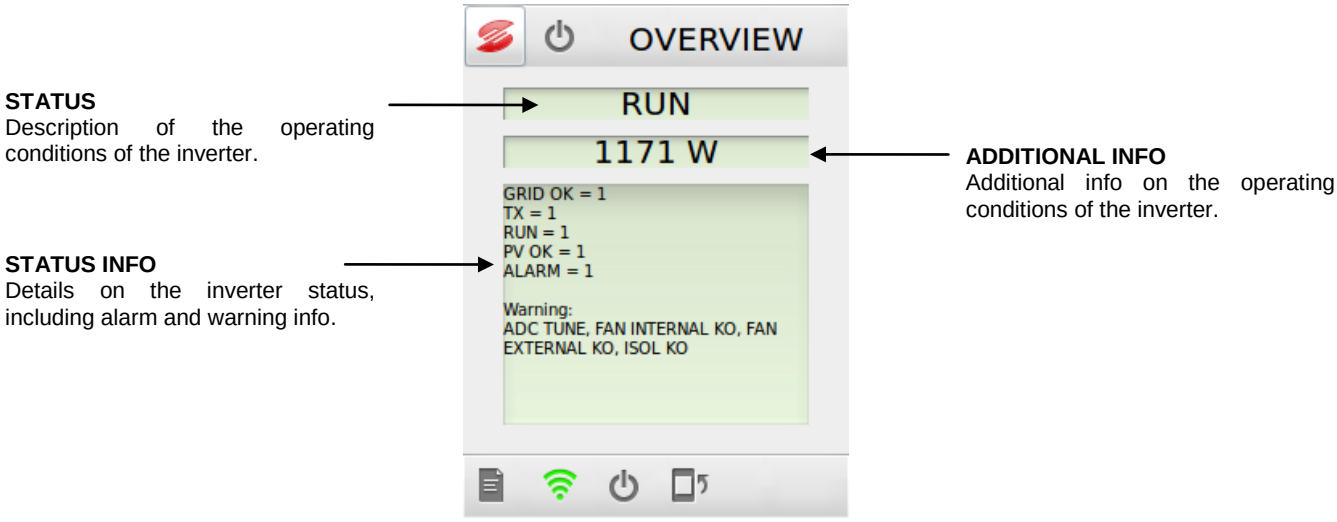


Figure 72: Example of a status window

More details on the Status icon are given in section 4.1.3.

4.3.7.1. Status Conditions

The status conditions of the inverter are as follows:

Status message	M089	Description
DISCONNECT SWITCH OFF	101	The integrated disconnect switch is in OFF position. The inverter is waiting for the disconnect switch to switch to ON.
STOP	102	The inverter is stopped. The inverter is in STOP status when: o it is at its first startup; o the **STOP** button has been pressed from the graphic interface module. The inverter quits this status only after the **START** button is pressed from the front panel.
PROTECTIVE DEVICE TEST	104	The inverter is testing the integrated grid coupling device.
POWER DELIVERY	106	The inverter is operating in parallel to the grid and is delivering power. While the inverter is in this status, the *Additional Info* field displays the power being delivered.
DECOUPLING	107	The inverter has opened the integrated grid coupling device and is no longer operating in parallel to the grid.
INITIALIZATION	108	The inverter is initializing.
LIMITATION	109	The inverter is limiting. Limiting causes are the inverter internal temperature (**M057**) and the heatsink temperature (**M059**).
SENSOR TEST	111	The inverter is testing the integrated current sensors.
INSULATION TEST	112	The inverter is performing the earth insulation test of the PV field.
RELAY TEST	113	The inverter is performing the insulation test of the integrated grid coupling device.
ALARM	116	An alarm has tripped, that cannot be autoreset. While the inverter is in the Alarm status, the *Additional Info* field displays the code of the alarm tripped.
ALARM (R)	117	An autoresettable alarm has tripped. While the inverter is in the Alarm (R) status, the *Additional Info* field displays the code of the alarm tripped.
RESET	118	The alarm has been reset by the user or by the autoreset function. The inverter is restarting.
START TIMEOUT	120	The field voltage detected by the inverter is higher than the value set in **P020**. The inverter is waiting for the time set in **P021** to elapse before connecting in parallel to the grid and start producing power. While the inverter is in the Start Timeout status, the *Additional Info* field shows the timeout countdown.
MIN GRID STAND-BY	121	The grid voltage detected by the inverter is lower than the minimum allowable value.
MAX GRID STAND-BY	122	The grid voltage detected by the inverter is higher than the maximum allowable value.
FREQ GRID STAND-BY	123	The grid frequency detected by the inverter is out of the allowable range.
SYNCHRO STAND-BY	124	The inverter is synchronising with the grid.
GRID TIMEOUT	125	The grid values are in the allowable range. The inverter is waiting for the preset timeout (5s) to elapse before connecting in parallel to the grid and start producing power. While the inverter is in the Grid Timeout status, the *Additional Info* field shows the timeout countdown.

Status message	M089	Description
OVERLOAD	126	The current delivered by the inverter has been higher than the nominal current for an exceedingly long time. The Overload condition will last for 15 minutes, then normal operation will be resumed. While the inverter is in the Overload status, the *Additional Info* field shows the timeout countdown.
WEAK SOLAR RADIATION	130	The grid voltage is lower than the value set in **P020**. The Weak Solar Radiation condition will last until the field voltage exceeds the set threshold.
MAX FIELD STAND-BY	131	Field voltage out of the allowable range.
POWER OFF	134	The inverter is powering off after it has been detecting a field voltage lower than the value set in **P020** for the time set in **P041**.

Table 29: Status messages for the SUNWAY M XS inverters

4.3.7.2. Status Info

The *Status Info* field lists important operating conditions for the inverter operation:

- GRID OK, when the grid voltage is in the allowable range for the inverter operation;
- FIELD OK, when the field voltage is in the allowable range for the inverter operation (voltage exceeding the value set in **P020**);
- MPPT ON, when the MPPT function is activated;
- RUN, when the inverter is producing energy.

4.3.7.3. Warnings

Warnings are service messages addressed to the user and are displayed in the *Status Info* field in the inverter Status window. When a warning appears, the Status window will include the “Warning” wording followed by the active warnings.

Figure 73: Example of a warning

NOTE Warnings are neither protections nor alarms and are not stored to the Alarm History.

Warning Message	Causes of the Warning
ADC TUNE ERROR	The tuning procedure of the analog-digital converters has failed.
INTERNAL FAN FAULT	The inverter has detected an internal fan fault. Reset the inverter. If the problem persists, contact the Customer Service of Elettronica Santerno SpA. The inverter does not stop, but performance will be affected by the high ambient temperature.
EXTERNAL FAN FAULT	At least one of the external fans is faulty. Reset the inverter. If the problem persists, contact the Customer Service of Elettronica Santerno SpA. The inverter does not stop, but performance will be affected by the high ambient temperature.
VARISTOR FAULT	The varistors integrated into the DC input are faulty because the protection against atmospheric overvoltage has tripped. Reset the inverter. If the problem persists, contact the Customer Service of Elettronica Santerno SpA.. The inverter does not stop, but the IP rating is adversely affected due to lack of integrity of the product.
FIELD VOLTAGE LIMITING	The inverter is in limiting mode because the field voltage is higher than the maximum MPPT voltage.
POWER BALANCE LIMITING	The inverter is in limiting mode due to the activation of the power balance function (5.3).
OVERTEMPERATURE LIMITING	The inverter is in limiting mode because the internal temperature (**M057**) or the heatsink temperature is out of the allowable range.
APPARENT POWER LIMITING	The inverter is in limiting mode due to the current settings of the reactive power control (**Settings > Advanced Configuration > Inverter** submenu, 4.3.5.3)

MWRN	Range	0 ÷ 65535	N/A
Warning	Address	1456	
	Level	ADVANCED	
	Function	Represents the warning status. The bit interpretation of the value read from the address is as follows: 0: ADC Tune Error 1: Internal Fan Fault 2: External Fan Fault 3: Varistor Fault 4: Field Voltage Limiting 5: Power Balance Limiting 6: Overtemperature Limiting 7: Apparent Power Limiting	

4.3.8. Wi-Fi Status Menu

The Wi-Fi Status menu shows the info relating to the inverter Wi-Fi functionality. The Wi-Fi Status menu displays the activation status of the Wi-Fi functionality, the details of the Wi-Fi connection and the activation status of the Technical Support service.

The figure below shows an example of Wi-Fi Status window.

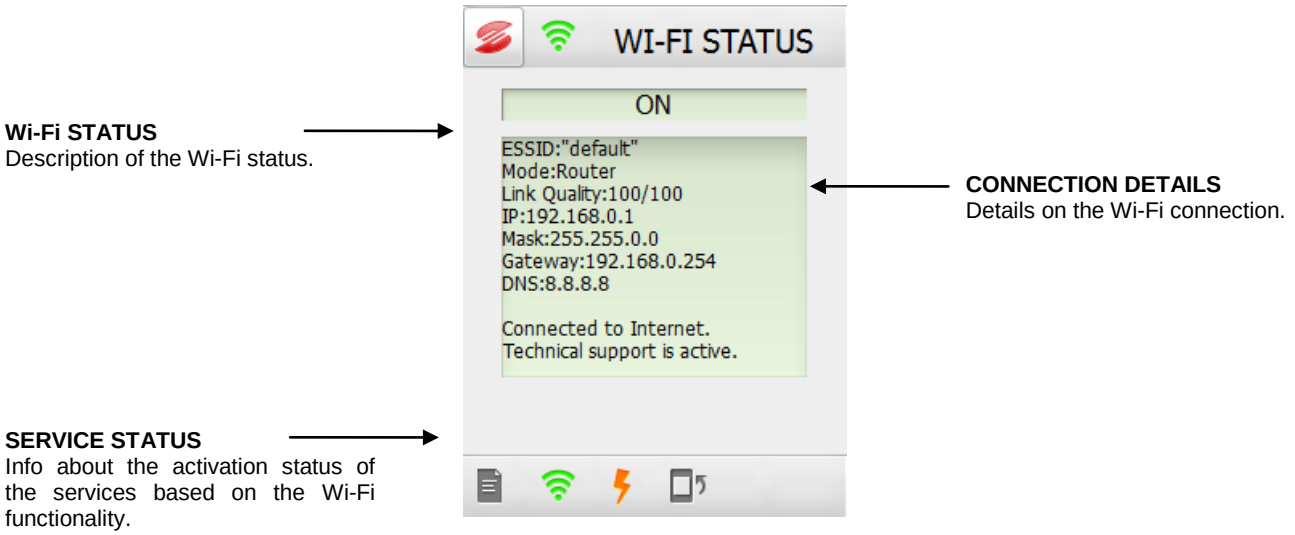


Figure 74: Example of Wi-Fi Status window

4.3.8.1. Wi-Fi Status

The *Wi-Fi Status* window shows the activation status of the Wi-Fi functionality set from the Wi-Fi submenu in the Connectivity menu (4.3.4.1).
The Wi-Fi status icon shows additional brief information about the Wi-Fi connectivity status, as described in section 4.1.3.

4.3.8.2. Connection Details

The *Connection Details* field shows detailed information on the Wi-Fi connection. Information is periodically updated. The following values are displayed:

- **ESSID:** Name of the target Wi-Fi network
- **Mode:** Type of connection that is established, based on the settings in parameter **L305 – TYPE OF CONNECTION**
- **Link quality:** quality of the connection expressed as a percentage.
  - **0/100:** no connection established; the Wi-Fi status icon is grey or red;
  - **1/100 to 10/100:** connection established, low signal; the Wi-Fi status icon is yellow;
  - **11/100 to 100/100:** connection established, good signal; the Wi-Fi status icon is green.
- **IP:** current IP address of the inverter. If the IP address is set to DHCP, the display shows the address assigned by the router to the inverter; if the IP address is set to STATIC (**L307 – IP TYPE**), the display shows the address set by the user.
- **Subnet:** current subnet mask. If the IP address is set to DHCP, the display shows the address assigned by the router to the inverter; if the IP address is set to STATIC (**L302 – SUBNET MASK**), the display shows the address set by the user.
- **Gateway:** current gateway of the inverter. If the IP address is set to DHCP, the display shows the address assigned by the router to the inverter; if the IP address is set to STATIC (**L303 – GATEWAY**), the display shows the address set by the user.
- **DNS:** IP address of the DNS for the URL resolution. The display shows the value set for parameter **L311 – DNS**.

4.3.8.3. Services Status

The **Services Status** field indicates the activation of the services based on the Wi-Fi functionality of the inverter (4.3.4.2). The following messages are displayed:

- **Connected to Internet:** This means that the inverter is correctly connected to the Internet. In that case, data may be correctly sent to Sunwayportal.it and the Technical Support functionality may be activated.
- **Technical Support is active:** This means that the inverter is correctly connected to the Technical Support service, once this has been activated from the Services submenu in the Connectivity menu. In that case, the Customer Service of Elettronica Santerno SpA may operate on the inverter in remote mode.

5. ADVANCED INSTALLATION

The SUNWAY M XS inverters are equipped with interface protective devices, as detailed in the sections below. The connection of the interface protective devices involves advanced installation and is not required for the basic operation of the product.

DANGER **Unless specified otherwise, the operations described in the following sections involve operating on low-voltage connectors. Take any safety measures to avoid contact with live connectors. In any case, avoid operating on the components of the product that are not expressely mentioned in the instructions for advanced installation.**

Accessing the communications devices and the connectors detailed in the following sections may be done without any specific mechanical operation. However, the connector cover may be removed as described in section 3.4.3.1.

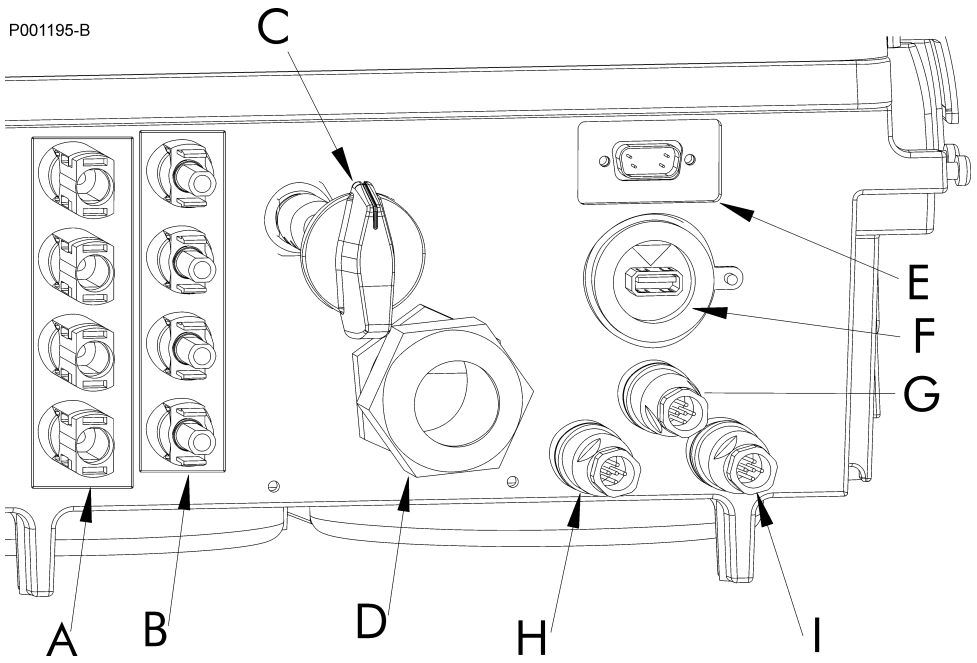


Figure 75: Connection points of the SUNWAY M XS inverter – version with USB connector

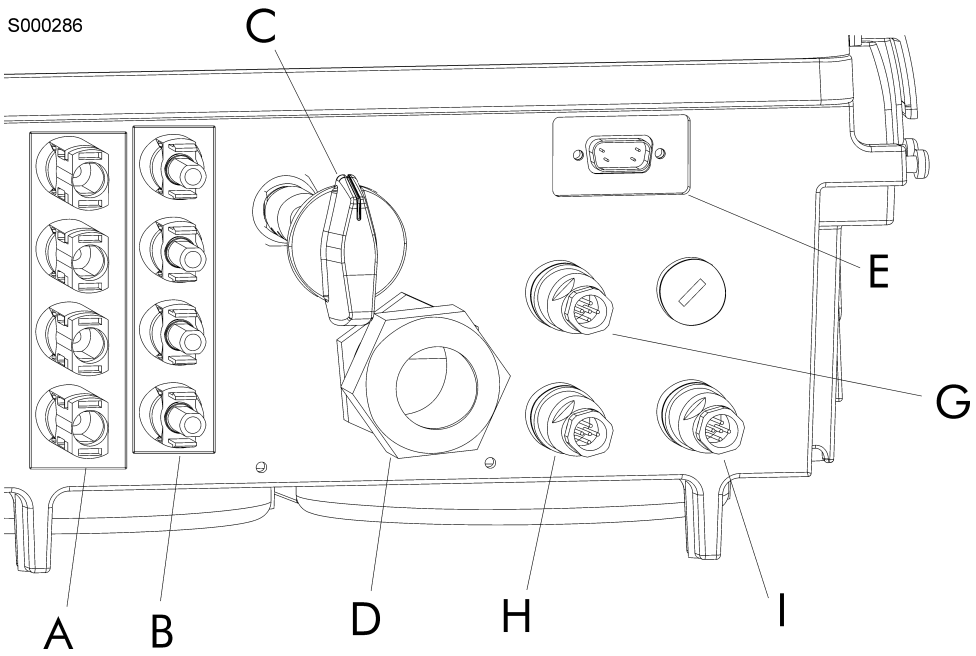


Figure 76: Connection points of the SUNWAY M XS inverter – version without USB connector

Where:

A Quick coupling connectors "+" (female) for the connection of the PV field
B Quick coupling connectors "-" (male) for the connection of the PV field
C PV field disconnect switch (option)
D Cable outlet for the connection to the grid
E D-sub connector for RS485 serial link
F USB port connector
G CAN connector for multi-inverter topology
H Optional connector
I Optional connector

5.1. Serial Communications

5.1.1. General

The inverters of the SUNWAY M XS series can be connected to a PC through a serial link. This allows reading and writing all the parameters normally managed through the touchscreen display as well as the acquisition of the data processed by the inverter.

Up to 247 devices (SUNWAY M XS inverters, ambient signals acquisition systems, etc.) can be connected to the local PC, provided that the Modbus RTU protocol is used. The 3-wire RS485 standard is used, which ensures better immunity to disturbance even on long cable paths, thus limiting communication errors.

The inverter behaves as a slave device (i.e. it can only respond to queries sent by another device); a master device (the PC or a Data Logger board) is then needed to implement serial communications.

The SUNWAY M XS may be connected directly to a computer or a multidrop network of devices (SUNWAY M XS inverters, ambient signals acquisition systems, etc.) controlled by a master PC (see Figure 78).

It is also possible for the user to connect to the PV plant to a remote PC connected to the local PC through a RS485 link, LAN network or Modem on switched telephone line, or via the Internet through the Link service offered by Elettronica Santerno (see Figure 77).

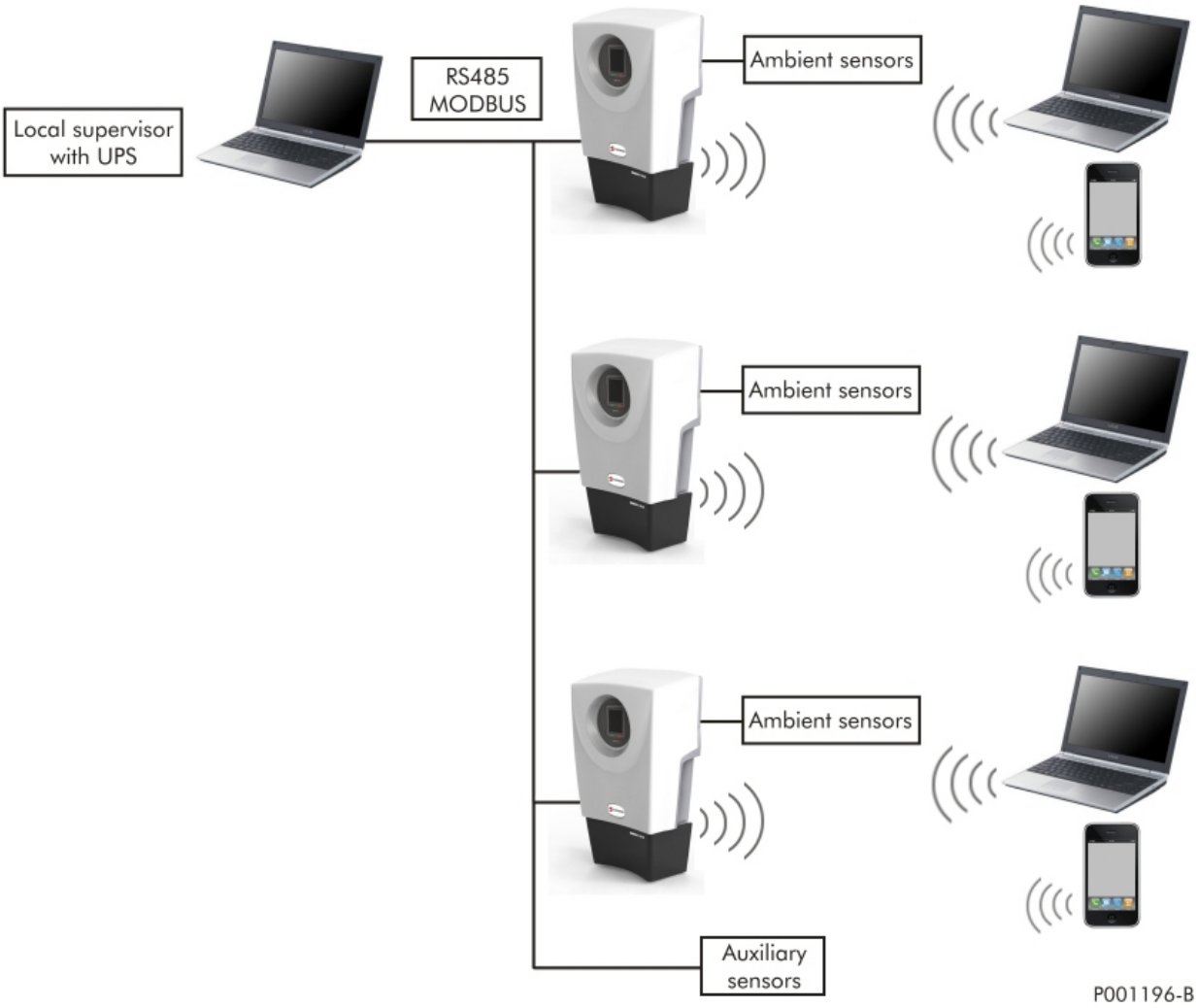


Figure 77: Example of a SUNWAY M XS connected to a communication network

5.1.2. Direct Linking

If a direct linking configuration is chosen, the electrical standard RS485 may be used provided that the PC is equipped with a RS485 port. If the PC is equipped only with a serial RS232-C port or a USB port, as it typically is, a RS232-C/RS485 converter or a USB/RS485 converter is required.

Logic '1' (usually called a 'MARK') means that terminal TX/RX A is positive in respect to terminal TX/RX B (vice-versa for logic '0', usually called a 'SPACE').

5.1.3. Multidrop Connection

The electrical standard RS485 allows the SUNWAY M XS to be connected to a network of inverters, under a multidrop configuration to which the single devices are linked. Up to 247 inverters may be interconnected depending on the link length and transmission rate.

The connection limit of the line drives is actually of 30 devices. If more than 30 devices are to be connected to the same line, or if the line length exceeds 500 m, the line should be broken up into smaller segments using RS485 repeaters.

Each inverter has its own ID number that identifies it univocally in the network mastered by the PC. The ID number can be set from the touchscreen display (see parameter **R001 – Inverter Modbus Address** in Table 13).

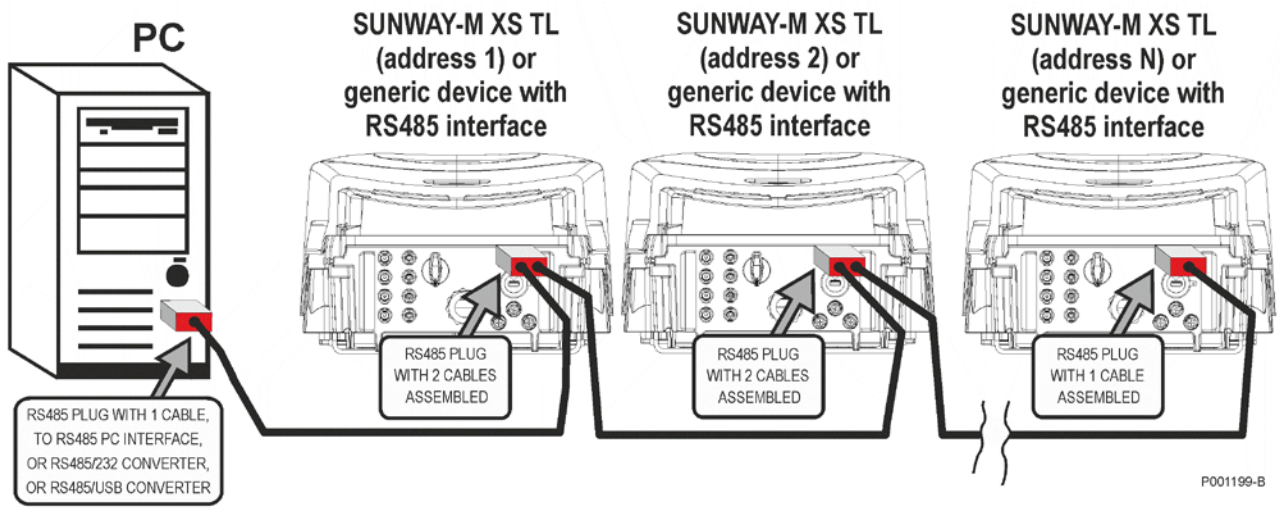


Figure 78: Multidrop network with RS485 connectors

NOTE The "generic device" in Figure 78 may be a SUNWAY M XS inverter or an ambient sensor (e.g. DATELEX 3017 or 3148).

5.1.4. Connection

The 9-pole, male D connector located beneath the front cover of the inverter is to be used to connect to the serial link. See Figure 75 and Figure 77.

The pins-signals matching is given in the table below.

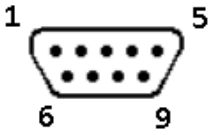
Pins of the DB-9 Connector	Name	Function
1, 3	A-Line	(TX/RX A) Differential input/output A (bidirectional) depending on standard RS485. Positive polarity in respect to pins 2 – 4 for one MARK.
2, 4	B-Line	(TX/RX A) Differential input/output B (bidirectional) depending on standard RS485. Negative polarity in respect to pins 1 – 3 for one MARK.
5	GND	(0 V) Control board zero volts.
6	N.C.	(VTEST) Test power supply input – **Do not connect**
7, 8	GND	Not connected
9	+5V	5V voltage for the connection of external polarization resistors.
PINOUT		

Table 30: DB9 Connector – RS485 Serial port

The metal case of the connector is connected to the inverter grounding. Connect the braid of the shielded duplex cable used for serial communications to the metal case of the female connector that is to be connected to the inverter.

The Modbus-IDA association (http://www.modbus.org) defines the type of connection for Modbus communications over serial link RS485, which is used by the inverter, as a '2-wire cable' configuration. The following specifications are recommended for the cable:

Type of cable	Shielded cable composed of a balanced pair named D1/D0 + common conductor ("Common")
Recommended cable	Belden 3106 (distributed by Cavitec)
Minimum cross-section of the conductors	AWG24 corresponding to 0.25mm^2; for important lengths, cross-sections up to 0.75mm^2 are recommended
Recommended maximum length	500 metres, referred to the max distance measured between any two stations
Characteristic impedance	Greater than 100Ω (recommended), typically 120Ω
Standard colours	Yellow/brown for D1/D0, grey for "Common" signal

Table 31: Specifications of the RS485 serial port

The typical wiring diagram recommended by the Modbus-IDA association for the connection of '2-wire' devices is shown in the figure below.

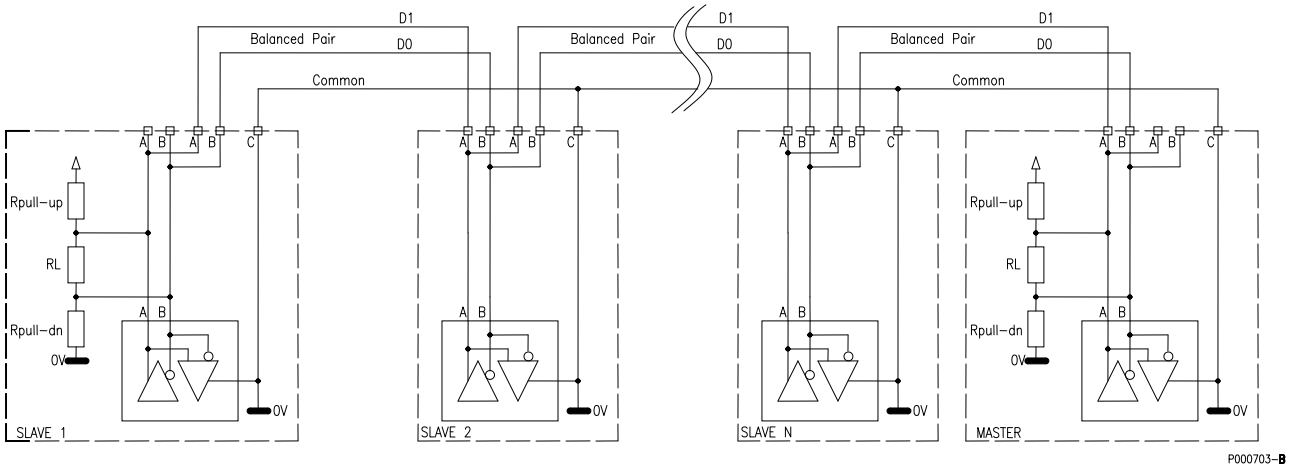


Figure 79: Recommended Modbus wiring diagram for "2-wire" devices

NOTE

It is advisable that all the devices connected to the communication multidrop network be wired sharing their common conductor (0V), to minimize any difference of ground potentials between devices, which may adversely affect communications.

NOTE

The common of the power supply to the inverter control board is isolated from ground. If one or multiple inverters are connected to a communication device with a grounded common (typically a PC), a low-impedance path between control boards and grounding is obtained. High-frequency conducted disturbance coming from the inverter power components could affect this path, causing malfunctions to the communication system.

If this happens, provide the communication system with a galvanically isolated communications interface RS485 or with a galvanically isolated RS485/RS-232 converter.

NOTE

The SUNWAY M XS inverters are not equipped with any termination and polarization resistance.

NOTE

Communication does not take place or is adversely affected if multidrop terminators are not properly set, especially in case of high baud rate.

If more than two terminators are fitted on a line, some drivers can enter the protection mode due to overheating, thus cutting off the communication of some of the connected devices.

RS485 Multidrop line connecting to multiple devices must be wired using a linear wiring (not a star wiring): each device connected to the line has to be reached by the cable coming from the preceding device, and is to be connected to the device coming next on the line. For this purpose, two pins for each line signal are provided on the inverter connector. The incoming line can be connected to pins 1 and 2, whereas the outgoing line can be connected to pins 3 and 4.

Obviously, the first device in the multidrop chain will have only one outgoing line, while the last device will have only one incoming line. Therefore, the line terminator is to be installed on the first device and the last device.

Figure 79 shows the termination diagram only for the devices at the ends of the chain, since the terminator is to be enabled only at them.
If the device at the beginning or at the end of the chain is a SUNWAY M XS inverter, the line termination and polarization must be external to the product. Figure 80 shows the wiring diagram of the termination and polarization resistors connected to the inverter DB9 connector.

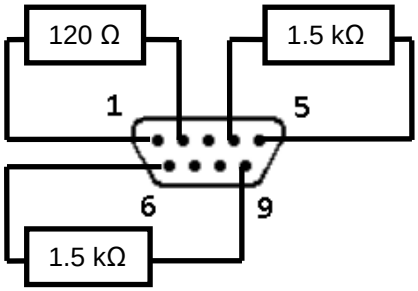


Figure 80: Wiring diagram for the external termination and polarization resistors

If both the device at the beginning of the chain and the device at the of the chain is a SUNWAY M XS inverter, the diagram in Figure 80 applies to both inverters.
If only the device at the beginning of the chain or at the end of the chain is a SUNWAY M XS inverter, the line termination and polarization is to be ensured for the other device as well, by taking account of its specifications and connection capability. Typically, correct communication is ensured by the line termination and polarization shown in Figure 80 for each end of the chain.

5.1.5. Communications Protocol

The implemented serial communications protocol is the Modbus RTU standard.

The inverter parameters are queried at the same time as they are read from the touchscreen display, so that both devices can be used at a time. Parameter modification is also managed along with the touchscreen display. Note that the inverter will always consider as valid the latest value set either via serial link or through the touchscreen display.

5.1.6. Specifications of the Serial Communications

The serial communications settings may be changed from the Serial submenu in the Connectivity menu (4.3.4.3).

Baud rate	Configurable between 1200 and 57600 bps (default: 38400 bps)
Data format	8-bit
Start bit	1
Parity (1)	NO, EVEN, ODD (default: NO)
Stop bit	2,1 (default: 2)
Protocol	MODBUS RTU
Supported functions	03 h (Read Holding Registers) 10 h (Preset Multiple Registers)
Device address	Configurable between 1 and 247 (default 1)
Electrical standard	RS485
Inverter response delay	Configurable between 0 and 1000 ms (default = 5 ms)
End of message timeout	Configurable between 0 and 10000 ms (default = 0 ms)
Communications watchdog (2)	Configurable between 0 and 65000 s (default = 0)

Table 32: Specifications of RS485 serial port

(1) Ignored when receiving communication messages.

(2) If set to a value other than 0, alarm **A081** trips.

5.2. USB Connection

The inverters of the SUNWAY M XS series whose part number is one among the P/Ns below are provided with a USB connector featuring IP67 degree of protection (see Figure 75). The USB connector is utilized for the connection of an external Wi-Fi dongle or a USB memory stick for the inverter software update.
The products whose part numbers are not included in the list below implement integrated Wi-Fi functionality, so no external Wi-Fi dongle is required. The inverter software may be updated through the SUNWAY M XS Updater utility.

Product code with USB connector:

- All the codes ZZ00770x0 (e.g. ZZ0077030)
- All the codes ZZ0077100 xxxxxxxx (e.g. ZZ0077100 10003000)

5.3. Multi-inverter Plants

The SUNWAY M XS inverters may support multi-inverter connection, both to the low voltage (LV) grid and to the medium voltage (MV) grid.

NOTE

The notes given below pertain to the Italian regulations in force (Guida per le connessioni alla rete elettrica di Enel Distribuzione, Ed. 1.1 - 87/244, December 2009).
For foreign Countries, please refer to the local regulations in force.

5.3.1. Connection to the LV Grid

The maximum allowable number of inverters that can be connected to the LV grid is 63.

According to the regulations in force governing the connection to the LV grid of photovoltaic generators, the maximum single-phase power must not exceed 6 kW. In case of plants comprising multiple inverters with overall power exceeding 6 kW, the inverters are to be installed on a three-phase grid and the inverters are to be evenly distributed over the three phases. It must be considered that the difference between the power delivered over two phases must never exceed 6 kW.

When maximum N.3 inverters are connected and the overall power of the PV plant is lower than 20 kW, no particular solution is required, except if one of the 3 inverters is a SUNWAY M XS 7500TL. In that specific case, the Power Balance function described in 5.3.3 is to be activated.

When more than three inverters are utilized or when the overall power of the PV plant is higher than 20 kW, all the three inverters must be simultaneously disconnected from the grid when the grid voltage or frequency is out of the allowable range. In that specific case, the Power Balance function described in 5.3.3 is to be activated.

When the overall power of the PV plant is higher than 20 kW, galvanic separation between the plant and the grid is required.

5.3.2. Connection to the MV Grid

The maximum allowable number of inverters that can be connected to the MV grid is 100.

No power balance limit between the phases is imposed by the regulations in force governing the connection to the MV grid of photovoltaic generators. Consequently, the Power Balance function is not required for the connection to the MV grid. However, it is recommended that the installed power of the connected inverters be evenly distributed among the three phases.

5.3.3. Power Balance

NOTE The connected inverters should be evenly distributed among the three phases, so that the difference of the power installed between two phases is not over 6 kW.

The SUNWAY M XS inverters feature an integrated Power Balance function limiting the difference among the power delivered over the three phases in a multi-inverter multiplant according to the allowable ranges. Once the Power Balance function has been configured and activated, the inverters exchange their production data in real time via an external CAN bus. Based on these data items, the inverters connected to each individual phase will automatically limit the delivered power in order not to exceed the power unbalance in respect to the other phases.

Communications among the devices connected to a multi-inverter plant is made via CAN connection made available by a dedicated 5-pole M12 circular connector located on the bottom side of the inverter enclosure (see Figure 75 and Figure 76).

The CAN connector pin-out is shown in Figure 81.

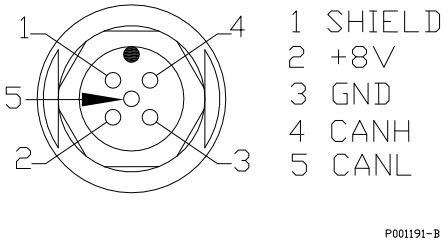
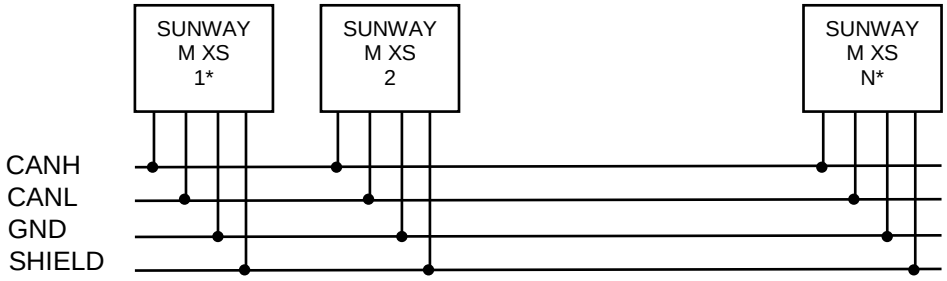


Figure 81: CAN connector

The signal connection on pin 2 is optional, whereas the connection of all the other signals among the connected inverters—including the ground signal (pin3)—is required.



(*) Inverters to be provided with a termination

Figure 82: CAN wiring diagram

The CAN communication rate is factory-set to 125 kbps and allows creating CAN buses with maximum length equal to 200 m with cable cross-sections equal to or higher than 0.34 mm^2 (AWG 22). The chain must be terminated at both ends with 120 Ω resistors.

Composition	**Cable pair characteristic impedance (Ω)**	**Cable pair capacity (nF/km)**	**Loop resistance per cable pair (Ω /km)**
2x2x0.34 mm^2 or 1x2x0.34 mm^2 + 1x0.34 mm^2	120	25	140

Table 33: Recommended specifications for CAN connection cable

It is recommended that stubs connecting the device to the input and output line be avoided in the multidrop chain. However, if stubs are required, their length shall be limited to maximum 0.3m (as recommended by "CAN Physical Layer for Industrial Application – CiA 102").

In order to reduce induced disturbance (Burst), a shielded cable is to be used. The shield is to be connected to earth. The GND (ground) terminal of the connector is not earthed and is not to be confused with the shield. Avoid inserting the communications cables into the same cable raceways as the cables for the connection to the grid and the PV modules, in order to avoid interference. This procedure is forbidden by the standards in force (LVD directive) when the grid conductors and the PV field conductors do not feature safety insulation (double insulation or reinforced insulation).
It is therefore advisable to provide dedicated cable raceways for the cable of the CAN multidrop trunk line.

For more information and details on the CAN standard you can consult the following CAN CiA documents:

- "CAN Physical Layer for Industrial Application – CiA 102"
- "CAN Open recommendation – Cabling and Connector Pin Assignment – CiA 303"

5.3.3.1. Elettronica Santerno CAN Wiring Solution

Special kits for the creation of a CAN bus external to the inverter are available as an option. The CAN bus external to the inverter may be required in multi-inverter plants connected to the LV grid.

The kits provided are listed below and may be purchased either as modular elements for the interconnection of maximum 63 inverters belonging to the same PV plant, or as an individual solution fitting a three-phase/single-phase PV plant.

Santerno Part Number	Function
ZZ0077401	Terminator at the beginning of the line. The kit is composed of: • One circular floating M12 connector, 5-pole, female, with preassembled 120 Ω terminator. • One connecting element between adjacent inverters. Length: 1 m.
CN5100066	Connecting element between adjacent inverters. Length: 1 m. Each plant requires a number of connecting elements equalling the number of connected inverters minus 1 (one element included in ZZ0077401)
ZZ0077402	End of line terminator. The kit is composed of: • One T joint • One circular floating M12 connector, 5-pole, male, with preassembled 120 Ω terminator.
ZZ0077400	Kit for three-phase/single-phase plant composed of: • 1 x ZZ0077401 • 1 x CN5100066 • 1 x ZZ0077402

Table 34: Elettronica Santerno CAN wiring solutions

The CAN kits are shown in the diagram below.

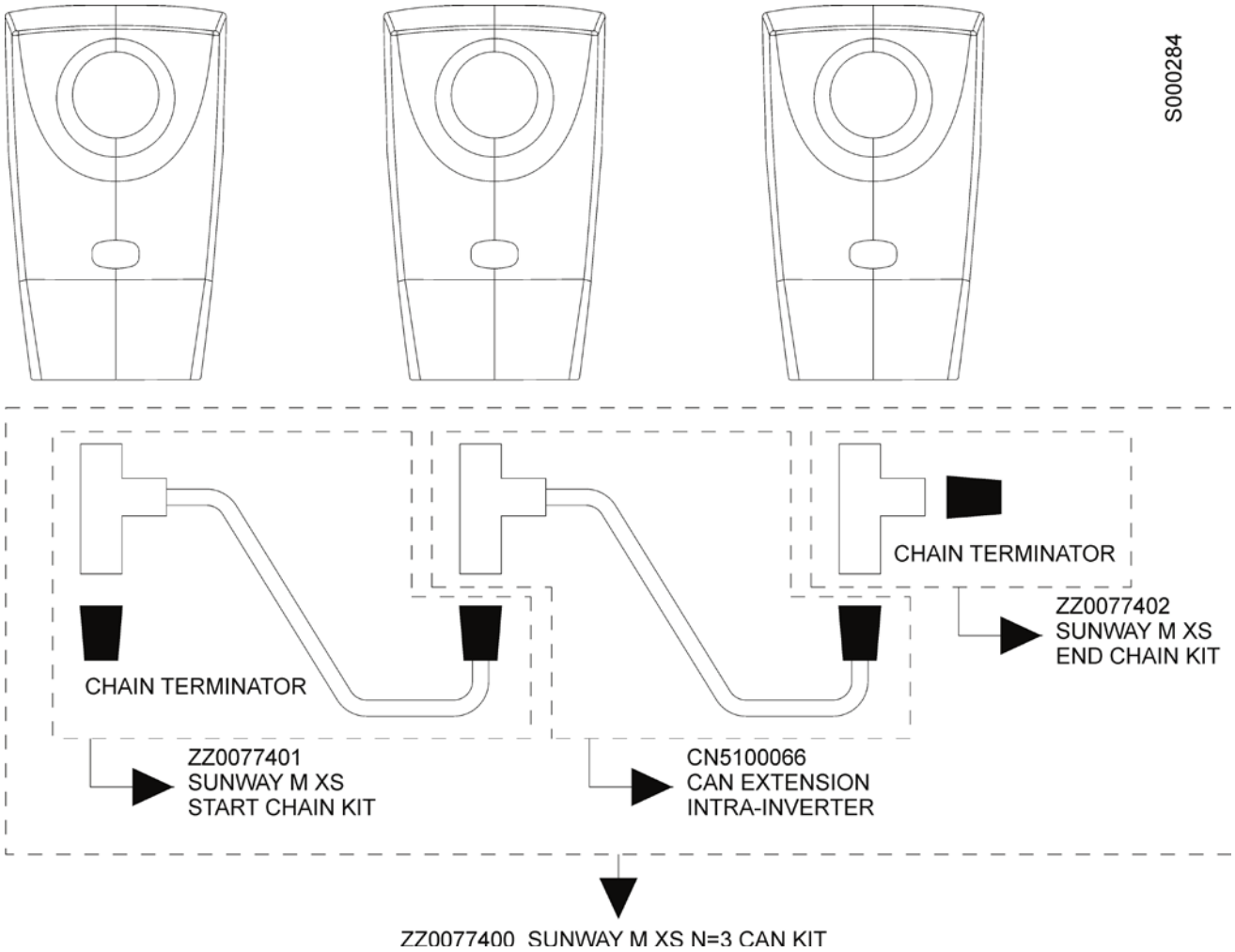


Figure 83: Wiring diagram with Elettronica Santerno solution

5.3.4. Power Balance Configuration

The Power Balance function may be configured and activated from the **Advanced Configuration > Inverter > Power Balance** submenu in the **Tools menu**. Do the following to configure the Power Balance function:

1. **Activating the Power Balance.** See section 5.3.4.1.
2. **Setting the Phase.** See section 5.3.4.2.
3. **Resetting the Inverter**. See section 5.3.4.3.

If the Power Balance function is successfully configured, the start menu will display a letter identifying the set up phase in the bottom-right corner.

Figure 84: Example of the start menu with Power Balance function activated

5.3.4.1. Activating the Power Balance

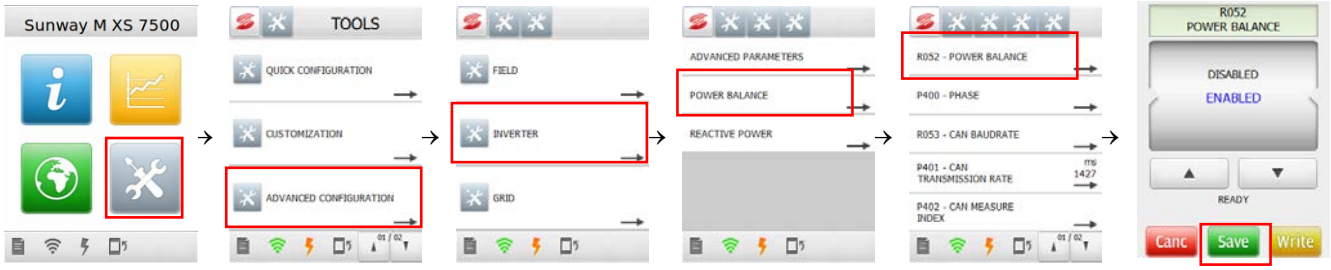
NOTE The activation and deactivation of the Power Balance function will not take effect until the inverter is restarted.

- From the start menu, select the **Tools** ( ) icon;
- Select the **Advanced Configuration** (ADVANCED CONFIGURATION) submenu;
- Select the **Inverter** (INVERTER) submenu:
- Select **R052 – Power Balance**; the screen below appears:

Figure 85: Power Balance activation page

- Select **ENABLED** using the arrow keys (▲ ▼);
- Activate your choice by pressing the **Save** (Save) button and confirm with OK. The system automatically quits the current page. If you press **Cancel** (Cancel), the previous settings are maintained.

In summary:



*Select the **Tools** icon* → *Select the **Advanced Configuration** submenu* → *Select the **Inverter** submenu* → *Select the **Power Balance** submenu* → *Selct **R052 – Power Balance*** → *Select **ENABLED**, press **Save** and confirm with **OK***

Figure 86: Activating the Power Balance function

5.3.4.2. Setting the Phase

- From the start menu, select the **Tools** ( ) icon;
- Select the **Advanced Configuration** (ADVANCED CONFIGURATION) submenu.
- Select the **Inverter** (INVERTER) submenu.
- Select the **Power Balance** submenu.
- Select **P400 - Phase**; the screen below appears:

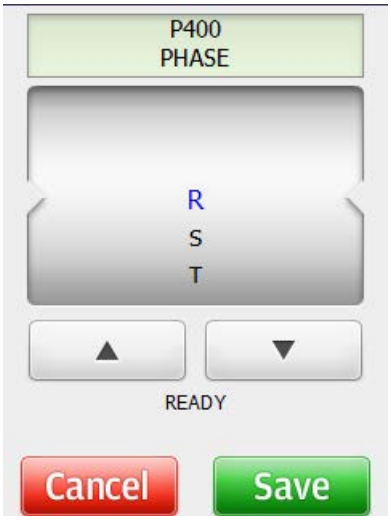


Figure 87: Phase setting page

- Select **ENABLED** using the arrow keys (▲ ▼);
- Activate your choice by pressing the **Save** (Save) button and confirm with OK. The system automatically quits the current page. If you press **Cancel** (Cancel), the previous settings are maintained.

In summary:

*Select the **Tools** icon* | *Select the **Advanced Configuration** submenu* | *Select the **Inverter** submenu* | *Select the **Power Balance** submenu* | *Select **P400 - Phase*** | *Select the desired phase, press **Save** and confirm with **OK***

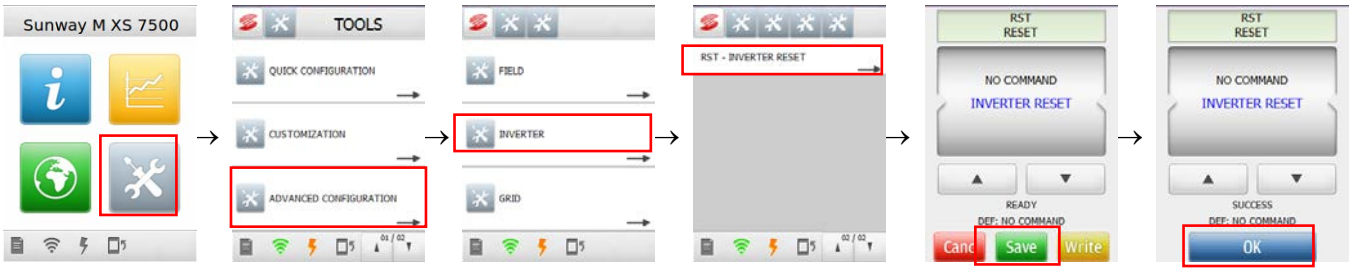
5.3.4.3. Resetting the Inverter

- From the start menu, select the **Tools** ( ) icon;
- Select the **Advanced Configuration** (ADVANCED CONFIGURATION) submenu;
- Select the **Inverter** (INVERTER) submenu;
- Select the **Power Balance** submenu;
- Select **RST – Inverter Reset**; the screen below appears:

Figure 88: Inverter resetting page

- Select "INVERTER RESET" using the arrow keys (▲ ▼);
- Activate your choice by pressing the **Save** (Save) button and confirm with OK. The system automatically quits the current page. If you press **Cancel** (Cancel), the previous settings are maintained;
- Wait for the success message.

In summary:



*Select the **Tools** icon* → *Select the **Advanced Configuration** submenu* → *Select the **Inverter** submenu, then select **Power Balance*** → *Select **RST – Inverter Reset*** → *Select "INVERTER RESET", then press **Save*** → *Wait for the success message, then press **OK***

5.4. Grid Interface Protection Autotest

The Grid Interface Protection Autotest enables checking the operation of the grid disconnecting device (Interface Protection) as required by the Grid Administrator (for Italy: Guida Per Le Connessioni alla rete elettrica di Enel Distribuzione, Ed. 1.1 - 1/244 December 2009).

The following tests may be carried out:

- test for the minimum voltage protection trip;
- test for the maximum voltage protection trip;
- test for the minimum frequency protection trip;
- test for the maximum frequency protection trip.

During the test, the inverter automatically varies the trip threshold of the variable to be tested until the protection trips, thus allowing checking if the integrated relay connecting the inverter to the grid opens. When this happens, the inverter stops, the interface contactor opens and the threshold value is fixed to the trip value. At the same time, the trip time of the protection is displayed.

After few seconds, the normal operation of the inverter is automatically resumed and the default values are reset.

The inverter decoupling events are stored to the Event History.

The inverter is to be producing energy (parameters FIELD OK = 1, GRID OK = 1 and RUN = 1 on the inverter Status page). The Status page may be accessed by pressing the Icon status from the status bar.

Figure 89: RUN status page

When the test is inactive, the trip thresholds of the protections are fixed and set to the values required by the standards in force:

Variable	Required value	Nominal value of the variable (factory setting)	Value of the trip threshold (factory setting)
Minimum voltage trip threshold	0.8 * nominal grid voltage	230 Vac	184 Vac
Maximum voltage trip threshold	1.2 * nominal grid voltage	230 Vac	276 Vac
Minimum frequency trip threshold	49.7 Hz (49 Hz) (1)	50 Hz	49.7 Hz
Maximum frequency trip threshold	50.3 Hz (51 Hz) (1)	50 Hz	50.3 Hz

Table 35: Protection trip times

(1) In some cases, the National Grid Administrator may require to change the values in brackets. If this is the case, please contact the Customer Service of Elettronica Santerno SpA.

The protection trip times are as follows:

Variable	Time
Maximum voltage trip threshold	200 ms (1)
Minimum voltage trip threshold	400 ms (1)
Maximum voltage frequency threshold	100 ms (1)
Minimum voltage frequency threshold	100 ms (1)

Table 36: Trip times

(1) Approximate value.

The trip times that can be checked for the autotest match with the values given in the table and detected by the system, apart from a negligible error.

The autotest procedure is as follows:

- from the start menu, select the **Tools** ( ) icon;
- use the arrow keys (02 / 02) from the status bar to scroll to the second page and select the **Commands** (COMMANDS) submenu;
- select the relevant icons from the **Autotest** submenu; carry out the following tests in sequence: minimum voltage and maximum voltage; minimum frequency and maximum frequency;
- press the **Run Command** (Run Command) button to enable the test: the trip value starts varying until it matches with the measured value (see Figure 90);
- if the test succeeds, the inverter temporarily disconnects from the grid and the test window shows the value of the trip threshold causing the inverter to stop and the time when the protection has tripped;
- if the test fails, the inverter does not stop. This means that the interface protection has tripped. Please contact the Customer Service of Elettronica Santerno SpA.

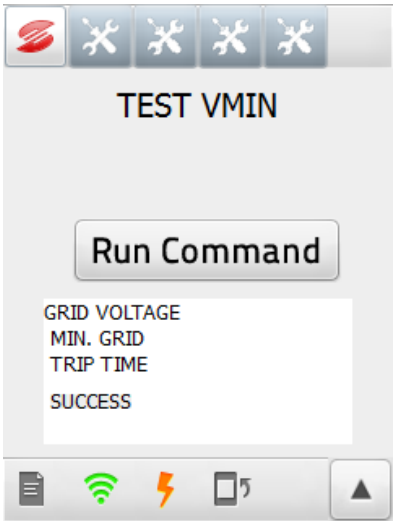


Figure 90: Example page of the Autotest function

Press the arrow button on the bottom-right corner to quit the test mode, or press the desired icon from the navigation bar. Press to return to the **Start Menu**.

5.5. Maintenance

The degree of protection IP65 limits scheduled maintenance only to the external parts of the product.
Every two years, clean the external fans and the rear heatsink with compressed air to remove dust. The frequency of scheduled maintenance may need to be increased depending on the installation conditions. It is to be increased if the inverter is installed outdoor or in a dusty environment.

It is recommended that the inverter operation be periodically checked using the diagnostic means made available from the touchscreen display. It is advisable to read the alarm history and to perform the autotest procedure.

6. SPECIFICATIONS

SUNWAY M XS Model	***4600***	***5000***	***6000***	***7500***
Nominal output power (W)	4600	5060	5980	7590
Maximum efficiency (%)	95.3	95.3	96.4	96.1
European efficiency (%)	95.0	95.0	95.8	95.6
INPUT				
Maximum peak power (Wp) suggested by the photovoltaic generator	5500	6000	7000	9000
MPPT range (Vdc)	330 to 740			
Maximum open-circuit voltage (Vdc)	845			
Maximum current of the photovoltaic generator (A)	15	17	20	25
Harmonic residual voltage (%)	< 5			
OUTPUT				
Nominal voltage (Vac)	230 ±15 %, single-phase			
Grid frequency (Hz)	50 (may be set to 60) +/-2 %			
Nominal output current (Aac)	20	22	26	33
Short-circuit nominal current **	1.5 * Nominal output current			
Power factor (cosφ)	1			
Output current distortion	< 3 % (total)			
GENERAL DATA				
Conversion bridge	IGBT			
Grid interface relay	Panasonic HE2A			
Insulation voltage to earth (kV)	2.1			
Insulation voltage between input and output (kV)	2.1			
Surge protective devices	Installed on each input polarity of the PV field			
Insulation loss detecting device	Integrated			
Noise at 1 metre from 16 Hz to 20 kHz (dB)	65			
Cooling system	Forced cooling			
Degree of protection	IP65			
Dimensions w x d x h (mm) *	414 x 703 x 260			
Weight (kg) *	31	31	35	35
Maximum ambient operating temperature (°C)	-25 to +60			
Storage temperature (°C)	-25 to +70			
Maximum relative humidity (%)	100			

Table 37: Specifications of the SUNWAY M XS inverter

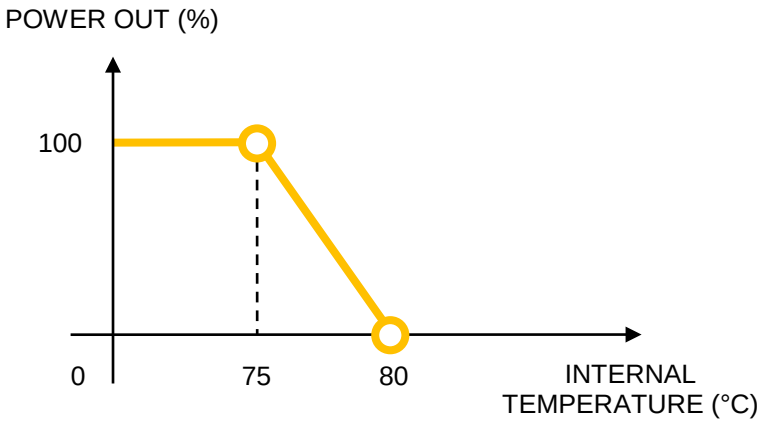
* Weights and measures may vary based on the options required.

** The actual value depends on the real operating conditions of the grid.

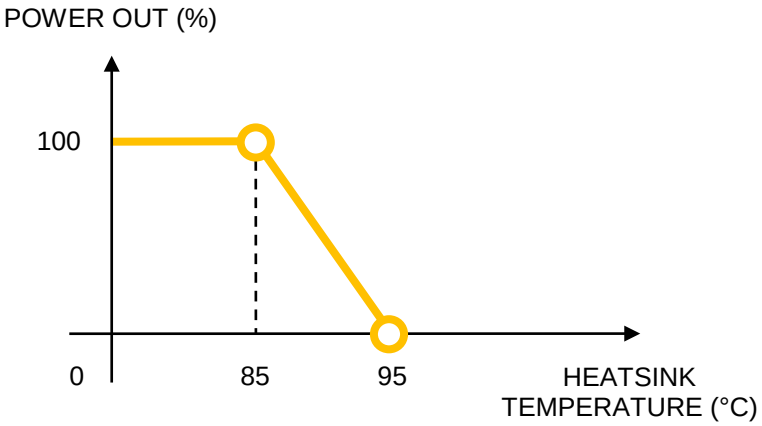
6.1. Power Limiting

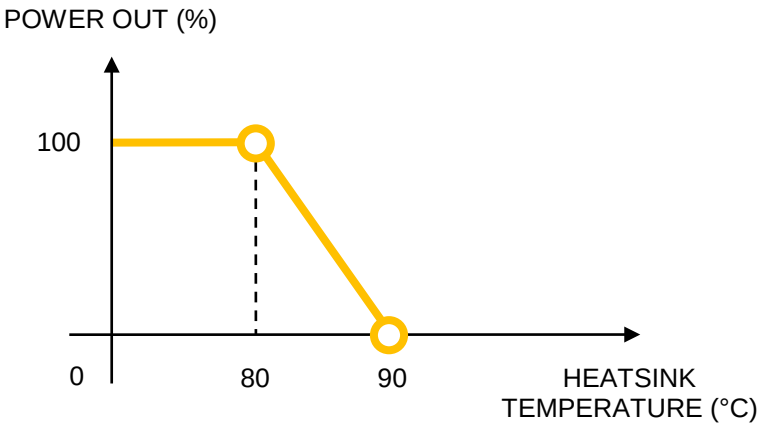
The Sunway M XS inverters may limit their output power based on 3 factors:

- Internal temperature
  The power limiting associated with the internal temperature decreases the power output by 20% every °C over 75 °C. This means that the output power is zero when the internal temperature reaches 80 °C.



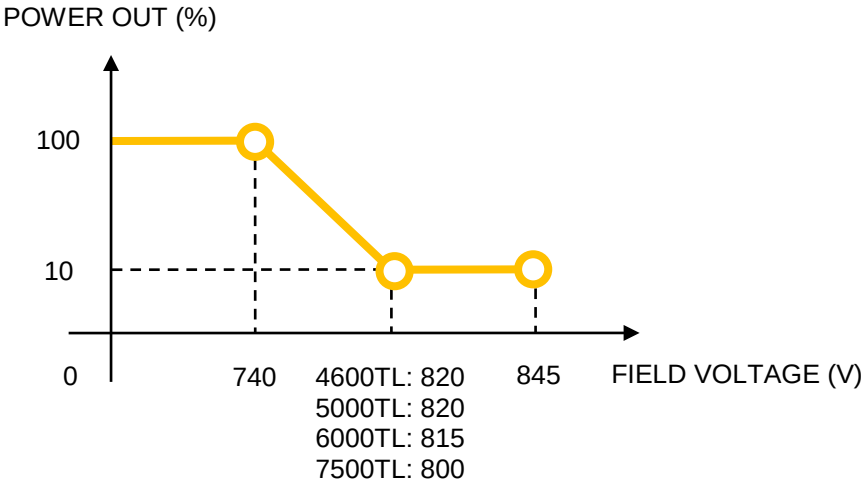
- Heatsink temperature
  The power limiting associated with the heatsink temperature decreases the output power by 10% every °C over:
  - 85 °C (size 4600TL, 5000TL, 6000TL). This means that the output power is zero when the heatsink temperature reaches 95 °C;
  - 80 °C (size 7500TL). This means that the output power is zero when the heatsink temperature reaches 90 °C.





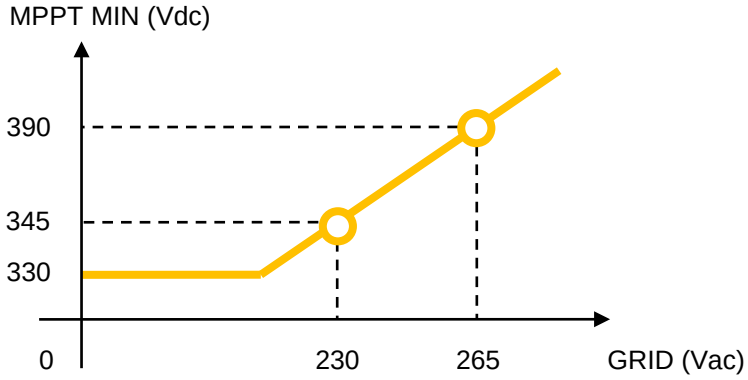
- Field voltage

  The power limiting associated with the field voltage decreases the output power every 1 Volt over 740 V by
  - 1.1% for size 4600TL, 5000TL, up to a minimum of 10%. This equals 10% of the output power at 820 V;
  - 1.2% for size 6000TL, up to a minimum of 10%. This equals 10% of the output power at 815 V;
  - 1.5% for size 7500TL, up to a minimum of 10%. This equals 10% of the output power at 800 V.



6.2. Dynamic Adjustment of the MPPT Range

The Sunway M XS inverters dynamically adapt the minimum voltage value for the operation of the MPPT algorithm to the grid voltage. The operating principle is illustrated in the diagram below.



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