CARLO GAVAZZI
Automation Components

CARLO GAVAZZI

ISMGT1xx
Solar Inverter with HF Transformer

Grid Connected Solar Inverter

User Manual

EcoEnergy

Safety

SAVE THESE INSTRUCTIONS – This manual contains important instructions for PV inverter models ISMGT150, ISMGT140, ISMGT138 & ISMGT128 that shall be followed during installation, application and maintenance of the PV inverter.

Safety Precautions/Safety Notes

Only skilled and qualified personnel is allowed to carry out the installation, wiring, opening and repair of the ISMGT1 inverters. Even if no external voltage is present, the ISMGT1 inverters may still contain high voltage and the risk of electrical shocks.

The temperature of the heat sinks outside of the device could exceed 70°C (158°F) during normal operation. Risk of burn injury if touched.

The following general safety precautions must be observed during all phases of operation, service, installation and repair of this device. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the device. The manufacturer assumes no liability for the customer's failure to comply with these requirements.

Safety Symbols

To reduce the risk of injury and to ensure the continued safe operation of this product, the following safety instructions and warnings are marked in this manual.

Warning, risk of electric shock
The purpose of Presents safety information is to prevent injuries or death to users and/or installers.

Earth ground symbol

Caution (refer to enclosed documents)
The pur pose of present information is to prevent damage to this product.

General Safety Precautions

- **Skilled and qualified personnel is allowed to mount, reconfigure or repair this Inverter.**
- **Remove all conductive jewelry or personal accessories prior to installation or service of the device, parts, connectors, and/or wirings.**
- **Ensure there is no grounding path through the human body. Insulated guards, e.g. insulated mat and/or shoes, are necessary when working the operating device.**
- **Use safety guard against risks of electrical shock or personal injury caused by any sudden component failure.**
- **Follow the instructions manual, all information on cautions or warnings must be adhered to.**
- **Use proper lifting techniques when handling enclosure, equipment or parts.**
- **The ISMGT1 inverter is provided with an equipment-grounding conductor and a DC grounding connection. The grounded conductor may be ungrounded and energized when ground fault is indicated.**
- **The list does not contain all measures pertinent to the safe operation of the device. If particular problems, which are not described in sufficient detail for the purposes of the buyer, arise, please contact the local CARLO GAVAZZI office, specialized dealer or technician.**

Safe Installation and Operation

- **Installation of the device must be in compliance with the relevant electrical installation local norms issued State or distribution network operator (DNO). Correct grounding, short-circuit and/or overcurrent protection must be provided to ensure operational safety.**
- **Read all instructions and caution remarks in the manual before installation.**
- **Switch off the circuit breakers before installation. Keep dry when working the inverter.**
- **When PV arrays are exposed to light they provide high energy. Cover the arrays with opaque (dark) material before installation.**
- **Check both AC and DC connections with a digital voltmeter prior to any installation or removal procedures.**
- **Properly close the front cover before switching on the circuit breakers.**
- **Install the inverter out of reach of direct sunlight, rain or dust sources.**
- **Risk of electrical shock may be contained even if no external voltage is present.**
- **Allow at least 5 minutes for the inverter to discharge completely, after disconnecting the AC and DC sources from the inverter, before carrying out any operation on it.**
- **The temperature on the external heat sink may be high during operation and cause burn injury if touched. Pay attention to hot parts.**
- **Prevent the risk of fire hazard, do not cover or obstruct the heat sink, or put flammable materials net to it.**
- **Allow modification in your electrical system to be carried out only by the skilled and qualified electricians.**

Repair and Maintenance

The ISMGT1 inverter contains no user serviceable parts, except for the fan and the GFDI fuse. Only personnel trained and authorized by Carlo Gavazzi are allowed to carry out internal repair and maintenance of the unit. Please return the device for overhaul if some fault is caused by parts other than the fan and the fuse described above. For the replacement of the fuse, please refer to the section 5.3.

WARNING!
Do not make alterations or tamper assembly in the inverter without manufacturer's authorization unless specified elsewhere in this Manual. Failing to do so may result in injury, electric shock, or fire and consequent warranty expiration.

Wiring the inverter

- **Input/Output Terminals: Use wire size #10 AWG to #6 AWG, 90°C (194°F) Copper Wire.**
- **Reconfirm that all connections and screws have been made correctly and tightened properly.**

WARNING!
Installation and wiring of the device must be in compliance with the relevant electrical installation local norms issued State or distribution network operator (DNO) and should follow the important safety instructions in this manual.

WARNING!
Use recommended connecting cables for both the AC and DC wirings. The cable shall be of the recommended section and with sufficient durability against temperature fluctuation, UV radiation and other possible hazards.

Connection of the AC cable

WARNING!
Reconfirm the circuit breaker connected to the main utility is switched OFF before connecting the power cable from the breaker to the AC connector.

Connection of the DC cable

CAUTION!
Identify the different polarity of DC voltage on each PV string and connect respectively to the input terminals marked "UNGROUNDED CONDUCTOR" and "GROUNDED CONDUCTOR". Make sure the DC voltage that PV arrays generate is equal to or less than 600 VDC in any condition.

WARNING!
Route the DC connection cables to the ISMGT1 inverters away from any possible hazard that may damage the cables.

WARNING!
Hazardous voltage is still present on the device after disconnection of all PV DC inputs. Allow five (5) minutes for the inverter to discharge the energy stored in capacitors.

WARNING!
PV arrays will be energized when exposed to light. Cover the arrays with opaque (dark) materials during installation and wiring.

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1. Introduction

1.1 General

The Carlo Gavazzi Industries ISMGT1 product family is a series of grid-connected photovoltaic inverters which are designed to convert DC power generated by photovoltaic arrays into AC power that is fed into the utility grid. The ISMGT128, ISMGT138, ISMGT140, and ISMGT150 are part of the family for the European market. The overview of the grid-tied solar energy system is shown in figure 1.1.1. ISMGT1 inverters utilize state-of-the-art technology, reliability and ease of use and comply with the requirements of VDE0126-1-1, DK5940, RD1663, RD661, G.83 and EN50178 regulation.

The ISMGT1 inverter is designed to operate automatically once it is installed and commissioned correctly. When the DC input voltage generated by the photovoltaic array rises above the pre-set threshold value, the embedded controller starts and goes through System Check mode and then into Monitoring mode until the PV Start Voltage is reached. During this time, the ISMGT1 inverter will not generate AC power. Once all conditions necessary for grid connection are satisfied, the ISMGT1 inverter goes into the Grid/MPP mode and begins feeding the AC power into the grid. When the input DC voltage falls below the minimum MPP voltage setting, the ISMGT1 inverter will stop feeding AC power into the grid and return to monitoring mode. Should the input DC voltage rise again above the PV Start Voltage, and all conditions necessary for grid connection are satisfied, the ISMGT1 inverter will enter the Grid/MPP mode again.

We appreciated your choice of Carlo Gavazzi ISMGT1 inverters for your power conversion devices in your solar power system. This document contains the information you need for the installation and settings of the ISMGT1 inverters. Therefore, it is strongly recommended to read this manual carefully before the ISMGT1 inverter installation and settings.

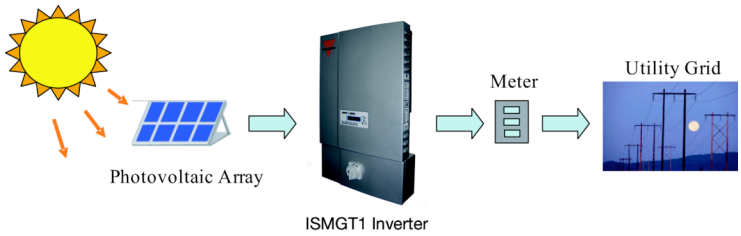


Fig1.1.1 Grid Connected Solar System Overview

1.2 Specifications

Specifications for ISMGT128 and ISMGT138

Name-Part number	ISMGT128	ISMGT138
Grid output (AC)		
Grid voltage, nominal	230 VAC	
Grid frequency, nominal	50 Hz	
Maximum output power	2800 W	3800 W
Maximum output current	12.2 A	16.6 A
Output over current protection (recommended)	20 A	20 A
Maximum grid backfeed current	0 A	
Waveform	True sine	
Power factor	> 0.99 @ norminal power	
Total Harmonic Distortion	< 3 %	
DC Component	< 0.5 %	
Phase	Single	
Solar input (DC)		
MPP voltage range	200 ~ 550 VDC	
Maximum input voltage	600 VDC	
PV start voltage	235 VDC (adjustable)	
Maximum input current	15 A	20 A
Maximum input short circuit current	24 A	
Efficiency		
Maximum efficiency	96.4 %	96.4 %
European efficiency	95.4 %	95.7 %
Night-time tare loss	0.5 W	
Environmental		
Operating temperature range	-25° ~ +65°C (-13° ~ +149°F)	
Maximum full power operating ambient	58°C (136.4°F)	55°C (131°F)
Relative humidity	Max. 95 %	

Mechanical		
Outdoor enclosure	IP44	
Cooling	Natural	Cooling fan
Input and output terminals	Accept wire size of 4 to 16 mm^2 (#10 to #6 AWG)	
Weight / Shipping weight	23 kg / 27 kg (50.7 lb / 59.5 lb)	
Dimensions (HxWxD)	768x454x175 mm (30.3x17.9x6.9 inches)	
Shipping dimensions (HxWxD)	840x540x275 mm (33.1x21.3x10.8 inches)	
Junction box		
AC connection	Screw terminal	
DC connection	3 strings input	4 strings input
Standard	**ISMGT128D**	**ISMGT138D**
DC / AC disconnect switch	Yes	
DC connect	Screw terminal	
Positive ground inverter	**ISMGT128DP**	**ISMGT138DP**
DC / AC disconnect switch	Yes	
DC connect	Screw terminal	
Interface		
Communication	RS-232 and RS-485	
Display	LED / LCD	
Certifications		
EN50178 (IEC62103), VDE0126-1-1, RD1663, RD661, DK5940, G.83		

Specifications for ISMGT140 and ISMGT150

Name-Part number	ISMGT140	ISMGT150
Grid output (AC)		
Grid voltage, nominal	230 VAC	
Grid frequency, nominal	50 Hz	
Maximum output power	4000 W	5000 W
Maximum output current	17.4 A	21.8 A
Output over current protection (recommended)	20 A	25 A
Grid output (AC)		
Maximum grid backfeed current	0 A	
Waveform	True sine	
Power factor	> 0.99 @ norminal power	
Total Harmonic Distortion	< 3 %	
DC Component	< 0.5 %	
Phase	Single	
Solar input (DC)		
MPP voltage range	200 ~ 550 VDC	
Maximum input voltage	600 VDC	
PV start voltage	235 VDC (adjustable)	
Maximum input current	22 A	25 A
Maximum input short circuit current	30 A	
Efficiency		
Maximum efficiency	96.5 %	96.5 %
European efficiency	95.8 %	95.8 %
Night-time tare loss	0.5 W	
Environmental		
Operating temperature range	-25° ~ +65°C (-13° ~ +149°F)	
Maximum full power operating ambient	58°C (136.4°F)	54°C (129.2°F)
Relative humidity	Max. 95 %	
Mechanical		

Outdoor enclosure	IP44	
Cooling	Cooling fan	
Input and output terminals	Accept wire size of 4 to 16 mm^2 (#10 to #6 AWG)	
Weight/Shipping weight	28 kg / 32 kg (61.7 lb / 70.5 lb)	
Dimensions (HxWxD)	768x454x210 mm (30.3x17.9x8.3 inches)	
Shipping dimensions (HxWxD)	840x548x305 mm (33.1x21.6x12 inches)	
Junction box		
AC connection	Screw terminal	
DC connection	4 strings input	
Standard	**ISMGT140D**	**ISMGT150D**
DC/AC disconnect switch	Yes	
DC connect	Screw terminal	
Positive ground inverter	**ISMGT140DP**	**ISMGT150DP**
DC/AC disconnect switch	Yes	
DC connect	Screw terminal	
Interface		
Communication	RS-232 and RS-485	
Display	LED / LCD	
Certifications		
EN50178 (IEC62103), VDE0126-1-1, RD1663, RD661, DK5940, G.83		

1.3 Adjustable Parameter Settings

This new series of ISMGT1 inverters have, currently four different interface protections in order to fulfill the market needs most of European countries. They can be distinguished by the model names described as follows. Some models have the same interface protection but differ in the display and documentation language (Eg. DE and FR, interface is VDE0126 for both but DE has German documentation and Display language whilst FR is French):

- ISMGT1xxD-DE : For Germany
- ISMGT1xxD-ES : For Spain
- ISMGT1xxD-EN : European version
- ISMGT1xxD-FR : For France
- ISMGT1xxD-IT : For Italy
- ISMGT1xxD-UK : For United Kingdom

Interface Parameter Settings

recommendation	VDE0126-1-1	DK5940	RD1663, RD661	G.83
Model name/s	ISMGT1xxD-DE ISMGT1xxD-FR ISMGT1xxD-EN	ISMGT1xxD-IT	ISMGT1xxD-ES	ISMGT1xxD-UK
Over-voltage (VAC)	260.0	262.0	253.0	264.0
Under-voltage (VAC)	190.0	188.0	196.0	207.0
Over-frequency (Hz)	50.19	50.3	51.0	50.5
Under-frequency (Hz)	47.51	49.7	48.0	47.0
Over-voltage clearing time (cycle)	8	4	8	74
Under-voltage clearing time (cycle)	8	9	8	74
Over-frequency clearing time (cycle)	5	3	5	24
Under-frequency clearing time (cycle)	5	3	5	24
Voltage quality monitoring* (VAC)	253.0	257.6	250.7	260.0
Voltage quality monitoring time* (s)	300	0 (NA)	0 (NA)	0 (NA)
Reconnect delay (s)	20	20	180	180
PV start voltage (VDC)	235.0	235.0	235.0	235.0

* The period of time for the ISMGT1 inverter to disconnect from the grid and enter the Monitoring mode after the detection of the AC voltage that is higher than the **Voltage quality monitoring** setting and below the **Over-voltage** setting. This function is available only in the models of Germany type according to the VDE 0126-1-1, Clause 4.2.3.

1.4 Accessories

- Operation Manual 1 pc
- Auto-Test software CD (ISMGT1xxxx-IT only) 1 pc

2. Installation

2.1 Placement

1. ISMGT1 inverters must be mounted vertically, may be located indoor or outdoor, according to protection class IP44.
2. Leave at least 50 cm (19.67 inches) of free space above and 100 cm (39.37 inches) below the inverter when installed outdoor. Allow 20 cm (7.87 inches) between inverters when installing multiple inverters for better ventilation (see figure 2.1.1).
3. Mount the inverter on a wall that is strong enough to sustain the inverter: 32 kg (70.5 lb) weight.
4. Avoid mounting the inverter on a location directly exposed to sunlight to maintain the ambient temperature of the inverter within -25°C and 65°C (-13°F and 149°F). Humidity shall be within 0% and 95%.
5. Keep DC wiring as short as possible to minimize power loss.
6. The mounting bracket should be fastened on a concrete or a masonry wall with the provided accessory.

WARNING!
Do not expose the inverter to the corrosive liquids and/or gases.

WARNING!
Not to operate the inverter in flammable or explosive environment, or close to flammable materials, failing to so may result in fire and / or explosion. Some parts of the cooling surface can reach temperatures over 70°C (158°F).

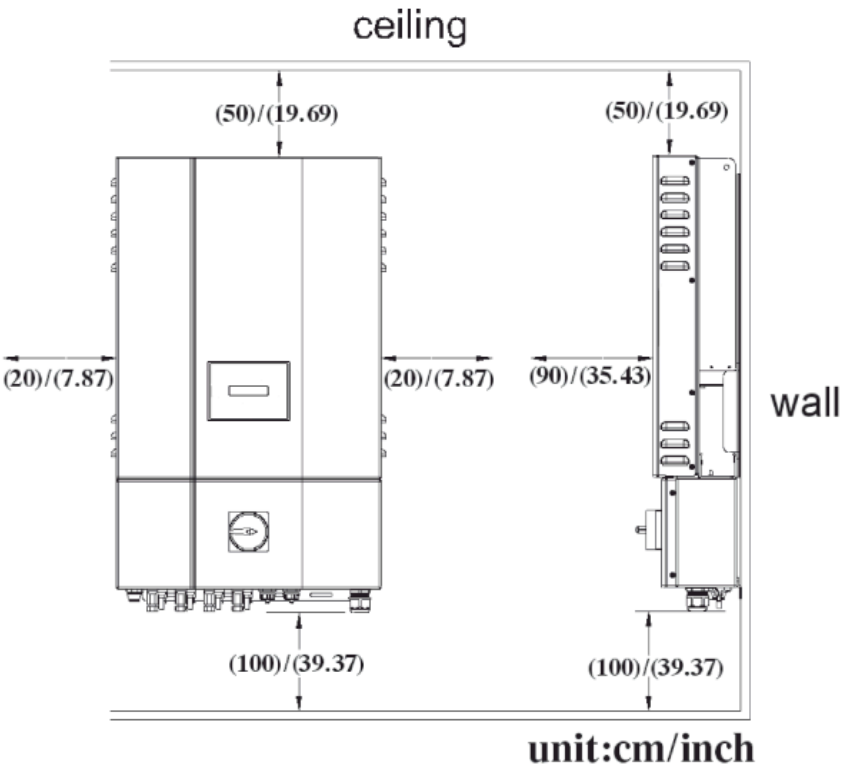


Fig 2.1.1 Clearances required for ISMGT1 inverter installation

2.2 Mounting

The steps listed below describe how to mount the inverter on the wall:

1. After removing the inverter from the carton, the attached mounting bracket must be removed by sliding the bracket down and away from the inverter as shown in the figure 2.2.1 below.

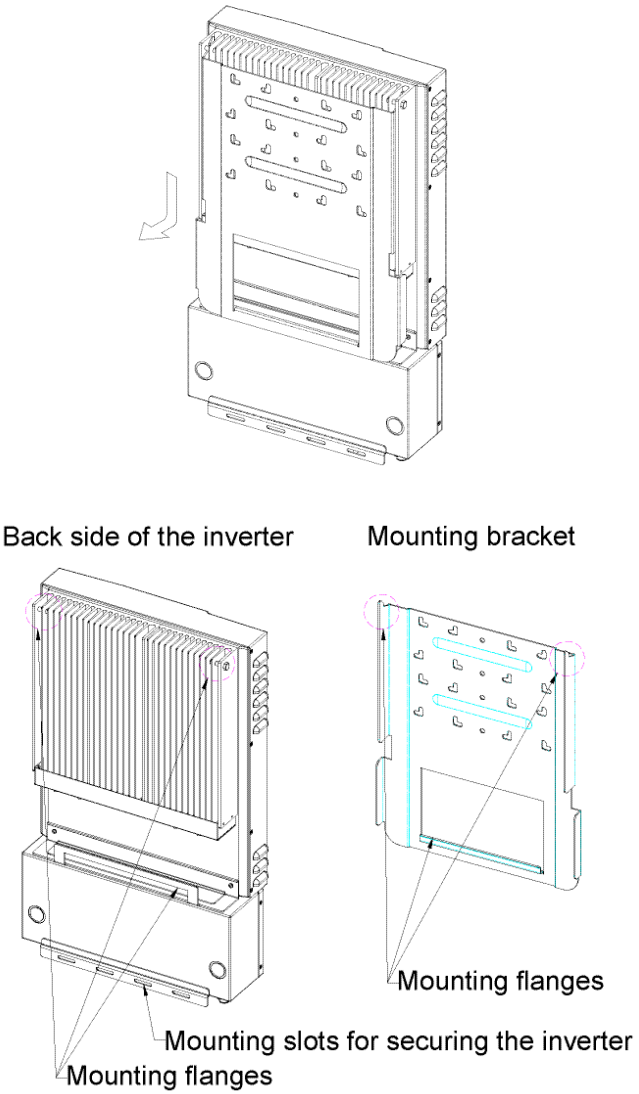


Fig 2.2.1 Removal of the mounting bracket from the inverter

2. Use the mounting bracket (figure 2.2.2) as a template to mark the location of the holes to be drilled in the wall. After drilling the holes, the mounting bracket is then held against the wall and fastened to the wall with anchors as shown in the figure 2.2.3. (A minimum of three (3) screws is required)

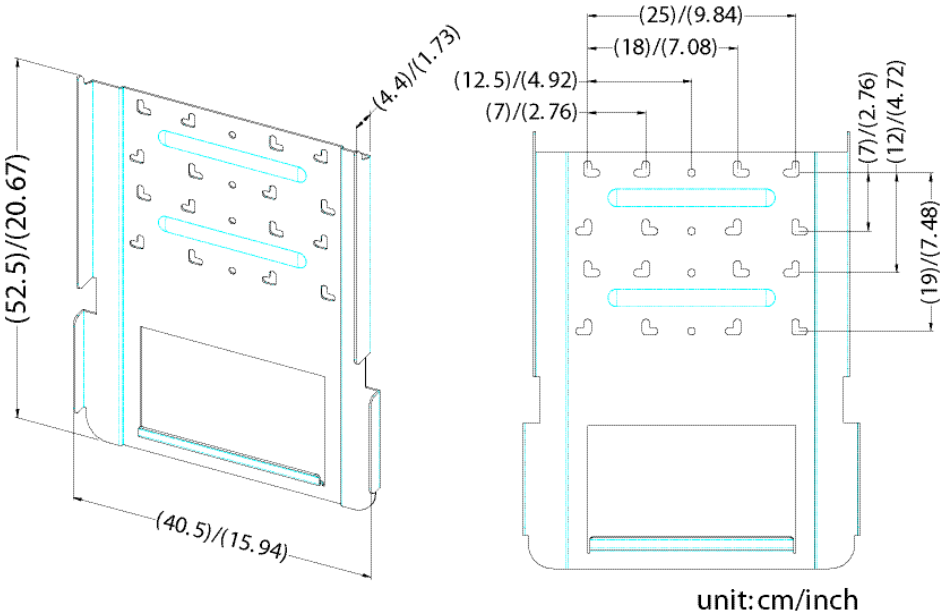


Fig 2.2.2 Inverter mounting bracket

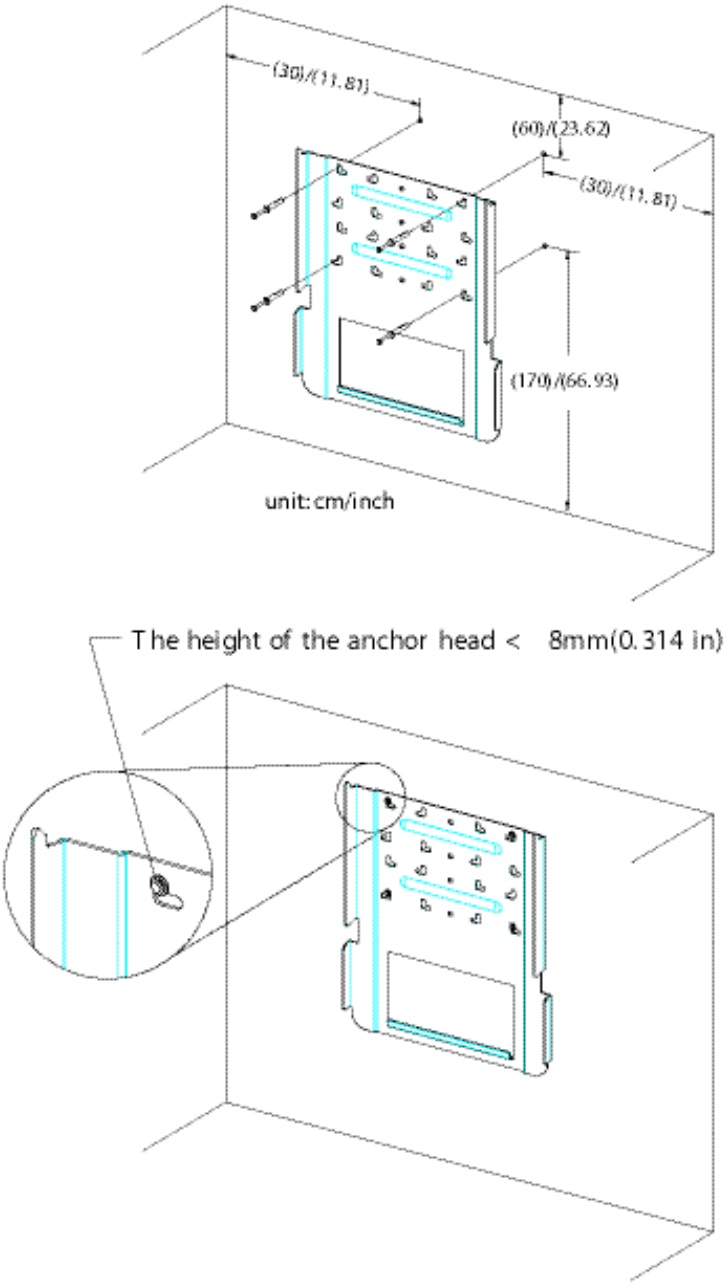
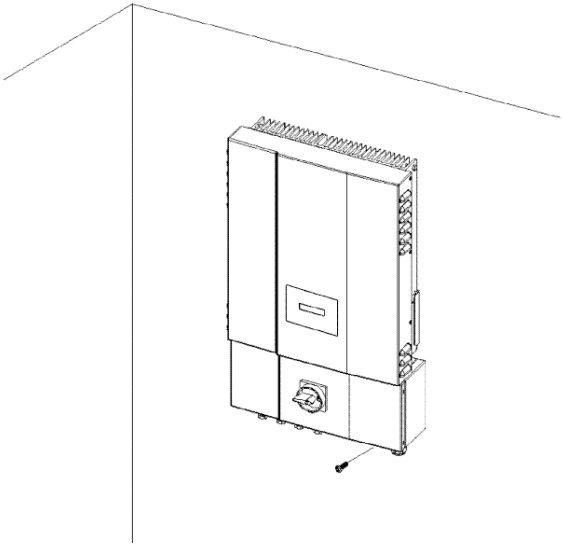
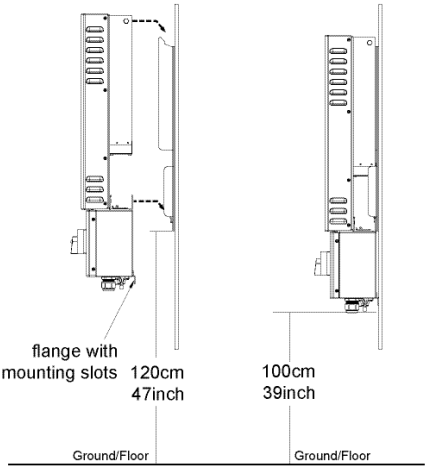


Fig 2.2.3 Fasten the mounting bracket

3. Once the mounting bracket is fixed to the wall, the inverter can be located and fastened to the mounting bracket. Slide the inverter over the mounting bracket flanges let it slide down slowly until it is hooked in place. Put the provided screw through the hole, as shown in figure 2.2.4 below, in order to fasten both inverter and the wiring box together to the mounting bracket.



Slide the mounting pins on the inverter
over the hooks on the mounting bracket.



Ensure the inverter is seated
properly on the mounting bracket

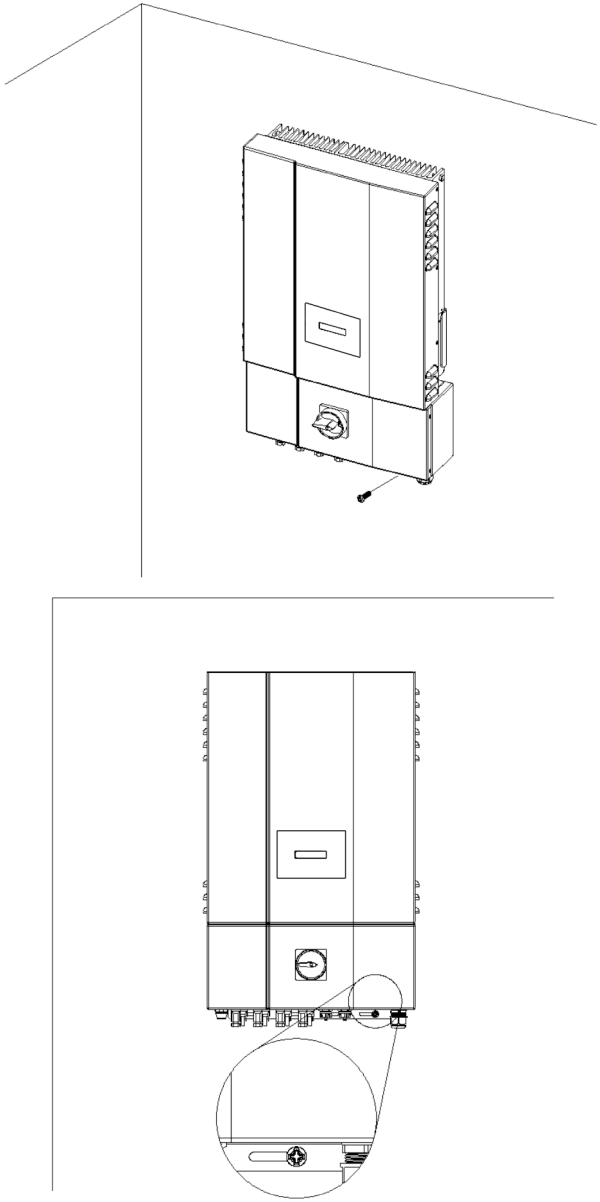


Fig 2.2.4 Hook the Inverter on the mounting bracket and then fasten the screw

After the inverter is held correctly on the bracket and secured with the screw, it is then possible to proceed to wiring.

2.3 Wiring the inverter

The ISMGT1 inverter is provided with four (4) (three (3) for ISMGT128) independent PV strings to be connected in parallel in the wiring box. The wiring box of the has screw terminals and cable glands for the DC , the wire section shall be in the range of #10 AWG and #6 AWG.

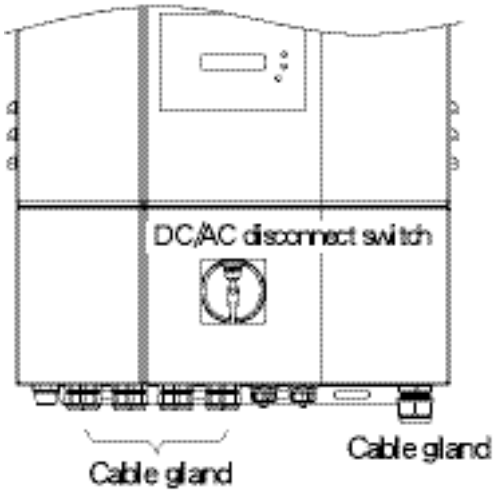


Fig 2.3.1 Wiring box type

It order to wire the inverter it is necessary to remove the front cover. There is a DC/AC disconnect switch built on the wiring box, then the DC/AC disconnect switch shall be turned to the OFF position first of all, as shown in figure 2.3.2. Then remove the screws, two on each side of the cover; remove the cover of the wiring box, as shown in the figure 2.3.3 below.

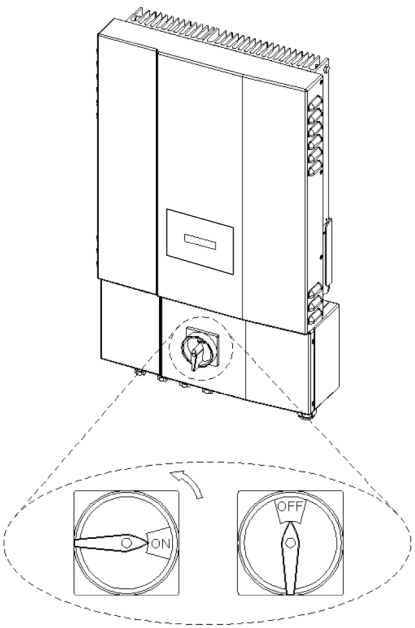


Fig 2.3.2 Turn the DC/AC disconnect switch OFF

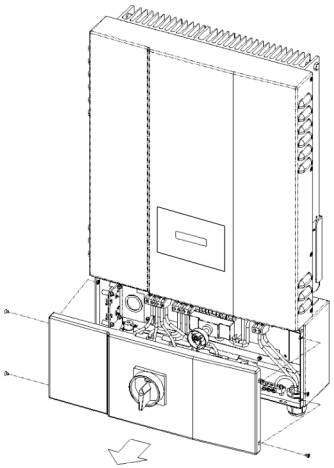


Fig 2.3.3 Remove the cover of the wiring box

In order to prevent water, dust or any other unwanted foreign body, entering the enclosure. All the unused cable glands must be filled with sealing pins, enclosed in the accessories, when the wiring work is almost completed. See figure 2.3.4.

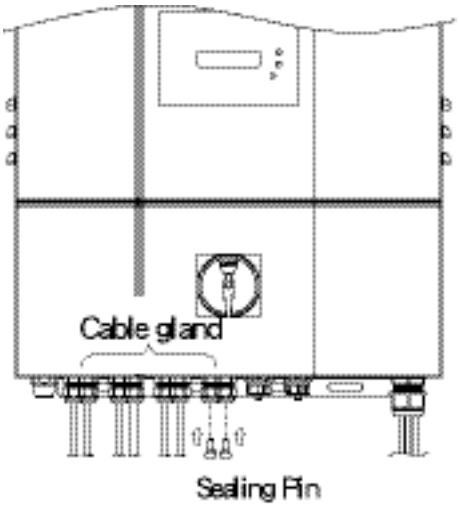


Fig 2.3.4 Sealing pins (plugs)

The three following sections describe the wiring for the AC ouputs, DC inputs, and communication ports. There is one (1) AC terminal block, a pair of DC terminal blocks and two (2) RJ-45 connectors in the wiring box as shown in the figure 2.3.5. The AC terminal block is used to connect to the utility grid through a circuit breaker and distribution panel according to national and local requirements. The DC terminal blocks are used to connect up to 4 PV strings in parallel in the wiring box. The RJ-45 connectors are used for external communication to a remote computer,terminal or another inverter in a Daisy Chain type connection.

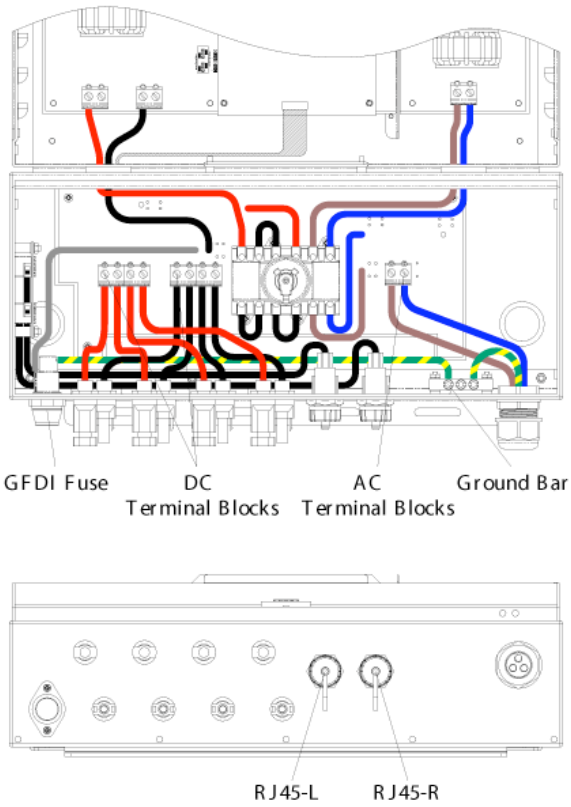


Fig 2.3.5 Wiring box front view

WARNING!

All electrical work shall be carried out in compliance with the relevant electrical norms, issued by local distribution network operator (DNO), and follow the important safety instructions in this manual.

WARNING!

Under the DNO's inspection authority a dedicated circuit breaker must be installed at the connection to the AC mains.

WARNING!

Make sure that suitable connecting cables are used for both the AC and DC wirings. The cables must be choosen considering the Current capacity, weatherproof and immune to temperature fluctuations and UV radiations, etc. Use #10 AWG to #6 AWG, 90°C (194°F) copper wire for all AC and DC wiring connections to the ISMGT1 inverter.

WARNING!

PV arrays are energized when exposed to light. Cover the arrays with opaque (dark) material during installation and wiring.

2.3.1 Connection of the AC cable

Use the following procedure to wire the AC cables.

1. Open the Distribution panel and switch off the circuit breaker used to connect the inverter to the grid.
2. Use #10 AWG to #6 AWG, 90°C (194°F) copper wire for all AC wiring connections to the ISMGT1 inverter.
3. Connect the cable GND to the screw of the ground bar labeled ⏚.

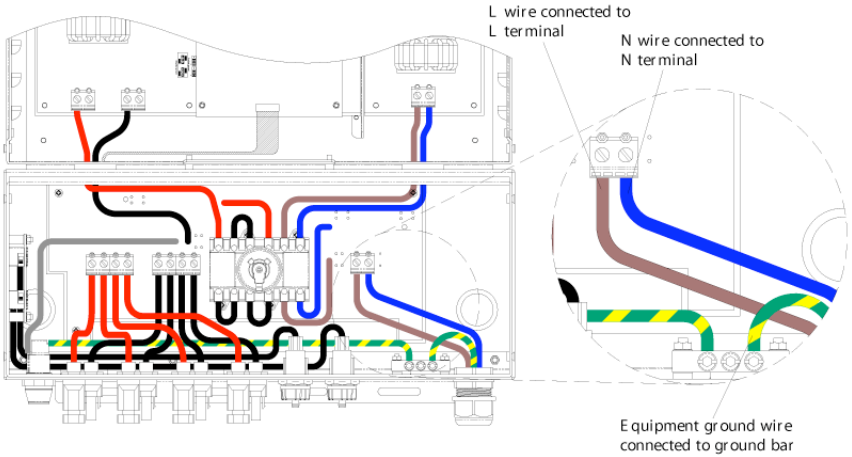


Fig 2.3.1.1 AC Terminal Block for AC cable connections

4. Connect the Grid Phase cable to the terminal labeled L of the AC terminal block.
5. Connect the cable Grid Neutral to the terminal labeled N (or Phase 2) of the AC terminal block. **NOTE: the ISMGT1 inverters can also be connected on a Utility Grid without Neutral. In this case, providing the Voltage is within the specified limit of the Interface setting, on this terminal it is possible to connect another Phase**
6. Tighten the screws with a torque of 1.7Nm (15.6 in-lb).
7. Reconfirm that all connections have been performed properly as described above and all screws are properly tightened.

WARNING!

Reconfirm that the circuit breaker to the main utility is switched OFF before connecting the power cable from the breaker to the AC terminal block.

CAUTION!

Ensure that the total impedance of the grid and the interconnected AC power cable is less than 1.25Ω.

WARNING!

According to the relevant electrical norms and directives, issued by local distribution network operator (DNO), each connection to an ISMGT1 inverter must be installed with a dedicated double-pole circuit breaker in the main utility service panel. The breaker must be sized to carry the rated maximum output voltage and current of the ISMGT1 Inverter. Refer to Section 1.2 Specifications: Output over current protection, pages 3~6. No other appliances shall be connected to the circuit breaker.

2.3.2 Connection of the DC cable

The wiring box of the ISMGT1 inverter is designed to have pairs of DC terminal blocks which support up to four (4) (three (3) for ISMGT128) PV strings to be connected in parallel inside the wiring box.

CAUTION!
ISMGT1 inverters are listed for no backfeed current. However, all other external source circuits and array wiring Current capacity should be taken into account by system installers when determining the proper rating of PV string fuse, or a fire hazard may occur if there is short-circuit in a PV string.

There are two (2) terminals, labeled UNGROUNDED CONDUCTOR and GROUNDED CONDUCTOR, per PV string located in the wiring box used for the DC cable connections. All the screws shall be tightened with a torque of 1.7Nm (15.6 in-lb).

Up to four (4) (three (3) for ISMGT128) PV strings (4 pairs) can be connected to the ISMGT1 inverter as shown in the figure 2.3.2.1. The PV strings will be connected in parallel inside the wiring box.

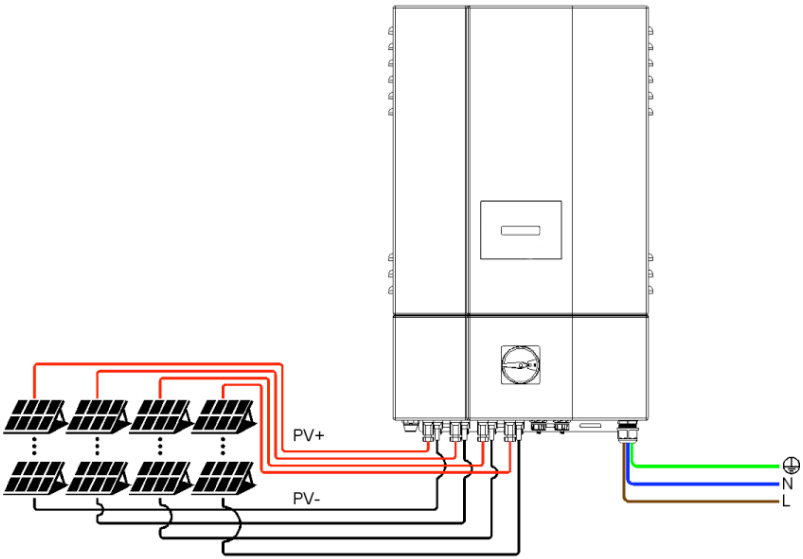


Fig 2.3.2.1 PV- terminal connection

The ISMGT1 inverter supports both negative and positive ground for PV strings connections. The JP14 and JP15 jumpers are used for the settings of the negative and positive ground.

CAUTION!

PV arrays provide Energy when exposed to light, they supplì very high DC voltage. Make sure safe working practices are followed.

WARNING!
Route the DC connection cables to the ISMGT1 inverters away from any possible hazard that could damage the cables.

WARNING!
Hazardous voltage is still present on the device after disconnection of all PV DC inputs. Allow 5 minutes for the inverter to completely discharge the energy stored in capacitors.

2.3.2.1 Connection of the DC wires for Negative Ground Arrays

The ISMGT1 inverters are shipped with negative ground setting, they are set as shown in the figure 2.3.2.1.1. The JP14 and JP15 jumpers are placed on the lower positions. The red DC wire is connected to the DCIN+ terminal, the black DC wire is connected to the DCIN- terminal. In this case the positive polarity of the DC input voltage from the PV string shall be connected to the terminal labeled UNGROUNDED CONDUCTOR and the negative polarity of the DC input voltage from the PV string shall be connected to the terminal labeled GROUNDED CONDUCTOR as shown in the figure 2.3.2.1.2.

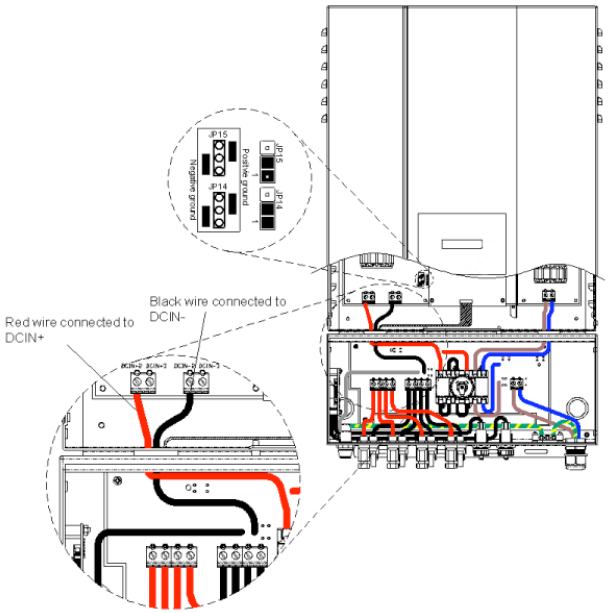


Fig 2.3.2.1.1 Negative Ground Setting and DC wires connections

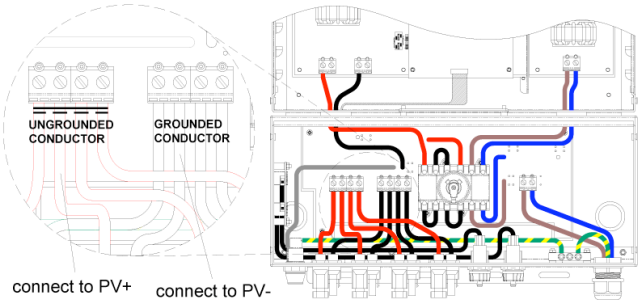


Fig 2.3.2.1.2 DC terminal blocks for DC cable connection in Negative Ground

CAUTION!

Identify the different polarity of DC voltage on each PV string and connect respectively to the input terminals marked "UNGROUNDED CONDUCTOR" and "GROUNDED CONDUCTOR". Make sure the DC voltage that PV arrays generate is equal to or less than 600 VDC in any case.

- The "+" cable of the DC input voltage shall be connected to the terminal labeled UNGROUNDED CONDUCTOR and the "-" cable of the DC input voltage shall be connected to the terminal labeled GROUNDED CONDUCTOR.
- Avoid using wire nuts to join any wire together or to make any improper junction anywhere in the PV system. Wire nuts are frequent cause of unreliable connections, resistive connections, and ground faults.
- Tighten the screws with a torque of 1.7Nm (15.6 in-lb).

2.3.2.2 Connection of the DC wires for Positive Ground Arrays

The ISMGT1 inverter also support PV arrays with positive ground for some applications. As shown in the figure 2.3.2.2.1, the JP14 and JP15 jumpers are placed on the higher positions to set to the positive ground. And the red DC wire is connected to DCIN- terminal and the black DC wire is connected to DCIN+ terminal. In this case the positive polarity of the DC input voltage from the PV string shall be connected to GROUNDED CONDUCTOR terminal and the negative polarity of the DC input voltage from the PV string shall be connected to UNGROUNDED CONDUCTOR terminal as shown in the figure 2.3.2.2.2.

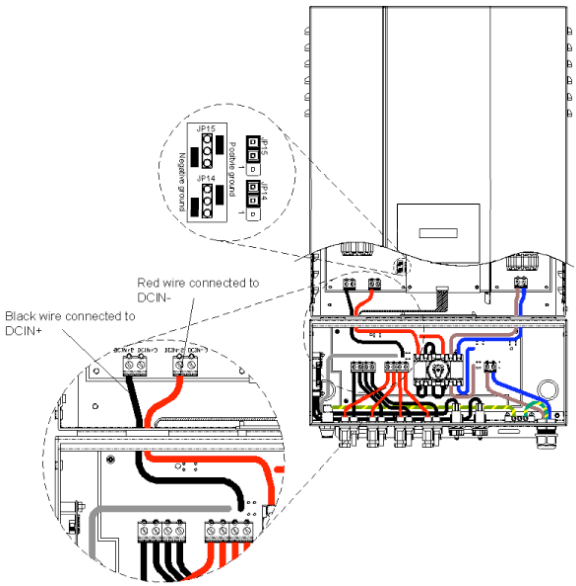


Fig 2.3.2.2.1Positive Ground Setting and DC wire connections

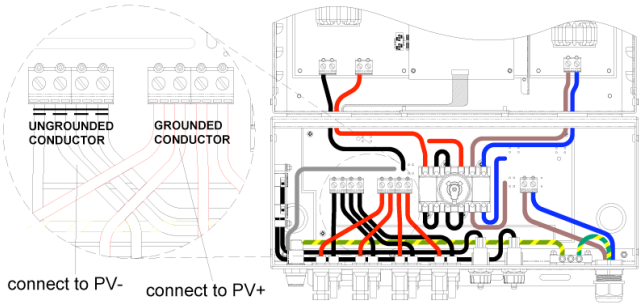


Fig 2.3.2.2.2 DC terminal blocks for DC cable connection in Positive Ground

CAUTION!

The Positive Polarities of the DC input voltage from a PV string shall be correctly connected to the "GROUNDED CONDUCTOR" terminal and the Negative Polarity of the DC input voltage from a PV string shall be connected to the "UNGROUNDED CONDUCTOR" terminal. Make sure the DC voltage that PV arrays generate is equal to or less than 600 VDC in any case.

- The "+" cable of the DC input voltage shall be connected to the terminal labeled "GROUNDED CONDUCTOR" and the "-" cable of the DC input voltage shall be connected to the terminal labeled "UNGROUNDED CONDUCTOR".
- Avoid using wire nuts to join any wires together or to make any improper junction anywhere in the PV system. Wire nuts are a frequent cause of unreliable connections, resistive connections, and ground faults.
- Tighten the screws with a torque of 1.7Nm (15.6 in-lb).

2.3.3 Connection of the Communication cable

The ISMGT1 inverter supports two common data interface standards, RS-232 and RS-485 that will be used to communicate to the remote computer or terminal. Only one of the communication interfaces can work at a time. As shown in the figure 2.3.3.1, there are two RJ-45 connectors (RJ45-L and RJ45-R) located on the bottom of the wiring box. The pin numbers of the RJ-45L and RJ-45R connectors and the corresponding signals are described in the figure 2.3.3.2 below.

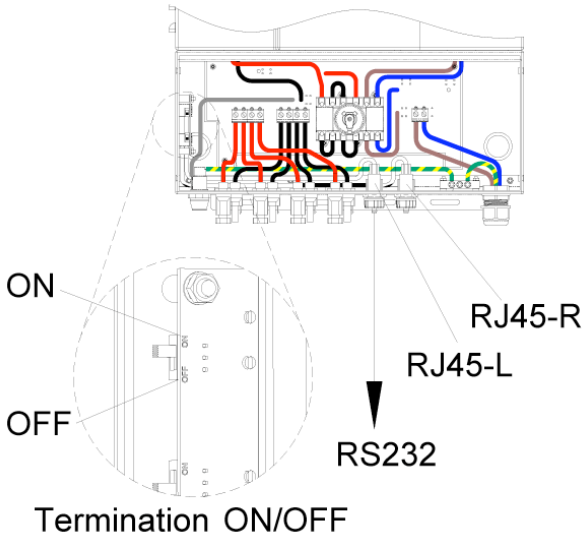


Fig 2.3.3.1 Positions of the communication ports and termination switch

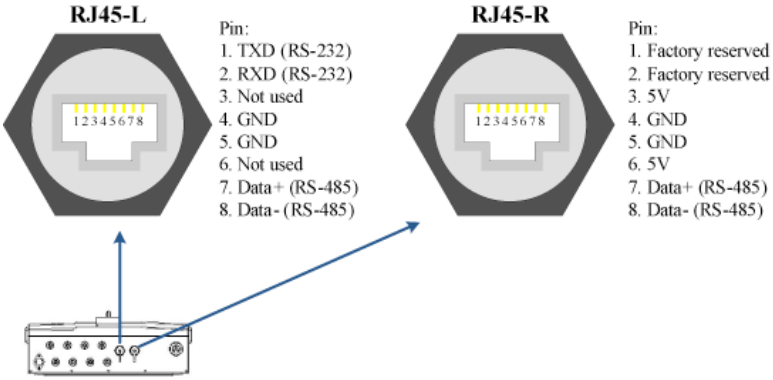


Fig 2.3.3.2 RJ-45 Pins and Signals

The RS-232 signal pins, TXD and RXD, are only on the RJ45-L. Therefore, only the RJ45-L can be used to connect to one remote PC or terminal when the RS-232 interface is used. The cable with the part number of WABG-0918S, which is 180 cm (70.9 inches) in length, is dedicated for the communications between ISMGT1 inverter and a computer. The cable pinout diagram between RJ45 and RS-232 is shown in the figure 2.3.3.3.

If the RS-485 interface is used as the external communication interface, both RJ-45 connectors will be used for the cascaded RS-485 connection (Daisy Chain) as shown in the figure 2.3.3.4. If the inverter is the last device within the RS-485 chain, then the termination switch shall be put to ON position (as shown in the figure 2.3.3.4). Users shall open the front lid of the wiring box to switch the termination switch to ON position. The termination switch default set is OFF.

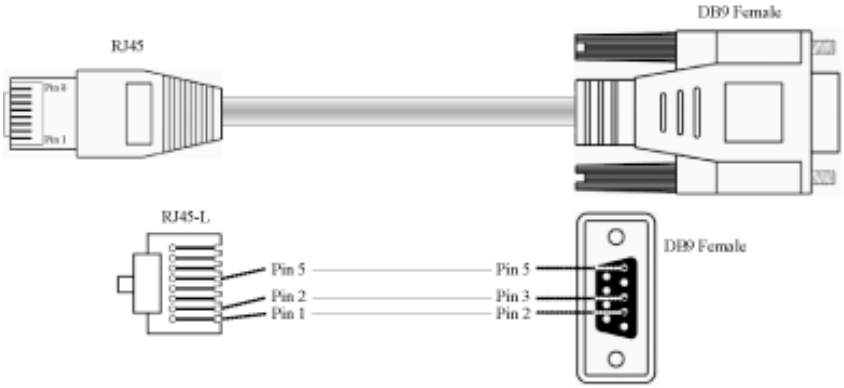


Fig 2.3.3.3 RS-232 connection

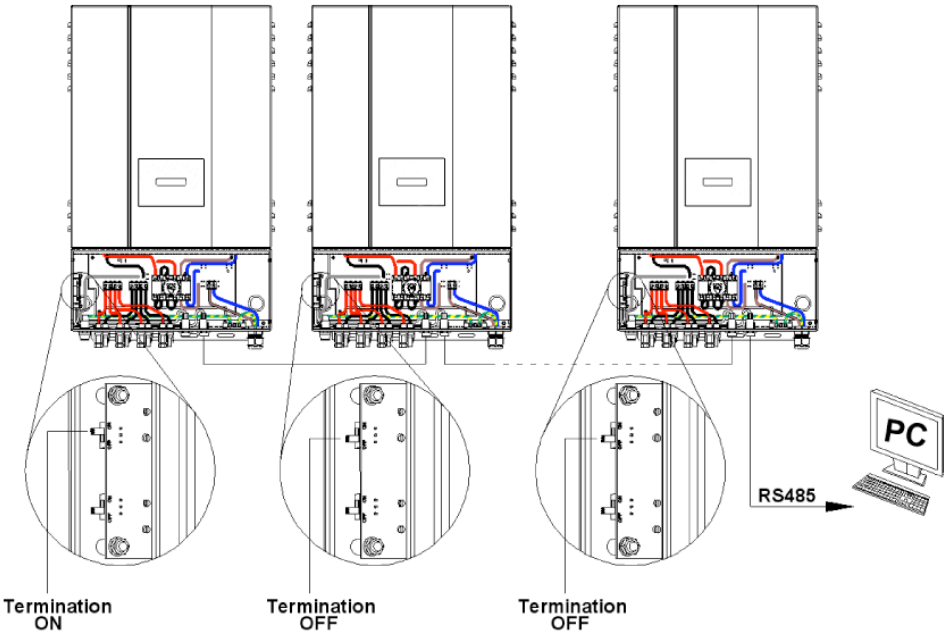


Fig 2.3.3.4 RS-485 connection

2.4 Wiring inverter in parallel

ISMGT1 inverters can be connected in parallel when more power is required. In the parallel configuration, each inverter shall connect to its own PV array. It is not recommended to connect one PV array to more than one inverter. This may cause the inverter to work abnormally. The figure 2.4.1 below shows the connections between inverters and PV arrays in parallel configuration.

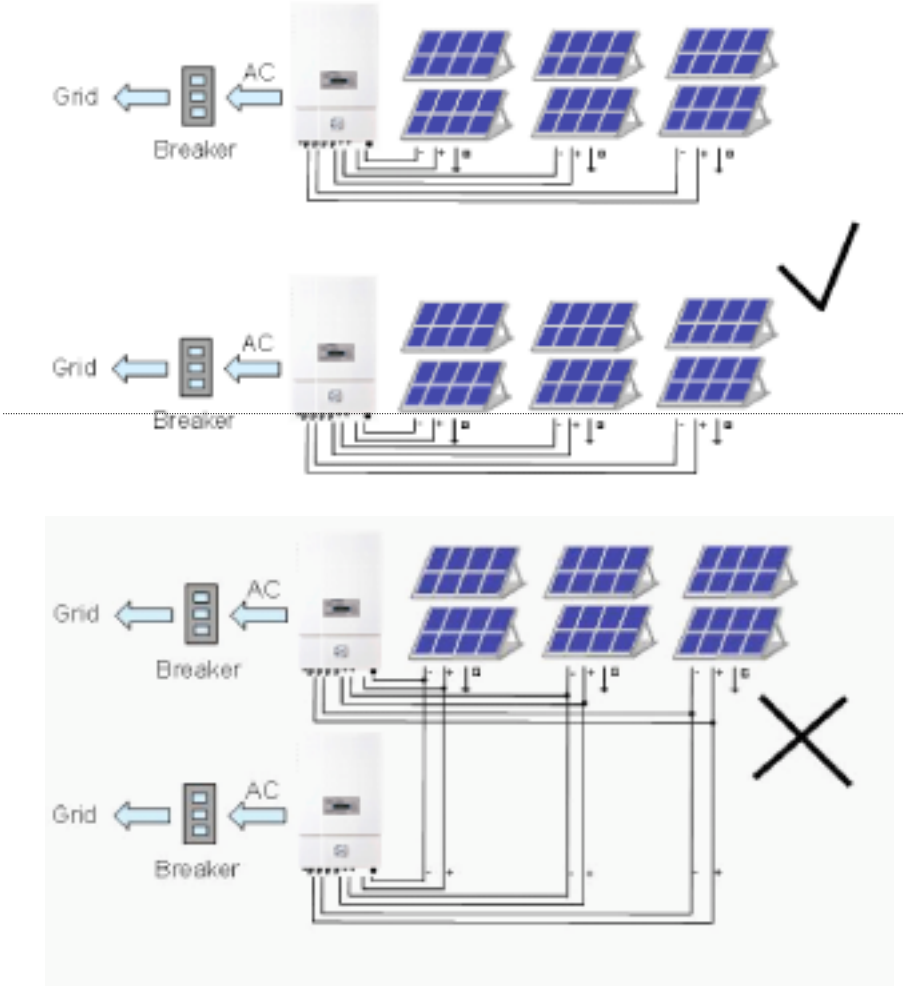


Fig 2.4.1 Parallel configuration of inverter

3. Operation

3.1 Overview

The ISMGT1 inverter will operate automatically. Once the irradiation is strong enough to generate DC input voltage over the pre-set threshold value, the inverter turns on. The inverter feeds power into the grid after input voltage rises over the PV start voltage and all necessary conditions are checked and fulfilled. The inverter goes into Monitoring mode from the Grid/MPP mode if the DC input voltage goes under the minimum MPP voltage. If the DC input voltage falls below the pre-set threshold value, the inverter will shut down itself. There are five main operating modes as described in detail below.

System Check : When the DC input voltage goes above the PV start voltage, the inverter is powered-up, initialises, and then enters the System Check mode. In this operating mode, the inverter runs the diagnostic routine. This stage lasts a few seconds.

Monitoring : After System Checking is complete the inverter enters the Monitoring mode. In this operating mode, the inverter monitors all parameters on both AC and DC sides in order to ensure that connecting to the Grid is safe. All conditions must be fulfilled and last for the specified period of time, then the system will enter the Grid/MPP mode.

Grid/MPP : After the Monitoring mode, the ISMGT1 inverter confirms that all conditions necessary for feeding the power into the utility grid are fulfilled. The inverter will turn on the AC relays and start feeding the AC power to the grid. In this operating mode, the inverter continues to convert the DC power generated by the PV array to the AC power that is then fed into the grid.

Fault : When fault(s) occurs and have been detected in the operating mode described above, the inverter will terminate the present state, stop feeding power to the grid, and then jump into the Fault mode and execute the programmed sequence. In case the faults clear for the preset time, the inverter will leave Fault mode and enter System Check mode. Some faults, like component failure, will cause the inverter to go into Idle mode. This Mode requires authorised service staff to clear the error(s).

Idle **:** The inverter jumps into this operating mode when it detects a major malfunction and will stop feeding the power to the grid for safety reason. This failure cannot be reset by anyone on field. Only authorised personnel is equipped to analise the failure and put the system back to operation.

3.2 Operation Feature

Anti-Islanding:

When an “island” condition is detected, the inverter will stop feeding the power to the grid and/or the load. The “island” is defined as a grid tied inverter maintaining operation and feeding power to a load that has been isolated from the utility power source. This causes an automatic shutdown of the inverter. This is a safety feature which is primarily meant to prevent electrical shock to staff who might be working on the grid lines.

Unity Power Factor:

The ISMGT1 inverter goal is to feed the power with a unity power factor (PF = 1) to the utility during operation. The inverter continues sensing the phase of the utility voltage, and constructs the output current waveform in phase with the utility voltage.

Maximum Power Point Tracking:

In order to find the most efficient way of utilizing the solar energy, ISMGT1 inverters are designed to track and absorb the maximum power from the PV array. The Maximum Power Point Tracking (MPPT) function is employed in the embedded control software to achieve this intended purpose.

3.3 LED Indication

There are three LED's on the front panel of the ISMGT1 inverter which displays the operating status of the inverter. As shown in the figure 3.3.1. The detailed explanations of the status and the corresponding LED indications are described in the following table.

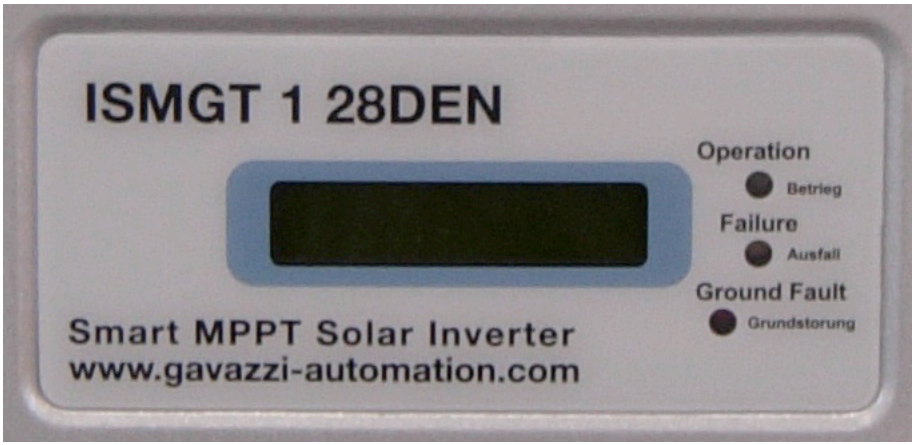


Fig 3.3.1 Front panel of the ISMGT1 inverter

LED Indication Table

LED indicators		Operating status	On Grid	Description
Green Yellow Red	☼ ☼ ☼	Initialization	N	The ISMGT1 inverter is in initial mode.
Green Yellow Red	☼ ● ●	System Check mode	N	The inverter is in System Check mode.
Green Yellow Red	☼ ● ●	Monitoring mode	N	The inverter is in Monitoring mode.
Green Yellow Red	○ ● ●	Grid/MPP mode	Y	The inverter is in Grid/MPP mode.
Green Yellow Red	☼ × ●	Power De-rating	Y	Output power is de-rated.
Green Yellow Red	× ☼ ●	Warning	Y	Warning detection.
Green Yellow Red	☼ ● ●	1.Low Insolation 2.Vac high	N	1.Insufficient Sun irradiation. 2.Vac is higher than the voltage quality monitoring setting.
Green Yellow Red	● ○ ×	Fault mode	N	The inverter is in Fault mode.
Green Yellow Red	× × ○	Ground Fault	N	Ground fault detected.
Green Yellow Red	○ ○ ×	Idle mode	N	The inverter is in Idle mode.
Green Yellow Red	● ● ●	Night Time	N	There is no DC power coming from PV array. System is powered off.

○ : LED ON ☼ : LED ON / OFF 0.1 / 0.9 Sec

● : LED OFF ☼ : LED ON / OFF 0.9 / 0.1 Sec

× : DON'T CARE ☼ : LED ON / OFF 0.25 / 0.25 Sec

3.4 LCD Display

The ISMGT1 inverter has a 2 x 16 characters LCD to show the operating status, input/output data, and error messages. As long as the DC input voltage is above the pre-set threshold value, the LCD will display the information following the process flow illustrated in the figure 3.4.1.

There are 3 main process flows in the device program: Regular procedure, fault procedure or idle procedure. In the regular procedure the system goes from Initialisation to, System Check, Monitoring, and then Grid/MPP mode providing no fault condition is detected. The inverter is expected to always work in the regular procedure and feed the power to the grid. If a fault condition, that can be self recovered, is detected during the System Check or Monitoring mode the system will go into the fault procedure. The system will return to regular procedure once the fault condition is cleared. An obvious example of the automatic restore is the detection of an “island” condition due to the grid failure, later the grid may be restored and the fault condition is automatically cleared when the power recovers. If a fault, which cannot be self cleared, is detected, the system will enter the idle procedure. The only tools to exit this procedure are available to authorised personnel. These three procedures are illustrated in the figure 3.4.1.

The following figures explain how the display works for the regular procedure.

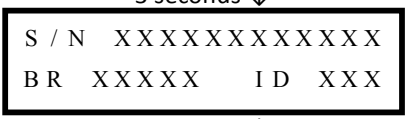
Initialisation Mode :

When the DC input voltage rises above the pre-set threshold value, the ISMGT1 inverter is powered up and will show the company name and model name (ISMGT150 in this example) on the LCD as shown below.

3 seconds ↓

After 3 seconds, software versions of two embedded CPU's, Sequential (SEQ) and Current (CUR) controller, will be displayed on the LCD. Afterward the serial number (S/N), the baudrate (BR) / address (ID) for the communication port will be displayed.

3 seconds ↓

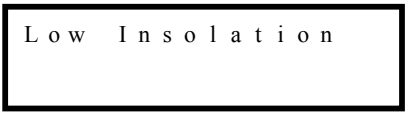


3 seconds ↓

System Check Mode :

After the basic information of the inverter is displayed, the system enters the System Check mode which is then indicated on the LCD.

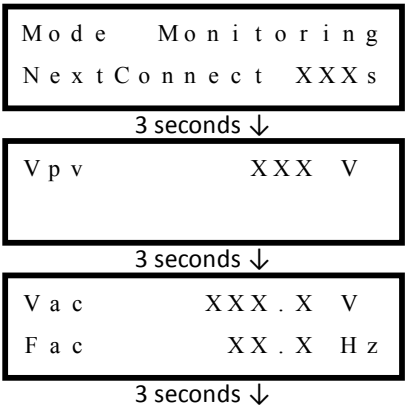
During the System Check, if the DC input voltage is not reaching the point of the PV start voltage setting, , then the following message will be shown on the LCD and the system will stay at this step.



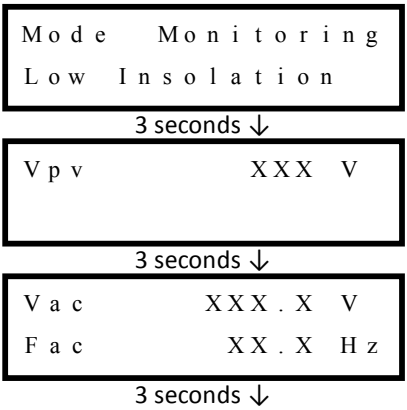
During the System Check, if the grid is not connected to the inverter, then the inverter enters to Fault mode and following message will be shown on the LCD.

Monitoring Mode :

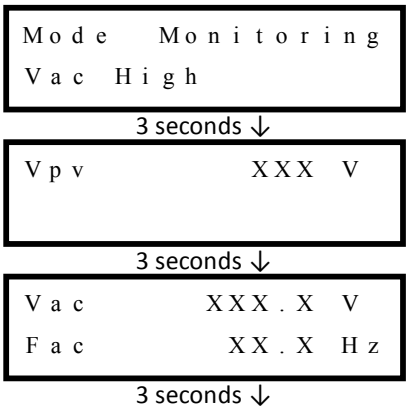
Once the System Check is done, the inverter goes into the Monitoring mode. If all data needed for grid feeding is in the acceptable range, the system will keep monitoring those data for a period of time. The following information tell the user that the system will go into the Grid/MPP mode in XXX seconds and then show the measured data of the DC input voltages and the actual voltage and frequency on the grid side.



During the Monitoring mode, if DC input voltage falls under the PV start voltage setting, the system stays in this mode and shows the information as follows. The system will still keep measuring the parameters of both DC and AC and display on the LCD.



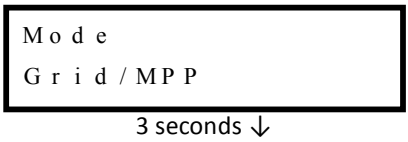
For ISMGT1xxxD-DE (Germany type), for instance which is set according to VDE0126-1-1, if the AC voltage on the grid side increases over the voltage quality monitoring setting and below the over voltage setting for at last 300 seconds in grid/MPP mode, the ISMGT1 inverter shall return to Monitoring mode and display the messages on the LCD as shown below. If the AC voltage decreases and below the voltage quality monitoring setting for at last 300 seconds, ISMGT1 inverter will then go back to regular procedure and re-connect to the grid if all conditions are satisfied.



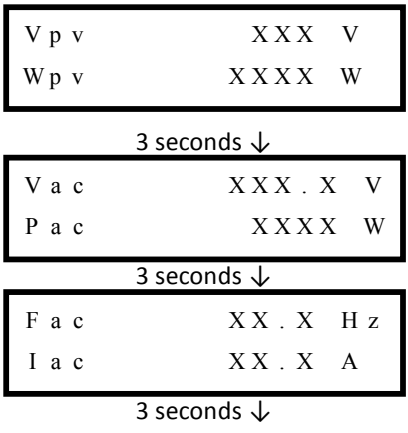
Grid/MPP Mode :

After the system enters the Grid/MPP mode, it will show the following information in order and repeatedly until the system goes to other operating mode.

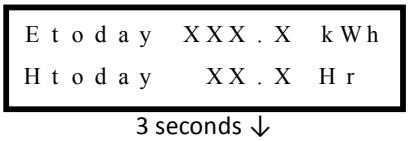
The first screen shows the current operation mode.



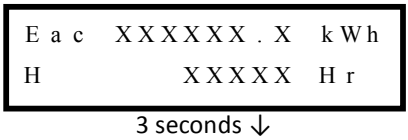
Next messages are the actual real time data of the input / output voltage and power. The first 2 lines screen are for the PV arrays and the following screens are for the output. Vpv is the incoming voltage from PV array. Wpv is the incoming power of PV array in Watts. Vac, Pac, Iac, and Fac are: Voltage, Power, Current, and Frequency that the inverter is feeding to the grid.



The following message shows the daily cumulated energy in kWh and period of time in hours for the power delivered to the grid since the inverter has been powered on and operated for current day.



The following message shows the cumulated energy in kWh and period of time in hours for the power delivered to the grid up-to-date since the inverter has been installed and operated.



Power De-Rating Message :

There are five possible de-rating causes, each one displayed with a different message when power de-rating is detected in Grid/MPP mode. Only one derating cause could be detected at the time. Therefore, only one of the following messages will be displayed if power de-rating occurs. When **Temp** message is presented, the power de-rating is caused by the over temperature. The **Ipv** message shows that the power de-rating is caused by restricting the DC input current to the maximum limit. The **Iac** and **Pac** messages illustrate the power de-rating is caused due to restriction of the maximum output AC current and power. The **VacH** message shows that the power de-rating is caused by the high AC voltage.

Mode Derating Temp
Mode Derating Ipv
Mode Derating Iac
Mode Derating Pac
Mode Derating VacH

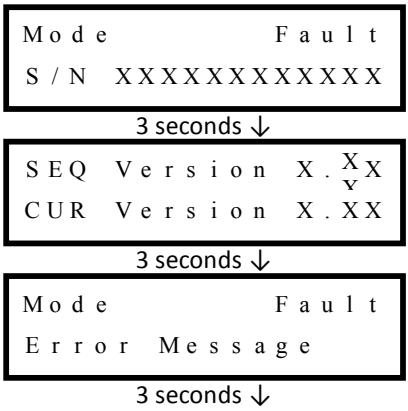
Warning Message :

There are three possible warning messages which can be shown when situations occur in grid feeding mode. When EEPROM message displayed, the system has encountered a failure accessing to the EEPROM. The COMM message, represents failure of the communication function. For the FAN BLOCK message, shows that the fan has stopped running. These warnings could be happening simultaneously.

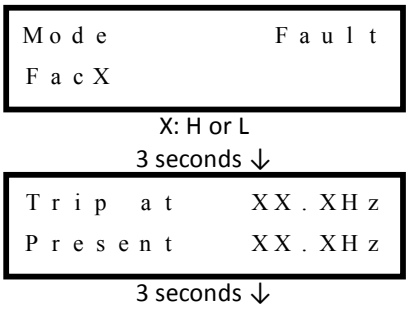
Warning EEPROM
Warning COMM
Warning FAN BLOCK

Fault Mode :

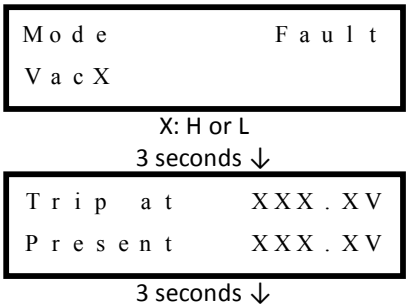
The fault messages are described as follows. First screen shows the mode fault, serial number of the inverter, the follows software versions of the sequential (SEQ) and current (CUR) controllers and then the error messages which are listed in the Error Message Table on section 3.7.



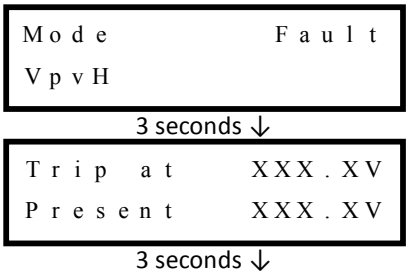
There are several error messages which show the detailed conditions causing the system going into the Fault mode. Such as the messages shown below which describe that the frequency on AC grid is too high (H) or too low (L). And after three (3) seconds, the message shows the present frequency and the frequency that caused the system to go into Fault mode.



The message below shows the AC voltage is too high (H) or too too low (L). And after three (3) seconds, the message shows the present voltage and the voltage that caused the system to go into fault mode.

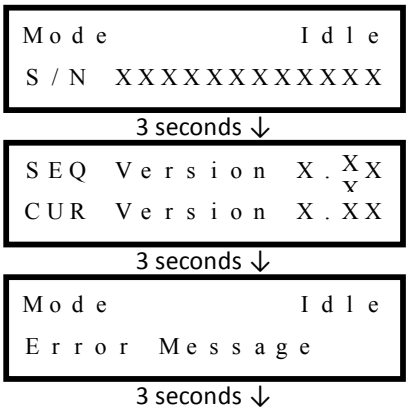


The message below shows the PV input voltage is too high.



Idle Mode :

The messages for Idle mode are as here after described. First screen shows the operating mode and serial number of the inverter, then follow the software versions of the sequential (SEQ) and current (CUR) controllers and then the error messages which are listed in the Error Message Table on section 3.7.



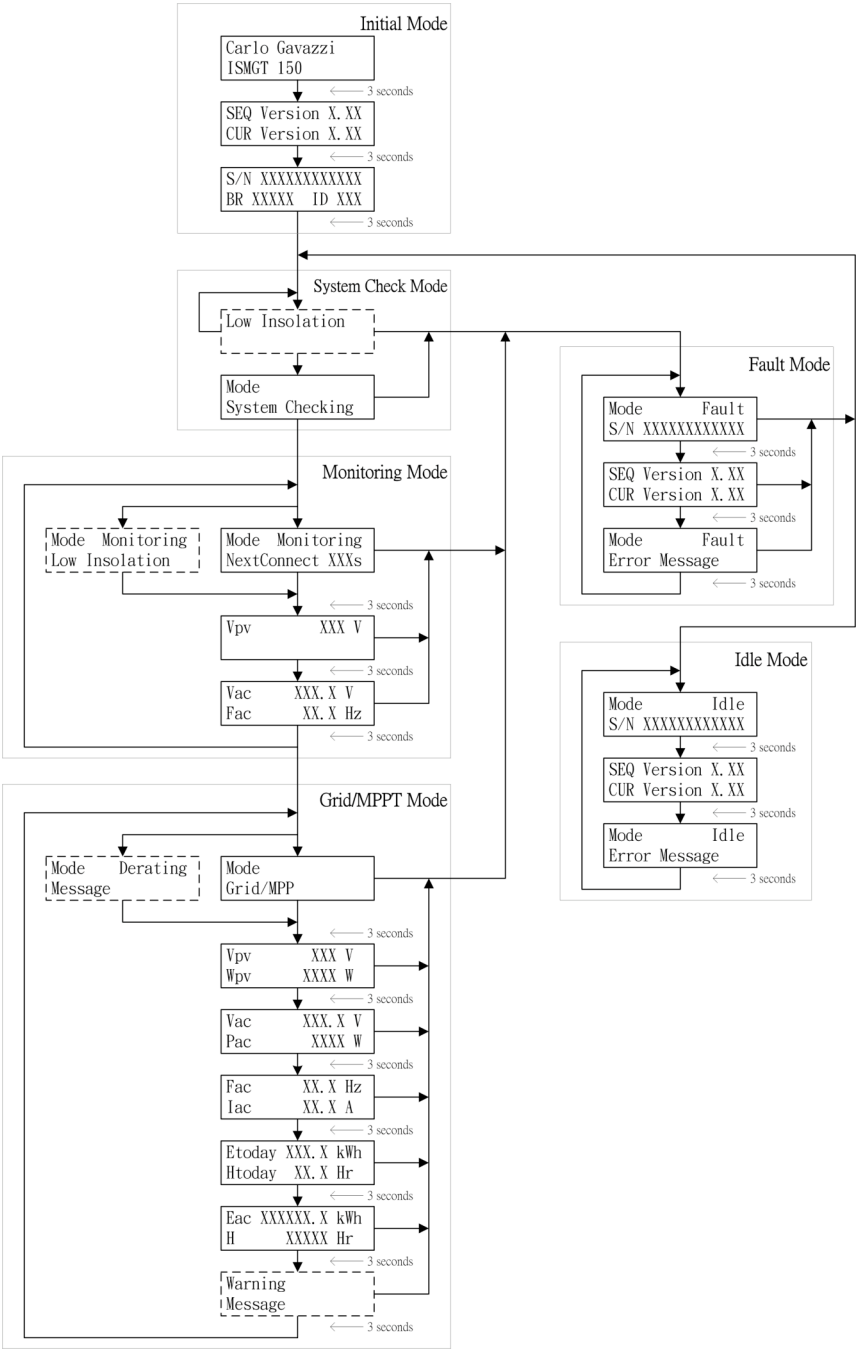


Fig 3.4.1 ISMGT1 inverter LCD display lay-out

3.6 Communication

There are two types of communication methods, RS-232 and RS-485 supported in the ISMGT1 inverters that may be connected to an external computer or terminal equipped with either RS-232 and/or RS-485. Only one type of the communication can be used at a time. ISMGT1 inverter will automatically switch to RS-232 or RS-485 depends on the external communication interfaces without manual setting. For the RS-485 interface, it allows multiple inverters that can be connected to an external computer. It allows only one inverter to be connected to an external computer if RS-232 interface is used. Please refer to the section 2.3, “Connection of the Communication Cable”, for the detail pin descriptions for both RS-232 and RS-485 interfaces.

3.7 Explanations of Error Messages

In the event of a fault, the inverter will stop feeding the AC power to the utility grid and display the error message on the LCD. Qualified service personnel shall do the analysis, measurement, and debug if needed according to the error message in order to resume normal conditions. It is recommended to screen out the fault condition(s) by referring to the table below and then remove the fault condition(s) to return normal condition and continue to feed AC power to the utility. Please contact Carlo Gavazzi Office or your service representative if the same error message is persistent.

Error Message Table

Error Message	Description
GridNA	No AC voltage is detected on the grid side.
Drift Fac	Islanding is detected.
VacH	The AC voltage of utility grid is over the upper limit.
VacL	The AC voltage of utility grid is under the lower limit.
FacH	The frequency of AC voltage of the utility is over the upper limit.
Error Message	**Description**
FacL	The frequency of AC voltage of the utility is under the lower limit.
VpvH	The DC voltage of PV array is over the upper limit.
Imax_AC	Over current on the AC side.
InvTempMax	The internal temperature of the inverter exceeded the safe operating limit.
Relay 1 Open	Relay 1 test open failed.
Relay 1 Close	Relay 1 test close failed.
Relay 2 Open	Relay 2 test open failed.
Relay 2 Close	Relay 2 test close failed.
MOV Fault,AC	High voltage protection function failed in AC side.
MOV Fault,DC	High voltage protection function failed in DC side.
GFDI	A grounding fault is detected. The ground fault fuse will be blown.

DCInjectCurH	Over DC current injected into the AC grid is detected.
VdcbusH	Internal DC bus voltage is over the upper limit.
Internal COMM	Internal communication failed.
Watchdog	Internal watchdog function triggered.
Idc Test	The DC injection current monitoring function failed.
Offset	Offset check for grid monitoring failed.

Error Message	Description
Temp. Sensor	The internal temperature sensor failed.
RAM Test	Memory failed
EEPROM Test	EEPROM test failed
System Error	The system failed.
Version Error	The firmware version is not correct.
CPU Delta Fac CPU Delta Vac CPU Delta GFDI CPU Delta Idc	Internal measurement comparison error or defective hardware.
IpvH	Over current on the DC side.

Driver Fault	Driver circuit or power device failed.
CalDataError	Calibration data is out of range.
CalDataLoss	Calibration data is lost.
Ibuck Over	Internal converter over current.
Converter Error	DC/DC converter hardware failed.
Autotest	Auto test failed.

4. Warranty information

Warranty Period

Refer to attached WARRANTY CARD.

5. Technical Documentation

5.1 Outline Drawing

ISMGT128DI

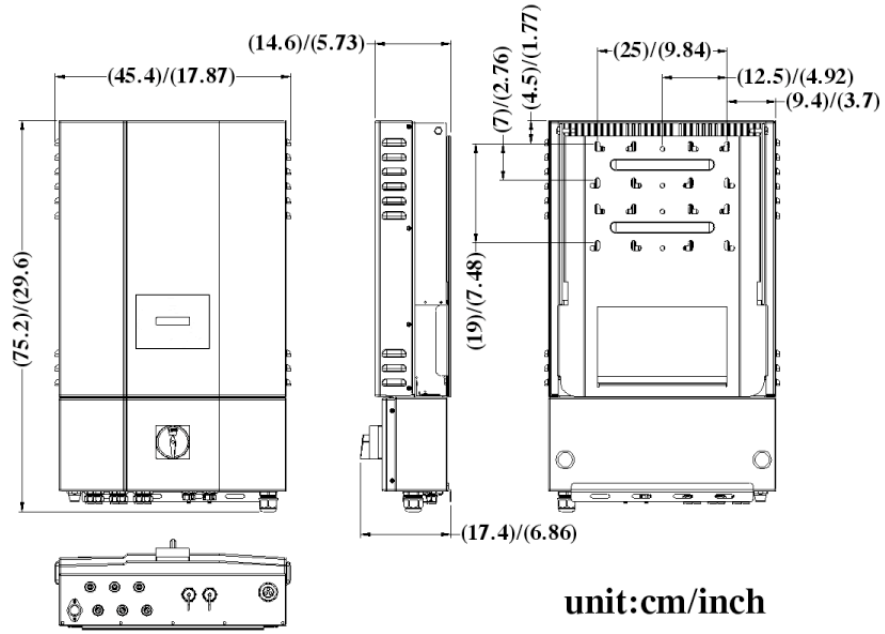


Fig 5.1.2 Outline Drawing of ISMGT128DS

ISMGT138DI

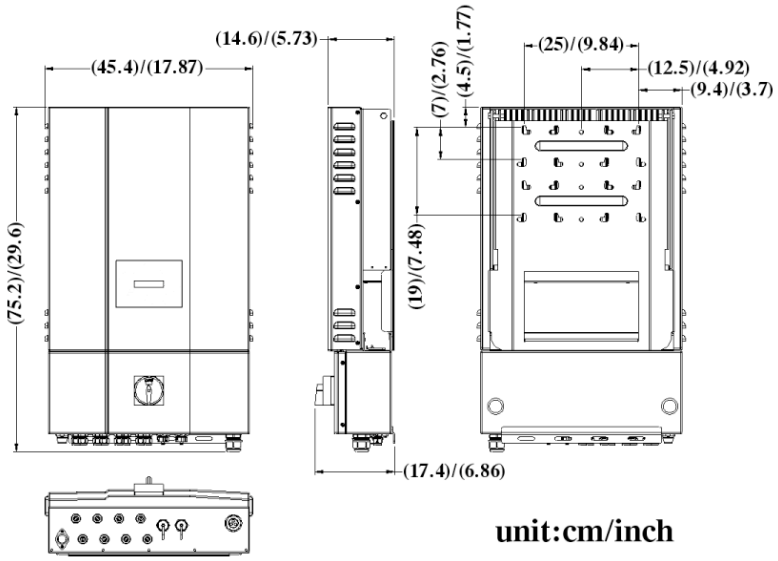


Fig 5.1.5 Outline Drawing of ISMGT138DS

ISMGT140DI and ISMGT150DI

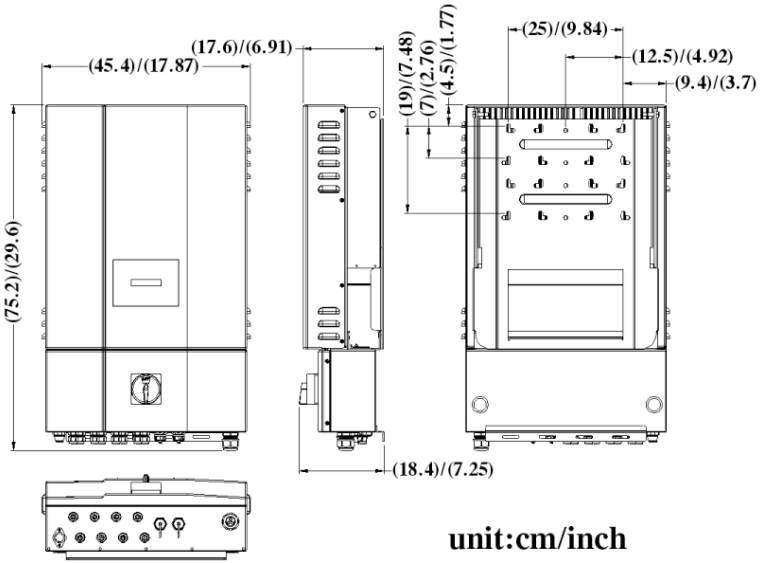


Fig 5.1.8 Outline Drawing of ISMGT140DS, ISMGT150DS

5.2 Efficiency

Efficiency of the ISMGT128

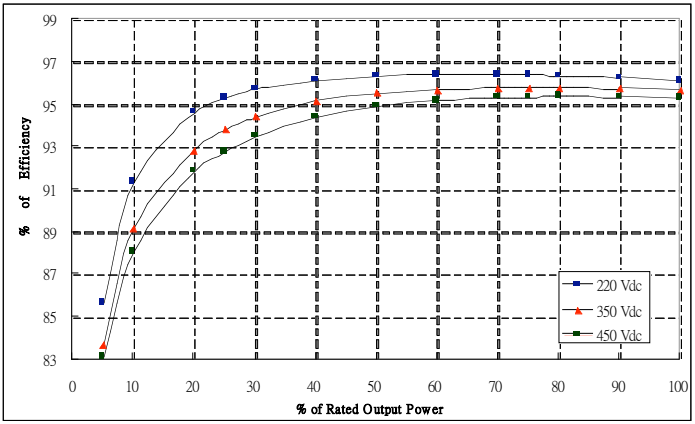


Fig 5.2.1 European Efficiency of the ISMGT128 = 95.4 %

Efficiency of the ISMGT138

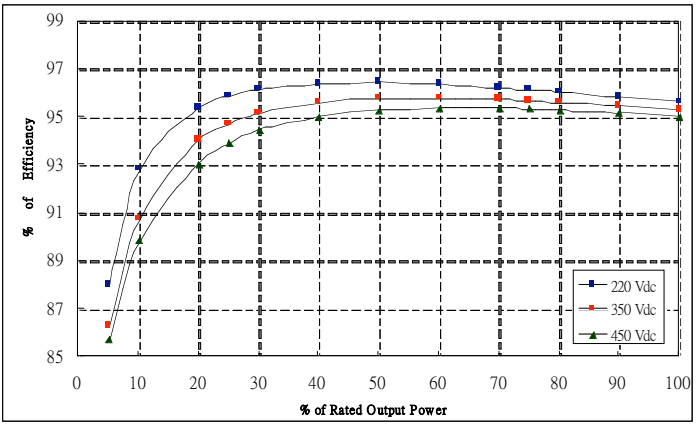


Fig 5.2.2 European Efficiency of the ISMGT138 = 95.7 %

Efficiency of the ISMGT140

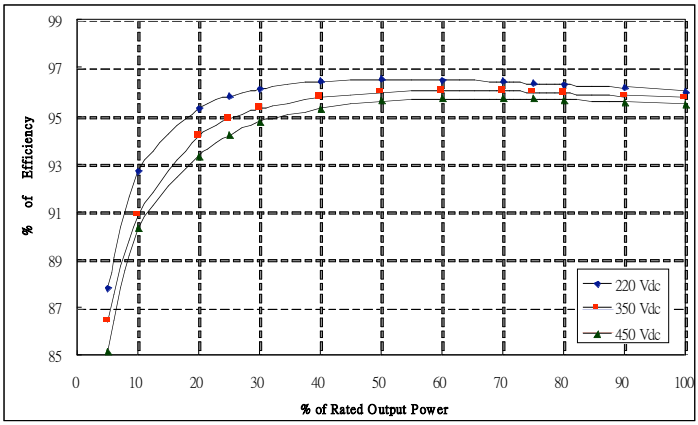


Fig 5.2.3 European Efficiency of the ISMGT140 = 95.8 %

Efficiency of the ISMGT150

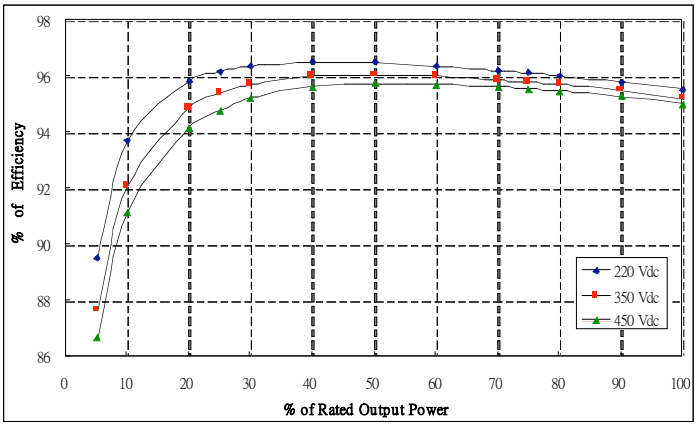


Fig 5.2.4 European Efficiency of the ISMGT150 = 95.8 %

5.3 De-rating Operation

The occasions when the ISMGT1 inverter will take into account and then regulate the output and/or restrict the input power to ensure the system is in a safe operation are described in detail below.

Temperature

The ISMGT1 inverter will monitor the temperature on the heatsink. Once the temperature exceeds 78°C (172.4°F) the system will reduce the output power until the temperature drops under the critical value. The ISMGT1 inverter will shut down the power output to the grid if the temperature reaches 82°C (179.6°F). If this occasion happens often, it is necessary to check whether the inverter is mounted at an appropriate place with good ventilation and not directly exposure to the sunshine.

Input DC current

When the input current from the PV strings is about to exceed the maximum limit, the ISMGT1 inverter will restrict it to the operating limit in order to prevent damage to the inverter. If this occasion happens frequently, it is necessary to check whether the PV array is configured properly to supply the DC current within the maximum limit of the inverter.

Output AC power

The maximum power that the ISMGT1 inverter feeds to the grid is limited according to the specifications listed in Section 1.2. Even if the output current does not up to the maximum current limit, the output power may still be limited in order to keep the output power within the maximum power limit. It often occurs in case the output voltage is higher then nominal AC voltage.

Output AC current

The maximum current that the ISMGT1 inverter feeds to the grid is limited according to the specifications listed in Section 1.2. Even if the output power does not up to the maximum power limit, the output current may still be limited in order to keep the output current within the maximum current limit. It often occurs in case the output voltage is lower then nominal AC voltage.

Output AC voltage

When the inverter is connected to a grid system with longer or thinner wirings, its output voltage might be higher than the over voltage setting. This will cause disconnection due to the voltage deviation instead of abnormal voltage happened in the grid. ISMGT1 inverter provides a setting of voltage quality monitoring which is less than the setting of over voltage. Once the AC voltage reach the voltage quality monitoring setting, ISMGT1 inverter will restrict the output current to keep the AC voltage stay

equal to or less than the setting of AC over voltage so that the inverter, instead of shut itself down, keeps output power to the grid although it is not the maximum output power.

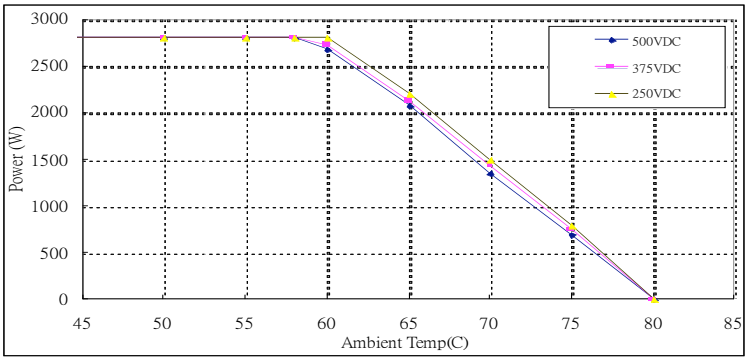


Fig 5.3.1 Temperature derating curve of the ISMGT128

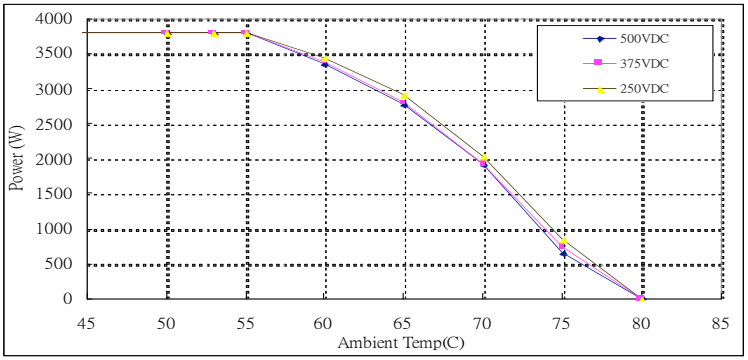


Fig 5.3.2 Temperature derating curve of the ISMGT138

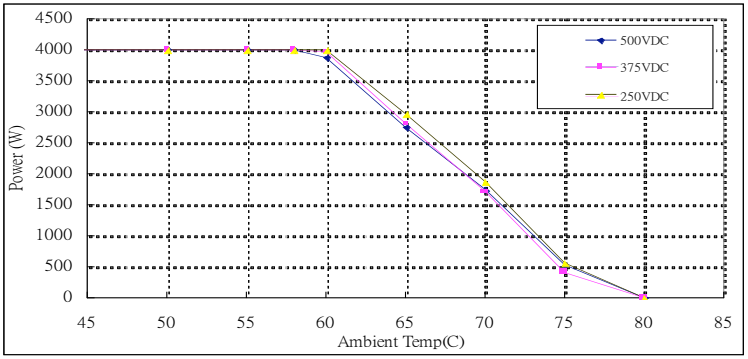


Fig 5.3.3 Temperature derating curve of the ISMGT140

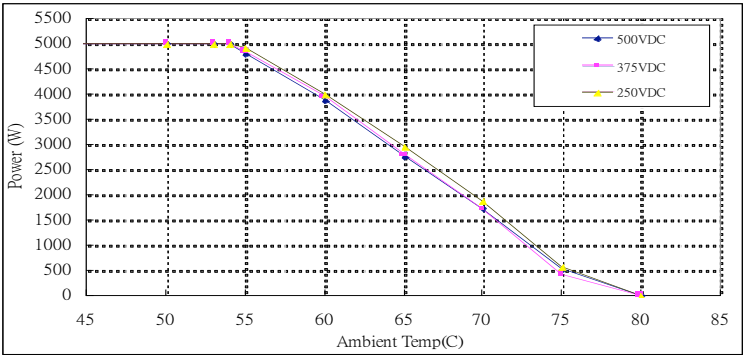


Fig 5.3.4 Temperature derating curve of the ISMGT150

5.4 Maintenance

5.4.1 Exchange of the GFDI Fuse

As shown in the figure 5.4.1.1, turn the cap of the GFDI fuse holder counter anti-clockwise to open the cap and replace the GFDI fuse. Before replacing the fuse, turn off the DC/AC disconnect switch and the breakers and wait for at least 5 minutes for system to discharge.

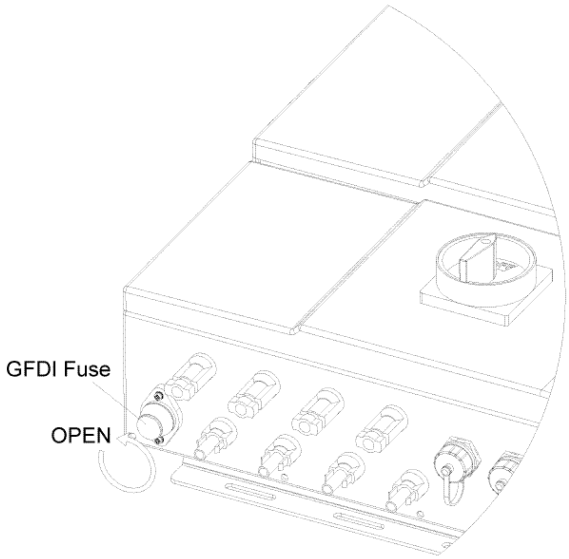


Fig 5.4.1.1 Open the cap of the GFDI fuse holder

1. Turn OFF the DC/AC disconnect switch and breakers.
2. Wait for at least 5 minutes.
3. Exchange the fuses.
4. Turn ON the DC/AC disconnect switch and breakers.

WARNING!
For continued protection against risk of fire, replace only with the same type and ratings of fuse (600 VDC, 1 A)!

5.4.2 Factory Service

Once the product is diagnosed requiring a Factory Service, the product could be removed and sent back using the original shipping box and the packing materials. A copy of the purchase invoice is also required to be included in the package.

Document

There are some documents must be attached with the return product. Please write as detail as possible.

1. Serial number and machine type of the inverter
2. Brief descriptions of connected system
3. Fault message(s) on front panel or fault condition(s)
4. Can the failure be reproduced? How to reproduce it?

The following sections will describe the steps to remove and then to hook back the inverter with the wiring box remaining on the wall.

5.4.2.1 Remove the Inverter

ISMGT1 inverter is designed to be easily separated from the wiring box and removed from the mounting bracket. It must wait for at least five (5) minutes for system to discharge after DC/AC disconnect switch and breakers are switched OFF and before opening the front cover of the inverter to disconnect the wires. Both DC and AC wires that are disconnected from the inverter must be properly wrapped with insulated material. After the inverter is removed from the mount bracket, the through holes of the wires on top of the wiring box must be covered with the cover plate that is attached on top of the wiring box to prevent the box from the water drops causing current leakages.

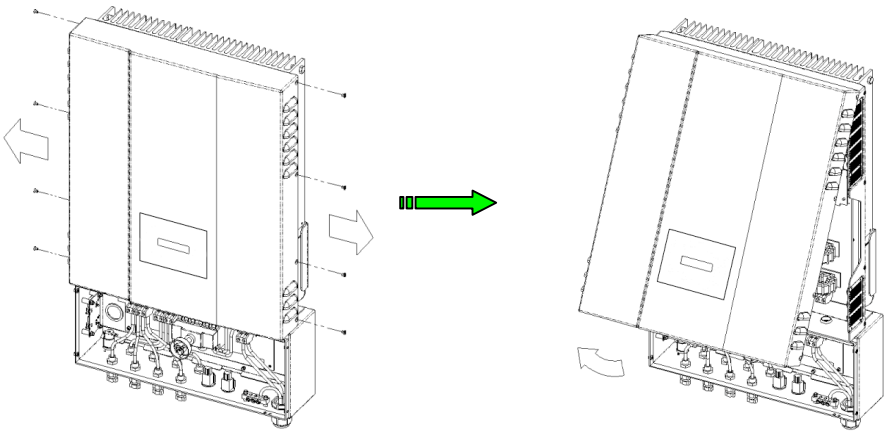


Fig 5.4.2.1.1 Remove the cover of the Inverter

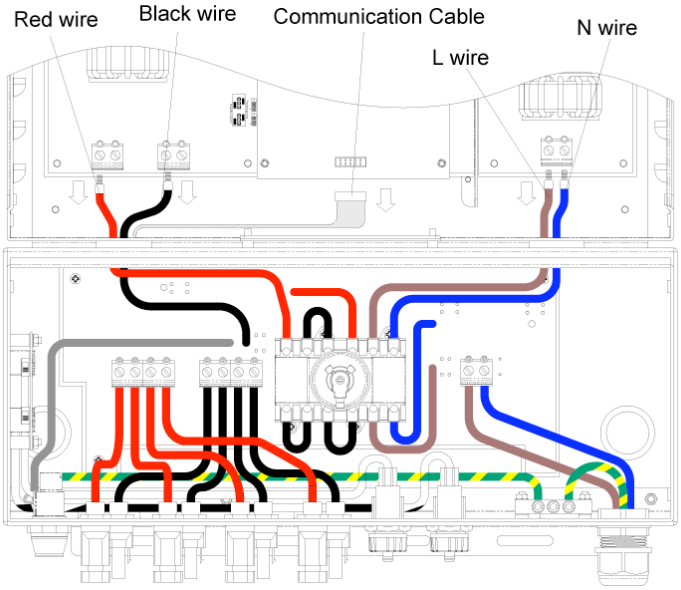


Fig 5.4.2.1.2 Remove the DC and AC wires

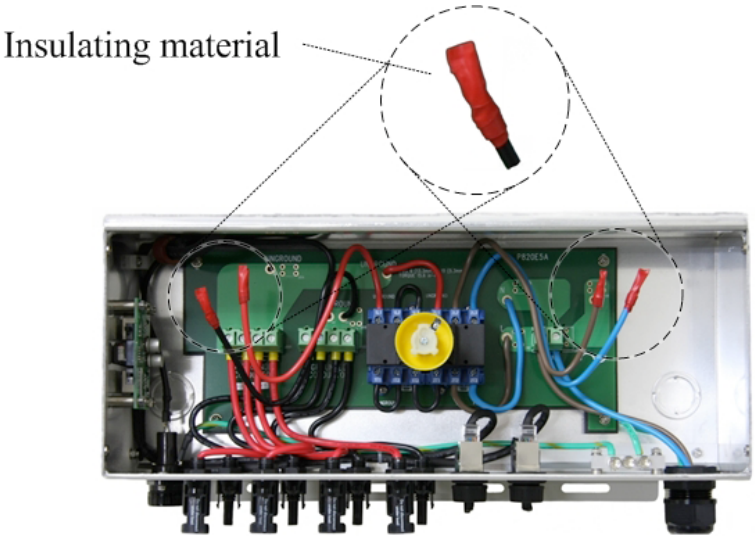


Fig 5.4.2.1.3 Keep the well-wrapped DC and AC wires in store in the wiring box

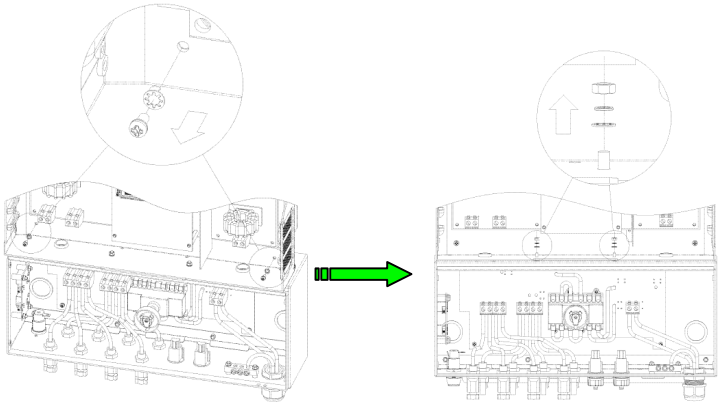


Fig 5.4.2.1.4 Remove the screws and nuts bonding between the inverter and wiring box

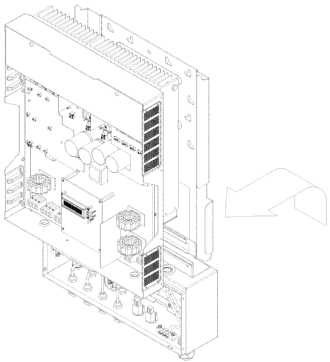
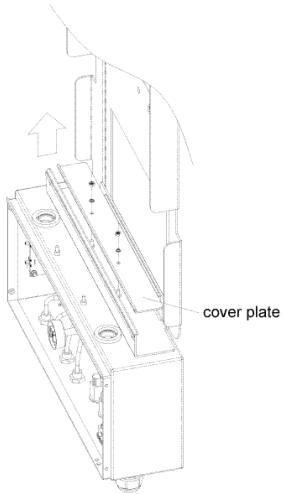


Fig 5.4.2.1.5 Un-hang the inverter carefully



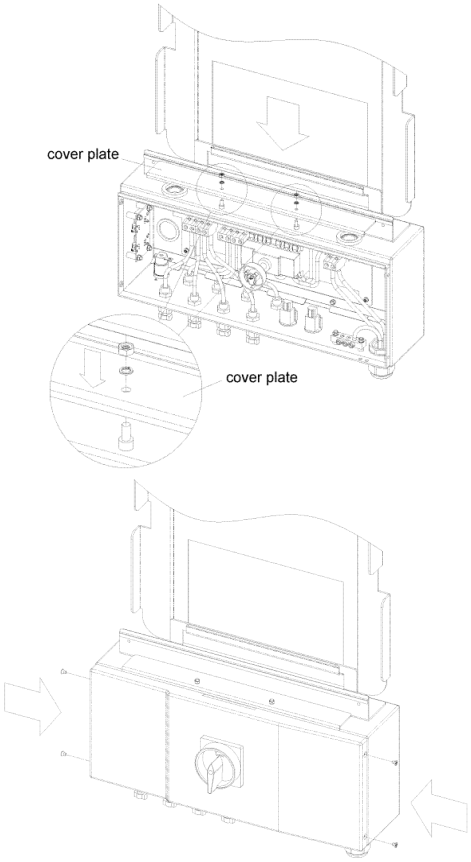


Fig 5.4.2.1.6 Locate the cover plate in place and fasten the screws

1. Turn the DC/AC disconnect switch to OFF position and turn off all breakers.
2. Wait for at least 5 minutes.
3. Remove the cover of the wiring box by following the steps described in section 2.3.
4. Remove the cover of the inverter as shown in the figure 5.4.2.1.1
5. Disconnect the red and black DC wires from the DCIN+ and DCIN- terminals, disconnect the brown and blue AC wires from the ACIN_L1, and ACIN_L2 terminal and disconnect the communication cable as shown in the figure 5.4.2.1.2.
6. All disconnected wires must be wrapped with insulated materials to prevent from the electric shock. Pull in those disconnected wires inside the wiring box as shown in the figure 5.4.2.1.3.
7. Loose the 2 screws by a cross driver and the other 2 nuts by a 7-mm wrench so that the inverter can be taken apart from the wiring box as shown in the figure 5.4.2.1.4.
8. Remove the inverter from the mounting bracket as shown in the figure 5.4.2.1.5.

9. Using the cover plate that is on top of the wiring box to cover the through holes of the wires as show in the figure 5.4.2.1.6.
10. Put the front cover of the wiring box back and fasten the screws.
11. Collect the removed screws and nuts in a plastic bag for the need of re-install the inverter in the future.
12. Keep the DC/AC disconnect switch and circuit breakers stay at the OFF position until the inverter is re-installed, all wires are connected correctly, front covers are put back and screws are fastened.

5.4.2.2 Re-install the Inverter

After re-installation of the inverter, all wires must be re-connected correctly before put the inverter back to work properly.

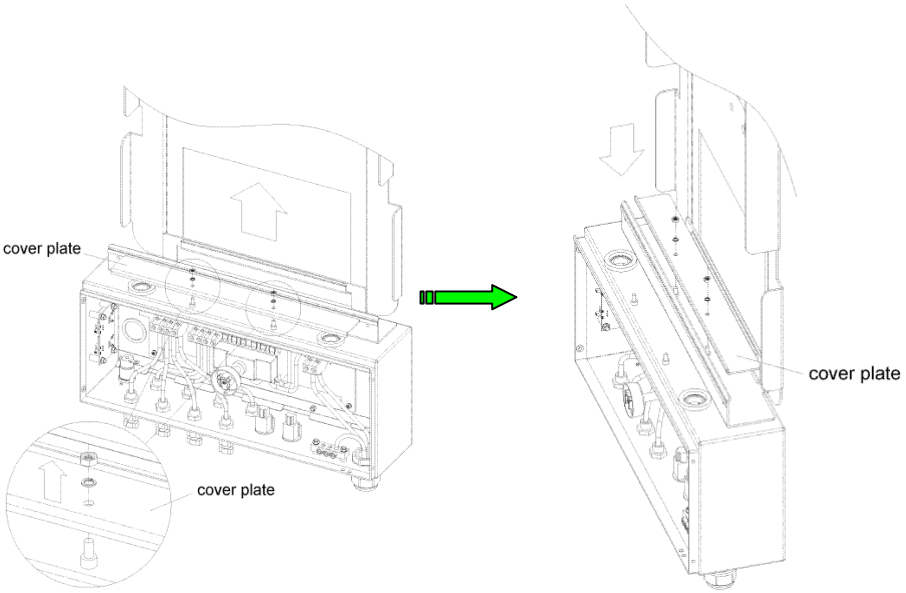


Fig 5.4.2.2.1 Re-install the cover plate and fix it on the top of the wiring box

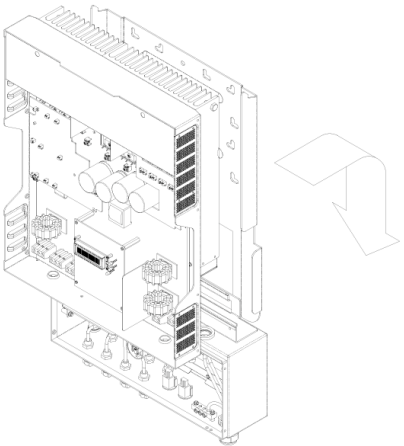


Fig 5.4.2.2.2 Hang the inverter onto the mounting bracket carefully

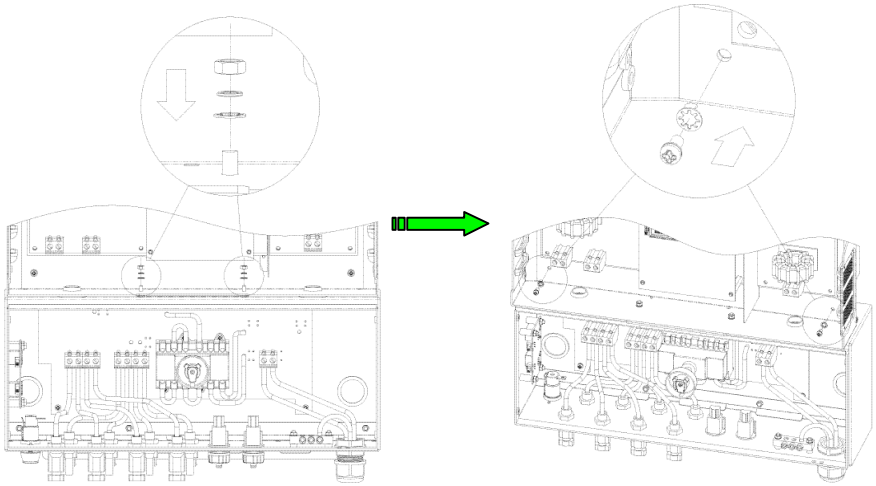


Fig 5.4.2.2.3 Fasten the screws and nuts bonding between the inverter and the wiring box for its construction and grounding continuità

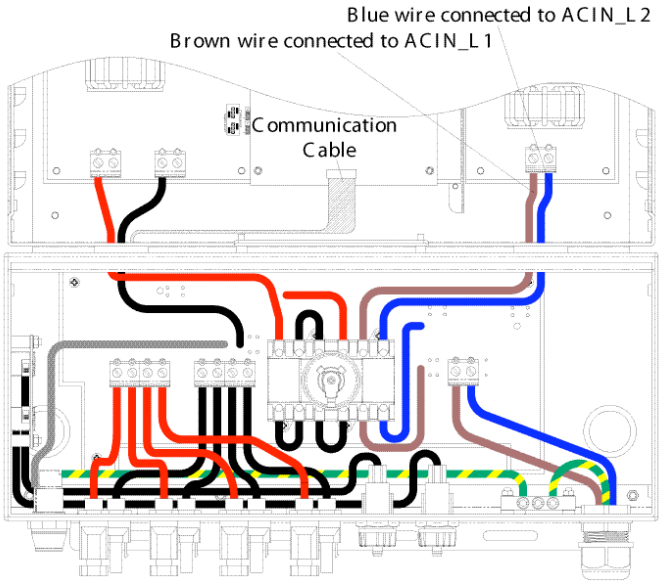


Fig 5.4.2.2.4 Connect the AC wirings to their correct terminals individually

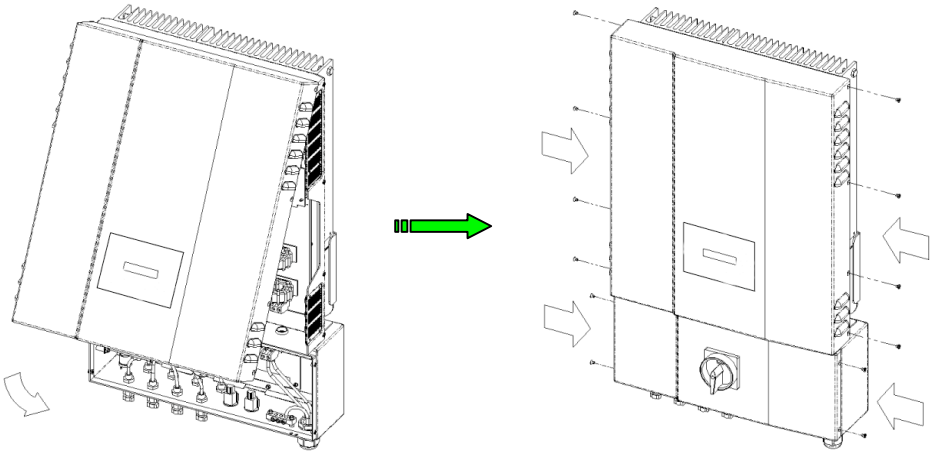


Fig 5.4.2.2.5 Fasten the screws of cover of the inverter first and the wiring box then

1. Turn off all DC/AC disconnect switch and breakers.
2. Remove the front cover of the wiring box by following the steps described in section 2.3.
3. Remove the cover plate used to cover the through holes of the wires and put it back to its original place as shown in the figure 5.4.2.2.1.
4. Remove the cover of the inverter and then hung it on the mounting bracket as shown in the figure 5.4.2.2.2.
5. Tighten the screws and nuts with a torque of 1.7Nm (15.6 in-lb) when performing the following items 6, 7 and 8.
6. Fasten the original 2 screws by a cross driver and the 2 nuts by a 7-mm wrench as shown in the figure 5.4.2.2.3.
7. If it is originally negative ground, then connect the red DC wire to the terminal labeled DCIN+ and connect the black DC wire to the terminal labeled DCIN- as shown in the figure 2.3.2.1.1. If it is a positive ground system, then connect the red DC wire to the DCIN- terminal and connect the black DC wire to the DCIN+ terminal as shown in the figure 2.3.2.2.1. Please refer to the section 2.3.2 for further details.
8. For the AC wire connections, the brown Vac wire shall be connected to the terminal labeled ACIN_L1, the blue Vac wire must be connected to the ACIN_L2 terminal as shown in the figure 5.4.2.2.4.
9. To connect the communication cable.
10. Put the covers of the inverter and wiring box back and fasten the screws as shown in the figure 5.4.2.2.5.
11. Turn ON the DC/AC disconnect switch and breakers.

WARNING!

PV arrays are always energized when exposed to light therefore hazardous voltage is still present on the terminal blocks and the PV string fuse holders even the DC/AC disconnect switch is switched OFF. Please cover the PV arrays with opaque (dark) materials during the inverter removal and absence until the inverter is hooked back and reconnected.

WARNING!

Hazardous voltage is still present on the device after disconnection of all PV DC inputs. Allow 5 minutes for the inverter to discharge the energy stored in capacitors completely.

WARNING!

Must confirm that all DC and AC circuit breakers are turned off for at least five (5) minutes before opening the front covers of the inverter and the wiring box and disconnect the DC and AC wires between them. The wires been disconnected must be wrapped with an insulated material to prevent staff from the electrical shock.

WARNING!

After the inverter is removed from the mounting bracket, the through holes of the wires on top of the wiring box must be covered with the cover plate that is attached on top of the wiring box to prevent the box from the water drops causing current leakages.

WARNING!

Not to keep any spare parts inside the wiring box.

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Uab Carlo Gavazzi Industri Kaunas
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